WEALTH & ASSET MANAGEMENT

THE CAPCO INSTITUTE

JOURNAL OF FINANCIAL TRANSFORMATION

RECIPIENT OF THE APEX AWARD FOR PUBLICATION EXCELLENCE

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DEAR READER,

Welcome to edition 51 of the Capco Institute Journal of Financial Transformation.

The global wealth and asset management industry faces clear challenges, and a growing call for innovation and transformation. Increased competition, generational shifts in client demographics, and growing geopolitical uncertainty, mean that the sector needs to focus on the new technologies and practices that will position for success, at speed.

There is no doubt that technology will be at the forefront of a responsive and effective wealth and asset management sector in 2020 and beyond. The shift to digitization, in particular, will see the speeding up of regulatory protocols, customer knowledge building, and the onboarding process, all of which will vastly improve the client experience.

This edition of the Journal will focus closely on such digital disruption and evolving technological innovation. You will also find papers that examine human capital practices and new ways of working, regulatory trends, and what sustainability and responsible investment can look like via environmental, social and corporate governance.

As ever, I hope you find the latest edition of the Capco Journal to be engaging and informative. We have contributions from a range of world-class experts across industry and academia, including renowned Nobel Laureate, Robert C. Merton. We continue to strive to include the very best expertise, independent thinking and strategic insight for a future-focused financial services sector.

Thank you to all our contributors and thank you for reading.

Lance Levy, **Capco CEO**

INVESTMENTS

SeLFIES: A NEW PENSION BOND AND CURRENCY FOR RETIREMENT

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ABSTRACT

There is a looming retirement crisis, as individuals are increasingly being asked to take responsibility for their own retirement planning and a majority of these individuals are financially unsophisticated. They cannot perform basic compounding calculations and do not understand the impact of inflation, both critical aspects of retirement planning. Yet, these individuals are being tasked with the responsibility for three complex, interconnected decisions: how much to save, how to invest (with many additional decisions), and how to decumulate one's portfolio at retirement.

Compounding these challenges, current financial instruments and products (e.g. T-Bills, TIPs, or Target Date Funds) are risky because they focus on the wrong goal – wealth at retirement, as opposed to how much retirement income can be guaranteed to support pre-retirement standard-of-living. Moreover, annuities are complex, costly, and illiquid and seldom used. Without financial innovation and a change in the metric for measuring retirement success, many individuals will retire poor – a financially and socially undesirable outcome for any country. This paper presents an easy, quick and efficient solution for countries to address all these challenges and improve retirement security by creating and issuing an innovative new bond – SeLFIES (Standard-of-Living indexed, Forward-starting, Income-only Securities). The SeLFIES bond is a single, liquid, low-cost, low-risk instrument, easy-to-understand for even the most financially unsophisticated individual, because it embeds accumulation, decumulation, compounding and inflation-adjustments. SeLFIES is good for governments too, as the bond lowers the risk of individuals retiring poor, improves balance sheet management, and funds infrastructure. The paper also discusses key design aspects of SeLFIES to show how they can ensure longevity risk protection and hedge standard-of-living risk, a key unmanaged risk globally today. Additionally, the paper concludes by demonstrating the universality of the SeLFIES design as well as by showing how it serves a useful purpose by becoming the "currency of retirement."

1. THE GLOBAL RETIREMENT CHALLENGE

The traditional three pillars of retirement security – state-provided pay-as-you-go (PAYG) social security (SS), employer-provided defined benefits (DBs) or defined contributions (DCs), and private DC savings – are teetering on the brink of trouble for a number of similar reasons. Very simply, these systems have been either underfunded (or have weak funding mechanisms) or impacted by sub-optimal investment decisions (i.e., mismatched assets to liabilities or use of incorrect financial instruments as the "safe" asset). Individuals will probably experience one or more of the following bad options: (a) retire poor, (b) have to postpone retirement, and (c)

work part-time in retirement (to generate income). Regardless, without some major improvements in retirement systems, it is highly likely that many individuals globally will still have to be bailed out by governments. This additional burden to governments would come at an inopportune time as debt-to-GDP levels are high and many economies are experiencing slow to moderate growth. Countries as diverse as Brazil and France have already made pension reform a key topic to address in order to change that trajectory.

The causes of this looming crisis are multi-faceted [Muralidhar (2018a)]. In this paper, we will focus our attention solely on improving the environment for investing in DC plans because

governments and employers want to limit their risk exposure to DB plans and would prefer to move new entrants to DC plans. The PAYG SS DB and employer DB systems are typically underfunded – i.e., the accumulation, if any, is insufficient for the retirement promises made. In the case of SS, these DB schemes were (largely) funded through the PAYG mechanism, whereby the young are taxed to pay off the old. As Modigliani and Muralidhar (2004) demonstrated, this method of funding SS puts the scheme in jeopardy as PAYG contributions have a high degree of sensitivity to changes in demographics or productivity. These factors have negatively impacted SS systems globally and will continue to do so for the foreseeable future. Given the widespread interest in the role of a public pension system, Merton (1983) proposed the creation of an innovative, mandatory, fully-funded public DC system, but different from traditional models considered at that time (and probably since). Modigliani and Muralidhar (2004) recommend converting PAYG systems to partially funded systems, and intelligent investment of assets (i.e., tied to benefits promised and what is feasible in markets). Both recommendations were ignored and some countries like Chile privatized SS, moving individuals into a traditional DC scheme. As the first generation of participants approach retirement, many of these countries are realizing that current DC schemes do not provide adequate and/or secure retirement incomes, leading to social unrest, just as Modigliani and Muralidhar (2004) had warned.

Employer-based DB plans have also suffered badly, especially with the bursting of the dotcom technology bubble in 2000-2 and the Great Financial Crisis (GFC) in 2008. The average funded status – or assets divided by liabilities at market prices – of these plans, in most countries is now below 100 percent, and some countries are considering reductions in pensions, leading to protests [Cumbo and Wigglesworth (2019)]. Pension funds are unlikely to achieve full funding anytime soon because the sponsors cannot contribute to their pensions (because of the tough economic environment), and expectations of future asset returns are weak [Aubry et al. (2018)]. In some part, the funding difficulties in DB plans was caused by insufficient contributions, poor investment approaches that did not try to match assets to liabilities (e.g., the improper application of Modern Portfolio Theory or MPT as noted in Muralidhar 2019b, or mispricing of risk as noted in Merton 2007), and our inability to correctly forecast future returns. At least with DB plans, there is an inter- and intra-generational sharing of risks, along with a backstop through a sponsor, so asset-liability mismatches and low funded status do not affect the current retiree generation entirely. But it does affect future generations and the sponsor who may have to bear an undue burden.

Increasingly, companies and government entities are no longer providing DB plans to new entrants (and in some cases to existing participants) and are transferring the entire retirement risk to the individual via DC plans (or to private savings, which have the same risk profile as a DC plan). There are many issues with transferring retirement planning decisions to individuals [Muralidhar (2018a)] beyond the fact that they are largely financially unsophisticated [Klapper et al. (2015)]. First, many are not saving enough, i.e., they are grossly underestimating how much they need for retirement [Davidson (2015)]. Second, there is insufficient coverage of individuals [GAO (2015)] – i.e., people either not being offered a plan or being offered one and not participating. Third, and the biggest issue, even for the sophisticated investor let alone unsophisticated participants, is that many are investing their assets poorly to achieve their goals. This is caused by both the shortcomings in the theory behind investing for retirement, and the lack of basic financial knowledge – the core focus of this paper.

People prefer pensions that provide retirement benefit payments for life and that they do not outlive their assets. A commonly-accepted retirement goal for a healthy pension is for it to sustain the relatively higher standard-of-living of the latter part of one's working life throughout retirement. Instead, globally, individuals are being made to take greater responsibility for their own retirement and take haircuts in post-retirement standard-of-living, as employer DB and government pension plans are either capped at levels well below a good retirement or completely replaced by DC plans. Our proposal to create a new financial instrument – SeLFIES (Standard-of-Living, Forward-starting, Income-only Securities) – is designed specifically to address the challenges of this new responsibility faced by working and middle-class individuals worldwide, the majority of whom are totally unprepared to do so, and do not have access to good quality financial advice.

2. THE DC RETIREMENT CHALLENGE

The complexity of retirement planning leaves many confused about what constitutes adequate savings. Available information is overwhelming and there is no robust, uniform method to calculate "replacement rates" (i.e., percent of salary replaced in retirement). Current 401(K) and other financial reports inform investors about accumulated wealth (and historical returns of various instruments) but provide no information about the likely guaranteed retirement income that the accumulated wealth would achieve. The recent passing of the SECURE Act in the United States will require reporting of potential retirement income, but the law does not specify a uniform method to do so, leading to a high degree of variability in how

firms will report to individuals. Further, the U.S. Department of Labor (DoL) in the U.S. provides safe harbor guidance about appropriate investments, but investing in existing assets is risky relative to the retirement objective, because these assets do not provide a simple, low-cost cash flow hedge against desired retirement income (as will be shown below). Even a portfolio of traditional, "safe" government securities, unless heavily financially engineered (at some cost), is risky because of the cash flow (and potential maturity) mismatch between traditional bonds and desired retirement income stream. Finally, annuities could provide desired retirement cash flows, but most investors do not buy annuities because they can be complex, illiquid, and opaque, and investors fear they cannot bequeath these assets to their heirs if they buy annuities. In this section, we examine these issues in more detail to make the case for a new instrument that addresses the challenges posed by current T-Bills, treasury inflation protected securities (TIPs), target date funds (TDFs), or annuities.

2.1 The retirement income goal

What is the desired retirement income stream or cash flow of an individual? Assume a 25-year-old in 2020. They would typically plan to work for 40 years and would like to receive say U.S.$50,000 real/year for 20 years in retirement (assuming death is known). They would like this real stream to be indexed to an appropriate nominal adjustment to allow them to retain their pre-retirement standard-of-living. Figure 1, which plots the likely real retirement cash flow of this 25-year-old, shows that the goal requires no cash flows for 40 years (through 2060) and then a steady stream of real income for 20 years. This is very different from a single wealth

number that individuals are asked to think about as their "retirement number." This is a critical point as the traditional approach to the retirement challenge has been entirely wealth focused; however, what Figure 1 demonstrates very clearly is that retirement is all about guaranteeing that individuals receive a target, steady level of real retirement income. This simple change in goal has enormous implications for what can be considered the safe asset. Merton (2007) had raised a cautionary flag about DC investment practice in the early 2000s that persists today – the excessive focus on wealth or size of assets in retirement accounts as opposed to the level of retirement income, the more appropriate measure of retirement welfare.

2.2 Challenges with T-bills

Merton (2007) warns that the "risk-free" asset in MPT and most DC plans is quite risky in terms of annuity income units [Merton (2010, 2012, 2013, 2014a, 2014b)]. Annuity income units (AIU) measures the level of steady income one can earn through an annuity at any given time based on prevailing interest rates. Merton (2014a) argues that the goal of retirement investors should not be to maximize wealth, but rather to maximize funded status (i.e., assets divided by liabilities), as this effectively puts the spotlight back on retirement income as the goal of investment decisions. The reason for raising this point was to show how assets regarded as safe in the traditional MPT context – T-Bills – are actually risky from a DC retirement context (or when measured from the perspective of AIU). While T-Bills preserve principal (assuming they are default-free) as shown in the left-hand panel in Figure 2, they provide no guarantee of retirement income because of the cash flow mismatch to Figure 1, as well as because the

Figure 1: Projected real retirement cash flows of a 25-year-old in 2020 (work 40 years; live for 20 years)
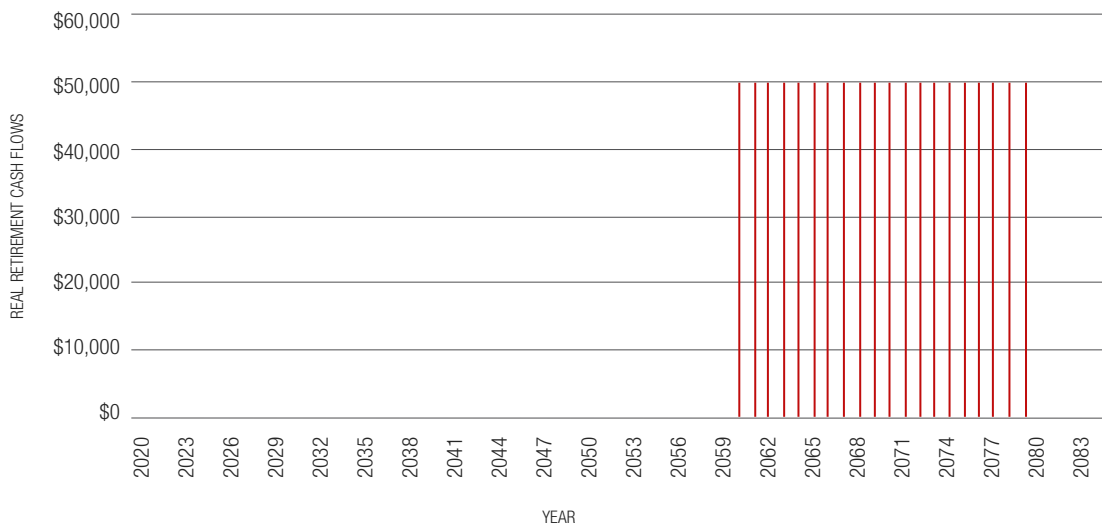
Figure 2: Measuring risk of T-bills from an absolute and annuity income unit perspective

U.S.$

ANNUITY INCOME UNIT
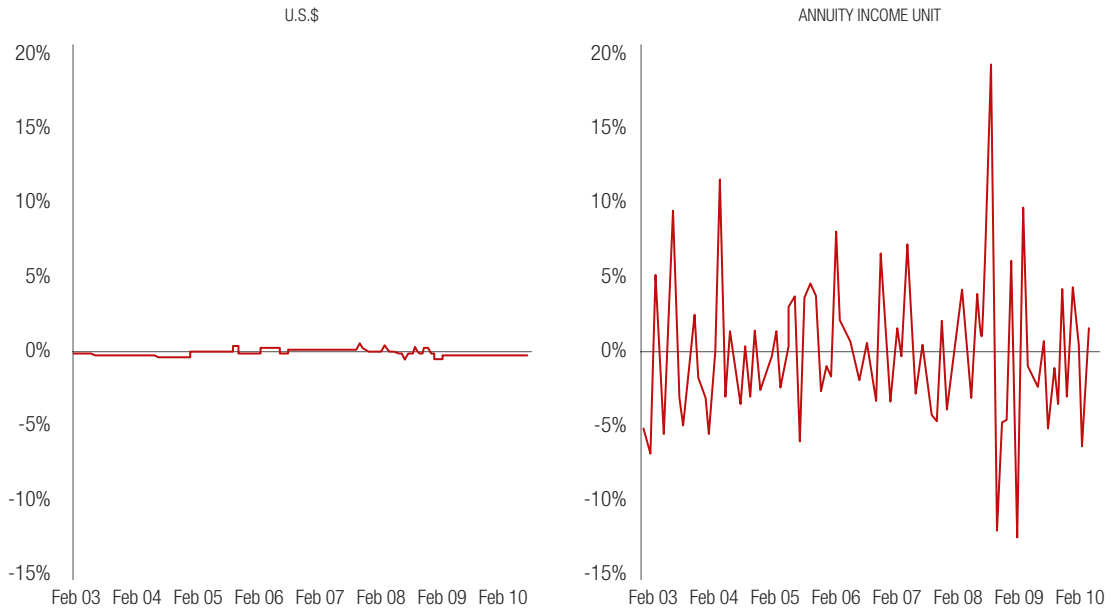
Source Merton (2014)

Figure 3: Cash flows of 30 year TIPs relative to retirement date (2060) and death (2080)
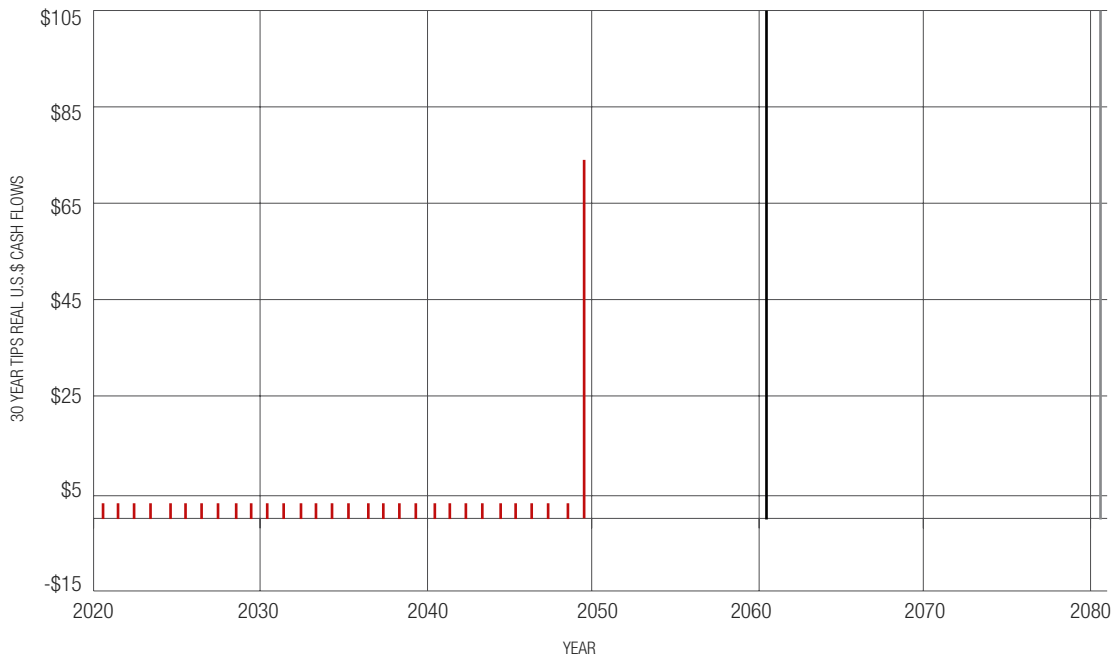
focus (wealth preservation) is entirely different from what is needed in DC plans (steady retirement income). This is shown in the right-hand panel in Figure 2 as the relative volatility of a T-bill (relative to desired cash flow in Figure 1 or AlU) is clearly non-trivial and non-zero or low. Hence, "safe" assets in current DC plans globally are risky from a retirement income perspective and this puts retirees at risk of poor retirement outcomes.

2.3 Challenges with TIPs

One might argue that T-bills are not the safe asset in retirement but rather that investors should invest in TIPs instead as they offer a longer maturity and protection against inflation. However, this comment is easily disproved from two critical perspectives – they engender a cash flow mismatch and they offer the wrong nominal protection. Consider a very simple 30-year TIPS bond that pays a U.S.$3 real coupon/year and repays the U.S.$100 principal at maturity. The real cash flows of this bond are plotted in Figure 3. This bond: (a) pays coupons when the individual does not need it – i.e., the payments are received pre-retirement (the retirement date denoted by solid green line at 2060), thereby requiring additional transactions to transform these coupons into the cash flow stream required in Figure 1; (b) pays a stub principal in 2050, which is also not needed – the cash flow stream required is a steady stream in Figure 1, and 2050 is short of the retirement date (2060); and (c) is linked to consumer price inflation, whereas the true risk in retirement is standard-of-living risk. As ING (2019) notes, "About half of retirees in Europe tell us that they don't continue to enjoy the same standard-of-living they had when they were working." This issue of appropriate indexation of pensions to standard-of-living had been raised by Merton (1983), but has been largely ignored and continues to be a challenge globally.

Very simply, converting the cash flows from the TIPS in Figure 3 to the desired cash flows in Figure 1 will require at least 61 additional, cost-inefficient transactions (two per year for each semi-annual coupon, and one for the principal payment, and that too of very small size for the average individual). Hence, TIPS cannot be considered the safe asset for retirement.

2.4 Challenges with TDFs

Moreover, Merton (2007) demonstrates that investment approaches adopted by many DC funds and retail investors, especially target date funds (TDFs), are actually inefficient and risky approaches from an individual retirement income

perspective [see also Bodie et al. (2010)].[1] Muralidhar (2011) had raised a similar cautionary flag. Very simply, these products rotate the asset allocation from stocks (risky from a DC retirement perspective) to bonds (also risky as shown in Figures 2 and 3), as one ages, with no focus on the retirement income target. As Kóbor and Muralidhar (2018) demonstrate, a TDF provides a highly variable retirement income because the glide path is independent of the target retirement income (e.g., Figure 1), and the achievable target retirement income is continuously impacted by stock market performance and changes in interest rates. Further, the glidepath is independent of the individual's personal situation (e.g., gender, current wealth, risk tolerance). As Merton (2014a) notes, investing an entire cohort (that was born in the same year) in the same TDF is like buying the average shoe size for a room of people – highly unlikely to be ideal for anyone. Moreover, two individuals with identical saving/investing characteristics, retiring a few years apart can achieve wildly different retirement incomes, as shown in Kóbor and Muralidhar (2018). As a result, even though the U.S. DoL provides safe harbor protection for TDFs, they are risky instruments. Providing safe harbor protection to these products raises the likelihood that governments will have to bail out participants who receive low to poor pensions from their DC plans.

2.5 Challenges with annuities

Muralidhar (2019c) summarizes the challenges with annuities, which continue despite the fact that thirty years ago Prof. Franco Modigliani noted (in his 1986 Nobel speech) that annuities are under-utilized (termed the "annuity puzzle"). Ostensibly, annuities could provide the cash flow required in Figure 1 and could be the "safe" asset, but this is useless if individuals do not purchase them. Salisbury and Nenkov (2016) note that, "In June 2015, U.S. retirement assets totaled U.S.$24.8 trillion, with only 8.6 percent of assets held as annuity reserves." Many explanations have been offered for this annuity puzzle, including adverse selection (i.e., only those who know they will live long want to buy annuities), bequest motive [Lockwood (2012)], complexity/inflexibility of contracts [Mitchell et al. (2000)], mortality salience [Salisbury and Nenkov (2016)], etc. Beshears et al. (2012), using survey data, note that even when the annuity option is the default in DB schemes, people opt for the lump-sum option, because while they want lifetime income, they want flexibility in their spending, and also worry about the credit risk of the plan sponsor.

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[1] Target Date Funds are portfolios of stocks and bonds, where the allocation to bonds increase as the investor ages. They are normally referred to by a retirement date (e.g., 2050), and have a starting allocation to stocks and bonds and then a glide path, which adjusts this allocation based on the calendar year.

In summary, existing instruments and products are risky, illiquid, costly, potentially complex, and clearly insufficient to address the looming global retirement challenge, especially for a largely financially unsophisticated population.

3. THE SeLFIES DESIGN

Muralidhar (2015) and Muralidhar et al. (2016) identify a new instrument that they call "bonds for financial security" (or BFFS), with a real cash flow stream identical to the one shown in Figure 4. SeLFIES go one step further and incorporate the innovation of Merton (1983); namely, hedging standard-of-living risk and issuance/innovation by governments to complete markets. Since the safe asset in DC plans (focused on target retirement income) does not exist, SeLFIES are designed to mimic the desired pension payments in Figure 1. Governments can create and issue this new low-cost, liquid, and "safe" ultra-long bond instrument and they can be purchased directly by any individual (to create a type of "individual DB") or institution. SeLFIES start paying investors upon retirement, and pay real coupons-only (e.g., U.S.$5), indexed to aggregate per capita consumption (to hedge standard-of-living risk), for a term equal to a period linked to the average life expectancy at retirement (e.g., 20 years). Figure 4 shows a very simple cash flow chart of SeLFIES that start paying in 2060 for 20 years. The sharp negative bar in 2020 is the potential payment made today to acquire the desired retirement cash

flow stream (i.e., the price of SeLFIES). SeLFIES are a purely market-based instrument (as discussed later), and the market forces at the time of issuance will determine its issue price. Market forces will subsequently determine its secondary market price as well. Most importantly, instead of current bonds that index solely to inflation, SeLFIES cover both the risk of inflation and standard-of-living improvements by indexing to per-capita consumption. A per-capita-consumption-indexed instrument will ensure that retirees preserve their standard-of-living, especially since retirement planning is potentially a 60-year process.

SeLFIES are designed to pay people when they need it and how they need it, and greatly simplify retirement investing. A 55-year-old in 2020 would buy the 2030 bond, which would start paying coupons at age 65, and keep paying, for say 20 years, through 2050. A 64-year-old in 2020 would buy the 2021 bond, so it caters to all individuals independent of retirement date. For example, if our 25-year-old in 2020 wants to guarantee U.S.$50,000 annually, risk-free for 20 years in retirement as in Figure 1, to maintain their current standard-of-living, they would need to buy 10,000 SeLFIES (U.S.$50,000 divided by U.S.$5) over their working life. The design of SeLFIES was based entirely on Figure 1 – the desired retirement income. More importantly, this statement of a retirement goal is extremely simple and easy for anyone to understand. Periodic DC plan statements can easily inform

Figure 4: Real cash flows of 2060 SeLFIES: Pay U.S.$5 real from retirement date (2060) for 20 years (2080)
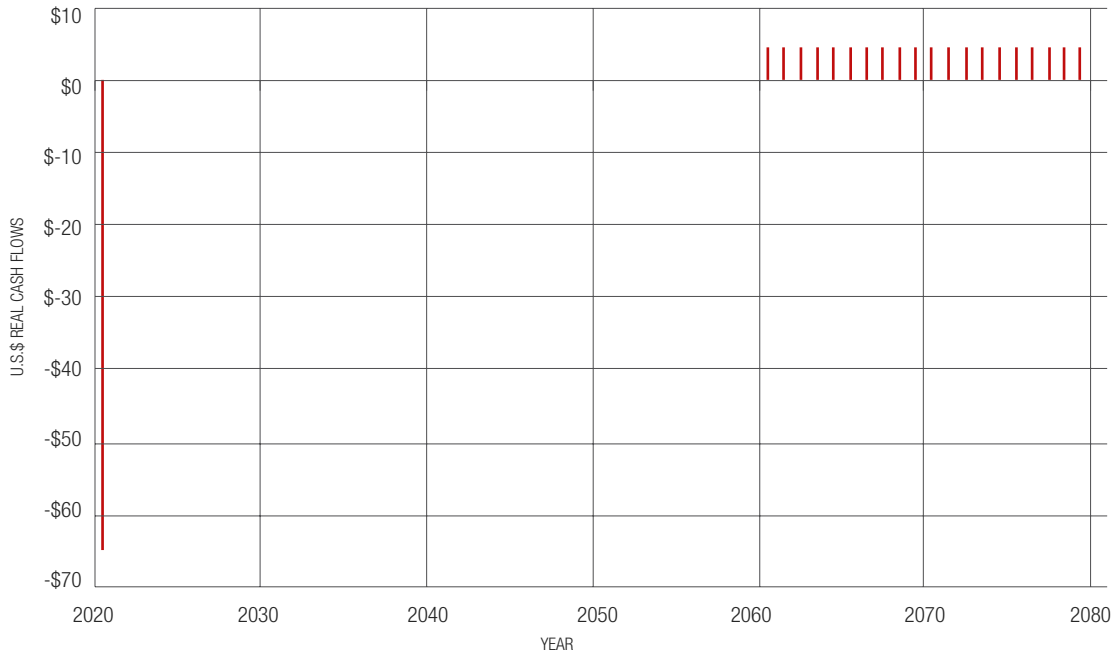
individuals as to how much retirement income they can expect to receive based on current holdings of SeLFIES (and conversion of other assets into SeLFIES-equivalents), relative to the target (10,000), thereby allowing easy course corrections prior to retirement.

SeLFIES require only the most basic information and offer choices for buyers of any educational strata. The two required inputs are anticipated date of retirement (i.e., the SeLFIES payment start date) and target income goal for a good retirement, which determines the number of SeLFIES needed to reach this goal. If they change their retirement date, they could easily sell/buy the relevant SeLFIES with little effort and cost. The complex decisions of how much to save, how to invest, and how to drawdown are simply folded into an easy calculation of how many bonds to buy. This is particularly valuable for financially unsophisticated investors as the bond also embeds compounding and inflation adjustments [Muralidhar (2019a)]. In addition to being simple, liquid, easily traded at very low cost, and with low credit risk, SeLFIES can be bequeathed to heirs (who can then either continue to collect the coupons or sell the SeLFIES in the secondary market). In a way, one can see SeLFIES as a "simplified term annuity in a bond". Even the most financially illiterate individual can be self-reliant with respect to retirement planning.

Since SeLFIES payments are indexed to per capita consumption, they protect against future inflation and standard-of-living uncertainties. The buyer must simply set their goal at the level they currently live on, a number they already know and relates to their everyday decisions. Since SeLFIES do not make payments until the retirement date, the buyer does not need to make any further transactions or decisions to reinvest coupon or principal payments during the entire accumulation period. One transaction, one time, for each SeLFIES purchased minimizes costs, decision effort, and errors.

To be clear, SeLFIES cannot address the issue of insufficient savings that has afflicted many pension systems globally. If people do not buy enough SeLFIES, they will not have a good retirement, and SeLFIES by themselves can do nothing directly to change saving rates. It can provide a better understanding/ knowledge to people on how they are doing in terms of saving for retirement (i.e., the funded ratio) because they understand income comparisons better than wealth-to-income comparisons. But just knowing they do not have enough for retirement will not assure that they will change their behavior to save more. In addition, saving without taking any risk with it will make it very hard for people to get to a good retirement

because the amount to be saved is enormous compared to traditional saving practices. Finally, as SeLFIES makes clear, if one just saves and buys appropriately designed income instruments it does assure retirement success; savings that go into U.S. Treasury long term bonds do not ensure a good retirement because if they are nominal bonds they have inflation risk and if they are TIPS there is standard-of-living growth risk. In sum, if people do not save enough, no financial instrument is going to ensure they have a good retirement.

4. DESIGN FEATURES AND IMPACT ON IMPROVING THE MARKET FOR RETIREMENT

4.1 Issuance and trading

The key issue to note is that SeLFIES will not be subsidized. They will be pure market-based instruments, traded and issued like any other government bond in any country. Many countries like the U.S., Japan, and even Brazil have "Treasury Direct" facilities that allow individuals to purchase government debt directly from Treasury, thereby reducing transactions costs. SeLFIES will be issued through the traditional auction process and traded in the aftermarket. The primary participants in these auction and secondary markets are large institutions like insurance companies, pension funds, and asset managers, and this current market-based process ensures effective price discovery. Thereafter, the market-based prices can be used as the basis for Treasury Direct, which is a low-cost channel for individuals. This transparent price discovery process ensures that the prices at which SeLFIES are sold to individuals directly are not subsidized or have to be rationed. Adopting current bond issuance processes for SeLFIES ensures efficiency.

4.2 Level of real coupon and indexation choices

Each country will need to decide on the appropriate level of real coupon that works for their target market. For example, Merton and Muralidhar (2017a and 2017b) argue for an annual U.S.\$5 real coupon for the U.S., Merton et al. (2019) suggest an annual €5 real coupon for Portugal (and the E.U.), and Merton, et al. (2020) suggest a BRL 0.04/month for Brazil, because the average income and the target population for Brazilian SeLFIES would require such a coupon.

Similarly, the appropriate index for nominal adjustments might differ by country as well. For example, for the U.S., Brazil, Portugal etc., recommendations have been made to tie SeLFIES to per-capita consumption to hedge standard-of-living risk in retirement. However, in Uruguay, the law requires that pensions be tied to growth in real wages, and hence if SeLFIES were issued it may make sense to issue bonds indexed to wages for legal reasons, even though it may not provide ideal

protection against standard-of-living adjustments.[2] Among the least ideal of the nominal indexation choices, countries with extensive issuance of standard inflation-linked securities may consider SeLFIES linked to some traditional inflation index as a first step to creating the "ideal SeLFIES" (because inflation indexation does not hedge changes in standard-of-living).

4.3 Longevity risk management

For SeLFIES to provide the same pattern of payments as a pension, it must address the lifetime payment feature and protect against longevity risk as well [Merton and Muralidhar (2019)]. Working and middle class citizens who reach retirement age [e.g., age 65] are a diverse group: some have economic responsibilities for several people and need to bequeath money to take care of their heirs. Others have no one else for whom they are responsible and, hence, have no motive to bequeath assets. For the latter, the annuity or a life pension is ideal because they maximize the benefit payment with no risk of running out and leave no "wasted" assets when they no longer need money. When the person reaches retirement, they have the best information as to their health (i.e., personal life expectancy versus the population), they will know who they are responsible for besides themselves, and what other assets and commitments they have. With this information, they are best positioned to make an informed decision on how much to annuitize or not, and thereby implement a personalized plan for de-accumulation.

SeLFIES do not directly provide an embedded annuity feature of payments for life but it does contribute to longevity risk protection for those who do eventually select full or partial annuitization at retirement, while providing decision flexibility to those who do not want to annuitize. The ideal design calls for the number of years of payout to equal a period somewhat longer than the life expectancy for the cohort population at retirement. For example, if life expectancy at age 65 is 20 years (age 85), then the specified-payment period on the SeLFIES might be set at 22 years (age 87). A well-run insurance company should be willing to exchange a life annuity with the same U.S.$5 indexed real payment for the specified term of U.S.$5 real payments on the SeLFIES. If so, then the retiree can simply exchange their SeLFIES for a life annuity with no extra payment and no reduction of retirement income level. Those retirees in different circumstances can adjust accordingly and potentially enjoy the built-in de-accumulation payments in SeLFIES with no further transactions.

Why would a well-diversified insurance company be willing to exchange one SeLFIES for a life annuity that pays U.S.$5 real/year till death (ignoring profit and cost considerations)? If the insurance company has insured a large group of diverse individuals in one cohort, then its net longevity realization should be close to the economy average of that cohort, with relatively low risk. SeLFIES delivered in the exchange is the perfect hedging instrument for the insurance company's aggregate liabilities of this cohort. The somewhat longer payments on the SeLFIES than expected (22 versus 20 years) provide compensation to the insurance company for cost and profit. It becomes more interesting if the insurance company is also diversified across multiple cohorts. Hence, SeLFIES with a maturity a touch above the economy average could facilitate a much more efficient annuity market to ensure individual longevity risk mitigation. Both insurance companies and pension funds would be natural institutional buyers of large denomination SeLFIES and create price discovery through their auction bids.

> " *SeLFIES would be the liquid, easy-to-understand, low-cost, and safe asset for retirement, because they embed accumulation, decumulation, compounding, and inflation-adjustments.* "

Some like Prof. Thaler have suggested allowing individuals to buy annuities from U.S. Social Security.[3] Because social security is a PAYG system, there is no price currently for buying one social security "unit". Because social security, unlike an annuity or SeLFIES, does not have a specified payment stream, but instead depends on what the U.S. Congress approves, there is the political risk of lobbying for increases in the benefit. And since social security is for life, the value of the benefit depends on the age and health of the buyer, as with buying annuities. However, since everyone is forced into the social security system, there is no need to adjust the price for selection bias on life expectancy, which (has to be done with purchase of immediate annuity and) would have to be done if one could voluntarily buy social security. SeLFIES could also

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serve a key role for such as a proposal as it will offer a liquid benchmark price for any real annuity offering, including one from Social Security.

4.4 Using SeLFIES to create better investment products

Currently, products like target date funds (TDFs), on which the U.S. DoL has conferred "safe harbor" protections, do not offer individuals any guarantee of target retirement wealth or income, as shown in Section 1. Individuals defaulted into TDFs, especially with auto-enroll and auto-escalate programs, could easily reach retirement with extremely inadequate, retirement income (especially with low interest rates and statements focused on the level of assets). SeLFIES greatly enhance innovation by creating better guaranteed retirement income products or what are referred to as "target income funds" (TIFs). Those seeking no risk, low-cost income instruments can invest all their savings in SeLFIES. For more risk-taking retirement funding strategies that cater to individuals who cannot/do not save enough or have a higher risk tolerance, a well-run asset management company can use a dynamic allocation strategy between risky assets and SeLFIES, with SeLFIES as the "risk-free" asset that locks-in guaranteed retirement income – a highly desirable result [see Levitan and Merton (2015), Kóbor and Muralidhar (2019)].

4.5 SeLFIES – a good deal for governments

SeLFIES are a good deal for governments, too. In fact, governments are the biggest beneficiaries. SeLFIES not only improve retirement outcomes for all citizens saving for retirement, but also have spill-over benefits. As a result, SeLFIES have been proposed (in chronological order) for regions/countries as diverse as Europe [Merton and Muralidhar (2016)], U.S. [Merton and Muralidhar (2017a, b)], France [Merton et al. (2017)], India [Merton and Muralidhar (2018a)], Australia [Merton and Muralidhar (2018b)], Japan [Merton and Muralidhar (2018c)], Turkey [Merton and Muralidhar (2018d)], Colombia [Garcia (2018)], Korea [Merton (2018)], Spain [Merton et al. (2018)], Portugal [Merton et al. (2019)], and Brazil [Merton et al. (2020)], among others.

First, individuals investing in current Treasury bills and bonds are taking risk relative to their retirement income goals (Section 1) and if they retire poor, then the government will have to bail them out. As a result, even swapping current bonds for SeLFIES can lower the risk of the retirement system to the benefit of the government. Second, cash flows from SeLFIES (Figure 3) reflect synergistic cash flows for infrastructure spending: namely, large cash flows upfront for capital expenditure, followed by delayed, inflation-indexed

revenues, once projects are online. Third, SeLFIES linked to per-capita consumption give governments a natural hedge of revenues against the bonds, especially if they have a value-added tax (VAT) as in Europe or goods and services tax (GST) as in India and Brazil. Fourth, it allows developing countries to improve their domestic investor base for their debt, thereby insulating countries from changes in global risk aversion (and fleeing foreign investors in times of stress) and "de-dollarizing" their debt. It also leverages the existing effective bond issuance and trading infrastructure created by Treasuries and Ministries of Finance, thereby requiring minimal effort for their creation. Fifth, issuing SeLFIES will also allow for the development of better pension products by innovative asset managers, insurance companies, banks, and pension funds, since they would invest in such bonds, allowing them to hedge their liabilities from annuities or life income instruments they issued.

SeLFIES as the safe asset also allows for robust risk-based regulation [Muralidhar (2018a)]. This way, the government not only helps to complete financial markets, but also improves overall sovereign debt management operations (through better hedging of revenues and bond payments, and potentially extending duration) and lowers the risk of retirement poverty.

SeLFIES can also be issued by entities other than the federal government. For example, many states in the U.S. (California, Connecticut, Illinois, Massachusetts, Maryland, and New Jersey) are launching pension plans for uncovered workers – these states and municipalities could easily issue SeLFIES as part of their debt refunding or expansion programs. Federal and state tax exemptions could make issuance for retirement funding in personal taxable accounts. The same is potentially true in countries like India and Brazil, which have large state governments that have autonomy to issue their own debt. There are other alternative, albeit lower credit, private issuers, but the overriding benefit of government issuance of SeLFIES is it mitigates credit risk.

5. SeLFIES – AS A CURRENCY FOR RETIREMENT

One of the challenges in preparing for retirement and anticipating likely pension outcomes is that we do not have a "currency for retirement"; namely a simple way to gauge the impact of changes in current economic policy on future retirement outcomes. One of the clearest indications of the unintended consequences of loose monetary policy in the 2000 – 2020 period has been the secular decline in funded status of DB pension funds [Cumbo and Wigglesworth (2019)].

5.1 Examining the impact of economic policies

Merton and Muralidhar (2015) show that central banks lowered rates in response to the great financial crisis (GFC) in the widely believed hope that these actions would stimulate consumption and investment through the "wealth effect". However, lowering interest rates led to big declines in the funded status of pensions (as liability values rose more than asset values). This decline in "relative wealth" caused a number of distortions not anticipated in traditional theory, especially in a population that is aging. Employers (both government and corporate) were forced to contribute to their pension funds and older citizens and retirees struggled, muting the impact on consumption, investment, and government spending (which might have been a more effective tool had these resources not been diverted to support pensions). Even the 2018 U.S. tax reform resulted in an unintended outcome, in this liability-centric world – corporations had greater incentive to contribute to their pension funds, instead of paying dividends or investing in new capital, thereby resulting in fiscal policy potentially having limited impact on future growth.

However, had SeLFIES existed, analysts would have been able to see the immediate impact on retirement security. For example, in 2019 (and again in 2020), the U.S. Federal Reserve decided to embark on a policy of lowering rates – which had an immediate impact on long term rates. If SeLFIES had existed, the immediate impact would have likely been a dramatic increase in the price of SeLFIES (since these are long duration instruments), immediately alerting individuals that planning for retirement just became a lot more expensive and would require additional savings relative to levels previously projected prior to rates being cut. This role as a "currency for retirement" could prove invaluable at examining the impact of a range of policy choices on retirement security well in advance of individuals reaching retirement and discovering that their savings are likely to lead to a paltry retirement income (as this is a challenge faced by Latin American countries). In addition, in countries with negative long-term interest rates, this realization might force a different choice of policies that do not necessarily trade off retirement security for current growth.

5.2 Alternative sources of funding retirement

One of the challenges with inadequate savings is that it will lead to poor retirement outcomes. As a result, other assets owned by individuals will need to be considered to bolster the retirement pot – with one asset in particular, one's house, holding potentially the greatest promise. The current instrument to convert one's home into retirement income, the reverse mortgage (RM), has not enjoyed sufficient success to make this a game changer. While there a number of changes that have been proposed to improve the RM contract [Merton (2015), Muralidhar (2018b)], at a minimum, SeLFIES will allow individuals to clearly understand how much potential retirement income (and protection of pre-retirement standard-of-living), their current assets are likely to generate. This is an additional benefit to having a "currency for retirement".

6. CONCLUSION

There is a looming retirement crisis, as individuals are increasingly being asked to take responsibility for their own retirement planning and a majority of these individuals are financially unsophisticated. They cannot perform basic compounding calculations and do not understand the impact of inflation, both critical aspects of retirement planning. Yet, these individuals are being tasked with the responsibility for three complex, interconnected decisions: how much to save, how to invest (with many additional decisions), and how to decumulate one's portfolio at retirement.

Compounding these challenges, current investment approaches and products (e.g. target date funds) are risky because they focus on the wrong goal — wealth at retirement — as opposed to how much retirement income can be guaranteed to support pre-retirement standard-of-living. Moreover, annuities are complex, costly, illiquid, and seldom used. Without financial innovation and a change in the metric for measuring retirement success, many individuals will retire poor — a financially and socially undesirable outcome for any country. This paper presents an easy, quick, and efficient solution for countries to address all these challenges and improve retirement security by creating and issuing an

innovative new bond — SeLFIES. The SeLFIES bond is a single, liquid, low-cost, low-risk instrument, easy-to-understand for even the most financially unsophisticated individual, because it embeds accumulation, decumulation, compounding, and inflation-adjustments. SeLFIES is good for governments too, as the bond lowers the risk of individuals retiring poor, improves balance sheet management, and funds infrastructure. The paper also discusses key design aspects of SeLFIES to show how they can ensure longevity risk protection and hedge standard-of-living risk, a key unmanaged risk globally today. Moreover, they can serve as a "currency for retirement".

SeLFIES is a win-win for all — it can greatly improve retirement funding security for citizens, provide a better cash-flow match, and fund infrastructure for the government. It also allows individuals to achieve their respective retirement goals with minimal financial sophistication at potentially low cost, high liquidity, and low risk. It allows financial institutions and insurance companies to innovate and improve their own hedging operations. SeLFIES completes the market and needs to be created. The time to act is now — the longer the delay, the higher the cost of ensuring retirement security for future generations and the burden and cost to government.

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ROBO-ADVICE AND THE FUTURE OF DELEGATED INVESTMENT

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ABSTRACT

Robo-advisors can replace financial advisors and asset managers at low costs. However, human managers and advisors will survive. This is predominantly because although robo-advisors primarily appeal to a clientele of already financially sophisticated investors, they lack some of the qualities people look for in a "money doctor", and their business models have not yet stood the test of time. While a general algorithm aversion is absent in the financial domain, even tech-savvy millennials do not particularly favor robo-advisors. As new survey data shows, investors view algorithms as an aid to human managers rather than competitors. A hybrid model with humans and robos working together, as already implemented by some financial institutions, might be the future of delegated investment.

1. INTRODUCTION

In a German savings bank, new assistant Pepper greets customers with his metallic voice. The humanoid robot stands four feet tall, can move its arms and head, and has large black eyes. It responds to simple questions and also offers customers a touch screen to navigate. While Pepper corresponds to the image that many of us have in mind when thinking about robots, his robo-colleagues working in investments look less the part. A typical robo-advisor is nothing more than an algorithm that processes data provided by customers to come up with an investment recommendation.

It is no wonder that many employees in the financial services industry perceive the digital transformation as a threat. Delegated investment is no exception, as a robo-advisor can serve many clients at a time and might put human financial advisors, as well as asset managers, out of business. In the words of practitioners "over many years, the fund industry has operated with a false sense of security, assuming that algorithms and computing power would digitize and revolutionize trading, but that the right products would ultimately be selected by humans." [Vater et al. (2017)]. In this article, I will examine to what extent these algorithms might indeed be able to replace their human counterparts.

One has to concede that the robo-advisors operating today do not literally "select" products but are programmed by humans to generate portfolio suggestions based on a number of inputs by clients. They are often restricted to a menu of ETFs or index funds, which they offer in varying compositions. However, it takes little imagination to foresee that with further progress of artificial intelligence (AI), the next generation of robo-advisors will be able to choose assets more freely, directly from the capital markets. One might further argue that robo-advisors do not actually "advise" clients, as they are limited in the ways in which they can provide explanations or react to questions. While some robos are designed to illustrate portfolio properties and to educate their clients on risks and return, they are so far unable to effectively communicate with customers or to address their individual needs.

Figure 1: Past projections and realized trajectory of the market for robo-advice (Global AUM in the robo-advisor segment)
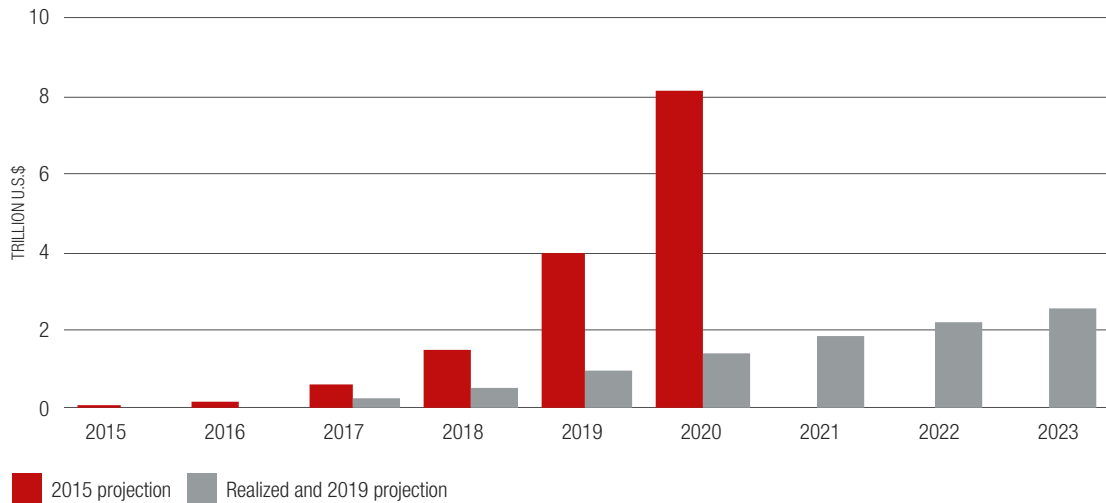
Source: Statista

Despite these current limitations, projections for market share and assets under management (AUM) for robo-advisors have been bright. Forecasts for global AUM in the year 2020 were as high as U.S.$8 trillion [Statista (2015)], or U.S.$2.2 trillion in the U.S. alone [O'Keefe (2016)]. These predictions have not been met, as global AUM in 2019 is closer to U.S.$1 trillion [Statista (2019)], with the U.S. accounting for more than half of this amount (Figure 1). Market penetration is not particularly high either, as in most countries the fraction of people using a robo-advisor is below 1 percent. Nevertheless, the segment has grown strongly and the verdict on whether robo-advisors will be successful in the long term is still pending.

Startups such as Betterment and Wealthfront (both founded in 2008) were pioneers in the market and have collected more than U.S.$10 billion each. The financial crisis initially spurred the development of investment advisory tools, as customers were looking for investment alternatives and traditional financial institutions had lost a great deal of trust. However, established players have now leapfrogged the fintech startups. Vanguard and Schwaab are currently listed as the largest robo-advisors in the world and have benefitted from their existing customer base and distribution channels. Many banks have by now introduced their own robo-advisor or are preparing to do so. However, some have also abandoned their plans (e.g., UBS and Commerzbank).

The average client holds about U.S.$20,000 with their robo-advisor, which suggests that it is indeed the broad retail market it taps into. As with any new service, most customers regard it as an addition to their existing investments and are reluctant to let the robo manage their entire financial wealth. As the AUM per customer remains rather stable, winning new customers is key to growth in the increasingly competitive market of robo-advice.

2. OPPORTUNITIES AND CHALLENGES FOR ROBO-ADVISORS IN ASSET MANAGEMENT

The market potential for robo-advisors predominantly exists due to the presence of economies of scale. A challenge for any delegated management of assets is that sufficient fees need to be generated from the offered service. For this reason, the market has been segmented for a long time, with the extensive care provided by private wealth management only available to high net worth individuals. The average retail investor has had to fall back on off-the-shelf mutual funds or to rely on a financial advisor usually paid on commission. It is well known that the latter setup creates a conflict of interest, which can lead to advisors pursuing their own incentives to the detriment of their clients.

The fixed-fee model has not gained enough traction to solve this issue, and has problems of its own. When the U.K. government banned commission-based advice in 2013, there were concerns that many people would remain unadvised. Indeed, in a consumer survey asking people how much they are willing to pay for financial advice, two-thirds responded "nothing" and a further 20 percent said "less than £100" [ABI (2010)]. Investors seem to prefer their fees to be deducted from their investments, as this way the total costs remain opaque (even though they exceed £100 for the typical investor). Despite this, in some circumstances, conflicted advice might be better than no advice at all [Chalmers and Reuter (2015)].

Robo-advisors present a solution to this dilemma, as they promise to offer affordable advice for a large number of customers. Once programmed and rolled out, the robo-advisor can be used by many customers, even at the same time. Unlike human advice, the marginal cost of an additional investor is close to zero; at least until the high acquisition costs incurred to attract new customers are taken into account.

Having said that, the costs are customer acquisitions are not insignificant, and indeed need to be taken into account. Industry experts report that the cost of attracting each new customer ranges between €500 and €1,000 within the German market [TME AG & Growth Ninjas (2018)]. Given the low fees charged by robo-advisors, typically around 0.5 percent, combined with the small portfolio sizes, around €20,000 for each customer, it can take a long time to amortize these costs. Considering the fixed costs for implementation (including regulation), it has been estimated that AUM of no less than U.S.$10 billion are needed for a robo-advisor to break even [International Banker (2019)]. Only the largest robo-advisors reach this threshold today and in fact, many robos are not as yet profitable.

Academics greeted the arrival of robo-advisors with excitement, and not just for their low costs. They are attractive from an academic perspective because they follow a passive approach using ETFs or index funds and recommend that clients invest in broadly diversified portfolios made up of multiple asset classes. This is consistent with finance research that has not found persistent outperformance from active management [Fama and French (2010)]. Instead, diversification is often described as the only "free lunch" in investments. With academic recommendations and robo-advisory practice so well aligned, it is no wonder that a finance professor is behind Germany's largest robo-advisor Scalable Capital.

Indeed, recent empirical research finds that robo-advisors are able to steer investors away from known behavioral biases, such as the disposition effect or trend chasing (D'Acunto et al., 2019). However, there are also unintended consequences, such as investors logging in and trading more frequently. The benefit of robo-advice is greatest for those adopters who hold underdiversified portfolios and who are most biased. This group is, however, the hardest to reach for robo-advisors, in particular those who do not invest in the stock market at all.

In their on-boarding, robo-advisors benefit from behavioral research on risk communication and eliciting risk preferences. Although MiFID II (Markets in Financial Instruments Directive) requires that financial institutions collect information on a client's risk preferences, most robo-advisors go beyond this requirement. They display return distributions, simulate outcomes, show alternative portfolio risk levels, and, in some cases, employ interactive tools in their risk communications. More sophisticated approaches can improve clients' risk and return assessment, as well as their confidence in the recommendation [Kaufmann et al. (2013)]. Some robo-advisors highlight volatility or other risk measures such as the value-at-risk (e.g., scalable capital).

Many robo-advisors have questionnaires regarding risk preferences to assign an appropriate portfolio. However, these questionnaires usually include few questions and the questions do not necessarily have an impact on the portfolio recommendation [Tertilt and Scholz (2018)]. Ideally, the preference elicitation relates to the interactive demonstration of portfolio properties. This means that an investor can adjust the risk level of the portfolio and watch the consequences for portfolio outcomes. Such tools can also be used in presence of a human wealth manager in a hybrid setting (as demonstrated for example by the Warburg Navigator by M.M. Warburg & Co.). The tools provide information that the manager might not obtain in a typical conversation with clients.

3. STOCK PICKERS AND MONEY DOCTORS

Many investment managers believe that their primary task is to generate "alpha", or outperformance relative to some pre-defined benchmark. Consequently, they subject themselves to the active versus passive debate, with the result that their contribution to the investment process is questionable. If one identifies as a stock picker, then it is only natural that they will be evaluated in terms of their stock picking abilities. An interesting study reveals that clients would have been better off had they not answered the phone when their advisor called to discuss transactions in individual stocks [Hoechle et al. (2017)].

Other research finds that advisors are not able to customize portfolios based on the preferences of their clients [Foerster et al. (2017)]. Instead, advisors and asset managers bring in their own behavioral biases, which might be subsumed under "the human factor", as none of us are free from bias. Robo-advisors have an advantage in these domains. A properly defined algorithm matches customers to portfolios that more adequately reflect their preferences. A passive low-cost strategy will beat most active managers and advisor recommendations [Garleanu and Pedersen (2019)]. If human managers intend to compete in these areas, theirs is a lost cause, in particular with further improvements in AI.

It might require a change in perspective in what an asset manager or advisor should achieve to define their future role. There are many anecdotes about how during the financial crisis the phones of wealth managers did not stand still. Worried clients called in to inquire about the status of their portfolios; needing assurances from their managers that they should not to succumb to panic. Some might view such calls as distracting. Should one not concentrate on much needed portfolio adjustments instead of comforting clients? In reality, such conversations are part of the value added of human managers or advisors, as they represent one of the things a robo currently cannot do.

Broadening this role description, asset managers can be viewed as "money doctors" [Gennaioli et al. (2014)]. In an analogy to medical doctors, they are trusted experts who provide guidance to people who know relatively little about finance. The financial services industry recognizes this and often advertises their services based on trust, experience, and dependability. Asset managers provide investors with peace of mind, as well as the confidence to invest in risky assets. In addition, delegated investment offers the opportunity to blame someone else when something goes wrong [Chang et al. (2016)].

It is no coincidence that robo-advisors have a hard time attracting clients who are not as yet investing at all. Although the degree of financial knowledge required to use different robo-advisors varies, the mental barrier for the uninitiated remains high. Robo-advisors cannot fill the role of a money doctor to a sufficient extent. Accenture (2015) has defined what they call "enduring human strengths": areas in which robo-advisors are unlikely to catch up soon. Among those are the ability to steady clients in through difficult markets, to persuade to action, to provide validation, and to synthesize custom client solutions.

If investment managers adopt their role as money doctors, it will become easier for them to outsource other tasks to technology. An effective division of labor relies on clearly defined competences.

4. ALGORITHM AVERSION AND THE CO-EXISTENCE OF HUMANS AND ALGORITHMS

One important question for a wealth manager or financial advisor is whether to use technology only "behind the scenes" or in direct interaction with the client. Robo-advisors, in their pure form, require the willingness of the customer to engage with an algorithm. They usually do not have any human touchpoint in the process. The rising number of investors in the segment shows that there is demand for this self-directed approach. However, these early adopters of robo-advisors are a selected group of (probably few) people who find online-only advice appealing. We cannot take them as proof that robo-advice will become a market-wide phenomenon.

> " *If investment managers adopt their role as money doctors, it will become easier for them to outsource other tasks to technology.* "

On the contrary, researchers have demonstrated the presence of algorithm aversion in many domains. The term implies that people either have a general preference for humans over algorithms, or at least will abandon an algorithm quickly if they see it stumble. An example for the latter case is experiments in which participants tie their incentives to either a human expert or an algorithm for predictions in various fields [Dietvorst et al. (2015)]. While the algorithms on average clearly outperform the humans, many participants turn away from them after mistakes. There seems to be the notion that an algorithm should be free from error. If not, there is something systematically wrong that will repeat itself.

Investing is a domain in which mistakes are inevitable. Not all investments will turn out well, and, in particular, not all the time. Investors in a portfolio constructed by a robo-advisor may at least occasionally find themselves in the red. If people lose confidence in an algorithm quickly, their stay with the

robo-advisor will be short-lived. On the other hand, finance is a quantitative field and investors might view it as the natural habitat of an algorithm. Indeed, financial decision making seems to be special, as participants in another experiment do not show algorithm aversion [Germann and Merkle (2019)]. Both initially and in the long-run investors favor the algorithm, but are not immune to a dip in followership after observing investment mistakes.

> " *The prevailing opinion is that technology serves as an aid to a human manager rather than a competitor. Both have different qualities in the investment process.* "

What we can learn from this research is how to overcome algorithm aversion. In another study, Dietvorst et al. (2018) find that it helps to let humans adjust the algorithms' proposals, even slightly. Then people feel more in control and are more satisfied with the proposal. It is, therefore, a good idea for a robo-advisor not to provide a take-it-or-leave-it offer as a final output, but to allow for some modifications. Of course, it is always possible for a customer to change some of the input variables to receive a different outcome. However, it is better yet to make this process transparent and show what consequences, for example, a risk adjustment has on the final portfolio composition. The interactive nature of robo-advice tools can increase their appeal and usability – at least for those who know what they are doing.

In a survey of 2,061 representative German adults, which I ran in late 2019 with the help of YouGov, about a third of the participants had some idea of what an investment algorithm is, but only 2 percent had already invested with a robo-advisor. A majority view algorithms as an aid to human investment managers rather than a competitor (Figure 2). Unlike what conventional wisdom might suggest, tech-savvy millennials are not much more in favor of digital solutions; overall results are not dramatically different for this age group (here 34 and younger). A study by FINRA Foundation and CFA Institute (2018) finds the same: the youngest cohort also values human interaction when it comes to their investments.

People who are more educated and those with investment experience are more likely to have heard of investment algorithms and have higher take-up rates. Robo-advisors seem to have the hardest time entering a market of financially less literate, non-invested households. While this group would probably benefit most from low-cost diversified investments, they are also the group that is most likely looking for a "money-doctor" for handholding.

Figure 2: Knowledge, take-up, and opinion about robo-advisors in Germany (2019)
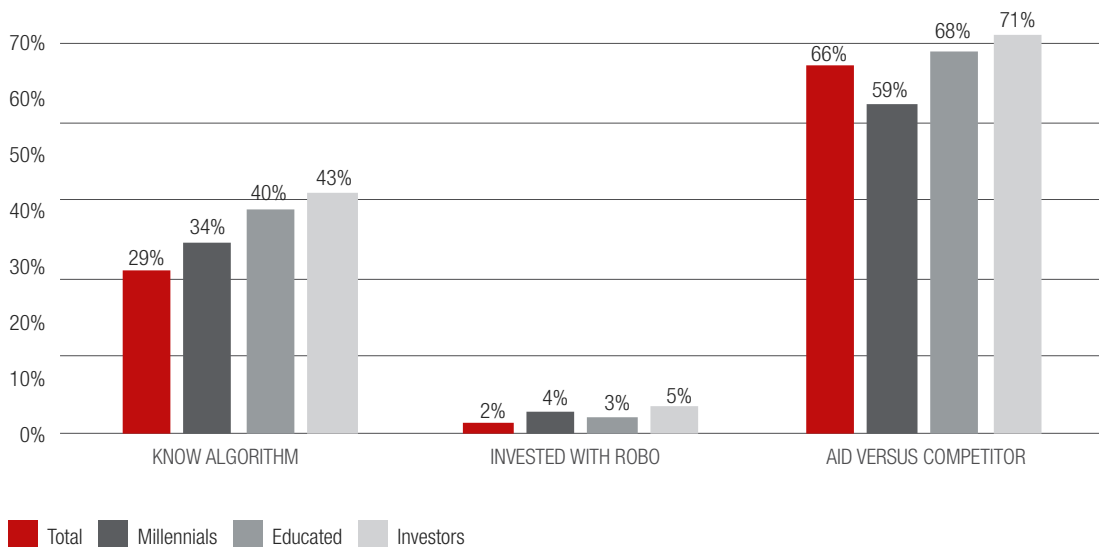
Source: YouGov, own survey
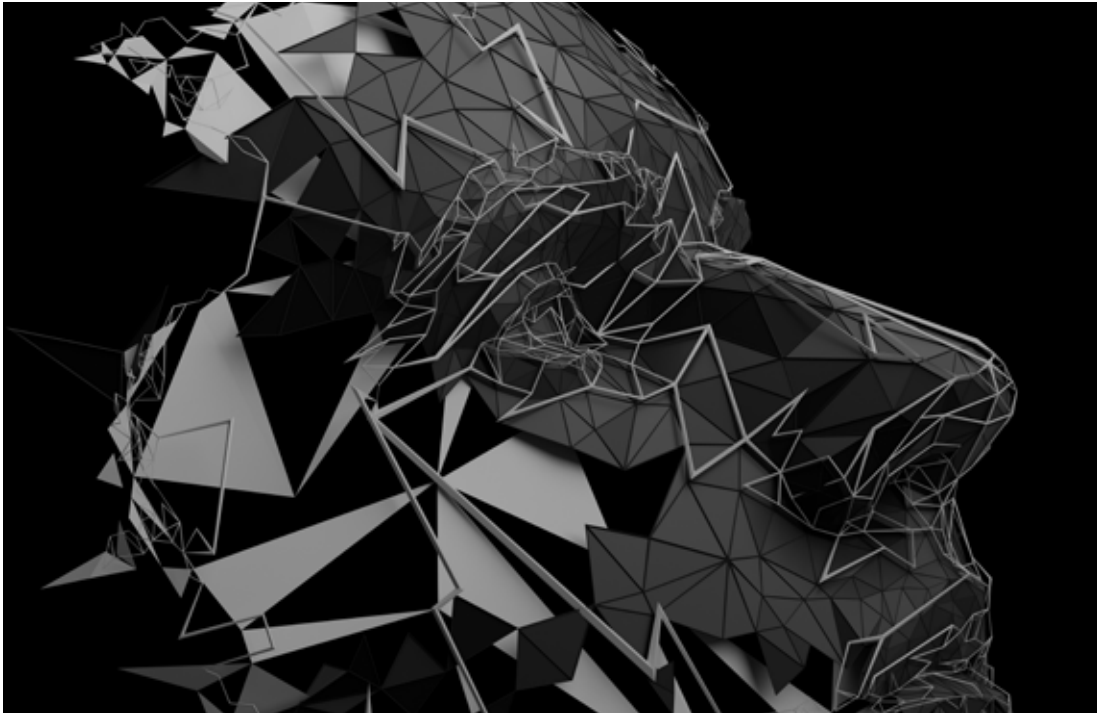
Not all investors fancy interacting with an online-only robo-advisor and some situations may require human intervention, even for those normally satisfied with the robo. Even Betterment, as one of the pioneer robo-advisors, recently added human advisors to their offerings. A move to attract those customers who do not feel comfortable with only the algorithm at their disposal. The Financial Times noted in 2017 that the wish "to speak to someone" is ubiquitous in robo-advisory [Beioley (2017)]. Some fintechs seek to introduce low-cost human touchpoints, while others begin to differentiate their business based on wealth level and sell human advice as a premium product. Yet, others start out as a hybrid service from the beginning [Cocca (2016) discusses the different advisory models in more detail].

This is consistent with the prevailing opinion in the population that technology serves as an aid to a human manager rather than a competitor (Figure 2). Investors understand that both have different qualities in the investment process. Similar evidence comes from a U.S. survey by the Financial Planning Association (2016). Obtained data on customer behavior can be used to better target the costly contacts to human advisors (e.g., U.K. robo-advisor Nutmeg).

How do investors view human experts that rely on technological support? Results from the medical domain look discouraging. Patients perceive physicians, who employ a computer-based diagnostic aid, as less competent [Arkes et al. (2007)]. To use technological assistance seems to undermine their status as an expert. However, not so in finance: it is widely accepted that financial advisors will not find investment proposals just by searching their brains. The image of the profession is that some number crunching is necessary to find a solution. It, therefore, feels natural to employ technology [Germann and Merkle (2019)].

5. CONCLUSION

With technological progress, some professions disappear, while others change forever. Robo-advisors in principle can replace financial advisors and asset managers at low costs. When they emerged, academics and practitioners alike mainly saw opportunities. Economies of scale, an investment process that links goals and preferences to adequate recommendations, an impartial agent without behavioral biases, and fewer conflicts of interest. It seemed only a matter of time until these advantages would pave the way for fintechs or bank-owned robo-advisors to obtain a major market share.

However, human managers and advisors will survive for a number of reasons:

- Robo-advisors primarily appeal to a clientele of already financially sophisticated investors. Not only are they the easiest group to reach for a new offer on the market, but also by design many robos demand a certain level of financial literacy.

- Robo-advisors lack some of the qualities people look for in a "money doctor", which range from the initial encouragement to invest in risky asset classes to the opportunity to initiate contact to bring up a specific question.

- The human touch is valued highly by millennials as well, which implies that it will not go away just by the passage of time.

- The business model of online-only robo-advisors still has to stand the test of time. Currently, there is a mismatch between the acquisition costs for each customer and the meager fee-income. Only very large robo-advisors can exploit the economies of scale, as the fixed costs for implementing an advisory tool are high.

Consequently, a hybrid model with humans and technology working hand-in-hand is widely advocated as the most promising solution. Most financial institutions are still in the experimental stage with such offers. On one end, robo-advisors have started to introduce human advisors as a backup that customers can turn to. Early reports suggest infrequent usage of the additional service, but this might be a direct consequence of the existing customer base self-selecting into unassisted robo-advice. On the other end, wealth managers have started to employ digital tools in their advice processes. They face the opposite problem that customers might be skeptical about why they should stare at a screen instead of having a light-hearted conversation.

Just as with the hybrid car, the open question with the hybrid model of delegated investments is whether it represents an intermediate stage before robo-advisors that are "more intelligent" appear on the market, or the final stage of evolution. To fulfill the role of a money doctor it will not be enough to optimize the investment algorithm. Robo-advisors will need to acquire some abilities that we at least today view as typically human.

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WEALTH MANAGEMENT IN THE AGE OF DIGITAL ASSETS: HOW FINANCIAL ADVISORS CAN FIND OPPORTUNITIES AMONGST DISRUPTION

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ABSTRACT

The advent of digital assets has led to the creation of new financial products with the ability to fundamentally change where and how wealth is invested. For wealth managers, the new asset class and varying products present both a challenge and opportunity. On one hand, digital assets allow retail investors to personally invest in tokenized alternative assets with minimal capital, diminishing the need for a financial advisor or broker. On the other hand, new product classes such as cryptocurrencies and security tokens can be added to wealth managers' existing portfolios as means to diversify holdings and corner an increasingly demanded market of blockchain-based assets.

This paper should be viewed as a starting point for wealth managers who are concerned about potential business disruptors or growth opportunities associated with digital assets. We will review cryptocurrencies, stablecoins, initial coin offerings, and security token offerings, and discuss their significance for wealth managers. We will also focus on an increasingly popular application of security token offerings, termed tokenization, and discuss how wealth managers may use tokenized products to supplement portfolio offerings.

While the full effect of digital assets to a wealth manager's business is still yet to be determined, forward thinking financial advisors will need to be prepared for this asset class marketplace in order to avoid potential disruption. Financial advisors should take proactive strategic steps, such as enhancing their digital capabilities or upskilling their staff on the benefits of digital assets, to ensure that they are well equipped to serve their clients' changing needs.

1. INTRODUCTION

The past few years have experienced a rapid expansion of the use of digital assets within global financial markets. With momentum fueled by retail investors on various online digital exchanges, the total market capitalization of globally-traded cryptocurrencies has increased threefold between March 2016 and March 2017.[1] By 2018, that number grew by another 500 percent.[2] During this period, the Chicago Mercantile Exchange (CME), the world's largest derivatives exchange, began listing futures and options for institutional buyers on the most liquid cryptocurrency, bitcoin.[3] Fidelity and other asset managers[4] established independent "digital asset" departments within their companies. Multiple banks and asset managers were reported to be setting up internal cryptocurrency trading desks. And, then in early January 2018, the global cryptocurrency market plummeted, losing 83 percent[5] of its market capitalization and the value of bitcoin within the next year.[6]

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[1] Rauchs, M., and G. Hileman, 2017, "Global cryptocurrency benchmarking study," Cambridge Centre for Alternative Finance, https://bit.ly/2VYedSK

[2] https://bit.ly/2IBJtPn

[3] https://bit.ly/2PZFz7g

[4] https://bit.ly/2TQ2TVX

[5] https://bit.ly/3aCw0TC

[6] XBTUSD <GO>, GP <GO>, 12-18-2017 – 1/18/19. Bloomberg Terminal. Accessed: 2/16/20.

The sudden shift from crypto-optimism to pessimism within financial markets led to a pivot from traditional cryptocurrencies such as bitcoin to multi-use digital assets and securities. It also allowed regulators such as the U.S. Securities and Exchange Commission (SEC) to better define regulatory requirements for digital assets,[7] provide guidance to those seeking to issue and trade them,[8] and fine fraudulent and predatory digital cryptocurrency firms.[9] While today the market capitalization of cryptocurrencies is smaller than in 2017, the various uses of digital assets and their applicability to financial markets have grown considerably.

To those managing investment portfolios for themselves or others, the growth of new types of digital assets presents both a disruption possibility and a unique opportunity. For example, an increasingly interesting way digital assets can be utilized is to tokenize tangible alternative assets such as real estate, providing digital ownership that can eventually be further fractionalized and freely traded on secondary exchanges. Illiquid asset markets encumbered by high barriers to entry and slow title transfers could see an approved individual investor buying 1/10,000th of an ownership stake in an alternative with the click of a button. Fractionalized alternative ownership coupled with cryptocurrency holdings could thus present a new and growing market for those seeking to further diversify any investment portfolio. Because of the digital nature of these assets, not only do they provide new products to invest in but can also change how asset managers invest and in what ways they reach their clients.

In this article we will provide an overview of tokenization, future opportunities for wealth managers and their clients, and how financial advisors can best respond to the new world of digital assets.

2. IMPACT OF NEW DIGITAL ASSET PRODUCTS

It is important for wealth managers to understand the complete scope of products that the new digital assets world offers when determining the best response strategy. With the collapse of the cryptocurrency markets and subsequent shift towards multi-purpose digital assets, wealth managers should develop specific responses for each of these new products. We detail these products below and potential opportunities for wealth managers.

2.1 Cryptocurrencies, initial coin offerings, and security token offerings

2.1.1 CRYPTOCURRENCIES

Cryptocurrencies are in many respects the simplest form of digital assets – digital tokens that are traded and understood similar to global commodities. Cryptocurrencies such as bitcoin have been classified by the Commodities Futures Trading Commission (CFTC) as such[10] and are freely traded in new digital retail marketplaces, or in the form of listed futures[11] and indices.[12] Due to the rise of firms that provide exchange and custody services, such as Coinbase or Gemini, potential investors are able to easily open cryptocurrency wallets online and purchase widely-traded tokens using U.S. dollars or other fiat currencies from their bank accounts.

It is prudent here to highlight why wealth managers should expect client interest in digital asset products. The U.S. is currently undergoing one of the largest wealth transfers in its history, with millennials set to inherit over U.S.$68 trillion from their predecessors, holding five times as much wealth as they have today.[13] With more than half a million millennials already with six figures and growing, it is an important target group for wealth managers who traditionally service a clientele whose average age is 64.[14]

Not only are millennials inheriting wealth en masse, they are also increasingly gravitating towards cryptocurrencies for investment opportunities. A report by Charles Schwab comparing equity holdings by generations found that the Grayscale Bitcoin Trust is ranked as the fifth most held equity asset by millennials.[15] According to a survey conducted by the financial services company eToro, 43 percent of millennial respondents active in online trading trust cryptocurrency exchanges more than their traditional equities counterparts; double that of Gen X respondents.[16] Even for those millennials that do not trade themselves, one-third said they would trust cryptocurrencies over the stock market. The same

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[7] https://bit.ly/2TD2PKF
[8] https://bit.ly/39At5e5
[9] https://bit.ly/2PY8JDz
[10] https://bit.ly/3330ewD
[11] https://bit.ly/33306gD
[12] https://bit.ly/2W05D5V
[13] https://bit.ly/3alCjFj
[14] https://bit.ly/2wJqlXy
[15] https://bit.ly/2TBW9fM
[16] https://prn.to/2PYqLFX

study found that 59 percent of millennials who do not trade cryptocurrencies said they would invest if offered by a traditional financial institution.

These statistics can be packaged in any number of ways, but the story is clear: millennials are inheriting large amounts of wealth and with their strong interest in cryptocurrencies they will likely look for digital asset diversification when investing with their financial advisors.

2.1.2 INITIAL COIN OFFERINGS

Initial coin offerings were the original and most popular way for firms to raise funds to finance blockchain-based projects. At the time, people generally viewed an initial coin offering as the crypto-asset equivalent of an initial public offering (IPO) allowing retail investors the ability to participate. The newly issued coins are bought with widely traded cryptocurrencies such as bitcoin and ethereum, and in some cases can even be purchased with traditional fiat currencies.

Unlike the shares sold in an IPO, initial coin offerings generally do not give their purchasers any ownership in the issuing company. Their value is instead indirectly linked to the success or failure of the blockchain project. Depending on the structure and purpose of the underlying tokens, certain ICOs are not required to register as security token offerings with the SEC. Some, such as TurnKey Jet, Inc., structure their tokens as utility tokens that function as transferrable software licenses by providing their holders with access to the company's decentralized applications (DApps).

This distinction does not mean that all token offerings characterized as initial coin offerings are inherently unregulated by the SEC, nor does it exempt companies from registration requirements if they characterize their tokens as utility tokens in name only. In fact, the SEC has increasingly scrutinized and enforced its oversight on initial coin offerings, such as with the cases of Telegram[17] and Kik.[18] As a result of this increased regulatory scrutiny and the high failure rate of previous initial coin offerings, the potential disruption to wealth managers and the role that these "securities" play in a diversified portfolio remains to be seen.

2.1.3 SECURITY TOKEN OFFERINGS

Simply put, security token offerings are regulated coin offerings, used to raise funds for a blockchain project or to release equity/cash in a physical asset. Security token offerings have great potential and new use-cases are still emerging. Just as digital certificates are offered to equity investors in an IPO, ownership information for security token offerings is recorded on the associated blockchain and issued to the owner as a security token. The same regulations that govern traditional IPOs and associated securities would apply to tokens offered through security token offerings. Conversely, an initial coin offering may structure their digital assets as utility tokens to avoid having to register their token offering with the SEC. More information on this distinction can be found in our paper detailing initial coin offering registrations with the SEC.[19]

One of the more interesting applications of security tokens is their ability to tokenize otherwise illiquid assets. We explore the potential benefits of tokenization below.

3. TOKENIZATION

3.1 Benefits of tokenization

Tokenization can be defined as the creation of security tokens that represent legal ownership in an underlying tangible product, effectively "tokenizing" an otherwise non-digital asset. The idea behind tokenized securities is that easily transferrable ownership will help make traditionally illiquid and inaccessible assets more accessible to retail investors, thereby allowing their incorporation into both retail trading and portfolio construction activities. Once tokenized, valuable alternative assets, such as buildings or expensive pieces of art, can be divided into digital fractional shares. Increasing the number of direct interests in any one asset decreases the minimum investment requirement, thus circumventing the traditional cost and specialization barriers associated with illiquid alternatives markets.

While all assets can theoretically be tokenized, the alternative investments space would greatly benefit from fractionalized ownership and a more efficient transfer of rights. Specialized due diligence costs, closing fees, transaction complexity, and opaque data sources all contribute to illiquidity in alternatives markets. The ability to tokenize and fractionalize traditional asset ownership would allow for increased market liquidity, more data transparency, and lower barriers to entry for market participants. For wealth managers, it means the ability to potentially include easily-transferrable alternative asset ownership as part of portfolio offerings. We elaborate on some of the key characteristics and benefits of tokenized assets in the following sections.

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[17] https://bit.ly/33cUVuF
[18] https://bit.ly/2IuHDA7
[19] https://bit.ly/33OI6nW

3.1.1 INCREASED LIQUIDITY

Distributed ledger technology (DLT) allows for the bilateral exchange of security tokens without a central mediator, bank, or clearinghouse. Once tokens are created and distributed by the original owner of an asset, they can then be traded on other secondary markets without the participation of the original token distributor, making traditionally illiquid investments easier to exchange. With lockup periods on fund investments and costly processes involved in the transfer of alternative asset ownership, the ability to digitally represent the ownership rights in these assets and transfer them within minutes would drastically change how their markets operate.

For traditional retail investors or small wealth managers looking to gain exposure to alternative assets such as real estate, hedge funds, or private equity, large amounts of up-front capital and established networks are required to successfully invest. Alternatives such as REITs or fund-of-funds exist and provide additional liquidity but they generally do not provide investors full decision-making control in the underlying asset holdings. With tokenization and fractionalization, investors can invest smaller amounts of capital in individual assets, promoting accessibility that creates more liquid secondary markets.

3.1.2 EFFICIENCY AND DATA AVAILABILITY

The process for buying and selling many alternative assets includes intermediaries with opaque sources for data and fees. Non-digital procedures, a high degree of specialization necessary to perform operational functions, and months-long clearing and settlement processes make ownership transfers within the alternatives market inefficient and costly. Digital security tokens instead have information recorded on an immutable ledger available to those who participate in the transaction, and other additional parties in some cases. Ownership rights, financial transaction information, and previous title transfers can be made available to the potential buyer who is in turn vetted as a credible market participant.

Compared to the alternatives space, equity markets have an abundance of information available on public and private platforms that a variety of investors can use to make investment decisions. It is much easier to access stock performance information than that of an antique art piece or apartment duplex because of the data and tools currently available. Security tokens and their resulting secondary markets would perform a similar function for alternative assets. Smart contracts could record a variety of underlying financial data on each asset, with digital exchanges providing individual investors access to information that is not currently as readily available for assets such as real estate or art.

3.1.3 FRACTIONALIZATION

Fractionalization can be understood as the ability for digital securities to be infinitely divisible. As the number of security tokens released on a blockchain platform is entirely customizable, ownership stakes in the underlying assets can be divided and represented by any number of tokens. With each ownership stake digitally recorded on a distributed and immutable ledger, traditionally high-cost assets can be divided amongst a marketplace of investors. As full ownership of the underlying asset is no longer necessary, the fractionalization of tokenized assets would immediately lower barriers to entry for alternative asset investors. Fractionalization can also potentially lead to efficient diversification within the alternatives market via structuring new types of products with various types of direct alternative interests. This new type of alternative structured product may be highly attractive to individual investors as it further lowers the specialization and capital requirements normally associated with investing in alternative assets.

4. STABLECOINS

A stablecoin is a type of cryptocurrency that attempts to reduce price volatility when investing in digital assets. Normally, stablecoins are backed by a reserve asset such as a fiat currency, as is the case with StableUSD and Paxos Standard Token, both listed on Binance's exchange.[20] This allows an investor to easily trade into and out of highly volatile and speculative cryptocurrencies without having to go through the lengthy process of converting to traditional fiat currencies.

If a wealth manager is serious about responding to the world of cryptocurrencies and tokenized assets, stablecoins will be a necessary part of any solution. Whether it is offering price stability to clients invested in illiquid cryptocurrencies, or simply accessing tokenized alternatives, stablecoins provide wealth managers with the likely conduit between traditional investments and the digital asset world.

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[20] https://bit.ly/2v4QYLI

5. HOW WEALTH MANAGERS CAN RESPOND

Digital assets and digitally formatted securities will likely serve as a disruptive force to a current wealth manager's business. Tokenization, stablecoins, and the emergence of new cryptocurrencies require wealth managers to change the way they view both traditional and digital assets, and further progress the latter as viable investment vehicles to integrate into the modern customer's portfolio. With the shift to digital assets and the general trend for millennial investors preferring digitally native securities, wealth managers should take action now in order to remain competitive.

We detail below various actions financial advisors and wealth management companies can take today to prepare for the digital asset world of tomorrow.

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By preparing today for the digital asset wealth management market of tomorrow, wealth management companies can evolve and adapt, turning a potentially disruptive technological movement into a growth opportunity.

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5.1 Strategies for wealth managers to survive and adapt

It is critical that wealth management companies view digital assets opportunistically, maintaining an open mind to the associated technological change and the potential impact digital assets may have on traditional portfolio management. Viewing these new products in a productive light, wealth managers can prepare for the likely scenario of a client enquiring about their advisor's digital asset capabilities. In a survey conducted by Bitwise, a leading provider of index and beta cryptoasset funds, nearly 80 percent of wealth management companies surveyed reported that clients had inquired about digital assets in 2018.[21]

Advisors can begin to take strategic actions today and better prepare themselves to support future digital asset capabilities. The same Bitwise survey found that 20 percent of companies surveyed planned to include cryptocurrencies in their portfolio offerings. By acting now, when the prevalence of digital assets is low and the industry is still in its infancy, advisors can ensure that they are current on what capabilities they need to offer in order to stay competitive.

Below are some proactive strategies that wealth managers can use in order to stay ahead of digital asset disruption and how advisors could start integrating them into their practices.

5.1.1 EDUCATION AND ADAPTION

The viewpoint that digital assets (whether tokenized assets or cryptocurrency type assets) belong in a portfolio is not likely to gain rapid popularity overnight. The required infrastructure is not institutionalized within wealth management, the underlying distributed ledger technology and regulatory structures are still in their infancy, and there is not widespread understanding of the many capabilities that digital assets provide. This, however, should not deter wealth managers from adopting a strategy geared towards upskilling themselves and their staff in digital asset capabilities that exist in the market today. By taking a proactive learning approach, wealth managers can adopt new capabilities as they become available.

Some of the actions that wealth managers can take include educating the necessary investment staff, attending conferences and community events geared towards digital assets, hiring outside agencies to conduct workshops and training sessions, and incentivizing employees to learn about digital assets and associated capabilities. Integrating these strategies into day to day processes for employees will help foster a culture where ongoing education of digital assets is encouraged. As client demand grows, investment professionals will be better equipped to answer questions in an advisory role or act on investment requests.

5.1.2 ENCOURAGE SPECIALIZED PARTNERSHIPS

Wealth management firms concerned about the impact of new digital products on portfolios should begin developing specialized partnerships with key companies operating in the digital asset space. We highlight two forms of specialized partnerships:

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[21] https://bit.ly/2wHVC2A

- **Platform partnerships:** digital assets require a high-level of security and encryption to custody the tokens and ensure no fraudulent activity occurs. The new technology and infrastructure required to support digital asset capabilities is complex and the expertise to build solutions in-house may not be available to all institutions. As a solution to this complex barrier of entry, wealth managers can look to partner with market participants who provide platform related digital asset services, such as a securities marketplace, issuance provider, or exchange. These partnerships will also help smaller wealth managers scale their digital asset practices without requiring significant investment in additional resources or expertise. By connecting with emerging companies like Securitize, Bitwise, or TZERO, wealth managers can quickly integrate required infrastructure for digital assets into their practices and service their clients without significant investment.

- **Specialized product partnerships:** product partnerships will be important for wealth managers to meet the increased demand for in-house product knowledge and specialists. As the concepts of digital assets and tokenization become adopted more broadly, the ability to participate in direct investment becomes more accessible to retail investors. For example, a client may be interested in owning a piece of a multi-family rental property in Rome, Italy, or partial ownership in the music streaming rights of a popular new song. Certain digital products that were not previously looked at through an investment lens may now be viewed as investable. Thus, wealth managers will increasingly need to seek specialized partnerships with brokers and a new class of product and investment specialists.

If incumbent firms look to begin forging these relationships sooner rather than later, they will gain a competitive advantage with regards to the products they can offer their investor segments. This allows an initially defensive strategy, geared at mitigating the disruptive impacts of digital asset adoption, to become offensive and serve as a customer acquisition tool via offering unique investments in a variety of products that may not be available elsewhere.

5.1.3 INVEST IN DIGITAL ASSET GROWTH

While the above strategies will be beneficial to wealth managers as the digital asset landscape develops and evolves, it will be equally important for market participants to continuously invest in enhancing digital asset capabilities. This type of broad strategic guidance can vary, and firms should optimize their investment selection processes by finding projects that will provide the greatest return on investment. We see two general investment categories:

- **Externally focused investment:** externally focused investment refers to investments that enhance a firm's connectivity with market participants external to the firm. For example, investment in a service from a well-respected digital asset custodian, such as Coinbase Custody or BitGo, rather than building a custodial solution in-house. Firms can also invest in a variety of other asset market services such as exchange connectivity and execution, specialized research services, broker-dealer services, and full-service based solutions that incorporate critical market functions into a single product. Focusing on investing in the right external services allows wealth management firms to enter the digital asset market in a financially conservative, flexible manner that can be scaled based on client demand.

- **Internally focused investment:** internally focused investment is rooted in the idea of investing in the relationship between the wealth management firm and the customer interested in digital assets. This could include investment in a customized client portal that allows for a holistic dashboard view into traditional assets (equities, fixed Income) as well as non-traditional assets (private company ownership, cryptocurrencies, and other new types of digital products). Internally focused investments seek to provide a deeper and more meaningful customer relationship between the wealth manager and the client. Making internal investments to build a more enhanced digital asset customer experience will be a differentiating factor as this landscape continues to mature.

6. CONCLUSION

The future client base of wealth management companies is uniquely interested in the world of digital assets and cryptocurrencies. While the institutional market for these products is still relatively in its infancy, client interest exists and provides a potential market for early adopters to take advantage of. By preparing today for the digital asset wealth management market of tomorrow, wealth management companies can evolve and adapt, turning a potentially disruptive technological movement into a growth opportunity.

THE E.U. ALTERNATIVE INVESTMENT FUND INDUSTRY: INSIGHTS FROM AIFMD REPORTING

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ABSTRACT

The asset management industry has grown significantly in recent years – in Europe alone assets under management have more than doubled in the last decade – and, as a result, is attracting heightened attention for its systemic implications. Alternative investments, including hedge funds and private equity, form a significant part of that industry. In the E.U., the Alternative Investment Fund Manager Directive (AIFMD) provides a dedicated regulatory framework for these alternative investment funds. This article presents a comprehensive mapping of the €6 trillion E.U. AIF market, and an overview of the indicators ESMA applies to assess industry-level risks.

1. INTRODUCTION

In the aftermath of the global financial crisis, the G20 stressed the need for consistent international regulation and oversight with respect to every financial market participant and financial products. In response to this, the Financial Stability Board (FSB) advanced a program of financial reforms to build a more resilient and less procyclical financial system. The work of the FSB emphasized the need for the creation of global monitoring capabilities to capture the scale and trends in non-bank financial intermediation [FSB (2011)]. In this context, the European Union (E.U.) adopted a Directive on Alternative Investment Fund Managers (AIFMD) in 2011, which for the first time comprehensively regulated the E.U. alternative fund industry.

The line between traditional and alternative asset management is difficult to draw, and the concept of alternative strategies tends to encompass all styles other than simple diversified long-term investments in plain vanilla stocks and bonds and without recourse to leverage.

In the markets, hedge funds and private equity funds are often referred to as "alternative" investments because they provide material alternatives to traditional funds by showing low correlation with traditional asset classes, dynamic trading strategies, and the use of a wide range of techniques and instruments. Alternative funds attempt to provide investors with returns by following so-called alpha-strategies aimed at generating excess returns on a portfolio managed actively and with wide discretion, as opposed to conventional investment funds where the portfolio is modeled around a reference market. The interest of institutional investors in alternative investments has resulted over time in a significant expansion of their allocation to these strategies, a trend that has been documented since before the financial crisis.

The E.U. regulatory framework AIFMD, in contrast, uses the term "alternative" in a more comprehensive way to include all investment funds not governed by the UCITS (Undertakings for the Collective Investment in Transferable Securities) Directive. In doing so, it covers all non-UCITS funds, regardless of their market classification, and prominently captures hedge funds, private equity, and real estate funds.

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[1] Contents and views expressed in this paper are those of the authors, and do not necessarily represent those of the European Securities and Markets Authority.

Importantly, AIFMD requires extensive reporting on alternative investment fund activities, and it is on that basis that in 2019 ESMA (European Securities and Markets Authority) was able to present for the first time a comprehensive view of the European alternative fund industry. In this article, we provide an up-to-date mapping of this nearly €6 trillion market, and an overview of indicators which ESMA applies to assess industry-level risks.

2. AIFMD: A REGULATORY FRAMEWORK FOR E.U. ALTERNATIVE FUNDS

Adopted in 2011 and entering into force in the same year, the objective of AIFMD is to provide a harmonized regulatory and supervisory framework for the activities of all alternative investment fund managers in the E.U. In broad terms, AIFMD lays down the rules for authorization, ongoing operations, and transparency of alternative investment fund managers. This objective is not only consistent with the G20 appeal for appropriate regulatory and supervisory arrangements to apply to all relevant market actors but goes further than that by establishing the necessary legislative framework for a single market for alternative investment fund managers.

The Directive strengthens investor protection and financial market stability, notably through:

- The enhancement of the oversight of alternative investment fund managers, by requiring proper authorization in order for them to manage one or more alternative investment funds.

- An incentive structure aimed at avoiding excessive risk-taking by imposing cross-sector rules on the governance and the remuneration practices for relevant categories of staff, with the aim of safeguarding investors from potential conflict of interests.

- A focus on systemic risk and consistent requirements regarding risk management procedures and processes.

- Extensive reporting obligations, to allow supervisors to have a fuller picture of the market though data collection that is consistent across E.U. jurisdictions.

- Close cooperation between all national supervisors (National Competent Authorities, NCAs) and the E.U.-level regulatory and supervisory authority (ESMA).

These legislative provisions have subsequently been complemented by a series of regulatory Acts, so-called Level-II measures, which provide the necessary detail to operationalize the legal requirements.

Importantly, these implementing Acts also provide, among a wide range of conduct-of-business requirements, important rules on leverage as a key source of financial risk. These include disclosure requirements towards investors and national supervisors. For each alternative investment fund under management, an authorized alternative investment fund manager is required to set the maximum level of leverage that can be employed by the fund and comply with this limit at all times.

Figure 1: Size of the alternative investment funds industry by type
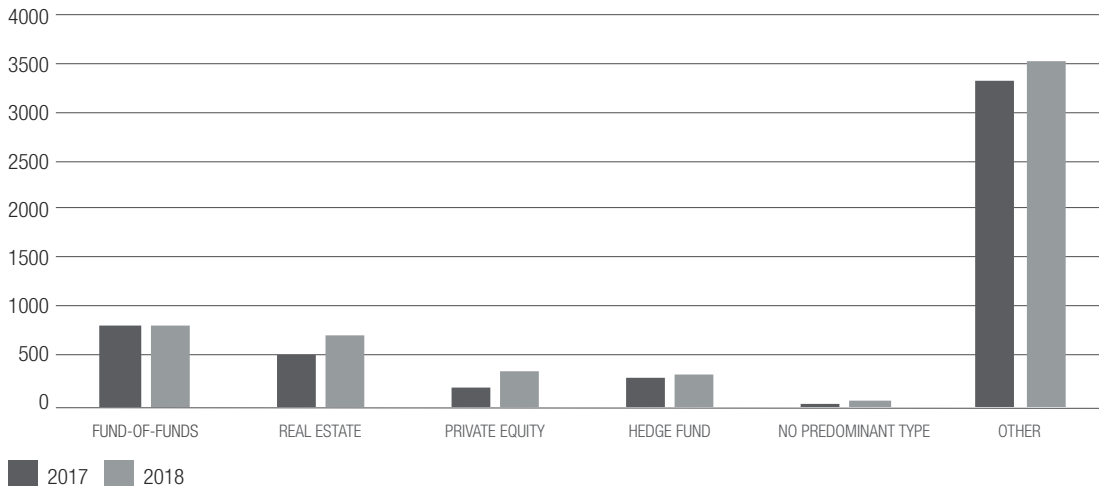
Note: Net asset value (NAV) by type of alternative investment funds managed and/or marketed by authorized alternative investment fund managers and sub-threshold managers registered only on national jurisdictions (in € billion).

Sources: AIFMD database, National Competent Authorities, ESMA

Regarding systemic risk, Article 25 of the AIFMD introduces the possibility for NCAs to set up leverage limits on alternative investment funds in order to reduce the build-up of imbalances in this sector. ESMA, in addition, can recommend to the NCAs the imposition of such leverage limits in case of a union-wide interest. ESRB (European Systemic Risk Board) Recommendation 2017/6/E stipulates that ESMA should give guidance on the framework to assess the extent to which the use of leverage within the alternative investment fund sector contributes to the build-up of systemic risk in the financial system. In that context, ESMA is designing indicators along with an assessment framework to be used by NCAs. The power of NCAs and ESMA to require managers to limit the leverage of funds they manage is of particular importance given the centrality of leverage as a source of risk in exposed funds.

Figure 2: AIF industry by type

Note: NAV by type of alternative investment funds managed and/or marketed by authorized E.U. alternative investment fund managers and sub-threshold managers registered only in national jurisdictions, end of 2018, in percentage. Data for 24 EEA countries.

Sources: AIFMD database, National Competent Authorities, ESMA

3. AIFMD REPORTING OBLIGATIONS

AIFMD sets out extensive reporting requirements for alternative investment fund managers, which vary according to the size and the complexity of the alternative investment funds. Prior to the 2007 financial crisis, alternative investment vehicles were not subject to public or supervisory disclosures and belonged to the opaquest players in the investment universe. Not surprisingly, uncertainty over risk exposures in alternative funds as well as counterparty risks in highly interconnected financial markets was a key concern for investors and policymakers alike at the time.

The confidential disclosure to supervisors of key fund, performance, and risk metrics, as required under AIFMD, provides NCAs with the necessary information to oversee whether alternative investment fund managers are properly addressing micro-prudential risks and to assess the potential systemic consequences of the individual or collective alternative investment fund manager activities. Disclosure requirements are, thus, also an important element of the macro-prudential oversight of the AIF industry.

Importantly, AIFMD standardizes the content of reporting, which in principle makes a uniform implementation of the reporting rules established by the Directive possible. In line with the principle of regulating the manager and not the product, an alternative investment fund manager must provide the requested information for the alternative investment funds it manages. The reporting requirements include data on the characteristics of the alternative investment fund (type, strategy, concentration of investors), along with detailed information on assets (principal exposures, exposures by asset type, and regional investment focus), as well as several risk features (market risk, liquidity profile, use of leverage, and stress test results).

Aggregated across the member states, these standardized statistics allow for a rich and exclusive view for ESMA of the E.U. alternative investment market. Based on this unique dataset, ESMA published its first Annual Statistical Report on E.U. alternative investment funds in 2019, shedding light for the first time on the Alternative Investment Fund industry using consistent detailed reporting information on funds. The report is part of a series of Statistical Reports published by
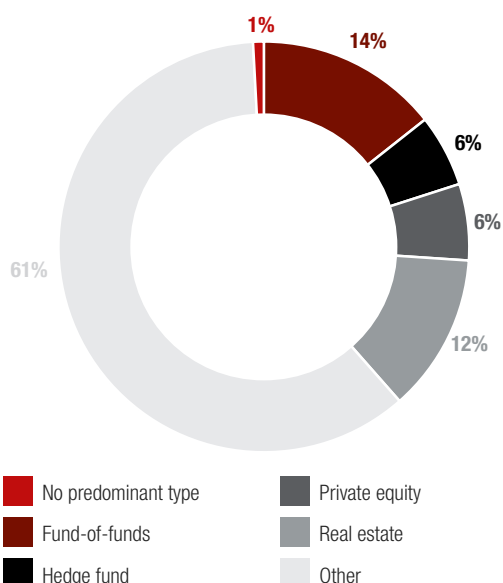
Figure 3: Size of AIF by type and country
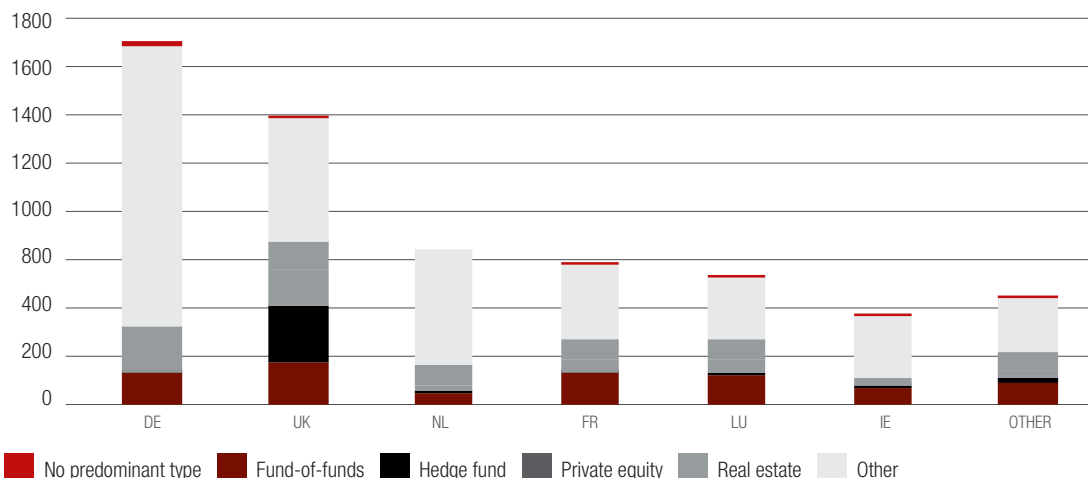
Note: NAV by type of alternative investment funds managed and/or marketed by authorized alternative investment fund managers and sub-threshold managers registered only in national jurisdictions, in € billion.

Sources: AIFMD database, National Competent Authorities, ESMA

ESMA covering different markets and entities under its remit, such as derivatives markets [(ESMA (2018)]. The 2020 Annual Statistical Report uses 2018 end-of-year data from around 30,400 alternative investment funds.[2]

4. THE E.U. ALTERNATIVE INVESTMENT FUNDS MARKET – LARGE AND DIVERSE

The alternative investment funds industry accounts for a significant share of the investment fund activity in the E.U.: the NAV of alternative investment funds in the E.U. amounted to around €5.8trillion at the end of 2018 (Figure 1).[3] By comparison, the NAV of UCITS amounted to €9.3 trillion.[4] Thus, alternative investment funds account for around 40 percent of the E.U. fund industry, and their assets have almost quadrupled in the last decade.

4.1 Wide variety of fund types

While hedge funds were the focus of the response to the crisis, the E.U. alternative funds universe was subsequently designed by lawmakers to be broader. It includes private equity and real estate funds, funds of funds, but also a large residual of vehicles pursuing diverse strategies (mainly in

bonds and equities with insurance and pension funds as the main investors). In terms of assets, hedge funds, in fact, make up only 6 percent of the E.U. alternative fund market and 80 percent of E.U. hedge funds by assets are managed in the U.K. Private equity accounts for 6 percent, real estate for 12 percent, and funds-of-funds for 14 percent. "Other alternative investment funds" accounts for 61 percent of the NAV of the sector (Figure 2), including commodity and infrastructure funds together with conventional non-UCITS investment funds pursuing more traditional strategies and targeting primarily traditional asset classes such as equities and bonds. Within this category, 70 percent of funds are equity or fixed income funds, and around 27 percent of the NAV is attributed to a further residual category, which includes mostly mixed funds and amounts overall to 17 percent of the NAV of all alternative investment funds, pointing to potential classification issues for alternative investment funds managers.

4.2 High degree of industry concentration

In terms of market concentration, the alternative investment fund industry is concentrated in a few countries, with the top-five accounting for more than 85 percent of the NAV (Figure 3). In countries with a large asset-management industry

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[2] AIFMD reporting obligations cover a wide range of measures of market and operational risk with different degrees of complexity for their calculation. Some very important indicators, such as leverage reported by alternative investment funds, cannot be directly used at this stage due to severe data-quality issues. Some other information is not always mandatory and may not be requested at the national level (e.g., the redemption frequency for open-ended alternative investment funds), which makes the use of aggregate data more difficult, see ESMA (2020) for further details on the dataset.

[3] The NAV of alternative investment funds amount to €5,860 billion according to AIFMD data, compared to a NAV of €5,873 billion according to EFAMA data. Thus, coverage of AIFMD data currently stands at more than 99 percent in terms of NAV.

[4] EFAMA statistics (https://bit.ly/32zke9W).

Figure 4: E.U. passport

5%
4%
14%
77%

E.U. without passport

Non-E.U. without passport

Non-E.U. not marketed in E.U.
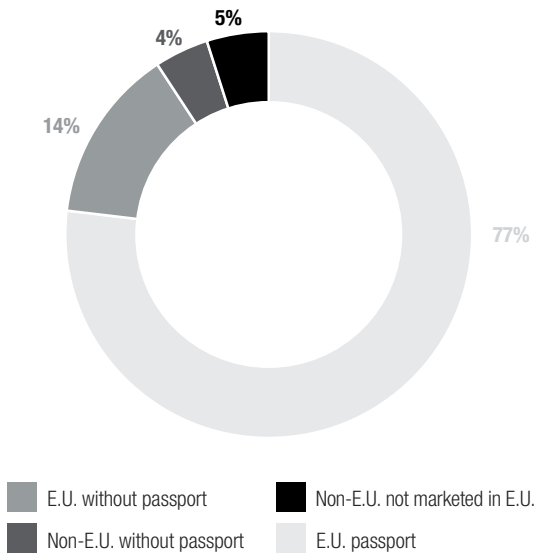
E.U. passport

Note: NAV of alternative investment funds by manager's access to AIFMD passport, end of 2018, in percentage.

Authorized E.U. alternative investment fund managers with access to AIFMD passport or marketing non-E.U. alternative investment funds without passport, sub-threshold managers registered only in national jurisdictions without passporting rights. Data for 24 EEA countries.

Sources: AIFMD database, National Competent Authorities, ESMA

(Luxembourg, Ireland, France), funds-of-funds also account for a significant share of the NAV. The hedge fund industry is heavily concentrated in the U.K., with more than 80 percent of the NAV managed by U.K. alternative investment funds managers. In most E.U. member states, "other alternative investment funds" account for most of the NAV. Most alternative investment funds have access to the E.U. passport (76 percent), allowing them to be sold throughout the E.U. (Figure 4).

4.3 Investor base dominated by institutionals

Alternative investment funds should principally target professional investors rather than retail investors. Professional investors account for around 85 percent of the NAV, while direct retail investors' participation is more limited, but quite significant at 15 percent of the NAV. Retail investors' participation might be underestimated since they could purchase banking or insurance products that are invested into alternative investment funds. In some E.U. countries, qualifying investor funds, referred to as "special funds", are created for investors with a special set of needs and not offered to the general public. qualifying investor funds for professional investors such as pension funds, insurance companies, or companies that seek an adequate investment for their excess cash are particularly important and tend to

Figure 5: Distribution of ownership

E.U. passport   ● Median   ● Average
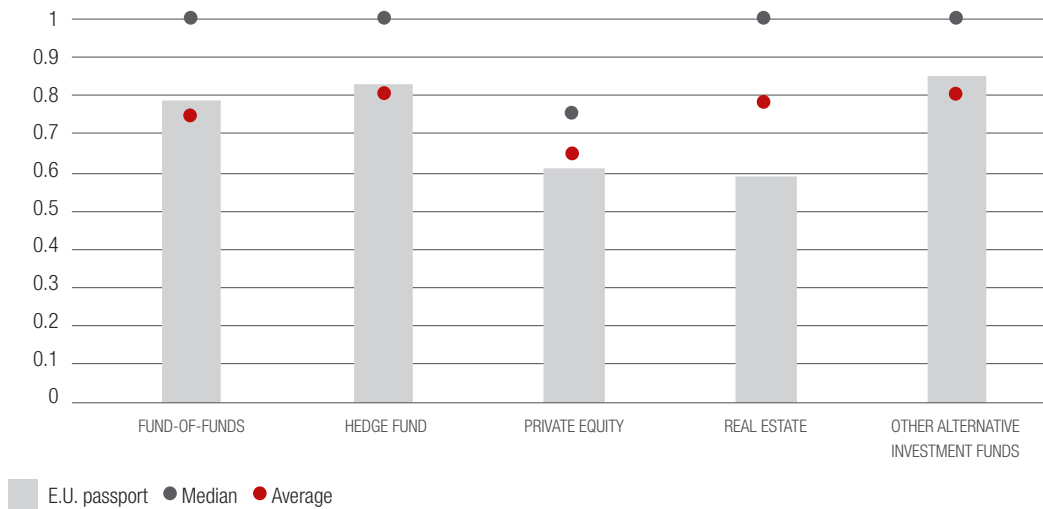
Note: Investor concentration of E.U. passported alternative investment funds, end of 2018, in percentage of NAV. Investor concentration computed as share of alternative investment fund equity beneficially owned by the five largest investors. Data for 25 EEA countries.

Sources: AIFMD database, National Competent Authorities, ESMA

Figure 6: Exposures by alternative investment funds and asset type
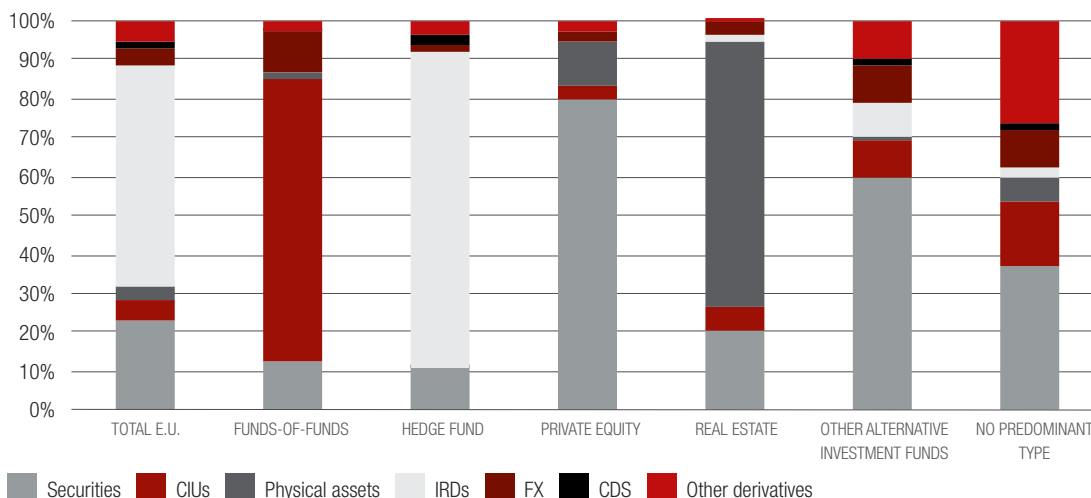
Note: Share of gross exposures by alternative investment fund type, end of 2018, in percentage of total alternative investment funds managed and/or marketed by authorized E.U. alternative investment fund managers. Data for 25 EEA countries.

Sources: AIFMD database, National Competent Authorities, ESMA

be very big. These investors may typically consider the fund structure to adequately meet their needs and deal with the valuation of illiquid assets, benefiting from the standardized disclosures and the investor protection standards ensured by the AIFMD. Among professional investors, unitholders are diversified across alternative investment fund types. Pension funds and insurance companies account for 28 percent and 16 percent of the NAV, respectively. Banks and other funds account for 8 percent each, and other financial institutions for 7 percent. Remaining investor categories are small, except for "unknown" investors (15 percent of the NAV).

4.4 Alternative investment fund shareholdings are concentrated in a few hands

The alternative investment fund industry is characterized by a very high concentration of investors. The top five holders account for around 75 percent of the NAV on aggregate (Figure 5). For at least 50 percent of alternative investment funds, the five main investors hold all the of the units of the fund. The high degree of concentration can be explained by two dominant factors. First, before the AIFMD, funds could be set up under national law for a single investor. When the AIFMD entered into force, those funds were converted into alternative investment funds, resulting in a highly concentrated participation, although under the Directive the funds must raise capital from a number of investors. Second, professional investors are

the main investors in alternative investment funds, and they typically hold a large share of the funds they invest in, which could also explain the concentration of ownership.

4.5 Alternative investment fund exposures – variety of assets, limited geography

Alternative investment funds are exposed to a wide range of asset classes, with variation across fund types (Figure 6). Real estate funds, private equity funds, and funds-of-funds are by construction heavily exposed to the underlying assets (physical assets for real estate funds, (unlisted) securities for private equity funds, and collective investment units for funds-of-funds). Hedge fund exposures are overwhelmingly biased towards interest rate derivatives – partly due to the fact that these derivatives have been reported in gross notional terms. The exposures of "other alternative investment funds" are more diversified, reflecting the diversity of strategies used within this residual category.

The geographical diversity of alternative investment fund investments, in contrast, is rather limited. Alternative investment funds invest mainly in the EEA (63 percent), followed by North America (16 percent), and supranational issuers (9 percent). Other regions account for less than 15 percent of the NAV. Hedge funds are the only alternative investment fund type that invest predominantly outside of the EEA, with their largest exposures to North America.

5. RISKS IN THE ALTERNATIVE INVESTMENT FUND INDUSTRY

Financial risks in alternative investment funds are a key concern of investors and supervisors alike. In particular, financial leverage from outright borrowing and synthetic leverage from derivatives exposures can – in adverse market conditions – be a source of financial losses to a fund and may, in unfavorable situations, deteriorate the liquidity position of a fund. Leverage and liquidity are, as a result, the two most important risk indicators in entity-level supervision.

Figure 7: Leverage
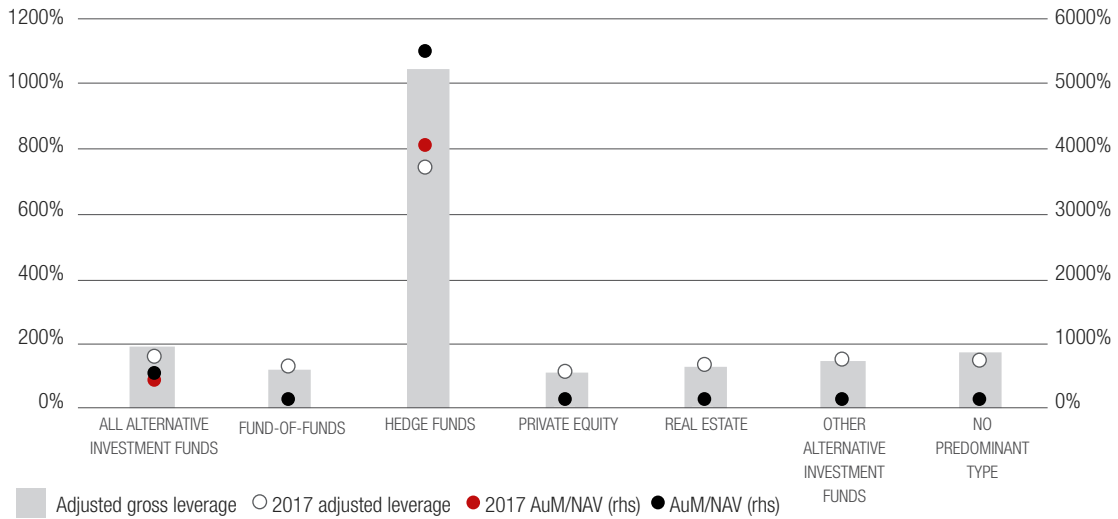
Note: Adjusted gross leverage of alternative investment funds managed and/or marketed by authorized E.U. alternative investment fund managers, end of 2018, in percentage of NAV. Adjusted gross leverage does not include interest rate differentials. Data for 25 EEA countries.

Sources: AIFMD database, National competent authorities, ESMA

Figure 8: Redemption frequency
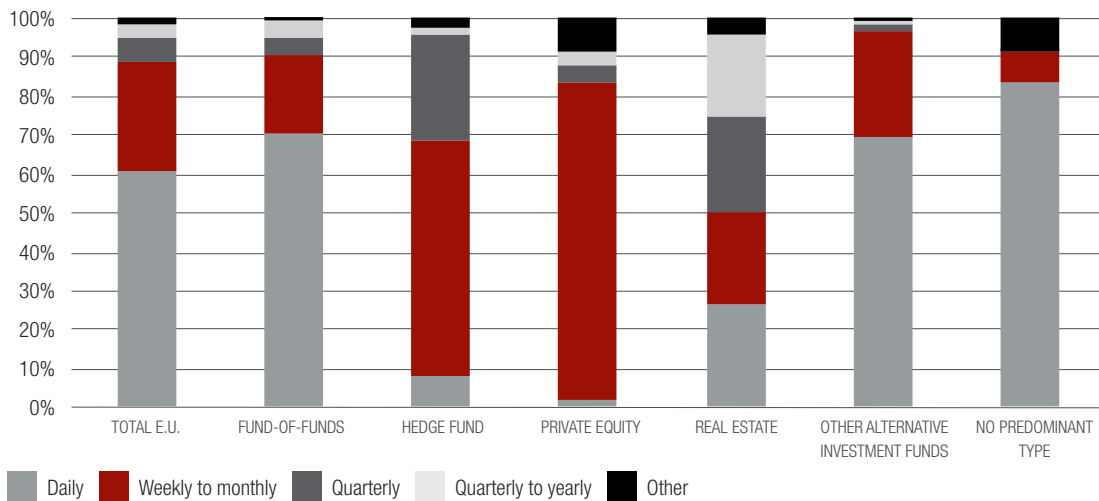
Note: Investor redemption frequencies allowed by open-end alternative investment funds managed and/or marketed by authorized E.U. alternative investment fund managers, end of 2018, in percent of NAV. E.U. and non-E.U. alternative investment funds by authorized E.U. alternative investment fund managers marketed, respectively, with and without passport. Data for 25 EEA countries.

Sources: AIFMD database, National Competent Authorities, ESMA

Figure 9: Hedge fund leverage by strategy
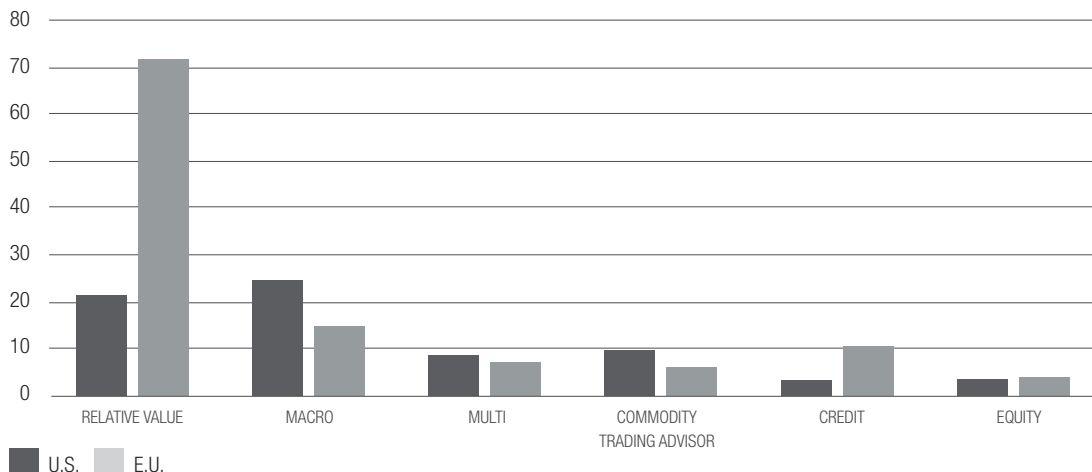
Note: Leverage defined as gross exposures/NAV, in percentage, end of 2018 U.S. data for qualifying hedge funds. For E.U., gross exposures excluding interest rate derivatives.

Sources: AIFMD database, National Competent Authorities, SEC, ESMA

5.1 Alternative investment funds' leverage and liquidity – limited, with pockets of risk

In the case of E.U. alternative investment funds, leverage is considered in terms of a fund overall exposure, and it includes any method by which its exposure is increased, whether through borrowing of cash and securities, gearing embedded in derivatives positions, foreign currency holdings, or by any other means.

At present, ESMA measures leverage[5] by the ratio of regulatory AuM (assets under management) to NAV, with regulatory AuM being relatively close to a measure of the gross exposure of a fund (see ESMA (2019) for a discussion of the two measures). Under the gross exposure and our present AuM-based approaches, derivatives are measured by notional amounts – rather than duration-adjusted as, for example, under the commitment approach. Using notional amounts tends to result in higher leverage figures, especially when a fund uses interest rate derivatives, for which the notional outstanding typically is significantly higher than the exposure after adjusting for the remaining duration of the derivatives portfolio. In order to arrive at a balanced view of the risks involved, we, therefore, complement the standard AuM measure of leverage with an adjusted leveraged indicator, for which interest rate derivatives are excluded from the computation of the leverage ratio.

Across all alternatives, leverage remains reassuringly limited, with a multiple of below 4.4 times NAV on average, measured by the ratio of gross exposures to NAV (Figure 7). Hedge funds stand out, as would be expected, with an average multiple of 55, which, however, goes down to ten if adjusted for their use of interest-rate derivatives. The high leverage of hedge funds stems mainly from the use of derivatives (synthetic leverage) rather than outright borrowing (financial leverage).

Around 70 percent of alternatives in the E.U. are open-ended, so need to stand ready to redeem fund shares at short notice. That exposes them to liquidity risks, which is why cash cushions, fund liquidity (the ability of funds to liquidate assets in their portfolio), and investor liquidity (the ability of investors to ask for a redemption of fund share at short notice) have the full attention of supervisors. Open-ended alternative investment funds tend to offer daily liquidity to investors (Figure 8). However, alternative investment funds that are more likely to be exposed to illiquid assets, such as private equity funds, real estate funds, and hedge funds tend to have longer redemption frequencies (weekly to monthly).

In aggregate, the liquidity profile of alternative investment funds points to potential liquidity risk: within one day, investors can redeem up to 28 percent of the NAV, while only 26 percent

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[5]   Under AIFMD reporting requirements, alternative investment fund managers also report two additional, dedicated and more sophisticated measures of leverage. The first is gross leverage (in percentage of NAV), and the second is the leverage under the commitment approach, where netting and hedging arrangements are taken into account to reduce exposures. Both indicators are calculated by market participants on the basis of complex reporting requirements, and the quality of data submitted by alternative investment fund managers varies considerably for the time being. ESMA and the NCAs are in the process of making them usable and publishable in the future.

Figure 10: Liquidity profile – hedge funds
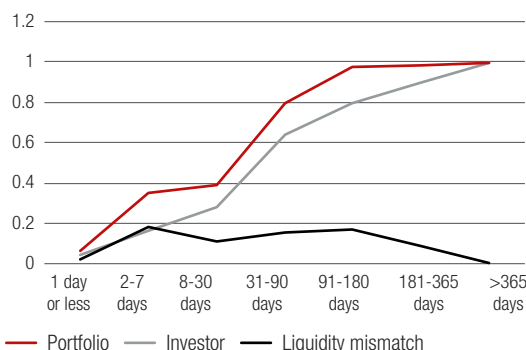
Note: Portfolio and investor liquidity profiles of hedge funds managed and/ or marketed by authorized E.U. alternative investment fund managers, end of 2018. Portfolio profile determined by percentage of the funds' portfolios capable of being liquidated within each specified period, investor liquidity profiles depend on shortest period within which each fund could be withdrawn or investors could receive redemption payments. E.U. and non-E.U. alternative investment funds by authorized E.U. alternative investment fund managers marketed, respectively, with and without passport. Data for 25 EEA countries.

Sources: AIFMD database, National Competent Authorities, ESMA

Figure 11: Liquidity profile – real estate funds
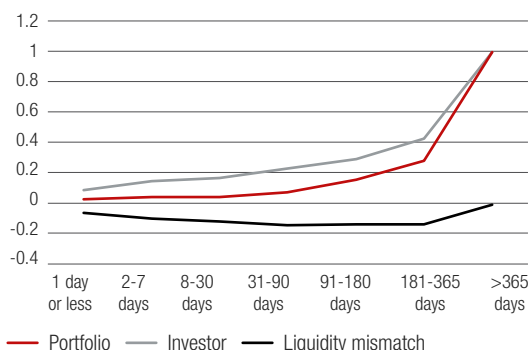
Note: Portfolio and investor liquidity profiles of real estate funds managed and/ or marketed by authorized E.U. alternative investment fund managers, end of 2018. Portfolio profile determined by percentage of the funds' portfolios capable of being liquidated within each specified period, investor liquidity profile depend on shortest period within which each fund could be withdrawn or investors could receive redemption payments. E.U. and non-E.U. alternative investment funds by authorized E.U. alternative investment fund managers marketed, respectively, with and without passport. Data for 25 EEA countries.

Sources: AIFMD database, National Competent Authorities, ESMA

of the assets can be liquidated within this time frame. However, this liquidity risk is very different across alternative investment funds types, and subsequent sections show the differences across sub-segments. Additionally, relying on aggregate figures may hide individual risks, as funds with excess liquidity might compensate for funds with a liquidity mismatch.

All in all, most E.U. alternative investment funds take limited recourse to leverage, with the notable exception of hedge funds, and the liquidity mismatch for most fund types is modest, except for real estate funds (see ESMA (2020) for further details). It is, therefore, useful to take a more detailed look at leverage risk in hedge funds and liquidity risk for real estate funds.

5.2 Hedge funds: High leverage but limited liquidity mismatch

Hedge funds are in general strongly leveraged compared to other funds, with an adjusted gross leverage of around 10x NAV. Among hedge fund strategies, relative value and macro have the highest levels of leverage (at respectively 71x and 15x NAV), even when interest rate differential exposures are excluded. We compare the figures for end-2018 with U.S. hedge funds, as reported by the U.S. Securities and Exchange Commission [SEC (2019)]. Overall, the use of leverage by

hedge fund strategies is qualitatively similar: relative value and macro are the most leveraged funds, followed by commodity trading advisor (CTA) and multi strategy. However, levels can be quite different, with E.U. relative value funds reporting very high levels of leverage compared to similar strategies in the U.S. (Figure 9).

Most of hedge fund leverage comes from derivatives, but financial leverage is also significant at around 80 percent of NAV. Most of the funding comes from the repo market, with E.U. hedge funds less reliant on prime brokers than their American counterparts. Regarding liquidity risks, most alternative investment funds are open-ended funds that offer weekly to monthly liquidity to investors. Hedge funds offering daily liquidity only account for 8 percent of the NAV. At the aggregate level, hedge funds' liquidity profiles point to very little liquidity mismatch: within a week, investors can only redeem up to 16 percent of the NAV, while 35 percent of the assets can be liquidated within this time frame (Figure 10). This pattern remains across all hedge fund strategies, despite different levels of portfolio and investor liquidity. For example, investors in commodity trading advisors can redeem up to 68 percent of the NAV within a week while portfolio liquidity is close to 100 percent at this horizon. For macro funds, investor redemptions within a week amount to 19 percent of the NAV against 80 percent for portfolio liquidity.

5.3 Real estate funds: Relatively high retail participation and sizeable liquidity mismatch

Real estate funds account for 12 percent of the NAV of alternative investment funds, at €730 billion, invested mainly in commercial real estate, and the industry is concentrated in a few countries. Real estate funds are sold mainly to professional investors (79 percent). Among alternative investment fund types, real estate funds have one of the largest shares (after fund-of-funds) of retail investors, especially for commercial real estate, with a share of 31 percent of the NAV. Among professional investors, pension funds and insurance companies are the main investors, accounting for 27 percent and 14 percent of the NAV respectively. Other funds also account for a sizeable share of real estate fund ownership, with 10 percent of the NAV. Banks have limited exposures to real estate funds, except for residential funds for which banks hold 15 percent of the NAV.

Real estate gross exposures are concentrated in physical assets (around 70 percent of exposures, across most real estate types), in line with the strategy used. Around 60 percent of real estate funds are open-ended funds, and there is considerable heterogeneity regarding redemption frequencies for open-ended funds. Real estate funds offering daily to monthly liquidity account for 47 percent of the NAV, ranging from 20 percent for industrial funds to 72 percent for residential funds. At the aggregate level, real estate funds' liquidity profile points to a potential liquidity mismatch: within a month, investors can redeem up to 16 percent of the NAV, while only 4 percent of the assets can be liquidated within this time frame (Figure 11). The liquidity mismatch relates mainly to commercial real estate funds, the largest real estate fund category: 22 percent of the NAV can be redeemed monthly whereas only 6 percent of assets can be liquidated within a month. The liquidity mismatch is more likely to occur than for other types of alternative investment funds, especially at the 1-month horizon, since in the past funds have experienced outflows of the order of 30 percent of the NAV, for example during the Brexit referendum [ESMA (2016)].

6. CONCLUSION AND WAY FORWARD

Collecting data on alternative investment funds and making operational use of them has been one of the most important policy initiatives in response to the global financial crisis. In the E.U., this commitment was translated into reporting requirements under AIFMD. This means that since July 2014 alternative investment fund managers have reported to national market regulators detailed information on the alternative investment funds they manage. Six years later, we are able to produce statistics from this highly sophisticated reporting system, and what emerges is a picture of a very diverse market, with limited leverage but pockets of vulnerabilities.

> *The rich alternative investment fund data set allows for a better understanding of the structures, performance, and risks of the E.U. alternative fund universe.*

The statistical and analytical evidence that E.U. and national authorities will be able to generate on alternative fund activities and risk exposures on that basis is set to grow in the coming years. The rich alternative investment fund data set allows for a better understanding of the structures, performance, and risks of the E.U. alternative fund universe. In parallel, ESMA is addressing key weaknesses in terms of low data quality in cooperation with national authorities and market participants. In addition, alternative investment funds evolve quickly, as do statistical and analytical techniques. Given the wealth of information available through AIFMD, further work is required to explore other dimensions of the dataset, including fund flows as well as performance. Counterparty and concentration risks could also be further studied, as alternative investment funds have to report their principal counterparties. The first findings presented here mark an important starting point and promise even more granular insights for entity supervision and financial stability surveillance in the E.U.

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CONSIDERATION ON BETTER TOKENIZATION PRACTICES AND REGULATIONS CONCERNING INVESTOR PROTECTION

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ABSTRACT

Tokenization is expected to improve the way people trade various types of assets by using technologies, such as blockchain and smart contracts. However, it is important to understand how it is similar to, and different from, traditional securitization mechanisms in order to evaluate tokenization as an asset mobilization mechanism. This paper establishes evaluation criteria, such as bankruptcy remote, legal certainty of transactions, transparency, liquidity, and finality, and applies them to both securitization and tokenization. We find several areas where tokenization could improve securitization as well as areas in which tokenization itself needs improving. While tokenization could increase certain aspects of transparency, such as traceability, enhanced liquidity, and reduced settlement risks, in certain cases investor protection is not enough. We discuss the ways in which practices of tokenization could be enhanced in order to ensure investor protection, especially focusing on bankruptcy remote, perfection of transactions against third parties, disclosure, ratings, and finality. These additional practices could increase costs and complexities of tokenization, but they are necessary to ensure that there are adequate levels of investor protection, which is a prerequisite for an asset mobilization mechanism.

1. INTRODUCTION

Asset tokenization, which generally refers to a set of mechanisms that allows various (real and virtual) assets to be traded on blockchain, has become quite popular among finance professionals in recent years,[2] with many believing that it could transform the way people trade assets globally.[3] While we don't dispute its potential,[4] we do find several issues regarding investor protection in the current asset tokenization practices that require deeper scrutiny.

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[1] The opinions presented in this paper are solely those of the authors and do not in any way represent those of the organizations to which the authors belong. We are grateful to William Baxter and Naoki Taniguchi of MUFG as well as team members from PwC Consulting LLC for their helpful comments on the earlier drafts.

[2] Laurent, P., T. Chollet, M. Burke, and T. Seers, 2018, "The tokenization of assets is disrupting the financial industry. Are you ready?" Deloitte, https://bit.ly/35YfRg

[3] Id.

[4] Cameron-Huff, A., 2017, "How tokenization is putting real-world assets on blockchains," NASDAQ, https://bit.ly/35mTyZC, and Ho, A., 2018, "How does tokenization work, anyway? Not everything will be tokenized, but those that can be will be," https://bit.ly/2Qpre4x

Figure 1: Securitization process

HOW SECURITIZATION WORKS
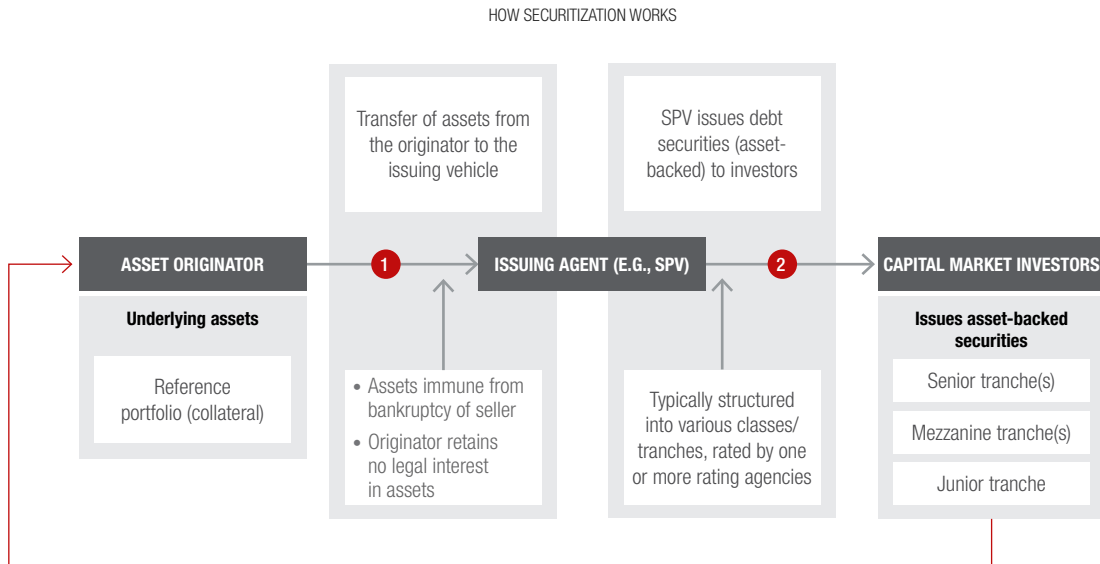
Jobst (2008)

Ever since securitization became part of the financial landscape, financial market participants and regulators have attempted to develop practices and regulatory treatments that can help ensure market integrity and protect investors.[5] Despite these efforts, there are still issues with securitization in the areas of transparency, liquidity, and settlement risks.

In this paper, we cover both securitization and tokenization and discuss how we can improve tokenization practices and regulations from an investor protection perspective.

2. SECURITIZATION AND TOKENIZATION

In this paper, we will discuss two different asset mobilization mechanisms – asset securitization and tokenization – and explain that while they are quite similar conceptually there are important differences between them.

2.1 Asset securitization

Since the 1970s, when U.S. government-backed agencies started to pool and securitize home mortgages, securitization has been used to mobilize real world assets.[6] The U.S. Office of Comptroller of Currency (OCC) explains that "Asset securitization is the structured process whereby interests in loans and other receivables are packaged, underwritten, and sold in the form of asset-backed securities."[7] Originators (those who own the assets that are securitized) could have several reasons for securitizing their assets, such as access to relatively cheaper financing and transfer of credit risks from their own balance sheets.[8] Investors, on the other hand, want to take credit risks only from underlying assets, and not from the parties involved in the securitization process. In the securitization process, this is achieved through a mechanism called bankruptcy remote, which will be discussed further below.

The process involves two steps, as shown in Figure 1. In the first step, the originator collects the assets or loans that are to be securitized, called the reference portfolio, and sells them to an issuer, such as a "special purpose vehicle" (SPV). The SPV then issues securities backed by the assets in the reference portfolio to investors.[9] In many cases, the reference portfolio is separated into several pools, called tranches, which have different risk levels, and the SPV sells them separately.[10]

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[5] For example, mechanisms such as bankruptcy remote is developed to protect investors. This will be discussed further below.

[6] Jobst, A., 2008, "What is securitization?" Finance & Development, September, https://bit.ly/2sOCcYg

[7] OCC, 1997, "Asset securitization comptroller's handbook," Office of the Comptroller of the Currency, https://bit.ly/2Fqi4P6

[8] Jobst. supra note 6.

[9] Id.

[10] Id.

Table 1: Types of tokens and their definition proposed by FCA (2019)

TYPES OF TOKENS	DEFINITIONS
EXCHANGE TOKENS	Exchange tokens (like Bitcoin, Litecoin, etc.) are not issued or backed by any central authority and can be used directly as a means of exchange. These tokens can enable the buying and selling of goods and services without the need for traditional intermediaries, such as central or commercial banks (e.g., on a peer-to-peer basis)… These exchange tokens can be used independently of a platform and are not limited to use within a specific network or only for goods and services offered by a specific issuer. (Para 3.31)
	Exchange tokens typically do not grant the holder any of the rights associated with the Specified Investments within our perimeter. This is because they tend to be decentralized, with no central issuer obliged to honor those contractual rights – if any existed. (para 3.35)
SECURITY TOKENS	Security tokens are those tokens that meet the definition of a Specified Investment as set out in the RAO, and possibly also a Financial Instrument under MiFID II. For example, these tokens have characteristics which mean they are the same as or akin to traditional instruments like shares, debentures or units in a collective investment scheme. (para 3.43)
	Security tokens include tokens that grant holders some, or all, of the rights conferred on shareholders or debt-holders, as well as those tokens that give rights to other tokens that are themselves Specified Investments. (para 3.44)
	We consider a security to refer broadly to an instrument (i.e. a record, whether written or not) that indicates an ownership position in an entity, a creditor relationship with an entity, or other rights to ownership or profit. Security tokens are securities because they grant certain rights associated with traditional securities. (para 3.45)
UTILITY TOKENS	Utility tokens provide consumers with access to a current or prospective service or product and often grant rights similar to pre-payment vouchers. In some instances, they might have similarities with, or be the same as, rewards-based crowdfunding. Here, participants contribute funds to a project in exchange, usually, for some reward, for example access to products or services at a discount. (para 3.51)
	Much like exchange tokens, utility tokens can usually be traded on the secondary markets and be used for speculative investment purposes. This does not mean these tokens constitute Specified Investments. (para 3.52)

2.2 Asset tokenization

Another asset mobilization mechanism we will discuss in this paper is asset tokenization. Given that asset tokenization is a very new concept, it has different connotations for different people. In this paper, we first define "token" and then discuss asset tokenization.

In recent years, some regulators have proposed definitions of different types of tokens.[11] One of the examples is the consultation paper of guidance on cryptoassets proposed by the FCA.[12] In its consultation paper, FCA classifies tokens into three categories: exchange tokens, security tokens, and utility tokens (Table 1). For the purposes of simplicity, we will follow FCA's definitions and mainly focus on security tokens.

In this paper, we refer to asset tokenization as a set of mechanisms used for issuing security tokens and allowing investors to trade them on a blockchain. Theoretically, we can assume two different types of asset tokenization, one of which has underlying assets and one that doesn't. This paper focuses on the former type of asset tokenization as described in Table 2.

As far as we are aware, unlike securitization, there are no widely accepted standard methods to tokenize underlying assets. However, in the simplest cases, originators places real assets in a safe vault[13] or bank account[14] as a custodian and issues digital tokens backed by these assets on a blockchain.

3. EVALUATION CRITERIA FOR ASSET MOBILIZATION MECHANISMS

Each asset mobilization mechanism has its own strengths and weaknesses. To compare them objectively, we have set several key evaluation criteria and apply them in the following.

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[11] For example, the UK Financial Conduct Authority (FCA) and the Swiss Financial Market Supervisory Authority (FINMA) issued the definitions and classifications of tokens in slightly different wording. See. FINMA, 2018, "ICO guidelines," https://bit.ly/2FnajJN and FCA, 2019, "CP19/3: guidance on cryptoassets," https://bit.ly/35shTxc

[12] Id at Chapter 3.

[13] For example, Digix tokenizes gold on Ethereum by putting gold into trusted vault, which is audited. See, DigiX, 2016, "Digix's whitepaper: the Gold standard in cryptoassets," https://digix.global/whitepaper.pdf.

[14] For example, Tether tokenizes fiat currency on the Bitcoin blockchain by putting USD into bank accounts. See, Tether, 2016, "Tether: fiat currencies on the bitcoin blockchain," https://bit.ly/2QIDQm86

Table 2: Types of tokens and asset tokenization mechanisms

	WITH UNDERLYING ASSETS	WITHOUT UNDERLYING ASSETS
EXCHANGE TOKENS		Bitcoin, etc.
SECURITY TOKENS	Asset-backed security tokens	Corporate bond/equity issued/traded on blockchain
UTILITY TOKENS		Some of the ICOs are defined a utility tokens by issuers

NB: the red box denotes the focus of this paper.

3.1 Criteria and evaluation

3.1.1 CRITERIA 1: BANKRUPTCY REMOTE

The first criterion is whether investors are protected from the bankruptcy of the originator or any other parties involved in the process of asset mobilization and how it is assured. As mentioned in the above, this mechanism is called bankruptcy remote[15]. Without bankruptcy remote, when those involved in the process go bankrupt the court could intervene to seize underlying assets of a token or security and include them in the bankruptcy proceedings, which would harm investors. Thus, investors should be protected from such risks, or at least informed about them so that they can accurately calculate risks and appropriate price.

Table 3: Types of legal systems and jurisdictions that adopted the trust form[16]

TYPE OF LEGAL SYSTEM	JURISDICTIONS THAT ADOPTED THE TRUST FORM
COMMON LAW	U.S., U.K., and other Commonwealth nations
MIXED-LAW	Louisiana, Quebec, and Scotland
CIVIL LAW	Japan, China, Lichtenstein, Israel, and several South American countries

Bankruptcy remote is dependent on the legal framework governing issuance and the underlying assets. In the case of securitization, it usually involves several key steps. As the first step, the originator needs to transfer the underlying assets from originator to the SPV. This transfer needs to be "true sale", which means that any legal or equitable interests in the underlying assets are eliminated from the originator and that the SPV is structured in such a way that the courts will not consolidate the underlying assets to the pool of assets within a bankruptcy proceeding.[17] Through true sale, the investors are protected from credit risks of the originator. In some countries, such as the U.S. and the U.K.,[18] the true sale is basically ensured by practices and common law,[19] while in other countries, such as Japan and China[19], it can be ensured by certain statutory provisions in the civil laws.[20] From a cross-jurisdictional perspective, "important efforts are underway to promote recognition by nontrust jurisdictions of trusts formed in other countries."[22] One of the efforts in this regard is the Hague Convention on the Law Applicable to Trusts and on their Recognition, concluded July 1, 1985 (Hague Conference on Private International Law, providing conflicts of law rules by which non-trust countries can recognize foreign trusts). As of April 19, 2017, that Convention has been ratified by Australia, Canada, China (only with respect to Hong Kong), Cyprus, France, Italy, Luxembourg, Malta, Netherlands, Switzerland, U.K., and the U.S.[23]

Other than the true sale, the SPV should also be protected from

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[15] JCR, 2011, "General methodology," https://bit.ly/39HHIII

[16] Hansmann, H., and U. Mattei, 1998, "The functions of trust law: a comparative legal and economic analysis," New York University Law Review 73:1, 434-479

[17] The Committee on Bankruptcy and Corporate Reorganization of The Association of the Bar of the City of New York, 1995, "Structured financing techniques," The Business Lawyer 50:2, 527-606

[18] Schwarcz, S. L., 2003, "Commercial trusts as business organizations: an invitation to comparatists," Duke Journal of Comparative & International Law, Herbert Bernstein Memorial Issue

[19] ICLG (2018). USA: Securitization 2018. https://iclg.com/practice-areas/securitisation-laws-and-regulations/usa at question 4.9

[20] Schwarcz, supra note 18 at 323.

[21] In Japan, trusts are legally recognized and when a trust is used as the SPV, transfer of assets to a trust is regarded as true sale and not consolidated to the pool of assets for the bankruptcy proceeding. See, ICLG, 2018, Japan: Securitization 2018, https://bit.ly/2QSiL8S at question 5.6 and Ueno, H., and H. Zenke, 2016, "Structured finance and securitisation in Japan: overview," Nishimura, and Asahi, https://tmsnrt.rs/2ZSDRYU

[22] Hansmann et al. supra note 16

[23] See https://bit.ly/2FAo6gd

its own bankruptcy (voluntary and involuntary) by structural and contractual setups.[24] How the SPVs are set up have been discussed for a long time and practices are relatively well established.[25]

3.1.1.1 EVALUATIONS

Securitization: practices around true sale and bankruptcy remote SPV was originally developed and used for securitization. In fact, the Committee on Bankruptcy and Corporate Reorganization of the Association of the Bar of the City of New York specifically mentions that "The sine qua non of structured financing is the effort to separate, as a legal matter, the credit quality of the assets being securitized from credit risk of any entity (other than credit enhancers) involved in the financing."[26] Of course, depending on the legal framework and circumstances of each case, the degree of certainty that such arrangements provide on bankruptcy remote would be different. However, it is worth noting that stakeholders working on securitization have made considerable efforts to ensure bankruptcy remote and it has a relatively long history within the marketplace.[27]

Tokenization: it is actually not easy to make general statements about tokenization given that it is still quite new and that there are no standardized structures. Despite this, we have seen examples of tokenization that employ neither true sale nor bankruptcy remote SPV in their projects. For example, Tether specifically mentions that "users must trust Tether Limited and our corresponding legacy banking institution to be the custodian of the reserve assets. However, almost all exchanges and wallets (assuming they hold USD/fiats) are subject to the same weaknesses.[28]" On the other hand, there are certain tokenization projects that have indicated that they use SPVs for legal reasons[29]. Thus, it is fair to say that not all tokenization projects take bankruptcy remote measures.

3.1.2 CRITERIA 2: LEGAL ISSUES ASSOCIATED WITH HOLDING AND TRANSFERRING OF SECURITIES/TOKENS

In asset mobilization mechanisms, physical assets and right(s) are separated and only the right(s) is/are traded in the financial markets in the form of securities/tokens. However, it is not always the case that the right(s) is legally acknowledged.[30] This is dependent on the jurisdictions in which the token offering took place and whether local authorities recognize the security/token offering. Who can claim legal rights to the assets is also subject to regulatory and legal considerations and only certain types of rights to the underlying assets can be legally perfected.[31] For example, it is possible that the court does not recognize any rights of the security/token holders in the underlying assets, even when they holds tokens that are securitized/tokenized of the underlying asset. If the legal effect is unclear, investors may unexpectedly suffer losses. Thus, evaluations of the legal rights associated with securities/tokens is important.

3.1.2.1 EVALUATIONS

Securitization: in the case of securitization, security interest in the underlying assets legally belongs to security holders, based on governing laws. For example, in the U.S., a "true sale" is conducted to transfer assets from a seller such that the assets will no longer legally belong to the seller's estate. This is achieved by receiving a legal opinion that a "true sale" has taken place and the seller no longer has claim to a security interest in the underlying assets. Additionally, the U.S. Article 9 of the Uniform Commercial Code (U.C.C.) sets out guidelines for transfers of financial assets and establishing rules for legally enforceable perfection and priority of the transfer of covered financial assets.[32] The trustee of a securitization will also take proper measures to ensure the underlying assets are perfected. Perfection is generally achieved by filing a UCC-1 financing statement under the applicable jurisdiction in the U.S.[33] In Japan, civil law and specific laws for asset

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[24] The Committee on Bankruptcy and Corporate Reorganization of The Association of the Bar of the City of New York. supra note 17 at 533.

[25] Id at pp. 554.

[26] Id at pp. 533.

[27] Id at 537.

[28] Tether, supra note 14 at 10.

[29] For example, Maecenas mentions legal issues and use of SPV as their product structure in their white paper. See. Maecenas, "The decentralized art gallery," https://www.maecenas.co/ at 10.

[30] Malasevschi, 2018, "Asset tokenization and legal implications," https://bit.ly/2QrCtcR

[31] For example, in the U.S., Uniform Commercial Code (U.C.C.) defines the way to perfect security interests in various financial instruments. For instance, it allows security interests in certain instruments to be perfected by filing. See. U.C.C. § 9-312(a). See also Schwarcz, S. L., 2006, "The impact on securitization of revised UCC Article 9," Chicago-Kent Law Review 74, 947-962

[32] Schwarcz, supra note 31.

[33] Generally, an SPV will perfect its interest in assets by filing a U.C.C.-1 financial statement to evidence the sale of assets. See. Moser, E. K., and J. E. Fish, 2011, Structured lending and securitisation in the United States: overview," Milbank, Tweed, Hadley & McCloy LLP, https://bit.ly/2sPXvJ6.

mobilization also set out legal requirements for perfection.[34] As long as the party engaging in securitization follows such laws and regulations, security interests in underlying assets are legally perfected with associated rights to them. Holders of the associated securities issued by the bankruptcy remote vehicle will have security interests in the underlying assets. When it comes to transfer of securities in the secondary markets, if the parties involved in the transactions take appropriate measures to perfect the security interest, through standard market practices of trading securities, the beneficiary of the security will have a security interest in the underlying asset.[35] In this way, the securitization mechanism allows parties and regulators to make considerable efforts to clear the legal issues associated with asset mobilization.

Tokenization: in the case of tokenization, it is not clear if parties involved in the tokenization process and investment transactions actually take such measures to legally perfect tokenized assets. For example, just putting gold in the secured vault and issuing tokens on the blockchain with that originator's "promise" to exchange tokens for associated underlying gold might not be enough to allow investors to legally claim a security interest in the gold tokenized in the case of bankruptcy of the originator. In the future, it may be possible for parties to record their interests and rights to underlying assets onto the blockchain and by legally acknowledging a filing for perfection. However, at this moment, the legal rights of the investors in underlying assets may not be assured unless parties involved in the tokenization and investment transactions follow applicable laws and regulations for perfections based on traditional asset securitization.

3.1.3 CRITERIA 3: TRANSPARENCY

Another aspect of investor protection is transparency and disclosure. Investors in the natural setting could face asymmetric information issues[36] and need to gain enough information to make appropriate investment decisions. Thus,

issuers of securities are required by law to disclose relevant information to the public.[37] In addition to disclosure, ratings from rating agencies could provide additional information to investors.

From a broader perspective, traceability through the history of origination, issuance, and circulation in the market would also be important. As asset mobilization mechanisms could cut the risks into small pieces and spread them out to the larger market, it is important to have enough traceability of the said security/tokens.[38] How much information is available to investors would be an important evaluation criterion.

3.1.3.1 EVALUATION

Securitization: within securitization, an issuer needs to follow disclosure requirements of securities issuers. In addition to general disclosure requirements, some countries impose specific disclosure requirements on securitization activities of originators and other stakeholders.[39] Furthermore, investors can also gain information from rating agencies. It should be said that while issues concerning the ratings of securitized products were found during the last financial crisis,[40] regulators and rating agencies have taken steps to remedy them.[41] Hence analytical frameworks and information provided by rating agencies could be a useful resource.

Securitization mechanisms could also lack traceability of the underlying assets, since the entire history of the underlying assets are not usually available. Steps are being taken by participants and regulators to improve traceability of securitization markets.[42]

Tokenization: while an issuer of a security token needs to abide by the same disclosure requirements, there could be several issues given the nature of the tokenization. For example, current disclosure requirements are tailored to deal with traditional securities and may not mandate that the issuer of the token reveal any tokenization specific risks, such as

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[34] Ueno, H., M. Kawato, 2009, "Country Q&A Japan," Nishimura, and Asahi, https://bit.ly/2tBnioA

[35] In the U.S., for example, parties involved in the transaction usually conduct filings following U.C.C. or other laws to perfect the security interest in underlying assets within specific dates after the effective date of transaction. See. Bjerke, B., and S. Fleischmann, 2019, "Securitisation," https://bit.ly/2QP10HH, 29.

[36] Cunningham, S., 2011, Understanding market failures in an economic development context, Mesopartner

[37] For example, in the U.S., the Securities and Exchange Commission (SEC) explains that "A primary means of accomplishing these goals is the disclosure of important financial information through the registration of securities. This information enables investors, not the government, to make informed judgments about whether to purchase a company's securities." and Securities Act of 1933 requires that investors receive financial and other significant information concerning securities being offered for public sale. See. SEC, "The laws that govern the securities industry," Securities and Exchange Commission, https://bit.ly/2tus7zY.

[38] Lack of traceability was one of the problems we saw in the financial crisis. See. Jobst. supra note 6.

[39] For example, in Europe, European Securities and Markets Authority (ESMA) publishes disclosure requirements as part of securitization regulations. See. ESMA, Securitization, https://bit.ly/35tqsYH

[40] Paligorova, T., 2009, "Agency conflicts in the process of securitization," Bank of Canada Review, Autumn, https://bit.ly/36wCDFe, at 40.

[41] Paligorova discusses various regulatory approaches related to rating problems. See. Id at 41.

[42] For example, in Japan, regulator amended supervisory guideline to improve traceability of underlying assets of securitization. See, JFSA, 2008, "FSA publishes the partial amendment of the Guidelines for Financial Instruments Business Supervision," Financial Services Agency, https://bit.ly/2ZYOj15

those associated with the quality and structure of computer code used for the smart contract or the technical specifications related to the underlying blockchain technology.[43] The global nature of token issuance is also another issue that needs to be taken into consideration, since disclosure requirements and supervisory actions are mandated by each jurisdiction.[44] As for the ratings, as far as we are aware, there are currently no widely accepted ratings for asset-backed tokens, which could make it difficult for investors to make appropriate investment decisions.

On the other hand, depending on the technical specifications, blockchain could improve transparency and traceability, since most of the blockchain networks provide the transactional histories.[45] This information is provided as part of the normal course of operation of the underlying blockchain network and no extra effort is needed.[46] If all the necessary information is recorded on the blockchain, it could be seen as immutable disclosure, although regulators do not currently recognize such information as fulfillment of disclosure requirements.

3.1.4 CRITERIA 4: LIQUIDITY IN THE MARKET

One of the important benefits of asset mobilization is to increase the liquidity of the underlying assets by using certain mechanisms such as securitization.[47] Thus, the degree to which they help increase the liquidity of the underlying asset is an important criterion. There could be countless factors that could affect liquidity in the market, however, in this paper, we will focus on information available to investors[48] and minimum trading units,[49] as these can be considered major differences between securitization and tokenization. The more we have limitations on these factors, the less liquidity we can enjoy in the market. Thus, when we evaluate asset mobilization mechanisms from the perspective of liquidity in the market, we should check how many limitations they impose on these factors.

Despite such benefits, issuers of asset-backed tokens need to learn from securitization in order to improve investor protection.

3.1.4.1 EVALUATION

Securitization: with regards to securitization, these two factors have certain limitations. In terms of information available to investors, as we saw in the financial crisis, originators and issuers of securitized products developed complex and nontransparent products[50] and investors faced difficulties in assessing their true risks. In addressing this issue, regulators are promoting transparent securitized products.[51] With regards to trading units, originators and other parties involved could face difficulties in cutting the underlying assets into very small pieces of securities. This is due to the fact that even if the securities are small, the parties involved still need to undertake all of the documentation work, calculate cash flows, and manage any other issues that require human interventions, which is a non-negligible number of costs per security per investor.[52] Although securitization mechanisms in general could increase liquidity of the underlying assets by cutting them into small pieces of securities, these limitations could negatively impact their liquidity in securitized product markets.

Tokenization: blockchain and smart contracts that are used for tokenization could mitigate some of the limitations we have observed with traditional securitization. On one hand, tokenization could be less transparent than securitization, due to complicated technical risks and lack of ratings. On the other hand, the blockchain technology could increase traceability and transparency. Consequently, it is difficult to compare

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[43] Dilendorf, M., R. Khurdayan, and G. Zaslavsky, 2019, "Another year in review: current state of Reg A+ tokenized offerings," Dilendorf and Khurdayan, https://bit.ly/2SUKvws

[44] Maume, P., 2019, "Initial coin offerings and EU prospectus regulation," European Business Law Review

[45] For example, anyone who participates in the bitcoin network can know what happened in the network, unless someone intentionally hides transactional information. See. S. Nakamoto, S., 2008, Bitcoin: a peer-to-peer electronic cash system, https://bitcoin.org/bitcoin.pdf.

[46] Id.

[47] Loutskina, E., 2010, "The role of securitization in bank liquidity and funding management," Journal of Financial Economics 100:3, 663-684

[48] Lester, B., A. Postlewaite, and R. Wright, 2011, "Information and liquidity," Journal of Money, Credit and Banking 43:7, 355-377

[49] The smaller the minimum trading units, the larger the investor base and thus larger market liquidity. See, Amihud, Y., H. Mendelson, and J. Uno, 1999 "Number of shareholders and stock prices: evidence from Japan," Journal of Finance 54:3, 1169-1184, at 1172.

[50] Segoviano, M., B. Jones, P. Lindner, and J. Blankenheim, 2015, "Securitization: the road ahead," IMF Discussion Note SDN/15/01, https://bit.ly/2ttKCEx, at 11.

[51] FSB, 2016, "Revisions to the securitization framework," Financial Stability Board, https://bit.ly/39EXQ1L

[52] For example, just managing cash flows from the underlying assets and distributing them to investors incurs costs that increase proportionally to the number of investors. Thus, issuers of securitized assets face limitations on minimum trading units.

tokenization with securitization with regards to transparency. Automated and timely records of transaction data on the blockchain, however, could support liquidity. As for the trading units, given that blockchain-based smart contracts could automate certain parts of the tokenization lifecycle, such as cash flow management, the parties involved in tokenization could issue smaller tokens, at a lower cost to securitization, which could help attract investors. In this way, the blockchain technology behind tokenization could improve liquidity by eliminating (part of) the limitations on factors affecting liquidity, while new opaqueness on technical risks and lack of ratings could negatively affect liquidity.

3.1.5 CRITERIA 5: SETTLEMENT RISKS

The parties involved in the settlement of securities transactions could face several risks, including counterparty default and breach of agreement.[53] When one of the parties defaults, their counterparts could face significant risks, such as principal risk,[54] replacement cost risk,[55] and liquidity risk.[56] The longer the time between payment and delivery of securities or tokens, the bigger the risk of the default.[57] Hence, it is important to evaluate this timing gap to assess risks associated with the settlement.

Settlement finality is also an issue that needs to be considered. The settlement should be final, and investors should not need to worry that it can be revoked. However, depending on the mechanism, this settlement finality could be a problem. Thus, the level of certainty of the settlement finality would be a criterion.

3.1.5.1 EVALUATION

Securitization: in the case of securitization, many of the security transactions settle by a payment process finalized two to three days after the payment trades are made (T+2-3)[58]. This is a considerably large timing gap and participants of the transaction could face non-negligible settlement risks. On the other hand, once settled with perfection against third party, it is final, and participants do not need to worry about involuntary revocation of transactions.

Tokenization: in the case of tokenization, the payment could happen off-chain or on-chain. When the payment is made in fiat currency, it would happen off-chain, and if the payment is made in crypto assets, it would happen on-chain. Such a difference would affect the efficiency and cost of transactions, as well as settlement risks. In the case of on-chain payment, it would be technically possible to implement the DVP (delivery versus payment) mechanism on the blockchain,[58] which would eliminate any settlement risks. Even in the case of off-chain payment, it is relatively easy to send tokens on the blockchain in a matter of few minutes to few hours after the payment is confirmed, which greatly reduces settlement risks as compared to the traditional T+2-3 days settlement of securitization products.

When we consider the finality, we should distinguish between finality from the legal standpoint and finality from the data on blockchain standpoint.

From the legal standpoint, it is possible that finality is ensured when the investor perfects the move of legal right against the third party. Thus, as discussed in criteria 2, there could be two different scenarios; 1) the data on the blockchain itself could work as legally recognizable record of move of legal right and ensures perfection against third parties and 2) investors need to recourse to an off-chain record of move of legal right to ensure perfection.

In terms of finality from the standpoint of blockchain record, we also need to consider two different categories of blockchains 1) that could provide finality of the data recorded and 2) that could not provide finality of the data recorded. For example, some of the blockchains, such as certain type of permissioned blockchains, could provide finality[60] and thus belong to the first category. However, most of the public blockchains would fall into the second category, as they can only provide probabilistic finality of the data recorded.[61] Given that data recorded on the blockchain could be involuntarily revoked in some rare cases, investors could be harmed. Although it would be difficult to forcefully change the record on the blockchain after several

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[53] BIS, 1992, "Delivery versus payment in securities settlement systems," Bank for International Settlements, https://bit.ly/37FsRAQ at para. 2.7.

[54] Id at para. 2.9.

[55] Id at para. 2.8.

[56] Id at para. 2.10.

[57] SEC, 2004, "About settling trades in three days: introducing T+3," Securities and Exchange Commission, https://bit.ly/2MXJaBl

[58] For example, in 2017, the financial industry working with regulators and financial market infrastructures implement a shortened settlement cycle from T+3 (trade date plus three days) to T+2. The scope includes a certain type of securitization products. See, T+2 Product Scope Working Group, "The list of in-scope cash products," https://bit.ly/2N05HgE.

[59] For example, if the crypto assets used for payment and tokenized assets are on the same blockchain, they can be traded in the form of DVP in a relatively simple manner. We see many projects working on decentralized exchanges that enable atomic swap between different tokens. See. Agarwal, H., 2018, "9 best decentralized exchanges that you can use to trade NOW," https://bit.ly/2ZULIFr

[60] Consensus mechanism affect finality of the blockchain. See, Hyperledger, 2017, "Hyperledger architecture, volume 1," https://bit.ly/2uixP8d, at 6-7.

[61] Samparsky, 2018, "Blockchain finality - proof of work and proof of stake," Medium, https://bit.ly/2MYptt6.

Table 4: Issues around finality of token transactions

	PERFECTION BY BLOCKCHAIN DATA	PERFECTION BY OFF-CHAIN RECORD
BLOCKCHAIN WITH FINALITY	Blockchain data alone could ensure finality of transactions of tokens.	Investors need to rely on off-chain records for perfection but don't need to worry about inconsistencies between the off-chain record and data on the blockchain.
BLOCKCHAIN WITHOUT FINALITY	In rare cases, investors could suffer involuntary revocation of transactional data on the blockchain and might not be able to perfect against a third party.	Investors can perfect against a third party, but, in rare cases, off-chain records and data on the blockchain could be inconsistent, which could cause confusion and harm investor protection.

confirmations[62] of blocks, if, for example, someone controls more than 51 percent of hash rate within the network, they can revoke the data recorded in the blocks.[63]

Table 4 summarizes four theoretically possible categories. In considering the issues of finality, we need to give careful consideration to the risks that can arise from both sides.

3.2 Conclusion of this chapter

Table 5 is a summary of the pros and cons of each mechanism.

4. BETTER TOKENIZATION PRACTICES AND RELATED REGULATIONS

Although tokenization could improve liquidity and traceability, as well as help reduce settlement risks, it may lack some of the investor protections that come with securitization, such as

bankruptcy remote, legal certainty, transparency, and finality of the transactions. In this section, we will discuss the issues associated with investor protection, while highlighting the other benefits of tokenization.

4.1 Bankruptcy remote

First, and foremost, the originator of an asset-backed token should setup a bankruptcy remote SPV, or use a trustee, execute a true sale of underlying asset, and transfer them to the SPV for bankruptcy remote. Not all of the originators of asset-backed tokens currently follow this practice, which means that investors could face unintended counterparty risks. While this practice would add complications to the origination process, and consequently increase costs, which could prevent small startups from originating asset-backed tokens, bankruptcy remote should not be abandoned, nonetheless.[64]

Table 5: Summary of evaluation results

EVALUATION CRITERIA	SECURITIZATION	TOKENIZATION
BANKRUPTCY REMOTE	(+) Well established practice	(-) No established practice
LEGAL ISSUES	(+) Well established practice to ensure legally binding perfection	(-) No clear practices
TRANSPARENCY	(+) Follow the disclosure requirements and ratings available for securities (-) Traceability is low	(-) Follow the disclosure requirement for securities but the requirement may not reveal all the risks associated with technology, and not enough ratings are available (+) Could provide on-chain data that increase traceability
LIQUIDITY IN THE MARKET	(-) Nontransparent products and limitation on minimum trading units	(+) Additional and timely data available on blockchain to investors, and less restrictive minimum trading units (-) Opaqueness on technical risks and lack of ratings
SETTLEMENT RISKS	(-) Need two to three days for security settlement (T+2-3) (+) Ensure finality of the settlement	(+) Could achieve DVP or at least T+ few hours (-) Depending on the legal treatment and blockchain design, investors could suffer involuntary revocation of transactions. There could also be a mismatch between legal status and data recorded on blockchain

[62] Nakamoto. supra note 46 at 6.
[63] Id.
[64] Simon, J., 2019, "Special purpose vehicles: at the intersection of blockchain and law," Medium, https://bit.ly/2QRQboe

Alternatively, originators could disclose the counterparty risks that investors might face in an easy-to-understand manner, so that they can take them into consideration when making investment decisions. In this case, investors should be well informed to understand the risks, which might come at the expense of retail investors.

In our opinion, bankruptcy remote is preferable to disclosure, since without bankruptcy remote counterparty risks could be spread out to the larger financial system in the case of a large-scale financial crisis.

In the future, it might be possible that certain technologies could be used to recognize bankruptcy remote. Smart contracts could be created that evaluate the financial circumstances of the parties involved in tokenization and automatically start the liquidation process of the underlying assets before they become insolvent. However, such technologies seem some way off.

4.2 Legal certainty

To ensure legal rights of the underlying assets, and the cash flows from them, it is important for parties involved in the transaction to take appropriate legal measures. In some cases, keeping a record of the transactions on the blockchain could be enough for perfection in some countries and under certain regulations. For example, in Japan, move of interest in trust can be perfected by keeping record of the beneficiary of trust and it could be possible that the record on the blockchain can be recognized as a record of beneficiary of trust. In this case, parties the involved don't need to take additional legal measures to ensure perfections.[65] However, it could also be the case that they need to take certain legal measures, such as keeping off-chain records or filing certain information to public registry following specific regulations.

An important issue that needs to be kept in mind is that different jurisdictions have different legal requirements and regulations for ensuring perfection, which makes selling and trading of asset-backed tokens globally rather complicated. That is why, when it comes to issuing asset-backed tokens across borders, issuers must pay special attention to defining the governing laws, jurisdictions, and arbitration processes involved to avoid complicated cross-border disputes. In the future, depending on the development of the markets, regulators may wish to consider harmonizing laws, regulations, and/or practices for perfection.

4.3 Transparency and liquidity

Meeting disclosure requirements may, however, not be enough, as investors need to understand the risks associated with the technology behind the tokenization, which could be beyond the scope of disclosure requirements. In considering appropriate disclosures, it is important to pay particular attention to the fact that tokenization on blockchains with smart contracts would, to some extent, shift the trust from being between the entities involved to mathematics and computer codes. Regulators may consider establishing additional disclosure requirements that focus on the specific risks associated with tokenization, including technical issues.

On the other hand, blockchains could open up the possibility that the information necessary is automatically recorded on the chain, which could cause duplication between on-chain data and off-chain disclosures. To our knowledge, there are currently no globally applicable standards regarding the information recorded on the blockchain vis-à-vis tokenization. However, as the industry develops such standards or best practices, regulators could, in the future, allow originators and issuers to omit off-chain disclosures by replacing them with on-chain records.

Regarding ratings, there are a few startup companies that are focusing on asset-backed tokens,[66] though they are at the very early stages of development. It might be beneficial for originators and issuers to talk with more traditional rating agencies to explore the possibilities of developing rating services for asset-backed tokens.

Given that blockchains could inherently provide additional and timely records of transactions automatically, once the concerns regarding transparency of tokenization have been addressed, they could become more liquid than traditional securitization.

4.4 Finality

As Table 4 illustrates, if tokens are issued and traded on a blockchain without finality of data recorded, regardless of whether investors take legal measures off-chain or not, it is technically difficult to perfectly eliminate issues associated with perfection. It is important for originators and issuers to understand this risk before deciding which blockchain technology to employ to issue their asset-backed tokens.

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[65] For example, the Japanese Trust Act stipulates that information of beneficiary of trust has been stated or recorded in the beneficial interest registry, as requirements for the perfection of an assignment of a beneficial interest in a trust, with certificate of beneficial interest, and defines electromagnetic records as one of the ways for creating such records. Keeping records on the blockchain is considered to be one of the ways for keeping records by electromagnetics. See, Japanese Trust Act Article 195 and Regulation for Enforcement of the Trust Act Article 31 and 32.

[66] For example, STO RATING and ICORATING provides rating for tokens. See, https://www.storating.com/ and https://icorating.com/ respectively.

> *Although tokenization could improve liquidity and traceability, as well as help reduce settlement risks, it could lack some of the investor protections that come with securitization.*

One practical solution is to employ a blockchain that provides credible finality of the data recorded in order to mitigate such risks.

While the issue of finality of the record on the blockchain might be solved at some point in the future, if originators and issuers decide to employ a blockchain that provides only probabilistic finality, they need to publish guidelines that define how they treat chain reorganizations, which could affect investor protection.

4.5 Further consideration

While the above practices could increase the costs and complications of tokenization, it is still very important to ensure that there is the same level of investor protection as that of traditional securitization. Despite that, it is also important to make the tokenization cost effective. This could be achieved by taking advantage of the programmability of tokenization, which could make it possible to replace the processes that require human intervention. To fully enjoy the benefits of programmability, the industry needs to request modifications in regulations to recognize technical developments. In this way, the tokenization industry could ensure security and safety of the technology they employ and allow the regulators to fully grasp the technical complexities.

In addition to working with domestic regulators, the industry also needs to engage with foreign and international regulatory bodies in order to get more regulatory harmonization across national borders.

5. CONCLUSION

Thanks to the technical developments of blockchain and smart contracts we now have tokenization as an asset mobilization mechanism, which could be an alternative to traditional securitization. Tokenization is, of course, in its infancy and its potential to change the way people trade asset-backed securities is still debatable. However, as was discussed in this article, blockchain and smart contract mechanisms could improve asset mobilization processes by increasing traceability, improving liquidity, and reducing settlement risks, as compared to traditional securitization. Thus, it would be beneficial to explore ways in which they could be utilized across financial markets.

Despite such benefits, issuers of asset-backed tokens need to learn from securitization in order to improve investor protection. This paper revealed several points of concern with regards to investor protection, such as lack of bankruptcy remote, certainty of their legal status, transparency, and finality. We explained that these concerns could be addressed by following practices developed for securitization or by a combination of new technologies and new regulatory frameworks. However, these steps are not without costs, and complexities, though essential.

To make the discussion practical, this paper focuses mainly on currently available and applicable solutions to improve investor protection. However, it should be borne in mind that more sophisticated technology-based solutions that could mitigate burdens and costs as well as improve efficiency are not too far off.

Regulators also need to look for ways to help this industry develop, and should consider developing new regulations or amending existing ones.

Asset tokenization could transform how assets are traded, but needs greater focus on investor protection to achieve its goals.

TECHNOLOGY

DIGITAL DISRUPTION
– A CEO'S SURVIVAL GUIDE

JET LALI | Chief Digital Officer, State Street Global Advisors

ABSTRACT

For a company to be successful in its digital transformation, leaders will need to understand what digital can deliver for their businesses and have a hand in driving that change themselves. Digital transformation is more than an IT solution, it is a firm wide event. Executives will need to comprehend the value of data and deeply understand what artificial intelligence (AI) can and cannot do for them. For those who get this right, the prize will be to unlock the information advantage for their businesses and for the very best, it will be digital supremacy and domination of their sector. This paper will explore the key areas of digital transformation, provide insights into how digital will disrupt our industry in the coming decade, and offer insights into how best to prepare for the change ahead.

1. INTRODUCTION

We are in the midst of the fourth industrial revolution. The agricultural, industrial, and technical revolutions changed the world through steam, electricity, and computing delivering unprecedented efficiency, automation, and productivity. Now the digital revolution is doing the same using advanced connectivity and exponential improvements in software, hardware, and the network effect.

Few notable industries have yet to undergo digital disruption. Those most ready for disruption are manufacturing, automotive, healthcare, and regulated services. Our own industries of asset and wealth management are laggards in the disruption lifecycle. However, change is coming and ours will be one of the next big industries to be rebooted.

As with all industrial revolutions, business models need to adapt and change if they are to survive. This is equally true today as evidenced by the number of companies that are making digital transformation their top strategic priority, the increasing number of Chief Digital Officers being hired and the significant budgets being allocated to deliver this change program.

The prize for companies that get transformation right is the information advantage they will have over their competitors. They will learn what their customers want and how their needs evolve so they can focus their resources on delivering better outcomes than their competitors.

Businesses will also face more competition than ever before and margins will continue to fall as digital drives automation and efficiency improvements, which will drive costs and fees lower. This will provide both better value for money and services for customers.

Best practices and innovation will come from all regions and sectors. In a digital world, information, ideas, and new business models are borderless and quick to deploy at marginal cost. Gaining a million more customers is often a marginal cost increase compared to the first million customers.

Customers embrace new technology faster than large companies are able to evolve. This is one of the reasons why the average tenure of a company in the S&P 500 index is getting dramatically shorter each decade. Disruption rarely happens within incumbents, businesses that are not adapting

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fast enough also fail faster than ever before. Kodak and Blockbuster are often used as examples of companies that failed to evolve and subsequently failed. What is less known is that Kodak invented the digital camera and that Blockbuster was given the opportunity to buy Netflix but declined on the offer.

2. THE INFORMATION ADVANTAGE

For online customers, a key challenge in the digital age has been to "find" the best solution for their needs. Google has largely solved the information "search" problem. However, this has created a new challenge of how to "find" the answer from the vast amount of data that is returned. Often, when running a search query, we are presented with millions of results. This quantum of data is impossible to comprehend for the human brain, but increasingly computable and understandable for machines and smart algorithms.

We humans typically rely on the top three search results and simply click on one of those. This is still much more efficient than conducting research without using the internet, however we now have too much information.

Having a website means that a company can be found by billions of customers and prospects within seconds. However, in reality, customers are deluged by information and are frequently unable to find the best solution to solve their problems or meet their needs. Information search alone also does not answer the initial need of the customer, which might have been "which bank account should I open"? or "which fund should I buy"?

In a post digital transformation world, this challenge will largely be solved. Not only will customers have access to the data they need, they will also have access to the technology that is able to integrate and comprehend millions of data points and make sense of all that knowledge to provide the best answer.

That answer will be presented in real time, in the right context, just as it is needed and in the right format. We will have moved from search engines to "answer engines".

3. INDUSTRY IMPACT AND WHAT CHANGES TO EXPECT

Over the next 10 years many of our current business processes will be unrecognizable to the next generation of investors, just as going to a travel agent or using the phone directory is alien to many of us today despite this being an everyday occurrence only a decade or so ago.

All change results in resistance and this revolution is inciting many concerns about privacy, security, and the loss of physical human connectivity. All are fair concerns, but on balance digital solutions are a positive force for humanity. We still have billions of people who remain unbanked and even more who neither invest nor have a pension. For too long this has been a luxury of the developed markets. For western markets, these services are more expensive than they need to be. They are also inefficient; it still takes days or weeks to open a bank account or obtain a mortgage.

Unlike analogue technology, digital technology is transformative as software only gets better, building upon the past quickly, and disrupting once its early versions have established themselves. For instance, even though the CPU (central processing unit) of an iPhone changes with each new model, the core software from previous operating systems still remains, incrementally improving with each upgrade.

Software that will automate work is already here, albeit still not in the mainstream but developing quickly. It will mature and become ubiquitous. Many inefficient processes will become automated and delivered in real time and cost a fraction of what they do today. Sophisticated processes are also not immune to automation. Financial planning advice, settlement of physical assets and contracts will be fully automated by the end of the decade. They will become the standard rather than the exception, as is the case today.

Barriers to entry are falling away fast and the speed at which asset and wealth managers will grow in the next decade will be akin to the speed of growth seen in technology companies of the last decade. Our industry is by nature digital. Our products are digital, distribution is digital, and our service and investment process can easily be digitized. We are much more digital than eBay, Amazon, Alibaba, and Uber.

In asset and wealth management, digital is already the preferred customer service channel. It is the way most customers conduct their research when making investment decisions. We can glimpse into the future by looking at the innovations that are already occurring in both the fast growing Indian and Chinese markets. These countries have had to leapfrog straight into digital solutions, without having had the luxury of an incumbent and mature financial solutions industry to cater for the needs of rapid economic growth over the last 25 years.

4. THE GLOBALIZATION OF COMPETITION

India and China have over 2.6 billion people to serve and it would take an entire generation to train enough advisors and wealth managers to serve their customer base, using the same model as the Western markets. Hundreds of millions of adults enter retirement without any systematic savings solutions, and if not resolved the impact of not providing these huge populations with the ability to save and invest is an existential threat to nation states.

In India, necessity and opportunity has led to regulatory and structural innovation. High levels of inefficiency and fraud led to the world's largest biometric database (Aadhaar) and tightened "know your customer" (KYC) regulations by the Securities and Exchange Board of India (SEBI). This subsequently enabled the development of digital KYC service agencies that can use retina scanning and fingerprints to immediately authenticate customers. Centralized KYC platforms now allow regulated asset managers and wealth managers to reuse existing applications and avoid having to repeat the process, enabling customers who have completed the KYC process with one regulated firm to avoid having to do so again when they decide to open an account with another firm. This dataset is not only used to validate KYC requirements but also to authenticate for a wide array of e-services, including accessing cash from ATMs as well as passport and driver license applications.

Innovation in China has been led by large conglomerates that can move at speeds typically only seen by much smaller, more nimble companies. Firms such as Ant Financial, which as of 2019 was valued at U.S.$150 billion, has one of the largest money market funds in the world, with assets under management (AuM) of over U.S.$100 billion, wholly distributed in small increments from 600 million individuals through their mobile applications. This fund is now even bigger than the flagship money market funds offered by JPMorgan and Fidelity.

In Europe and America, large financial institutions no longer enjoy blind trust from either customers or regulators. Since the 2008 global financial crisis, they have demanded increasing levels of transparency from financial services firms. Concurrently, large digital players, such as Google, Amazon, Apple, Facebook, and even Uber have quietly become financial services companies. For instance, Uber now offers bank accounts, debit cards, and credit cards to its drivers. The huge advantage these companies have is access to their massive datasets on billions of customers and a culture of rapid product innovation.

In this decade, data will be the differentiator and the most important source of competitive advantage. Disparate data sets will become unified, leading to new applications. For example, the data held by Uber's passenger rating system, in which every customer is rated by the driver on a five scale rating, could in theory become a proxy for a credit rating system, to help model lending risk when offering credit cards or loans. Could a high "star rating" contribute to the calculation of low credit risk? Equally, Uber could potentially sell this data as a service and compete with Equifax and Experian as a global data provider.

PayPal was an early pioneer in payments 20 years ago, and 12 years ago it became a regulated bank (Luxembourg, 2008). In the last six years, PayPal has been joined by Apple, Google, Facebook, Amazon, and Uber in the payments business. Payments are a logical place to start, as this segment of financial services provides the lowest barrier to entry from a regulatory perspective.

How long will it be before these technology giants also decide to acquire banking licenses? This time not in Luxembourg, but in their most lucrative markets. Technology companies already have a history of rapidly extending and deepening their business models. Very few products are more digital than money or investment funds.

5. CONVERGENCE OF INNOVATION AND REGULATION: NEW PLAYERS, NEW SERVICES

Currently, none of the top 10 digital companies in the world originate from Europe. More specifically, they were all born in the U.S. and China. This is similarly true for AI expertise. These markets have a significant head start in the most disruptive technology of this decade. Although one could argue that different types of innovations are taking place in Europe and India, with the former leading the way with full-service, digital-only banks and India leading with a well adopted biometric platform, businesses in both these regions are far behind and will need to do much more to catch up if they want to compete in the digital future. The increasingly protectionist regulatory and tax regimes we see in both these markets may also be a mistake, as these will ultimately keep them behind rather than encourage competition.

The American digital conglomerates are learning from their Chinese counterparts, who showed them how to leverage their captive customer base to compete in financial services. Apple became one of the world's largest payment solutions providers overnight when they launched Apple Pay. They enabled this

capability with a simple software upgrade to their iPhone operating system, making it extremely easy for the end-user to adapt and utilize.

Legacy banks like Santander found it difficult not to partner on Apple Pay, as it offered convenience for their existing customers, even though it was certainly not commercially beneficial. They feared losing customers by not keeping up with their competitors, who had also committed to offering the new payment capability. Businesses with large customer bases understand how important a frictionless customer experience is. They understand that design and the latest features are crucial elements to maintain in the ongoing digital arms race against their competitors.

As new technology emerges, so do new services. Uber needed the smartphone before its business model could become viable. Similarly, challenger banks have made the smartphone their only "branch". Legacy banks and businesses are now burdened by their physical branches and legacy technology systems, something that not long ago was their competitive advantage and a barrier to entry for new competitors.

New digital business models and companies will emerge across all aspects of financial services. The technologies that will help power these models will include distributed ledgers, blockchain, digital assets, artificial intelligence (AI), and connected applications. All will become part of the backbone of new financial services business models.

Institutional business models have been more difficult for digital players to enter, but the traditionally more bespoke and complex solutions used by this industry are under pressure to standardize in order to both leverage scale and reduce operating costs. All large incumbents are facing fee pressure from their service partners and competitors. This dynamic is here to stay and over the long-term most players will be in a race to the bottom. New entrants may even operate at a loss to gain digital supremacy, by acquiring the most valuable customers and distribution partnerships. The reward for being the leader in a digital economy is often global domination of the sector. In a digital economy, there are rarely more than three or four players that own most of the global market share across the entire industry.

Transformation across institutional players may first occur with the adoption of smart contracts, which are automated self-actioning and based on robotics. As assets become digitized, collateral will leave accounts automatically and deposit themselves in the right place, for example when a securities lending borrower defaults.

Clearing and settling of derivatives with blockchain and smart contracts is already in the pipeline for the largest Institutions. It currently takes days, and a large volume of highly paid lawyers, to create and settle contracts. By 2030, the largest investment firms and custodians will partner to solve this inefficiency. Then the hurdle will not be technology, but rather the question of who will own the platform, as that will deliver competitive supremacy and a hugely valuable amount of data on the market.

As demonstrated in India, digital KYC is both a threat and opportunity for the wealth management industry. Rather than requiring weeks to onboard a new customer across legal, compliance, billing, accounts, and finance, this could happen instantly. Privacy concerns and partnering across competitors will be the main hurdle, rather than technology. Those that offer the best service and customer outcomes will gain customers fast and those that do not deliver will see their businesses decline just as quickly.

As we move into the retail markets, digital-only challenger banks may turn out to be the ones that take the lead. They have already begun to expand their business models, using technology and low fees as their competitive advantage. Revolut and Chime, the market leaders in the U.K. and U.S. markets, now offer FX services, checking and savings accounts, and free share dealing between them. It is inevitable that they will continue to move up the food chain into higher fee-paying business models, such as investing and next generation wealth management. Both these businesses started in the last five years and already have millions of customers. They are well funded and expanding aggressively across financial services capabilities.

Once these businesses have established large enough customer bases with their payments and savings solutions, they require only a simple software release to extend into investing and ultimately wealth management propositions. They will then have to decide whether to compete with robo-advisors such as Betterment and Wealthfront or to partner with them. API-driven (application programming interface) business models and open data regulations, like PDS2, will make both a real possibility.

In the future, a competitor may not be a single company but rather an alliance of companies, similar to the precedent set by the airline industry. Maybe these alliances will be organized around Amazon, Google, or Apple ecosystems, who themselves are building on top of existing global payments standards. These companies already have payment systems and industry relationships. They are currently more interested

in capturing data and owning the client experience rather than reinventing regulations and payment standards that are already digital and for the most part, working well.

The most likely scenario maybe a collaboration between the old-world banks and these very modern financial service players. It will be faster and more lucrative for them to just own the customer and the client experience, leaving the heavier lifting to the incumbents.

6. AI WILL BE THE DIFFERENTIATOR

The largest technology players and banks are aggressively investing in their AI solutions. These will provide hyper personalized, predictive, and pre-emptive advice across all aspects of modern life.

AI will provide curated answers in real time, based on what is useful for us at an individual level. This will lead to improved outcomes for customers. For instance, an understanding of the appetite for financial risk will be much more nuanced and relevant than it could ever be today, where wealth managers and advisors simply categorize everyone into a few broad segments. The reality is that customers are much more dynamic and continue to change perspectives over time.

Companies will be able to make real-time decisions and advise clients when to invest, which may happen on pay day or when a bank balance is higher than the average maintained.

We will also see an evolution of "buy lists" as AI solutions are able to scan the entire market of investments. Currently, buy lists rarely exceed 200 preferred products and it can take many months of due diligence and expensive salespeople to get your products added to the coveted lists of the largest wealth managers.

AI solutions will be able to automatically invest the right amount into an ISA (individual savings account) investment or 401k account when the tax window opens up. This will be the client experience that firms will compete to offer, as over time it will be harder to leave an AI-driven personal assistant that can predict what you need, before you even know yourself, than it will be to depart from the underlying checking or savings account. Your AI assistant will know your behaviors intimately and be intrinsically connected into many aspects of your life, possibly even becoming an extension of who we feel we are.

7. INEVITABLE REGULATION

New financial products that offer improved customer experience and outcomes will be followed by new regulations that are required to manage the resulting new risk. For instance, it is already difficult to understand why AI makes the recommendation it is making. It uses a dataset of billions, with highly nuanced statistical decision-making. Regulators will need to define miss-selling better than they do today, as it will be difficult to understand whether the fault was with the AI or with user error.

Newer distributed solutions that transcend borders are here to stay and will pose interesting challenges for regulators. In a world where privacy is rapidly declining, there will always be a place to circumvent the system. Regulators will find new ways to manage emergent risks from new financial products, just as they did with Bitcoin, which started with a niche but borderless customer base that soon became too big to ignore.

Whilst industry regulations will continue to be as important as ever, there will be a new voice that is also effective at regulating the activities of large companies: individuals will combine their voices and pools of assets to have a more active say in how companies operate and whether they are suitable to manage their wealth. In the past, single voices could not easily challenge multi-billion dollar businesses. Even global scandals that proliferated social media did not impact the share price much and if it did, it was only for a brief moment.

Increasing transparency, access to information, and the network effects will enable investors to also connect digitally with one another, with a powerful and unified voice. In finance, this started with peer-to peer lending, crowd funding, and more recently in crypto currency investing. In the future, the financial services network effect will allow investors to connect on issues related to their "environmental, social and governance" (ESG) goals.

Not-for-profits like Wikipedia have already disrupted commercial businesses like Microsoft Encarta and Encyclopedia Britannica. The network effect will also enable individuals and interest groups to vote with their assets, whether it is through influencing investment firms or even creating special vehicles to push a specific agenda at an AGM.

Where governments and investment firms are not moving fast enough, individuals and groups will connect over borders for a common cause. "The crowd" has the potential to become a powerful global voice that transcends the boundaries of nation states or economic unions that typically limit regulators. Imagine an ESG-focused pool of assets that operates like a crypto currency, being tactically deployed at global scale, not having to consider the commercial ramifications of a public company. Wealth managers may have to manage rapid inflows and outflows in ways that cannot be imagined today.

Single voices will be able to rapidly grow into a loud voice of popular opinion in the future. When that capability is combined with the ability to move your bank accounts with a swipe of your finger on a mobile phone, the power of the customer will become paramount. Digital will overcome the current inertia to change, which requires effort and time. We are already seeing large asset owners like the Ontario State Teachers Fund select investments on behalf of the ESG stance of their retirement plan participants. Digital will enable the combined voices of complete strangers to effect change outside of traditional institutions, across borders on a single cause, which may manifest as a refusal to invest in products and companies that pollute the environment.

Today, industry ratings from companies like Morningstar and Lipper will be supplemented by new ESG metrics, which will increasingly determine which products and companies to invest in. Solution providers themselves will not be immune though, they will also be judged on their own company's performance. One example might be employee diversity ratings becoming increasingly more common and public.

Regulation will continue to be a barrier to entry for some disruptive innovations and against monopolistic threats such as Facebook's Libra, but it will also not stop innovation. Regulators have evolved themselves and have since overhauled their approach. Once seen as fortresses protecting incumbents, regulators are no longer satisfied with high fees, poor transparency, and products that do not deliver on their promises. They have learned lessons from their failure to protect consumers in the 2008 global financial crisis.

Regulators increasingly welcome competition wherever it comes from and are fast becoming more global too, monitoring what other countries are doing with good ideas spreading across jurisdictions faster. Some of the strictest regulations, such as UCITS – which govern mutual funds and ETFs in Europe to help protect investors – are now being adopted in Asian and Latin American markets.

In January 2019, 50 regulators established the Global Financial Innovation Network (GFIN) to learn from each other, open up their markets, and globalize their approaches across borders. Participants include the World Bank, the SEC, the FCA (Financial Conduct Authority), MAS (Monetary Authority of Singapore), and HKMA (Hong Kong Monetary Authority). Switzerland, perhaps not surprisingly, remains a notable exception.

Cross-border government agencies do not always deliver rapid innovations, but regardless of whether GFIN is a success or not, it will not delay the disruption that has begun. Technology industries are learning about regulations fast, and if needed can up skill the institutional talent they currently do not have. For example, Amazon has just built its European headquarters in the City of London – not a bad location if you wanted to

leverage the largest pool of global financial services talent in the world, especially technical and regulatory talent that is well versed in global compliance.

8. DIGITAL AND AI REDUCE THE FRICTION OF BUSINESS

In the past, companies did not often expand horizontally. A retailer like Walmart would simply build more stores in the U.S. if they wanted to expand. However, once industries get digitized, the biggest challenge, rather than developing new services, is acquiring customers onto a platform. Industries like asset management, which has upwards of 30 percent profit margins, are difficult to ignore for any large digital business looking to expand.

New entrants that enter this space will be able to cherry-pick markets and solutions to create cost-effective and scalable offerings. They will bring significantly improved customer experiences that differentiate them from incumbents, focusing on the most lucrative and inefficient segments, rather than the need to compete everywhere. But, where they do, they will win on price, on customer service, and will aim to dominate.

Expansion into wealth management may not look like today's traditional "one-stop shop" physical business model either. In a digital world, it is possible to scale horizontally with partners and competitors and still provide an effortless experience. New wealth management entrants will have access to bank accounts in the incumbent banks, allowing for seamless interoperability across old and new players.

That said, large incumbents are not resting on their laurels. Technology forward companies like Schwab and Vanguard have successfully moved into wealth management through their robo-advice solutions. Goldman Sachs has moved into retail banking, and asset managers such as BlackRock, Allianz, and Schroders have invested in fintech startups such as Scalable Capital, Moneyfarm, and Nutmeg, respectively.

Schwab in particular has evolved quickly, having started as an online broker, they then started distributing funds, launched their own ETFs, and have now developed the world's second largest robo-advice business. Most of this expansion has been due to organic growth, a pattern that really makes Schwab stand out from the rest of the competition in an industry that has typically grown through acquisitions.

AI assistants that started with text (online chat), have now evolved to voice (Alexa) and will end up as realistic holographic copies of humans, as recently demonstrated by Samsung with their Neon platform. These avatars will allow remote working and allow for your banker to appear in your home, rather than just on a video call.

Digital assistants can already recognize your voice, face, and emotions better than any human can. Voice and facial recognition are biometric markers, which will become the de-facto way to seamlessly authenticate customers as we move away from user IDs and passwords. Platform integrations and connected data will reduce the friction of KYC and account set up.

AI will only improve, and just as it now outperforms radiologists when scanning for breast cancer, it will also outperform financial advisors and personal bankers on many different tasks. There will no doubt come a point when we will not quite know whether we are speaking to a machine or a person.

This evolution will happen brick by brick, and it may take a generation before customers abandon traditional wealth managers. But the added value provided by a frictionless, more accurate, more personable, and immediate service will be increasingly difficult to compete with.

It is useful to note that the more data an assistant has over time, the better its answers will become. Ability to sift through mountains of information is inversely true for humans. For instance, when faced with the thousands of page results from a Google search, humans rarely get past the first few pages.

Improving the client experience is the key battleground for companies that want to disrupt, this will create a headache to incumbents that are reluctant to transform. This will be underpinned by the requirement for legacy banks to provide increasing amounts of transparency, whether it is from regulators, tax authorities, or customers. In the end, moving providers will nearly be as simple as swiping left when clients' expectations are not being met.

To compete, financial services companies will need to acquire and become familiar with new data sets about their customers' preferences and behaviors, and hire and train a totally different talent base to the one they have today – one that is able to leverage this new technology and the opportunities it offers.

9. THE NEXT GENERATION OF WEALTH MANAGEMENT

The shift of new entrants into wealth management will begin in retail markets, where millennial and Gen X consumers have already indicated that they prefer cost and convenience over

the trust and brand affinity offered by the legacy banks. But digital and data sharing will offer new products and capabilities that do not currently exist.

It is feasible to forecast that in the next decade a wealth management customer could have a checking account, investing capability, and wealth management service using a plug and play digital model. Regulators may even advocate it as it could reduce duopolies that are currently evident amongst many technology giants. It will enable smaller players to offer niche services that provide choice, increase competition, and reduce the market risk of large incumbents going bust. The harder question to forecast will be who would provide the ecosystem and standards required to power this future.

Our industry is responding to this change, unlike the newspaper industry which did not see the evolution until it was too late. Large financial services companies like my own (State Street), are responding quickly. We have created the world's first front-to-back platform that is being rapidly digitized. This means that we can provide a missing capability for our industry in terms of a back-end infrastructure for custody, trading, reporting, risk management, and regulatory requirements. This is an important prerequisite before any business is able to scale their investing propositions and distribution capabilities.

Others may build their own front-to-back solutions, but the race to acquire customers and create compelling solutions will be a higher priority for most firms. Most wealth and asset managers will grow when they improve customer outcomes, with broad product solutions at competitive prices.

Digitization of the back-end platform and the front-end experience will profoundly change the strategy and solutions offered by existing and future asset and wealth managers. Products that do not offer transparency or meet a myriad of customer needs will be rapidly superseded by new solutions and services better focused on customer outcomes.

Customers are adopting new digital solutions in financial services faster than ever before. Digital has, and will continue to, lower barriers to entry and democratize competition between large and small financial services firms. If businesses can scale effectively, there is still a huge benefit to being large, although very few global firms have been able to achieve this. However, most often size is no longer such a competitive advantage.

For smaller players, a digital world helps level the playing field as vendors can more cost-effectively offer institutional scale on tap in the form of front-end digital capabilities from cloud service providers. It is possible to operate an entire business based on external platforms, leveling the playing field for smaller companies to aggressively compete with large incumbents and the fast-moving new entrants. New players that can demonstrably offer better outcomes to investors, will be welcomed with open arms.

10. DISRUPTION BECOMES THE NEW NORM

The most disruptive business models of the last decade have all been powered by a combination of digital and the network effect, where businesses use their platforms to connect customers with suppliers in real time and at scale. This is illustrated by the rapid growth and market valuations of Alibaba, Airbnb, and Uber, who all operate in totally different industries, but have leveraged the same market forces to be successful.

If we look back 20 years, few anticipated that a phone would become the most popular way for the world to bank. Smartphones now have powerful front-end virtual assistants (AI), which are improving exponentially every few years. Back-end technology has also used AI to power digital solutions we rely on daily, whether making quant investment decisions for our pensions, re-routing internet traffic, or returning Google search results when we search for information.

As customers become more comfortable with the use of voice assistants, voice search will become mainstream. This area will continue to expand and become a key part of the customer experience. It is different to traditional computing on a number of levels. Firstly, it is an ambient technology that does not get in the way like a PC or even a mobile phone, both of which require an interruption, as they need visual and special attention before we engage with them. Secondly, AI solutions like voice give us access to massive computer power in the cloud. Finally, it does this in a way that people who are not technologically sophisticated can use. Even a three-year-old is able to ask Alexa to play their favorite song or game on the device. Now imagine the expertise that a lay person will have on practically any topic in the next five years. This technology will help make us experts in many fields, for instance being able to instantly and naturally translate English into Japanese. The microcomputers that we will use to leverage these services will continue to improve in cost, speed, and capability as they will leverage resources from the cloud and become so small that they become invisible in plain sight, embedded into eyeglasses and even jewelry.

11. DIGITAL TRANSFORMATION IS AS MUCH ABOUT STRATEGY, PEOPLE, AND PROCESSES AS IT IS ABOUT NEW TECHNOLOGY

AI solutions will also help unify the digital technology stack and the disparate data held by asset and wealth managers. They will increase the productivity of employees by being able to answer several thousand predefined or learned questions and provide insights from unrelated systems that, due to the limitations of "human factors" like memory, would have not been possible for a person.

To compete, wealth managers will need to equip their advisors and wealth managers with similar technology. Companies that are able to leverage this technology most successfully will still have an important role to play. That said, whilst machines can crunch numbers faster than us, they are still far away from being able to understand all the nuances of human interaction. Currently, even two-year-old children are able to perceive more about human social interaction that cannot be coded for in AI. However, the inverse is also true, toddlers cannot fly planes or drive cars, but AI can.

Retail customers will benefit first from simple AI solutions. They will help demystify basic investing and immediately and precisely provide complex advice, such as the benefits of diversification and the power of compounding.

For more sophisticated users, AI will interrogate the world's data in real time, answering questions such as "What's the best way to get exposure to the S&P 500 based on total cost of ownership and liquidity?" (For those that are curious, the correct answer is SPY).

Answers will be comprehensive, in the format required by the client and delivered based on current data. As these technologies mature, these digital "answer engines" will likely become the client experience of choice. However, just as every Google search result provides far too much information for us to possibly comprehend when we search, these new solutions will have their own challenges. Even when mature, they will miss important information if the query is not precise enough.

Trained and regulated advisors will still be required to validate the answers and fill in the gaps when software does not have the complete answer. Trained advisors will still know the best questions to ask and how to ask them specifically enough to get the precise information that a client needs. Someone will also need to be accountable for when things go wrong. Just as we are still likely to need pilots on our airlines, assistants will become the tools that do most of the work but under supervised conditions.

This blending of human and machine will be a significant client service advantage for firms that are able to equip and train their workforce quickly enough. This combination will also reduce risk, increase client retention, grow sales, and improve onboarding, enabling employees to know their customers better and allow managers to have greater control over their teams' activities.

Digitizing processes will enable every aspect of the service offering to be measurable. For instance, the types of questions customers ask before they move their accounts to competitors, or to complete the myriad of processes required to onboard a client or open an account. Concurrently, improving customer service and employee productivity at the same time.

12. GETTING AHEAD OF EMERGENT CUSTOMER BEHAVIOR AND HIRING THE RIGHT TALENT WILL BE CRITICAL

Looking further out, it is hard to imagine a future where we will trust a machine to look after our financial health and invest our money. We still get comfort from humans sitting in the flight deck, even though most of the actions are executed by a machine. Whenever a new technology emerges, we are naturally cautious, however, this reluctance to adopt is replaced by comfort once enough people have consistently experienced successful outcomes.

In the early 20th century, elevators and telephones were the disruptive technologies of their time. They shortened the distance between people and enabled high rise department stores, residential towers, and office blocks, without impacting the customer experience.

It is hard to believe in retrospect, but the earliest elevators were untrusted menacing machines requiring white gloved lift attendants to operate them. This echo of history is still evident today in high-end apartment blocks in New York and offices in Mumbai.

Today, we hear about people who are willing to trust their Teslas even though full autonomous driving is not here yet. AI in financial services will follow a similar glide path. It will start as assisting humans, but then become a solution that does the work and is monitored by humans. For low value transactions, we will allow the machine to make the decision for us and explain later.

Laggards will always exist, and so traditional solutions will live on, just as some people still prefer a vinyl format over digital music. Some customers still prefer bricks and mortar over digital banking, but they will become the minority, willing to pay the premium for analogue solutions in the digital age.

Customer expectations are evolving fast, the oldest millennials are now in their 40s. By the end of the decade, they will be senior managers and decision-makers within organizations and the wealth creators in society. They are already used to real-time collaboration and communication. They will not be cautious about disrupting legacy business models, they will demand it.

Critical factors for success for leaders in our industry will be to hire and/or train a highly educated and data driven workforce, that know how to benefit from exponential improvements that come from digital connectivity, storage, and computing power.

To succeed, companies need to disrupt and reinvent their customer acquisition, engagement, cross-sell, and up-sell processes. They need to collect data across the customer lifecycle and from external sources, so that they can personalize services and predict what their customers need in real-time.

Digital provides opportunity to remove the friction and the inherent lag in traditional distribution processes. Enabling the delivery of solutions and information to customers in real time. Thus, circumventing the need for emails, phone calls, and meetings, and the associated costs for human capital needed to support that, which will further drive down servicing costs and prices.

This has happened already with print journalism. Newspapers at best provide yesterday's news, it would take at least one day for a piece to be written, printed, and distributed. Daily newspapers took decades to become established as their analogue distribution networks required many people doing manual processes that were hard to scale.

Today anyone with a smart phone can produce and broadcast their own TV programs, distribute their own music, products, and ideas. We can become self-employed and use our own car as a taxi or rent out our residences, all through a mobile application in a matter of minutes. Digital has already disrupted industries ranging from news media, music, video rentals, retail, banking, and all aspects of the travel industry, as well as working practices within these industries.

Disruption to analogue processes within banks and with customers will be similarly profound. The changes have only just begun and will be played out over the next 10 years. Many businesses will not survive as the pace of change will accelerate with each passing year, making it harder to catch up for those that have delayed their start. The largest businesses will find it hardest to evolve and will be encumbered by their

costs. The smartest businesses will be able to adapt and create new business models. For instance, Encyclopedia Britannica has evolved into a new segment and focuses on class room education. But it is no longer the preeminent source of knowledge that it once was.

> "
> *For online customers, Google has largely solved the information "search" problem. A key challenge in the digital age has been to "find" the best solution for their needs.*
> "

Wealth managers will also see threats from many different angles. These will include startups, large American and Chinese digital conglomerates, and rapidly evolving incumbents such as Schwab, Chase, Goldman Sachs, Vanguard, and BlackRock, who are all pivoting their business models. Competition will be welcomed by regulators, whose primary mission is to protect investors rather than incumbents. Regulators will welcome the change, as they now prioritize improved competition, transparency, data-based risk management, and fee compression.

As we move forward into the new decade, it is easy to forget the profound changes that have occurred over the last 10 years. Digital transformation has only just begun, and it has impacted the world fundamentally. Digital change accelerates exponentially, and we should expect even bigger changes to happen during the next decade. Many changes are easy to forecast as they are timing issues based on extrapolations, similar to "Moore's Law". But the ones that will have the most impact are not, these will be "black swans", such as the world wide web, which has been the most disrupted force in business in recent years. Companies that have leveraged that technology have become the largest on the planet and will continue to forge the blueprint for what comes in the near future.

Wealth management will operate very differently by the end of this decade. Many investment firms will not succeed, unless they have a radical plan to better understand how to benefit from the changes that are coming. Companies will also need to understand how to deliver their services digitally and for significantly lower fees, whilst also providing better outcomes for customers and shareholders. This will be the defining challenge for the industry in the next 10 years.

APPLYING ARTIFICIAL INTELLIGENCE IN FINANCE AND ASSET MANAGEMENT: A DISCUSSION OF THE STATUS QUO AND THE WAY FORWARD

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ABSTRACT

Artificial intelligence (AI) and machine learning (ML) are gaining more and more traction in finance and asset management. But AI/ML is a complex tool that requires specific skills to be created, trained, and interpreted well for a given task. In this paper, we discuss some of the context parameters to be considered in order to apply AI beneficially in financial settings. We explore a matrix of use-cases, following the lifecycle of asset management and structured by the type of underlying AI technology. As AI requires human setup and interpretation, we briefly review the role of us "humans-in-the-loop" of AI implementations. Finally, the emerging field of asset tokenization promises to disrupt the conventional markets and market practices, opening up for a new field of AI applications to tackle the new way of trading and servicing securities. The AI game is on in asset management. Not to play is not an option.

1. INTRODUCTION

To learn about artificial intelligence, let's start with making a cup of tea

In 1825, the English scientist Michael Faraday began the annual tradition of delivering the annual Christmas lectures at the Royal Institution in London. The lectures present scientific subjects to a general audience, in an informative yet entertaining manner.

In 2019, the lectures focused on the topic of statistics, probability, and artificial intelligence (AI).[1] One of the live experiments was for the audience to give instructions to a pretend-robot making a cup of tea.[2] For those who are familiar with the English tradition of tea drinking, this process could be understood by a human through sentences as simple as "make us a cupper" or "put the kettle on". However, challenges arise if these instructions were targeted at a machine.

The live recording of this lecture shows that when the audience did not specify the size of the tea bags, the type of mug, the volume of boiled water that needs to be added, when to start and stop pouring the water, and how to add the milk, we are not able to achieve our objective of making a cup of tea.

As there are more and more "AI packages" around that can be simply downloaded and installed, we see a proliferation of AI use-cases and applications, often with limited success. Those unsuccessful scenarios are due to a lack of understanding that AI is actually not a simple tool. It needs knowledge and skill (and sometimes a bit of art) to choose the right type of algorithmic approach and to provide a proper data and learning environment for AI algorithms to be useful. It needs skill to properly apply AI to a use-case, as well as to interpret the results. Some of the main considerations for AI applications are described in this paper.

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[1] https://bit.ly/38galPw
[2] https://bbc.in/2la0yht

1.1 Context, framing, and data flow

The above example shows the dependency of execution on precise instructions and also demonstrates one of the basic concepts of applying AI: the importance of framing in knowledge representation. This concept was introduced by Marvin Minsky, one of the founding fathers of artificial intelligence [Minsky (1974)]. We need to be able to provide the preconditions, the meaning, and usefulness of actionable options as well as the resulting post-conditions for a stepwise process like the one described. Without this piece of context, which is equivalent to "common sense" in the human world, the AI algorithms do not have sufficient information and fail to achieve the objective as intended. We humans have perfected the usage of common sense and common knowledge, as well as the degree to which we are assuming such knowledge to be present in other humans. This allows us to convey concepts with a minimal amount of factual information.

Another example for this was given by my AI Professor Michael M. Richter. In a working group meeting, he announced there was some news to share and he would demonstrate the framing and context idea by giving us two versions of information, both 100 percent factually correct:

First, he said: "Our dear colleague Frank will soon get married".

Then he said: "Our dear colleague Frank will soon get married for the first time".

Both statements are correct, however, why would he add the words "for the first time"? By adding this piece of information that, albeit true, is actually not necessary, our Professor triggered a totally different view on the communicated fact. In the first case, it is positive news, everyone was happy for Frank and wished to congratulate him. After the second statement, everyone was thinking about failed marriages, divorces, people separating, and marrying multiple times. The urge to congratulate Frank was rather dampened.

The conclusion to this can be that the high-quality capability of our intelligence is actually not based on processing as much information as possible, thus not being purely data-driven. The high performance of our intelligence might be the result of the creation of common concepts, abstraction, and generalization as well as communication and evaluation of only the really necessary additional parts of information. If this is true, then computational processing of sparse data together with a clever way of building of common concepts will be key to high performing "intelligent" algorithms.

1.2 Optimization and alignment of incentives

The other basic idea of AI is that its algorithms aim to optimize an objective, a target, a purpose. For this optimization task, we need to specifically formulate an algorithmic valuation function that aligns with the real-world-task of an AI application. Imprecise definition of this function will hamper the results. Examples for this can be taken from early attempts to create winning strategies in AI algorithms for automated playing of video games. In one attempt, the AI was tasked to play the game Tetris and given the capability to use all buttons that a human player can press. The objective coded into the algorithm was to maximize playing time, as a proxy for achieving highest scores. At first sight, we can assume that this is a valid incentive, as typically the longer the playing time, the higher the score. However, after stacking bricks in no orderly fashion as fast as possible (achieving a short spike in the score), the AI learned to hit the pause-button right before it would lose the game, thus "maximizing" playing time in a way that was not intended and that is not useful for the objective of achieving the high scores [Murphy (2013)]. As Murphy summarizes his result: "the only winning move is not to play" (in which movie did we hear this before?).

Applying this logic to AI in finance and asset management, we would subject ourselves to the same pitfall if we do not give precise instructions to, e.g., "optimize portfolio investment return within a given risk budget" or 'maintaining a certain portfolio segmentation' to fulfill the promises given to customers and regulations around the investment. We must start with a framing exercise, specifying the data and methods needed to achieve a specific objective, and let the machine carry out the number crunching functions as per our instructions and definitions. In other words, we must provide the objective together with the real-world framing and context, as it arises from the asset management task we are asking the AI to help solve.

1.3 Transparency and explainability of results

Many AI approaches, especially the very data intense ones, suffer from the so called "black-box problem" [see, e.g., Vontobel (2018) for a broader discussion of this topic]. This means that the complexity of the computational models, together with the vast amount of data going into these computations, make it outright impossible to understand or explain the reasoning the "black box" is going through to reach its solution. This can be criticized as potentially having hidden issues like unfairness, biases, etc., hence, there is a recent

call to action to make AI more self-explanatory. However, it is not even clear what this could mean, since [see also Google (2019)]:

- Different audiences will expect different levels of explanation. For example, the customer inquiring a loan decision in terms of their personal data versus the mathematician expecting a sound mathematical explanation of the decision equations inside the "black-box".

- Explanations could be requested in real time by the actors or decision subjects, as opposed to situations where an auditor or supervisor would like to access the reasoning at a later stage.

- Different use-cases might warrant different qualities of explanation. For example, in an operational context of handwriting recognition, all that matters is the resulting accuracy of the algorithm, whereas in customer facing or even medical, life-critical settings it would be careless not to attempt to investigate the path of reasoning inside the decision algorithms and to be able to correlate similar cases to ensure quality, fairness, and non-discrimination.

- It is still a question of technical feasibility of generating meaningful explanations, especially in the large-scale neural network models of deep learning, where millions

of data points are intertwined by millions of statistical training operations. There is simply no straightforward way to explain the resulting system (and if there was, it would probably not be necessary to take all the efforts of neural training anyway).

With these different perspectives on challenges for AI applications in mind, section 2 will provide an overview of existing and emerging application use-cases for AI in finance and asset management, section 3 will look into the role humans play in the context of AI applications, especially in finance, after the financial crisis, and in section 4 we present one particular, newly emerging use-case in the context of tokenization of assets – an example of the increasingly emerging cross-overs of new technologies.

2. AI IN FINANCE AND INVESTMENT MANAGEMENT

Artificial intelligence is entering all stages of the investment lifecycle

AI is a technology that promises a number of advantages, such as being capable of looking into vast amounts of data, assisting humans with decision-making, executing simple operational tasks all by itself, and being increasingly explainable, hence,

Table 1: Use-cases for AI in asset management

	CLIENT VIEW	MARKET VIEW	PORTFOLIO VIEW	MIDDLE/BACK-OFFICE OPERATIONS	RISK MANAGEMENT
NLP	Observe sentiment on social media, detect outreach opportunities	Compile Information from earnings reports, assess sentiment in Market comments. Support higher level instrument analysis and facilitate decision making		Observe conduct risk and morale of employees	Risk assessments based on analysis of texts and other unstructured information
BEHAVIORAL TREND ANALYSIS	Analyze own website traffic for insights on user behavior. Identify growth options, e.g., through nudges to induce client activity	Detect trends in industries, trade timing, technology, etc., that are induced by market participants	Extract "herd-movements" in market data for own portfolio as early chance/warning indicators		Risk mining, i.e., crowd-sourced continuous internal risk assessments utilizing the swarm intelligence of the staff of a company to detect and identify risks. Those risks are anticipated by insiders of departments, industries, cultures, projects, etc.
AI-AND ML-BASED PATTERN RECOGNITION	Detect trading patterns of clients and client groups (by size, industry, over time, etc.)	Analyze unstructured data from alternative sources, like IoT-data (from e.g., vessels, goods in trade contexts)	Investment decision support based on large scale data views that humans can not conquer	Monitor for suspicious transactions, and trigger required actions	
	Optimize client identification and authentication to reduce risk and fraud	Trading algorithms that intelligently minimize risk, market impact, fees, etc.	Attempt to observe unexpected relationships between securities and indicators	Streamline, optimize, and automate tedious functions to better focus human effort	Risk mining increases risk transparency by removing filtering and aggregating layers of human reporting.
NLG	Chat functions for on-demand queries of clients and employees		Regularly generate up-to-date portfolio reports and risk commentary	Generate regular and on-demand MI reports, with language and detail adjusted to the target audience	

useful even in critical situations that are customer facing and/ or subject to regulatory oversight.

Table 1 shows a number of use-cases in asset and investment management. One way to characterize the use-cases is given by their positioning in the value chain of asset management. We distinguish between:

- Client facing functions.
- External, market-oriented perspectives.
- The internal view on the actual portfolio management.
- Opportunities in the supporting functions in the middle- and back-offices.
- The risk management view.

The other dimension is segmented by the types of AI-based algorithms that are used to perform a given use-case. In order to avoid talking about "AI" in too generic terms, we differentiate the field into:

- AI/ML algorithms for pattern recognition, where learning can happen supervised, unsupervised, with reinforcement learning, and more recently with transfer learning and synthetic data.
- Natural language processing (NLP), with a focus on analyzing and extracting sentiments or intents.
- Natural language generation (NLG), with a focus on automated production of texts that are intended for human consumption.
- More recently, emerging intentions to apply behavioral analysis to emerging trends from data (not only finding trends, but also answering why they are there)

In this collection of use-cases, we can find some applications of AI and ML that are already proven in practice and reliably creating benefits. These are mainly in the middle/back office functions, where automation and streamlining based on machine learning have an immediate (cost and/or risk reducing) effect on the amount of remaining human efforts to be deployed.

The language-oriented use-cases for NLP and NLG are still constantly evolving, and there is ample room for improvement as different challenges arise in different languages (grammar, meanings, synonyms). In specific, customer facing applications need to deal with clients that in some cases mix multiple languages into their communications with the banks' chat bots or other channels (especially, the multicultural locations like Hong Kong, Singapore, among others, experience these challenges). More straightforward are the use-cases in which

the AI is processing written (corporate) reports and news statements. Blackrock stated that their algorithms to detect signals in earning guidance are analyzing 5,000 earnings call transcripts per quarter and more than 6,000 broker reports every single day [Blackrock (2019)]. Extracting relevant explicit information, as well as other implicit sentiments from those texts is aiming to mimic the basic first level activity that a human analyst would do. With this, the machine is able to cover a wider scope of texts and to summarize the contents for the next level of activity.

> " *Applying AI (from creation, training, up to interpreting intelligent systems) requires a good deal of skills from the human collaborators.* "

Common applications of AI algorithms are the attempts to authenticate users (to reduce risks, fraud, anti-money-laundering cases) or to identify trading patterns for individual participants or, e.g., industry groups. Optimized trading algorithms are frequently implemented, where we can state (in accordance to the incentive alignment argument of section 1) that there are different performance indicators to be optimized. In some cases, the predictive pricing has priority and the AI aims to achieve best returns for the trades. In other cases, the optimization objective can be to reduce market impact (on market prices) and trading risk or trading fees. Similarly, minimization of margin requirements, thus optimizing a banks' regulatory capital via AI-based control of risk-weighted assets (RWA) and better margin valuation adjustments (MVA) [FSB (2017)].

More recently, the discipline of behavioral analytics is emerging stronger as it appears that pure data analytics alone often does not capture the actual intentions, concerns, and incentives of the actors in the markets. The models developed based on factual data are being enhanced by the behavioral analysis and assumptions on human market participants. So-called nudges are one way to influence users and clients to either start to think about financial options or to reconsider their decisions when they appear to be non-rationally skewed towards a non-beneficial outcome [see Suh (2019) for some thoughts on AI and nudges].

Another rather new idea is the implementation of AI into corporate wide "risk mining" activities. Risk Mining is the idea to enhance the existing risk management framework in a company by a real time, interactive component that triggers individual employees to think about and report on risks. For any kind of risk (technical, financial, reputational, cultural, and the like) a risk catalogue is provided to break down risks into risk questions that help to analyze and inquire risks in more detail. Those risk questions are provided to staff via their favorite communications channels (messengers on phones, desktop systems, etc.), rather frequently but in small, acceptable doses. The objectives of the generated risk questions and their answers arise either from company-specific scenarios (which might be reported first in other departments) or from industry-wide developments (of regional/global scale, seen and felt by many or all companies in a certain industry). Result of the risk mining is a real-time management information that is not conventionally aggregated, across the levels of corporate hierarchy. Thus, real-time insights can be extracted that do not suffer from the usual time lag and information gaps.

There are more use-cases presented in Table 1 though, we do not explain them all in detail. This overview is aimed to provide a first level of information on the potential application settings for AI in the business areas of finance and asset management. In all cases, especially in a financial context, questions regarding responsibility, accountability, and controllability arise. Some of these we will tackle next.

3. WHAT IS OUR ROLE AS HUMANS WHEN AI IS BEING DESIGNED AND IMPLEMENTED?

AI versus humans, or rather collaborative co-existence?

From autonomous cars to sustainable investment management, there are a number of scenarios where we expect the technology to adhere to certain values that we uphold as humans in similar circumstances. We do not dive into the rather philosophical issues of decision-making in cars when it comes to life or death situations (of the people inside the car or the ones outside). We will rather focus our discussion more on the ethical aspects of applying AI and the question of what role we humans take for us, next to the AI we create.

The E.U. commission has set up a high-level expert group on AI (AI HLEG) to work out the implications of our expectations towards trustworthy AI. Acknowledging that new capabilities

come with additional risks, the HLEG provided the following requirements for the creation and application of AI [AI HLEG (2019)]:

- Human agency and oversight
- Technical robustness and safety
- Privacy and data governance
- Transparency
- Diversity, non-discrimination, and fairness
- Environmental and societal well-being
- Accountability

Each of these requirements appears to be sensible and realistic in itself. In particular, in an asset management context with the required safety and security, we can identify a certain common theme across them: the principle of trust. What, in comparison, makes us trust a human advisor? It is the assumption that the advisor is well educated for the task we ask for (as measured by educational and institutional standards), reliable and consistent, valuing our privacy, acting with our best interest and fairness in mind, and able to be held accountable for the given advice.

We should expect no more and no less from an AI system. An increasing number of countries are introducing regulatory director/manager responsibility frameworks that aim to link a personal responsibility (and liability) to the management of a financial institution [Zetzsche et al. (2020)]. Applying AI for tasks in the financial value chain must not defer the responsibility away from the human. Thus, human agency and oversight will give us the right (and requirement) to ask the questions of the system and receive solution options or recommendations. We humans will be supported by the system, in our information collection, reasoning, and decision-making. However, we keep oversight over the process by mechanisms like the "human-in-the-loop" (HITL) principle, which enables human insight and intervention during all stages of AI system activity. Tang (2020) proposes a framework of six HITL paradigms that help differentiate the ways humans and AI systems interact (Figure 1).

The six paradigms capture the various roles and different skill sets that are required to efficiently work with AI. The AI system creator, for example, needs a completely different skill set that of an AI user, but most importantly, even the AI user should be educated in the basics about the type of AI algorithm at hand, its strengths and weaknesses, its scope of application,

Figure 1: Human-in-the-loop paradigms to ensure human agency
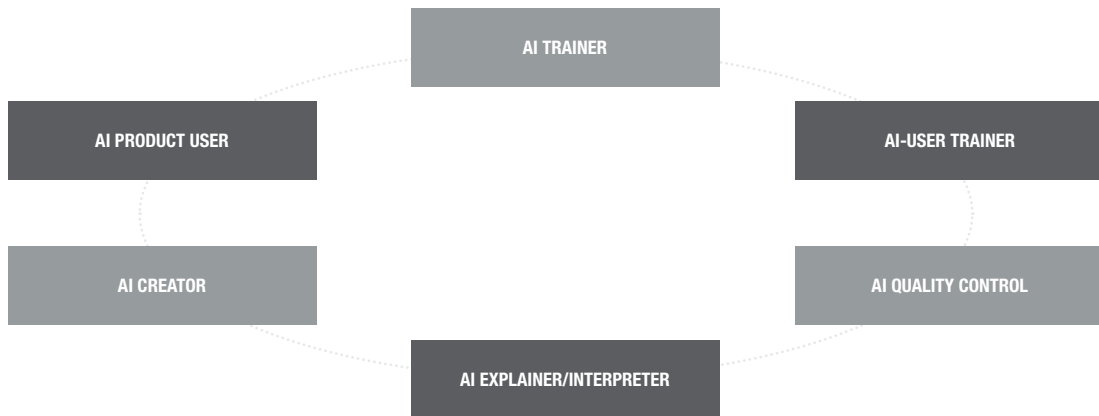
and the proper way of training and interpreting the results. AI quality control is often executed by internal corporate boards that oversee the alignment of AI and AI strategies with the mission, vision, and purpose of a company.

Providing opportunities for staff to acquire the right skills for their intended role in the AI context is the first and foremost step when embarking onto the AI journey.

4. TOKENIZATION OF ASSETS AND THE CHALLENGES OF REAL-TIME SETTLEMENT

Convergence of AI and blockchain technologies

Now, returning to more financial technology, we want to introduce a use-case for AI that is not explicitly mentioned in Table 1, is entering the marketplace from a non-conventional angle, and has the power to disrupt the ways of trading and investing as we know them today. The next big movement in asset management will likely be the currently evolving tokenization of "everything", especially of higher value private assets. By tokenization, we mean the creation of a digital representation of an asset and that this representation typically can be easily fractionalized in a simple and scalable way. Digital representations of assets can be held on a blockchain, as a form of distributed ledger technology (DLT). A distributed ledger in finance and asset management is largely an immutable journal of ownership transfers (transactions) that are held private to the participants in these transactions. Transactions and resulting balances of participants are agreed upon by a specific consensus mechanism (of which there are several options, depending on the particular setting of the blockchain).

Blockchain technology came to fame with the advent of Bitcoin [Satoshi (2008)] and other crypto currencies, which are distributed via an unpermissioned network, meaning that there is no control and restriction regarding who is participating anonymously in the network. Applications in financial institutions require, however, that the participants be subject to a "know your customer" (KYC) process, so anonymous participation is ruled out. It also makes the computation of consensus more cost effective, if the number and type of participants is limited to trusted parties in the DLT network. Many examples for enterprise grade blockchain-applications are developed on the R3 Corda framework [Brown (2018)].

Issuance of tokenized assets is then possible in two different ways: (i) issuance of "asset-backed" tokens, i.e., there exists a regular asset, often certified on paper, and the digital tokens are merely an electronic pointer to (fractions of) this certificate, or (ii) issuance of natively digital tokens, for which no other representation exists than the digital token itself, typically issued on an immutable ledger on a DLT. This DLT can be run by the issuer or by an intermediary that offers additional services like key storage and management (instead of asset custody in the non-digital case).

In both ways of issuance, the result is a token representation of an asset that will be tradeable instantly through triggering the change of ownership on the DLT. In the standard settlement of paper certificates, the monetary payment can typically be executed faster than the settlement of securities under custody, which happens via the different intermediaries in the custody chain. Contrary to that, since token ownership is transferred instantly, the DLT-settlement is requiring an equally instant settlement of the purchase amount. This in turn

requires a form of digital money available for the "delivery-versus-payment" (DvP). In the token space, where the digital asset is exchanged instantly against digital money, we can rather talk about "token-versus-token" (TvT) instead of DvP.

Those payment tokens can be utility coins (like the JP Morgan coin) or stable coins or other platform/specific tokenized versions of cash that allow for instant exchange. The long awaited, prepared (and sometimes feared) advent of "central bank digital currencies" (CBDC) will offer the electronic fiat version of digital payment on DLT. At the time of writing of this article, China and a few other countries are expected to be close to the introduction of the digital version of their sovereign currency.

Risk mitigating functions like the central counterparty (CCP) are not required anymore, if instant settlement of the TvT process is achieved. But in order to provide such a risk-free settlement, the system must provide settlement finality, i.e., guarantee the irreversibility and irrevocability of the DLT transaction.

Assuming the DLT realization is able to provide instant settlement of the tokens and the digital money, a new challenge arises that can be approached with the help of AI: the immediate provisioning of this cash from a treasury perspective. Today, the treasury department of a market participant benefits from the T+1 or T+2 settlement duration by netting the trades during the day and being able to provision only exceeding amounts for payment to counterparties on the following day(s). This will change fundamentally with TvT. As each trade is settled in real-time, netting up buys and sells

will not be possible anymore. ISSA reports that, for example, a daily gross settlement obligation volume of U.S.$1.3 trillion today are netted to only U.S.$19.8 billion and collaterized by U.S.$7.3 billion in margin deposits [ISSA (2019)].

While smaller scale "daily business" arguably leads to a largely balanced stream of TvT of similar size on buy side and sell side, the required buffer in digital cash is likely not extremely big compared to the trading volume of a market participant. Also, even in today's non-digital process, market participants host sizeable volumes of cash on their depositary accounts with the central banks. Retail business might be balanced, as consumers buy and sell in similar (uncritical) sizes under different market conditions. Critical situations will arise in commercial and institutional segments, when large funds and other investors might create a large-scale unbalanced movement on the buy side. Such a purchase must immediately be supported by availability of tokenized cash, pre-funded on the TvT accounts. This has limiting implications on the liquidity and cost, as well as on the possibility of market makers to provide intraday liquidity and trades to the market.

One option to tackle this challenge is the attempt to predict in specific the large scale of movements that are not covered by the average pre-funded amounts. Even short-term reaction times, gained by an algorithm that anticipates movements shortly before they happen, would be helpful. Treasury will then use digital exchanges to provide for more tokenized cash generated from non-digital reserves and be guided in this process by short term prediction systems.

Figure 2: Schematic system diagram for a one-day predictive solution
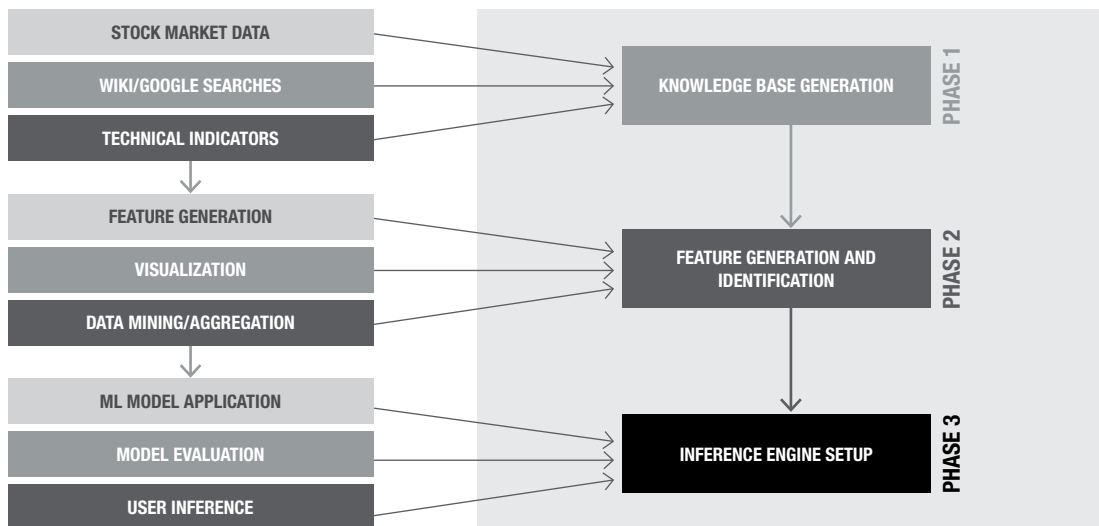
Source: Weng et al. (2017)

Weng et al. (2017) have proposed an approach for such an AI prediction engine that is not only based on historical time series data. It also takes into account data from very current news feeds and information from crowd-sourced inputs (e.g., social media) as well as trends in user visits or query statistics from search engines or information databases (Google, Wikipedia). The principal objective of such a system is not to excel in the precise prediction of a large set of stocks and their future prices. The important quality is to use the variety of inputs as sensors for surprising, potentially large movements in an asset, which would require an unprepared amount of liquidity in a short period of time. Figure 2 shows the basic functionality of this prediction system, structured into processing phases, with the more detailed sub-functions that establish a good current view into the market and its predictive indicators.

Another upcoming challenge with tokenized assets lies in the fact that – especially in the early years – several assets might exist in an on-chain version (i.e., DLT-based) as well as in an off-chain version. For the investor community, this reduces the perceived risk with this rather new class of tokenized assets, as the 1:1 exchangeability of digital and non-digital version would be guaranteed by their financial institution to safeguard the holdings in any case. However, it can be expected that there is a difference in trading volume and trading speed, as well as liquidity, in such competing markets, resulting in (slightly) differing prices due to the bifurcation of liquidity into both markets [OECD (2020)]. Such arbitrage opportunities will attract market participants who try to exploit these differences by "intelligent" trading algorithms, or even create such opportunities by a set of actors on both markets, who execute strategies to drive prices on one market and harvest the benefits on the other.

5. CONCLUSION AND OUTLOOK

The only winning move is to skillfully play

In this article, it has been shown that AI in finance and asset management has been implemented in a large variety of use-cases already, with constantly more emerging across the value chain.

The major take-away is the recommendation not to view AI as a simple plug-and-play tool. Applying AI (from creation, training, up to interpreting intelligent systems) requires a good deal of skills from the human collaborators in order to harvest the benefits for the intended use-case.

Applying AI to asset management must be seen as part of the more general digitalization journey. The challenges are, therefore, not only in the understanding of the technology. Major roadblocks can be the conservative collective mindset in the corporation, avoiding new opportunities, or the reluctance of the top management to invest time, money, and education in the workforce that will be tasked to "work on" and "work with" new technologies. As ever so often: new skills help to understand, to implement, and to apply new technology. Not to play is not an option.

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FRONT OFFICE EFFICIENCY: IMPROVING BUSINESS DEVELOPMENT AND INCREASING SALES

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ABSTRACT

This article looks at front office efficiency and analyzes how it represents a critical success factor for private banking organizations, especially for business development and sales. We address the levers for optimizing front office efficiency from an organizational point of view as well as different options for an efficient front office set-up. To this end, three specific cases from previous project work with leading international private banking institutions help illustrate the relevant aspects for optimizing front office efficiency. The conclusion provides the most important take-aways for actionable next steps.

1. INTRODUCTION

In recent years, private banking organizations based in Switzerland have faced stiff headwinds. Challenges originate from different directions, ranging from the low interest rate environment to high regulatory pressure, which has further exacerbated the operating costs of running a traditional private banking business. An integral component of a private banking organization represents the front office – operating at the intersection of client-facing roles and middle/back office functions – because it ultimately serves as a distribution channel of investment products and services that generate top-line revenues. However, as well as representing revenue-generating client services, the front office also contributes significantly to the increasing operating costs, unless properly managed.

Finding an efficient front office set-up to manage these competing objectives is even more critical today than it has ever been before. While the required technological upgrades (such as digital platforms) entail critical actions to strengthen the front office's backbone, this article will, instead, focus on different structural front office set-ups and how organizing

them efficiently can help improve business development and increase sales, respectively. After briefly reviewing the current environment, we are going to discuss the levers for optimizing front office efficiency before assessing different options of an efficient front office set-up, including the illustration of three specific cases from our previous project work with leading international private banking institutions. Finally, we wrap up with the most important take-aways for actionable next steps.

2. CURRENT ENVIRONMENT

The challenges facing private banks must not be underestimated, as they are multifaceted. Private banks face external pressures, such as the never-ending list of new market regulations and intense competition from both established and new players, as well as internal challenges, which include the difficulties relationship managers face when trying to use current front office support set-ups (despite often including some degree of standardized services performed by pooled and non-client-facing staff) to meet client requests. This situation is exacerbated by evolving client demands and expectations due to demographic changes and digital offerings geared towards next generation clients. As the

speed with which news flows across the globe increases, front office organizations are forced to extract and process relevant information for clients in near real-time. Despite these demands, and efforts, empirical data and findings show that – simply put – too much time and effort is spent on compliance tasks and administrative work and not enough is spent on value-adding activities, such as client acquisition, relationship management, and investment advisory. Stagnating, or even falling net new money figures result from this dichotomy. In numerous client engagements, our time-tracking analyses of front office staff have found that relationship managers spent a disproportionate amount of their time on administrative duties and internal compliance-related tasks, with only a negligible amount of time dedicated to prospecting activities, i.e., efforts to acquire new clients.

3. LEVERS FOR IMPROVING FRONT OFFICE EFFICIENCY

There is no generally accepted terminology for referring to, and describing, the elements of a front office. Each organization uses their own terms to label the individual functions, yet they represent similar roles and responsibilities. What is important, however, is not how organizations describe the functions that make up their front offices, but how one can determine the relevant levers of a front office operating model that impact the efficiency of those functions.

The relevant levers can be roughly grouped into five categories covering the following front office activities: (1) prospecting; (2) client relationship management (e.g., investment advice, meeting preparation, and related tasks); (3) account monitoring, order execution, and reporting; (4) administration and documentation (e.g., KYC, FATCA, formal paperwork); and (5) internal and other activities.

Certain front office functions can obviously be performed by support staff, i.e., professionals other than a relationship manager who should not get involved in replying to all client requests – think of executing market orders or providing account statements. Rather, a relationship manager's time must be shielded from purely administrative work that is marginal and focused on providing value-adding services that clients appreciate; this way the relationship strengthens and ultimately yields more revenues.

Single elements of the above categories may be executed by different middle/back office resources, resulting in more client-facing time for relationship managers. Having separate resources to handle administrative work generally leads to increased client satisfaction, since relationship managers have more time to dedicate to clients. Our experience corroborates this belief since we find that top-performing relationship managers, those who achieve the greatest increases in assets under management, are those who have more active client engagements.

4. OPTIONS FOR AN EFFICIENT FRONT OFFICE SET-UP

While there is no cookie-cutter approach to setting up the front office optimally, there are, as mentioned above, a number of levers that need to be taken into consideration. Starting from the top, it is paramount for a private bank to formulate its own concrete vision. Once the vision has been selected, the bank needs to decide on an organizational model for determining an efficient front office set-up that can help achieve this vision. The bank needs to ensure that the different levers are optimized in unison, and not separately.

Specifically, the bank needs to decide how tasks, roles, and responsibilities are assigned and allocated. Furthermore, should they be physically centralized or decentralized; and what are the reporting lines for the respective set-ups? Our experience of working with front office organizations in financial institutions of different sizes allows us to help answer these tricky questions, mainly because they are closely related to performance-relevant topics, including the ownership of profit and loss/risk-taking, the incentivization of the workforce, and the corresponding sales targets/resourcing budgets. Relevant questions to be considered in this context include:

- What activities should the front office perform to achieve efficiency and scalability?
- What people/profiles are best suited to perform these activities?
- How should the front office adapt to the changing needs of diverse clients?
- How should the front office be organized to comply with evolving regulations?
- How should the front office deploy and leverage digital innovation to improve the client experience, while increasing return on assets and reducing operating costs?

Only after these questions are answered, should banks start considering designing and weighing different organizational options. It may entail streamlining non-client facing activities, launching front office rationalization initiatives, using digital services, tweaking client segmentation, and implementing coherent IT systems/tools fit for purpose.

Figure 1: International bank creates a centralized service team

FRONT OFFICE OPERATING MODEL
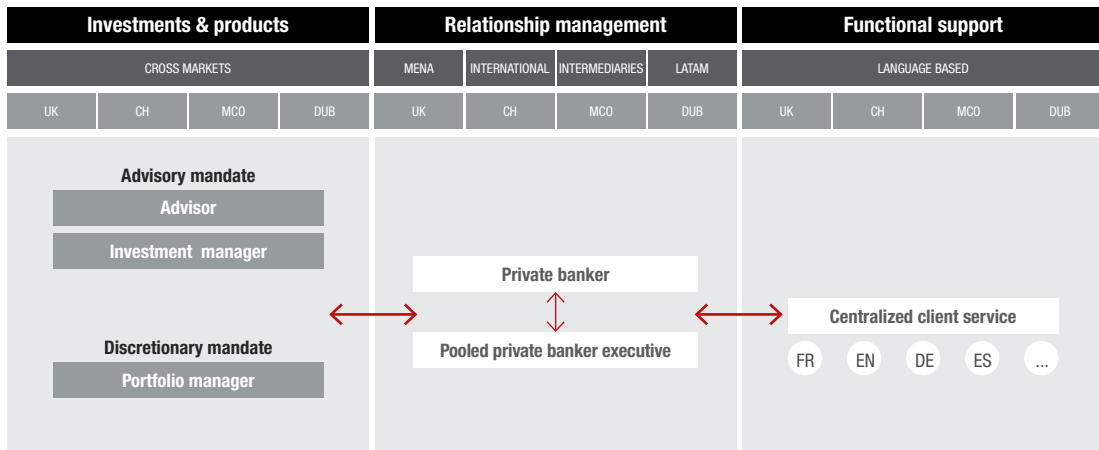
Because each organization is unique, there are numerous options to optimize the front office set-up. However, to provide a flavor of the options available to banks, we are going to discuss three specific cases of projects where we helped leading international private banking institutions optimize their front office set-ups. In each of these cases, we first describe the initial client situation and then discuss the approach we recommended for changing the front office operating model. We will examine the impact achieved through the chosen approach and highlight the challenges the banks would face to successfully implement their respective front office set-ups in the future.

Case one: International bank creates a centralized client service team

CLIENT SITUATION

- Following a front-office efficiency and six sigma study, the bank wanted to streamline (pain point) processes (e.g., account opening) and provide more consistent and efficient services to clients.

- Some roles executed by assistants included activities (e.g., client orders) for which not all were trained properly.

- The bank also wanted to reduce risk by creating a "client team" around the relationship manager servicing a client.

APPROACH

- **Introduction of a client service team – specialization tailored to client needs:** the bank created a centralized client service team, which became a separate department

reporting into a new global lead, by carving out client management functions from assistant and relationship manager functions. A client could call the client service team directly for client management activities (e.g., statement queries, basic order execution) and the client service team would call the client directly for margin calls, call backs, and other servicing questions (e.g., KYC). The model was rolled out globally.

- **Consistent service for clients – informed and efficient:** the roles and responsibilities were harmonized, skill needs identified, and a training curriculum created and executed.

- **Streamlined client servicing, including specialized topics (e.g., client documentation):** the bank also created a client-facing account control team to assist relationship managers with complex documentation by region.

IMPACT

- The client segmentation approach creates a differentiated, more tailored offering for UHNW clients and reduces the overall cost of investment advisory.

- Clients have their relationship manager as main point of contact for all services.

- Relationship managers can focus on client-facing and relationship management activities rather than client servicing.

- Harmonization of skills ensures that servicing of clients is done effectively and efficiently.

CHALLENGES AHEAD

- The challenge is when the roles are physically moved away from the relationship managers.
- Processes need to be more rigorous and clearer between the relationship manager, the client service team, the account control team, and operations.
- Profit/loss ownership shifts away from the relationship manager, but must be managed by region.
- The bank manages relationships more holistically rather than with a relationship manager-direct model.
- Shifting of lower-end clients into a similar model with higher account loading and more workflow-supported processes.

Case two: International bank introduces three functional support teams – online banking service, client service, and client due diligence advisory specialist

CLIENT SITUATION

- The bank experienced high regulatory pressure, conduct issues, and reputational risk (e.g., Libor scandal, pressure from DOJ and FCA).
- In addition, the bank faced a higher cost-income ratio than its competition, decreasing AUM, and low interest rate margins.
- The front office was focused on de-risking activities, taking time away from growing the business.

APPROACH

- **Reduced administrative and compliance burden on the relationship managers with the creation of the client due diligence advisory specialist team:** strengthened collaboration between operations and front office to support the bankers with KYC and AML client reviews, adverse media screening, and processing of documents.
- **Alternative client channel with the creation of the online banking service team and the client service team:** clients can make payments, execute orders via the digital platform, and interact with the online banking service team. A call back unit performs independent call backs, manages complaints, and contacts clients for special initiative.
- **Risk owners with skin in the game:** the chief operating office is part of the business organization and is responsible for business management and business risk, control, and governance. Business risk managers sit with the bankers and help them navigate through risk matters.
- **Building the organizational growth engine:** created sales management functions to support the CEO in business planning and strategy. Recently hired a new head for the private bank from the investment banking division with private equity background. KPIs with renewed focus on net new client metrics.

Figure 2: International bank introduces three functional support teams

FRONT OFFICE OPERATING MODEL
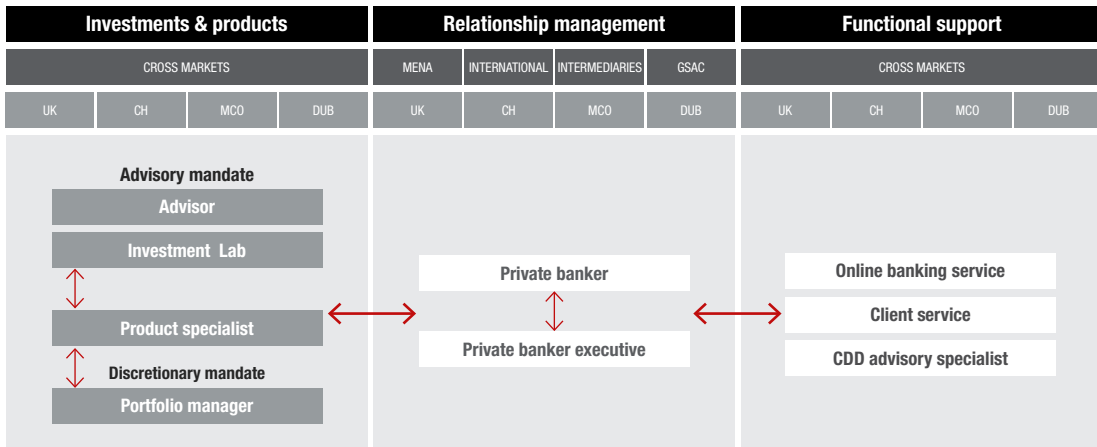
Figure 3: International bank introduces a client lifecycle management team

FRONT OFFICE OPERATING MODEL
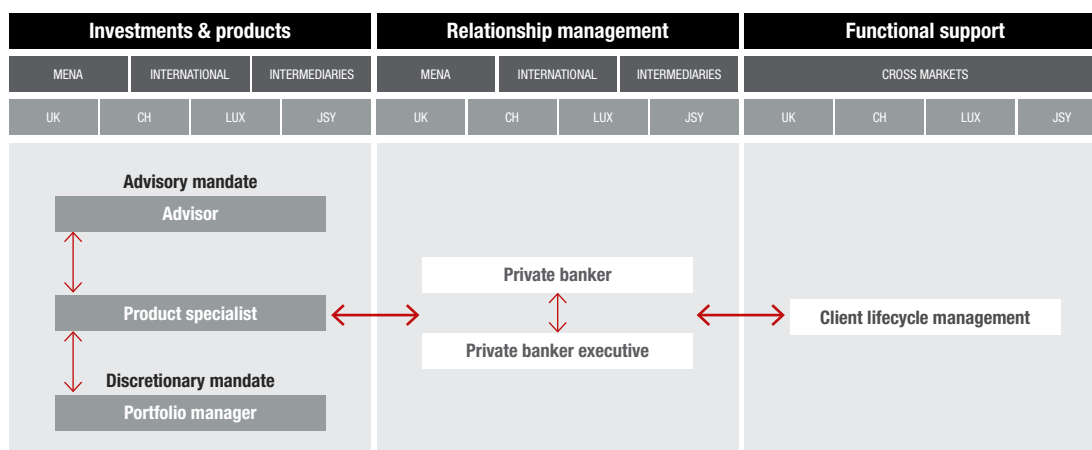
IMPACT

- Cost effective organization with improved cost-income ratio through market segmentation (including divestiture).

- Reducing the risks of their client portfolio while still growing the business has raised the stakes for many private bankers.

- Support functions taking over administrative and compliance tasks, enabling the banker to focus on business development.

CHALLENGES AHEAD

- Ring-fencing of the bank between the home market and "International" generates client management and private banker ownership challenges.

- Limited opportunities for further cost reduction.

- Ability to generate growth while keeping a cost-effective organization.

- Cultural shift from the private banker to become a "hunter."

Case three: International bank introduces a client lifecycle management team

CLIENT SITUATION

- The bank was dealing with increasing regulatory pressures, conduct issues, and reputational risk (e.g., data theft, Panama Papers).

- The front office focused on de-risking activities, taking time away from growing the business.

- A new client onboarding platform was implemented, redefining the approach to client lifecycle management.

APPROACH

- **Parallel implementation of new core banking and client onboarding platforms:** migration to "high industry standard" platforms required a thorough analysis of all business processes across the bank and offered the opportunity to redefine roles and responsibilities from front to back office and ensure appropriate risk control and governance.

- **Reduced administrative and compliance burden on the relationship managers with the creation of the client lifecycle management team:** an operations team dedicated to the front office to support the processing of client documentation, maintenance, due diligence, and client file reviews with improvement in the client data quality and management.

- **Rationalized geographic markets presence:** divested from select markets, allowing the front office to focus business development on refined geographic segments.

IMPACT

- Rationalization of the front office task is work in progress. Still ambiguous split of task ownership and accountability between the front office and the client lifecycle management team.

- Recent implementation of core platforms with synergies yet to be realized.

- De-risking exercise completed, portfolio re-positioned, and "back to growth" strategy relaunched, giving positive business perspective to the front office.

CHALLENGES AHEAD

- The "international" team is composed of several small sub-teams of relationship managers and client executives.

- Details of the teams' work organization between relationship managers, client executives, and the client lifecycle management team is highly dependent on the team as well as on the seniority of the team members.

- Planned "regionalization" of the client lifecycle management team that will ultimately be in line with the high-level regions (four teams).

- Keeping control and ensuring that standards, procedures, and due diligence are executed in line with legal and internal regulations.

- Complying with new standards around client lifecycle management rather than relying on the excellence of individual professionals.

From the three specific cases discussed above it becomes clear that the organizational set-up of the front office is only the beginning of the transformation process. Obviously, it requires weighing the pros and cons of each organizational option. The questions that need to be answered include, therefore, how does any given option in practice impact the ownership of profit and loss, the incentivization of the workforce (including the details of the future incentives structure), and the related sales targets/resourcing budgets? When relationship managers have more time, how should they use it effectively to increase sales and net new money inflows? And what are the expected challenges ahead? These change aspects and success factors must be considered at an early stage and be diligently planned to ultimately succeed in setting up an efficient front office that yields tangible benefits.

5. CONCLUSION

Private banking organizations in Switzerland must deal with the current challenges, ranging from the low interest rate environment to increasing regulatory pressure, which, for better or worse, are not expected to disappear anytime soon. Against this backdrop, the front office represents the core of private banking and lends itself as a starting point to differentiate an institution's offering by providing a unique client experience and thus setting the stage for improving business development and increasing sales.

A private banking organization should define top-down how it envisions serving clients, through what channels, and with what offerings. In addition, it needs to consider how the service coverage/catalogue is affected by a change in the front office and how client relationship management takes place going forward. After formulating its own concrete vision, a private bank needs to decide on an organizational model that works with the relevant levers available to optimize the front office. While the number of levers is limited, the options to optimize the front office set-up are still numerous. As a word of caution: critical questions must be answered before initiating the transformation process given that it will likely affect relationship managers and clients one way or another.

Finally, like in any change management endeavor – while certain variations may apply to different organizations – a comprehensive implementation plan must cover all dimensions and implications, ranging from communications through to logistics. Last but not least, senior management commitment represents a critical success factor for such a strategic transformation.

CLIENT PREFERENCES FOR DIGITIZATION AND ECOSYSTEMS IN WEALTH MANAGEMENT

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ABSTRACT

This article uses empirically collected data in Switzerland, Germany, and Austria to illustrate how the share of digital clients in wealth management has evolved since 2012. Using this data, we try to determine the relationship between client characteristics and the preference for bank-centric or open ecosystems. We find that a clear majority of clients seem to lean toward an open digital wealth management ecosystem as opposed to a bank-centric one.

1. INTRODUCTION

Digitization is probably the most important strategic challenge in wealth management at the moment, at least the one that is most intensively discussed by management and supervisory boards. At the same time, opinions differ widely as to how wealth management for high net worth individuals will be affected. Opinions range from minimal disruption to the replacement of client advisors with robots. Nevertheless, most private banking executives believe that "wealth management is a people's business," and that digitization will complement, rather than replace, client advisors. This perspective, while fully justified, could have the negative impact of preventing a genuine discussion on technological innovations, especially since the social media revolution has demonstrated that personal relationships, or their cultivation, can very well be digitized.

2. DIVERSITY OF BUSINESS MODELS

From today's perspective, it is difficult to see which technological changes will actually be relevant for broad client segments. Wealth management is already proving to be very diverse and an industry with a wide range of different business models. At the same time, the wealth management client is

not easy to describe as such, and wealthy clients are also characterized by a very colorful variety of preferences and values. This requires a very differentiated view of a wealth manager's client base when it comes to defining business strategies for the future. For this reason, this article focuses on data describing client behavior in order to create a fact-based basis for strategic decisions.

The private banking/wealth management segments considered here typically deal with clients who possess free financial assets of at least €500,000. Most remarks in this article refer to the private banking/wealth management markets in Germany, Austria, and Switzerland and use a representative, and regularly conducted survey of high-net-worth clients in the three countries as a database [Cocca (2018b)].[1] While the conclusions of this study can be applied to other wealth management markets, it is necessary to take local characteristics into account.

3. CLIENT PREFERENCES FOR DIGITIZATION

3.1 Do not forget the client

Not everything that is technologically possible will be applied by wealth management clients. Ultimately, clients will decide

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[1] Around 300 wealthy individuals were surveyed in Germany, Austria, and Switzerland in each of the years 2012, 2014, 2016, and 2018. The main criterion for participation in the survey was disposable investment capital of over €500,000 in Germany and Austria and over CHF 900,000 in Switzerland. The extensive questionnaire included more than 100 singular questions and allowed, therefore, for a very deep understanding of clients' preferences and behavioral characteristics.

which technological innovation will prevail. This is one of the most important strategic unknowns today. The increase in "convenience" for the client often represents an important additional benefit of technological innovations, which, however, must also be perceived as such by the client. This implies distortions of perception in both positive and negative directions. Influencing this in the desired direction will be a challenge if the aim is not merely to gain the perhaps small group of technology-savvy clients, but to achieve increased penetration among broader client groups. A scenario that is conceivable is one where despite all the benefits that can be derived from innovative technological solutions clients will simply not be convinced to make use of it. Of course, a provider can also influence this decision through (financial) incentives. However, the risk of inertia of client behavior or an inherent irrationality must be taken into account.

Client preferences are very heterogeneous and the term "future client" is deeply misleading. Even today, in banking, as in other consumer goods industries, it is already becoming apparent how diverse client behavior can be and how difficult it is to determine inherently homogeneous client profiles. For example, clients may be early adopters in one area and remain the absolute traditionalists in another. Despite that, the "special good" that wealth management is about also plays a special role here. Money is undoubtedly a special good and related services are certainly subject to special laws, which can change over time but do not necessarily have to.

3.2 The (augmented) client experience

The primary reason why wealth managers should (indeed must) address the issue of digitization has to do with satisfying the needs of their clients. Today, and increasingly so in the future, wealth management clients expect to be able to obtain information about their personal finances digitally at any time, and to communicate with their wealth managers and conduct financial transactions (or at least parts of them) through digital channels. Over the decades, wealth management has been able to build a differentiating client experience, which involves visiting a traditional private bank and receiving very personal advice from a client advisor. The more it becomes normal for wealthy clients to demand sophisticated services from other areas of life digitally, either in whole or in part, the more likely it is that wealth management services will also be in demand via digital channels. This means that the digital client experience must increasingly be part of the general client experience in wealth management.

If the digital channel is used, there is an opportunity to "simply" offer the existing range of services digitally or to develop a

wide variety of new investment solutions. A wealth of creative innovations can create a completely new world of experience, for example in the form of supporting tools and applications or as portal and interaction platforms. The transfer of the real client experience into the digital world forms the basis of this world of experience and can be oriented towards the already established associations, such as security, trust, and premium service. However, this alone will not be enough; what is needed is an "augmented reality", a world of experience that creates new possibilities for the client. The creation of such a digital environment or architecture represents the great opportunity of digitization.

Compared to previous generations, the generation of predominantly digital clients has a radically different demand for transparency and spontaneity in their interaction with product and service providers [Buhl et al. (2012)]. As social interaction increasingly takes on new forms, the bank-client interaction in wealth management will inevitably be expanded or possibly even redefined. While today personal contact in the form of a physical consultation continues to be the dominant form of interaction [Cocca (2018b)], this could be expanded in the future in favor of virtual channels. The proliferation of social media offerings such as Facebook or LinkedIn proves that a trusting environment for digital clients, in which very personal to intimate information can be exchanged, can also be created in virtual space. The spread of such an interactive environment in wealth management could be linked to special technical requirements with regards to data security and privacy protection. Increasingly, however, nothing could stand in the way of a fundamental acceptance of virtual communication. In addition to the challenge of presenting a consistent client experience via all communication channels, completely new possibilities also arise in the support of a consultation by multimedia solutions [Böhlmer et al. (2011), Grahl and Ullrich (2011)]. A physical presence or physical meeting can still be meaningful, but could only remain unavoidable where extremely complex services have to be created or where personal confidence building is of particular importance (e.g., new client). It is likely that purely virtual providers (robo-advisors) will establish themselves for an increasingly standardizable range of services [Cocca (2018a)].

3.3 Client empowerment

Digital solutions involve the unconscious (sometimes conscious) expectation of offering client solutions that open up completely new possibilities and can be implemented with aesthetic elegance [The Economist (2013), Leurs (2012)]. These expectations arise from the digital world experiences of the client in other areas of life. Amazon, for example, has

set completely new standards for delivery times, shipping costs, return options, or customer complaint management. Today, features such as comparison options or client ratings of products and providers are also standard in online retailing. This philosophy of "client empowerment" can become the guiding principle in the bank's innovation process. The digital client wants to increase the degree of autonomy and self-determination and expect the bank to enable them to pursue their interests independently in a self-determined fashion. This "empowerment" of the wealth management client leads to a client who has more power and influence and who is granted new scope for shaping their own interests. Of course, not all clients will have such preferences. There will continue to be a clientele that has neither the time, knowledge, nor interest to deal with all this. The question for the bank is whether, strategically, it wants to focus solely on this client group. A characteristic feature of client empowerment in virtual worlds is the provision of direct connectivity. The traditional business model of banks is based on having an information advantage over the client and making this advantage available to the client in individual areas. In an information society with ubiquitous information access, this form of using asymmetric information distribution comes under pressure. Tomorrow's wealth management could be about providing clients with tools and solutions that enable them to have more direct access to knowledge and information. The exclusive client experience in wealth management will thus become a question of access to smarter and more intelligent investment solutions, investment tools, investment opportunities, and theme-based networks.

3.4 Today's client preferences

To determine the potential impact of digitization on behavior of wealth management clients, collected client data [Cocca (2018b)] is now used to capture client preferences and their development over the last years. The totality of the surveyed clients, which is representative of an average client book in private banking/wealth management, is illustrated in segments by means of the degree of digitization. In this regard, three relevant segments that differ in terms of the degree of digitization (i.e., how they make use of online wealth management services today) can be distinguished:[2]

- **Digital deniers:** the client has a personal advisor and does not use any virtual banking channels.
- **Hybrid clients:** the client has a personal advisor, but also uses virtual banking channels for services related to wealth management.
- **Digitals:** the client has no personal advisor, and more than half of their wealth is with an online bank.

Figure 1 shows how these segments have developed proportionally between 2012 and 2018. The values refer to the distribution of the assets among the three client segments (not the number of clients). It is easy to see that the hybrid clients make up by far the largest group (around 80 percent to 90 percent). Furthermore, it is clear that the proportion of digital deniers has continuously decreased, whereas the proportion of digitals has increased significantly, albeit non-linearly, since 2012. In 2018, the proportion of digital clients fell to below 5 percent after a peak in 2014.

Figure 1: Distribution of wealth management assets across client segment

	Digital deniers	Hybrid clients	Digital clients
2012	16.2%	81.6%	2.2%
2014	14.6%	77.8%	7.6%
2016	11.5%	82.1%	6.4%
2018	8.8%	86.6%	4.6%

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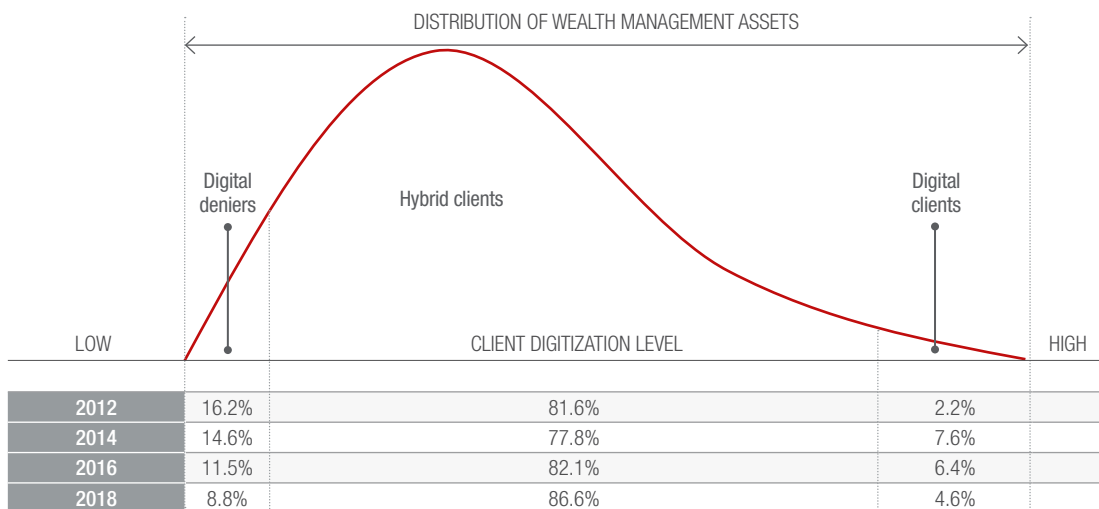
[2] Cf. for an evaluation and commentary on earlier data samples of the same study: Cocca (2016), Cocca (2018b)

Figure 2: Share of unsatisfied clients 2012-2018
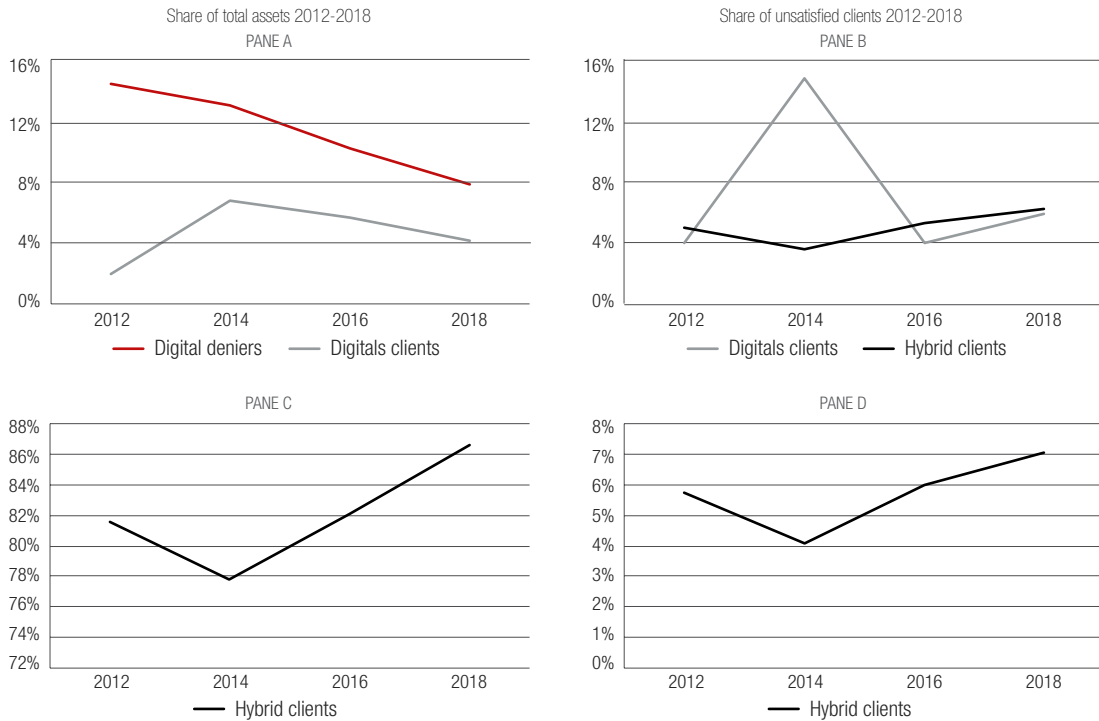
This temporal development is remarkable against the background of the sometimes very high expectations for growth rates in the digital client segment. This shows that the trend towards fully digital clients in wealth management is neither exponential nor linear. There are two questions that come to the fore when looking at these figures. What could the falling number of digital clients (as defined here) represent and what can this mean in terms of further development?

The declining share of digital clients can be attributed to the following two effects:

1. Whereas previously clients with a high digital affinity were forced to leave their own traditional providers, in recent years traditional wealth managers have also expanded their digital offerings to allow these clients to become "more digital" at their own house bank without having to switch to a pure online player. This means that such a client would still be considered as a "hybrid client", even though their use of digital offerings may have increased.

2. Linking this to other variables reveals that while in 2012 digital clients expressed a particularly high degree of satisfaction with their providers of digital wealth management services (usually a pure online bank or online

broker), this figure fell sharply in 2014 (cf. Figure 2, pane B). This could indicate that some of the clients who switched to new online providers in the early years were dissatisfied with the products and services they found and subsequently switched back to an established wealth manager.

The latter point could indicate that some new pureplay online providers did not always succeed in meeting the expectations of their clients. This does not necessarily mean that the (falling) trend observed in these figures will continue. Diffusion processes of innovation often do not run linearly but in waves [Fenn and Raskino (2008), Steinert and Liefer (2010)]. This could also be observed in this case and might indicate a dynamic competitive process between the market entry of innovative models, the reaction of established providers, and the further reaction of innovators, etc. Thus, an expected wave-like diffusion of digital services can be developed as a possible future scenario, which will essentially depend on whether the fintechs of the first wave succeed [Mackenzie (2015), Zavolokina et al. (2016)] in developing their own strengths and, above all, in correctly addressing their own weaknesses in order to accelerate growth.

3.5 Second generation fintechs

One of the main criticisms of today's fintech providers in wealth management is that although they are usually very efficient, client-friendly, and cost-effective, their advantages tend to be limited to only a small section of the entire wealth management value chain. Hence, if digital clients want to cover further parts of the value chain, they must look for and integrate additional providers, i.e., control the interfaces. Having said that, while this is probably the most important weakness of individual fintech providers, it could also be the area for greatest improvement that second wave of the fintech evolution could aim for.

In addition, the ability to offer even more complex financial services in a cross-border context virtually will be important. On the one hand, this will be promoted by further increasing the technical performance of hardware and software. On the other hand, it will be relevant to what extent national and international regulation and legal systems will tend to converge or will have a further and increasingly complex effect. The sharply increasing number of fintech offerings in wealth management is a positive development from the perspective of promoting innovation. However, the confusion caused by the large number of providers poses a problem in terms of market fragmentation and could ultimately only allow a few to gain a foothold in the market [Dohms (2017)]. It is, therefore, likely that we will end up with a few large providers that lead the second wealth management technological revolution.

4. WEALTH MANAGEMENT ECOSYSTEMS

4.1 Holistic wealth management

Throughout the entire consultation process, total wealth is a central aspect of holistic advice. In this process, the main question is who has the overall view of the client's assets. This may well be called the "holy grail" of wealth management advice. For very wealthy clients, this function can be performed by the family office, an independent third-party, or by the main bank. An enormous challenge remains, however, for a complex wealth to generate such a consistent overall view, which allows continuous control based on current market data across all asset classes. In addition, it is usually the clients themselves who avoid such a concentration of power with a traditional wealth manager who holds all the information and threads together. An independent entity that performs such an aggregator role by using digital technology would be a benefit in ensuring optimal consulting results. However, the difficulty of managing a complex wealth situation with alternative asset classes and different jurisdictions should also be recognized.

The architecture that would now allow the concept of holistic wealth management to be implemented on the one hand and the integration of various elements of the value chain on the other is found in the concept of a digital ecosystem [Subramaniam et al. (2019)].

4.2 Digital ecosystems

The term "digital ecosystem" has been assigned various meanings in research [Selander et al. (2013), Kallinikos et al. (2013), Adomavicius et al. (2008)]. Skog et al. (2018) use a more inclusive definition than other authors. Specifically, rather than being bounded by a particular technology (e.g., a platform), they refer to digital ecosystems as sociotechnical networks of interdependent digital technologies and associated actors that are related based on a specific context of use. From this, certain characteristics of digital ecosystems are derived. First, they emerge as complex and dynamic webs of interdependent elements (including firms, institutions, and clients). Second, digital ecosystems often span industry boundaries to comprise heterogeneous actors and technologies from several industries. Third, digital ecosystems are inherently hierarchical where the power to influence others increases with centrality, i.e., actors' influence is generally related to the number of external actors that depend on them [Adomavicius et al. (2008)].

4.3 Wealth management relationships

Although the term "ecosystem" has gained in importance as a strategic concept, particularly in recent years, it must be pointed out that ecosystems (or network structures) are not in themselves a new phenomenon in wealth management. This results from the nature of the business. Digitization enables one thing above all else: closer networking of the bank externally with its clients and suppliers as well as internally with its own internal units. This networking enables a significantly higher level of interaction with the client. This is very much in the bank's interest, as an increase in interaction brings useful effects: increased client loyalty and earnings potential per client. An increase in interaction also enables a much deeper understanding of client behavior and offers new opportunities to develop tailor-made offers. Closer networking, both internally and externally, can form the basis for establishing a wealth management ecosystem, with the bank serving as an access point to this network of relationships. This corresponds to what is often a wealth manager in a wealth management client's network today. After all, the wealth manager is, or aims to be, the primary contact person (preferred partner) for the client when it comes to identifying and hiring suitable lawyers, tax advisors, fiduciaries, real estate agents, art experts, etc.

[Deloitte (2019)]. In addition, networking among clients at client events, where important business relationships that have nothing to do with actual wealth management are arranged by the private banker must not be underestimated. All of this is certainly part of traditional wealth management and in a certain sense an ecosystem that has always operated in this business segment [Fasnacht (2018)]. The difference with the current use of the term can be seen in the following points:

- It defines a bank/advisor-centric ecosystem in which the bank tries to be the central hub and claim the interface to the client for itself.

- Digital communication or interaction channels do not play a (significant) role in these ecosystems today.

- This ecosystem is particularly relevant in the higher client segments (from approximately €5 million). The lower the client segment, the less relevant such ecosystems are, as the bank tends to offer more standardized services and the client usually has a lower demand for services from such a network/ecosystem.

However, the term "digital ecosystem", as used today, is understood in a different way and contains more far-reaching elements:

- A digital wealth management ecosystem is not necessarily bank-centric and could also be managed by a third-party provider, which does not necessarily have to be a regulated financial services provider either [Tschanz (2018)].

- A digital wealth management ecosystem could be based on an open architecture, in which the best providers for parts of the value chain are selected according to the best-in-class principle of the client [Schmidt et al. (2018)].

- In a digital wealth management ecosystem, access and control of interfaces is done via digital channels [PWC (2019)].

- A digital wealth management ecosystem can be developed around financial needs or emerge from non-financial areas (e.g., lifestyle needs)

5. BANK-CENTRIC OR OPEN ECOSYSTEMS?

These considerations lead classical wealth managers to ask themselves what basic strategy they should pursue when participating in, or establishing an, ecosystem. From a wealth manager's perspective, the main consideration here is what role it should play in an ecosystem [Deloitte (2019)]. Two basic strategic positioning options are conceivable in an ecosystem: an ecosystem around the wealth manager or an open ecosystem in which the wealth manager is one of many hubs. Which of the two positions a wealth manager should aim for will depend on many internal and external factors. It can be assumed, however, that the central hub function will tend to be favored, as this promises more market power. A relevant, but difficult to ascertain, dimension in this context is the question of which preferences can be observed among wealthy private clients or which clients have which preferences from today's perspective. Based on the data sample already presented, this central question will be investigated by examining which characteristics are related to the propensity of clients to use an open versus bank-centric digital wealth management ecosystem.

Figure 3: Distribution of bank-centricity and digitization levels

DISTRIBUTION OF BANK-CENTRICITY LEVELS

Mean: 4.76; Std. dev.: 1.353; N = 360

DISTRIBUTION OF DIGITILIZATION LEVELS

Mean: 3.84; Std. dev.: 1.693; N = 360
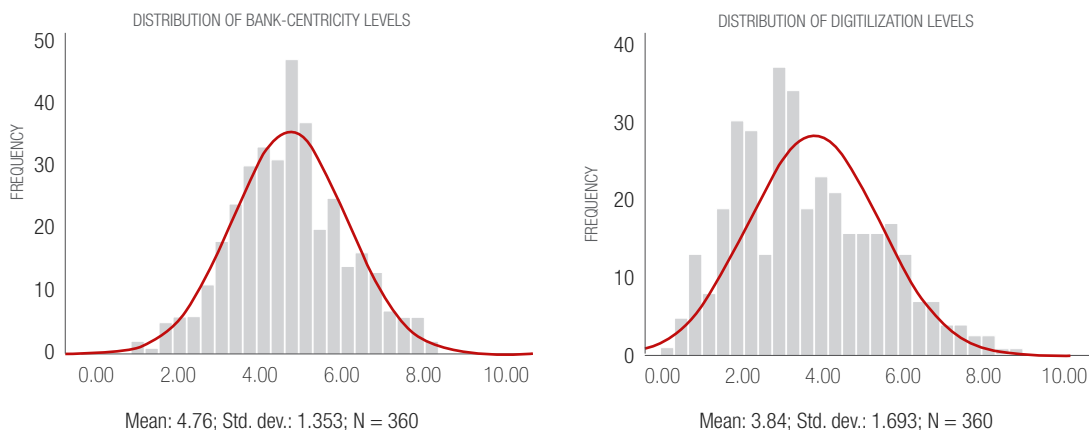
For this purpose, the two relevant main dimensions of the analysis are constructed:

- **The digitization level of each client in the sample:** here, a number of variables related to the use of online channels for communication and transaction processing are used and an individual index level is calculated. The index ranges from 0 to 10, where 0 stands for a very low and 10 for a very high level of digitization. The following aspects are covered in this dimension: among others, virtualization level of interaction, demand for personal advice, preference for online providers, preference for personal advice versus robo-advisors, demand for 24x7 offers, early-adopter behavior, fear of hacker attacks and data loss, online banking usage, and social media usage.

- **The degree of bank-centricity of each individual client in the sample:** this is based on a wide range of variables, including a client's propensity to place their own bank or advisor at the center of their investment decisions versus their propensity to make investment decisions independently or using third-party opinions/sources. For each client, a value is calculated on a scale of 0 to 10, where 0 stands for a very low and 10 for a very high level of bank-centricity. The following aspects are included in this dimension: general trust in banks, satisfaction with one's own bank, number of bank connections, willingness to change advisors, parties involved in the investment decision, independence versus benefit of the client advisor in investment decisions, assessment of client advisors, access to the bank's investment competence, assessment of banks' past failures, attitude towards supervision of banks, and perception of banks' own interests.

Figure 4: Bank centricity and digitization levels
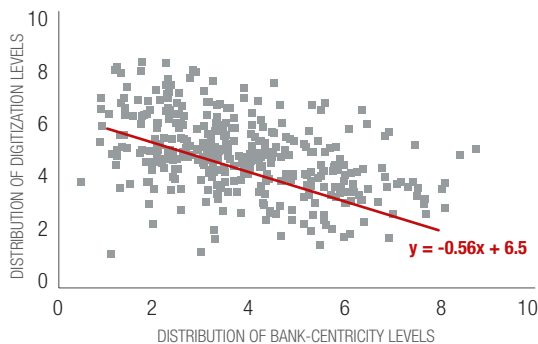
Correlation:
Kendall's Tau-b: -0.321(**)
Spearman's Rho: -0.463(**)
** significance at the 1% level

Figure 3 shows the frequency distribution of the two dimensions for the entire sample.[3] The relationship between the two main dimensions is shown in Figure 4. Here, it is evident that there is a significant negative correlation between digitization and bank-centricity levels. In other words, clients who have a high digital affinity tend to show lower bank-centricity in their investment and decision-making behaviors.

In a further step, a four-quadrant matrix is now formed from the point cloud, using the axis mean values as boundaries. This results in four quadrants, which have the following characteristics (Figure 5):

1. **Open ecosystem preference:** wealth management clients who show a high preference for the use of digital channels and innovative offers and who at the same time act very independently or with the involvement of third parties in investment decisions, thus relegating the role of their own bank or advisor to the background.

2. **Bank-centric ecosystem preference:** wealth management clients who have a high preference for the use of digital channels and innovative offers and at the same time rely very heavily on their own bank or advisor when making investment decisions.

3. **Weak relationships preference:** wealth management clients who are very skeptical of technological innovations and do not use them, but who act very independently or with the involvement of third parties when making investment decisions and who do not have a close relationship with a bank or a particular advisor.

4. **Classic advice preference:** wealth management clients who are very skeptical about technological innovations and do not use them, but at the same time rely very heavily on their own bank or advisor when making investment decisions.

5.1 Patterns and preferences across types

Table 1 shows the analysis of various differences between the four client types shown in Figure 5. First of all, it should be noted that client types 3 (weak relationships preference, 38.61 percent) and 4 (classic advice preference, 35.83 percent) represent the largest groupings. Clients who currently have an affinity for a bank-centric wealth management ecosystem account for 4.44 percent of the total sample and clients who have a preference for an open wealth management ecosystem account for 21.11 percent. This shows that, on the one hand, wealth management ecosystems are only an option for about a quarter of the traditional client base of a bank operating in

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[3] Only data from the 2018 survey were used for this analysis (n = 360).

Figure 5: Four-field matrix of ecosystem preference
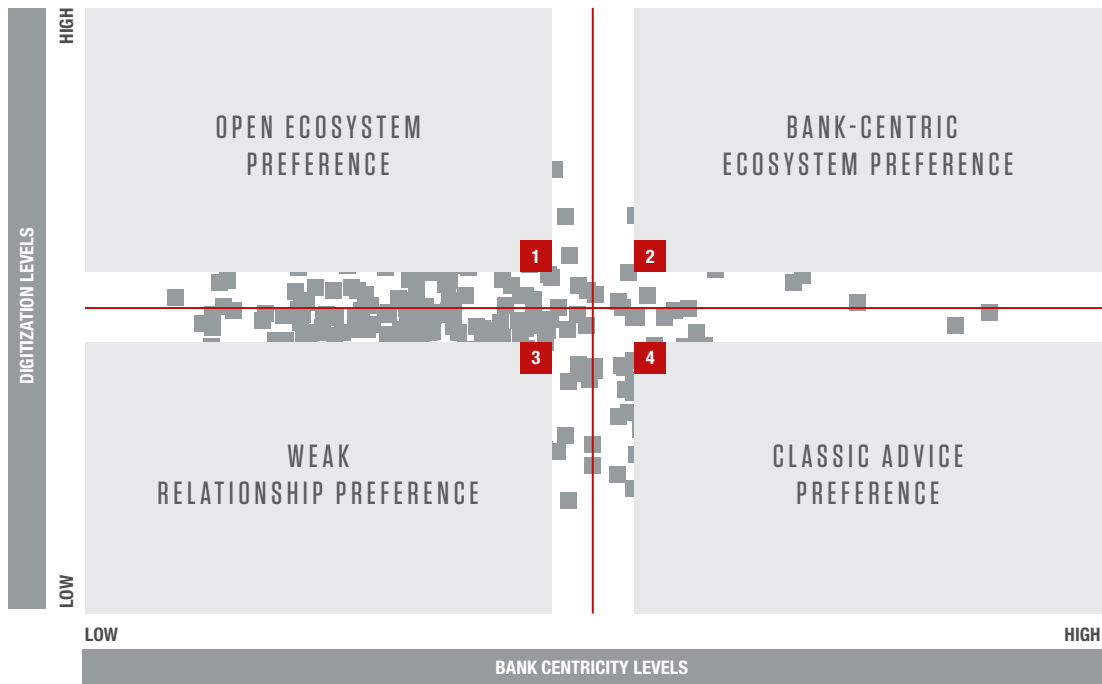
the wealth management sector, and on the other hand that there is a clear preference for an open versus a bank-centric wealth management ecosystem.

Next, we will examine the characteristics of those clients with a preference for open wealth management ecosystems in more detail. Here, 20 characteristics are examined and the different characteristics between the four client types are considered. The 20 characteristics are divided into the following categories: socio-demographic aspects, bank-client relationship, behavioral characteristics, and product preferences. The statistical significance of this group comparison is not considered, as only general tendencies will be explored.

The following findings can be made:

1. The differences in client size measured by client assets are small between the client types, with client type 2 having the highest average value, €2.52 million.

2. The proportion of younger clients (under 50 years of age)[4] makes up the highest proportion in the subgroup of client type 1 (43.42 percent). For the subgroup of client type 2, the share is also above average at 37.5 percent. In the subgroup of client type 4, only 17.83 percent of clients are under 50 years old.

3. In the overall sample, the proportion of women is 26.4 percent. In a comparison of the subgroups, the proportion of women is highest for client type 4 (31.70 percent) and lowest for client type 2 (6.2 percent).

4. In the overall sample, the proportion of clients who specify a major bank (such as UBS, Deutsche Bank, or Erste Bank) as their main bank for wealth management is 31.4 percent. This share is highest in subgroups 3 and 4 and clearly lowest in subgroup 2.

5. In the overall sample, the share of clients who have a traditional private bank as their main bank for wealth management is 10.3 percent. This share is lowest in subgroups 1 and 2, at 6.3 percent and 6.6 percent respectively.

6. The proportion of clients who are highly loyal to their wealth manager (long banking relationship, high proportion of assets with the main bank) is lowest in subgroups 1 and 3.

7. The proportion of clients with above-average price sensitivity to the price of banking services is highest in subgroups 1 and 2.

8. The proportion of clients who attach above-average importance to the financial stability of their wealth manager is lowest in subgroups 1 and 2.

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[4] In wealth management, the average age of clients is approximately 65 years, which is why the younger client category is defined as "under 50".

9. With regard to the question of how clients rate their own financial knowledge, 17 percent of the overall sample indicate that they have very good knowledge. In a subgroup comparison, the two client types 1 and 2 show significantly higher values (42.10 percent and 37.50 percent).

10. In the overall sample, 23.30 percent of the clients describe themselves as risk friendly. In a subgroup comparison, the two client types 1 and 2 show significantly higher values (43.40 percent and 37.50 percent).

11. 12.50 percent of the clients in the overall sample describe themselves as emotional investors. In a subgroup comparison, the two client types 2 and 1 have significantly higher values (18.80 percent and 15.80 percent).

12. Clients who state that their investment goal is primarily "asset growth" (versus asset preservation) are overrepresented in the subgroups of client types 1 and 2.

13. The proportion of clients who believe they can achieve an excess return without additional risk is highest in subgroups 1 and 3, as compared to the overall sample.

14. Clients who hold derivatives in their investment portfolio are overrepresented in subgroup 1 compared to the overall sample.

15. Clients who hold hedge funds in their investment portfolio are overrepresented in subgroup 4 compared to the overall sample.

16. Clients who hold private equity in their investment portfolio are overrepresented in subgroups 1 and 2 compared to the overall sample.

17. Clients who hold commodities in their investment portfolio are overrepresented in subgroups 1 and 2 compared to the overall sample.

18. Clients with an above-average preference for sustainable investment products are underrepresented in subgroups 1 and 2 compared to the overall sample.

19. Clients who have an above-average affinity for using a bank account abroad (offshore accounts) are overrepresented in subgroups 1 and 3 compared to the overall sample.

20. Clients who have a below-average affinity for using passive investment funds are underrepresented in subgroups 1 and 4 compared to the overall sample.

Based on these considerations, clients who have a preference for an open wealth management ecosystem are: under 50 years of age, not very loyal, care less about the financial stability of the wealth manager, very price sensitive, have high financial literacy, and rather risk friendly.

Figure 6 summarizes the most striking features of the four client types in question.

With regard to differences in characteristics between clients with a preference for a bank-centric (subgroup 1), as opposed to an open wealth management ecosystem (subgroup 2), the following aspects can be highlighted:

- **Gender:** the proportion of men is higher in subgroup 2 than in subgroup 1.

- **Banking group:** the proportion of big banks clients is lower in subgroup 2 than in subgroup 1, but since the proportion of clients with a private banking relationship is somewhat the same between the two subgroups, this indicates a higher proportion of clients with relationships to regional banks (residual group) for subgroup 2.

- **Loyalty:** the share of clients with high loyalty to their own main bank is significantly higher in subgroup 2 than in subgroup 1 (as expected).

- **Price sensitivity:** the share of clients with high price sensitivity is slightly lower in subgroup 2 than in subgroup 1.

5.2 Strategic implications for wealth managers

From the analysis of this data, some implications for the strategy of wealth managers can now be deduced:

- If we start with the current client base of a traditional wealth manager (for which the data sample used here is representative), it can be assumed that around a quarter of clients have some affinity with a digital wealth management ecosystem. This does not mean that around a quarter of clients have a concrete need, but rather that based on the preferences shown today a potential affinity can be derived in today's investment and decision-making behavior along the dimensions of the degree of digitization and the degree of bank-centricity. The extent to which a client would actually use a digital wealth management ecosystem will depend on the actual design and the perceived cost-benefit relationship for the client.

- A clear majority of clients seem to be more receptive to an open wealth management ecosystem than a bank-centric one. This highlights the problematic role that a bank could play in an ecosystem if the client prefers no bank-centric ecosystem. This is the most strategically sensitive point, as it would argue in favor of wealth management ecosystems operated by independent platforms. This could also be an opportunity for "big tech" companies.

- Looking across all four client preferences, however, it should also be noted that an absolute majority of clients still have a preference for the traditional relationship between client and wealth manager.

- Young, male clients with very good financial knowledge and a pronounced risk appetite, who are highly price sensitive, are particularly responsive to open digital wealth management ecosystems. This is the market

Table 1: Four-field matrix of ecosystem preference

	1	2	3	4	
	OPEN ECOSYSTEM PREFERENCE	**BANK-CENTRIC ECOSYSTEM PREFERENCE**	**WEAK RELATIONSHIPS PREFERENCE**	**CLASSIC ADVICE PREFERENCE**	
Share of overall sample	21.11%	4.44%	38.61%	35.83%	
					Average
Client assets	€ millions	€ millions	€ millions	€ millions	€ millions
(1) Average client assets	2.27	2.52	2.20	2.09	2.19
	% of subgroup	% of subgroup	% of subgroup	% of subgroup	% of overall sample
Socio-demographics					
(2) Share of clients with age below 50 years	43.42%	37.50%	23.74%	17.83%	26.40%
(3) Share of female clients	19.70%	6.20%	31.70%	27.10%	26.40%
Bank relationship					
(4) Share of big bank clients	30.30%	18.80%	33.80%	31.00%	31.40%
(5) Share of private bank clients	6.60%	6.30%	9.40%	14.00%	10.30%
(6) Share of highly loyal clients	30.26%	50.00%	41.73%	51.94%	43.33%
(7) Above average price sensitivity	35.53%	25.00%	5.04%	6.98%	13.06%
(8) Above average preference for financial stability	18.42%	18.75%	26.62%	28.68%	25.28%
Behavioral characteristics					
(9) Knowhow (percentage of clients with very good knowledge in financial matters)	42.10%	37.50%	8.60%	8.50%	17.00%
(10) Risk-friendly (percentage of clients that state to be risk seekers)	43.40%	37.50%	14.40%	19.40%	23.30%
(11) Emotionality (percentage of clients that state to be emotional investors)	15.80%	18.80%	9.40%	13.20%	12.50%
(12) Capital gain oriented	67.10%	75.00%	44.60%	45.70%	51.10%
(13) Strong belief market outperformance is possible	32.89%	25.00%	29.50%	27.91%	29.44%
Client product preferences					
(14) Clients with derivatives in their portfolio	25.00%	21.00%	14.39%	24.03%	22.22%
(15) Clients with hedge funds in their portfolio	10.53%	6.25%	4.32%	11.63%	8.33%
(16) Clients with private equity in their portfolio	26.32%	18.75%	13.67%	15.50%	17.22%
(17) Clients with commodities in their portfolio	56.58%	62.50%	45.32%	48.84%	49.72%
(18) Share of clients with high preference for sustainable investments	32.89%	43.75%	44.60%	44.96%	42.22%
(19) Offshore account affinity	56.58%	50.00%	51.80%	44.96%	50.28%
(20) Share of passive investment funds	39.60%	45.40%	43.20%	41.00%	41.60%

segment that needs to be addressed primarily in order to attract potential clients for a digital wealth management ecosystem. This type of client also largely corresponds to the typical digital client who appears as an early adopter of new technological innovation [Cocca (2016)].

- The parameters from investment and decision-making behavior, combined with product preferences, suggest a higher affinity for open wealth management ecosystems, in specific trading-oriented rather than relationship-oriented wealth management (i.e., highest share of self-directed clients with a diversified portfolio composition in terms of derivatives, private equity, or hedge funds holdings within subgroup 1 versus lowest such share in subgroup 4). This could indicate that wealth management ecosystems could form around particularly attractive trading offerings (zero-fee-offerings, crypto-trading, startup investment platforms, news portals) and thus be more likely to compete with existing online providers than with traditional providers.

6. CONCLUSION

Due to the novelty of the digital solutions currently being developed, it is difficult to analytically determine the extent to which certain client groups would use a new service. A client survey, for example, can only give a current picture of the clients and only weigh up potential demand. This can, of course, change quickly over time. The statements made here about possible future client behavior, thus, represent a necessary starting point for a well-founded analysis, but naturally do not provide a conclusive picture.

The integration of individual successful fintechs into a cohesive digital ecosystem could represent the next stage in the fintech revolution in wealth management. The client data analyzed here show that the role of the traditional wealth manager in such an ecosystem is unlikely to be that of the central hub. The idea that wealth managers will succeed in building a digital ecosystem around themselves, therefore, seems rather unlikely. On the other hand, from today's perspective,

Figure 6: Empirical characteristics deviating from the overall sample average

OPEN ECOSYSTEM PREFERENCE
- Age below 50 years
- Not very loyal
- Price sensitive
- Financial stability not very important
- High knowhow
- Risk-friendly

1

BANK-CENTRIC ECOSYSTEM PREFERENCE
- Male
- Emotional investor
- Asset growth as a goal
- High proportion of passive investments
- Regional banks as wealth managers

2

WEAK RELATIONSHIP PREFERENCE
- Female
- Big bank clients
- Not price sensitive
- Risk averse
- Rational

3

CLASSIC ADVICE PREFERENCE
- Age above 50 years
- Private bank clients
- Loyal
- Financial stability important
- Low knowhow

4

DIGITIZATION LEVELS — HIGH / LOW

BANK CENTRICITY LEVELS — LOW / HIGH

the general preference for a digital wealth management ecosystem is not particularly pronounced and only around a quarter of clients show some affinity. Ultimately, therefore, these data tend to indicate that there could be a parallelism of different service architectures in the future. Traditional wealth managers use strongly bank-centric solutions to serve clients who are less independent and prefer a traditional relationship with an advisor, while digital wealth management ecosystems are preferred by clients with a high level of expertise and a propensity for autonomous, bank-independent investment behavior.

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THE FUTURE OF ASSET MANAGEMENT – A TECHNOLOGICAL PERSPECTIVE

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ABSTRACT

This article looks at the major challenges facing asset managers and what they need to do to stay relevant. Most asset managers will contend that the environment in which they are operating is changing rapidly, and that they need to adapt. It is true that technology is evolving and that they need to keep abreast of how it impacts the industry, however, having the latest technology will not be enough. To be successful, asset managers need to better manage their corporate cultures, have a rigorous focus on clients, and update their business models.

1. INTRODUCTION

The asset management industry has undergone very little change, if at all, over the past 40 years. And, it has not felt the need to change. It is a necessity of modern life, since most people lack the necessary expertise needed to manage their own wealth, and hence delegate these duties to established players. Economies of scale and high legal and regulatory obligations have also helped keep new entrants at bay. Protected by a relatively stable environment, asset managers have tended to focus primarily on optimizing their existing business models and developing products that met increasingly tightening regulatory requirements and slightly changing client needs. While doing so, they earned a lot of money. And since the status quo is working quite fine, innovation was not deemed very important.

But different factors may cause a change in this attitude.

2. FACTORS FORCING CHANGE IN THE ASSET MANAGEMENT INDUSTRY

2.1 Macro-economic and industry trends

In an environment of global quantitative easing and increasingly correlated markets, alpha is becoming hard to generate. And, automated passive investing products offer simpler and lower-cost alternatives to arduous research and product selection. The trend of switching from active to passive products will gain even greater momentum, leading to compressed margins and increasing cost pressures. This cost pressure is further exacerbated by the fact that asset managers are suddenly faced with a completely new type of client, with different needs and expectations.

2.2 Demographic shifts

In 2020, millennials will account for the largest adult segment in the U.S. And they are on the cusp of their best earning years. They will benefit from a monumental wealth transfer from their baby boomer parents, the largest wealth transfer in history. Estimates assume that up to U.S. $70 trillion will be passed between these two generations in the next decades. Millennials will not only become increasingly more relevant as investors, but also as agents for investment decisions. Millennials are relationship managers for clients of wealth managers, investment committee members of pension funds, or chief investment officers for family offices. In these positions, too, they will be strongly guided by the values of their generation:

- As investors, they are demanding greater transparency and reduced costs. Mounting financial scandals, perceptions of increased inequality, and spiraling complexity have led to eroding trust in traditional financial institutions. Return on investment is less important for them than sustainability and emotionality when investing becomes more important than pure facts.

- As users or clients, millennials are different because they are digital natives. This generation has never owned an investment product or had a financial planner, but they happily rely on their smartphone for all manner of services and prefer consulting an app or their social network to personal contact with an investment professional or financial institution. They grew up with technology baked into their lives. And they will never accept investment solutions and services that do not come with a large portion of digital services.

2.3 Technology

Technology is evolving as well. Advances in robotization are helping asset managers handle their existing processes more efficiently, and the increased use of cloud solutions promises a more cost-effective IT setup. Additionally, ever decreasing computation costs and ever larger data volumes mean that "big data" will become an important factor in the investment process. However, the truly disrupting technologies are blockchain and new technical possibilities to revolutionize customer interaction.

2.3.1 BLOCKCHAIN AND DLT

Blockchain and distributed ledge technology (DLT) have the power to turn the antiquated methods and processes in the fund industry upside down. Although the industry moves vast sums of money every day, it still uses the methods of the last millennium for processing transactions. Thousands upon thousands of transactions are processed via fax every day and spreadsheets are used to painfully consolidate and reconcile the many disjoined ledgers.

Public blockchain networks have the power to legitimately solve many of the issues of the industry with thoroughly novel constructions. At the heart of finance is the question of how we trade and record its history. Many counterparties and processes, which were previously required to build a web of trust, become superfluous in the context of a blockchain-powered financial infrastructure.

Blockchain-based identity could make compliance and fund subscription vastly more efficient, with passported know your customer (KYC) procedures where investors prove their identity once, instead of multiple times for multiple institutions. Fund shares as tokens could advance entirely new models and markets for distribution. Asset pricing and net asset value (NAV) calculations can be handled on-chain, transparently and in real-time. Risk management and portfolio guidelines may be implemented as code, bringing new levels of confidence and control to asset positions, while significantly reducing monitoring effort as a side effect. Near-instant trade settlement between counterparties that happens directly and with deterministic certainty. Even custody of assets can be managed not by independent third parties, but by smart contracts that simultaneously allow discretionary trade and cryptographic security.

The technology, therefore, has the potential to not only improve the existing model of the asset management industry by minimizing costs and risks, but it can also open up completely new opportunities for asset managers to manage and distribute products. Combined with new technologies for customer interaction, it can form the basis for a new fund ecosystem.

2.3.2 CUSTOMER INTERACTION

The technology for greatly simplified and improved customer interaction has also made great strides in recent years. In addition to the online touch points, the areas of (video) chat and email have also developed greatly. But asset managers have not fully embraced these media, relying instead on printed reports sent by mail. Moreover, new communication channels such as social media have been added, which make it easier for asset managers to contact their potential end-investors directly.

Innovation is mostly a product of technical progress that makes new ideas possible and the willingness to use new technology. The financial services sector has largely been able to ignore technological progress because core financial infrastructure has not been forced to adapt. It has been sustained by powerful incumbents, captured regulators, and complacent central banks. Even celebrated fintech companies with shiny apps and slick user experience (UX) designs still use the rusty rails of legacy financial infrastructure.

But with the new, potent emerging user groups – who combine complete openness towards new technologies with shrinking trust in established financial institutions – a major change for the financial industry is ahead of us.

So, the question is: what is the impact on the financial services industry?

Everyone remembers Bill Gates' famous words that "Banking is necessary, banks are not". But the prediction of the decline of the banks has not materialized as yet – despite a severe financial crisis. Why should anything change now?

The big change is the combination of new technologies, which facilitate a change in the ecosystem, and a user group that is much more open to change. Banks will still be around in 10 years, but clients will increasingly consume financial services from specialists, large tech companies, and fintech platforms.

As a result, however, the traditional sales channels of asset managers will become less important. But that is not necessarily a danger for asset managers. It can also be a great opportunity.

The existing distribution channel simply has some big problems, such as:

- **It is not very transparent:** the asset manager normally does not know which end-investor is invested in their products. And the customer lacks product transparency, for example, regarding the breakdown of the exact costs.
- **It is extremely expensive:** up to 70 percent of the total product costs are spent on distribution.
- **It is highly inefficient:** banks and insurance companies tend to sell products that help them achieve their business objectives. These products are not necessarily the best to satisfy the end-investor's needs.

As the existing distribution channel becomes less important, direct sales (B2B or B2C) and sales via platforms such as Revolut, N26, Amazon, WeChat, or Netflix can offer completely new opportunities. Those platforms are very much client-focused, strong in designing great user experience, and they know how to work with data. They are also not asking for 70 percent distribution premium.

3. HOW CAN TECHNOLOGY HELP TO ADDRESS THE CHALLENGES OF THE NEW REALITY?

A key point to remember is that these new platforms are often not banks. They do not have expertise in anti-money laundering (AML), they are poor in fulfilling regulatory obligations, and they have little experience in selling or reporting financial products. This is where the asset managers can help. Asset managers distributing through tech platforms will need to cover certain functions that are currently covered by the distribution partner in the traditional setup with banks. This will not only involve classic business functions; many tech platforms will also demand technical solutions from the product provider (e.g., sophisticated portfolio reporting).

In return, digital platforms can provide what they know best: they know their customers inside-out. KYC, a discipline often perceived by banks as an operational- and compliance-driven function, is the core function for digital platforms. And it is the first important step in unlocking a great client experience. Asset managers need to win back client relationships. As mentioned before, asset managers currently do not know their customers well enough. If managers do not even know their customers' names, how can they know their pains, wishes, or personal goals? And this is exactly what they can get from digital platforms in return for their investment expertise.

> *New distribution models are a great opportunity for asset managers, as it allows them to get immediate and full access to the investor.*

The bottom line is that the combination of excellence in investment expertise combined with great regulatory know-how from asset managers and fast, client-focused delivery capabilities with great client experience from digital platforms can be very powerful.

Asset managers want to get closer to their clients, despite increased regulatory duty and costs. However, numerous counterparties and intermediaries stand between them – an artefact of rules and regulations long past their "sell by" date. However, with the introduction of new distribution channels, the acquisition of additional customer information becomes easier.

But technology can do much more. It can help asset managers build great digital touchpoints, which can create a substantially differentiated customer value and experience, such as client portals, which allow direct interactions, options to conveniently buy products directly, sophisticated reporting, powerful investment insights, and interaction capabilities.

For business-to-consumer (B2C), the technology enables solutions that can connect the asset manager directly with the end-investor. For example, asset managers can develop direct investment applications that allow investors to save and invest money seamlessly.

With an app alone, the work is, of course, not done. Marketing in the retail segment is known to be enormously complex and expensive. But good marketing is a necessity if you move closer to your client. If their trusted banking party is no longer their counterpart for investing, they need to know their asset manager, their skills and capabilities, and they need to trust them. Social media can play a major role in building that trust as a channel to spread the word. But, ultimately, the message itself is what matters. If an asset manager manages to build trust in their work and company through good brand marketing and good product marketing, they will also be able to attract direct clients.

However, as the ease with which asset managers can be compared increases with the elimination of the distribution partner, it will become even more important for asset managers to achieve even better performance results in the future. This is why big data and artificial intelligence (AI) might become more relevant in the investment process. Portfolio managers will be provided with much more powerful tools to make even better investment decisions.

In summary, technology can help asset managers build and strengthen their client relationships, to create better investment products, and lower production costs and risks. But is it that simple?

4. WHAT ELSE MATTERS BEYOND TECH?

The new distribution models are a great opportunity for asset managers, as it allows them to get immediate and full access to the investor. They will even get access to new client segments. Imagine the huge potential of all non-banked segments they can target through apps or platforms. User groups who do not currently have bank accounts, but who use social media and other online platforms intensively have huge potential. Distributing their products directly or through platforms will substantially lower distribution costs, allowing a more aggressive pricing of the investment product.

But the new models will require asset managers to cover topics they have never covered before, which will have a major impact on the organization.

They will need new skills, such as marketing, sales, and distribution, which collaborate with tech platforms, rather than banks or call center agents, for direct client requests.

The culture and values of the organization also need changing. The new asset manager needs to become more agile (e.g., reporting in real-time, faster product lifecycles, faster technology cycles), leaner (end-to-end integration, cost focus), smarter (better able to analyze client data and understand client needs), and more client-centric (instead of product-centric).

The quality of the investment product is important and will stay important (e.g., transparency will help investors to better compare performance), but this is not where asset managers win the race. This is where the race is lost. If their performance is poor, they will lose clients.

The difference can be made with client experience. That is where you win new clients. To offer the best client experience, they will need to fully understand the investor. They must understand the client's needs, pains, feelings, and wishes. Only then, will they will be able to offer

- Great products
- With a great user experience
- And a great service

We still do not know whether or when the big disruption in the financial industry will finally happen. But even if nothing changes at all – an asset manager who puts client experience first, can make the difference.

CONCLUSION: CLIENT EXPERIENCE IS KEY

Why was Uber successful? Not because they painted their taxis black instead of yellow. But because ordering an Uber is extremely convenient. You are still in the bar, you open your app, you order your Uber and you even get a quote before the ride starts plus a well-estimated arrival time. The client experience is simply better with Uber than it is with a normal taxi.

Why was Apple iTunes so successful? Not because they were cheaper. Definitely not because of the more beautiful CD covers. Because it was more convenient. You can sit at home and buy the one single you want. You do not have to buy a full CD. The client experience is simply better with iTunes than at a CD shop.

Even if the industry does not change dramatically, an asset manager can make a difference with better client experience. But for that they need to have a client relationship, they need to understand their client, their pains and fears, their needs and desires. If they understand their clients, their investors down to the last detail, they will be able to offer outstanding investment products their clients will love and service that will keep them coming back. Not only because of great performance, because they have outperformed the benchmark for 15 years, for example. They will love it because they get what they want.

Client experience is key! Not technology.

TRANSFORMING INSURANCE SETTLEMENTS: REAL-TIME PROCESSES THROUGH BLOCKCHAIN, INTERNET OF THINGS, AND EXPLAINABLE AI

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ABSTRACT

The insurance industry continually struggles to identify the validity and justification of insurance claims, which put service providers and clients in a complicated trust relationship. The complexity is not only concerned with people who are involved in fraudulent claims, but due to the nature of certain businesses, genuine claims are often handled with a mindset of potential fraud. The current insurance business model is largely a traditional, paper-based, error-prone claiming mechanism. Current practices comprise complex and costly processes, often resolved by the involvement of the legal administrators. The overall process also has a multi-point authentication issue, as it needs to maintain an immutable ledger, which is distributed and validated among different parties. Recently, technology has made evolutionary advancements in the area of distributed ledgers. In this paper, we present a novel architecture that will allow a massive amount of heterogeneous data to be used for insurance claims evidence. Our framework leverages the state-of-the-art networking technology and both blockchain and off-chain decentralized repositories. The framework also employs explainable artificial intelligence (XAI) for bringing trust within the reasoning and deep learning algorithms and helping in different ecosystems of the insurance industries. Our solution uses advanced technologies in the insurance industry that could potentially enhance transparency, trust, and automation in handling insurance claims.

1. INTRODUCTION

In the U.K. alone, 469,000 fraudulent claims and applications were detected in 2018, a rise of 3 percent in 2017, with their value up by 6 percent. Every day, 1,300 insurance scams are uncovered, each with an average value of £12,000 [ABI (2018)]. New methods are needed to ensure claims are more transparent, foolproof, and financially more viable for both clients and insurance service providers. Due to the explosion of smartphone-based online services, almost all the services associated with insurance lifecycle are offered through online systems. Such a solution will require a number of state-of-the-art technologies and tools to work together for its proven success.

Artificial intelligence (AI) solutions create a paradigm where computer systems can sense what is occurring within an environment, and think, learn, and act in response to what they are sensing. Internet of Things (IoT) has environmental sensors that are designed to measure a variety of conditions, storing all the data in a decentralized database. Current technology advancements, including high-speed Internet availability and 5G networks for IoT data [Cero et al. (2017)], decentralized data storage computing through cloudlets, smartphone technology, blockchain-based decentralized security [Khan et al. (2017)], mobile edge and fog computing [Yang et al. (2018)], ubiquitous M2M (machine-to-machine) connectivity

[Li et al. (2018a)], IoT for device to device (D2D) monitoring systems [Rahimi et al. (2018)], location-aware systems, crowdsourcing and crowdsensing, and web services, to name a few, contribute to the potential for creating systems that transform insurance claim management [Rahimi et al. (2018)].

Current smart health and home monitoring systems already produce big data designed to alert users after an event has occurred. This creates the possibility of continuously collecting and analyzing that massive amount of data, utilizing it to predict, alert, and prevent risky behavior autonomously, and proactively warn of an event that is about to happen. AI software platforms can analyze a multitude of environmental sensor measurements to create information and messages that are sent instantaneously to the mobile devices of property owners and managers [Ehsan et al. (2019)]. AI systems have the potential of empowering and enabling faster and better decision-making and mitigating property damage and personal injury risk; an early warning AI system can identify and predict the onset of fires, water damage, equipment failures, food/medicine spoilage, and other catastrophic events [Weitz et al. (2019)].

We believe that insurers should modernize and personalize policies, with swifter rollouts and more meaningful tracking of trends and results. One-quarter of those operating in the sharing economy, who believe there is a risk of doing so, said they want coverage they can activate or deactivate as needed. A further 22 percent indicated they were interested in being automatically insured when buying/renting services or possessions to manage this risk [Riikkinen et al. (2018)]. In this paper, we outline a novel framework, employing state-of-the-art technologies that have the potential to radically transform the insurance claims business. We examine the technologies, their applications, changes to insurance industry processes, and the overall benefits of the proposed solutions.

2. TECHNOLOGIES UNDERPINNING A NEW INSURANCE CLAIM FRAMEWORK

The next generation of smart cities will face the challenge of convergence of technological advancements, where a massive amount of data will be generated on a daily basis, all of which needs to be digested, processed, and responded to, both for real-time user queries and historical Spatio-temporal related queries. Blockchain, IoT, Mobile Edge Computing (MEC), and AI are key technologies that can work together to solve smart city solutions. In this section, we outline some of the key technologies and the role that they play in a potential solution.

2.1 Key technology components in an insurance platform solution

Although MEC [Chen et al. (2019)] is a popular topic, its application in insurance claims processing has received less attention. Recent advancements in IoT devices has led to an increase in connected devices, with greater processing capability [Fernandez-Carames, and Fraga-Lamas (2018)]. The existing IoT device to cloud communication architecture needs to be redesigned to leverage the full potential of MEC. MEC can work as an intermediary between entities related to the physical world and IoT nodes and the cloud in the cyber world [Wang et al. (2018)]. Furthermore, MEC shows the potential to address the availability and improved connectivity, resilience, scalability, low latency, and real-time delivery of a massive amount of data, which the traditional cloud-only solution fails to guarantee [Chen et al. (2018)]. For real-time insurance applications, such spatio-temporal multimedia data generated by each business process consists of a very large volume of data to be shared with the cloud [Zhang et al. (2018)]. The introduction of a MEC layer [Liu et al. (2017a)] at the vicinity of the IoT sensors or users related to insurance claims processing would make it possible to save bandwidth and processing resources, and incorporate security solutions before the processed data is sent to the cloud. However, due to stringent requirements for privacy, security, and anonymity in data sharing within insurance processing ecosystem, MEC will typically require technologies such as Tor and Blockchain [Zhou et al. (2018a)].

The use of blockchain within the insurance industry can bring transparency, as most of the claims are managed by multiple parties. These disruptive technologies, together with MEC, can allow for anonymous and secure sharing of data with any intended stakeholder without the need for a central authority. This will allow IoT and user data to be secured and anonymized. Moreover, the incorporation of blockchain and Tor will enable security implementation to become more robust. A user can carry out any insurance-related business activity or conduct any financial transaction without the need for central authority or middleman. On the other hand, the chain of blocks containing the timestamped history of spatio-temporal activities and transactions related to insurance business process or a user's history containing multimedia data can be linked by cryptographic hashes within the blockchain [Liu (2017b); Yin et al. (2018); Li et al. (2018b)]. This will allow for securing the data from cyberattacks or unauthorized access from anyone in the middle, thereby saving the relevant institutions from penalties or criminal punishments. This makes insurance claims more secure, and dictions can, therefore, be taken with more confidence.

For many insurers, the cloud-computing debate is over [Benhamouda et al. (2018)]. With seven in ten carriers using the cloud in their businesses, it is already an integral part of their technology environment and business platform strategies. Cloud providers are actively evolving their capabilities to offer advanced solutions in partnership with system integrators to create industry-specific solutions [Esposito et al. (2018)]. For example, the number of U.S. insurers with claims systems fully deployed in the cloud has seen a steady rise from 13 percent in Ovum's 2016 survey to 26 percent in 2018 [Juniper (2017)].

Blockchain has gained traction due to its fully decentralized peer-to-peer redundancy solution, providing a secure identity for each stakeholder and support of smart contracts, which can be activated on spatio-temporal logic [Turkanovic et al. (2018)]. This ensures secrecy of block data through secure wallets and strong encryption, guaranteeing the service level agreement through the transparency of the historical blocks, all at a low cost in managing distributed databases. Furthermore, blockchain offers immutable and non-hackable transaction storage for different smart city applications [Gao et al. (2018)], which is particularly useful when the users are mobile, i.e., moving among inter-MEC nodes, which requires decentralized yet secure and seamless integration and interaction for cyber profiles [Valtanen and Backman (2018)].

Although Blockchain supports strong security, it does not deliver perfect anonymity because each transaction added to the block reveals the address of the miner, and the transaction parties, which is visible to the public [Zhou et al. (2018b)] . In order to add anonymity to blockchain transactions, researchers have proposed a multitude of solutions, such as via Tor, usage of a one-time pad address for each transaction, secure wallets, TumbleBit, and Zcash, to name a few [Zhao (2018)]. The raw IoT data and the multimedia payload emanating from applications can thus be anonymized and at the same time added to the blockchain at the MEC node before it can be sent to the cloud. The MEC node is assumed to host the cloudlet architecture acting as a high-end computing platform that can run blockchain nodes or Tor virtual machines [Moubarak et al. (2017)]. In addition to security and privacy, the MEC node can also be used in tandem with other scalability solutions incorporating 5G and IoT communication [Marjanovic et al. (2018)].

We envision further leveraging the fog computing paradigm by assuming that "edge devices" will perform a large portion of the cloud activities related to insurance claims, such as storage, communication, and processing, and in return will receive a substantial number of incentives for sustainable growth [Ni et al. (2018)]. Moreover, depending on the scenario and available bandwidth, edge devices will carry out as much local processing as possible and offload to the cloud backend only when a favorable network condition is observed. Hence, together with blockchain-based security, each user within an insurance ecosystem takes control of their usage data, granting permission to whomever they want and when they want [Yeow et al. (2017)].

With the massive volume of data collected, the amount of data processing and event detection in different scenarios is a daunting task. However, advanced AI, with the support of multi-tier machine learning, deep learning, and other types of data science advancements, have made it possible to analyze such massive volumes of data and find phenomena of interest [Porambage et al. (2018)]. AI has been successful in automatic reasoning by following some predefined workflows, the big data set to work on, and the types of output to deal with [Ehsan et al. (2019)]. These technologies together show promising prospects for various smart city challenges, including in the insurance industry. Existing insurance policies are often processed on paper contracts, which leaves claims and payments error-prone, and numerous steps requiring human supervision. This inherent complexity of insurance involves consumers, brokers, insurers, and reinsurers [Raikwar et al. (2018)]. New technologies can enable each part of the insurance lifecycle to leverage and provide improved quality of services [Lamberti et al. (2018)].

About one-third of CIOs at insurers surveyed by Ovum said their biggest challenge with IoT is the cost and complexity of implementation. About 25 percent cited a lack of consumer demand for products incorporating IoT, while just over 20 percent said associated compliance issues, particularly around privacy, were too complex. Notwithstanding, several insurance companies have moved towards technology-driven models, e.g., in Asia, AIA Hong Kong has launched a blockchain-enabled "bancassurance" platform, allowing the life insurer and its bank distributors to share policy data and digital documents in real-time, streamlining the onboarding process, improving transparency, and reconciling commissions automatically through smart contracts [Bhushan (2015); Code (2018)]. The Hong Kong Federation of Insurers is also working to establish a blockchain-based auto insurance platform [Ledger (2019)]. In Europe, AXA is offering flight-delay insurance over a blockchain platform with parametric triggers and smart contracts [PwC (2019)]. In the case of health insurance, a blockchain smart contract can store the cryptographic public ID of the patient, therapist,

hospital, caregiver, and other community of interest and their relationship, along with the permission and authorization level by different entities. During insurance claims processing when access to health data is needed, the smart contract is used to validate access control, permissions, relationships among the entities, and sharing the hash of the actual off-chain health data with joint ownership [Hawkins et al. (2018)]. Finally, the off-chain health data can be queried with the session key obtained from the smart contract execution [Rahman et al. (2018)].

2.2 Explainable AI considerations

AI has been successful in solving many problems by enabling a robust algorithm to take major decisions too time-consuming and complex for humans. AI has been under development in the insurance industry for many years, but it could not completely succeed in solving a fundamental problem. Current AI models work in a Blackbox mode, where it is not always known how the outcome of an action is derived. It is not possible to trace back to the raw data in different sub-processes, since many assumptions are made within the algorithm, which cannot be explained to humans. The reproducibility of individual steps or semantic explanation of the evidence that will convince stakeholders is very important for the insurance industry – and this is where Blackbox AI fails. Any complex insurance claim decisions need to fully visible and justified. Transactions in each stage of an AI-operated system must be recorded to ensure transparency and traceability for clients and industry experts. To resolve this, we propose to use

explainable AI, which records all transitions and logs outcome-driven decisions. We believe our proposed framework is the first XAI solution to be considered for automated insurance claims processing. In this paper, we proposed to combine XAI with IoT, and blockchain, to ensure that insurance-related data processing is more transparent, less human-error prone, and faster.

We envision an XAI algorithm that will be tailored to understand the evidence needed for different types of insurance industries, the workflows, and the decisions that will be made via the human-AI algorithm teams. This reference point helps subsequently, when a claim is being challenged by a client. The XAI also assists insurance industry stakeholders to gain confidence in the decisions made. Several insurtechs are already engaging in real-time, as-needed coverage. Trov, a global on-demand insurance agency, uses an application that enables consumers to insure single items such as cameras and digital devices with coverage that can be activated and terminated at any time over a mobile app [Insurance Journal (2018)]. Another advanced feature that we envision is the use of XAI data for improving system performance. In the future, we expect to capture the most relevant data on a live system, but at present, we leverage all transaction data to create a benchmark dataset for future systems to make decisions more quickly and precisely. We believe that this will transform the insurance industry's operational methods, where technology will be able to take over all major legal liabilities with minimal legal involvement.

Figure 1: Managing insurance-related data through the proposed infrastructure

(a) A high-level architecture where different lifecycles of car insurance are being captured in a smart city
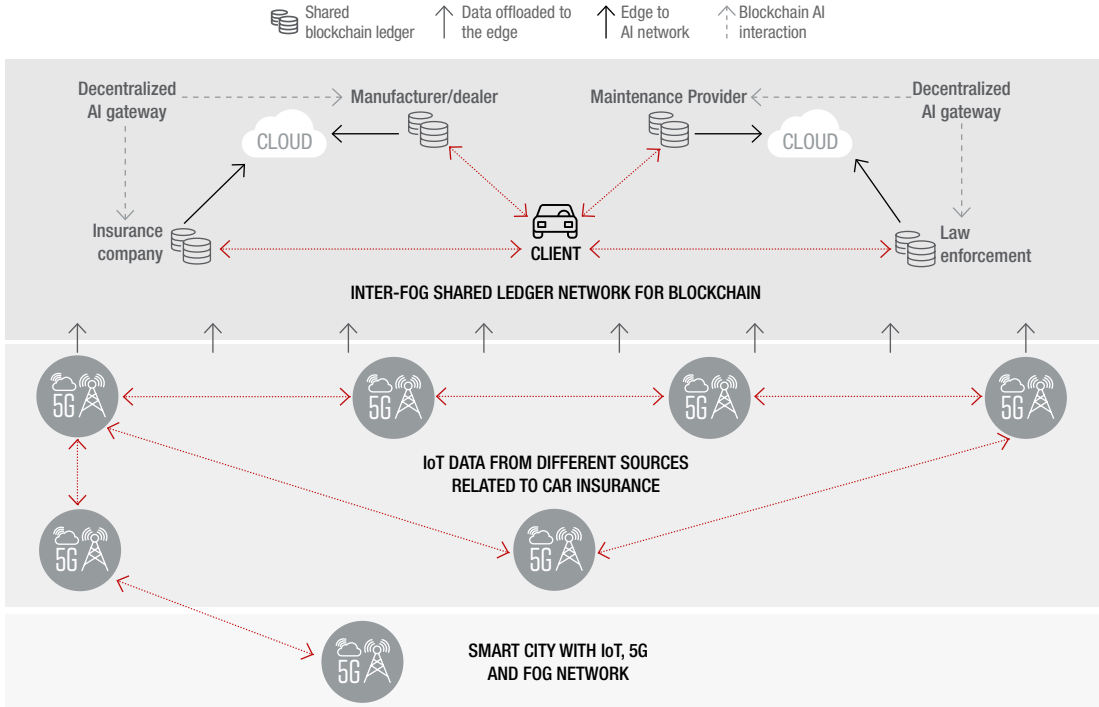
(b) Different steps during a typical claims process, which can be supported by the proposed framework

3. A NEW, DATA-DRIVEN FRAMEWORK FOR INSURANCE CLAIMS

In this section, we present a design to illustrate how the insurance-related data will be managed through our proposed infrastructure. Figure 1 is a very high-level illustration, where infrastructure is shown at the component level. As shown in Figure 1a, IoT data related to the insurance industry in a smart city is collected via the 5G, Mobile Edge/Fog network, which is then stored within the blockchain and off-chain storage for evidence purposes. The immutable and distributed blockchain ledg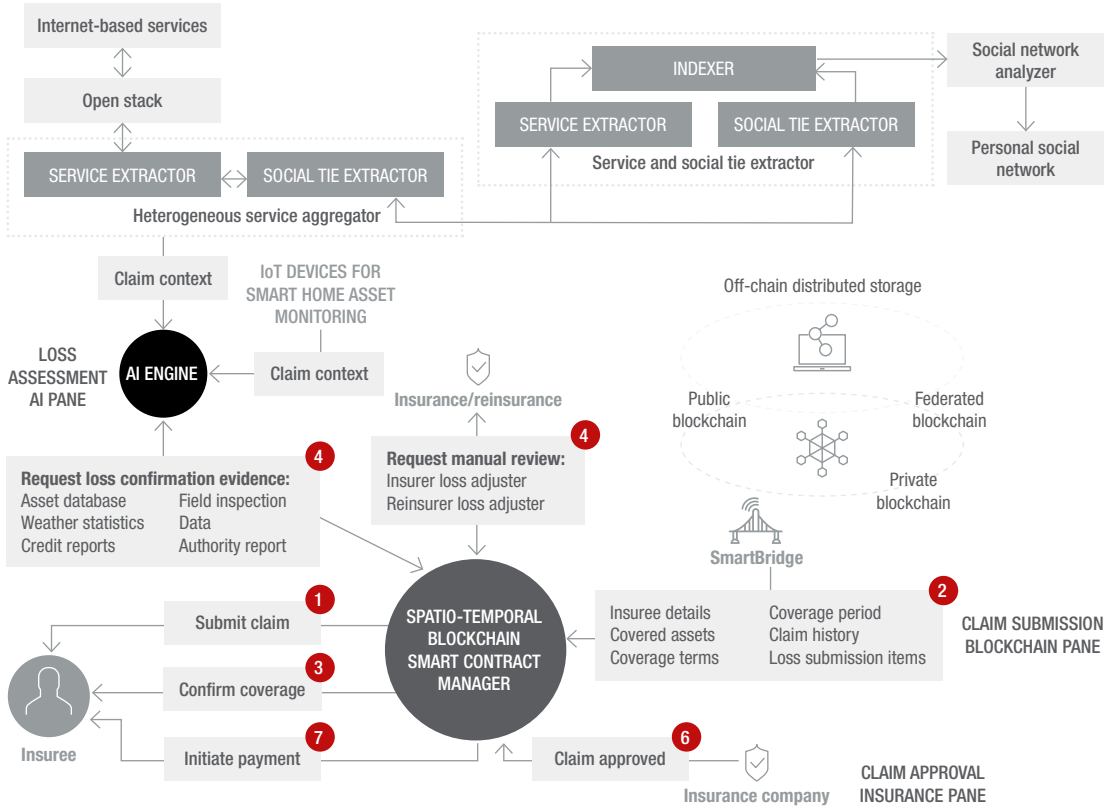er can then be used in different use-cases and by different stakeholders of the insurance ecosystem. Figure 1b shows a generic insurance claims process in which blockchain and off-chain storage is used by the XAI so that the claims-processing human agents can understand the steps and intervene during the claim's preparation lifecycle.

3.1 Core system components

Let us take the example of auto insurance. There are two ways in which blockchain can prove to be beneficial for the auto insurance industry. First, it can connect all users and service providers with the help of shared ledger in which all the information will be readily available. It will help auto insurers reduce risk and fraud. Second, with the help of smart contracts, claims processing will be faster.

Figure 2 shows the cloud, edge, client nodes, and their communication pattern. As shown in Figure 2, IoT devices forward their insurance-related data traffic to the MEC nodes first, which does the security handling, small scale analysis, and then shares the final results with the cloud. The task of decentralization and anonymity of the captured insurance-related data also takes place in the MEC nodes. Hence, with the help of advancement in 5G technologies, the MEC nodes can provide many IoT-Edge centric services to the underlying applications, thereby reducing the load on the cloud. Since the MEC node supports both security and anonymity of the IoT data, once deployed near public places, it can securely support underlying insurance applications with mobility of the users. A cloudlet server can be hosted at the house of a subject, at relevant organizations, or the premises of the 5G base station. The cloudlet server acts at the IoT edge network to support IoT data processing, security, storage, and analytics at the edge. This will allow the high data rate IoT sensors that are used to capture insurance-related evidence to be processed with low

Figure 2: Three tier protocol architecture
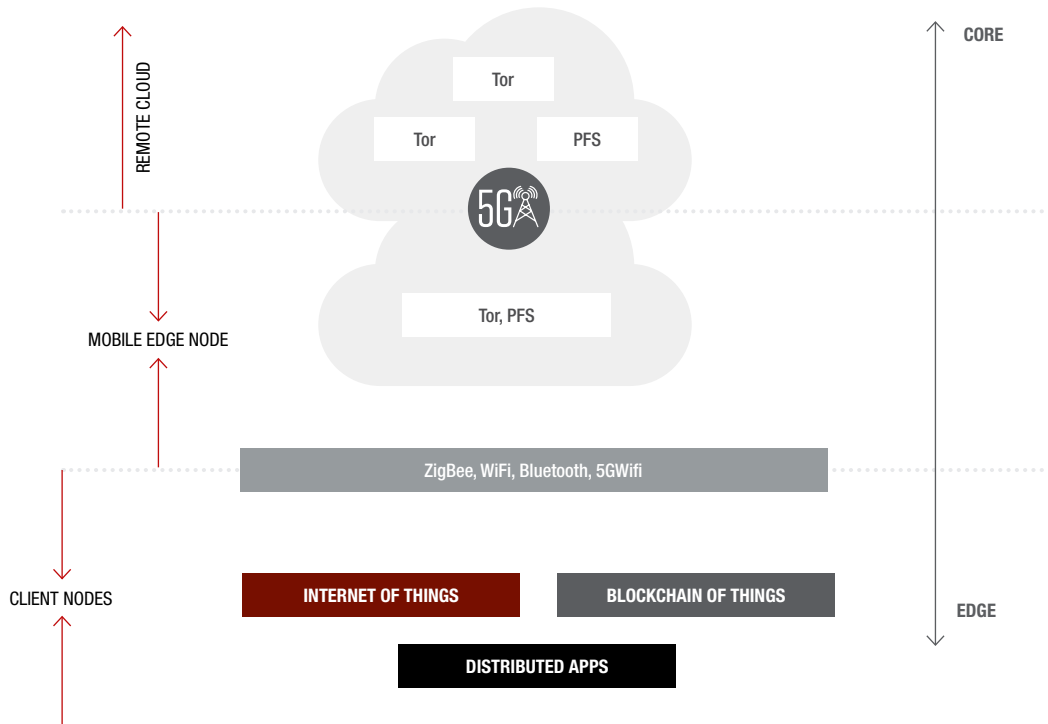
Figure 3: Context-aware AI-based insurance assistance framework
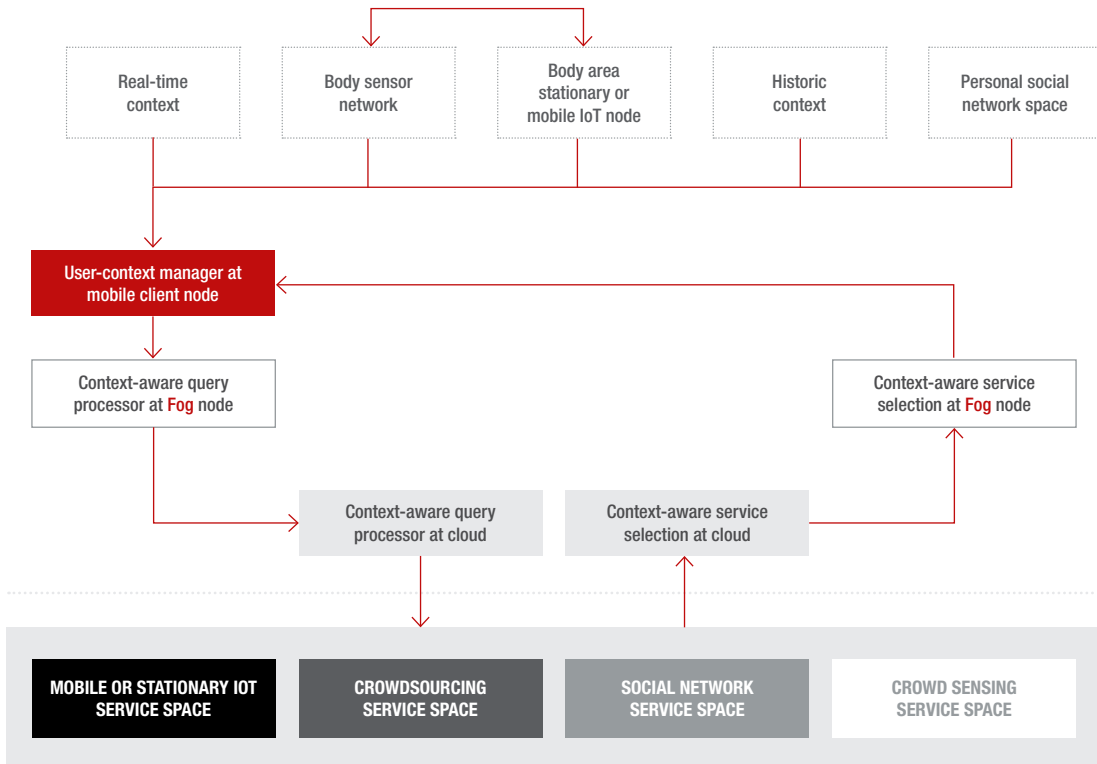
latency and high security in a decentralized manner. In the absence of a mobile edge tower, a smaller server can be used as an edge router such as a laptop, or a smartphone that can intake the sensory data and share it with the cloudlet or the mobile edge network for further processing.

We can also use mobile edge/fog nodes to act as virtual clouds within the fog tier to handle the offloading and reduce the latency. The fog tier tries to answer most of the insurance-related queries from the fog tier, provide high bandwidth, support low latency, help in smart-phone low battery consumption, and local and low computation need that can be used to provide navigation to users in the same physical proximity. The boundary and coverage of each client node and fog node determine the sub-boundaries of the fog tier and those of the D2D communication possibility. If two or more insurance-related stakeholder nodes are within the same fog tier boundary, they can start a D2D (device-to-device) communication. However, each fog node acts as an opportunistic node, such that whenever good network bandwidth is available, the fog nodes upload the fog tier transactions to the core IP-based cloud backend.

3.2 Context-aware insurance data collection

The proposed framework aims to provide context-aware insurance services through the following: collection of insurance evidence from IoT, crowdsourced, and social media data; storage of the incoming multimedia data initially at the distributed fog nodes and finally to the big data repository; and inter-correlation of context-aware clusters of crowd data rendered back via spatio-temporal services to each individual, based on context. As shown in Figure 3, different insurance applications allow a query or task to be sent by a requester to a very large crowd or a set of IoT nodes through the proposed platform, which leverages both fog and cloud computing architecture. The requester then receives complex insurance-related results in a personalized fashion. Figure 3 shows details about different components within the framework.

We assume that to support the insurance ecosystem, numerous stationary IoT devices will have been deployed around a city, within vehicles, within houses, and so on, for collecting different types of insurance phenomena data. Furthermore, we assume that each person within a massive crowd has a smartphone and is optionally surrounded by both

Figure 4: IoT protocol stack to support the blockchain-based AI insurance assistance framework

DECENTRALIZED MESSAGING AND COMMUNICATION	DECENTRALIZED MESSAGING AND COMMUNICATION
SMART CONTRACTS ACCESS MANAGEMENT	IoT EDGES AND CLOUDS INTEGRATION AND ACCESS CONTROL
PAYMENTS SUPPORT OF POPULAR CRYPTO CURRENCIES	IoT TO BLOCKCHAIN PAYMENT GATEWAY
IoT THIN CLIENT WITH SMALL FOOTPRINT	MULTICHAIN TO BRIDGE AMONG EXISTING BLOCKCHAIN
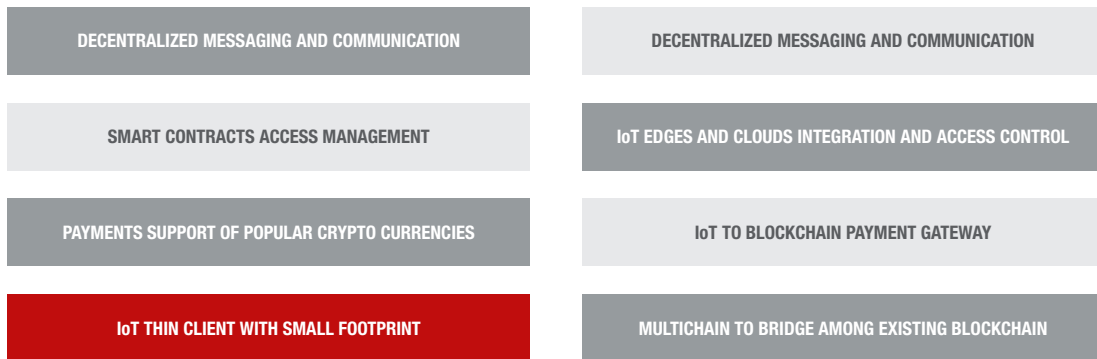
a "body sensor network" (BSN) and a subset of IoT devices, whether stationary or mobile, forming a "body IoT network". The smartphone in our framework has 4G LTE-A/5G internet connectivity through which an individual can be connected to personal social networks. The built-in smartphone sensors, the sensors within the BSN, and the IoT sensors together allow collecting real-time user and ambient context data.

4. STAGES IN THE DEVELOPMENT OF THE NEW SYSTEM

Insurance data handling is a complex process, and hence, modular development is needed so that the insurance data can be recorded at every step of data migration. In this section, we delineate the proposed development steps for the full deployment of the system.

4.1 Source insurance data extraction

Figure 4 shows the protocol stack of collecting, analyzing, and visualizing IoT data. Since the IoT devices are thin, we assume there is limited capacity for connecting with edge devices running full blockchain nodes. The framework allows an IoT node to communicate with nearby edge nodes running smart contracts, to use decentralized messaging services, to save raw IoT sensory data into a decentralized repository via the edge networks, to add IoT data of interest to the blockchain, and to connect to cryptocurrency exchanges and gateways. The IoT data is fed to the AI engine for logic extraction and finding patterns of interest as evidence.

The modules are responsible for collecting the raw contents from heterogeneous internet-based sources and IoT devices. The framework embeds a suite of protocols and algorithms that can communicate with complex and proprietary sources

of existing heterogeneous internet-based services and retrieve online multimedia content. To manage load balancing and scalability, the framework uses proxy servers, where each proxy server actually listens to each type of content retrieval service request and, depending on the number of concurrent service requests, a greater number of proxy servers may be employed within the system. A proxy server stores the list of content retrieval services available within the framework. A properly designed service client algorithm is envisioned to: store the path to an internet resource, bandwidth, round trip time, delay, URL patterns, HTTP access methods, response types, and authentication patterns, inter alia. The indexer stores each extracted service in an index server, referred to as a "personal social network". This serves as the AI dataset for a particular subject.

4.2 Insurance data semantics extraction

This module is responsible for pre-processing and analyzing content, extracting logic, indexing the emotion primitives, presenting the claims results to the user, and adapting the emotion value from the user feedback to train the system. In its upstream data collection path, the Controller receives raw content from the Web Data Extractor. The Controller also issues requests to extract new content in the downstream path. Upon receiving raw media content, the Controller delegates the content to the model component, i.e., insurance phenomena extraction logic. This component mashes up all the logic extraction services available within the framework and delegates the content to the most optimal service, depending on media and user requirements. It also leverages the metadata of each API (application programming interface) in the form of types of media support, response type per unit content, size of each payload per request, types of request

and response (i.e., JSON, XML, REST), number of requests per API call, type of domain knowledge supported, types of functionalities supported, types of logic values supported (positive, negative or neutral), ranges of logic value, and semantic attributes, such as affection friendliness, sadness, amusement, contentment, and anger, to name a few. The unit could be horizontally enriched with various services. There are three different working phases.

4.2.1 TRAINING PHASE

The system makes use of a supervised learning method to classify the semantics of the retrieved content, assuming conditionally independent classification features. Classifications would include positive, negative, or neutral sentiments. We use this theorem to evaluate the posterior probability of sentiment membership for classifying new input samples according to its associated features (i.e., content/ text keywords). We do the same for all possible classifications. Thus, we are able to classify a new event as the classification with the highest posterior probability.

4.2.2 EXECUTION PHASE

When the system receives new content to be classified, it tries to analyze the data before classification. Using the AI engine, we get the probability of a certain classification given the input data. Our proposed algorithm employs a fast and reliable technique to classify raw data with great certainty and against the training dataset even with noise in the data.

4.2.3 FEEDBACK PHASE

The use of the AI algorithms provides highly accurate results to classify the emotion tag for the input feed. However, for different reasons, we might receive an incorrect or undefined decision. Thus, we add the capability for the user to train the system at run-time to refine the algorithm's knowledge base and improve its overall efficiency.

4.3 Insurance primitives

Insurance Primitives, which work as an atomic type of insurance process repository, store the output of "claims extraction logic". Each API stores its result to a separate repository. Some APIs use the stored emotion primitives as a training dataset and use their stored emotion data as an input to the claims' extraction logic. This dataset gets enriched throughout the lifecycle of the emotion extraction service. The richer this database is, the more accurate the logic behaves.

5. PROOF OF CONCEPT APPLICATION SCENARIOS

In the proposed framework, we use blockchain in different scenarios, which can then be linked to the insurance policies. The collected data through our proposed framework can help insurance transparency greatly. In this section, we will present our visionary architecture for supporting different use-cases.

5.1 Property rental scenarios

Figure 5(a) shows a scenario in which a user rents a hotel using cyber-physical interaction between blockchain and IoT devices. Figure 5(b) shows the interaction between the smart lock and the rest of the blockchain clients to successfully and securely handle the complete device-to-device contractual agreements. The IoT smart lock cannot store the complete blockchain record and cannot run the complete Ethereum virtual machine (EVM) due to its storage and processing limitations. Hence, it has to rely on a set of miners for proof of payment and a smart contract logic execution operating within the edge or in the decentralized cloud. The smart lock will use the proof of payment from which it also has to pay to the miner nodes that calculated the hash as proof of payment from the complete blockchain. The proposed approach, as shown in Figure 5(a), will allow the property owner to rent rooms to the user in exchange for money. Although the property owner is not trusted, and may try to maximize the benefit by different approaches, including concurrently renting the property to different users, the system will block such security holes. Similarly, the renter will be able to book a room from the owner through the blockchain, even though not fully trusted or known to the owner, with potential for minimizing costs by avoiding payment to the owner.

The framework will ensure that the owner and the renter have the incentive to protect their privacy. The physical property is controlled by IoT devices and pre-determined protocols and is, therefore, trusted, i.e., the property is programmed to follow decisions made by the blockchain smart contract system. It is also assumed that the physical property will not disclose information to any third party and will use the blockchain platform to carry out transactions between owners and renters by recording agreements/payments and tracking agreement execution. Trusted properties will always follow instructions accepted by the blockchain system. The secure transactions will allow insurance claims processing transparent and trustworthy by different stakeholders.

Figure 5: Proof of concept design architecture for real life deployment

(a) A scenario where a user books a hotel with the help of blockchain and IoT devices
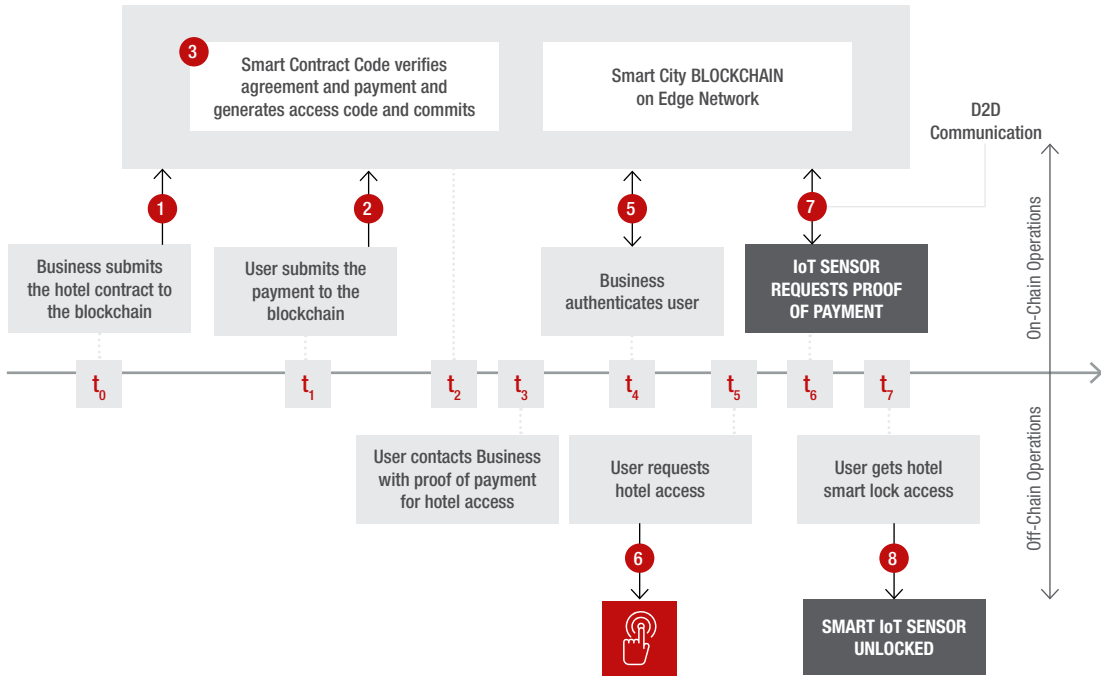
(b)The detailed machine-to-machine communication among different blockchain nodes to commit the transactions
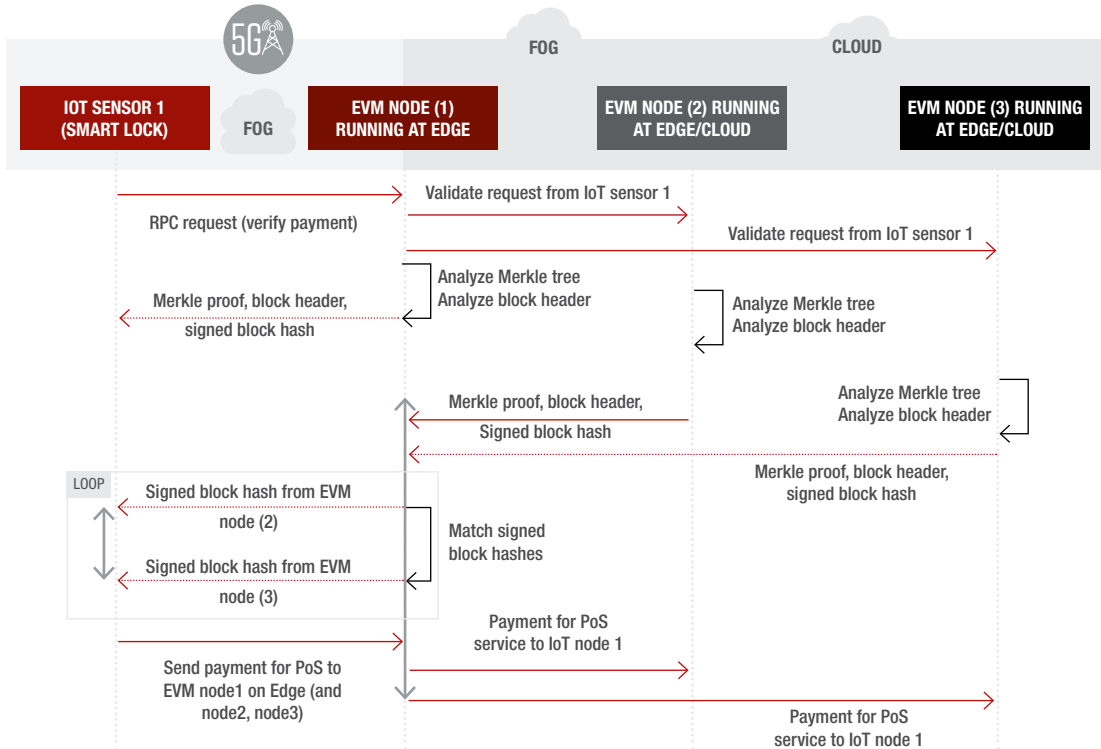
5.2 Smart home monitoring scenarios

Figure 6 shows a scenario where data is collected from smart home IoT sensors, which is then shared with both blockchain and a decentralized repository storing the sensory data payload for the XAI engine, which can then be used as insurance claim evidence for analysis. The multi-dimensional data types collected from the smart home include those sensing ambience, user activity, energy usage, aspects of security, and human physiological data. This data is fed to the XAI engine for event analysis, event indexing in the blockchain, saving the payload in the off-chain solution, or further inquiry of other blockchain bridges, if deemed necessary, and alert generation for various threshold values of sensory data. The smart contract can also interface with the external cryptocurrency gateway and exchange in the case of payment for any third-party services. Finally, the owner of the house can share smart home data with an insurance service provider. The service uses distributed apps to connect to the decentralized databases.

6. NEW ERA OF OPERATIONAL PROCESSES

The proposed solution will require numerous changes in the current operational model of the insurance business. This will not only help in bringing transparency into the insurance industry but also make its operational costs more manageable via changes in the current operational model. In this section, we examine the possible areas where operations will be transformed.

6.1 Underwriting

The department responsible for verifying the authenticity of a claim and deciding on claim coverage requires a trustworthy repository of data. Blockchain, IoT, and XAI offer a central repository of truth. Using the blockchain, underwriters can obtain data from external sources to automate some aspects of underwriting, since the data in the blockchain is trustworthy and is from verified sources (see Figure 1b above). On blockchain, external data from off-chain can be included as

Figure 6: A complete smart home scenario where different types of data are recorded in the blockchain and shared with community of interest
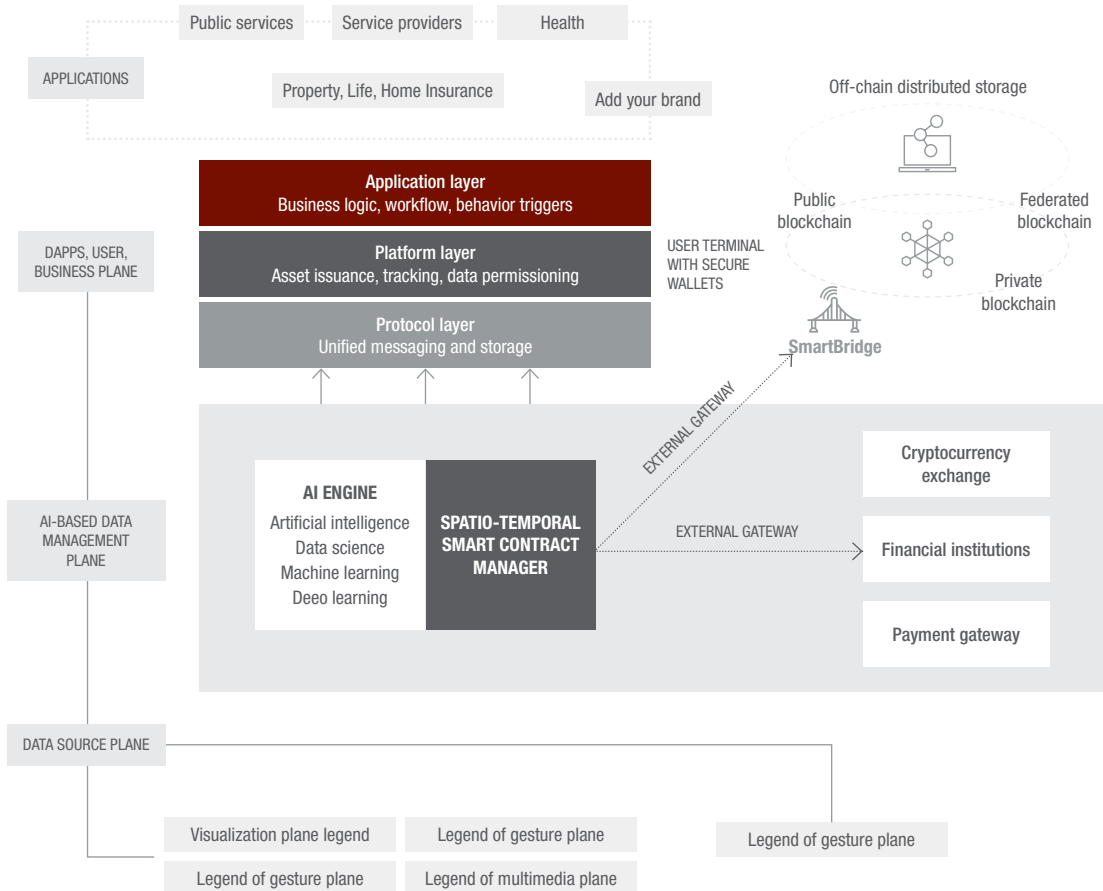
evidence using smart contracts to decrease risk liability and provide semi-automatic pricing (see Figure 5). This can help to automate and shorten the underwriting process, reducing the cost of operations (see Figure 6). Blockchain also brings transparency and improves trust in the underwriting process by enabling shared visibility in complex multinational programs, providing transparency across underwriting coverage and premiums at local and international levels.

6.2 Claims processing

Improving claims processing methods is often considered a priority for insurance companies. For the consumer, submitting a claim and getting it approved is yet another tedious process. Processing can take quite a while, especially considering the number of data points needed for verification and the amount of manual effort required. With blockchain and XAI, most of the necessary information that is required for claims verification can be processed in either real-time or near real-time. Since blockchain can take inputs from a variety of different sources without altering any information, insurers can use the data available in the blockchain to track the usage of an asset. Provenance is one major area where insurers can take advantage of blockchain. A shared ledger and insurance policies executed through smart contracts can bring an order of magnitude improvement in efficiency to property and casualty insurance.

Alongside big data, mobile and digital technologies, blockchain is essential for establishing an efficient, transparent, and customer-focused claims model based on higher degrees of trust. Within claims prevention, new data streams can enhance the risk selection process by combining location, external risk, and analytics. Thanks to the proof of location protocol of blockchain, a distributed ledger can enable the insurer and various third parties to easily and instantly access and update relevant information (e.g., claim forms, evidence, location of the event, police reports, and third-party review reports). The use of data from a mobile phone or IoT sensors can streamline claims submission, reduce loss adjuster costs, and increase customer satisfaction, with blockchain systems facilitating communications and coordination among all parties. IoT sensors can trigger alerts to insurers that a crash has occurred (thereby initiating a new claim), and then route secure and relevant data to preapproved and conveniently located medical teams, towing services, and/or repair garages. Blockchain is in the middle of connecting and ordering data from the multiple devices and apps involved in the multidimensional process. Similarly, the combination of sensor data, satellite imagery, mobile technologies, and blockchain could be used to facilitate claims payments and rescue services when natural disasters

occur in remote areas. Data from weather stations could determine claims amounts based on actual weather readings, with blockchain enabling greater automation, more efficient data sharing, and stronger safeguards against fraud.

7. EXAMPLE INSURANCE APPLICATION AREAS FOR THE PROPOSED SOLUTION

We propose the above technology solution in a variety of areas of insurance, in each case improving speed, efficiency, and transparency, and reducing operational costs; hence improving overall profitability. The proposed method will be customized based on industrial rules and policies. Notwithstanding, the technological aspects remain the same regardless of the business characteristics of the different insurance industries.

7.1 Health insurance

Blockchain and IoT can potentially interconnect medical care facilities, insurers, patients, physicians, and other parties, thereby improving the level of care provided to patients. Furthermore, processes can be streamlined, as all the data is held in a central, secure repository. Through a blockchain of IoT health data, medical records can be cryptographically secured and shared between health providers, increasing interoperability in the health insurance ecosystem. An individual can be surrounded by a set of gesture tracking sensors and ambient intelligent IoT sensors supporting in-home therapy sessions. IoT nodes and gesture tracking sensors are secured by the private/public encryption keys. A patient may allow access to their data to the community of interest, including caregivers, therapists, insurance company, medical doctors, hospital authority, and so on. Patient-related data can also be digitally signed and saved into the blockchain by trusted parties and an individual can authorize a subset of personal therapy data on an ad-hoc basis. The smart contract embeds the access policy of the patient. Any transaction that enters the edge network gets parsed by the geographically distributed, permission mining/consensus nodes to get approved and added to the blockchain. With investment from Munich Re, among others, insurtech company Bought by Many has created a way for customers to sidestep traditional routes to purchase niche products that legacy insurers often avoid, such as travel insurance for those with pre-existing medical conditions [Lamberti et al. (2018)]. Our system provides key data and methods to enable the provision of such services in a low-cost, transparent, and secure way.

The collected health data includes an enormous amount of multimedia data in the form of text, image, audio, and video. An offline centralized cloud or decentralized cloud storage can

be used to store the multimedia data while the transaction in the blockchain stores the hash of the pointer of the files distributed in the cloud storage. Using XAI to automatically process the massive amount of health data would bring trust and efficiency. While reading or querying the file, the patient must first authenticate with a private key to obtain the hash of the distributed file pointers before accessing the actual file providing the distributed hash to the cloud controller. Since the cloud storage pointer hash is saved in the blockchain and then goes through a Tor anonymity network, the security, immutability, integrity, and backup of the hash is guaranteed. To improve secure storage, distributed (to avoid the single point of access), a cryptographic P2P cloud storage architecture such as StorJ, BigchainDB, or IPFS can be adopted. Since the customer is at the center of ownership for their therapeutic data stored in different autonomous and private health institutions' computer systems, they may share data on-demand with any institution through the cryptographic signature in the blockchain [Sreehari et al. (2017)].

7.2 Automobile insurance

Blockchain and car IoT can connect consumers, service providers, and others, with the help of a shared ledger of readily available information. This will help auto insurers reduce the risk of fraud. Second, with the help of smart contracts, claims can be automated and processed more quickly. By creating a consortium of automobile stakeholders, government agencies, and so on, one can obtain all the information easily. Moreover, insurance companies can use smart contracts to issue automatic pay-outs to medical facilities and other beneficiaries. Consumers increasingly want more control over their specific coverage. A survey of life insurance consumers indicated that 90 percent of buyers revealed a preference for self-management of existing policies through digital channels [Juniper (2017)].

8. ADVANTAGES OF THE PROPOSED SYSTEM

The proposed solution has a number of key advantages. We believe that it can be used in many different areas and sectors of the insurance industry. However, this is based on a common regulatory requirement in some sectors. To take full advantage of this system, we need to customize it based on the sector of insurance and local regulatory considerations. The performance of the system can vary by sector, but in general, it should be more transparent and cost-efficient.

8.1 Identity theft and cost savings

Key problems faced in the insurance industry are false claims, fraud detection, and the time taken to validate each application. Blockchain shows promises as a solution since it can serve as a distributed register which has both internal and external customer data. Once the personal information is entered in the blockchain, the platform can automatically validate the documents, such as address proof, medical reports, and so on. This will not only speed up the entire process but at the same time, it will reduce human intervention, thus minimizing the probability of errors. Blockchain offers more efficient data processing and reduction in fraud, thereby saving an estimated 15-25 percent of expenses incurred during the insurance process, potentially saving billions of dollars [Insurance Journal (2018)]. In a blockchain, transactions are time-stamped and immutable, so identities are secure, and all data is far more trustworthy. This means that fraud is more easily detected, which could have profound implications in the insurance industry, where 65% of all fraudulent claims go unnoticed. According to the Institute of International Finance, some U.S.\$60 billion of fraudulent claims are submitted annually in the U.S. and Europe alone, any meaningful reduction would bring substantial benefits to insurers' bottom lines [Ralph (2017)].

8.2 XAI for automated customer support

AI-powered, customer-service chatbots can be better equipped to meet the expectations of providing context-aware customer support for a real-time touchpoint and customized assistance while fulfilling a company's need to cut costs. XAI powered chatbots will further become more powerful as voice recognition technology with an explanation of internal steps improves, adding trust, lowering the cost, and shortening the time of each insurance claim. XAI can also bring drone technology to a new level of utility for insurers, such as in hard-to-reach disaster areas to record loss and damages. XAI can provide drones with increased computational abilities that might allow them to spot a damage in an image that is not apparent to the naked eye or to make on-the-spot decisions about how to use the data they are capturing, potentially speeding up the claims process. XAI can also analyze crowdsourced spatio-temporal multimedia data to find event details that will allow pinpointing and forensic analysis of the actual cause of an event.

8.3 IoT for forensics and evidence

As more devices and objects are connected to the IoT, the amount of data that will be created and collected will increase significantly. This data will be hugely valuable to insurers as they look to develop more accurate actuarial models, or new products such as usage-based insurance (UBI) models. In the auto insurance market, for example, encrypted data gathered about driving times and distances, acceleration and braking patterns, and other behaviors can be used to identify high-risk drivers, validate information included on applications, and give consumers more control over their premiums. The challenge in this future state, however, is not only how to manage the sheer volume of data and logic related to insurance industry, as thousands or millions of devices are communicating with each other, but to also protect from ransomware or other distributed denial of service (DDoS) attacks [Pan et al. (2018)].

Via blockchain, one can manage large, complex networks by having the devices communicate with each other on a peer-to-peer basis securely, instead of building an expensive data center to handle the processing and storage load. Having these devices manage themselves is significantly cheaper than the data center model. For example, sensor-equipped devices such as fitness wearables can measure a person's activity, diet, and vital signs. This can help health insurance companies assess and predict health, which potentially means fewer customer ailments and fewer claims. Telematics-based car insurance, in which insurance rates are influenced by a customer's actual driving frequency and habits (e.g., reckless versus safe), relies on IoT sensors to supply the data for analytics to help determine "good driver" rates. Smart home monitoring systems enable homeowners to optimize security and lower the risk of break-ins through IoT-powered devices such as connected doorbells, which activate motion detectors, deploy night vision, and allow users to speak to persons at the door from anywhere in the world.

8.4 A Decentralized insurance big data repository

A fundamental problem across business sectors is the security of the business and customer data. Traditional systems in use, whether in the banking industry, insurance, or healthcare, have significant weaknesses, providing possibilities for exposure of data to third parties, as demonstrated by widely reported breaches of consumers' social media data (e.g., Facebook) and insurance data. Blockchain emerges as a solution that can circumvent key weaknesses in traditional platforms. Unlike current systems, in blockchain, the data is not present at a central location, thus making it safe and secure. Furthermore, the information is encrypted, maintaining anonymity.

8.5 Smart insurance contract

Blockchain supports "smart contracts," which can automate self-executing agreements that were largely theoretical before blockchain existed. For instance, a life insurance smart contract could immediately release funds to a beneficiary upon the death of a policyholder through electronic checking of death certificates. By dramatically reducing the need for human involvement, claims processing is accelerated, errors and delays are reduced, and improved service is delivered to insurance customers in their greatest area of interest. This will bring transparency in every transaction on the distributed ledger. The aim is to transfer this logic to every possible transaction in the future.

8.6 Client on-boarding

Every customer is required to verifying their identity with the insurance company. Insurers and customers waste a lot of time verifying their documents and identity. This can be reduced with a blockchain platform that can talk to other blockchain platforms to verify the identity of the user. The records in the blockchain can be made available to those who have permission to view the information. All the user records are securely stored in the blockchain using cryptographic techniques.

9. CONCLUSION

In this paper, we have addressed key efficiency and transparency challenges in the global insurance industry. We discussed technologies that can be used for the improvement of current practices. Subsequently, we propose a technical framework that can potentially be used to solve key problems. Two of the most important elements of the claims process are access to the data in real-time and providing a secure and trusted platform for sharing insurance data. We propose an IoT-based 5G network for super-fast data sharing and the use of blockchain for data sharing and maintaining security. We have discussed key technologies that are important in minimizing the aforesaid risks. Through the integration of XAI, our proposed solution will not only reduce the operational costs of insurance claims but also bring transparency to this process. The proposed XAI-driven system will be able to operate independently and should be able to calculate adjustments via its own AI capacity. We believe that our method can help to significantly build trust among insurance customers and help to rebuild sustainability in the global insurance industry.

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ESG

HUMAN CAPITAL AND THE FUTURE OF WORK: IMPLICATIONS FOR INVESTORS AND ESG INTEGRATION

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ABSTRACT

Human capital development (HCD) is a key consideration for most companies, but only recently have investors focused on understanding the risks and opportunities related to human capital with the emergence of environmental, social, and governance (ESG) investment frameworks and impact investing. We argue that the importance of human capital is likely to be magnified in an environment of rapid technological change, where the future of work is uncertain and that existing frameworks for measuring and evaluating HCD might not be fit for purpose. Against this backdrop, we derive an HCD metric that focuses on outcomes rather than inputs; demonstrate that even in the current disclosure landscape one could measure with reasonable accuracy this metric for thousands of companies; and provide exploratory evidence on its relationship with employee productivity. Moreover, we develop an estimate of probability of automation of job tasks for each sub-industry and show the relationship between this probability to elements of our HCD metric and other human capital characteristics. Finally, we outline an investor engagement framework to improve the disclosure landscape related to HCD and to empower effective investment stewardship.

1. INTRODUCTION

Human capital development (HCD) is a key consideration for most companies around the world. While human capital has been a key consideration for businesses, it is only recently that investors have paid attention to it. With the emergence of environmental, social, and governance (ESG) investment frameworks and impact investing activities human capital has been propelled to an important pillar of investment analysis, both from a financial and a social impact perspective. This is because human capital is now recognized as one of the most important drivers of competitiveness, value creation, and sustainable competitive advantage. Moreover, HCD,

through strong workplace practices, is linked to positive societal impacts as manifested by better health outcomes and well-being.

The importance of human capital is magnified in an environment of rapid technological change, where the future of work is uncertain. How are organizations investing to develop their human capital to adapt to these changes? Are those investments effective? Will technologically driven automation of job tasks bring prosperity, and if so, how quickly and to whom? Or, will it negatively impact workforces and have profound and adverse effects on society?

In this evolving landscape, existing frameworks to measure and evaluate HCD might not be fit for purpose. For example, many metrics that represent proxies for human capital development measure inputs, such as dollars spent in training, rather than outcomes, such as improved wages over time. Moreover, they do not yet incorporate the profound and increasingly visible effects of automation on human capital issues.

Against this backdrop, this paper has two sets of goals. The first group of goals relate to the development of an HCD metric that is actionable and cost-effective. Within this context, our aims are to propose an HCD metric that focuses on outcomes; show that even in the current disclosure landscape one could measure with reasonable accuracy this metric for thousands of companies; and provide some exploratory evidence on its relationship with employee productivity.

The second group of goals relate to creating the infrastructure to understand the impact of automation of job tasks at the sub-industry level. We focus on sub-industries since investors analyze sub-industries to understand competitive dynamics; hence, our data might fit seamlessly within their existing tools and models. Within this context, our aims are to develop an estimate of probability of automation of job tasks for each sub-industry and show the relationship between this probability to elements of our HCD metric and other human capital characteristics.

Our key results are as follows:

- First, even though companies have not disclosed the necessary data to exactly measure our HCD metric, investors already have the data necessary for calculating a proxy for thousands of companies around the world.

- Second, the HCD metric exhibits meaningful relations to key measures of productivity, raising the possibility that it could be relevant to business valuation and investment analyses.

- Third, most sub-industries exhibit relatively high degrees of job task automation. This is because most occupations with low probability of automation tend to be those that do not fall under the corporate sector or that are a very small percentage of the occupations in most sub-industries.

- Fourth, sub-industries with higher probability of automation have higher training expenditures per employee and higher employee turnover.

- Finally, investors need to engage in a constructive way with companies to improve the disclosure landscape and be effective stewards of their investments as HCD will become a key consideration in an environment of rapid technological change.

2. HCD METRICS

Recently, there have been several efforts to increase disclosure of HCD metrics. Below we review a few of them:

2.1 Europe

The U.K. requires companies to consider their impact on a range of stakeholders and the broader society. For example, the 2006 Companies Act states that under their duty to promote the success of the company, a director must consider the best interests of their employees.[1] While not directly related to human capital reporting, this legally binding duty indicates the direction that the government is moving towards. More recently, the U.K.'s Corporate Governance code, which applies to all companies operating in the U.K. with a premium listing on a comply or explain basis, promotes company reporting on human capital data.[2] However, it offers little guidance on measurement methodology to companies, resulting in data that is inconsistent and incomparable.

Denmark has been identified as a pioneer when it comes to mandating company reporting on human capital metrics. The government requires companies to report on the formation of intellectual capital in their annual reports, and many companies will additionally report on human capital metrics alongside this.[3]

2.1.1 CASE STUDY: WORKFORCE DISCLOSURE INITIATIVE

In the U.K., the Workforce Disclosure Initiative (WDI) was launched in 2017 in response to investor demand for more meaningful and consistent company reporting on workforce data. The initiative, led by ShareAction, is supported by more than 120 investors with assets under management of in excess of U.S.$13 trillion.[4] In 2018, 90 companies, including Adidas, Microsoft, and BHP, responded to the WDI survey; an increase of more than 100 percent from 2017. Among 34 categories relating to metrics on direct operations and supply chain workforces, companies were asked to report on their turnover and training by employee age, gender, and seniority.[5]

1 UK Government, 2006, "Companies Act 2006," https://bit.ly/2ZWk76T
2 Financial Reporting Council, 2018, "The UK corporate governance code," https://bit.ly/2QuDKzC
3 CIPD, 2017, "Human capital metrics and analytics: assessing the evidence of the value and impact of people data," https://bit.ly/2sQXB3c
4 ShareAction, 2019, "Workforce disclosure initiative – report on 2018 company disclosures," https://bit.ly/39C8IgS
5 ShareAction, 2019, "Workforce disclosure initiative – company resources," https://bit.ly/37E16sw

2.2 United States

In the U.S., there are no laws regarding reporting on human capital metrics. However, investors in the U.S. are increasingly interested in understanding how companies manage human capital. In 2017, a group of U.S. investors called The Human Capital Management Coalition, representing U.S.$2.8 trillion of assets under management, created a petition for the SEC to mandate issuer disclosure on human capital policies, practices, and performance.[6] The coalition sought additional mandated disclosure to enable investors to evaluate company performance on human capital management – motivated by the understanding that human capital related information can be financially material.

2.3 Global

In January 2019, the International Organization for Standardization introduced a new standard for human capital reporting.[7] It comprises guidelines and metrics on diversity, leadership, culture, turnover, and skills, among other areas. It aims to standardize key metrics, ensuring they are internationally recognizable and useful to a wide range of stakeholders.

3. A NEW HCD METRIC

When it comes to employee data, most companies measure inputs rather than outcomes.[8] Consequently, companies are not providing investors with a view on how their efforts to develop human capital are impacting their workforce. As a result, organizations may spend time and effort on improving metrics and key performance indicators, while often receiving minimal outcomes.

We propose a new way of measuring the outcome of a firm's investments in human capital. Overall, the aim of the HCD metric is to enable the continuous assessment of the effectiveness of a firm's investments:

There are three core components of the HCD metric:

1. **Employee wage change:** determines how employees' wages change over time, allowing companies and investors to see if training programs are enabling employees to increase their wages and improve their livelihoods.

2. **Training dollars:** demonstrates how much a company spends on training its employees per year. Company spend on training should be indicative of their investment in reskilling and retraining employees.

3. **Employee turnover:** shows the percentage of employees that leave a company over a set period. This demonstrates whether companies can retain employees, which in the long run will determine if they are able to retain the skills required within the firm.

The HCD metric reflects the ability of management to train employees on issues that improve their earnings potential and livelihoods, while at the same time creating a work environment where employees want to stay. We propose median instead of average change to avoid the metric reflecting the impact of a few outlier observations. Another attractive aspect of this metric is its inherent verifiability, making it verifiable and auditable.

What is the sample from which a company could generate data for this metric? The set of people that generate the data for the metric could be a randomly drawn set of employees within certain levels of seniority, tenure, wage level, gender, ethnicity, or other individual characteristics of interest. The number of people in the sample could be a function of the number of employees in the organization. Companies with more employees could construct a sample where the median estimate is calculated across a larger set of employees.

$$\text{HCD} = \text{median of } \left[\left(\frac{\text{Change in employee wage}}{\text{Starting employee wage} + \text{Training expenditures}} \right) \times \left(\frac{1}{\text{Employee turnover rate}} \right) \right]$$

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[6] SEC, 2017, "Rulemaking petition to require issuers to disclose information about their human capital management policies, practices and performance," https://bit.ly/2txwFpe

[7] ISO, 2019, "New ISO international standard for human capital reporting," https://bit.ly/2ZSfXgk

[8] Serafeim, G., R. Zochowski, and J. Downing, 2019, "Impact weighted financial accounts: the missing piece for an impact economy," https://hbs.me/2tTMu9G
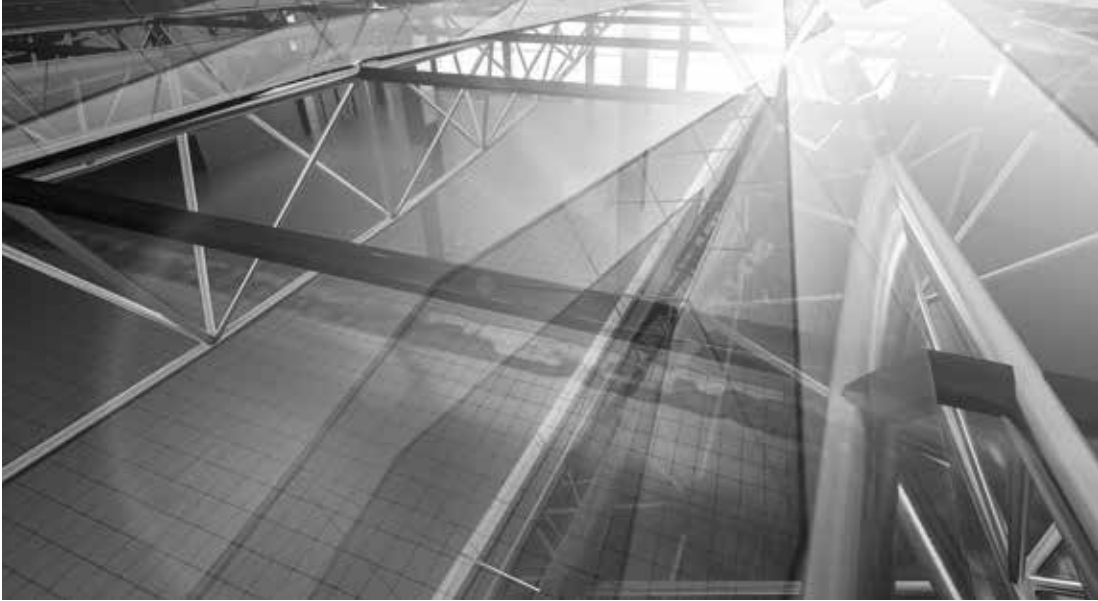
3.1 Constructing a proxy for the HCD metric

Unfortunately, companies are not currently providing the necessary data to construct such a metric, making it impossible to understand its exact properties and relations to other measures of interest. Here, we provide the first attempt at constructing such a metric with the data available to us.

We collected annual data for the period 2005-2017 from Bloomberg on total salaries and wages and total employees for a global sample of companies that disclose these data items. Moreover, we collect data on employee turnover and employee training expenditures. We keep only firms that disclose data on salaries and wages, number of employees, and employee turnover, while for employee training we assume that if the information is missing then it is zero.[9] Tables showing the

distribution of observations across years, industries, and countries are available from the authors. Our sample increases over time as disclosure of turnover has improved. It represents a wide variety of industries and countries. A somewhat interesting fact is that we have relatively few observations for U.S. firms. However, this is not surprising since most U.S. firms do not separately disclose employee wages.

Because we do not have the exact data to construct the proposed metric, we attempt to approximate it. In an ideal state we would like to be able to observe the evolution of wages of a random group of employees to understand human capital development. Instead, we can observe the total compensation allocated to the total number of employees in the organization. Consequently, we construct this proxy for HCD:

$$\text{Proxy } f \text{ or HCD} = \left\{ \frac{[(\frac{\text{Employee wage}_t}{\text{Employees}_t})] - [(\frac{\text{Employee wage}_{t-3}}{\text{Employees}_{t-3}})]}{[(\frac{\text{Employee wage}_{t-3} + \text{Training expenditures}_{t-3}}{\text{Employees}_{t-3}})]} \right\} \times (\frac{1}{\text{Employee turnover rate}_t})]$$

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[9] This assumption makes no difference for our results. Excluding firms with missing employee training expenditures does not change any of our conclusions.

To increase the likelihood that we measure meaningful human capital development, we measure changes in employee wages over three-year periods rather than one-year periods, since investments in training and workplace practices might take time to have an impact on employees.

An obvious problem with this approximation of our metric is that it might favor companies that experience low or even negative employee growth and penalize companies that are growing their workforce. To account for that effect, we estimate cross-sectional models for each year, where the dependent variable is our HCD metric and the independent variables are 3-year employee growth, country indicator variables, and industry indicator variables. Indeed, we find that the HCD metric exhibits a strong negative relation with employee growth.[10] Hence, we use the unexpected (residual) component of the HCD metric to ensure that our metric is uncorrelated to employee growth.

Table 1 presents all industries, with more than 50 observations, and classifies them into three groups – low, medium, and high – based on the average value of the HCS metric across firms in each industry. In the low category, we find many of the industries in the energy and utilities sectors, as well as the airlines and the hospitality industries. In the high category, we find industries in the financial services sector, as well as the food and beverages sector and the transportation services sector, such as auto parts, air freight and logistics, and transportation infrastructure.

Table 1: Industrial classification according to the HCD metric

SECTOR	LOW	MEDIUM	HIGH
COMMUNICATION SERVICES	• Diversified telecommunication services	• Media	• Wireless telecommunication services
CONSUMER DISCRETIONARY	• Hotels, restaurants & leisure • Household durables	• Automobiles • Textiles, apparel & luxury goods	• Auto components • Specialty retail
CONSUMER STAPLES		• Food & staples retailing	• Beverages • Food products
ENERGY	• Energy equipment & services • Oil, gas & consumable fuels		
FINANCIALS	• Insurance	• Banks	• Capital markets • Diversified financial services
HEALTHCARE		• Health care equipment & supplies • Pharmaceuticals	
INDUSTRIALS	• Airlines • Construction & engineering	• Aerospace & defence • Commercial services & supplies • Electrical equipment • Industrial conglomerates • Machinery • Professional services • Trading companies & distributors	• Air freight & logistics • Building products • Road & rail • Transportation infrastructure
INFORMATION TECHNOLOGY	• IT services • Semiconductors & semicond. equipment		• Electronic equipment, instruments & components
MATERIALS	• Metals & mining • Paper & forest products		• Chemicals • Construction materials
REAL ESTATE			• Equity (REITs) • Real estate management & development
UTILITIES	• Gas utilities • Independent power and renewable electricity producers • Multi-utilities	• Electric utilities • Water utilities	

[10] The overall model explains anywhere between 20 and 40 percent of the variation in the HCD metric in any given year.

Figure 1: Relationship between HCD and productivity metrics

REVENUE PRODUCTIVITY

EARNINGS PRODUCTIVITY
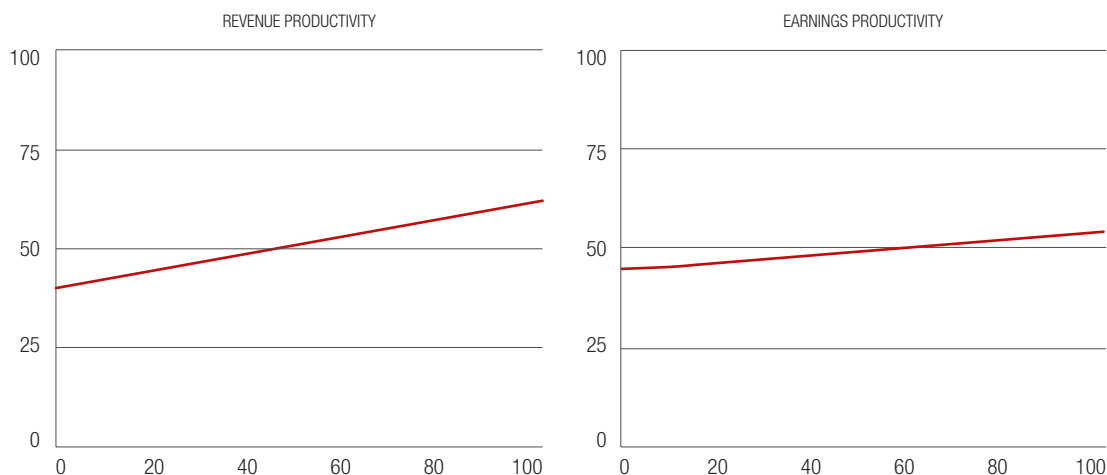
3.2 HCD metric and its relationship to productivity

Notwithstanding these industry statistics, we are interested at the firm-level in how the metric might be related to the output produced by employees. We, therefore, estimate the relationship between the HCD metric and the changes in revenue and earnings productivity (revenue or EBITDA per employee) for the firms in our sample. In all the models we include controls for the industry, country, and size of the company. To make inferences easier, we transform both the HCD metric and the productivity metrics to ranked measures that reflect the percentile that each firm falls in. Each variable, therefore, ranges from 0 to 100.

In Figure 1, we observe a positive relationship between the HCD metric and the productivity metrics, both for revenue and earnings productivity. Moving from the 20th percentile of the HCD metric to the 80th percentile is associated with a move from the 43rd percentile to the 60th percentile for revenues productivity and from the 45th percentile to the 58th percentile for earnings productivity. The lower increase for earnings productivity makes sense given that higher labor compensation is accounted as an expense in the income statement.

Econometric models using the raw variables (before the rank transformation to percentiles) are available from the authors for the interested reader. We estimate models using both

changes in productivity and the levels of productivity as the dependent variable, including and excluding controls for starting level productivity for each firm. Across all models, the HCD metric is positively associated with productivity.

Our key conclusions from this empirical exercise are twofold:

- First, although companies have not disclosed the necessary data to exactly measure the HCD metric investors could calculate a proxy for it for thousands of companies around the world.

- Second, the HCD metric exhibits meaningful relations to key measures of productivity, raising the possibility that it could be relevant to business valuation and investment analyses.

4. INVESTING IN HUMAN CAPITAL: SHAPING THE FUTURE OF WORK

The HCD metric described in the previous section outlines a new way of measuring the outcome of a firm's investments in human capital. A key component of the HCD is the training spend per employee. A key question is not only how much money is spent, but, more importantly, for what reason. In order to remain competitive, companies need to invest in the right mix of skills, knowledge, and capabilities, both in terms of their employees' training but also in terms of their recruitment practices.

Advances in artificial intelligence (AI), machine learning, and big data can have a significant impact on the mix of skills, knowledge, and capabilities required to perform different tasks. These include evolving jobs that reduce physical strain on workers, improved safety, increases in productivity, and more meaningful work that ultimately leads to higher rates of job satisfaction.

At the same time, new capabilities brought by these technologies evoke widespread fear of diminishing worker rights, mass job losses, and unequal access to opportunities due to the lack of relevant skills and education needed for the jobs of the future. While technological advancement is not a new phenomenon, the current pace at which technology spreads and disrupts industries is incomparable to previous waves of automation.[11] A recent report from OECD highlighted the impact of automation by estimating the share of workers in occupations at high risk of automation by income class.[12] The difference in the percentage of occupations at high risk of automation between upper income and lower income workers was about 10 percent in OECD countries.

Disruptions arising from new technologies have the potential to polarize workforces and the broader society. Carefully managing the development and dissemination of automation and AI, as well as their impact on the workforce, will be particularly important to ensure disadvantaged populations and minorities are not disproportionately affected in the transition.

We identify two equally important reasons why investors should consider the impact of automation on the future of work:

- The risk-return case for better understanding how different businesses identify the skills that will become more important than others as AI and automation are adopted (reskilling and upskilling current employees, changing recruitment practices for future employees)

- The impact case of supporting a transition to more automated tasks through a process that does not have a destabilizing systemic impact on society.

4.1 The risk-return case

Human capital is a key element of ESG frameworks and impact investing activities. Recent research has shown that among multiple environmental and social metrics, diversity and employee turnover are among the four metrics that have shown the strongest and most consistent relationship with financial performance.[13] At the same time, such frameworks have not yet been updated to incorporate the profound and increasingly visible effects of automation on human capital issues. For example, employee satisfaction and wellbeing could decrease if there is a risk of mass automation and mass layoffs, which in turn could lead to mitigating any productivity benefits from the adoption of new technologies and even to a reduction in overall productivity.

From a societal perspective, inequality due to loss of jobs and a lack of reskilling opportunities could have a significant impact for investors. Increased inequality can destabilize the financial and social systems that investors operate in, increasing uncertainty and leading to declines in economic activity.[14] This could result in falling consumption as a result of lack of jobs, declines in net worth, and the ability to access capital, all of which inhibit a country's Gross Domestic Product (GDP). This can have a negative impact on long-term investment performance, especially for large investors and asset owners that depend on long-term economic growth.

4.2 The impact case

The impact investing market has expanded fivefold between 2013 and 2017, reaching U.S.$228 billion globally.[15] This market could grow even further and bring considerable benefits as investors are increasingly looking for ways to generate benefits for society alongside financial returns. For investors that care about social impact, a better understanding of how automation will affect jobs is valuable. For example, large-scale automation could lead to increasing inequality between highly skilled high-paid workers and low skilled low-paid workers.[16] Research also indicates that technology-enabled changes to work tend to affect lower-paid and less qualified workers more than others.[17] These challenges

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[11] World Economic Forum, 2016, "The fourth industrial revolution: what it means, how to respond," https://bit.ly/2ZSgdMk

[12] OECD, 2019, "Under pressure: the squeezed middle class," https://bit.ly/2ZWg0rs

[13] Goldman Sachs, 2017, "The PM's guide to the ESG revolution – from article of faith to mainstream investment tool," https://bit.ly/37JNifV

[14] PRI, 2018, "Why and how investors can respond to income inequality," https://bit.ly/2QLiqoE

[15] GIIN, 2018, "Annual impact investor survey 2018," https://bit.ly/2tA4OEC

[16] McKinsey Global Institute, 2017, "Jobs lost, jobs gained: workforce transitions in a time of automation," https://mck.co/2QR4BVF

[17] British Academy and the Royal Society, 2018, "The impact of artificial intelligence on work – an evidence synthesis on implications for individuals, communities and societies," https://bit.ly/2FrfDLW

can provide opportunities for impact investments, both in businesses that manage the transition better but also in supply chain solutions and initiatives that offer support through training and education programs.

4.3 Developing a sub-industry automation score database

While it is becoming increasingly apparent that the role of technology in reshaping the future of work is an important topic to understand, we currently lack the infrastructure and tools to accurately model and predict these trends. To fill this void, we have developed a new database that provides an industry outlook on the future of work. To build the database, we adopted the probability of occupation automation scores calculated by Frey and Osbourne (2017) to calculate probability of automation scores for Global Industry Classification Standards (GICS) sub-industries.[18]

Frey and Osbourne (2017) have calculated the probability of automation of 702 occupations by assessing the extent of automation of non-routine cognitive tasks across occupations. In order to do so, the authors identified some inhibiting bottlenecks to automation that persist across occupations.

These were separated into the following categories: perception and manipulation tasks, creative intelligence tasks, and social intelligence tasks. Beyond these bottlenecks, it is already technologically possible to automate almost any task, provided that sufficient amounts of data are gathered, and computer resources are allocated. As a result, their model predicts the pace at which these bottlenecks can be overcome, which in turn can determine the extent of automation across occupations.

Figure 2 shows the distribution of the 702 occupation automation scores calculated by Frey and Osbourne (2017). We observe that approximately 13 percent of the occupations in the sample have a probability of automation score of below 0.02. Similarly, we see that the same percentage of occupations have a high score above 0.94. Overall, we note that while there is some agreement in the literature about the relative probability of automation across professions and industries, there is significant disagreement about the outcome of automation, as it might not necessarily lead to job losses.[19] We do not assume the latter, only the former. Our analysis, therefore, demonstrates the relative propensity across subindustries that jobs will be automated.

Figure 2: Distribution of occupation probability of automation scores
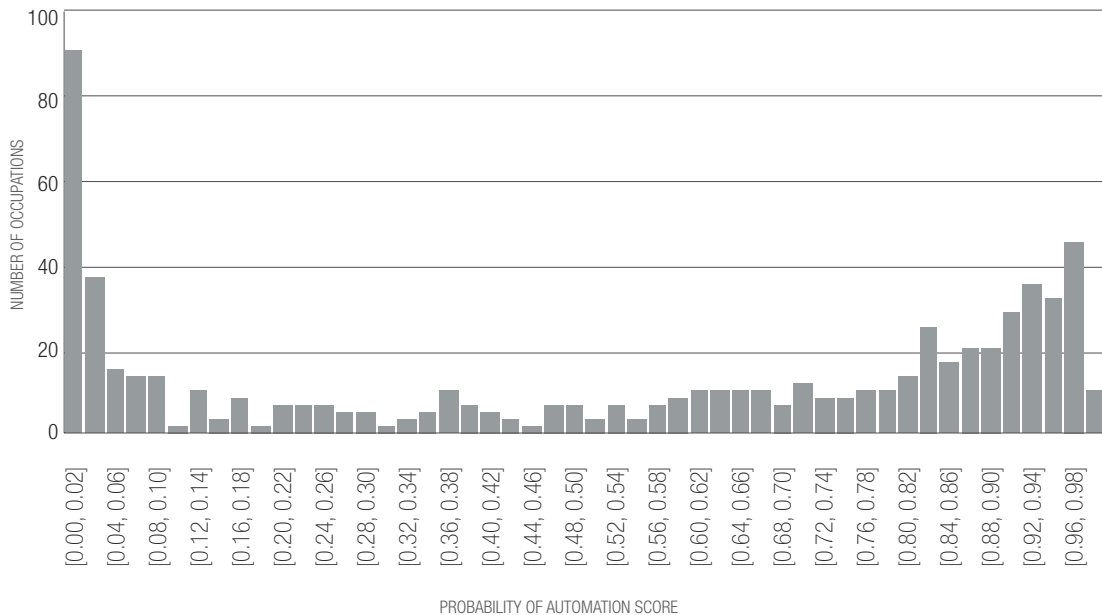
Source: Frey and Osbourne (2017)

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[18] Frey, C. B., and M. A. Osborne, 2017, "The future of employment: how susceptible are jobs to computerisation?" Technological Forecasting & Social Change 114, 254 - 280

[19] Arntz, M., T. Gregory, and U. Zierahn, 2016, "The risk of automation for Jobs in OECD countries: a comparative analysis," OECD Social, Employment and Migration Working Papers, No. 189, OECD Publishing, Paris, https://bit.ly/35pMueD

Table 1: Industrial classification according to the HCD metric

INDUSTRY	EMPLOYMENT	PERCENT OF INDUSTRY EMPLOYMENT
COMPUTER SYSTEMS DESIGN AND RELATED SERVICES	99,370	4.46
SOFTWARE PUBLISHERS	16,510	4.19
MANAGEMENT OF COMPANIES AND ENTERPRISES	9,910	0.42
STATE GOVERNMENT, EXCLUDING SCHOOLS AND HOSPITALS	6,640	0.30
COLLEGES, UNIVERSITIES, AND PROFESSIONAL SCHOOLS	6,480	0.21

Probability of automation scores at the occupation level are useful, but to make them more relevant to an investor audience we developed a methodology to aggregate these scores at the sub-industry level. For each occupation, we took the top five industries with the highest level of employment from the U.S. Bureau of Labor Statistics.[20] We mapped these five industries to their corresponding GICS sub-industries. Where it was not possible to map the occupations and the industries to GICS sub-industries, due to lack of representation in GICS (e.g., public sector or no clear match), we have marked these in our underlying dataset and excluded the occupations from our analysis. Table 2 presents an example for the occupation of "Computer programmers".

Figure 3: Occupation to sub-industry mapping – including low, medium, and high probability of automation categorization
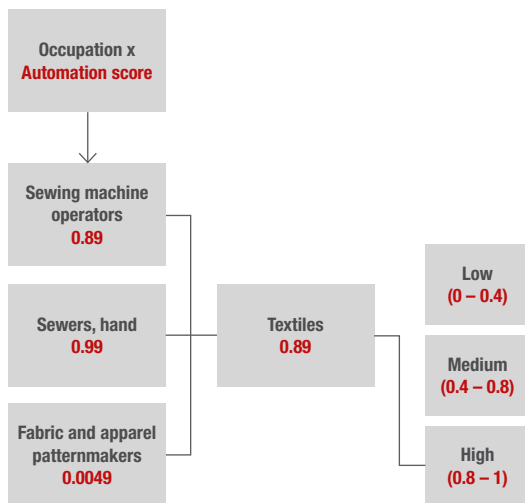
Figure 3 illustrates how we combine the probability of automation scores for the different occupations within a sub-industry to calculate a total subindustry probability of automation score. The example also shows how we group the sub-industries according to whether they have low (0-0.4), medium (0.4-0.8), or high (0.8-1) probability of automation. Note that each occupation is weighted depending on its relative presence within a sub-industry, measured as the number of jobs within the sub-industry associated with that occupation. A table with all the sub-industries and their automation probability can obtained from the authors.

Once we calculate the sub-industry probability of automation scores the distribution of our data changes, with more sub-industries having a medium and high probability of automation. Figure 4 represents the distribution of sub-industry probabilities of automation after combining the probability of automation scores for the different occupations within each sub-industry.

There are several explanations for this change in the distribution. First, many of the occupations with low probability of automation scores, such as Choreographers and Podiatrists, are niche occupations that do not comprise large parts of the employee population for corporations. Although these occupations are present in certain sub-industries, their relative presence is low and, therefore, do not significantly influence the overall sub-industry scores. Second, there are several occupations with low probability of automation scores that could not be mapped to GICS, such as Elementary School Teachers and Healthcare and Social Workers. Most individuals within these professions are employed by the public sector, which is not accounted for in GICS. Additionally, in some cases it was not possible to map specific occupations to GICS using our mapping methodology, e.g. Lodging Managers.

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[20] United States Department of Labor, Bureau of Labor Statistics, https://www.bls.gov/

Figure 4: Distribution of sub-industry probabilities of automation
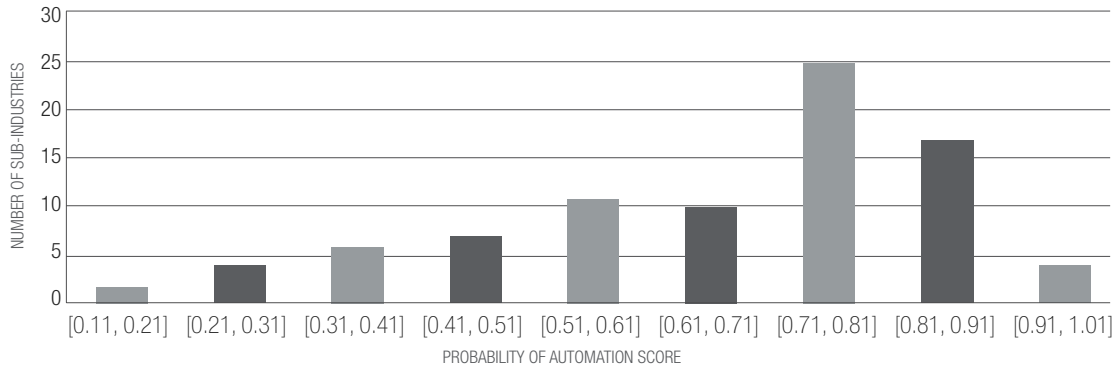
5. ANALYSIS OF SUB-INDUSTRY CHARACTERISTICS BY PROBABILITY OF AUTOMATION

We conducted our analysis in two parts. First, using the sub-industry automation score database and a global sample of large companies that report data on elements of our HCD metric, we examined the association between our probability of automation and HCD metric elements (training, employee turnover, and wages over sales), as well as some other key variables of interest, i.e., wage gap and employee diversity (percentage of women employees, percentage of women managers). Because our data are coming from a global sample of companies and these characteristics might differ across countries, we estimated models that account for

country differences and isolate the difference that could be attributed to sub-industries.[21]

Second, we used occupation level data to generate over 9,700 data points that demonstrate the makeup of skills, knowledge, and abilities in each subindustry. This is calculated using the proportions of occupations within a sub-industry. An illustrative example is shown in Figure 5.

- **Abilities:** refer to enduring attributes of the individual that influence performance. These are split into the following categories: cognitive abilities, physical abilities, psychomotor abilities, and sensory abilities.[22]
- **Knowledge:** refers to organized sets of principles and facts applying in general domains.[23]

Figure 5: Importance and level of abilities, skills, and knowledge mapped to sub-industries

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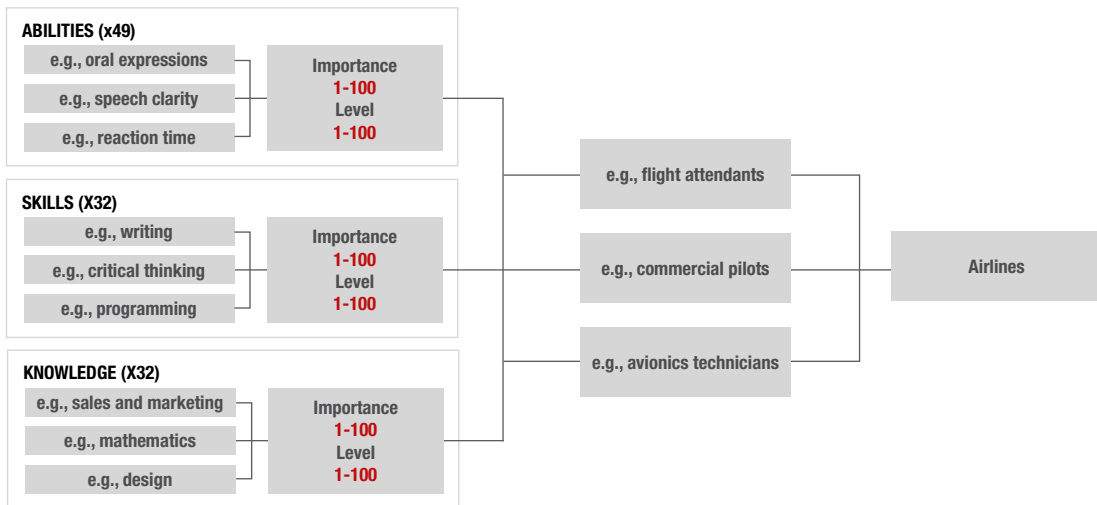
[21] Specifically, we estimated ordinary least square panel regressions with country, sub-industry, and year fixed effects. The baseline sub-industry was automobile manufacturers and the estimated coefficients on each sub-industry effect was the incremental effect of being in that sub-industry relative to a firm belonging to the automobile manufacturer sub-industry.

[22] ONet online, https://bit.ly/2FlyGaJ

[23] ONet online, https://bit.ly/36oNP6V

- **Skills:** refer to developed capabilities that facilitate learning or the more rapid acquisition of knowledge. These are split into the following categories: basic skills, complex problem-solving skills, resource management skills, social skills, systems skills, and technical skills.[24]

Using this dataset, we analyzed trends in the level of skills, knowledge, and abilities for sub-industries with low and high probability of automation (refer to section 6, below).

5.1 Training

Key finding: the average training spend per employee is higher in sub-industries with high probability of automation.

In an era of automation, retraining and reskilling is increasingly important; the lack of skills needed to embrace emerging technologies is already creating a widespread talent shortage.[25] Lifelong learning is crucial, and employers need to emphasize the importance of continuous training, development, and adaptability to their employees.[26] Companies need to be prepared to invest in training and development; an Accenture survey found that although 74 percent of executives at U.S. companies anticipate significant task automation over the next three years, only 3 percent plan to increase their spending on employee training.[27] A few examples of these efforts might be helpful in understanding these programs.

In the **Integrated Telecommunications Services** sub-industry, AT&T is investing between U.S.$200 to U.S.$250 million a year to identify where every job function is heading and provide workers with the training they need to prepare for future roles. Management has implemented a "Future Ready" reskilling program that offers "nanodegrees" in collaboration with an educational organization called Udacity; this enables existing employees to take hands-on courses in subjects like data science and machine learning.

In the **Systems Software sub-industry**, SAP launched a large-scale program to upgrade their workforce's skills. One of the company's main divisions, the 20,000-employee digital-business-services (DBS), implemented a comprehensive workforce skills upgrade to support shifts in its product portfolio toward more digital innovation and cloud-based products. The upgrade is taking place over multiple years and will include boot camps, shadowing experienced colleagues, peer coaching, and digital learning.

In the **Industrial Conglomerates sub-industry**, Siemens invests more than €500 million (~U.S.$580 million) a year in the training, reskilling, and upskilling employees. In the U.S., the company is investing U.S.$50 million annually in the continuing education of employees and is increasingly introducing the German model of apprenticeships in their U.S. operations. Currently, the apprenticeship program operates in nine states. In addition, the company has provided U.S.$3 billion worth of industrial software to academic and training institutions.

Figure 6: Average training expenditures per employee across low and high probability of automation sub-industry groups
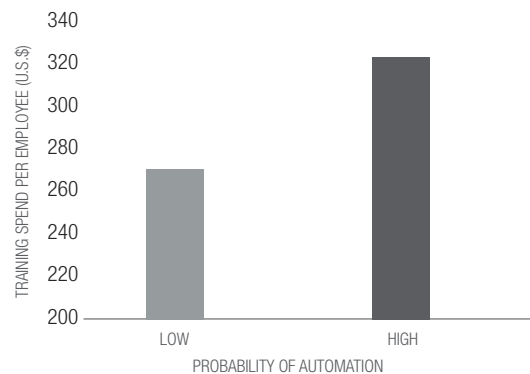
Currently, companies use training cost per employee as a metric to demonstrate their investment in human capital. Our analysis of average training cost per employee across subindustry groups (classified as low to high probability of automation) seeks to understand this relationship and is shown in Figure 6. We find that sub-industries with high probability of automation spend approximately U.S.$318 per employee, which is U.S.$50 more per employee than sub-industries with low probability of automation.

Home Improvement Retail and Restaurants are sub-industries with significantly lower per employee spend than the rest of the high probability of automation subindustries; while Electrical Components & Equipment and Apparel, Accessories & Luxury Goods spend the most. Among the low probability of automation sub-industries, Advertising spends the most per employee and Education Services spend the least.

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[24] ONet online, https://bit.ly/2Qs4fWp
[25] Raconteur 2018, "Reskilling future workers: who's responsible?" https://bit.ly/2N1CvpL
[26] Ibid
[27] Accenture Strategy, 2018, "Reworking the revolution – are you ready to compete as intelligent technology meets human ingenuity to create the future workforce?" https://accntu.re/2N39mdQ

If we assume that high probability of automation sub-industries will need to retrain many employees, then we can take these results as a positive signal; on average these sub-industries are already spending more on training. However, among our sample of sub-industries, Home Improvement Retail, Restaurants, and Real Estate Operating Companies are all high probability of automation sub-industries with a lower training spend per employee, between U.S.$121 to U.S.$167 per employee. Inadequate training could pose a challenge for companies and employees; if many occupations are automated then reskilling and retraining will be necessary. First, to ensure that there are enough workers equipped to support in technical roles, and secondly to help displaced workers find opportunities to be redeployed elsewhere. As previously discussed, we do not assume that automation will necessarily lead to job losses. However, investors should know which industries are more likely to be affected by automation in order to engage with companies on the potential impact on their human capital.

Automation and technological advances can also be used to improve training processes; companies recognize that automation technologies can be most impactful when utilized to complement and support humans.[28] For example, in 2016 Amazon introduced robots and reduced holiday worker training time to two days, compared to the six weeks of training that is often required[29], and similarly in 2017 Walmart introduced virtual reality technology to optimize training for workers in-store.[30]

After implementation, streamlining training or adopting online programs can significantly reduce training hours and costs. This calls into question the relevance of traditional metrics like training spend per employee, which only capture inputs rather than the output of the training program. If we take the example of Amazon, without context we might perceive the reduction of training time and spend as a negative, when in fact it is a sign of increased efficiency and cost savings. Overall, new technologies require companies and investors to redesign metrics that better capture training outcomes rather than training inputs.

5.2 Turnover

Key finding: the average employee turnover rate is higher in sub-industries with a high probability of automation.

Employee retention is moving up the ranks of importance for investors, especially considering shortages of highly skilled workers in tech-based roles.[31] Currently, turnover rates are used to understand employee retention. While turnover rates are known to vary across industries, they can be used as a proxy to gauge employee engagement; for example, a high turnover rate is often an indicator of poor company culture or inadequate opportunities.

> *The HCD metric outlines a new way of measuring the outcome of a firm's investments in human capital.*

As we move into an era of automation, employees will have new concerns that could impact their fulfillment and engagement at work, e.g., is my job safe, am I qualified for this role, and will I have to work alongside technology? Companies that can appease employee concerns on these topics will ultimately fair better in attracting and retaining the best human capital. In the Multi-line Insurance sub-industry, in 2017 Aviva asked their 16,000 U.K. employees whether their job could be automated and offered to retrain any employees for a new role within the firm if they thought it could. Overall, the program sought to reassure employees of their job security despite increasing automation within the insurance sector.[32]

As discussed in section 5.1, one factor that will impact employees is whether they have access to training and reskilling programs. Ultimately, companies that offer relevant and reputable training programs will attract and retain the best talent. Considering this, we foresee that well-designed company training programs will become increasingly important; not only to support companies to fill internal skills gaps, but to also offer a competitive advantage in the war for talent.[33]

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[28] Deloitte Insights, 2018, "The rise of the social enterprise – 2018 Deloitte global human capital trends," https://bit.ly/2QT8fOG
[29] The Wall Street Journal, 2016, "How Amazon gets its holiday hires up to speed in two days," https://on.wsj.com/2MWqpOw
[30] Deloitte Insights, 2018, "The rise of the social enterprise – 2018 Deloitte global human capital trends," https://bit.ly/2QT8fOG
[31] CIPD, 2019, "The intangible workforce – investor perspectives on workforce data," https://bit.ly/2ulyaah
[32] Quartz, 2017, "A UK company is offering new jobs to employees who admit they could be replaced by robots," https://bit.ly/35rrO6d
[33] Raconteur 2018, "Reskilling future workers: who's responsible?" https://bit.ly/2N1CvpL

Figure 7: Average turnover of employees across low and high probability of automation sub-industry groups
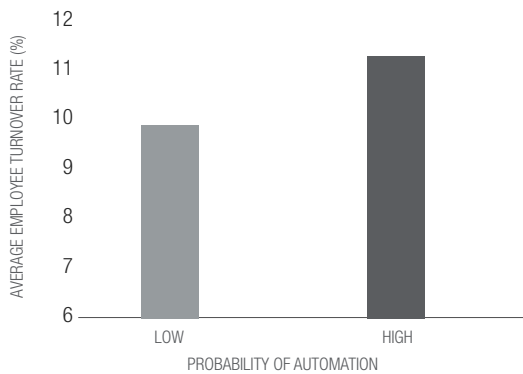
In the Trading Companies & Distributors sub-industry, Symbia logistics – a privately held US company focused on warehousing and logistics – used to experience high turnover rates. When a new CEO took over, she aimed to build a sustainable team and increase retention rates. To achieve this, the company invested over U.S.$350,000 in retraining and implemented automation training for mechanics to teach them how to troubleshoot and service robots. Since these changes, the company has experienced a 20-30 percent improvement in their retention rates.

Our analysis of average employee turnover rates across sub-industry groups is shown in Figure 7. We find that the turnover rate of high probability of automation sub-industries is 1.6 percent higher than low probability sub-industries. Among the high probability of automation group, Security and Alarm Services and Specialized Finance exhibit the highest turnover rates, between 18-24 percent, while Automobile manufacturers and Steel have the lowest turnover rates, at approximately 5.5 percent. In the low group, Education Services have a high turnover rate of nearly 20 percent, which is double the group's average. And Health Care Services, Application Software, and Electric Utilities have the lowest turnover rates of between 5-6 percent.

Employee turnover rate could signal a variety of issues relating to company performance and preparedness for the future of work. On the one hand, high employee turnover might be associated with a bad company culture. On the other hand, low employee turnover could be the result of a lack of opportunities within an industry, exacerbated by a lack of retraining opportunities for employees. For example, if

company retraining efforts are unable to meet the workforce's reskilling needs, then low skilled workers could face reduced opportunities for employment. In this scenario, there is a significant risk of workers losing jobs or remaining in low paid jobs with limited opportunities for career progression. Low turnover rates could signify higher rates of unemployment, or potentially higher rates of exploitation among low-skilled workers who have insufficient employment opportunities and reduced bargaining power in the workplace.

Alternatively, low turnover rates in high probability of automation industries, e.g., Steel and Automobile Manufacturers, could also be a sign that automation is improving employee satisfaction. It is widely anticipated that automation of tasks will augment employee experiences at work, as workers will no longer be required to perform repetitive routine tasks, freeing up time to work on tasks requiring a higher level of skill.[34,35] Similarly, increased use of robotics can improve job safety in many sectors, such as mining.

5.3 Wage gap

Key finding: sub-industries that are less likely to be automated exhibit a higher wage gap than subindustries with high probability of automation.

In Figure 8 we observe that sub-industries with low probability of automation have a higher wage gap, defined as the CEO to median salary. This means that within sub-industries that are less likely to be automated, companies pay CEOs approximately 72 times their median employee salary. In comparison, in sub-industries that are highly likely to be automated top earners earn 60 times the median employee salary.

Figure 8: Average wage gap between the median and highest paid employee compensation, across low and high probability of automation sub-industry groups
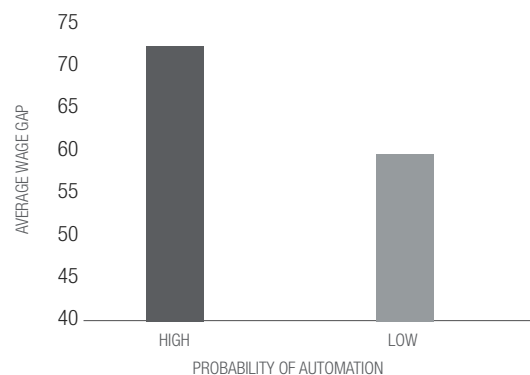
[34] World Economic Forum, 2018, "The future of jobs report 2018," https://bit.ly/39KIDxx
[35] International Federation of Robotics, 2018, "The impact of robots on productivity, employment and jobs," https://bit.ly/2Fv3NAp

Within the low probability of automation subindustries, Health Care Services, Technology Hardware, Storage & Peripherals, and Systems Software exhibit the highest wage gaps, ranging from 105 to 132. Among our sample. several of the sub-industries that are least likely to be automated are technology related, which often have notoriously high CEO-to-worker pay ratios.[36] An additional factor that contributes to higher ratios – and can skew wage gap data – is the level of outsourced contract work versus full time employment overseas. While 2018 SEC rulings mandate disclosure on pay, this is only for employee pay.[37] Consequently, if a company outsources a significant proportion of its low paid work overseas, they might report a comparatively low wage gap, despite paying CEOs much more than those overseas workers. Ultimately, this highlights a shortcoming of current wage gap measures, when used as a proxy for understanding levels of inequality.

The potential discrepancy in wage gap, caused by a company's choice to outsource work, also highlights another side effect of automation. Due to the cost savings associated with automation and risks of offshoring, some companies are bringing certain production processes back in-house.[38] A recent study in Australia found that on average companies could save $30,000 (AUD) per year, per resource by automating and migrating processes in-house.[39] As a result, many Australian companies have scaled back their offshoring and returned processes to Australia.[40] Overall, this highlights a global phenomenon associated with automation and the future of work; countries that are dependent on work provided by overseas companies could be negatively impacted in the short-term.

5.4 Gender diversity

Key finding: sub-industries with low probability of automation have more female employees and more female managers.

Discussions about automation have started to consider whether the future of work will be different for men and women. A World Economic Forum study used data from LinkedIn to determine that globally only 22 percent of artificial intelligence (AI) professionals are women.[41] AI is an in-demand skill, but even beyond tech-based roles automation is affecting job opportunities differently for men and women. Women tend to have jobs that are both the most and least likely to be automated.[42] In addition, when factoring in ethnicity, research from the Institute for Women's Policy Research finds that in the U.S. women are always more at risk of automation than their male counterparts.[43] They also find that although women are more likely to work in digital roles than men, they are notably underrepresented in the highest-paying tech jobs.

Our analysis of employee diversity across sub-industries finds that sub-industries that are less likely to be automated employ a higher percentage of females and have more female managers (Figure 9).

Among the sub-industries with low probability of automation, Education Services and Health Care Services employ the highest percentage of female employees, with both at approximately 58 percent of the workforce. High rates of female employment in the Education and Health sectors is positive, as both sub-industries contain occupations that are projected to grow.[44] Overall, male employees dominate most high probability of automation subindustries. However, the sub-industry with the highest percentage of female employees – Apparel, Accessories & Luxury Goods – is a high probability of automation sub-industry.

Figure 9: Average percentage of female employees and managers across low and high probability of automation sub-industry groups
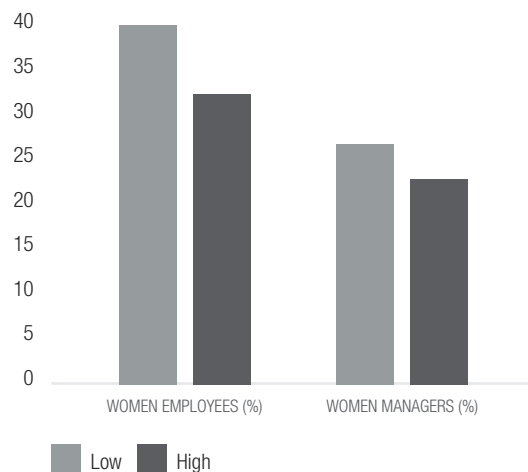
[36] Molla, R., 2019, "CEOs – especially those in tech – are making more money than ever," https://bit.ly/2QRlwHz
[37] Gelles, D., 2018, "Want to Make Money Like a C.E.O.? Work for 275 Years," https://nyti.ms/2ZWEssw
[38] A.T Kearney, 2018, "Future of work and workers – impact of robotics and artificial intelligence," https://bit.ly/2ZWEGQo
[39] Ibid
[40] Ibid
[41] World Economic Forum, 2018, "The global gender gap report 2018," https://bit.ly/2ZUFUvH
[42] Institute for Women's Policy Research, 2019, "Women, automation and the future of work," https://bit.ly/36vjKT4
[43] Ibid
[44] Ibid

When it comes to the percentage of female managers, we see the same trend in the low probability of automation group; Health Care Services and Education Services have the highest percentage of female managers as well as Broadcasting. Women managers are underrepresented in industries with high probability of automation, such as Diversified Metals & Mining, Steel, and Tires & Rubber. These sub-industries are historically dominated by male employees as they have required manual labor. However, with increased automation we will see more females entering these sectors and taking on managerial roles.[45] For example, in the Diversified Metals & Mining, BHP Billiton credits the increasing use of technology and automation on mining sites for boosting diversity in the sector. The Chief People Officer, Athalie Williams, stated that this allowed the firm to broaden its hiring pool to outside the sector. The company is now on track to achieve its target of having a 50 percent female workforce by 2025.[46]

6. LOOKING AHEAD: SKILLS NECESSARY FOR THE FUTURE

Most of the current research around the future of work and the impact of automation concludes that almost no occupation will be unaffected by technological changes. Similarly, the most common recommendation is for businesses to take the necessary actions in promoting a learning mindset, to invest in reskilling and upskilling employees, and to expand learning opportunities and support for workers that carry out tasks particularly susceptible to automation. The critical question then becomes, what are the new skills that companies should focus on developing? A recent report by the World Economic Forum attempted to introduce an approach to identify reskilling and job transition opportunities.[47] The point of reference of the report was at the occupation rather than the industry level.

We expect that as technological advances transform the composition of tasks required to perform jobs within the high probability of automation sub-industries, these sub-industries will increasingly start resembling the low probability of automation sub-industries in terms of the skills, abilities, and knowledge requirements. For example, if data processing and manual tasks that are prevalent in the high probability of automation sub-industries end up being automated, workers will then be required to perform well in high-value tasks, such as reasoning and decision-making.

For the purpose of providing insights at the industry level, we compared the average makeup of skills, abilities, and knowledge in the two sub-industry groups (low and high probability of automation). The results in Table 3 present the highest differences in terms of skills, abilities, and knowledge.

This information is particularly relevant to both investors and companies. Investors not only need to understand and model potential risks and opportunities of automation, but they also need to gain more insights into how their investee companies are changing their recruitment and training practices to prepare for this transition. HR departments should consider these transformational changes as a guide to review and if needed revise their practices. HR departments in sub-industries with high probability of automation might soon realize that they require individuals with skills that are not yet part of the core skill set of their current functions.

6.1 Investor engagement on the future of work

While traditionally most investors have been passive, rarely exercising their "voice", we have seen this changing in the past few years and we expect this trend to continue. Investor engagement is an important aspect of stewardship. In a 2017 survey, 73 percent of the 475 investors questioned said they considered active ownership and engagement an integral aspect of ESG investing.[48] And human capital management is increasingly significant to investors; Blackrock identifies it as an engagement priority, citing shortages of skilled labor,

Table 3: Average makeup of skills, abilities, and knowledge in the two sub-industry groups with low and high probability of automation

SKILLS	KNOWLEDGE	ABILITIES
Operations analysis	Computers and electronics	Fluency of ideas
Systems evaluation	Telecommunications	Written expression and comprehension
Systems analysis	Communications & Media	Inductive reasoning
Science	Engineering & Technology	Mathematical reasoning
Programming	Mathematics	

[45] Treadgold, T., 2018, "Australia's iron ladies are rocking the world's mining industry with tech," Forbes Asia, https://bit.ly/2tvR0v0
[46] Sanderson, H., 2018, "BHP on track to achieve 50 percent female workforce by 2025," Financial Times, https://on.ft.com/2Nft7z1
[47] World Economic Forum, 2018, "Towards a reskilling revolution – a future of jobs for all," https://bit.ly/37G9cRi
[48] State Street Global Advisors, 2018, "Performing for the future – ESG institutional investor survey," https://bit.ly/2Fn9e4n

Table 4: Important questions investors need to consider in engagement and stewardship efforts

THEME	QUESTIONS
IMPLEMENTING TECHNOLOGY	• How does your organization make decisions about if and how to implement automation and AI? • If you are implementing automation or AI, have you considered employee experience, skills, and other human capital factors? • What is the intended outcome of implementing automation and/or AI?
RETRAINING AND RESKILLING EMPLOYEES	• Does your organization have a strategy for accessing which skills are required to work with emerging technologies? • Have you considered how to develop your employees' skills in line with shifting demands? • Are you offering new opportunities to employees with changing roles? • Are you ensuring training opportunities are available to male and female employees? • Are you ensuring training opportunities are available to employees from diverse backgrounds, and, in particular, to ethnic minorities? • Are you ensuring training opportunities are available to low and high skilled workers? • Do you have policies to formalize your commitments to equitable retraining and reskilling opportunities? • Do you assess the effectiveness of your training programs? If yes, how?
EMPLOYEE SATISFACTION	• What actions have you taken to improve employee loyalty and reduce turnover rates? • How effective have these efforts been? • Do you measure employee satisfaction? If so, do you look beyond turnover and tenure metrics?
RECRUITMENT	• Are you recruiting with future skills requirements in mind? • Have you adapted your recruitment process to ensure you can assess candidates on skills you will require in the future?
HUMAN RESOURCES	• Is your human resources department aware of how automation and AI could impact human capital management? • Are relevant resources about the risks and opportunities available to the HR department?

uneven wage growth, and technology as key motivations.[49] With this in mind, understanding the risks and opportunities of automation, what questions to ask management, and what data to examine is of major importance to investors.

7. CONCLUSION

Human capital development is essential for hiring, training, managing, and retaining high performing employees who are one of the key drivers of corporate success and sustained competitive advantage. From both corporate and investor perspectives, assessing human capital development is challenging. Because human capital development is an intangible asset, there are no generally accepted standards for both measuring the value of people and quantifying return on investment. Particularly on the latter, without an understanding of how, for example, employee training can yield long term benefits, investments in human capital can be perceived as costly. In an era where automation and rapid technological change will potentially impact every industry, creating an infrastructure where human capital development can be better measured is essential.

To address some of these challenges, we derived a human capital development metric by focusing on outcomes rather than inputs and by exploring the relationship of the metric with employee productivity, and, therefore, long-term benefits. The three components of our metric include employee wage change, training dollars spent, and employee turnover. When these three components are combined, they reflect the ability

of a company to train employees on tasks that improve their earnings potential and livelihoods, while at the same time create a work environment where employee want to stay. Our results showed that there is a positive relation between the HCD metric and productivity metrics (both for revenue and earnings productivity), making the metric particularly relevant to business valuation and investment analyses.

Moreover, to help investors better understand the potential impact of automation across sub-industries, we developed a new database that provides an industry outlook on the future of work. Through a combination of probability of automation scores for over 700 occupations and employment data from the U.S. Bureau of Labor statistics, we calculated sub-industry probability of automation scores and provided insights relevant to our HCD metric. We found that the average training spend per employee and the average employee turnover are higher in sub-industries with high probability of automation. Sub-industries that are less likely to be automated exhibit a higher wage gap than those with high probability of automation.

Although it is hard to precisely predict how automation will impact the future of work, we expect with a high degree of certainty that technological advances will transform the composition of tasks required to perform jobs. Our future of work database provides a tool for investors to better understand potential risks and opportunities across sub-industries and to prioritize and frame engagement efforts. Our HCD metric provides a new way to measure outcomes and link these with long term benefits.

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49 BlackRock, 2019, "BlackRock investment stewardship engagement priorities for 2019," https://bit.ly/2MY1I9K

INTEGRATING CLIMATE TRANSITION RISK INTO INVESTMENT PORTFOLIOS

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**CARSTEN KEIL | ** Head of ESG Engine & Solutions, DWS Group GmbH & Co. KGaA

ABSTRACT

There have been significant advancements in addressing climate transition risk from an investment portfolio perspective in recent years. This has been warranted given the shortcomings of carbon foot-printing as a proxy for climate risk. The challenge for investors has been to understand the increasing variety of climate transition risk methodologies available in the marketplace, followed by the subsequent incorporation of climate risk into the investment process. By combining the various techniques offered by multiple data providers, DWS aims to capture risk across multiple dimensions that incorporate carbon intensity metrics, carbon pricing scenarios, and climate-related opportunities. This ability to identify climate risks and opportunities at a security, sub-sector, and sector level basis allows us to optimize a portfolio that not only reduces climate transition risk, but also tilts investments towards entities that promote the low carbon transition.

1. INTRODUCTION

Climate change is a significant risk for investors, from the financial losses incurred from extreme weather events, to the asset re-pricing in the transition to a low carbon economy, and the use of law courts as a new instrument to enforce and accelerate climate action. In this article, we illustrate how we are integrating climate transition risk into our investment processes and its implications from an asset allocation perspective.

According to MSCI's own calculations, 20 percent of the MSCI All Country World Index faces asset stranding or significant challenges when it comes to the transition to a low carbon economy.[2] At the same time, technologies to address climate change present substantial investment opportunities across all sectors and asset classes.

The traditional approach to assessing climate risk within an investment portfolio has been through carbon footprinting, which involves identifying the concentrations of carbon across the investment portfolio. However, this approach has suffered from a number of shortcomings. For example, it fails to capture information on changes to a company's carbon exposure or strategy. In addition, the dataset suffers from inconsistent company disclosures and, in particular, low reporting of Scope 3 emissions, namely the indirect emissions that occur in the value chain of the reporting company.

As a result, the past few years has witnessed increasing efforts to improve ESG (environmental, social, and governance) and specifically climate-related disclosures through, among others, the E.U. Action Plan and the Task Force on Climate-related Financial Disclosures. As the market awaits a long overdue improvement in ESG, and specifically climate-related disclosures, attention has turned to alternative, and more sophisticated, approaches to measure and manage both physical and transition climate risk within an investment portfolio. Not surprisingly, there is a rapidly developing

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ecosystem of data providers, asset owner initiatives, and online platforms available to financial institutions that provide varying techniques that aim to integrate these risks into the investment process.

To understand this landscape, we examine some of the transition risk methodologies available in the marketplace and provide details of the approach we are adopting at DWS, namely the DWS climate transition risk rating, which seeks to identify the climate risks and opportunities at a security, sub-sector and sector level basis. Our methodology then allows us, among other things, to optimize a portfolio that not only reduces climate transition risk, but also tilts investments towards entities that promote the low carbon transition.

2. THE THREE CHANNELS OF CLIMATE RISK

Physical, liability, and transition risks are the three channels of climate risk from an investment perspective.[3]

Physical climate impacts can range from water stress and cropland decline to river flooding and heatwaves, with potential disruptive effects on property and trade flows.

Liability risks relate to those individuals or entities who have, or will suffer losses or damages due to climate change and who seek compensation from those they hold responsible. Typically, these are the world's largest carbon emitters and potentially financial sector actors who have facilitated "polluters" in their business activities.

Clyde & Co., the international law firm, found that as of 2019 around 1,200 climate change cases had been filed across 30 jurisdictions, including Australia, Brazil, Canada, Germany, India, Spain, the U.K., and the U.S.,[4] with the latter representing a majority of cases, with over 950 cases filed. This includes nine cities and counties from New York to San Francisco suing major fossil fuel companies and seeking compensation for climate change damage such as pollution and rising sea levels.

Finally, transition risks relate to the increasing scope of climate change regulation, technological change, and shifts in consumer preferences. These have the power to significantly alter the operating models of businesses, with the potential to drive revaluation events both to the upside and the downside.

For example, companies not managing climate risks with sufficient strength (downside revaluation risk) or companies seizing the opportunities presented by the transition to a low carbon economy (upside revaluation potential).

In this article, we examine the steps required by asset managers and asset owners to integrate transition risk into their investment processes, which are becoming part of the fiduciary duty requirements for institutional investors. In future articles, we will outline how we are integrating physical climate risk into the investment process.

3. ASSESSING CLIMATE TRANSITION RISK METHODOLOGIES

Poor disclosures and backward-looking data have made it hard for investors to determine whether integrating climate transition risk within an investment portfolio context was being achieved with the available ESG datasets. For example, while carbon footprinting, which identified the concentrations of carbon within a portfolio, was useful in identifying systemically important carbon emitters, it was a poor proxy for climate risk in general.

To address the shortcomings of carbon footprinting, more sophisticated approaches to address climate risk have emerged. For example, when it comes to integrating climate transition risk, multiple data providers and numerous transition risk assessment methodologies have come to the market.

We expect these will continue to evolve. Indeed, a significant data revolution is already underway and global efforts to improve disclosures, such as through the E.U. Action Plan and the Task Force on Climate-related Financial Disclosures, should result in improvements in how climate risk is incorporated into the investment process. An area where we have already seen significant improvements in is that of mapping physical climate risk to listed equity market performance.

In terms of integrating climate transition risk, there are currently a multitude of scoring methodologies, including those from MSCI, ISS-Oekom, Sustainalytics, S&P Trucost, the Paris Agreement Capital Transition Assessment, the Transition Pathway Initiative, and Moody's. Each have their own distinct characteristics and a brief overview of each are outlined below.

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[3] Prudential Regulatory Authority, 2015, "The impact of climate change on the UK insurance sector," Bank of England, September
[4] Clyde and Co., 2019 "Climate change – the evolving landscape of litigation," March

MSCI low carbon transition score: MSCI's low carbon transition methodology is based on a carbon intensity footprint measure.[5] The key addition from previous methodologies is that avoided emissions are now also considered. This means that MSCI approximates the emissions not generated when a company's products are used instead of products from industry peers, such as electric cars versus cars with internal combustion engines. MSCI finds that 20 percent of the constituents of the MSCI All Country World Index (ACWI) face asset stranding or significant transition challenges, most notably in the energy, utilities, and materials sectors.

ISS-Oekom's carbon risk rating: The ISS-Oekom rating system captures not only the current carbon-related performance of the company and its ability to seize climate-related opportunities, but it also incorporates the company's industry specific characteristics favoring companies involved in clean tech solutions and penalizing those with high GHG (greenhouse gas) emissions along their value chain.[6]

Sustainalytics's carbon pillar risk rating: Sustainalytics rating methodology covers carbon related risks in the companies' own operations as well as those concerning the company's products and services. When it comes to emssions from the company's own operations, it refers to its energy use and GHG emissions covering not just scope 1 (direct emissions produced by the burning of fuels of the emitter) and 2 (indirect emissions generated by the electricity consumed and purchased by the emitter), but also parts of scope 3, such as transport and logistics. In terms of the company's products and services, it refers to the energy efficiency and/or GHG emissions of its services and products during the usage phase.

S&P Trucost's carbon earnings at risk: The carbon earnings at risk methodology identifies current and future carbon price scenarios in 130 regions to identify sectors, companies, or business segments at risk in the event companies have to pay a future price for their greenhouse gas emissions.[7] According to the World Bank, only 20 percent of global GHG emissions are currently covered by a carbon price and less than 5 percent of those are priced at levels consistent with reaching the temperature goals of the Paris agreement.[8] However, an increasing number of jurisdictions are implementing carbon

pricing schemes, 57 compared to 51 for 2018. As a result, a growing number of companies are also assessing carbon pricing from a risk management perspective. According to CDP, as of 2017 over 1,300 companies, including 100 Fortune Global 500 companies, have disclosed and are using an internal carbon pricing mechanism, or plan to implement internal carbon pricing within two years.[9] These companies are using this information to assess investment decisions and manage their long-term climate risks.

Paris Agreement Capital Transition Assessment (PACTA): The 2 Degrees Investment Initiative developed this methodology to address the limitations of relying on corporate disclosures of ESG/climate data. Despite the increasing attention from regulators, investors, and companies on climate change, the proportion of companies disclosing their carbon emissions is still surprisingly low. PACTA provides an alternative approach by assessing companies' current installed assets and capex plans for key carbon intensive sectors. This methodology has been used by financial regulators, such as the California Insurance Commission, which has prompted many more financial institutions to consider climate risk exposure and management.

Transition Pathway Initiative (TPI): The TPI is an asset-owner backed research initiative by the London School of Economics and FTSE Russell. This methodology evaluates and tracks the quality of companies' carbon management and how future carbon performance compares to national targets/pledges and the Paris climate agreement ambitions. In its September 2019 report, TPI found that of the top 109 energy companies only two oil and gas companies are aligned with the emission reduction pledges made by national governments in the Paris Agreement.[10]

Moody's carbon transition assessment (CTAs): This approach assesses the carbon transition risk to non-financial companies from evolving policy, legal, technological, and market changes. It then considers how these trends are evolving in specific geographies and sectors and hence the implications for individual companies. The CTAs are forward looking as they not only examine the current positioning of the company, but also their plans to mitigate climate risks.[11]

5   See supra note 2
6   ISS-Oekom, 2019, "Climate risk rating – methodology"
7   S&P Trucost, 2018, "Integrating future carbon price risk into portfolio analysis"
8   World Bank Group, 2019, "State and trends of carbon pricing 2019," June
9   CDP, 2017, "Putting a price on carbon," October
10 Transition Pathway Initiative, 2019, "Management quality and carbon performance of energy companies," September
11 Moody's, 2019, "Framework to assess carbon transition risk for corporate sectors," September

Figure 1: Median climate transition risk score by sector
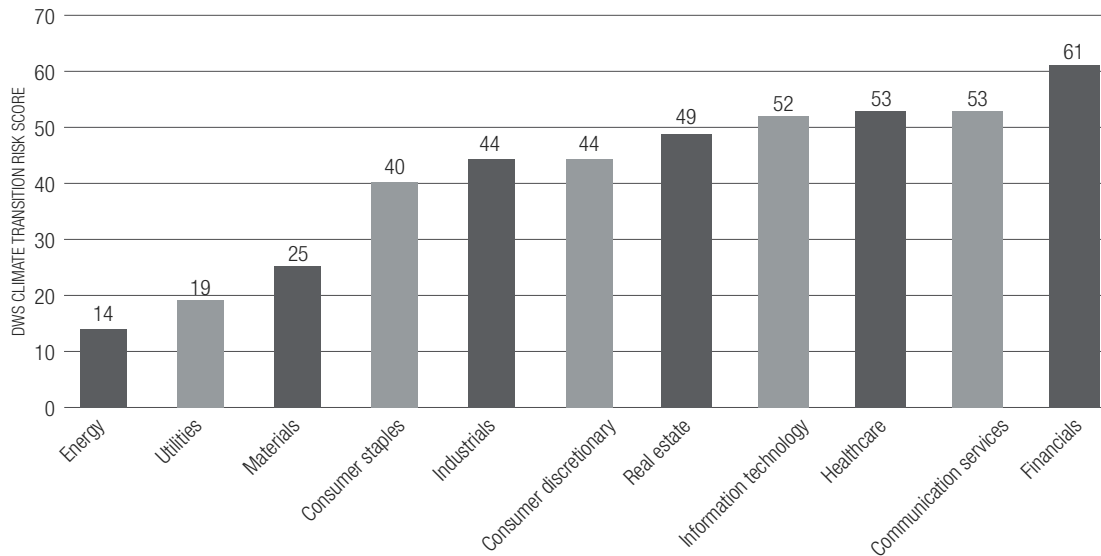
Source: DWS Investment GmbH (October 2019)

4. THE DWS APPROACH TO ESG INTEGRATION AND CLIMATE TRANSITION RISK

The cornerstone of our ESG integration efforts in public markets is the DWS ESG Engine. This uses data from three generalist providers – MSCI, ISS, and Sustainalytics – and supplements these inputs with further information from five other specialized providers, S&P Trucost, ISS-Ethix, RepRisk, Morningstar ESG, and Arabesque S-Ray. This means that the ESG Engine has access to in excess of 35 million data points for over 10,000 companies. This enables us, as a first step, to rank the ESG quality, from A to F, of corporate and sovereign issuers from the developed and developing world in both listed equity and fixed income markets.

When it comes to ranking issuers specifically on climate transition risk, DWS has designed and implemented its own proprietary climate transition risk rating via the ESG Engine. It seeks to identify the risks and opportunities associated with a transition to a low carbon economy. In a similar way to how we assess the ESG quality of corporates and sovereigns, the DWS A to F climate transition rating system enables us to identify, among other things, climate transition leaders and laggards.

Initially, we began by amalgamating the latest generation climate risk measures of MSCI, ISS-Oekom, and Sustainalytics. In the fourth quarter of 2019, we added S&P Trucost's carbon value-at-risk methodology to our ranking assessment, with an overview of the results outlined below. This made it possible

for our transition risk methodology to incorporate not just carbon intensity metrics and climate investment solutions but also to assess the potential implications of more stringent carbon price schemes across sectors and geographies.

The DWS Climate Transition Risk scoring ranges from 0 (absolute climate transition risk laggard) to 100 (absolute climate transition risk leader), which is then translated into our traditional A to F letter rating system.

Those that fall within our A to C ratings, constituents with a score in excess of 50, we label as leaders. These have either low or perfectly managed risks, deliver climate solutions, and benefit from opportunities in the transition to a low carbon economy. Those that fall within our D to F ratings, constituents with a score of less than 50, are labeled laggards and have elevated risks. E and F constitute the true laggards, which an ESG investor or climate transition risk averse investor should seek to avoid. This approach allows us to identify on a sector, sub-sector, and individual security level basis the extent of the climate transition risk and opportunity.

We find that the high and excessive transition risk companies, that is issuers with a DWS Climate Transition Risk rating of E and F, are mostly operating in the energy, utilities, and materials sectors. For example, in the case of the energy sector, the median climate transition risk score is 14, and consequently very close to what we define as an absolute laggard. On the other hand, our findings reveal that those

companies with limited climate transition risk exposure are those in the financials, communication services, healthcare, and IT sectors (Figure 1).

How climate transition risk affects financial performance is at the heart of this mapping exercise. For example, within materials, the availability of key inputs in the mining sector, such as water and energy, will likely physically and financially constrain the establishment of new operations or make existing operations uneconomical.

Meanwhile, new business opportunities should arise as demand will likely increase for materials used in existing and future low-carbon energy and industrial technologies. Examples include copper, which is important for electrification and improving energy efficiency. Similarly, substituting steel with aluminium can help reduce emissions within the transportation sector, although the energy intensive nature of aluminium smelting also needs to be taken into consideration.

In certain countries, the transportation sector has overtaken the power sector as the most carbon intensive industry. Governments, particularly those in Europe, are responding with new stringent fuel economy and emissions regulations encompassing CO_2, NO_x, and particulate matter. This may result in car manufacturers not only incurring penalties due to missed emission reduction targets, but also force them to invest in new product strategies.

As a result, regulation and technologies are potentially combining to drive out diesel engines, and eventually all internal combustion engines, and enable the electric vehicle and e-mobility sectors to become key growth markets for carmakers.

While the oil sector widely dismissed the threat of electric vehicles, arguing as late as in 2017 that they were a drop in the ocean of cars, leading car companies are already shifting their strategy. According to Reuters, the world's leading automotive companies had committed U.S.$90 billion to electric vehicle strategies by January 2018.[12] According to BNEF, incremental sales of EVs may be higher than that of internal combustion engines by 2020, and by 2023 internal combustion engine sales should already be falling.[13]

When it comes to the fossil fuel sector, investors may be financially impacted even before companies see the peak in fossil fuel demand. This is what happened in the coal and European electricity sector transitions. The share prices of major U.S. coal producers is a case in point. Leading U.S. coal producers saw their share price peak around 2011 at the point when rapid coal demand growth slowed. By 2014, global coal demand stagnated, and the largest coal producer filed for bankruptcy.[14]

Similarly, fossil fuels in electricity generation peaked across the OECD in 2007, at a time when solar PV and wind were just 1 percent of the electricity mix.[15] Shortly before then, the share price of leading German power utilities also peaked. Since then, over U.S.$150 billion of assets have been written down, and the European power sector's capitalization has fallen significantly.

From a sector perspective, we identified energy, materials, and utilities as those facing the highest climate transition risk. We then investigated climate risks by sub-sector and individual security, such that for utilities, for example, we find that independent power companies within the MSCI ACWI are populated with the largest share of excessive transition risk entities. Within materials, it is construction and then metals and mining where climate transition risks are most prevalent. For industrials, securities in the marine and airline sectors are most exposed.

In terms of coverage, the DWS climate transition risk rating can be evaluated for approximately 13,000 issuing entities. Of the entire population, we find that issuers with high transition risk (E rating) and excessive transition risk (F rating) represent between 10 and 20 percent of the population.

5. THE INEVITABLE POLICY RESPONSE

Revaluation events in response to technological change, climate-focused regulations, or changing consumer preferences are already happening and may become more widespread and significant in the years ahead. Indeed, with an increasing number of actors demanding action to address the climate crisis, it seems inevitable that even more robust climate policies and regulations will emerge over the next few years. This will, therefore, expose investors to additional financial risk. In response, the Principles for Responsible Investment alongside Vivid Economics and Energy Transition Advisors (ETA) have launched the Inevitable Policy Response (IPR).

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[12] Leinert, P., 2018, "Global carmakers to invest at least $90 billion in electric vehicles," Reuters, January 15, https://reut.rs/2vE5A4z

[13] Bloomberg NEF, 2019 "Electric vehicle outlook 2019," May

[14] For details on this and the European electricity companies discussed, see Carbon Tracker (September 2018). According to their estimates, fossil fuels will peak in the 2020s as renewables look set to supply all growth in energy demand

[15] BP Statistical Review of World Energy (1965-2018)

The IPR assesses when policymakers will most likely act (by 2023-2025), how they will act (carbon pricing, banning the sale of emission emitting cars, phasing out coal use, and energy efficiency measures), who will be hit (from the costs to the economy, the sectors, regions, and asset classes most exposed), and who are likely to be the most valuable companies in the transition to a low carbon economy. We expect this will also become an important tool for climate risk and opportunity integration.

6. CLIMATE TRANSITION RISK AND THE DWS ASSET ALLOCATION PROCESS

In order to enhance our asset allocation process and given ongoing asset re-pricing risks, we not only look to incorporate less climate risk, but also to capture the low carbon investment opportunities. Indeed, by identifying the climate risk leaders and laggards not just at a sector level, but also on a sub-sector and security level basis, we are able to invest in sectors that may not look appealing on a headline climate transition risk basis, but thanks to gaining exposure to specific sub-sectors and individual securities we can capture lower climate risk or even a measurable investment opportunity.

We find that investment opportunities are particularly concentrated in the information technology, utilities, and industrials' sectors, even though at a headline sector level some of them represent high transition risk plays.

Figure 2 provides a more in-depth examination of where climate risk and opportunities reside by sector. For example, the boxplots identify the 25th and 75th percentile of the sector distribution according to its climate transition risk score. The whiskers examine the extremities or tail of the dstibution. It also includes the outliers that exist across many sectors including where risk scores are in excess of 50 and 75 and which classify inside our A-C rating. This is the segment of the universe we identify as offering climate investment solutions. We find that these are most prevalent in the information technology, industrials, and utilities sectors.

Within IT, investment opportunities are specifically concentrated in the hardware and communications sectors. In industrials, it is in the electrical equipment and building producing sub-sectors. In utilities, it is among the water utility entities and within a subset of the independent power companies focused on renewable parks.

From a sector allocation perspective, a model portfolio not only needs to be optimized to avoid carbon transition risk, but it also needs to be tilted towards sectors that promote the low carbon transition. In a typical model portfolio, this is likely to mean reduced allocations to energy, materials, and utilities alongside increased allocations to IT, communication services, and healthcare.

Figure 2: Identifying climate transition investment opportunities by sector

GLOBAL EQUITIES INCLUDING EM (N = 2760)

DWS CLIMATE TRANSITION RISK SCORE
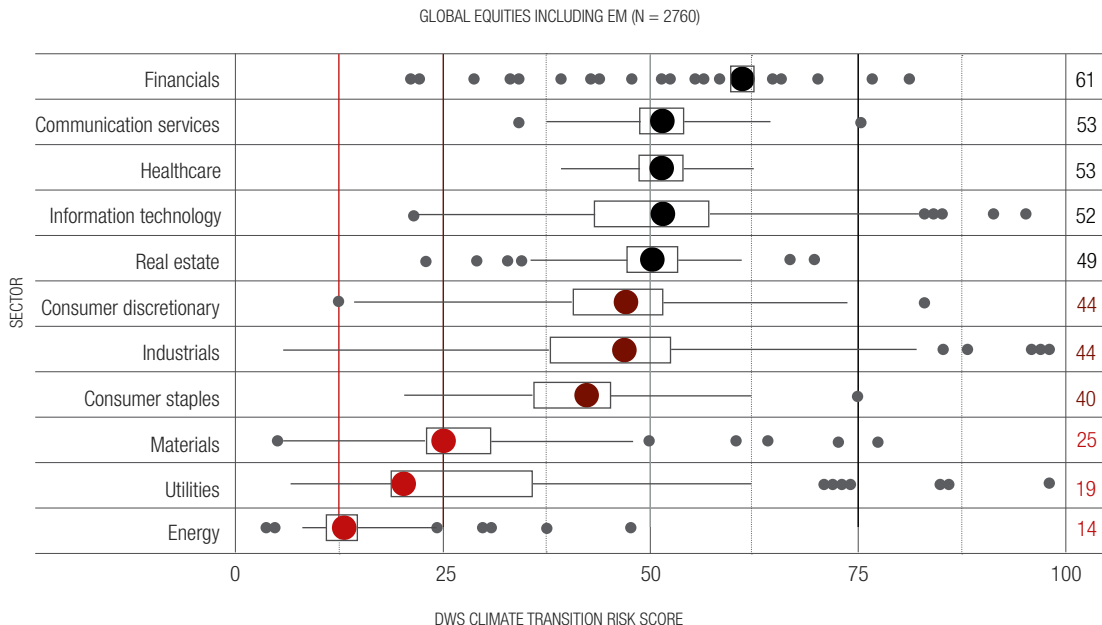
Source: DWS Investment GmbH (October 2019)

7. CLIMATE TRANSITION RISK, STRESS TESTING, AND REGULATORY REQUIREMENTS

Climate change has moved to the top of the political agenda across multiple jurisdictions. This is clearly illustrated by the ambitions of the E.U. Sustainable Finance Action Plan and the work of the Network for Greening the Financial System (NGFS), which is examining, among other things, how to mitigate the financial stability risks when it comes to climate change. Comments from the newly elected heads of the IMF, the European Commission, and the European Central Bank indicate that the momentum in this area is only likely to accelerate.[16]

For investors, and particularly those operating in Europe, it is becoming a regulatory requirement to integrate ESG and specifically climate risk into the investment process. In addition, from 2020, PRI signatories will be required to report under the framework of the Task Force on Climate-related Financial Disclosures (TCFD).[17]

This will have significant reach given the growing PRI signatory base. As of January 2020, the number of asset owner and asset manager PRI signatories had hit just over 2,500, with the U.S., U.K., France, Australia, Canada, and the Netherlands constituting almost 60 percent of total signatories.[18]

Local regulators and supervisors around the world are also responding, from the large insurance regulators in the U.S. including climate risk assessment in their regulatory reviews,[19] to the announcement in September 2019 by the Malaysian central bank that it will require local financial institutions to report on their exposure to climate risks.[20]

We expect that efforts in Europe may become a template for other regions in the world. Indeed, the launch of the International Platform on Sustainable Finance by the E.U. in October 2019 will allow organizations and networks from around the world to share, exchange, and potentially align initiatives on sustainable finance.

8. DWS CLIMATE RISK SCREENING AND MANDATES

Combining multiple data sources is the key capability of DWS's ESG Engine, our proprietary software which integrates eight data sources into our investment systems and processes. Our Climate Transition Risk rating methodology is now part of our

Figure 3: PRI signatories by number and assets under management
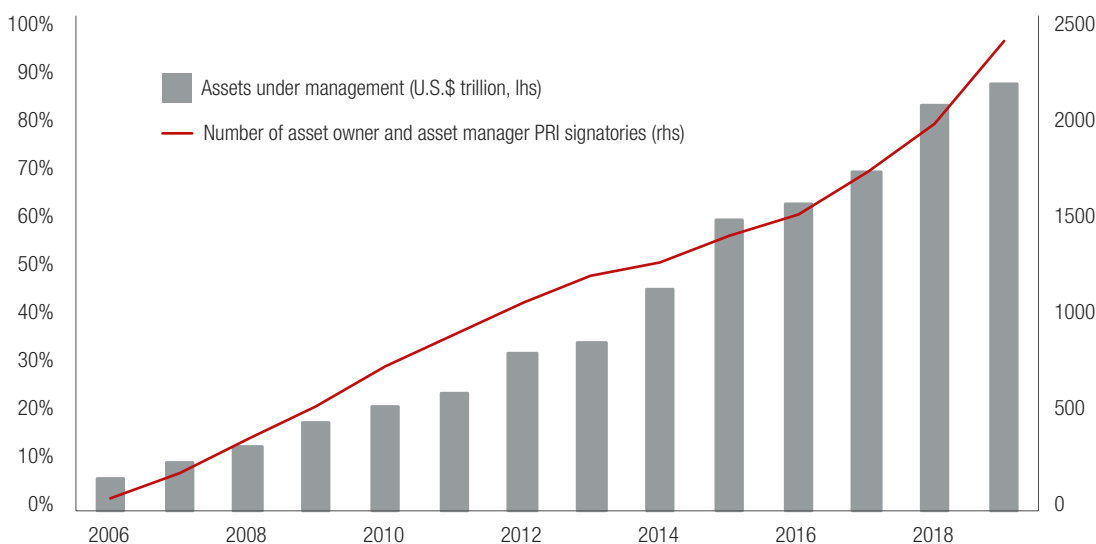
Source: PRI signatory database (data as of April each year)

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[16] Krogstrup, S., and W. Oman, 2019, "Macroeconomic and financial policies for climate change mitigation: a review of the literature," IMF working paper 19/185; EU Commission, 2019, "Political guidelines for the Next European Commission 2019-2024."

[17] PRI, 2019, "TCFD-based reporting to become mandatory for PRI signatories in 2020" https://bit.ly/36ON9XS

[18] PRI signatory database, 2020, https://bit.ly/31mzMNn

[19] NAIC Climate Risk Disclosure Survey, California Department of Insurance

[20] Bank Negara Malaysia, 2019, "Governor's keynote speech at the regional conference on climate change," September

ESG screening, with this methodology also being available for mandates. It, therefore, extends and complements the existing capabilities of the ESG Engine, which includes norms-based screens, sector exclusions, best-in-class, and screening according to the United Nations' Sustainable Development Goals, among others.

As such, this means that the DWS climate risk screening will be applied to all our ESG funds, whereby excessive climate transition risk is avoided (F) and higher levels of risk (E) and unknown risks are limited (to 5 percent each).

This will have important implications. Our work shows – for a wide capital weighted global universe including emerging markets – that excluding the highest risk band (F) reduces the carbon footprint to 90 percent, and yet keeps 99 percent of the assets since high climate transition risk is correlated with high carbon intensity. Limiting high transition risk (E) to 5 percent of the portfolio reduces the footprint to 63 percent and keeps 94 percent of the assets, and eliminating it all together reduces the footprint to 32 percent and keeps 89 percent of the assets.

When it comes to setting standards for our own ESG labeled funds, this process will set an even higher bar since we will continue to screen to ensure a minimum ESG quality, but we will now include climate transition risk as well. This means that while an issuer might qualify as a climate transition leader, if it violates another ESG aspect, such as being in breach of U.N. Global Compact, it would be disqualified from all DWS ESG labeled funds.

9. CONCLUSION

There have been significant advancements in addressing climate transition risk from an investment portfolio perspective in recent years. This has been warranted given the shortcomings of carbon footprinting as a proxy for climate risk.

> *In order to enhance our asset allocation process and given ongoing asset re-pricing risks, we not only look to incorporate less climate risk, but also to capture the low carbon investment opportunities.*

The challenge for investors has been to understand the increasing variety of climate transition risk methodologies available in the marketplace, followed by the subsequent incorporation of climate risk into the investment process.

By combining the various techniques offered by multiple data providers, we aim to capture risk across multiple dimensions that incorporate carbon intensity metrics, carbon pricing scenarios, and climate-related opportunities. This ability to identify climate risks and opportunities at a security, sub-sector, and sector level basis allows us to optimize a portfolio that not only reduces climate transition risk, but also tilts investments towards entities that promote the low carbon transition.

SHAPING A SUSTAINABLE ECONOMY: A BIRD'S EYE VIEW OF THE E.U.'S ESG REFORM PROJECT

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ABSTRACT

In March 2018, the European Commission published an ambitious Action Plan on Sustainable Finance[1], which proved to be the first step in a series of regulatory reforms aimed at fundamentally reorienting capital flows towards sustainable investment and managing perceived financial risks stemming from climate change. While the resulting reform framework is sprawling in nature, and adds to a disparate set of pre-existing regulations, the overall design forms a blueprint that will touch almost every aspect of the financial services industry and profoundly alter the language of sustainable investment. In this article, we will examine the major features of the reform project and how the new regulatory architecture will impact financial institutions based in the E.U. and further afield, alongside the question of how the reforms will flow through to commercial companies.

1. TIMING: HOW LONG DOES THE MARKET HAVE TO PREPARE?

The European Commission's (E.C.'s) eventual aim is to revise the E.U. corporate disclosure framework in line with a new "taxonomy" that is designed to create a common language around sustainability for financial institutions and corporates alike. For this reason, two key pillars of the regulatory reform agenda have been labeled the "Disclosure Regulation"[2] and the "Taxonomy Regulation"[3] respectively; it is these regulations that will set E.U. standards for disclosure and classification relating to sustainable investment. Although the Disclosure Regulation technically entered into force on December 29, 2019, it is only set to apply from March 10, 2021. However, the key provisions of the Taxonomy Regulation (the text of which has now been agreed but not yet formally published

in the Official Journal of the E.U.) will begin to apply from December 31, 2021, creating a nine-month disconnect between the two sets of requirements. Amendments to the Benchmarks Regulation will also create a new regulatory framework applying to sustainability-linked benchmarks.

A number of other proposed regulatory reforms discussed in this article are yet to be finalized (including proposals to amend major E.U. regulations including MiFID II (the revised Markets in Financial Instruments Directive and Regulation), the AIFMD (Alternative Investment Fund Managers Directive), and the UCITS (Undertakings for Collective Investment in Transferable Securities) Directive). Nonetheless, the E.C. has indicated that firms should be readying themselves for the introduction of these new standards.[4]

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[1] See communication from the Commission, "Action Plan: Financing Sustainable Growth", dated March 8, 2018.
[2] Regulation (E.U.) 2019/2088 on sustainability-related disclosures in the financial services sector.
[3] Regulation of the European Parliament and of the Council on the establishment of a framework to facilitate sustainable investment (currently in draft form).
[4] See European Commission Press Release of 04/ 01/2019.

2. A GLOBAL DRIVER FOR CHANGE?

One feature of the reforms worth noting at the outset is that their impact will not be confined to the E.U. Instead, it will extend outward to a host of non-E.U. firms with some kind of nexus to the E.U. (as a result of, say, E.U. investors or an E.U. affiliate).

2.1 Impact on non-E.U. financial institutions

In line with the E.U.'s overall aim of encouraging buy-side capital to flow towards and promote sustainable economic activity, the reforms have a particular impact on the global asset management industry. For example, where a non-EEA (European Economic Area) manager markets funds directly to EEA investors under a European national private placement regime, it may need to make certain pre-contractual disclosures in line with the Disclosure Regulation. Similarly, non-EEA sub-managers of EEA investment managers may need to assist in providing data necessary for the required ESG (environmental, social, and governance) disclosures.[5] Finally, European distributors of financial products will require issuers or "manufacturers" of those products to disclose sustainability data, regardless of where the issuer or manufacturer is based, so that the E.U. firm can comply with its own disclosure obligations.

While non-E.U. firms with no direct nexus to the E.U. will be better insulated from the impact of the new requirements, it is entirely possible that the new sustainability data required to be disclosed by E.U. firms could shape the disclosure expectations of non-E.U. investors. The effect on investor expectations may, for example, be comparable to what we have recently observed with implementation of the E.U. research unbundling rules, following which there have been calls from U.S. investors for greater transparency over research spending.

2.2 Impact on non-E.U. corporates

The E.U. reforms will undoubtedly result in a greater appetite for ESG disclosure from non-E.U., as well as E.U. issuers, although in some cases companies may find that this data is being collated by intermediary specialists rather than by financial firms themselves. Ultimately, E.U. financial institutions will need to ensure that whatever they disclose to their investors and to the market more generally can be backed up by data from investee companies; otherwise, they could be leaving themselves open to accusations of misrepresentation or mis-selling (i.e., greenwashing). In addition, it is possible

that the E.U. taxonomy will become the key point of reference for corporate disclosures required to be made to E.U. investors, despite its limitations.

Non-E.U. corporates should also bear in mind that the new disclosure rules form only one part of a wider reform project that will require E.U. asset managers in particular to take sustainability risk into account in due diligencing investment opportunities and developing corporate engagement strategies. In other words, they may see an increase in activism and direct engagement as well as just data gathering.

2.3 Impact on overseas regulators

The E.U. may succeed more generally in setting a standard that other regulators seek to replicate (albeit that there appears to be little prospect of the U.S. embarking on a similarly full-scale reform following U.S. Congress' recent rejection of proposals on increased climate change disclosure). The U.K., for example, has already indicated that its post-Brexit regulatory framework intends to "match the ambition" of the E.U.'s sustainable finance action plan. However, as is often the case, the market is moving at a far swifter pace than the legislative response, partly due to demand from institutional investors; as a result, the investment landscape may itself look different at the point that overseas regulators respond with regulatory frameworks of their own.

2.4 E, S or G?

Although the new regulatory framework does not define ESG as a concept, the definition of "sustainable investment" set out in the Disclosure Regulation clearly envisages that the concept of sustainability covers all three aspects of responsible investment, as follows:

- **Environmental investment:** described as an investment in an economic activity that contributes to an environmental objective, as measured, for example, by key resource efficiency indicators on the use of energy, renewable energy, raw materials, water and land, on the production of waste, and greenhouse gas emissions, or on its impact on biodiversity and the circular economy.

- **Social investment:** described as an investment in an economic activity that contributes to a social objective, in particular tackling inequality or fostering social cohesion, social integration and labor relations, or an investment in human capital or economically or socially disadvantaged communities.

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[5] This is a particularly common structure for UCITS.

- **Good governance investment:** here, the Disclosure Regulation indicates that, rather than good governance investments forming a specific sub-category of sustainable investments, governance will instead form a "baseline", such that an investment in an investee company may not be labeled sustainable unless the corporate itself demonstrates good governance practices (in particular with respect to sound management structures, employee relations, remuneration of staff, and tax compliance).

Notably, the Disclosure Regulation also defines "sustainability risk" as an "environmental, social or governance event or condition that, if it occurs, could cause an actual or a potential material negative impact on the value of the investment." As we will explore below, this concept of managing risk is central to much of the reform effort, and for good reason; international bodies like the Financial Stability Board have been pressing regulators to limit the systemic risk that climate change may ultimately pose to the financial markets.

3. THE TAXONOMY REGULATION: CONSTRUCTING A COMMON LANGUAGE

The E.U.'s regulatory reform initiative is underpinned by a "Taxonomy Regulation", which is intended to establish an E.U.-wide taxonomy on environmental sustainability, and to give both corporates and financial institutions a common language to identify which activities and financial instruments may be considered to be environmentally sustainable.

Pursuant to the Taxonomy Regulation, in order for an economic activity to be classified as "environmentally sustainable" it must substantially contribute to one or more specified environmental objectives, and must not simultaneously cause significant harm to another environmental objective.

These environmental objectives, as specified in the Taxonomy Regulation, are as follows:

a) Climate change mitigation.

b) Climate change adaptation.

c) The sustainable use and protection of water and marine resources.

d) The transition to a circular economy, waste prevention, and recycling.

e) Pollution prevention and control.

f) The protection of healthy ecosystems.

In order to qualify as environmentally sustainable, the activity must also be carried out in accordance with certain baseline governance and social safeguards, and must comply with "technical screening criteria" to be mandated by the E.C. With a view to fleshing out the features of the new taxonomy, a technical expert group on sustainable finance (TEG) was set up by the Commission that has now published a Technical Report on Taxonomy.[6] This report is intended to be the first step in developing a unified classification system for sustainable economic activities and the TEG has noted that, over time, it intends for the classification system to be "as comprehensive as possible and cover all relevant parts of the economy."[7]

3.1 Who will need to adopt the taxonomy?

The taxonomy will primarily drive classification and disclosure standards in relation to "green" or environmentally sustainable investment products. It will ultimately also drive disclosure standards for large corporate issuers (see below). Where a financial product does not have sustainable investment as its objective and does not promote environmental characteristics, in-scope firms will need to clearly state that the E.U. criteria for environmentally sustainable investments (as set out in the Taxonomy Regulation) have not been taken into account.

The dividing line between those financial products that fall within scope of the sustainable investment category and those that do not is likely to become a key issue once the Taxonomy and Disclosure Regulations apply, not least because the percentage share of any product's investment into environmentally sustainable economic activities will need to be disclosed where that product is marketed as being "sustainable" in nature. This disclosure threshold could be challenging to meet in practice, given that it will involve a careful analysis of all underlying investments against the new taxonomy.

3.2 What does it say on the tin?

The TEG's Technical Report does not set out to produce an exhaustive list of activities classified as "sustainable" in nature. Instead, it sets out a series of guiding principles and "technical screening criteria" (i.e., performance thresholds) intended to assess whether specific activities contribute to climate change adaptation or to an increase in climate resilience. The criteria specified under the taxonomy are not intended to function in a vacuum; rather, they will look at the wider system in which economic activities operate and take into account resources used and the infrastructure underpinning the activity.

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6   See https://bit.ly/2Tp8Eeh. Note that since this article was written, the TEG's Final Technical Report on the Taxonomy was published, which incorporates certain sector-specific feedback, but which advocates a generally similar design. See: https://bit.ly/2TFEweZ
7   See page 23 of the Technical Report.

It is important to bear in mind that a key aim of the taxonomy is to provide firms with a means of identifying which proportion of investee companies' activities are environmentally sustainable in nature. As such, the taxonomy is intended to help firms to assess which activities will ultimately remain viable in a net-zero emissions economy, alongside activities that will assist with adaptation to changing climate conditions such as rising sea levels.

3.3 How well will it function in practice?

In putting together its technical guidance, the TEG had to grapple with the question of how to put in place a workable framework enabling financial professionals with no background in natural sciences to incorporate sustainability factors into their investment decision-making processes. This is reflected in the membership of the TEG itself, which is largely made up of firms that are active in the financial services sector (e.g., banks and insurers) alongside environmental consultancies and benchmark providers. Notably, only one major corporate and one utility company is represented in the TEG.[8]

However, although the TEG has successfully constructed a methodology that is comprehensible outside of the specialist scientific communities, actually building the taxonomy into trading decisions will be another matter entirely. The TEG's technical guidance builds on existing NACE codes in particular (i.e. the existing European industry standard classification system), and in this current form it may simply not be sufficiently granular for effective incorporation into trading decisions, particularly on an automated basis. In other words, it will likely take some time for the market to construct a workable solution enabling codes and classifications based on the taxonomy to be factored into trading systems. In addition, even after firms get over the hurdle of building internal systems and controls to assess compliance with the taxonomy, ongoing maintenance will be required as new data is published and as the taxonomy itself is updated. This may ultimately require a substantial investment in time and resources for those institutions that wish to demonstrate the environmental sustainability of their investment strategies.

Another issue that may arise in applying the taxonomy is a disconnect between the data that financial firms require in order to demonstrate that an investment fits the profile of the taxonomy on the one hand, and the data that issuers are practically able to provide on the other. As we will explore below, data availability is likely to remain a serious concern for the industry in the short term at least. There is a particular issue in that financial institutions will not simply need to assess whether corporates engage in business practices that promote one specific environmental objective, but also that their activities do not "cause significant harm" to another environmental objective. Assessing this at the level of economic activities involving a complex supply chain or a number of jurisdictions may simply not be possible, and as any firm that has attempted to implement the UNPRI (United Nations-supported principles for responsible investment) will attest, different sustainability goals can at times become incompatible.

Finally, although European corporates should eventually be in a better position to disclose in line with the taxonomy (particularly given that the E.C.'s guidelines on non-financial reporting are set to reference the taxonomy), this is less likely to be the case for non-E.U. corporates. Again, this will lead to a disconnect between the new needs of E.U. financial institutions and the corporate community.

3.4 The law of unintended consequences

A key concern raised by many in the market was that codifying "best practice" around sustainability via the taxonomy could lead to firms approaching investment decisions in a binary manner by categorizing corporates as either "green" or "brown". Perhaps unsurprisingly, however, the end result is likely to be more nuanced.

Once it operates effectively, the taxonomy should in theory function simply as a yardstick to gauge where companies are on their individual journeys towards sustainable business practices. That should not in itself alter the manner in which firms incorporate ESG into their investment strategy, and financial institutions will in theory continue to be free to use ESG data in the same manner as they do currently. However, as will become clear from the regulatory reforms discussed elsewhere in this article, the taxonomy is intended to sit within a broader regulatory ecosystem that, when combined with investor pressure, will push investment strategies towards a greater consideration of ESG and sustainability risk.

The result of this is that the potential rewards attaching to stewardship and investor engagement with corporates currently ranking lower on the sustainability scale may ultimately increase (i.e., as investee companies' value becomes more intrinsically linked to their sustainability profile). However, it is also entirely possible that screening practices drawing

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8 See https://bit.ly/39nx9hK

from the taxonomy will proliferate, particularly amongst firms operating passive strategies, but also amongst those firms operating as non-bank credit providers or investors. Thus, if the European taxonomy achieves its goal of becoming a key baseline for sustainability data, it could conceivably contribute to overpricing of securities in certain sectors (e.g., renewables) simply because their issuers fit the parameters set by the taxonomy, whilst having a negative impact on access to funding by those entities that are not sufficiently sophisticated to disclose in line with the taxonomy.

4. GOVERNANCE REFORM: MIND OVER MARGINS?

The E.U. has set itself a major challenge of reorientating investor capital towards sustainable investment, given the ambitious targets it has set (which include closing a stated annual investment gap of almost €180 billion).[9] One method that the European Securities and Markets Authority (ESMA) is proposing to adopt in order to help achieve this aim is to embed a consideration of sustainability into the organizational requirements applying to E.U. asset managers and investment firms. For example, ESMA has proposed that E.U. asset managers (of both alternative investment funds and UCITS) be required to take sustainability risks into account when establishing decision making procedures, allocating responsibilities, and ensuring compliance with their internal procedures.[10] Asset managers will also need to consider whether they have the necessary internal expertise for the "effective integration of sustainability risks" into their governance structure, and that there is ultimate oversight of sustainability risk by senior management.

E.U. investment firms (a category that covers a wide range of regulated firms, from major broker-dealers through to retail investment advisors) would also need to build "ESG considerations" into their organizational framework under a similar set of proposals.[11] Notably, and unlike in the asset management space, this requirement is only set to apply where ESG considerations are actually relevant to the provision of investment services to clients. However, given

that reforms to other aspects of the regulatory framework will incentivize both regulated firms and their clients to consider the ESG profile of investments in a wider range of scenarios, ESG considerations are increasingly likely to become relevant to investment advisory and portfolio management services in particular.

These "organizational" reforms indicate that E.U. regulators are seeking to effect a cultural shift at the heart of financial institutions. Rather than simply requiring firms to put in place an ESG policy for their trading personnel, the aim is to require decision-makers and senior managers to engage with the issue in a top-down manner. Although ESMA has indicated that regulated firms do not all need to go out and hire sustainability officers,[12] there will be some work to do around assessing whether firms have requisite expertise to interrogate ESG-linked data, and that they have the right governance arrangements around the purchase of third-party research. At the same time, however, issues around the climate impact of investments cannot simply be examined in a silo within the business; board-level and senior management must be in a position to interrogate their firm's overall approach to sustainability and what it ultimately means for clients and investors.[13]

The aim here is not by any means, however, to force all asset managers down a narrow path of activist investment. The choice of wording around sustainability "risk"[14] rather than ESG issues more generally suggests that the aim is instead to ensure that the investor community is not seen to be contributing to overall macroeconomic risk deriving from climate change. Eventually, however, it is conceivable that this assessment of sustainability risk could extend outward to encompass other longer-term issues facing the real economy, such as digitalization and automation. This all fits in with the E.U.'s more general drive to address what regulators perceive as "short-termism" in the capital markets, which has itself arisen from a concern that current decision-making within corporates does not take a sufficiently long-term view of the business (thus reducing the incentives for corporates to move towards a more sustainable operating model).[15]

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[9] The E.C. has calculated that in order to make the E.U. climate-neutral by 2050, Europe needs to secure between €175 to €290 billion in additional yearly investment in the next decades.

[10] See ESMA final report on technical advice to the European Commission on integrating sustainability risks and factors into the UCITS Directive and the AIFMD (ESMA34-45-688).

[11] See ESMA final report on technical advice to the European Commission on integrating sustainability risks and factors into MiFID II (ESMA35-43-1737).

[12] See ESMA Final Report

[13] See ESMA Final Report

[14] Defined in the Disclosure Regulation as "an environmental, social or governance event or condition that, if it occurs, could cause an actual or a potential material negative impact on the value of the investment."

[15] See ESMA's survey on short-term pressure on corporations from the financial sector.

5. CREATING A DIALOGUE: HOW WILL THE REFORMS FLOW THROUGH TO THE REAL ECONOMY?

Pursuant to ESMA's proposed reforms, asset managers will be required to take sustainability into account when performing due diligence on and monitoring investments. Specifically, they will be required to consider sustainability risks and the principal adverse impact of investment decisions on "sustainability factors" (defined in the Disclosure Regulation as environmental, social, and employee matters, respect for human rights, anti-corruption, and anti-bribery matters) when making investment decisions.

Embedding a regulatory obligation to take the sustainability profile of investments into account when making investment decisions, alongside the regulatory push for ESG disclosure detailed above, will likely lead to more active engagement between corporates and the investor community. There will also be increased demand for corporate disclosure around ESG. The E.U. is aware of this need for disclosure, however, and is considering various options to improve standardization of disclosure within the corporate sector. The Taxonomy Regulation, for example, will require larger listed companies that are within scope of the E.U. Non-Financial Reporting Directive to indicate the proportion of their turnover, capital expenditure, or operating expenditure that is associated with activities classified as environmentally sustainable according to the E.U. taxonomy. Corporates may also find themselves subject to increasing state-level intervention, particularly following the publication of the so-called "European Climate Law", which is set to make cutting greenhouse gas emissions to net zero legally binding by 2050.

Nonetheless, this new corporate disclosure regime will have limitations. In particular, while it is a move towards a common set of standards, there will likely still be an initial lack of standardization in corporate disclosures as the corporate community attempts to apply the taxonomy in a practical context. There is also the issue that smaller corporates will simply fall outside of the disclosure regime. Although the Recitals to the Taxonomy Regulation note that SMEs may voluntarily decide to disclose against the standards, many will simply not have the technical expertise or resources necessary to produce quality ESG and non-financial data disclosures, which could ultimately have a negative impact on their ability to seek out financing opportunities.

Over time, however, a move away from ad-hoc qualitative disclosures that are prepared using a variety of methods by a multiplicity of third-party intermediaries will not only be an improvement on the current position, it will be crucial to achieving the E.U.'s goal of moving capital towards sustainable investments while limiting the potential for inadvertent mischaracterization of the sustainability profile of investments.

5.1 Voting for change?

ESMA has proposed that, "where applicable", asset managers will also be required to develop corporate engagement strategies (including the exercise of voting rights) with a view to reducing the principal adverse impact of investee companies on sustainability factors. It is currently unclear, however, how far this proposed requirement is intended to extend. For example, there is no definition of "investee company" given for these purposes, or any shareholding threshold beyond which firms will need to begin engaging around ESG issues (or even whether a substantial investment in a debt issuance rather than equity would, for example, result in an "investee company" relationship).

This new language also suggests that asset managers could in the future be faced with situations where their regulatory obligation to engage with investee companies over long-term sustainability issues begins to conflict with the manager's commercial need to demonstrate profits to investors over a far shorter time horizon. In an environment where investors contact their manager after a few bad weeks, it is easy to envisage the tensions that may arise.

6. A NEW DISCLOSURE REGIME

Pursuant to the Disclosure Regulation, a range of E.U. financial institutions, including asset managers, banks, and investment firms, along with certain insurers and pension providers, will be required to post a number of sustainability-linked disclosures on their websites. These disclosures will include:

- A policy on the firm's approach to sustainability risk.
- Data on whether, and if so how, the firm takes into account the "principal adverse impacts" of its investment decisions or advice on sustainability.
- How the firm's remuneration policies are consistent with the integration of sustainability risks.

As with much of the revised regulatory framework, this new requirement will largely bite where firms provide either advice or portfolio/asset management services, and the required disclosures will need to summarize the integration of sustainability risks into the firm's investment decision making processes, investment advice, or insurance advice, as relevant.

In-scope firm will also need to include disclosures on sustainability risks in their pre-contractual disclosures, describing the manner in which sustainability "risks" have been integrated into the firm's investment decisions or advice, and the "likely impact" on the returns of financial products made available or advised upon by the firm.

6.1 Potential disclosure pitfalls

Whilst the remuneration framework may not at first glance appear the most natural means of advancing the E.U.'s ESG agenda, the reference to remuneration policies is consistent with an increasing trend towards the use of remuneration to promote compliance culture within firms. In this case, the aim is to discourage "excessive risk-taking with respect to sustainability risks." Nonetheless, in an environment where sustainability risk is itself challenging to quantify and price into investment strategies, it is unclear what bar would need to be met in order to apply changes to an individual's remuneration (e.g., by reduction in a bonus prior to vesting) as a result of exposing the firm to unacceptable sustainability risk.

A more pervasive concern for firms caught by the scope of the Disclosure Regulation will no doubt be the potential for inadvertent misrepresentation around the ESG profile of products or services being offered, and the potential for clients or investors to hold firms to account regarding statements on sustainability. Assessing the likely impact of sustainability risks on the returns of financial products is, in particular, a rather subjective analysis and clearly open to challenge. The best defense will be to ensure that any investment decisions or advice is given on the basis of sound data and monitoring practices relating to sustainability, although this again raises the issue of access to quality datasets. Even for those firms that regard issues with data quality as opportunities to deliver alpha (i.e., by employing their own quantitative solutions to price sustainability risk more accurately than their competitors), making a public disclosure to the market around strategy will always come with a risk.

Given that short selling strategies are viewed by a number of market players as an effective means of managing sustainability risk, another specific concern may arise in relation to disclosure of short sales. For example, a failure to effectively disclose shorting of screened assets could create issues with investors who have been operating on the assumption that certain assets are effectively excluded from a portfolio.

Finally, although there is scope for firms to avoid making the detailed disclosures referred to above by stating that sustainability risks are not relevant to their investment decisions, they will need to provide a clear explanation of why this is not the case. Simply stating that sustainability is not relevant to the service being provided will prove tricky, however, where firms have had interactions with individual

clients or investors such as institutional investors around the integration of sustainability into their investment strategies. In other words, signing up to the UNPRI and assuring major investors that an investment strategy takes sustainability into account will not sit comfortably with a public statement that sustainability risk is irrelevant.

6.2 Products promoting ESG

The Disclosure Regulation also contemplates that certain additional transparency requirements will apply to any financial product that "promotes, among other characteristics, environmental or social characteristics, or a combination of those characteristics," and to financial products that have sustainable investment as their "objective". It is at present, however, rather unclear where the dividing line sits between products where sustainability risk is "relevant", and products which actively "promote" or have as their "objective" ESG goals, and which are therefore subject to a higher degree of compliance. Indeed, as issues of sustainability grow in relevance across the market, the dividing line between investments that "promote" or "seek to achieve" sustainability and those that simply have regard to, or incorporate a consideration of sustainability risk may grow increasingly murky.

6.3 Scope creep

Given the scope of application of the Disclosure Regulation, this is an area where E.U. law could inadvertently end up colliding with local regulation. Where non-EEA asset managers market funds to EEA investors under the AIFMD regime, for example, it appears that they will need to comply with the pre-contractual disclosure requirements mentioned above.[16] Where they use E.U. intermediaries to market their funds, they may also need to supply those intermediaries with ESG data as a result of the revised product governance framework outlined below. However, asset managers established outside of the EEA may well have concerns around providing only one sector of their investor base with ESG data in the standardized format required under the revised regulatory framework. There has already been a fair amount of thinking done in the U.S. around when and how incorporating sustainability risk and ESG considerations into investment advisory relationships could coexist with, or alternatively conflict with, the advisor's fiduciary duty, for example; this delicate balancing act may not sit particularly comfortably with the E.U.'s push for sustainability to be incorporated into investment decisions.

7. GREENWASHING RISK

In the midst of this move towards greater levels of transparency, E.U. and non-E.U. financial institutions and corporates alike would be well advised to consider the risks inherent in ESG disclosure. Greenwashing (i.e., the practice of making unsubstantiated or misleading claims about the environmental benefits of a product, service, technology, or company practice is likely to become an increasing concern in light of the reforms discussed in this article. Indeed, the E.U. conflicts of interest regime is set to be updated to refer to conflicts inherent in the misrepresentation of products or investment strategies as fulfilling ESG preferences where in fact they do not. This will provide an additional "hook" for regulators to enforce against perceived greenwashing.

> *As issues of sustainability grow in relevance across the market, the dividing line between investments that "promote" or "seek to achieve" sustainability and those that simply have regard to, or incorporate a consideration of sustainability risk may grow increasingly murky.*

Alongside the proposal to require larger E.U. issuers to disclose in line with the E.U. taxonomy, however, there are a number of new features of the regulatory framework that should in theory assist firms with accessing reliable data on sustainability. This will be key to limiting regulated firms' potential exposure to greenwashing risk. For example:

- ESMA has proposed new guidelines on ESG disclosure requirements for credit ratings agencies (CRAs), which aim to increase transparency around whether ESG factors are a key underlying element of credit ratings. So, for example, where ESG factors have been taken into account by a CRA, the CRA will need to indicate how ESG considerations have been factored into its rating.

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[16] This is because the requirement would sit within Article 23 of the AIFMD, which applies to any alternative investment fund manager (AIFM) that markets its funds to EEA investors under national marketing regimes permitted by AIFMD, regardless of whether the manager is established in the EEA or in a non-EEA jurisdiction.

- The E.U. Technical Expert Group on Sustainable Finance has produced a report proposing an "E.U. Green Bond Standard",[17] which is intended to be a voluntary code applying to any type of listed or unlisted bond issued by an E.U. or international issuer.[18] Pursuant to the proposed standard, any proceeds from the sale of E.U. green bonds (or an amount equivalent to the proceeds) would need to be used to finance or refinance "green projects" (i.e., projects contributing substantially to at least one of the environmental objectives set out in the Taxonomy Regulation) in order for the debt issuance to be classed as an E.U. green bond issuance. In addition, an accredited "verifier" would need to verify the alignment of the bond issuance with the E.U. Green Bond Standard. This proposal would provide some market discipline in an area where issuers are not at present subject to particularly rigorous constraints around use of proceeds etc.

- Amendments to the E.U. Benchmarks Regulation will result in the creation of two new categories of benchmarks, which are designed to reflect portfolios of assets with lower carbon emissions than standard benchmarks (an "E.U. Paris-aligned benchmark" and an "E.U. climate transition benchmark"). These new benchmarks should do the job of tracking whether securities included in the benchmarks are truly "green" in nature. There will also be a more general obligation for administrators of ESG-focused benchmarks to provide an explanation of how the key elements of their methodology reflect ESG factors.

The above revisions to the Benchmarks Regulation will be key in particular for ESG-focused or green funds that use a benchmark to measure their performance, given that they will need to disclose information on how any such benchmark is consistent with the environmental or social characteristics of the fund (e.g., where the benchmark is used by the fund as a reference to measure performance). If the revisions to the Benchmarks Regulation do not perform as intended, there is a real risk of a disconnect arising between the information on benchmark administration that managers require and the data that administrators are willing to disclose to the market.

More generally, as ESG data becomes increasingly price sensitive, we may well see regulatory authorities globally becoming increasingly focused on the quality of, and supporting

evidence for, data being disclosed to the market. Steven Maijoor (Chair of ESMA), for example, recently stated that ESG ratings are not currently subject to an "optimal" level of public scrutiny, noting that the lack of clarity underpinning scoring mechanisms and the diversity of approaches to assessment make it more challenging to effectively compare sustainable investments.[19]

8. TRACKING THE PREFERENCES OF END-INVESTORS

The E.U.'s goal is for ESG data to flow throughout the financial system; in other words, it should not simply be reserved for consumption by sophisticated professional investors, but should also be available in some form to retail end-investors. The E.C. has expressed concern that, at present, only a minority of clients receiving investment advice proactively raise ESG issues, and that there is currently a limited understanding amongst clients around the impact of ESG factors on risk and performance.[20] Two key methods that the E.U. is proposing to adopt in order to rectify this lack of engagement with end-clients are:

- Requiring firms to define a "target market" for financial products by reference to ESG preferences.
- Incorporating an assessment of each end-client's ESG preferences into the suitability test applying to investment advice, advice on insurance-based investment products, and portfolio management services.

Requiring firms to engage with the expectations and preferences of end clients in this way could ultimately prove a powerful tool in shaping the focus given to ESG issues in the retail market. This will in turn form one of many drivers pushing corporate issuers towards a greater consideration of ESG, particularly given increasing industry moves to open up the equities market to retail investors.

8.1 Assessing end-client preferences

Pursuant to E.U. product governance rules, when banks or investment firms sell or "distribute" financial instruments to their clients, they need to establish what the "target market" for those financial instruments should be. Pursuant to ESMA's proposed reforms,[21] E.U. distributors will need to define

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[17] See TEG's report on E.U. Green Bond Standard.

[18] The E.U. Green Bond Standard seems likely to supplant the ICMA (International Capital Markets Association) Green Bond Principles, which are currently considered to set market-standard criteria for green bonds.

[19] See https://bit.ly/2IiyJ8A

[20] See Explanatory Memorandum to the Final Report.

[21] See ESMA final report on technical advice to the European Commission on integrating sustainability risks and factors into MiFID II (ESMA35-43-1737).

target markets by reference to their ESG preferences "where relevant". ESMA appears to have left this test of relevance deliberately vague, however, noting that the amendments to the product governance regime "are currently just a first step of a more extensive project," and that this more flexible approach is "meant as a starting point" that "allows market participants to accommodate themselves to ESG-requirements in the context of Product Governance."

8.2 Engaging with end-clients

When providing investment advice or portfolio management services, E.U. investment firms and banks are required to obtain information from each of their clients on matters such as their financial situation and investment objectives, in order to assess whether the product or service in question is suitable for that client. However, under the current regime, the information sought by firms about their clients' investment objectives will generally relate to financial objectives, while non-financial objectives (including ESG preferences) are rarely addressed. The E.C.'s proposed reforms, therefore, aim to build an assessment of each client's ESG preferences into the suitability test.[22] Firms undertaking a suitability test will, for example, need to disclose information on the ESG characteristics of products offered to clients, and explain how the client's ESG preferences have been taken into account in selecting the product or providing the portfolio management service.

9. CONCLUSION

Whether the E.U.'s regulatory reforms will accomplish what they have set out to do and close the substantial investment gap needed to move Europe towards carbon neutrality remains to be seen. Ultimately, although regulators can come up with a set of best practices and lawyers can advise on them, it will be left to the market to come up with solutions to pricing, disclosing, and incorporating sustainability risk into investment decisions.

The scale of reform may well be unpopular amongst those firms that do not perceive themselves as activist investors and that are still struggling to adjust to the substantial compliance burden of post-crisis regulatory reform. For those firms that do already operate green funds or investment strategies, compliance with the new reforms may come at an unwelcome cost. However, the shift towards sustainable investments is already happening, and it is unarguably important for regulators to provide greater certainty and more effective supervision of the negative practices that could spring up in this new environment.

One thing that is certain is that in this new world, there will undoubtedly be some winners, some losers, and some casualties, and those firms that do not aim to get ahead of the agenda may simply find that they are left behind.

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[22] See draft Delegated Regulation amending Delegated Regulation (EU) 2017/565 as regards the integration of ESG considerations and preferences into investment advice and portfolio management, and draft Delegated Regulation amending Delegated Regulation (EU) 2017/2359 as regards the integration of ESG considerations and preferences into investment advice for IBIPs.

ESG AND THE DUTIES OF INVESTMENT MANAGERS EXAMINED

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ABSTRACT

There has been a shift in thinking among industry stakeholders, policymakers, and regulators alike towards viewing environmental, social and governance (ESG) issues as financial risks that can have a material impact on investment performance. This has resulted in legislative and regulatory changes in the U.K. and the E.U., seeking to clarify that ESG issues are financially material, which may in turn impact the interpretation of investment managers' fiduciary duties, tortious and contractual duties, as well as their regulatory duties. This article will discuss the duties of investment managers, consider how ESG issues interact with those duties, and explore how recent legislative and regulatory changes may impact the applicable legal liability regime.

1. INTRODUCTION

Investment managers owe duties to their clients, where they exercise discretionary power over their portfolios. The duties by which investment managers are bound fall into four main categories: a (tortious) duty to exercise due skill, care and diligence, fiduciary duties of trust and loyalty, contractual duties as set out under the Investment Management Agreement (IMA), and duties arising from the regulatory framework. There is significant interplay between these duties: the principles underlying fiduciary and tortious duties have influenced the regulatory framework, and regulatory rules and guidance help define the scope of duties applied at common law. This article will discuss the duties of investment managers, consider how environmental, social and governance (ESG) issues interact with those duties, and explore how recent legislative and regulatory changes may impact the applicable legal liability regime.

It has been the subject of extensive debate whether investment managers and other institutional investors are permitted and/or required to consider ESG issues when discharging duties to their clients or beneficiaries. Institutional investors have traditionally viewed their duties as being defined exclusively by the pursuit of financial returns, causing them necessarily to dismiss the consideration of ESG issues as being ethical or moral considerations that should not be taken into account. However, there has been a shift in thinking among industry stakeholders, policymakers, and regulators alike towards viewing ESG issues as financial risks that can have an impact on investment performance. This has resulted in legislative and regulatory changes in the U.K. and E.U., seeking to clarify that ESG issues are financially material, which may in turn impact the interpretation of investment managers' fiduciary duties, tortious and contractual duties, as well as their regulatory duties.

2. FIDUCIARY DUTIES

The underlying feature of fiduciary duties is the obligation of loyalty and fidelity, as opposed to a duty to act competently, which is covered by tortious and contractual duties. The core duties that a fiduciary must uphold at all times are: (1) a duty to avoid acting where there is a conflict between the fiduciary's duty and his or her own interests, or a conflict between duties owed to multiple principals (no conflict rule) and (2) a duty not to make an unauthorized profit from the

fiduciary's position (no profit rule).[1] These are negative duties, in that that they proscribe a fiduciary from engaging in disloyal or dishonest conduct.[2] While there may also be a positive duty for the fiduciary to act in the best interests of the principal, this can be viewed as a combination of the established duties and not a separate duty. It should be remembered that the recast Markets in Financial Instruments Directive (MiFID II) requires firms to act honestly, fairly, and professionally in accordance with the best interests of their clients when providing investment services or ancillary services, which can be viewed as a positive (regulatory) duty with fiduciary characteristics.[3]

In addition, a duty to act in good faith may be considered a fiduciary duty,[4] but a fiduciary would be held to account for breaching the core duties even where he/she has acted honestly and well-intentioned.[5] It should be noted that the IMA typically purports to exclude the general application of fiduciary duties to the investment manager, as under the Investment Association's Model IMA.[6] As a general rule, such terms will be upheld on the basis that the scope of fiduciary duties is to be defined by the terms of the agency contract, so long as they are clear, unambiguous, and reasonable, and are consistent with the limits imposed at common law on the construction of exclusion clauses.[7]

There are important questions around whether the consideration of ESG factors is consistent with the fiduciary duties of investment managers and other institutional investors. There has been a series of research papers, coordinated by the United Nations Environment Program Finance Initiative (UNEP FI), analyzing fiduciary duties and the consideration of ESG factors on a cross-jurisdictional basis. Three reports have been published so far: the Freshfields Report (2005),[8] Fiduciary II (2009),[9] and Fiduciary Duty in the 21st Century (2015).[10] The central argument of the UNEP FI is that the integration of ESG considerations into investment decision making is consistent with the fiduciary duties of institutional investors, as these are long-term investment value drivers.[11] As such, UNEP FI concludes that investment approaches that take into account ESG factors are clearly permissible and arguably required.

Investment managers will generally be permitted to consider ESG factors in the investment process where they are aligned to the objectives of the portfolio. Given that the purpose of the portfolio is normally to produce a financial return for the investor, the incorporation of ESG principles must be consistent with this core objective. According to Cowan v Scargill, a case concerning pension fund trustees where the purpose of the fund is the provision of financial benefits, the best interests of the beneficiaries are normally their best financial interests, without reference to moral or political considerations.[12] Furthermore, Martin v Edinburgh District Council provides that there is a duty not to fetter investment discretions for extraneous reasons, such as those of a political or moral nature.[13] While not focused specifically on modern ESG investing, these judgments indicate that fiduciary duties require the manager to pursue the client's financial objectives where this is the purpose of the portfolio's mandate. As such, there is no legal basis for an investment manager to prioritize moral or ethical considerations over financial performance, unless agreed under the mandate. However, the consideration of ESG factors may also contribute to achieving the client's financial objectives, which means that there can be an alignment of ethical considerations and financial returns. The consideration of ESG factors may be compatible with a requirement to serve the client's best interests even where fiduciary duties are defined by the pursuit of financial returns, so long as this is undertaken in order to promote the client's financial objectives rather than the ethical views of the investment manager.

1   Law Commission, 2014, "The fiduciary duties of investment intermediaries," (Law Com No 350, 2014), para. 3.28.
2   Attorney-General v Blake [1998] Ch 439 [455].
3   Directive 2014/65/EU on markets in financial instruments and amending Directive 2002/92/EC and Directive 2011/61/EU [2014] OJ L173, Article 24(1).
4   Bristol and West Building Society v Mothew [1997] 2 WLR 436 [18].
5   Regal (Hastings) Ltd v Gulliver [1967] 2 AC 134 (HL) [142].
6   The Investment Association, 2018, "Model discretionary investment management agreement," May, accessed 24 September 2019, Clause 20.
7   Kelly v Cooper [1993] AC 205
8   United Nations Environmental Programme Finance Initiative, 2005, "A legal framework for the integration of environmental, social and governance issues into institutional investment," https://bit.ly/2RkbeQA
9   United Nations Environmental Programme Finance Initiative, 2008, "Fiduciary responsibility legal and practical aspects of integrating environmental, social and governance issues into institutional investment," https://bit.ly/2FVZpe4
10 United Nations Environmental Programme Finance Initiative, 2014, "Fiduciary duty in the 21st Century," https://bit.ly/373muYg
11 Principles for Responsible Investment, 2015, "Fiduciary duty in the 21st Century," September 8, accessed 30 August 2019, p 16.
12 Cowan v Scargill [1984] 3 WLR 501.
13 Martin v Edinburgh District Council [1988] S.C.L.R. 90.

The amended Occupational Pension Scheme (Investment) Regulations 2005 (OPS Regulations) define "financially material considerations" as including ESG factors.[14] This puts on a statutory footing the concept that ESG factors contribute to financial performance, and, therefore, that the incorporation of ESG factors is consistent with fiduciary duties, where defined in terms of the beneficiary's best financial interests. Although the OPS Regulations are applicable to pension fund trustees, the amendment may also influence the interpretation of the fiduciary duties of investment managers, such that the incorporation of ESG factors would be deemed consistent with pursuing financial returns on clients' portfolios. In addition, the IMA between the investment manager and the pension fund trustee will usually include a term requiring the former to comply with the latter's statement of investment principles (SIP). The SIP must cover inter alia the pension fund trustee's policies in relation to financially material considerations over the appropriate time horizon of the investments, including how these are taken into account in the selection, retention, and realization of investments.[15] A direct obligation would, therefore, be imposed on investment managers to consider ESG factors as financially material considerations in managing pension fund assets, where they are required to comply with the SIP under contract. It should also be noted that trustees will need to disclose in the SIP how they incentivize asset managers to align their investment strategy and decisions with the trustees' policies.[16] This creates a "comply or explain" obligation for pension fund trustees to incentivize the investment manager to incorporate ESG objectives into its investment approach through alignment with the trustee's policies.

It is also significant that the E.U. Sustainability-related Disclosures Regulation defines "sustainability risk" as an ESG event or condition that, if it occurs, could cause an actual or a potential material negative impact on the value of the investment.[17] The concept that ESG factors impact on financial returns is, therefore, also set to be codified under E.U. law applicable to financial market participants and financial advisors. This provides further support for the position that ESG factors should be considered by investment managers where fiduciary duties are characterized by a requirement to pursue the client's best financial interests.

The consideration of ESG factors must support the investment strategy and objectives agreed with the client to ensure that his or her financial interests are prioritized. Whether the client has a short-term or long-term time horizon may be particularly significant in determining alignment of ESG factors with the client's financial objectives. It has traditionally been argued by proponents of ESG investing that such strategies produce stronger and more sustainable returns in the long term, rather than the short term. Indeed, in the U.K. government's response to "Clarifying and strengthening trustees' investment duties", it states that, while the risks and opportunities presented by ESG factors are not exclusively long term, they often are long term, as the risks from mispricing assets increases as time passes.[18] If the financial benefits of incorporating ESG factors only materialize in the long term, it may be considered that the client's best interests would only be served where he or she has instructed the manager to pursue a long-term time horizon. As such, where the client has a short-term time horizon, it may not be in the client's best interests to incorporate ESG factors as the financial benefits of such a strategy may not materialize within this timeframe.

However, one notable exception to the view that the financial benefits of ESG investing are long term is the impact of climate change on the performance and risk profile of financial institutions. The U.K.'s Prudential Regulation Authority (PRA) recently stated that, while the financial risks from climate change may crystallize in full over longer time horizons, they are also becoming apparent now.[19] The PRA considers that the financial risks from physical and transition risk factors are far-reaching in breath and magnitude, and while the time horizons over which financial risks may be realized are uncertain, there is a high degree of certainty that such risks will occur. This may indicate that, in order to serve the client's best financial interests, investment managers should at least consider the extent to which companies mitigate the risks associated with climate change in the investment decision making process, even where the client has a short-term horizon. Although

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14 The Pension Protection Fund (Pensionable Service) and Occupational Pension Schemes (Investment and Disclosure) (Amendment and Modification) Regulations 2018, SI 2018/988, Regulation 4.

15 The Occupational Pension Schemes (Investment and Disclosure) (Amendment) Regulations 2019, SI 2019/982, Regulation 2(3)

16 The Occupational Pension Schemes Regulations 2019 (n 15), Regulation 2(4).

17 Regulation (E.U.) 2019/2088 on sustainability-related disclosures in the financial sector [2019] OJ L317/1, Article 2(24).

18 Department for Work & Pensions, Clarifying and strengthening trustees' investment duties: Government response; The Occupational Pension Schemes (Investment and Disclosure) (Amendment) Regulations 2018 (now the Pension Protection Fund (Pensionable Service) and Occupational Pension Schemes (Investment and Disclosure) (Amendment and Modification) Regulations 2018) (2018), 19-20.

19 Prudential Regulation Authority, 2019, "Enhancing banks' and insurers' approaches to managing the financial risks from climate change," Supervisory Statement 3/19

investment managers are not typically subject to PRA regulation, the statement could suggest a broader shift in regulatory thinking around climate change risk.

Stewardship or "active ownership" by institutional investors is a core component of an effective ESG investing strategy. The "Proposed Revision to the UK Stewardship Code" proposes to make explicit references to ESG factors, reflecting the significant developments that have taken place in sustainable finance, responsible investment, and stewardship since the Stewardship Code (the Code) was last updated in 2012. Under the draft proposals, signatories would be expected to take into account material ESG factors, including climate change, when fulfilling their stewardship responsibilities. It should be noted that the FCA requires all U.K. investment managers to disclose the nature of their commitment to the Code or, where they do not commit to the Code, their alternative investment strategy.[20] While the Code is not binding on investment managers, the draft proposals will have the effect of defining the investment manager's fiduciary duties as consistent with incorporating ESG factors in fulfilling their stewardship responsibilities.

3. DUTY OF CARE

A duty to exercise due skill, care, and diligence is owed by investment managers to their clients, which requires them to meet a certain standard of care when selecting and acquiring or disposing of investments for the clients' portfolios. It should be noted that, while the relationship between the parties can also give rise to concurrent duties of care in tort and contract, the scope of this duty is the same as that expressly set out in the contract.[21] A breach of the duty of care will result where the manager falls below the standard of care, defined by reference to that expected of an ordinary investment manager who professes to have the skills required to service the type of portfolio in question. Given the high level of sophistication in modern investment management and specialist skills that managers are expected to possess in relation to specific asset classes, markets, and strategies, the standard of care should be tailored to the type of portfolio. For example, the expertise required to manage a portfolio of equities would differ significantly to one of bonds or derivatives, as would a long-term strategy compared with a short-term strategy. Where specific expertise is required to effectively manage the

> *Regulatory rules and guidance may have the effect of creating obligations at common law for investment managers to consider climate change risks, as such standards serve as a baseline for determining the standard of care applied by the courts.*

client's portfolio in accordance with the agreed investment strategy, this is reflected in the standard of care expected of the manager.

As the regulatory framework concerning climate change and other ESG issues continues to develop, rules and guidance may have the effect of creating obligations at common law for investment managers to consider climate change risks, as such standards serve as a baseline for determining the standard of care applied by the courts. In Shore v Sedgwick Financial Services, it was stated that the skill and care to be expected of a reasonably competent advisor ordinarily includes compliance with regulatory rules,[22] and in Seymour v Caroline Ockwell, while the duty of care owed at common law is not necessarily co-extensive with the duties owed under the regulatory regime, this afforded strong evidence as to what is expected of a competent advisor in most situations.[23] However, according to Gorham v British Telecommunications, the courts are not excluded from making their own assessment, but may determine the standard of care in the context of rules and codes of practice and are expected to attach considerable weight to them.[24] This principle of using regulatory rules and guidance to interpret the standard of care may also apply where duties arise from contract, as in SPL Private Finance v Arch Financial Products, where the court was prepared to interpret a term of the IMA in line with "principles of good market practice", referring to the FCA Principles for Business.[25]

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[20] Financial Conduct Authority, Conduct of business sourcebook, Handbook, 2.2.3 R.
[21] South Australia Asset Management Corp v York Montague Ltd [1997] AC 191 (HL) [211].
[22] Shore v Sedgwick Financial Services Ltd [2007] EWHC 2509 [161].
[23] Seymour v Caroline Ockwell & Co [2005] EWHC 1137 [77].
[24] Gorham v British Telecommunications Plc [2000] 1 WLR 2129 [2141].
[25] SPL Private Finance (PF1) IC Limited and 17 Others v Arch Financial Products LLP [2014] EWHC 4268 [178]. The relevant term pertained to the management of conflicts of interest, but may nevertheless indicate the court's willingness to interpret the contractual duty of care in line with regulatory rules and guidance.

It is significant that the FCA has set out its objective to ensure that regulated financial services firms integrate consideration of long-term climate change risks and opportunities into the business, risk, and investment decisions they make, where such long-term considerations are appropriate.[26] The FCA will expect that regulated financial services firms consider climate change risks and opportunities in both the design and delivery of their products, which includes both segregated portfolios and pooled funds.

There is a regulatory expectation that investment managers and other firms should take steps to integrate climate change risks and opportunities. Although the FCA has not yet published final rules and/or guidance on climate change and green finance, it is anticipated that such measures will be introduced in due course. Furthermore, if the U.K. implements the Sustainability-related Disclosures Regulation, financial market participants (including investment managers) would be required to disclose how they integrate sustainability risks into their investment decision-making processes.[27] This could lead to a position where investment managers attract private law liability for failing to take climate change and other sustainability risks into account and/or such matters were not adequately disclosed to the client, in particular where this causes a significant decrease in value of the client's portfolio. The standard of care applicable to the manager at common law would be interpreted in line with the applicable regulatory framework, which may include expectations around managing the risks from climate change appropriately.

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[26] Financial Conduct Authority, 2019, "Climate change and green finance: summary of responses and next steps, Feedback to DP18/9," Feedback Statement 19/6

[27] The UK's decision to withdraw from the European Union has created some uncertainty around whether the UK will implement the legislation under the EU Sustainable Finance Action Plan.

4. CONCLUSION

It is becoming increasingly clear that investment managers must consider ESG factors in discharging their duty of care and fiduciary duties to their clients. For the first time, the concept that ESG factors are financially material considerations has been codified in U.K. statute, putting it beyond doubt that pension fund trustees are permitted to take such matters into account when serving their clients' best financial interests. This will have a broader impact on how institutional investors, such as investment managers, think about their duties to their clients and that they need to consider a wider range of issues when pursuing their clients' best financial interests, particularly in the longer term. While at present climate change risk is high on the supervisory agenda – perhaps reflecting political trends – it is highly likely that regulators will extend their focus to other ESG issues and introduce rules and guidance compelling investment managers and other regulated firms to incorporate ESG into their financial decision making processes. These trends point to increased legal and regulatory risk and the potential for investment managers to be held to account for losses related to inadequate consideration of ESG issues. In this fast-moving area of law and regulation, it is vital that investment managers and other regulated firms are aware of their obligations in relation to ESG and take active steps to ensure that such risks to their clients and business are appropriately managed.

GRETA'S EXPECTATIONS – WE MUST ALL BE STEWARDS NOW!

EOIN MURRAY | Head of Investment, Hermes Investment Management

ABSTRACT

We need to rethink our economic model – and the new one needs to be premised on stewardship in the broadest sense of the word. Action is required on the part of all participants in the economic system, with the investment industry, as the turntable of capital, having a key role to play. This paper will focus in part on climate risk, more specifically on the "putative" tail risks represented by climate tipping points. It will also consider recent developments in the fixed income markets to see if a market- and climate-friendly innovation can be found to provide the direction and pace of change that we need.

1. INTRODUCTION

On the brink of irreversible climate change, with potentially catastrophic results for our planet, and after decades of denial, dithering, and discussion, the 2020s simply have to be a decade of delivery if we are to rise to Greta's wholly legitimate expectations! Over the course of much of the last century, orthodox economics has been dominated by the study of abundant, perpetual growth, and the appropriate policy response to short deviations that from time-to-time puncture the normal trajectory. Instead, now we must think of our planet and its scarce resources in terms of regeneration. For all the undeniable benefits of the modern world (massively reduced malnutrition, much improved living standards, a huge fall in infant mortality), there has also been a significant cost – an ocean awash with plastic (the Great Pacific garbage patch now covers an area roughly three times larger than France or more than twice Texas if you prefer), the Arctic on fire (in June and July 2019, more than 100 long-lived and intensive wildfires blazed within it), and climate patterns irrevocably changed with dire consequences should we choose to do nothing.

The need for a new economic model is not particularly novel, but never before has it been so relevant. The capital markets must play a role, alongside governments, corporations, regulators, banks, individuals, and communities, and at their heart lies the investment management industry. The link between environmental, social, and governance (ESG) factors and investment outcomes has been clearly demonstrated across numerous academic studies, and many will now admit that what were once considered to be non-financial or extra-financial issues have become highly financial when an appropriate time horizon is considered. The notion that fairness to all stakeholders is at the heart of long-term success for shareholders has also firmly taken hold, with a recognition that the investment industry has a vital role to play in holding corporate management to account through active engagement. But more than that, today there seems little challenge to the notion that collective action on the part of all players is necessary to deal with the existential crisis that threatens our planet – we are all stewards now.

2. CLIMATE FACTS AND THE MACROECONOMIC ENVIRONMENT

We should pause to reflect on the precise nature of the problem that we face before we consider what actions we must take. Climate change is increasingly playing on investors' minds and its effects are likely to be a defining investment theme for at least the next decade. The physical impacts of climate change are broad-based, encompassing everything from old favorites such as GDP, health, mortality rates, and the capital stock, through new entrants to economic parlance such as water stress, displacement, biodiversity, and species survival.

Figure 1: Insufficient action means that transformational pathways are now required
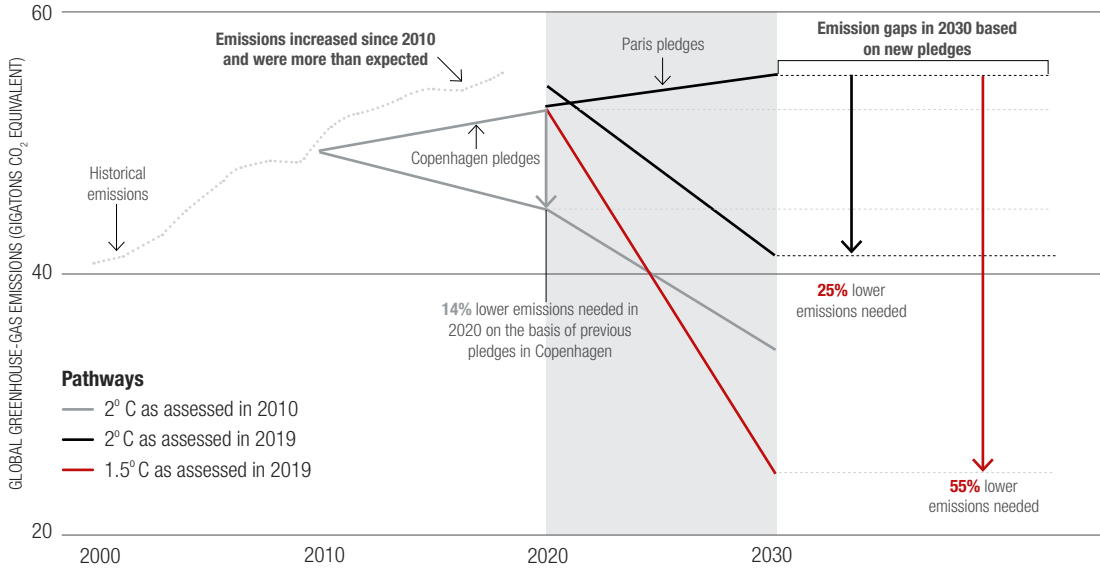
Source: Nature

There is a greater than evens chance that "empirical estimates based on the variability of the climate in recent decades likely massively underestimate the effects."[1]

Figure 1 illustrates the median of scenarios that meet the necessary temperature goals at global least costs, and includes projected emissions based on parties' pledges made for the Copenhagen accord and for the Paris agreement. Emissions are aggregated using global warming potentials from the 2007 IPCC (Intergovernmental Panel on Climate Change) Fourth Assessment Report (with the 5th assessment report revising upward the estimated measures of radiative forcing that drives these warming potentials).[2] It is clear that ongoing delay increases the gap that must eventually be closed.

Much of the heavy lifting in a macro sense rests upon the notion of a global carbon tax, but its global adoption is fraught with barriers and hurdles, as developed countries, in particular, worry about their economic competitiveness and their labor markets. Meanwhile supranational organizations lack the teeth

Table 1: Impact of climate change on aggregate global GDP

GLOBAL MEAN SURFACE TEMPERATURE INCREASE (DEGREES CELSIUS)	NO OF ESTIMATES	IMPACT ON LEVEL OF GDP (%)	
		AVERAGE OF ESTIMATES	RANGE OF ESTIMATES
<= 2	4	0.3	-0.5 to +2.3
2.5	11	-1.3	-3.0 to +0.1
3	9	-2.2	-5.1 to -0.9
5.4	1	-6.1	-6.1
6	1	-6.7	-6.7

Source: JP Morgan

[1] JP Morgan research, 2020, "Risky business: the climate and the macroeconomy," January

[2] Myhre, G., D. Shindell, F.-M. Bréon, W. Collins, J. Fuglestvedt, J. Huang, D. Koch, J.-F. Lamarque, D. Lee, B. Mendoza, T. Nakajima, A. Robock, G. Stephens, T. Takemura, and H. Zhang, 2013, "Anthropogenic and natural radiative forcing," in Stocker, T. F., D. Qin, G.-K. Plattner, M. Tignor, S. K. Allen, J. Doschung, A. Nauels, Y. Xia, V. Bex, and P. M. Midgley (eds.), Climate change 2013: the physical science basis. Contribution of working group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, 659-740 https://www.ipcc.ch/report/ar5/wg1/

Figure 2: The global total annual impact of climate change on total economic welfare income
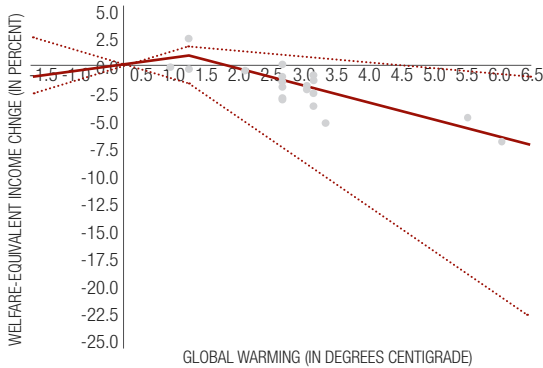
Source: RSJ Tol in "Review of Environmental Economics and Policy"

The observed increase in CO_2 concentrations since pre-industrial times reflects the burning of fossil fuels, largely in the developed world, for electricity generation and transportation, alongside changes in agriculture and land use. The consequence of this increase has been a steady rise in temperatures, which will continue even if CO_2 concentrations are stabilized at current, or kept to some pre-defined, levels.

Objectives to contain temperature rise, such as those agreed at Paris in 2015, now appear challenging, with an increase of 3.5 to 4 degrees Celsius at the end of the century expected if no new policies are enacted relative to governmental commitments, enshrined in legislation by the end of 2017. While there remains uncertainty as to the precise impact on the global economy, it is clear that a business-as-usual approach to mitigation will spur higher temperatures and yet more adverse climate change.

to deliver on its implementation. For developing economies, the issue is subtlety different, with carbon intense activity still seen as a key driver of economic growth and ultimately of raising living standards. Carbon taxation is thus not only an environmental consideration but a highly social one.

The economic damage of climate change has focused largely on the impact of temperature-related mortality, morbidity, and stress, with knock-on consequences for labor, productivity,

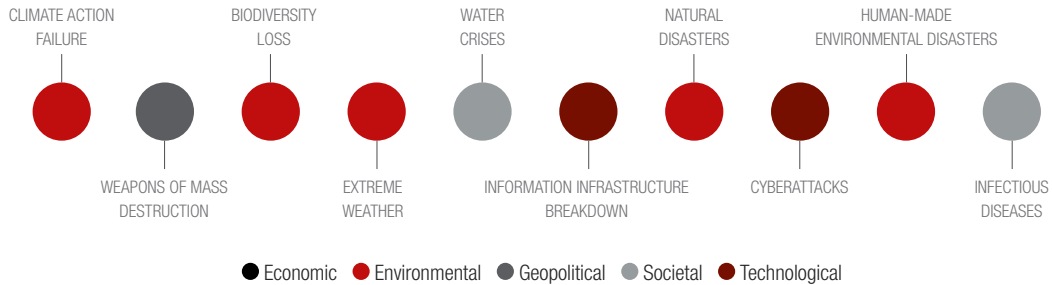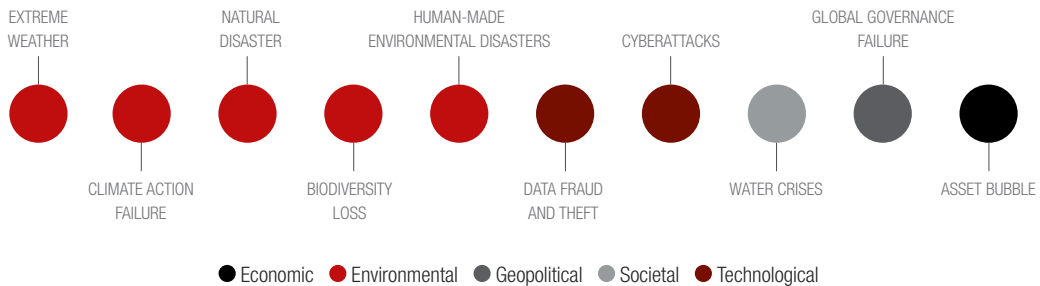**Figure 3a:** Top 10 risks over the next 10 years from a severity of impact perspective

Figure 3b: Top 10 risks over the next 10 years from a likelihood perspective

Source: World Economic Forum

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3 IMF Fiscal Monitor, 2019, "How to mitigate climate change," October

and output. Although difficult to quantify, we will also suffer effects of climate change on income and wealth, often related to extreme weather events, as well as the indirect follow-ons of famine, water stress, conflict, and migration.

Attempts have been made to model emissions as an externality to the global economy. The IMF estimated[3] that in order to achieve Paris alignment, a global carbon tax should be immediately introduced in 2019, rising to U.S.\$75/ton of CO_2 by 2030. Some scientists today suggest that this may be only half as much as needed, and the likelihood of this happening any time soon feels a long way off. Five sectors (electricity and heat production, agriculture and land use, industry, transport, and buildings) account for the vast bulk of emissions – while some feel the mounting pressure of reallocation of capital today and enlightened stewardship, most are not yet inspired to genuine action.

The hope that wind and solar geo-engineering developments can transform these sectors quickly enough seems forlorn at best. Where traditional economics defines human wants as infinite, perhaps we need to rethink our model for a more regenerative one. For every year that the planet misses its carbon reduction target, the greater the effort required in following years.

> *For every year that the planet misses its carbon reduction target, the greater the effort required in the following years.*

3. RISKS

Investment is about the balancing of risk and opportunity. This year's World Economic Forum Global Risks Report recognized the importance of climate change (Figure 3). While noting that downward pressure on the global economy from macroeconomic fragility and financial inequality will continue in the new decade, the WEF report listed four of the top five risks by impact and all of the top five by likelihood as relating to the environment. "Climate change is striking harder and more rapidly than expected ... global temperatures are on track to increase by at least 3 degrees Celsius towards the end of the century – twice what climate experts have warned is the limit to avoid the most severe economic, social and environmental consequences".

Figure 4: Risk of abrupt and irreversible changes in the climate system
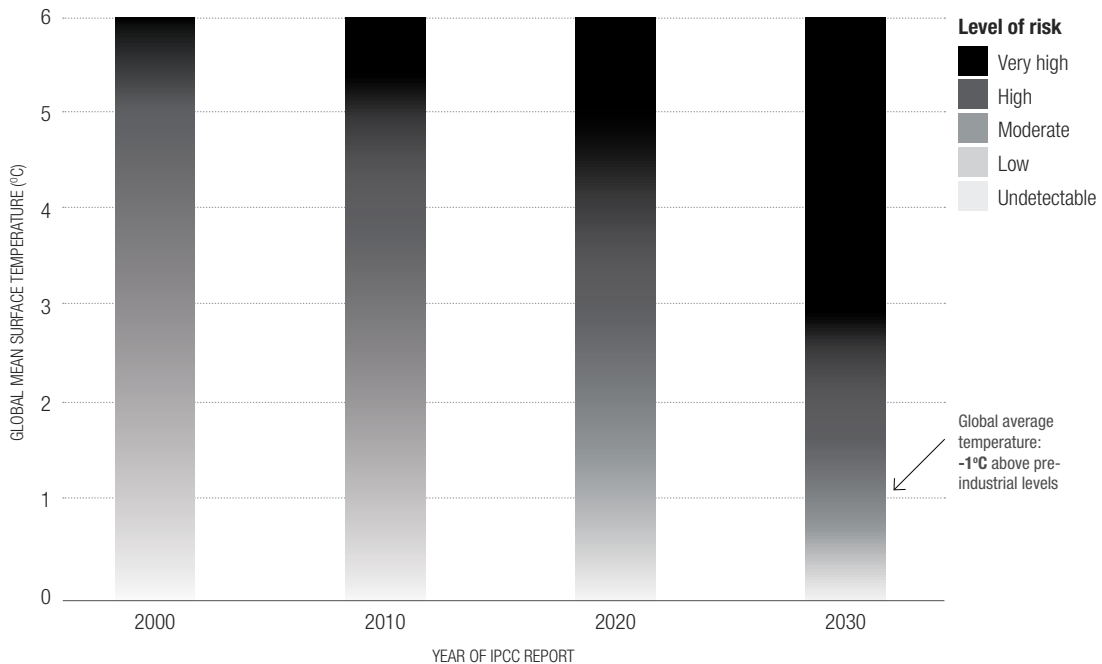
Source: Lenton et al. (2019)

> *Self-reinforcing feedback loops could push the planet beyond a threshold that prevents the stabilization of the climate at intermediate temperature changes.*

Others have devoted themselves to a deeper unpacking of the opportunities presented by tackling climate change from a returns' perspective (and there are many). It is our intention to focus on risk, but again not on those traditional aspects of risk associated with climate change – physical risk and transition risk. Others have done a better job of that elsewhere, so it is our goal to focus on some of the tail risks that often go unmentioned – after all, by definition, they are of low likelihood.

Conventional studies of risk and uncertainty in the worlds of economics and finance have leaned heavily upon the Gaussian distribution, with its symmetrical representation of probability. Neoclassical finance and portfolio theory are grounded in it, its appeal to simplification being at the same time its greatest strength and weakness – we can describe "risk" and the oft conflated notion of "uncertainty" in one simple metric, yet it does a poor job of describing the actual world that we live in. For convenience, occasional and unpredictable large deviations or outliers are deemed to be sufficiently rare so as to be ignorable. It seems highly likely that taking this approach to understand and model climate change in a financial setting will result in insufficient action – there is simply too great a probability of extreme values that can have an outsized impact on overall outcomes.

The "tail" risk (bearing in mind that we remain unconvinced by the relevance of normality for climate change) that we explore in this paper is the possibility that self-reinforcing feedback loops could push the planet beyond a threshold that prevents the stabilization of the climate at intermediate temperature changes. These are referred to as tipping points.

Individual tipping points include the thawing of permafrost in northern Siberia, large-scale die-offs of coral reefs in our oceans, and ongoing slowdown (and potential eventual reversal) of the Atlantic Meridional Overturning Circulation (AMOC), a key part of global heat and salt transport in our oceans. As Lenton et al. (2019) state: "As well as undermining our life-support system, biosphere tipping points can trigger abrupt carbon release back to the atmosphere … (which) can amplify climate change and reduce remaining emission budgets."

We know that the remaining planetary emissions budget is around 500 Gt of CO_2 just to have a 50/50 chance of staying within temperature rise of 1.5 degrees Celsius. It is estimated that the loss of boreal forest in northern America could use up around 110 Gt of that budget, and Amazon dieback an additional 90 Gt. Add to those emissions from melting permafrost of around 100 Gt, and we have already gone 3/5 of the way. With annual consumption currently at roughly 40 Gt of CO_2, then we will clearly be out of runway very soon.

These tail risk tipping points will have high impact and are perhaps more likely than we would care to admit. Some scientists might see them as unlikely, but that is increasingly not the view of the IPCC, whose reports demonstrate increasing concern at the likelihood of them being achieved. Their 6th assessment due in 2021/22 is expected to show a far greater climate sensitivity than in earlier versions.

With Greenland and the Antarctic ice sheets also melting at an increasing rate, the potential for sea level rise is deeply worrying – we risk profound loss of marine biodiversity and mass migration from the wipe-out of low-lying population centers (and consequent need for eventual migrant resettling). In financial parlance, it is unclear why we would willingly accept such risks for no obvious return. When risk is high, potential damage is significant, and our scope for reaction is limited by the time we have left to intervene – we need to urgently reflect on our custodianship of the planet. This new form of stewardship must be fit for our entire planetary system, and should "include decarbonization of the global economy, enhancement of biosphere carbon sinks, behavioral changes, technological innovations, new governance arrangements, and transformed social values." [Lenton et al. (2019)] The investment industry, sitting at the juncture of capital allocation, policy advocacy, and corporate engagement, must take a lead in renewed stewardship.

4. CAPITAL MARKETS

The capital markets represent the meeting place of investors and savers with corporates in need of capital to fund productive activity. The purpose of investment – the reason why people invest capital – is to deliver sustainable wealth creation over the long-term. Sustainable, because there is no point making an investment that rises strongly in value this year, only to collapse at some point shortly thereafter. That is the risk investors run when businesses behave in an unsustainable way, both specifically, if they suffer a reputational, governance, or operational failure, and systemically if climate change, political instability, or regulatory action harms their business model. Creating wealth, because this is not just a zero-sum game of winning at someone else's expense. It is investing to earn a share of the new wealth that is created by the investment that can enrich investors, employees, and society. And long-term, both because investing often takes a long time before it pays off and because investors' needs stretch way into the future.

Asset managers have two vital stewardship roles. The first is the way we act as responsible stewards of our clients and beneficiaries' capital with heavy responsibility in the way we allocate it to different investments. The second requires us to be sound stewards of investments once they have been made.

The way we act as stewards with respect to the allocation of capital used solely to be concerned with the consideration of identified financial factors to drive investment decisions – now we must also take account of ESG factors, the E to resolve the climate crisis and the S to mitigate the consequences of having to do so in a just and fair way. Sustainable investment strategies that incorporate such metrics have historically matched or outperformed conventional strategies over most time horizons [Eccles et al. (2014)]. It is also worth noting that there is significant correlation between many traditional quantitative factors and corporate ESG performance; ESG is not a qualitative afterthought.

The way we fulfill our stewardship responsibilities towards the investments we make broadly involves engaging with companies and exercising our responsibilities as stakeholders with influence (bondholders can and should engage too). It brings an additional benefit in terms of knowing the companies invested in inside out, and it is why asset managers (and/ or owners) should be willing to support, encourage, exhort, pressurize, and if necessary work with other asset managers to require invested entities to do the things that ensure wealth is created sustainably [Dimson et al. (2015)].

Our notion of stewardship should also extend to the way in which we as investors interact and engage with communities, as well as the policy and advocacy that helps focus the minds of governments and the supranational institutions that also must play a vital part in the solution.

In the face of this activity, many corporates are responding positively. Consider Drax, the U.K. power company, which is choosing to end its use of coal in 2022 to focus on its biomass energy model in the future, well ahead of the governmental deadline of 2025. Additionally, it has demonstrated that it can capture carbon dioxide from flue gas, the first time that carbon has been captured from a wood-burning power plant anywhere in the world. While still a pilot project, it is hoped that it will eventually lead to a larger-scale rollout of the technology. Unfortunately, today, the company has no means to store the captured CO_2, which is simply released back into the atmosphere. Work to do, but these and other recent activities have convinced investors, such as Norway's U.S.$1 trillion oil fund, the world's largest sovereign wealth fund, to remove the company from its investment blacklist.

Of course, the global biomass industry has strong links to deforestation and could in the long-term be more damaging than the very fossil fuels which it seeks to replace, so a fine balance is needed. In a similar vein, U.S. airline JetBlue has signed up to a new credit facility that is priced according to its performance on environmental and social matters. So-called performance-linked or positive incentive loans see the interest payments on the loan or bond go up or down in conjunction with their achievement of pre-defined ESG targets. Such innovations are intended to help carbon-intensive companies turn their operations greener.

CONCLUSION

Going green to solve the climate crisis sounds simple but won't be easy. In the words of Voltaire:

"Dans ses écrits, un sage Italien
Dit que le mieux est l'ennemi du bien."[4]

Delaying action to achieve a perfect understanding may simply be wasting time, with further activity down that path becoming increasingly inefficient and less productive. "Collabor-action", working together to achieve common goals is a necessity – and for financial institutions, now is the time.

It is becoming increasingly clear that institutional investors no longer believe that they can wait for data and disclosures to catch up – the severity of climate risks, particularly tail risks such as tipping points, demand action today. "There have been two energy revolutions in human history: the agricultural revolution, which exploited far more incident sunlight; and the industrial revolution, which exploited fossilized sunlight. Now we must return to incident sunlight – solar energy and wind … while maintaining our high standards of living" [Wolf (2010)]. Despite decades of talk, emissions trends continue to point in the wrong direction. We need a new energy system that will lie at the heart of, and drive, a new economic paradigm.

If asset managers are unable or perhaps more unattractively put, unwilling, to adopt a "whatever it takes" model of stewardship at a time of climate emergency, then it will be a fiduciary failure of biblical proportions. Our generation will not live to see the worst of times that we have bequeathed to our successors but will live long enough to be sure of our responsibility for the damage we have done. All of us in asset management must do all we can to ensure that we avoid this fate. This is the new stewardship.

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[4] Ratcliffe, S., 2011, Concise Oxford Dictionary of Quotations, Oxford University Press, p. 389

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REGULATORY IMPLICATIONS
OF ESG INVESTMENT

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ABSTRACT

In the age of big data and globalization, regulation is increasing in both scope and scale. Much of the recent regulation in the E.U. has focused on ESG investments and compliance, with a focus on increased data reporting requirements to promote transparency. This suite of regulations will pose a real challenge to financial market participants. This article focuses on some of the recent E.U. regulations regarding ESG investment, examines how it will impact the market, and proposes a solution to the challenge. Integrating data analytics into the regulatory and business framework will enable artificial intelligence and machine learning to assist companies and investors with compliance. It will also assist in providing a reliable, objective standard to promote comparability. Finally, this article will discuss how the implementation of some E.U. legislations have enabled fintech businesses with ESG goals to disrupt financial markets.

1. INTRODUCTION

In the age of big data and globalization, where complex international transactions can take place in a matter of seconds, regulation is increasing in scope and scale, and necessarily so.

At the same time, we have seen an increased focus on Environmental, Social and Governance (ESG) related investments. Since early 2019, ESG-related activism across the stakeholder spectrum has increased, resulting in major institutions such as Blackrock and Goldman Sachs producing bold promises on ESG investments to address some of the world's most pressing needs on climate, the environment, and businesses' broader effect on the communities in which they operate. These steps are all welcome beginnings on a difficult path to a low-carbon economy and a more equanimical society. 2020 marks the start of the decade of delivery for the U.N. Sustainable Development Goals (SDGs) – the success or failure of ESG investments will play a significant role in

whether or not these SDGs are attained. The big challenge now is ensuring ESG regulation and the regulation of big data dovetail to help achieve these goals rather than hinder an already difficult undertaking.

There is urgent need for global action to create a harmonized regulatory platform for ESG investments which:

- Applies to all market participants
- Is clear in its aims and objective in its standards
- Is deliverable (i.e., realistic) in the demands it places on those who have to comply

There has been some recent reaction from each of the world's major powers: the European Green Deal,[1] the proposed Green New Deal of the U.S.,[2] and the improvements in Chinese companies' ESG disclosures.[3] However, the E.U. has been leading the way on creating a plan to address these issues.

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[1]   https://bit.ly/2SzXtPB
[2]   https://bit.ly/2vCG0NB
[3]   https://bit.ly/2SQhAYN

In 2015, the European Commission (E.C.) unveiled its Action Plan on Sustainable Finance (the E.U. Action Plan), which was designed to complement (and be the E.U.'s method of achieving) the commitments set out in the U.N. SDGs.[4]

As part of the E.U. Action Plan, the E.C. has created a High-Level Expert Group and a Technical Expert Group, each of whom delivered a report in 2018-2019[5] setting out the methods by which, and the proposed legislation under which, these commitments can be delivered. The purpose of the E.U. Action Plan is to transform its economy into a greener, more resilient system to reduce the its carbon footprint, boost competitiveness by improving efficiency of production, and reduce cost of resources. The strategy comprises the following four key recommendations:

1. Establish and maintain a common sustainability taxonomy at the E.U. level (the E.U. Taxonomy)[6] and develop E.U. sustainability (ECO) standards and labels.[7]

2. Foster transparency and long-termism in financial and economic activity by: (i) moving focus away from short-term performance (as investments into environmental and social objectives require a long-term orientation); (ii) upgrading disclosure rules to make sustainability risks fully transparent (thereby allowing investors to take better informed and more responsible investment decisions); and (iii) promoting a retail investment savings strategy that includes making ESG part of any investment advice.

3. Develop an E.U. green bond standard (E.U. GBS).[8]

4. Develop benchmarks for low-carbon investment strategies.

The E.U. Taxonomy is the foundation of the E.U. Green Deal (and one of the cornerstones of Ursula von der Leyen's presidency of the E.U.).[9] With such a large, diverse financial system to which the E.U. Taxonomy is intended to apply, it is hard at this stage to draw firm conclusions on the potentially huge impact it will have on sustainable finance in the E.U.

However, regulation related to the E.U. Taxonomy has started to come into effect – notably, Regulation 2019/2088 on sustainability-linked disclosure and Regulation 2019/2089 on climate-transition benchmarks. Each of these requires additional reporting from financial market participants who are in-scope, ranging from disclosure by investors of the impact of sustainability on a particular decision to disclosure by operators of benchmarks regarding their incorporation of ESG factors into their models. Meanwhile, delegated acts that will implement the other aspects of the E.U. Taxonomy in 2020-2021 will require further information to be reported on both the underlying investments and the actions being taken by the reporting entities to ensure that the disclosures meet the requirements of the regulation.

There are also other regulations that form part of the broader E.U. ecosystem of legislation on sustainability and transparency, notably Regulation 2017/2402 (the Securitization Regulation)[10] and Regulation 2015/2366 (the Payment Services Directive 2 or PSD2).[11]

The Securitization Regulation requires quarterly reporting (with the issuer special purpose vehicle (SPV) typically being the designated reporting entity) on the underlying assets of a securitization. This regulation has also introduced to the market the concept of a securitization that is simple, transparent, and standardized (STS). If a securitization can certify that it is "STS compliant" it may allow the investors to claim beneficial risk weighting or capital treatment.

PSD 2 introduces a wide range of measures, imposing greater transparency, security, and technological standards on banks – one of the key requirements of this piece of regulation is to require banks to share customers' data with third parties and is in large part responsible for the fintech boom in Europe in the last few years.

All of the above are well-meaning attempts to contribute to the development and functioning of an ESG investment market and, in that sense, they represent progress. However, as we will discuss in the following sections, the implementation of the raft of E.U. regulations in this area has been (and will be) problematic. There are two key reasons for this:

1. **Practicality of compliance:** it is often difficult for financial market participants to know what exactly it is that they need to comply with. In addition to this, the sheer volume of information that is required to be reported on makes it very difficult to comply.

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4 https://bit.ly/2uJdOsk
5 https://bit.ly/323LXiL (High-Level Expert Group Report, 31 January 2018); https://bit.ly/3bK7hOC (Technical Expert Group Report, 18 June 2019)
6 https://bit.ly/3bF1km5
7 https://bit.ly/39HTMNv
8 https://bit.ly/2SQNZhZ
9 https://bit.ly/2uJrAv1
10 https://bit.ly/2P2nbKr
11 https://bit.ly/321TkHj

2. **Standardization or objectivity:** there is no one accepted definition for what ESG means and one company's assessment of what is ESG may be different from another's. This creates a huge problem for investors seeking to compare ESG investments against one another. The self-assessment method cannot be correct as it is open to abuse and manipulation by market participants.

As we will explain, there are solutions to both of these problems. The answer lies in use of artificial intelligence (AI) and machine learning.

2. KEY IMPLICATIONS

As discussed above, two of the major issues hindering the development of regulation as regards ESG investment are the practicalities of complying with the volume of reporting requirements as well as the cementing of an objective standard for what constitutes ESG. We will analyze each of these below.

2.1 Regulation and practicality of compliance

The Securitization Regulation requires the designated reporting entity to report, on a quarterly basis, all of the information set out in Article 7. This includes (but is not limited to) information on all of the underlying exposure in the securitization, any significant events, and "any change in the risk characteristics of the securitization or the underlying exposures that might materially impact the performance of the securitization."[12] The form of this reporting is to be provided by way of a series of reporting templates set out in an accompanying regulatory technical standards paper.[13]

Although securitizations already typically required quarterly reporting from the issuer SPV in some form, this new regulation adds a further layer of requirements on issuers and participants in a securitization transaction. Issuers are now required to go through, in many cases, hundreds of data fields for its assets (and for portfolio managers of multiple securitizations, they will have to ensure the issuer conducts this exercise for each of the securitizations they manage). This is a sizeable additional burden and we spent a significant amount of time working with our clients in 2019 determining the "hows" and "whys" of compliance with this new regulation.

Further to the general reporting requirements of Article 7, the Securitization Regulation has also introduced a concept of a simple, transparent, and standardized (STS) securitization. This new label is welcome in many ways but it (i) introduces a further layer of reporting requirements on issuers who wish to take advantage of it; (ii) excludes the most common category of securitization in Europe, namely CLOs (collateralized loan obligations), due to the requirement that the pool of assets not be actively managed;[14] and (iii) allows for self-certification of compliance by the issuer SPV, hardly promoting a transparent standard as the recitals to the Securitization Regulation state they wish to do.

The Sustainability-related Disclosures Regulation (Regulation 2019/2088)[15] requires of "financial market participants" disclosure of a series of detailed information on the characteristics of each investment and how it does or does not incorporate sustainability impacts. Article 4, for example, requires each financial market participant with more than 500 employees to publish and maintain on their website:

(a) Where they consider principal adverse impacts of investment decisions on sustainability factors, a statement on due diligence policies with respect to those impacts, taking due account of their size, the nature, and scale of their activities, and the types of financial products they make available; or

(b) Where they do not consider adverse impacts of investment decisions on sustainability factors, clear reasons for why they do not do so, including, where relevant, information as to whether and why they intend to consider such adverse impacts.

Article 6 goes on to require descriptions of sustainability risks in pre-contractual disclosures, and Article 7, descriptions of how individual investment products treat potential adverse impacts on sustainability factors. Articles 8 and 9 then address requirements for disclosure where a financial product is stated to promote ESG goals. While the aims of this regulation are admirable, the actual detail of the disclosure required by Articles 4, 6, 8, and 9 will not be known until the RTS are developed (the deadline for this is December 31, 2020). Until

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[12] Article 7(1)(g)(iii), EU Regulation 2017/2402
[13] https://bit.ly/2SyGZaw
[14] Article 24(7), EU Regulation 2017/2402
[15] Published in the Official Journal of the E.U. on 27 November 2019 and due to come into force on 10 March 2021

then, although we know that urgent action is needed, there will be no mandatory requirements imposed upon financial market participants.

The situation is similar in Regulation 2019/2089, which amends Regulation 2016/1011 as regards E.U. Climate Transition Benchmarks and their sustainability-related disclosures. Articles 13, 19a, 19b, and 27 each require disclosure of information regarding how a benchmark deals with ESG factors.

PSD 2, while not directly linked to ESG factors in the way that the regulations discussed above are, forms part of the E.U.'s legislative framework on transparency and can, therefore, be placed within the "S" and "G" of ESG. It requires payment service providers to disclose large amounts of information, from information on the service provider itself[16] to reporting on financially-important incidents.[17] PSD 2 has also played a vital role in loosening the hold of the major financial institutions on the banking industry and allowing disruptors to enter the market. The regulation requires banks, when authorized by the customer, to share customer account information with third-party service providers.[18] This has increased the ability of fintech companies (from challenger banks to digital payments companies, to financial services infrastructure providers) to enter a previously closed market, as we will discuss below.

Compliance with these regulations is, of course, technically possible. The legal necessity to comply will drive companies to find a way to fulfill the requirements. However, the increase in data reporting requirements suggest it will be vastly more effective from a cost-benefit perspective, as well as an efficiency perspective, to employ the power of AI and machine learning tools to pull this data, analyze it, and deliver it to the company's designated ESG officer or analysts to provide a final, human quality control. The CEO of Sensefolio, a data analytics company providing ESG ratings and research, sums the issue up in the following way:

"In regards to ESG data in general, I strongly believe that ESG data based on AI will become extremely popular as they are the only ones able to monitor properly the materiality of companies. There is too much information out there, even if you hire a team of 200 people, you won't get as much insight

as sophisticated algorithms. This goes from reading each text to find the (hidden) links and relations between them…"[19]

This is even more true as the investment world could use such tools to do more than merely comply with the law – machine learning can help deliver the modern investment paradigm: improve investment theses and delivering greater returns to stakeholders while acting in a socially responsible manner.

Table 1: Third-party agencies providing ESG (or SDG) scores

Arabesque S-Ray: Through machine learning and big data, Arabesque S-Ray systematically combines over 200 ESG metrics with news signals from over 30,000 sources published in over 170 countries. It is the first tool of its kind to rate companies on the normative principles of the U.N. Global Compact: Human Rights, Labour Rights, the Environment, and Anti-Corruption (GC Score). Additionally, Arabesque S-Ray provides an industry-specific assessment of companies' performance on financially material sustainability criteria (ESG Score).
MSCI: MSCI ESG Ratings aims to measure a company's resilience to long-term, financially-relevant ESG risks. It leverages AI and alternative data to deliver dynamic investment-relevant insights to power investment decisions. It uses a rules-based methodology to identify the performance of industry participants. It rates companies on an "AAA to CCC" scale according to their exposure to ESG risks and how well they manage those risks relative to peers.
Sensefolio: Sensefolio utilizes machine learning and natural language processing techniques that allow machines to read more than 10,000 different sources of information (which means around 1 billion data points when covering the 20,000 companies in its database) and interpret them as well as humans.
Sustainalytics: recently purchased by S&P, it produces an ESG report for each company, including qualitative analysis and commentary on the company's ability to manage ESG issues; a summary of a company's ESG performance with ESG scores in relation to industry peers; and an overview of any ESG controversies, with access to a full controversy report. This process produces an ESG score, which investors can use to make decisions relative to their investment objectives.
TrueValue Labs: TrueValue Labs applies AI to sift through millions of data points each month, as well as uncover opportunities and risks hidden in massive volumes of unstructured data, including real ESG behavior that has a material impact on company value. Its peer comparison feature helps investors form a relative value analysis of a sector, industry, or a customized group of companies.

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[16] See for example, Articles 43-45, Directive (EU) 2015/2366
[17] Article 96, Directive (EU) 2015/2366
[18] https://bit.ly/2wpN0Tc
[19] "AI is the most powerful and accurate tool to monitor companies' ESG" – Interview with Oliver Khatib, CTO at Sensefolio, 5 June 2019, AltData Insights, https://bit.ly/2whsLlx

2.2 Objectivity

The second problem is that of objectivity and standardization of reporting data. Currently, it is extremely difficult for investors to determine how what one company or one investment reports as being compliant with ESG requirements of the various E.U. regulations matches up against another's reporting on the same issue. Each market participant structuring an investment as ESG compliant will use a different set of metrics in coming to the same conclusion. This makes it hard for investors to conduct a relative value analysis.

What is more, an investor's analysis needs to go beyond a mere tick-box review of the annual and quarterly reporting on ESG issues. ESG investors will look to the heart of a company's or investment's practices – for example, a company's Modern Slavery Statement (whose delivery is required by Article 54 of the Modern Slavery Act 2015) will not necessarily reveal underlying supply chain issues. Likewise, such issues will not necessarily be revealed by merely requiring suppliers to complete a diligence questionnaire before entering into a contract; in many cases, conducting site-visits or demanding adherence to internationally recognized standards will also be required. It is when we start delving into this level of detail, as ESG investors must, that objective comparison of investments becomes complicated.

3. AI/MACHINE LEARNING – THE SOLUTION

These two problems, reporting and objectivity, have a common solution: harnessing the power of AI and machine learning to analyze vast quantities of unstructured data in a fraction of the time it would take a human to do so, and often with a greater degree of accuracy. The solution must incorporate both aspects, for while AI is extremely useful in analyzing large datasets, it cannot learn from them and develop in the way that machine learning can.

It is the aim of the E.U. Action Plan to develop an objective standard that can be evenly assessed across market participants and each of the regulations referred to in this article attempts, in its own way, to move us closer to such a standard.

In our view, an immediately actionable solution exists but has not yet been implemented: a requirement that for any investment to be labeled ESG (or SDG), it must use two or more

reputable third-party agencies to provide it with an ESG (or SDG) score. Companies like Sustainalytics, Arabesque S-Ray, MSCI, Truevalue Labs, and Sensefolio all provide sophisticated data analytics for ESG and SDG investment, which leverage AI, machine learning, and natural language processing to provide a near real-time assessment of each investment and which updates on an ongoing basis throughout the life of the investment (Table 1). This allows investors to look at more than merely the company-reported data on an investment (which by its very nature will be historic once reported) and also encompass more recent information in between reporting dates.

There are some legitimate concerns around employing such third parties in this manner, particularly (i) that they tend to employ their own proprietary model to produce the score and so, even between these so-called objective third parties it is hard to find a common standard; (ii) that it is not clear how effective these scores are at achieving the goals of ESG investors; and (iii) how to verify the quality of the data that feeds into their models.

These points are fair but not fatal – the proprietary nature of the model does not invalidate it. Seeing the ultimate impact of an ESG investment will not be possible until we have a bigger sample of ESG investments to analyze. Furthermore, the very nature of AI and machine learning programs is that the more data provided to them, the better their outcomes become. As Oliver Khatib, CTO of Sensefolio has stated: "At Sensefolio, the more data we retrieve, the more accurate our algorithms become, and thus our ESG Ratings. By adding more and more information, our artificial intelligence algorithms are better trained and better able to distinguish a good information from a bad one…"[20]

A practical methodology for this proposal could be to require that, in order to be labeled as ESG (or SDG), each investment uses an ESG (or SDG) score from at least two of these eligible third-party companies, with a requirement for a minimum weighted average between the two scores, as well as a permitted margin of error throughout the life of an investment. Further eligibility requirements or concentration limits could also be included. This is akin to how debt investments (including securitizations) around the world are already analyzed by rating agencies, hence would be familiar to the majority of market participants.

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[20] Ibid.

This method would provide the objectivity that is so crucial to the success of the E.U. Action Plan and opening up the ESG and SDG investment market to the U.S.$3-5 trillion of investor capital that needs to be deployed if we are to achieve the SDGs by 2030.[21] However, it is clear that we must take self-certification out of the equation if we are to avoid creating a new form of "greenwashing". As Thomas Kuh, Head of Index at TrueValue Labs, has eloquently summarized: "... company-reported data has critical limitations as a basis for analysis and ratings. Self-reported and unaudited, it is subject to manipulation to fit a company's framing ... Analysts need external sources of information to develop credible ESG ratings. Even as company-reported data improves, it will never be sufficient on its own as a basis for meaningful ESG ratings and will always be subject to manipulation. Company disclosure will continue to be an important element of ESG analysis but will become less determinant as investors develop external perspectives that deepen their understanding of how ESG issues impact market valuations."[22]

4. FINTECH – DEVELOPING THE SOLUTION

The third-party ESG rating companies discussed above are good examples of businesses that are well placed to play a crucial role in easing the regulatory burden in ESG investments.

However, they only represent a small portion of fintech industry players who could gain market share in an environment of increasing regulation and growing ESG investments. Challenger banks, fintech infrastructure, and payment services companies have been experiencing hyper-growth in recent years. They are operating in an optimal environment of regulatory fragmentation around the globe. Fast-mover advantage, as compared with established companies in the space, allows them to target areas and consumers that established companies or individuals do not have the bandwidth to think about.

The challenger banks, such as Revolut (valued at c. U.S.$5.5 billion), Monzo (valued at c. U.S.2.5 billion), and N26 (valued at c. U.S.$3.5 billion) have in recent years received a lot of attention for their success in winning customers by tapping into the millennial trend for living life through your phone. Accounts can be opened in minutes and can be easily split into sub-accounts for savings or alternative currencies (frequent international travelers using these companies often

get far superior currency conversion rates than those offered by traditional "bricks-and-mortar" banks). The challenge these companies present to the traditional banks not only promotes economic growth (SDG 8) but also the development of innovation and infrastructure (SDG 9).

> *"Challenger banks, fintech infrastructure and payment services companies not only promote economic growth but also the development of innovation and infrastructure."*

Fintech infrastructure and payment services (the plumbing of the financial services industry), while not always taking the headlines, has become more mainstream in the past few years. Companies such as Stripe, a payment services provider that allows companies and individuals to receive online payments, Plaid, which enables companies and individuals to connect with a counterparty's bank accounts, and Currencycloud or Transferwise, which specialize in payments platforms for cross-border payments for companies and individuals, respectively, have all grown exponentially as the world has become increasingly globalized.

Aside from very well-known players mentioned above, as well as Square (which provides credit card payment processing services for SMEs) and Klarna (which provides e-commerce payment solutions), in terms of market innovation the leader is arguably M-Pesa. This mobile-phone based money transfer service has c. 17 million customers in Kenya and has recently expanded to South Africa, India, and Eastern Europe. Around 49 percent of Kenya's GDP is processed over the platform[23] and it (along with a few other similar services) has increased the proportion of Kenya's population with access to formal financial services to 83 percent (in 2016).[24] Given the high percentage of the world's population living in emerging economies, who lack access to a traditional banking infrastructure but would have access to mobile phones, this is a business with huge potential scalability that would also

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[21] SDG Bonds and Corporate Finance: A Roadmap to Mainstream Investments, White Paper prepared by the U.N. Global Compact Action Platform on Financial Innovation for the SDGs, 2018

[22] https://bit.ly/2vJClYY

[23] https://bit.ly/2P2P0SN

[24] https://bit.ly/2wkuG8Y

actively contribute to achieving a number of the SDGs, in particular SDGs 8 (Decent Work and Economic Growth), 9 (Industry, Infrastructure and Innovation), and 11 (Sustainable Cities and Communities).

Established financial institutions have by now realized the potential for these fintech businesses to take their market share. Given that in many cases they lack the competitive advantage of size and flexibility, it is likely that they will continue to consolidate by acquiring the most successful companies in this space (see, for example, Visa's recent purchase of Plaid for U.S.$5.3 billion and Visa's U.S.$80 million investment in Currencycloud's latest round). This will combine the capacity and infrastructure of a traditional financial institution with the innovation of a fintech challenger. For certain fintech businesses (especially those operating on subscription models or with predictable cash flows or customer receivables) raising debt finance either by way of loans or securitizations could be good options to consider, particularly where companies are reluctant or unable to raise a further round of equity, which would dilute control (or they are unable to issue equity due to the nature or structure of the project).

5. FROM ESG TO SDG…AND BEYOND

The ESG actions of companies around the world clearly have the potential to shape the future of the planet and our place within it. However, we would suggest that the term ESG, while it has undoubtedly moved us forward and charged the debate, is a term that belongs to 2019. The term for the 2020s and beyond should be "SDG". The Sustainable Development Goals encompass ESG and go beyond it, to the heart of a global struggle to create a more equal planet. Each of the seventeen goals is quantifiable and measurable by looking at the sub-indicators published by the U.N. and using methodologies developed in line with them. As we have noted previously, several of the third-party data analytics providers have already developed models that analyze investments based on how closely they align to the SDGs; these providers deserve more attention.

Although financial market participants and institutions across the finance services industry are working towards a common definition of ESG, there is as yet no universally accepted one and it seems likely that the powers of vested interests in

Figure 1: United Nations sustainable development goals

this debate will ensure that one agreed-upon definition will be tough to achieve. By contrast, given the SDGs have been developed by the U.N., there is much less room for debate.

Whichever term is used, the global shift towards sustainable investments will increase the data reporting requirements of companies and financial market participants. The volume of reporting and the uncertainty of the form in which it must be delivered will make it hard to comply. As we have discussed above, the solution to this lies in greater integration of data analytics, using AI and machine learning to make a giant task more manageable.

For financial instruments that use the label "sustainable", "ESG", or "SDG", requiring mandatory usage of third-party data analytics companies to provide ESG ratings (in a similar way to how the credit rating agencies currently rate financial market transactions), would be one method of providing the reliability and objectivity that is required for ESG investments to gain wider traction. This combined with, firstly, a growing willingness of companies to actively change their activities to promote sustainable behavior, and, secondly, the increasing scope and specificity of E.U. sustainable finance regulation could be the framework for promoting transparency through harmonized reporting obligations and methodologies. These three elements provide us with a roadmap that successfully balances the need for accountability and the need to encourage sustainable growth in a globalized world.

ESG INVESTING IN EMERGING MARKETS[1]

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ABSTRACT

Recent studies by MSCI ESG Research LLC have shown historical positive links between environmental, social, and governance considerations and corporate financial performance. Because investors might still question whether ESG historically added value in emerging markets, where companies' consideration of ESG risks is a more recent phenomenon, we compared the performance of four ESG indexes to their MSCI emerging-market parent. Overall, we found that despite emerging-market companies' tending to have lower MSCI ESG Ratings than global peers on average, ESG characteristics measured by MSCI ESG Ratings had contributed to performance overall.

INTRODUCTION: MSCI ESG INDEXES[2]

In principle, MSCI ESG indexes are based on a standard market-capitalization parent index. Depending on stated objectives, different ESG indexes can be designed or customized using one or more of the following index-methodology components:

1. **Exclusions:** removing certain companies from the underlying index universe to align the portfolio with investors' values and constraints. All index methodologies start with an exclusionary screen. It is important to mention that exclusions can follow different investor motivations, such as (a) values-based reasons (e.g., divesting from weapons manufacturing or to comply with international standards such as the U.N. Global Compact); (b) constraints (e.g., institutional investors who may face legal restrictions to invest in controversial weapons manufacturer)s; and (c) economic reasons (e.g., investors who may want to

Figure 1: MSCI ESG indexes and their possible applications
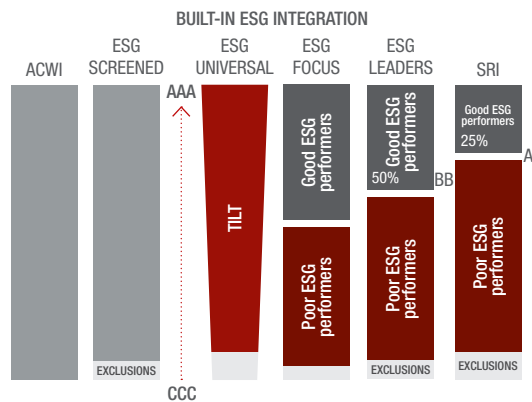
All the above MSCI ESG Index methodologies apply certain exclusion screens (based on controversies and business-involvement screens) marked in gray. Light blue indicates companies that are not selected for the index due to low MSCI ESG ratings. Gradient fills denote indexes that use optimization techniques.

Source: MSCI ESG Research

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[1] This article contains analysis of historical data, which may include hypothetical, back-tested or simulated performance results. There are frequently material differences between back-tested or simulated performance results and the actual results subsequently achieved by any investment strategy. The analyses and observations in this article are limited solely to the period of the relevant historical data, back-test, or simulation. Past performance –- whether actual, back-tested or simulated – is no indication or guarantee of future performance. None of the information or analysis herein is intended to constitute investment advice or a recommendation to make (or refrain from making) any kind of investment decision or asset allocation and should not be relied on as such.

[2] While we selected these four indexes due to their breadth and size representation, MSCI also offers several more focused or thematic ESG indexes that we did not analyze here. The performance of these indexes is not represented by our analysis and may differ. For more information on the performance of other regions, including developed markets, please see: Giese, G., L.-E. Lee, D. Melas, Z. Nagy, and L. Nishikawa, 2019, "Foundations of ESG investing: how ESG affects equity valuation, risk, and performance." Journal of Index Investing 9:4, 46-57.

mitigate certain business risks, such as those who may want to avoid exposure to fossil fuels to mitigate the risk of stranded assets). It is important to point out that some of these exclusions can be industrywide — such as the exclusion of tobacco producers — whereas others are company-specific, such as the exclusion of companies that have breached the U.N. Global Compact.

2. **Selection of the best-rated companies:** the MSCI ESG Leaders Index selects the best-rated 50 percent of companies in terms of free-float market capitalization, whereas the MSCI SRI Index selects the best 25 percent. Both indexes perform the selection per Global Industry Classification Standard (GICS®)[3] sector and subregion to avoid regional and sector biases.

3. **Weight tilt of companies within the index universe:** the MSCI ESG Universal Index tilts the market-cap weights of components using a scaling factor in the range between 0.5 and 2.0, which aggregates companies' MSCI ESG rating and ESG-rating trend in a simple robust combined ESG score.

4. **Optimization:** the MSCI ESG Focus Index maximizes the index-level ESG score within the index universe subject to

a tracking-error constraint. In addition to this, optimization also offers the possibility to combine equity style-factor exposures with ESG exposure.

Table 1 summarizes the index methodology for each of these standard ESG indexes. The range of MSCI ESG Indexes covers approaches that perform a best-in-class selection of MSCI ESG Ratings and result in market-capitalization weights (the MSCI ESG Leaders Index and MSCI SRI Index); approaches that reflect MSCI ESG Ratings and MSCI rating changes by tilting the market-capitalization weights of the index components toward better-rated companies and rating upgrades (MSCI ESG Universal Index); and approaches that use optimization techniques that focus on higher MSCI ESG Ratings and change the weights away from market-capitalization weights (MSCI ESG Focus Index).

As per Table 2, four out of the four emerging-market ESG indexes reviewed outperformed the parent index during the study period.[4]

In this paper we will focus on the MSCI Emerging Markets ESG Leaders Index since it has the longest live history of all the indexes mentioned above.

Table 1: Standard MSCI ESG Indexes and construction methodology

INDEX	INDEX CONSTRUCTION
MSCI ESG SCREENED	Market-capitalization weighted
MSCI ESG UNIVERSAL	Market-cap Weight-tilt from 0.5 to 2.0 depending on • MSCI ESG rating • MSCI ESG rating change (upgrade, neutral, or downgrade)
MSCI ESG FOCUS	Optimize index-level ESG score under tracking-error and sector constraints
MSCI ESG LEADERS	Best-in-class selection of top 50% of ESG-rated companies in terms of free-float market cap per • GICS sector and • Sub-region (to avoid regional or sector biases) Market-capitalization-weighted
MSCI SRI	Best-in-class selection of top 25% of ESG-rated companies in terms of free-float market cap per • GICS sector and • Sub-region (to avoid regional or sector biases) Market-capitalization-weighted

³ GICS is the global industry classification standard jointly developed by MSCI and Standard & Poor's.
⁴ The analysis extends the analysis of emerging markets ESG indices featured in Giese et al. (2019).

**Table 2:** Key metrics in emerging-market ESG indexes

	MSCI EM INDEX	MSCI EM ESG UNIVERSAL INDEX	MSCI EM ESG LEADERS INDEX	MSCI EM SRI INDEX	MSCI EM SRI INDEX
TOTAL RETURN[a](%)	3.3	3.8	6.0	5.3	4.4
TOTAL RISK (%)	14.8	14.5	14.3	13.7	14.8
RETURN/RISK	0.23	0.26	0.42	0.39	0.3
SHARPE RATIO	0.17	0.2	0.36	0.32	0.24
ACTIVE RETURN (%)	0.00	0.5	2.6	1.9	1.1
TRACKING ERROR (%)	0.00	1.3	2.6	5	1.2
INFORMATION RATIO	NaN	0.36	1.00	0.39	0.86
HISTORICAL BETA	1.00	0.98	0.95	0.87	1
NO OF STOCKS[c]	899	755	378	176	313
TURNOVER[b](%)	6.5	23.1	11.7	9.8	27.8
PRICE TO BOOK[c]	1.6	1.6	1.9	2.1	1.6
PRICE TO EARNINGS[c]	13.4	13.7	15.3	15.8	14
DIVIDEND YIELD[c](%)	2.7	2.6	2.6	2.8	2.7

Data from November 30, 2012 to October 31, 2019.
[a]Gross returns annualized in U.S.$, [b]annualized one-way index turnover over index reviews, and [c]monthly averages.

Source: MSCI ESG Research

Figure 2: Distribution of industry-adjusted ESG scores for three subregions

Emerging Markets USA World ex USA
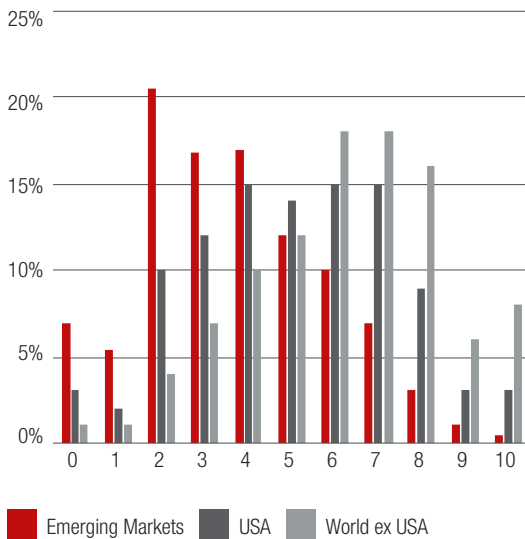
Data as of July 31, 2019
Source: MSCI ESG Research

Figure 3: Cumulative index performance

171.47

113.16

MSCI EM ESG leaders MSCI Emerging markets

U.S.$ gross returns from September 2007 to August 2019

2. UNDERSTANDING DIFFERENCES IN ESG CHARACTERISTICS ACROSS REGIONS

The distribution of MSCI ESG Ratings is not the same in all regions or market types. As can be seen in Figure 2, constituents of the MSCI Emerging Markets Index tended to have lower MSCI ESG Ratings as of July 31, 2019, compared to constituents within the MSCI USA Index and MSCI World ex USA Index. However, the ESG ratings (and the industry-adjusted scores that they are based on) are calculated relative to industry peers across a global set (the MSCI ACWI Index), which means that we can still compare companies within regions or markets. While few emerging-market companies have received top MSCI ESG Ratings, companies within this universe can still be differentiated based on the actual distribution of their MSCI ESG Ratings. Companies with an industry-adjusted score of 7 or 8 out of 10, for example (equivalent to ESG ratings in the A to AA range), may be considered "best in class" within the MSCI Emerging Markets Index context.

The MSCI Emerging Markets ESG Leaders Index is a market-capitalization-weighted index that is designed to target companies with high ESG performance relative to their sector peers. The MSCI Emerging Markets ESG Leaders Index consists of large- and mid-cap companies across 26 emerging-market countries.

The MSCI Emerging Markets ESG Leaders Index outperformed the regional MSCI Emerging Markets Index from the time it went live in June 2013 through August 2019 (see Figure 3). It also outperformed in historical simulations for the period of September 2007 through June 2013.

The MSCI Emerging Markets ESG Leaders Index was launched in June 2013. Data prior to the launch date is back-tested (i.e., calculations of how the index might have performed over that time, had the index existed). Please see footnote 4 and the disclaimers at the end of this report for information regarding back-tested or simulated history.

On the other hand, the MSCI World ex USA ESG Leaders Index performed in line with the MSCI World ex USA Index while the MSCI USA ESG Leaders Index underperformed the MSCI USA Index. This underperformance can be explained by the fact that the MSCI USA ESG Leaders Index is comparatively underweight in larger technology companies.

Table 3: Historical regional performance comparison

	MSCI EM	MSCI EM ESG LEADERS	MSCI WORLD EX-USA	MSCI WORLD EX USA ESG LEADERS	MSCI USA	MSCI USA ESG LEADERS
TOTAL RETURN[a](%)	3.6	6.9	6.5	7.0	14.8	14.0
TOTAL RISK (%)	17.1	16.2	14	13.7	12.1	11.8
RETURN/RISK	0.21	0.42	0.46	0.52	1.22	1.18
SHARPE RATIO	0.17	0.38	0.41	0.47	1.17	1.12
ACTIVE RETURN (%)	0	3.3	0	0.6	0	-0.8
TRACKING ERROR (%)	0	2.8	0	1.1	0	1.7
INFORMATION RATIO	NaN	1.17	NaN	0.51	NaN	-0.48
HISTORICAL BETA	1	0.9	1.0	0.97	1	0.97
NO OF STOCKS[c]	868	351	1019	474	615	333
TURNOVER[b](%)	6	10.1	2.3	8.7	2.7	10.7
PRICE TO BOOK[c]	1.6	2	1.6	1.7	2.7	2.9
PRICE TO EARNINGS[c]	13.1	14.9	16.1	16.2	18.6	19.4
DIVIDEND YIELD[c] (%)	2.6	2.6	3.2	3.3	2.0	2.0

Data from Aug. 31, 2010 to July 31, 2019. Historical data is provided for informational purposes only. Past performance is not indicative of future results, which may differ materially. [a]Gross returns annualized in U.S.$, [b]annualized one-way index turnover over index reviews, and [c]monthly averages.
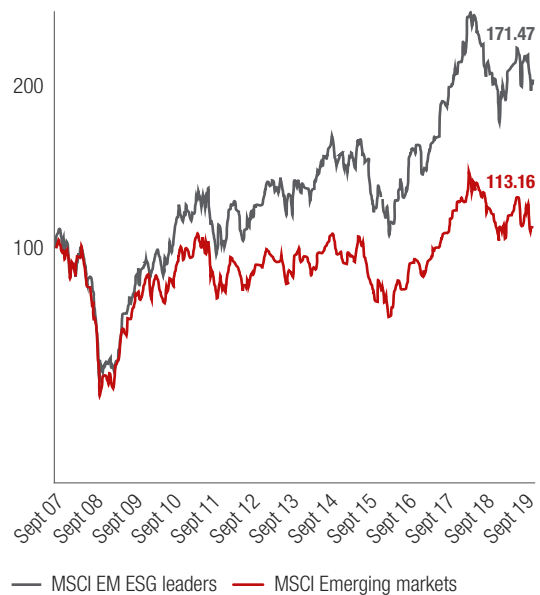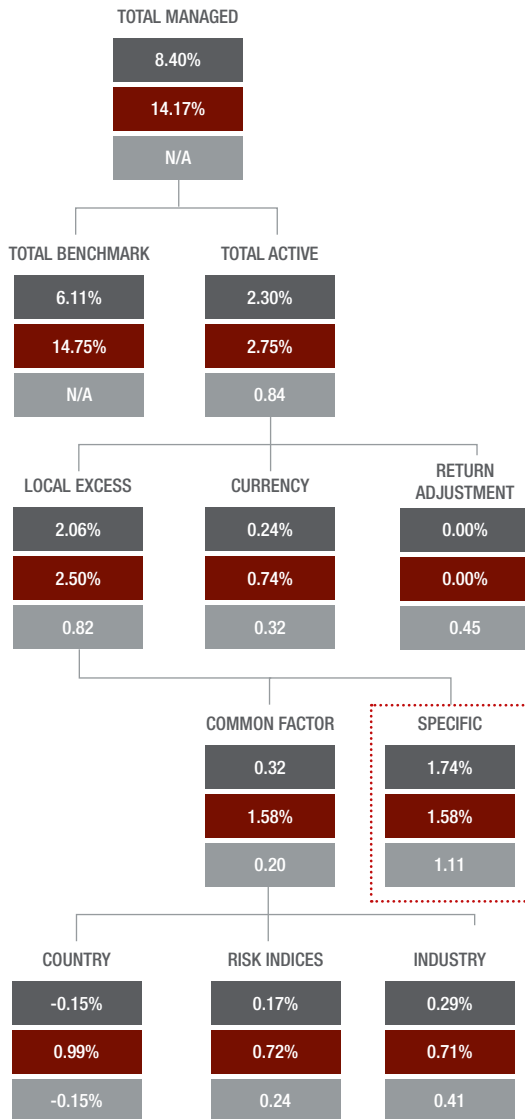
Source: MSCI ESG Research

Figure 4: Performance attribution analysis
(June 2013 – July 2019)

TOTAL MANAGED

| 8.40% |
| 14.17% |
| N/A |

TOTAL BENCHMARK

| 6.11% |
| 14.75% |
| N/A |

TOTAL ACTIVE

| 2.30% |
| 2.75% |
| 0.84 |

LOCAL EXCESS

| 2.06% |
| 2.50% |
| 0.82 |

CURRENCY

| 0.24% |
| 0.74% |
| 0.32 |

RETURN ADJUSTMENT

| 0.00% |
| 0.00% |
| 0.45 |

COMMON FACTOR

| 0.32 |
| 1.58% |
| 0.20 |

SPECIFIC

| 1.74% |
| 1.58% |
| 1.11 |

COUNTRY

| -0.15% |
| 0.99% |
| -0.15% |

RISK INDICES

| 0.17% |
| 0.72% |
| 0.24 |

INDUSTRY

| 0.29% |
| 0.71% |
| 0.41 |

■ [Full-time-span] [Annualized] [Net] Return
■ [Full-time-span] [Annualized] [Net] Risk
■ [Full-time-span] [Annualized] [Net] Information ratio

Analysis as of July 31, 2019. The white box displays the annualized return contribution of assets and the gray box displays the active risk, which is composed of the standard deviation of common factors and a stock specific component.

Source: MSCI's Barra PortfolioManager

3. STOCK-SPECIFIC PERFORMANCE CONTRIBUTION FROM ESG FACTORS

To better understand the contribution of which ESG factors made to the actual performance of the MSCI Emerging Markets ESG Leaders Index, we ran a performance attribution analysis in MSCI's Barra® PortfolioManager. As highlighted in Figure 4, a significant portion of the outperformance was stock-specific. The outperformance was driven by either overweighting or underweighting stocks based on ESG criteria. Results are net of systematic factors. More specifically, we have used MSCI's Barra PortfolioManager tool to perform attribution analysis that captures most of the known alpha sources. Anything that is left over – i.e., that is stock-specific – relates to the way the index was constructed. In the case of the MSCI Emerging Markets ESG Leaders Index, this reflects the stock selection based on the MSCI ESG Ratings.

Figure 5: Contributions from overweighting versus underweighting
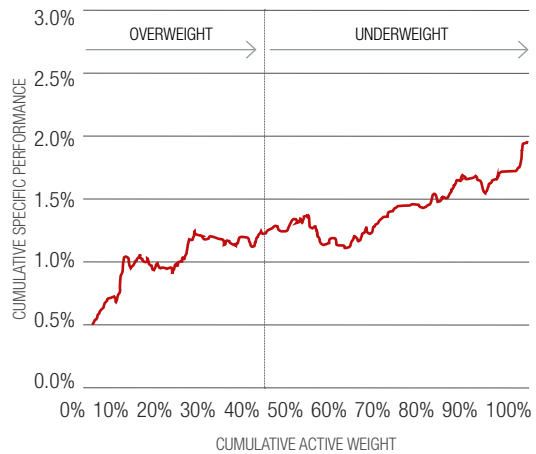
Data from June 6, 2013 to July 31, 2019. The figure shows the cumulative specific performance contribution of the MSCI Emerging Markets Leaders Index versus the cumulative average of overweight and underweight stocks (sorted from largest to smallest based on the active weight).

Source: MSCI ESG Research

More specifically, we then tried to understand whether this outperformance and stock-specific contribution was driven by including high-rated stocks or by excluding low-rated stocks from the index. Figure 5 shows that both underweighting low-rating stocks and overweighting high-performing stocks had a significant, positive impact on returns. That is, the stocks included in the index, which had high MSCI ESG Ratings, performed better on average than the stocks included in parent index, the MSCI Emerging Markets Index. The reverse logic applies for the excluded stocks.

Table 4: Top contributors consistently excluded or consistently included in the MSCI Emerging Markets ESG Leaders Index since inception

COUNTRY	INDUSTRY	COMPANY	AVERAGE ACTIVE WEIGHT	ANNUALIZED NET SPECIFIC CONTRIBUTION
ALWAYS IN				
CHINA	Software & Svc	Tencent Holdings Ltd	3.33%	0.51%
TAIWAN	Semiconductors	Taiwan semiconductor	3.27%	0.22%
BRAZIL	Banks	Itaú Unibanco Holding SA	0.90%	0.07%
RUSSIA	Oil & Gas E&P	Novatek PAO	0.27%	0.07%
INDONESIA	Banks	Bank Central Asia TBK PT	0.34%	0.06%
INDONESIA	Banks	Bank Rakyat Indonesia (ersero) TBK PT	0.26%	0.06%
CHINA	Banks	China Merchants Bank Co. Ltd.	0.28%	0.05%
NEVER IN				
CHINA	Software & Svc	Baidu Inc.	-0.60%	0.19%
CHINA	Integ Oil &gas	Petrochina Co, Ltd.	-0.45%	0.08%
SOUTH KOREA	Automobiles	Hyundai Motor Co.	-0.56%	0.05%
CHINA	Integ Oil &gas	China Petroleum & Chemical Corp.	-0.48%	0.05%
BRAZIL	Beverages	Ambev SA	-0.59%	0.04%
SOUTH KOREA	Steel	POSCO	-0.41%	**0.04%**

Data from June 6, 2013 to July 31, 2019. Stock selection based on always in/out of the index and positive annualized net specific contribution.

Source: MSCI Emerging Markets Index, MSCI Emerging Markets ESG Leaders Index

To better understand the contribution of the over- and underweight stocks, we then looked at the ESG characteristics of the top contributors that had been excluded during the full period or had been included during the full period in the MSCI Emerging Markets ESG Leaders Index since inception in June 2013. Several of the companies that were consistently excluded from the index are state-owned enterprises like PetroChina and China Petroleum & Chemical Corp (see Table 4). Taiwan Semiconductors (TSMC), Tencent, and a few banks are among those that were consistently included.

When we look at the annualized net contributions, the most significant positive contributors have been Tencent (always included) and Baidu (always excluded). As of July 2019, Tencent had an MSCI ESG Rating of BBB while Baidu was rated CCC. The biggest MSCI ESG Rating divergence between these two companies was in management of privacy and data security risks, with additional difference being caused by differences in human capital management (Table 5).

Table 5: Comparison of performance on key ESG issues (quartiles relative to MSCI ACWI industry peers)

| KEY ESG ISSUES	TENCENT = BBB	BAIDU = CCC
CORPORATE GOVERNANCE	*	*
CORRUPTION	*	*
DATA SECURITY	***	**
HUMAN CAPITAL	****	*

**** - top quartile; * - bottom quartile

Data as of July 2019

Source: MSCI ESG Research

Over the period from June 2013 to August 2019, the constituents of the MSCI Emerging Markets ESG Leaders Index with high MSCI ESG Ratings tended to perform better than their market peers with low MSCI ESG Ratings in terms of share-price performance.

Figure 6: Corporate performance of top contributors vs. industry peers
(based on ROIC for all companies except banks and ROE for banks)

5-year average ROIC/ROE (banks)　　5-year average industry ROIC/ROE (banks)
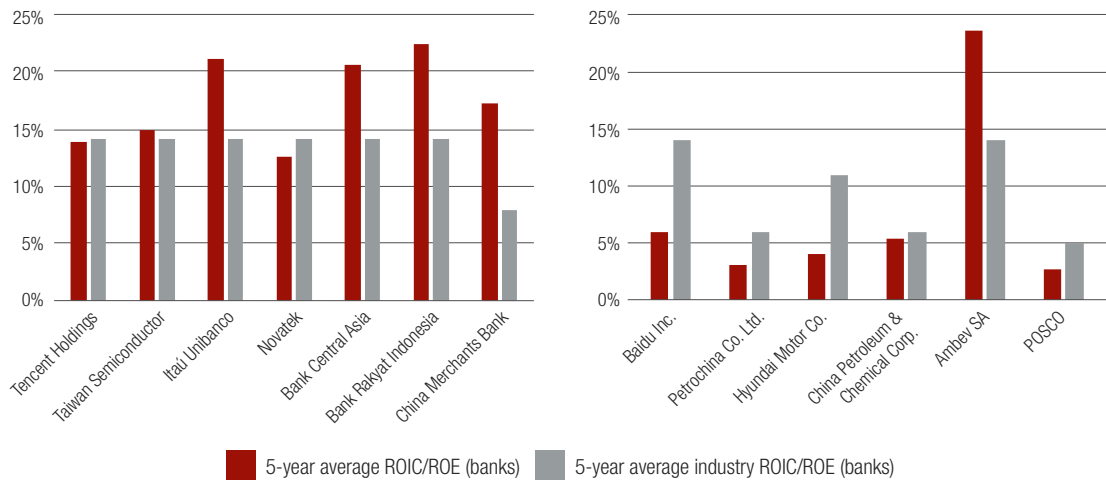
Data from July 2019. Source: MSCI ESG Research, Thomson Reuters, SNL

The five-year corporate performance, which considers both the return on invested capital and return on equity, records of the individual companies always included or always excluded from the MSCI Emerging Markets ESG Leaders Index further bolster the idea that MSCI ESG Ratings may have helped differentiate companies within the same or different sectors, including in the emerging markets, where the overall distribution of ratings tended to be lower during the six-year study period. This observation holds for emerging markets, even though the overall distribution of MSCI ESG Ratings tended to be narrower than for companies in developed markets during the six-year study period. Comparing these companies to their industry peers (Figure 6), we see that, in most cases, the five-year average return on invested capital and return on equity of the companies always included in the MSCI Emerging Markets ESG Leaders Index was higher than for their industry peers. In contrast, nearly all the companies always excluded from the MSCI ESG Leaders Index (except for Ambev) had lower returns than their industry peers.

4. ESG INVESTING IN EMERGING MARKETS

Thus far, we have extensively analyzed the MSCI Emerging Markets ESG Leaders Index and the added value of ESG Ratings in stock selection. This leads us to the question of what the transmission channels that led to the superior performance over this period might be. To address this, we studied the three transmission channels examined in our 2017 study [Giese et al. (2017)]. These three transmission channels are based on the following rationales:

- **Cash-flow channel:** companies with a high ESG rating may be more competitive and may be able to generate abnormal returns, leading to higher profitability and dividend payments.

- **Idiosyncratic risk channel:** companies with a high ESG rating may be better at managing company-specific business and operational risks and, therefore, may have a lower probability of suffering incidents that can impact their share price. Consequently, their stock prices display lower idiosyncratic tail risks.

- **Valuation channel:** companies with a high ESG rating may have lower exposure to systematic risk factors. Consequently, their expected cost of capital may be lower, leading to higher valuations in a discounted-cash-flow model framework.

The former two channels are transmitted through corporations' idiosyncratic risk profiles, whereas the latter channel is linked to companies' systematic risk profiles.

The analysis in Giese et al. (2017) focused on developed markets (as represented by the MSCI World Index), where we have a longer time series of data available, going back to 2007. In this paper, we asked whether evidence of these relationships could also be identified in emerging markets, where we have available data since June 2013. All the results shown in this paper are neutralized for industry exposure (using industry-adjusted ESG scores) and firm size. More specifically, we created size-adjusted ESG scores as the residuals from regressing standard MSCI ESG scores on the

Figure 7: ESG quintiles

GROSS PROFITABILITY OF ESG QUINTILES (A)

BOOK-TO-PRICE RATIO OF ESG QUINTILES (B)

■ Mean ● Current
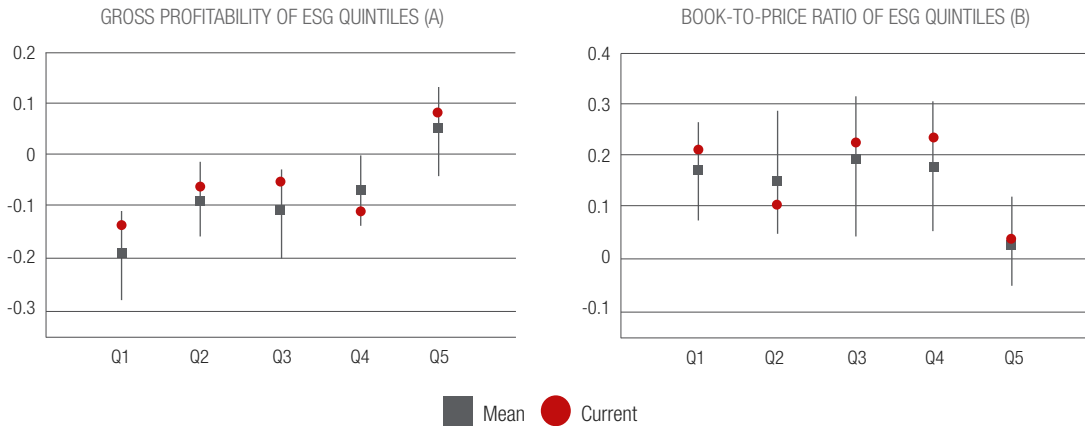
MSCI Emerging Markets Index constituents, data from June 2013 to July 2019. Left: Gross profitability (z-score) of size-adjusted ESG quintiles is computed as most recently reported sales less cost of goods sold, divided by most recently reported company total assets. Right: Book-to-price ratio is computed as the last reported book value of common equity divided by current market capitalization.

The average value over the period is represented by gray squares. The current exposure is represented by red dots. The vertical bars represent the 5% to 95% range of observed values.

size exposure in MSCI's Global Equity Model for Long-Term Investors model and an intercept variable. In our analysis, we show the distribution of financial variables across five size-adjusted ESG score quintiles (Q1 to Q5), with Q1 indicating the companies with the lowest MSCI ESG Rating and Q5 indicating the highest-rated companies.

Similar to Giese et al. (2017), we found that high ESG-rated companies (Q5) were more profitable, especially when compared to the bottom-quintile (Q1) companies (Figure 7(a)). Furthermore,

Figure 8: Idiosyncratic incident frequency of top and bottom ESG quintiles

— Worst ESG quantile, mean = 9.579
— Best ESG quantile, mean = 3.158
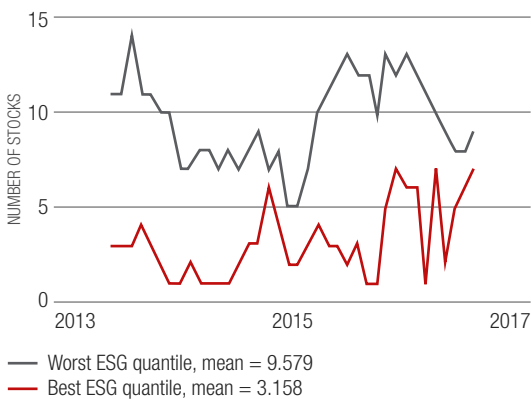
MSCI Emerging Markets Index constituents, data from June 2013 to July 2019. For each month, we report the number of stocks that realized a more than 50% cumulative loss over the next three years, taking the price at month end as the reference point for return calculations.

Q5 companies were also valued at a premium (Figure 7(b)) over the period of June 1, 2013, to July 31, 2019.[5] To assess idiosyncratic risk, we identified companies in the MSCI Emerging Markets Index that experienced a drawdown of more than 50 percent or went bankrupt in the three-year period after the company was categorized in either the top or bottom MSCI ESG Rating quintile. We consider these events to be an idiosyncratic risk incident. We found that companies with high ESG Ratings (top quintile of MSCI Emerging Markets Index constituents) had a significantly lower incident frequency than companies with poor MSCI ESG Ratings (Figure 8). In line with Giese et al. (2017), we also tested the robustness of the idiosyncratic risk results by using a 50 percent drawdown threshold. This analysis achieved similar results to the original paper, though it must be noted that analysis could only be conducted using a significantly reduced sample size.

Finally, we found that the MSCI ESG Ratings change (ESG momentum) might also be a useful indicator for emerging markets. ESG momentum is defined as the change in ESG industry-adjusted score in the previous 12 months. Figure 8 shows the returns for the top ESG momentum quintile (companies with the biggest improvement in ratings) versus the bottom ESG momentum quintile (biggest negative change in ratings), equally weighted, from July 2013 to July 2019.

5 Bioy, H., and E. Stuart, 2020, "European sustainable fund flows: a record-shattering year," January 30, Morningstar

Figure 9: Financial performance of top and bottom ESG momentum quintiles
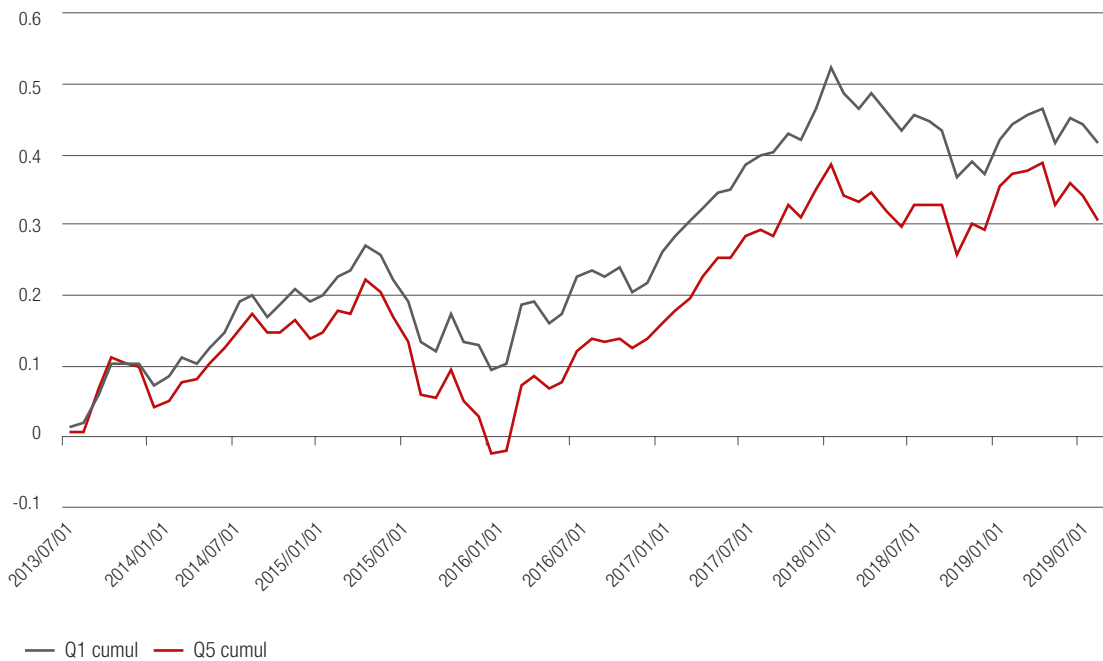
MSCI Emerging Markets Index constituents, data from June 2013 to July 2019. The figure shows the cumulative performance of the top and bottom ESG momentum quintiles. ESG momentum is defined as the 12-month change in the ESG score.

5. CONCLUSION

In emerging markets, companies tended to have lower MSCI ESG Ratings than global peers, but the performance premium associated with better ESG ratings was stronger than in developed markets over the six-year period examined in this paper.

- MSCI ESG Ratings are designed to identify industry-specific, financially relevant issues in addition to corporate governance risks.

- The MSCI Emerging Markets ESG Leaders Index, which was launched in June 2013, outperformed the MSCI Emerging Markets Index between June 2013 and August 2019. We found that a significant part of this outperformance was driven by stock-specific selection, based on ESG factors.

- We also found that emerging-market companies with high ESG ratings had higher profitability, lower idiosyncratic risk, and a premium on their valuation over the same time period when compared to emerging-market companies with low ESG ratings.

REGULATING ESG
INVESTING THE E.U. WAY[1]

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ANDY PETTIT | Director of Policy Research, EMEA, Morningstar

ABSTRACT

The publication of a Sustainable Finance Action Plan in March 2018 marked the European Commission's formal launch of a major project to leverage financial markets to address sustainability challenges. The Commission had previously identified an annual funding gap of between €175 billion and €290 billion to meet its envisaged target of a 50 percent cut in greenhouse gas emissions by 2030. To plug the gap, the broad series of steps set out in the Action Plan ultimately seeks to induce behavioral change to reorient capital flows and mainstream sustainability in risk management. In this paper, we examine how the plan uses traditional regulatory tools to achieve these goals, and the challenges and opportunities in doing so. We find that changing fiduciary and suitability standards are the most coercive tactics, but enforcement and implementation will determine the degree to which these approaches cause the investment industry to consider and cater to investors' ESG preferences. Further, new disclosure regulations will have a profound impact on the information investors have and, if they are enforced and effective, make it much easier for them to express their sustainability preferences through their investments.

1. INTRODUCTION

A hundred and ninety-six countries, and the E.U. itself, are now signatories[2] to the 2015 Paris Agreement on climate. The governments of many of those countries are increasingly turning to their financial services sectors to help fulfill the commitments they have signed up to.

To put some context around the scale of the task, the E.U. estimates a yearly investment gap of between €175 billion and €290 billion to meet its envisaged target of a 50 percent cut in GHG (greenhouse gas) emissions by 2030 and to be climate-neutral by 2050.[3]

In turn, the E.U. has started a major project to leverage financial markets to address sustainability challenges – particularly global warming – complete with new legislation and directives that are in various phases of development.

2. THE EUROPEAN COMMISSION'S (E.C.) SUSTAINABLE FINANCE ACTION PLAN

The E.U.'s efforts are guided by the Sustainable Finance Action Plan, the E.C.'s proposed package of new laws and regulations that aims to elevate the environmental and social sustainability of an enterprise as a key factor for investors. Political agreement and much of the legislative text was largely complete by late 2019, with work on the detailed implementing measures continuing through 2020.[4]

Without question, this is a massive shift in the way governments have thought about the need to regulate capital markets. Traditionally, financial regulators have focused on protecting investors at least from fraud (and increasingly from substandard or conflicted advice), ensuring that financial markets are transparent, trading is fair, and avoiding systematically important failures or liquidity crises. The

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[1] Note: In this paper, we do not consider some of the proposals that affect bank or most insurance regulations. Rather, we choose to focus on the aspects that could affect ordinary investors and how their investments are managed.
[2] https://bit.ly/392KD2d
[3] E.U. Green Deal, https://bit.ly/3948Eps

E.U.'s Sustainable Finance Action Plan represents a sharp discontinuity with those historical concerns. Instead, the E.U. plans to harness financial markets as part of a broader policymaking agenda promoting sustainability as core to economic growth and societal benefit.

Indeed, the E.U. now has three additional goals beyond the traditional regulatory concerns for financial markets, which it describes as: 1) reorienting capital flows toward a more-sustainable economy; 2) mainstreaming sustainability in risk management; and 3) fostering transparency and long-termism. In other words, the E.U. wants more investors to consider sustainability factors as they make investment decisions and to put their money in sustainable products, and by changing the investing culture, put a stronger onus on corporate CEOs to think much more long-term about the sustainability of their operations.

3. INTEREST FROM INVESTORS CONTINUES TO INCREASE

As of December. 31, 2019, 2,405 sustainable funds were domiciled in Europe. Of those, 360 were launched during the year, and in that same period inflows were more than twice as high as those in 2018.[5]

With this growth, the share of passive investment mandates has increased to 21 percent of the European sustainable fund market, up from 14 percent five years ago.

These funds use ESG factors as a key part of their security selection and portfolio construction process, to pursue a sustainability-related theme, or to seek a measurable positive impact alongside financial returns.

This level of interest and growth trajectory is promising for those governments keen to increase the flow of funds to sustainable investments. On the flip side, it can create temptation for funds to exaggerate their "E," "S," or "G" credentials to attract a share of fund flows – so-called "green-washing".

> "
> *In all cases, the E.U. intends to induce a variety of third parties to carry out a public aim.*
> "

Investors actively choosing a "green" product, sometimes at higher cost or with the chance of lower returns, will expect some assurance that the product really is green. The core elements of the E.U. plan suggest that regulators are alert to the challenge and are aiming to provide an environment that facilitates continued growth while protecting investors from being misled into unsuitable products.

4. POLICY APPROACHES TO MEET THE E.U.'S SUSTAINABLE INVESTING GOALS

While the E.U.'s set of goals to increase sustainable investing is new, the core approaches that the E.C. plans to take to advance the agenda are not – they are the same basic tools the E.U. has historically used to protect investors and keep markets fair.

In all cases, the E.U. intends to induce a variety of third parties to carry out a public aim. Specifically, the E.C.'s proposals for new regulations, and modifications to existing legislation, rely heavily on the traditional pillars of financial regulations: disclosures, suitability regulations, and fiduciary standards of conduct or other duties to investors (Table 1).

Table 1: The E.U. plans to leverage traditional approaches to achieve a new sustainable finance goal

DISCLOSURES	SUITABILITY RULES	FIDUCIARY OBLIGATIONS
...to induce private third parties to align their investing decisions with EC suitability goals	...will require financial advisors to consider their clients' interest in sustainable products as part of their recommendations	...will require asset managers to integrate ESG factors into their overall investment process

4 Under the EU legislative process, once the Commission adopts a proposal for a Regulation, the Parliament and Council separately consider their views before entering into trialogue negotiations. Once agreed and adopted by both institutions, the Commission will publish the text in the Official Journal, to take effect usually 12-18 months later.

5 Bioy, H., and E. Stuart, 2020, "European sustainable fund flows: a record-shattering year," January 30, Morningstar

Table 2: Select E.U. initiatives to implement the Sustainable Finance Action Plan

E.U. INITIATIVE	STATUS OF IMPLEMENTATION
Establish a taxonomy of environmentally sustainable activities (disclosure)	Political agreement reached on **Taxonomy Regulation**. Technical screening criteria relating to climate change mitigation and adaptation due by December 2020.
Standards and labels for green products (disclosure)	**Green bond standard** drafted; draft recommendations for adding labels to standard disclosures for retail investment products.
Strengthen corporate sustainability disclosures (disclosure)	Nonbinding **climate reporting guidelines** issued in June 2019; public consultation on revising the **Non-Financial Reporting Directive** opened in February 2020.
Developing sustainability benchmarks (disclosure)	Amendments to **Benchmark Regulation** completed with delegated Acts to be consulted on in 2020 and implemented in 2022.
Integrating sustainability into credit ratings (disclosure)	ESMA published **guidelines on sustainability disclosures in credit ratings** – no explicit proposal to require incorporating sustainability factors into ratings.
Incorporating sustainability when providing financial advice (suitability)	ESMA has produced draft guidelines to help with further refinement of a **MiFID II and IDD** delegated Act incorporating these concepts.
Clarifying institutional investors' and asset managers' duties (fiduciary duty)	The new **Disclosure Regulation** has been published in the Official Journal, with a March 2021 compliance date.

Table 2 highlights select legislative or non-legislative proposals that aim to advance the E.U.'s goals, along with their status. We do not include a high-level goal on fostering investment in sustainable projects that is not yet fully defined, nor prudential bank and insurance regulation, which is outside the scope for this paper.

As demonstrated in Table 2, although the E.U. is taking financial regulation in a completely new direction – actively trying to steer investments as part of a new sustainability goal – its plans rely heavily on the traditional financial regulatory approach of compelling disclosure. However, the two most coercive approaches they plan to take out of the toolkit are changing fiduciary and suitability standards. How well these approaches perform is predicated on how effective the disclosures are, particularly the extent to which they are comparable, useful, and complete. Since these regulations hinge on a public/private partnership between regulators and financial professionals, their success depends on whether the market can scale up the integration of this ESG data into capital markets and whether financial product manufacturers can deliver cost-effective green products. Furthermore, regulators in different member states will need to enforce the rules sufficiently so that the obligations do not become a check-the-box exercise, without stifling private-sector innovation.

5. UNDERSTANDING THE REGULATORY APPROACHES AND THEIR STRENGTHS AND WEAKNESSES

Every approach to correcting market failures has strengths and weaknesses that can help us predict likely future implementation challenges. In this section, we consider the degree to which each approach is likely to achieve the E.U.'s core goals, summarized in Table 3. In summary, given the heavy reliance on disclosure, the effectiveness of the action plan depends heavily on the degree to which financial advisors faithfully integrate ESG factors into their recommendations for ordinary investors; the degree to which the disclosures allow for comparability and meet investors' needs; and the degree to which asset managers integrate ESG factors into their processes and provide products that meet investors' needs.

6. DISCLOSURES ARE DESIGNED TO NUDGE INVESTORS

The E.C.'s regulatory approach will rely heavily on new disclosures by listed equity companies, issuers of bonds, and investors, which are advanced by five of the new investment proposals in the hope that this information will induce investors to align their investing decisions with E.C. goals of increased sustainability.

Table 3: How each policy approach advances the core goals of the E.U.'s sustainable action plan

GOAL	NUDGING WITH DISCLOSURE	COERCING THROUGH SUITABILITY RULES	DIRECTING CHANGE THROUGH A NEW FIDUCIARY DUTY
REORIENTING CAPITAL FLOWS TOWARD A MORE SUSTAINABLE ECONOMY	📄	⚠️	⚖️
MAINSTREAMING SUSTAINABILITY IN RISK MANAGEMENT	📄		⚖️
FOSTERING TRANSPARENCY AND LONG-TERMISM	📄		⚖️

Indeed, the obligations being placed upon downstream institutional investors and financial advisors all have a significant dependency on understanding what individual companies are doing to manage ESG risks and create positive impacts. Disclosure of this information in a common language with standardized ways of measuring performance is a critical foundational requirement that underlies the development of an environmental taxonomy. "Green" bonds will be a significant factor in achieving the E.U. aims, and these also face more standardized disclosures about how each bond uses the money raised and the environmental impact that it makes.

Newly required disclosures will provide investors with a framework for sustainable activities, labels for green financial products including bonds, the incorporation of ESG factors in market indexes, clarity about the aims of low-carbon or positive-carbon benchmarks, and new corporate issuance disclosures to underpin all the other sustainable finance efforts.

Credit rating agencies have also been served new disclosure guidelines by European Securities and Markets Authority, or ESMA. The supervisory authority stopped short of mandating the consideration of ESG factors in credit rating decisions but, effective end of March 2020, they should inform whether ESG factors were a key driver of a credit rating action. Further, the E.C. is in the midst of reviewing the market structure for sustainability ratings, data, and research with results expected in late 2020.

These disclosures will provide an important foundation to enable the other aspects of the E.U. plan to work. It is not an exaggeration to say that aligning these disclosures with investor needs is essential for the other parts of the plan to effectively push investors to redirect capital toward sustainable investments. Further, they are necessary for investors to properly consider sustainability as part of their process, a key goal of the E.C. Finally, they will add new transparency if they are correctly calibrated and if disclosures across entities are comparable and useful. Nonetheless, it would be a mistake to assume the disclosures will work on their own. They are a necessary nudge, but hardly sufficient to achieve the goals of the Sustainable Finance Action Plan.

The central proposals to enhance disclosures are new Taxonomy and Disclosure Regulations.

6.1 Taxonomy regulation

The E.U. Taxonomy is effectively a classification tool to help investors and companies make informed investment decisions. It has been a cornerstone of the action plan to scale up investment to the most environmentally effective activities, a prerequisite of which is increased data flows across capital and commodity markets.

Initially, the Taxonomy is focused exclusively on environmental activities. An expert group identified 67 business activities across eight sectors that contribute to climate change mitigation or adaptation, without doing significant harm to four other environmental objectives that the Taxonomy will ultimately cover: water; circular economy and waste; pollution prevention and control; and the protection of healthy ecosystems.

In its first incarnation, the organizations compelled to reference the Taxonomy are the manufacturers of investment products that promote environmental or sustainable characteristics; E.U. member states that create any public labeling schemes for green investment products or corporate bonds; and, in a late amendment, large corporations.

Those corporations will now be required to disclose the proportion of their revenues that are aligned with the Taxonomy, which will help investors assess to what extent their investments contribute to environmentally friendly activities. It is an important addition that will help investors report on the proportion of investments that are Taxonomy-eligible. For example, consider a company with 80 percent of its revenue in Taxonomy-aligned activities. If half of an investor's portfolio were in such a firm, the investor's portfolio would be 40 percent aligned with the Taxonomy, assuming it included no other Taxonomy-aligned investments. If the remainder of the portfolio were in companies with revenues that were 50 percent aligned with the Taxonomy, then the portfolio would be 65 percent Taxonomy-aligned.

The E.C. hopes that a broad range of other market participants will voluntarily embrace the Taxonomy, such as banks in the assessment of green loans, and plans to examine how to leverage it for other financial products. However, regulators face two significant challenges: firstly, the plan's current limited scope, and secondly, competition from other taxonomies, labels, and standards being developed within and beyond the E.U.

Despite that, these moves toward more standardized disclosures by financial products about the positive environmental objectives they contribute to, together with the methodologies used to measure and monitor progress, could play a meaningful role in minimizing levels of future greenwashing. The success of the disclosure regime will depend on the Taxonomy continuing to evolve, but also on new disclosures that are completely apart from the Taxonomy. In the next subsection, we expand on the other parts of the new disclosure regime beyond the Taxonomy, which will also be critical for providing the common language, particularly around principal adverse impacts of an investment, E.U. policymakers believe will advance the goals of the Sustainable Finance Action Plan.

6.2 Disclosure regulation

The new Disclosure Regulation supplements the current rulebooks governing manufacturers of, and advisors on, financial products. Broadly, managers must disclose how sustainability risks are considered in their investment process, what metrics they use to assess ESG factors, how they consider investment decisions that might result in negative effects on sustainability factors, and principal adverse impacts in the regulators' jargon.

Disclosures are most useful when they are concise, standardized, and, ideally, quantified and forward-looking. The preamble of the Regulation acknowledges that divergent and non-harmonized disclosure standards create an uneven playing field for products and can confuse investors and distort their investment decisions. How effectively these goals are transposed into practice will emerge later in 2020, in the form of the Delegated Acts and Regulatory Technical Standards, which will define how the Regulation is implemented. These developments will be critical in shaping how effective the Disclosure Regulation will prove to be.

> " *One promising way to operationalize a sustainability suitability score is to illustrate potential trade-offs.* "

A prerequisite for products promoting ESG characteristics will be to explain how they plan to achieve their aims and provide supporting indicators, including, where relevant, its ESG benchmark and a broad market benchmark. They will also need to assess and report on sustainability-related risks and their potential negative effects on the financial returns of the product.

This escalating universe of investable ESG products can reasonably be expected to presage an ever-increasing creation of benchmark indexes; the many broad market benchmarks are likely to be supplemented with more-focused versions that track markets through different policy lenses. Reflective of the broad reach of the E.U.'s plan, providers of such benchmarks also face major new disclosure obligations.

Firstly, to assuage concerns about the wide variety of carbon benchmarks being used by investment portfolios, two categories of carbon benchmark are being defined in regulation. Carbon benchmarks must be either E.U. Climate Transition or the more aggressive E.U. Paris-Aligned, and to use either label providers must describe how the constituents were selected and why others were excluded.

Secondly, benchmark administrators will have to disclose in all of their benchmark statements, except those of interest rate or foreign-exchange-rate benchmarks, whether ESG objectives are pursued.

A big unknown for the investors hoping to benefit from these new disclosure obligations is the degree of consistency and comparability to expect. The different implementation times will compound the challenge, with even the first components of the Taxonomy not taking effect until 2022, while the Disclosure obligations for ESG fund managers kick in earlier in March 2021 and for benchmark providers in April 2020. Thus, until the Taxonomy is live, and corporations are reporting revenue breakdowns accordingly, benchmarks and funds are being handed a reporting challenge that will likely require them to develop estimation models to measure their constituents' level of Taxonomy-eligibility. As a result, it will almost certainly hinder comparability in the early stages but potentially allow best practices to gradually emerge and gain adoption. On balance, we support this progressive approach as preferable to waiting for a distant date for all parties to comply. The shorter the time period in which a reasonable degree of useful standardized disclosures can be achieved, the better for all concerned.

7. COERCING ADVISORS AND INVESTORS THROUGH SUITABILITY RULES

Suitability fact-finds are a core (and legally required under Markets in Financial Instruments Directive or MiFID) first step in advisors getting to know their clients and form part of their suitability assessment.

Traditionally, these efforts have meant that advisors considered factors such as time horizon, investing objectives, and risk tolerance as they make their recommendations to clients. Under the proposal, financial advisors will need to further consider their clients' interest in sustainable products as part of their recommendations.

These suitability standards are much more coercive than the new disclosures and can help direct capital flows to new investments – if investors respond to them. Designing a mechanism to operationalize a sustainability preference will be challenging, since sustainability encompasses a wide range of activities, while other suitability factors, such as capacity for loss and knowledge and experience, are more linear and easily quantifiable. Furthermore, incorporating the suitability preferences hinges on adequate, accurate, and comparable disclosures.

Since so much depends on suitability, it will be critical for the E.U. and ESMA to ensure that the industry has the guidance and tools it needs to address a variety of challenges as they implement the suitability requirement.

First, there are a wide variety of definitions of ESG, so an advisor and investor could talk about ESG preferences without ever actually understanding each other. For example, each could mean negative screens, best in class and impact, or some other more granular concern. Particularly in the early stages, when the Taxonomy is not fully developed, this wide variety of definitions, preferences, and goals for investors will make it challenging to ensure an investor's sustainability preferences match up with a particular investment. Even as the Taxonomy is fully developed, it provides definitions of positive activities that contribute to sustainability. Some investors may be more focused on sustainability risk, an activity they do not want to support with their investments, or activities that are not defined in the taxonomy. Aligning a suitable investment to this wide variety of ESG interests will prove challenging. Investment advisors will need robust data on the universe of investments and clear guidelines on how to cope with this wide variation in sustainable preferences. Ensuring advisors and investors understand the differences in preferences between avoiding ESG risks, making sustainable impact investments, or avoiding certain types of companies, industries, or products will be critical.

Second, it is difficult to operationalize for consistency of preferences for investors interested in incorporating ESG factors into their investments. For example, simply asking people whether they value sustainability is likely to result in inconsistent answers that do not reflect revealed preferences.[6] One promising way to operationalize a sustainability suitability score is to illustrate potential trade-offs, and we have tested this approach successfully.[7] However, using a trade-off-based approach to elicit how important sustainability is to an investor leads to another problem: advisors will need to clearly convey to investors that they may not be sacrificing returns by virtue of picking sustainable products. Further, sustainability should not be used as an excuse for poorly performing or high-cost investment products. There will inevitably be a transition period during which regulators monitor how firms experiment with ascertaining investors' preferences and how to communicate the actual potential trade-offs of various sustainable strategies, while using a principles-based approach.

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6 Sin, R., R. O. Murphy, and S. Lamas, 2019, "The true faces of sustainable investing: busting the myths around ESG," Morningstar, https://bit.ly/37ZvP36
7 Ibid.

Finally, we believe that portfolio-level analysis is critical to allow investors to see how their portfolios perform in terms of performance on ESG metrics. After all, most investors will not want a portfolio solely devoted to a specific ESG goal, or perhaps fully devoted to any sustainability goal. If an investor has moderate preference for sustainability, their portfolio should tilt toward moderate sustainability. Draft ESMA guidance would allow advisors to either direct a portfolio toward various ESG investments at the percentage levels clients specify, or to examine a portfolio and decide on the degree to which it meets an investor's sustainability goals. Eventually, if the Sustainable Finance Action Plan works as intended advisors may be highlighting remaining "brown" investments in a portfolio and assessing the suitability of those investments, rather than looking for green investments. The next section explains how a new fiduciary focus on ESG factors rounds out the Sustainable Finance Action Plan.

8. FIDUCIARY OBLIGATIONS DIRECTING CHANGES IN ASSET MANAGERS' PROCESSES

Asset managers and financial advisors in the E.U. often have a fiduciary obligation to their investors (depending on the investment product they manufacture), meaning that they have duties to act in the best interest of end investors and conduct adequate due diligence prior to making investments.

The E.U. is explicitly incorporating ESG considerations into these fiduciary obligations. It is both a coercive and pragmatic step. Coercive in that it forces ESG factors to be a part of investment analysis, and pragmatic in that it will eliminate claims of failure of fiduciary duties in instances where ESG is not considered but becomes financially material.

Operationally, the expanded considerations will be executed via amendments to the suite of existing directives that cover the investment fund and insurance-linked investments sector, namely UCITS (Undertakings for the Collective Investment in Transferable Securities), AIFMD (Alternative Investment Fund Managers Directive), Solvency II, MiFID II, and IDD (Insurance Distribution Directive). The drafted amendments will require investment managers to integrate all relevant financial risks into their overall investment and due-diligence processes, but also include all relevant sustainability risks that might have a relevant material negative impact on the financial return of an investment.

Informing investors that these sustainability factors are being considered, and how so, is mandated by the aforementioned Disclosure Regulation. When the sustainability risk assessment leads to the conclusion that there are no sustainability risks deemed to be relevant to the financial product, the reasons should be explained. When risks are identified, the extent to which those sustainability risks might impact the performance of the financial product should be disclosed either in qualitative or quantitative terms.

Beyond posting these policies on their websites, products that promote ESG characteristics will have to report in their pre-contractual disclosures on what that really means and how they enact their investments and benchmark them.

Additionally, and somewhat separate from the Sustainable Finance Action Plan's package of measures, the Shareholder Rights Directive II requires investment managers to disclose more about how they engage with the firms in which they invest and steward their investors' assets.

Already, many fund prospectuses say they include sustainability factors, but it is not clear to what degree they do so. Should this approach work, it would both aid the identification of the best ESG products and minimize greenwashing. To make it work, firms will have to apply pressure to get the company disclosures they need, which could force public companies to consider sustainability in order to continue to be attractive investments.

9. CONCLUSION

Policymakers have set out their stall to make Europe the first climate-neutral continent by 2050 and appointed the financial services industry a key participant in achieving it. The intervening years will continue to see much iterative development across all strands of the Sustainable Finance Action Plan – from risk assessment, through investment selection and reporting, to research, data, and ratings services.

Its success will depend in part on the degree of enforcement of the rules by the E.U. and member states, how it translates into a range of cost-effective greener products, and the ability of the market to scale up the integration of ESG data into capital. During 2020, it will start to become clearer how prescriptive the implementing rules of the different components will be.

The disclosure requirements can provide an important nudge to investors. Furthermore, the Taxonomy will eventually provide a mechanism to substantiate qualitative disclosures with quantitative metrics and diminish the risks of greenwashing. The more consistent the additional disclosures are, the more successful the other components of the action plan will be.

The suitability rules, imposing requirements on financial advisors to consider clients' ESG preferences, create challenges and opportunities for advisors. The wide range of activities that fall under the ESG banner means that a top-down approach, talking about ESG in general terms, will yield more engagement with clients. That engagement will be key to combining clients' financial and sustainability goals into investment recommendations that match investor's preferences. Ultimately, matching investors to suitable products will hinge on adequate, accurate, and comparable disclosures by product manufacturers. Nonetheless, if advisors can clearly explain the differences between meeting specific preferences, reducing risk, or making investments in sustainable activities, this approach could help achieve key E.U. goals and nudge a growing number of ordinary investors to choose sustainable products.

The fiduciary requirements that funds consider sustainability (or explain why they do not) will be effective only if asset managers have access to high-quality ESG data from issuers, which is why the disclosure component is so critical. Nonetheless, as we monitor these changes, we should keep in mind that the European investment market has long been criticized for its high number of funds and share classes that limit economies of scale in comparison with the U.S. Other regulations, notably MiFID II and PRIIPs (Packaged Retail and Insurance-based Investment Products Regulation), have successfully exerted downward pressure on, and more disclosure of, costs and it would be a retrograde step were this to be unintentionally reversed. The hope is that the new regulations will not spur the creation of new funds that do not meet investors' needs. Rather, if implemented properly, the new regulations should spur existing funds to fully integrate sustainability into their processes, investors to pay more attention to existing sustainability funds, and new products to meet a genuine need with clear and clearly explained sustainability goals at reasonable cost.

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