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SeLFIES: A new pension bond and  
currency for retirement  
ROBERT C. MERTON | ARUN S. MURALIDHAR

WEALTH & ASSET  
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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.

A handwritten signature in black ink, appearing to read 'Lance Levy', with a stylized, flowing script.

Lance Levy, **Capco CEO**



# SeLFIES: A NEW PENSION BOND AND CURRENCY FOR RETIREMENT

**ROBERT C. MERTON** | Distinguished Professor of Finance, Nobel Laureate – Economics 1997, MIT Sloan School of Management  
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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

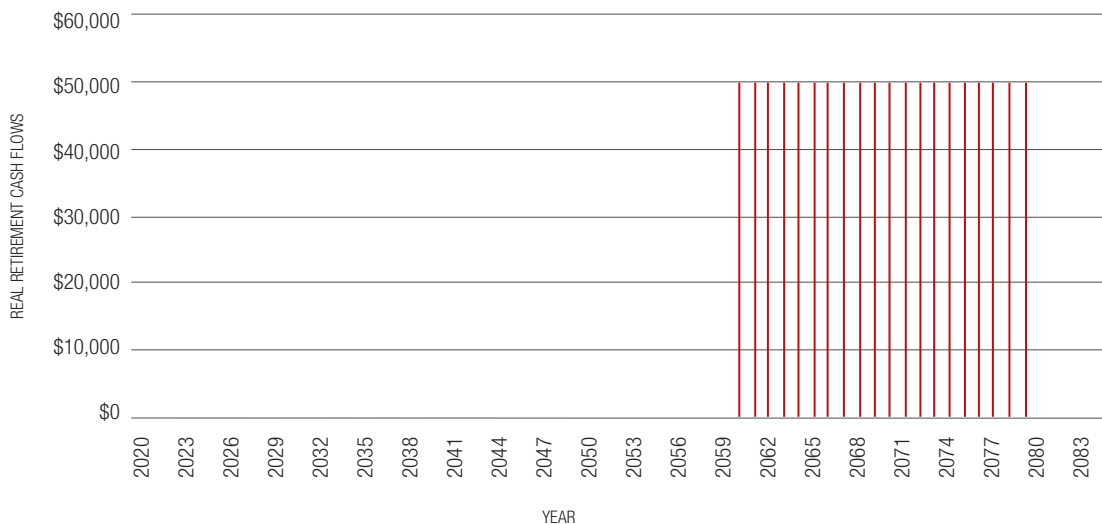
What is the desired retirement income stream or cash flow of an individual? Assume a 25-year-old in 2020. They would typically plan to work for 40 years and would like to receive say U.S.\$50,000 real/year for 20 years in retirement (assuming death is known). They would like this real stream to be indexed 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.

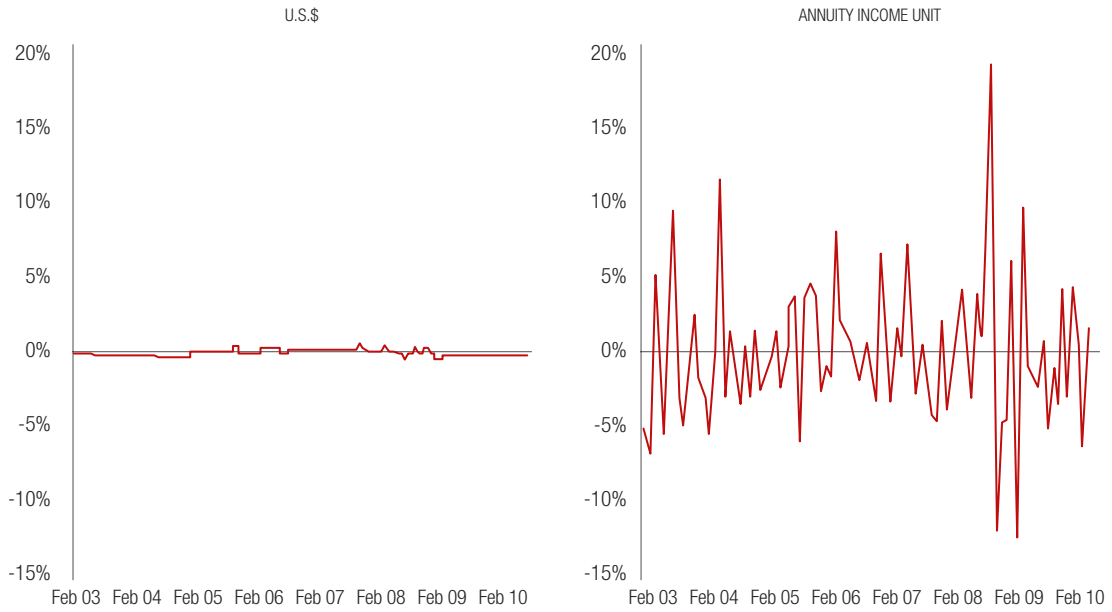
### 2.2 Challenges with T-bills

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)

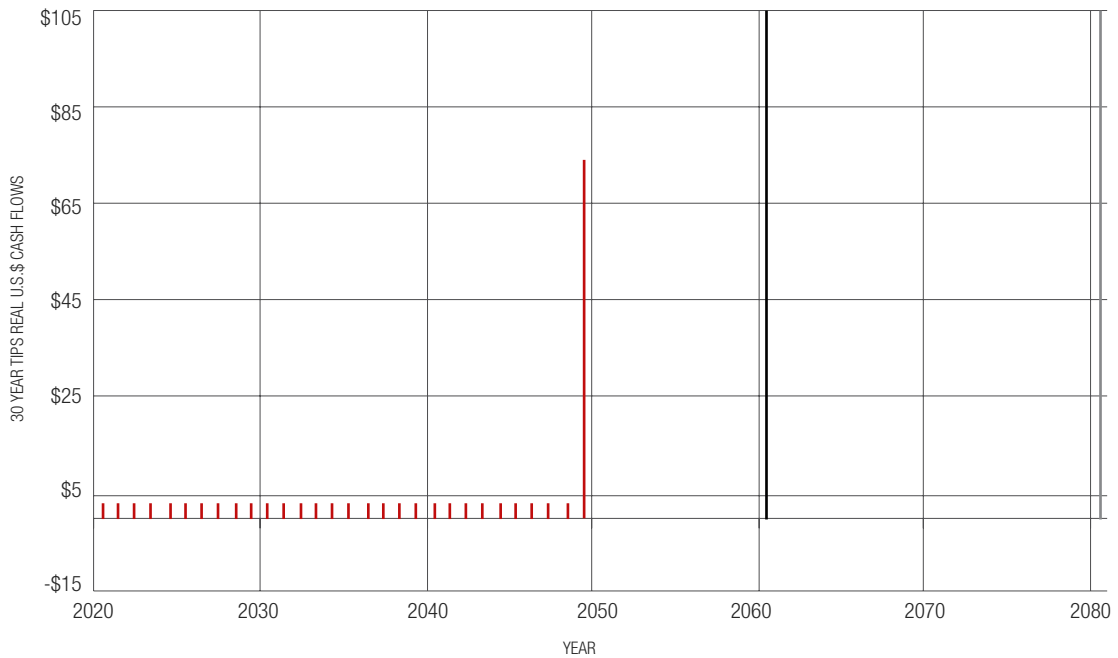


**Figure 2:** Measuring risk of T-bills from an absolute and annuity income unit perspective



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 AIU) 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)].<sup>1</sup> 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.

<sup>1</sup> 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.

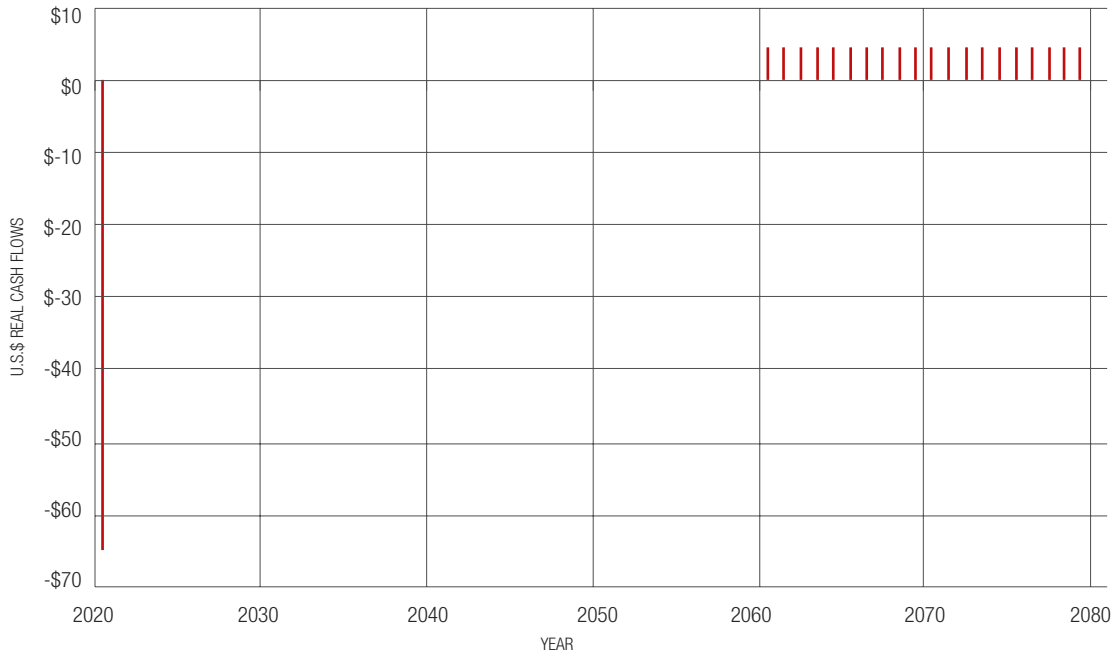
### 3. THE SeLFIES DESIGN

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.<sup>2</sup> 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.<sup>3</sup> 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

<sup>2</sup> The Ministry of Finance in Uruguay has recently issued wage-index securities with staggered principal repayment – a sort of variation on SeLFIES – to help local insurance companies hedge their annuity offering to individuals and try to complete the market and encourage private provision of annuities.

<sup>3</sup> <https://bit.ly/2PKuvuA>



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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