

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/331642722>

# SeLFIES for Portugal–An Innovative Pan European Retirement Solution

Preprint · March 2019

DOI: 10.13140/RG.2.2.17574.57929

---

CITATIONS

0

---

READS

76

3 authors, including:



**Robert C. Merton**

Massachusetts Institute of Technology

184 PUBLICATIONS 47,485 CITATIONS

SEE PROFILE



**Arun Muralidhar**

George Washington University

89 PUBLICATIONS 266 CITATIONS

SEE PROFILE

Some of the authors of this publication are also working on these related projects:



Dynamic Beta Management [View project](#)



Decision-Based Attribution [View project](#)

## **SeLFIES for Portugal - An Innovative Pan European Retirement Solution**

**By Robert C. Merton, Arun Muralidhar and Rui Seybert Pinto Ferreira**

Working Paper – this draft March 10, 2019

### **Abstract**

*With a rapidly aging population, Portugal faces some serious pension challenges including a Social Security system which is under pressure, and pension benefits gradually approaching levels that will require individuals to supplement Social Security with private savings. In addition, Portugal has a low rate of financial literacy and hence transferring the responsibility of retirement planning to the general population runs a major risk of many individuals retiring poor. While some attempts have been made to create private pension plans, they have not had the level of acceptance as has been the case in some of the Anglo-Saxon countries. This paper argues that the government of Portugal could issue a new form of Sovereign Contingent Debt Instrument (SCDI) that can address the growing retirement challenge and achieve other goals as well. SeLFIES (Standard-of-Living indexed, Forward-starting Income-only Securities) are a new type of bond that greatly simplify retirement planning to the level of basic financial literacy and can not only address retirement security, but also improve the government's debt financing and funding for infrastructure. Finally, since Portugal is part of the EU, the demand for these new bond instruments could be Euro-wide thereby providing additional benefits to the government in reducing its overall financing cost.*

**Keywords:** *SeLFIES, Portugal, retirement security, complementary DC system, financial innovation, market completion, financial literacy*

**JEL Classification:**

## Background on Portugal and the Challenge of Pension Security

As is the case in most EU countries, and even globally, the pension component of the Social Security defined benefit (DB) system in Portugal is financially unsustainable in the long term. The same applies to the often overlooked separate pension system for public servants, a further contingent liability of the nation.

The chosen financing method is the widely adopted *pay-as-you-go* (PAYGO) system which is based on a solidarity contract between generations. Under pure PAYGO, current payments into the social security system are used to pay current expenditures. Under this system, unlike say the United States which has built up reserves from previous contributions in a Trust Fund, pension expenditures can only be met by taxing the working population. As a result, the stability of this system is highly susceptible to small changes in demographics (e.g., life expectancy and population growth) and productivity growth (Modigliani and Muralidhar 2004).

For many years now, Portugal has struggled with the PAYGO system (Cabral 2017). As a result, Portugal has had to make some difficult adjustments. On the one hand, general tax receipts have been used and national debt issued to make up for the shortfall. However, the government has also tried to correct the benefits side of the equation with reductions in pension and early retirement entitlements, extending the retirement age gradually, and furthermore, lengthening the period for calculation of benefits (from 10 to 15 years to the full contributory period). For spouse or survivor pensions in particular, the impact has been dramatic.

The Portuguese retirement savings system is based on three pillars:

1. The Citizenry Social Protection System (“Sistema de Protecção Social de Cidadania”);
2. The Providential System (“Sistema Previdencial”) and
3. The Complementary System (“Sistema Complementar”).

This proposal does not address the first two, both managed by the state, but instead tries to increase their effectiveness and reach of the third, as well as make the third pillar a real and viable alternative to currently offered savings products for retirement. As is the case in the rest of the world, with PAYGO DB systems struggling from low economic growth and worsening demographics (Modigliani and Muralidhar 2004), there is increasing pressure to transfer the responsibility of saving for retirement onto the individual by encouraging them to contribute to defined contribution (DC) systems – either voluntarily (as in the United States) or mandatorily (as in many Latin American countries). Essentially, these DC systems will need to be robust to complement the declining benefits that will be earned from struggling PAYGO DB systems. If these DC systems are not appropriately designed, and assets invested poorly, the government will have to bail out poor retirees, leading to higher costs to future governments.

The Portuguese PAYGO DB and overall pension challenge is best understood by examining some key facts noted in two European Commission reports (2018a, 2018b):

1. By 2070, Portugal's population will decrease by 2.3 mln, a reduction of 22%. More importantly, the population aged 65 years or more, will increase by 27% and will be 3 times the young population, while the population aged 80 year or more, will increase by 165%. Over the 2016 to 2070 period, the dependency ratio (the ratio of 65 and more year olds to 15-64 year olds) will double from 32.1% to 67.2%. For the 80 year olds and more to 15-64 year olds, the total dependency ratio rises from 53.6% to 89.7%, the highest in the EU!
2. The same report predicts a pension substitution ratio (average starting pension to average salary) of 55.9%. It was 68.3% in 2016 and is only likely to decline further given worsening demographics. Survivors/spouses currently get 50% of the original benefit.

Clearly, pension entitlements are going to be further limited by (a) the requirement that the calculation of benefits will be based on 40 years of contributions; (b) the impact of part time

work; (c) volatility in earnings; (d) career interruptions due to unemployment (the unemployment rate has declined to 6.7% as of Q4 of 2018 from 16.2% in for 2013); and (e) other aspects such as illness, stays abroad, training etc.

For 2017, the Pordata database by FFSS Foundation (Pordata N/A) highlights the following additional challenges:

1. both public servants and private sector pensioners already comprise 41% of the country's population;
2. there are 153.2 seniors for 100 youths and there are only 1.5 social security contributors for each pensioner;
3. the average annual pension is €5,131.4, for spouses it's €2,732.9. By contrast, Portugal's minimum annual wage stands at approximately €8400.
4. pensions paid by the social security system alone amount to 7.2% of GDP.
5. national debt per capita amounts to €23,593.8 in 2017, an increase of 277% from 2000 (€6,257.1).

### **Portugal – Attempts to Create a DC System**

In 1989, the Portuguese government saw the writing on the wall and launched legislation for the commonly denominated *private PPR* pension savings plans. These pension plans would fall under the third pillar, the Complementary System.

The complementary system comprises three DC sub-systems:

1. The savings that are capitalised and managed by the “Instituto de Gestão de Fundos de Capitalização da Segurança Social”, a state entity. These are publicly managed *state PPRs*, initially funded voluntarily by employees. From Nov 2018, employers can also contribute to the individual's PPR.

2. Collective complementary pension systems promoted by corporates or self organised professional groups; and
3. Complementary savings products sought by individuals such as *private PPRs* offered by the finance industry, term life insurance and savings plans offered by mutualist associations.

The success of all three of these DC sub-systems of the Complementary system has been limited at best.<sup>1</sup> The initial and generous tax incentives granted to *private PPRs* have been whittled down to be immaterial over the years. Furthermore, subsequent changes to legislation have made early redemptions more flexible to the point where PPRs lost their clear long term savings character. By the end of 2018, *state PPRs* had €44 mln under management and 7,619 policy holders (in a country with a population in excess of 10 mln).<sup>2</sup> By 2017, only €540 mln were managed under PPRs.<sup>3</sup> Closed end pension funds by corporates (mainly banks and insurers) make up the bulk of pension assets. PPRs as such, initiated and funded voluntarily by (only) individuals are negligible.

Total private pension assets make up only approximately 10% of Portugal's GDP and have remained constant at approximately €20 bln for some years now. Contributions for these three sub-systems amount to 0.3% of GDP and only to 2% of Portugal's total pension outlays. In contrast and by way of example, for Spain and Sweden these ratios were 0.7% and 5.3% and 2.5% and 21.7%, respectively (2015).

Also in 2017, only 6.4% of the active population had savings in a pension plan of any kind . Roughly half each had corporate and individual plans. Among 30 year olds, the ones most likely to, and in need to save for the long term, the ratio was only 2%.

---

<sup>1</sup> "O Sector dos Serviços e os Desafios da Segurança Social" by Confederação do Comércio e Serviços de Portugal, "Segurança Social: Modelos e Desafios" by Conselho Económico e Social and "Estatísticas Anuais e Trimestrais" by Autoridade de Supervisão de Seguros e Fundos de Pensões (ASF).

<sup>2</sup> IGFCSS Annual Report 2017 and "Fundo dos Certificados de Reforma – Folheto Informativo, Dec 31 2018 by Segurança Social Portugal, [http://www.seg-social.pt/documents/10152/16069308/Newsletter\\_2018/2cbc6b0a-c93b-4f96-9a9b-491ae0da2c96](http://www.seg-social.pt/documents/10152/16069308/Newsletter_2018/2cbc6b0a-c93b-4f96-9a9b-491ae0da2c96) .

<sup>3</sup> "O Sector dos Serviços e os Desafios da Segurança Social" by Confederação do Comércio e Serviços de Portugal, "Segurança Social: Modelos e Desafios" by Conselho Económico e Social and "Estatísticas Anuais e Trimestrais" by Autoridade de Supervisão de Seguros e Fundos de Pensões (ASF).

Only 2.3% of corporates (less than 1,000) with 10 employees or more offered independently managed pension plans to their employees<sup>4</sup> and only 2.5% of the active population were beneficiaries of matured pension plans.<sup>5</sup>

This is fascinating given the fact that the current average pension is below the current minimum wage suggesting that without additional savings and private pensions, many will retire with a low standard-of-living.

Even more worrisome is the composition of pension portfolios. The annual report of Autoridade de Supervisão de Seguros e Fundos de Pensões ASF (1) for 2017 shows equities making up only 8.4% of total assets with Portuguese public and private debt making up another 30% and 16.5%, respectively. None of these bonds have the needed long duration needed by pension funds (as demonstrated later), suggesting that these pension funds are bearing meaningful asset-liability risk.

All three sub-systems share similar attributes which may explain to a large extent their limited reach.

1. They are all voluntary and on an “opt-in” basis. As a result, participation in these plans depends on the financial wisdom and literacy of the saver. Opting-in means that mostly young savers must make an informed choice to defer current consumption *in lieu* of future income during retirement. Savers not only need to calculate how much money they will need at retirement but also rely on professional help to choose the right product at the right time (Bodie et al 2008). Asset allocation happens over the working life and is not a one/off affair (Merton 2010 and Levitan and Merton 2015). It so happens that Portuguese financial literacy is among the lowest in the EU. According to Klapper et al

---

<sup>4</sup> “Segurança Social: Modelos e Desafios” by Conselho Económico e Social and “Estatísticas Anuais e Trimestrais” by Autoridade de Supervisão de Seguros e Fundos de Pensões (ASF).

<sup>5</sup> Authors’ calculation from ASF Annual Report and the active population from PORDATA.

(2015) only 26% of adults are financially literate, and Portugal is not an outlier as many countries suffer from adult financial illiteracy.

2. Savers, especially unsophisticated savers, are likely to rely on financial and real estate markets professionals to achieve their financial goals for retirement. However, this increases costs as management, trading and administration costs accrue over time, even during market downturns. More importantly, with current market instruments, market volatility may also hit the pensioner at the wrong time, and leave them with a relatively poor pension. Long term returns from investing are far from assured and depend on the point of entry and exit. Long periods of low interest rates, as has been experienced in Europe, including negative interest rates, especially post the Great Financial Crisis (GFC), force money managers into increasingly risky investments, to obtain competitive returns. More importantly, standard-of-living changes and inflation can erode the true value to an individual of a nominal pension.
3. Current products in the market are not ideally designed for stable pension payments. As private pensions fall due, most pay out the capital upfront (i.e., “lump-sum” payments), but typically pensioners ideally would like their accumulated wealth in these DC plans to be paid out over the rest of his/her life time. Annuity usage in Portugal is limited.

### **Background on Portugal’s Current Debt Issuance**

Clearly, there are a number of challenges that must be addressed in Portugal. While financial literacy can be increased through financial education programs, there is clearly scope for financial innovation and the use of finance science to improve DC pension outcomes (Muralidhar 2019). The government will need to play a key role in addressing this looming crisis and hence we examine the government’s current debt situation as our proposal requires the Portuguese government to issue an innovative new debt instrument. A similar proposal has already been made for EU countries in general (Merton and Muralidhar 2017a) and even for France (Merton,

Muralidhar and Martellini 2017), the United States (Merton and Muralidhar 2017b) and India (Merton and Muralidhar 2018).

Portugal's current debt to GDP ratio is approximately 122% and approximately Euro 247 bln.<sup>6</sup> As of February 2019, the average maturity of the outstanding national debt was 7.9 years and 6.4 years if EU and IMF debt is included (IGCP Monthly Bulletin, February 2019). By nominal amount, while 38% of Portuguese debt is held by residents in Portugal, only 12% are instruments tailored to and held by retail investors.<sup>7</sup> One of the challenges for Portugal, now that it is a part of the EU and issues bonds in Euros, is that it is competing in the issuance market with other issuers as well. As a result, Portugal's ability to extend maturity and issue more debt is impacted by the availability of other issuers with potentially higher credit standing (e.g., Germany).

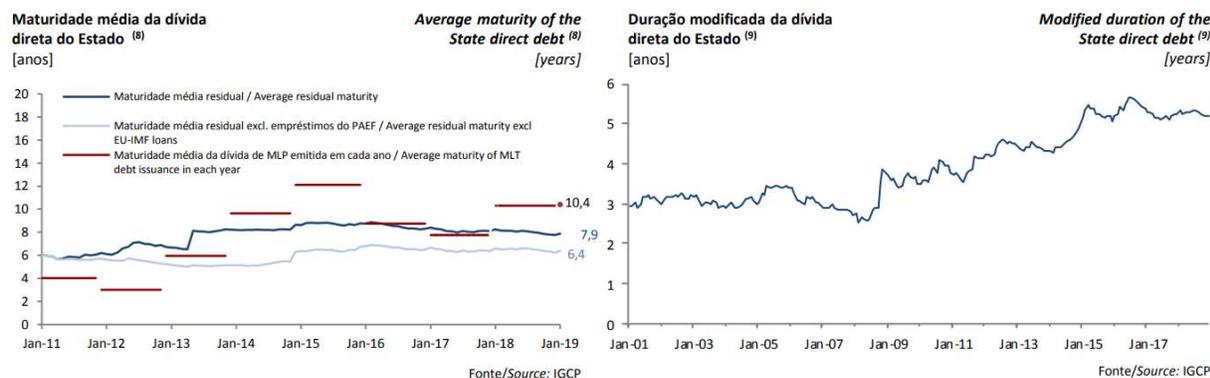
At a very high level, the typical asset allocation model for pension saving portfolios should require a very long duration asset to hedge pension liabilities (Sharpe and Tint 1990). Therefore, the relatively low duration of current Portuguese debt relative to instruments ideally held in pension portfolios or used by insurance companies to offer annuities will lead to either enormous retirement risk in retail portfolios or an absence of annuity offerings by private pension or insurance companies. These investors may need to consider other Euro issuers to achieve this higher duration, but one of the other challenges that has plagued Euro-debt has been the existence of negative interest rates at the medium end of the maturity spectrum. For example, as of March 2019, the German 10 year bund yields 0.07%.

The state's interest in obtaining the longest possible maturity for its bonds is demonstrated by Figure 1.

---

<sup>6</sup> <https://tradingeconomics.com/portugal/government-debt-to-gdp>

<sup>7</sup> [https://www.igcp.pt/fotos/editor2/2019/Boletim\\_Mensal/02\\_BM\\_fev.pdf](https://www.igcp.pt/fotos/editor2/2019/Boletim_Mensal/02_BM_fev.pdf)



• **Figure 1: Average Maturity of Portugal's Direct Debt (Source: IGCP 2019)<sup>8</sup>**

Interestingly, Portugal's Instituto de Gestão de Crédito Público (IGCP) has issued GDP-linked securities for retail investors and they were (initially) successful. From 2013 to Oct 2017, IGCP issued €12 bln of 5-year maturity, retail-driven securities called "Certificados do Tesouro Poupança Mais (CTPM)". For CTPM, the 4th and 5th annual coupons were linked to 80% of Portugal's GDP's growth rate. From Oct 2017, a new type of GDP growth rate indexed securities was issued, but its terms were far less attractive and the general consensus is that these securities were not a success. One of the challenges of GDP-linked securities is that they are not a natural hedge against any particular type of investment goal that investors may have (Merton and Muralidhar 2017a). They are attractive from the point of view of the issuer because the coupon payments are reduced in periods of low economic activity, when the issuer of the bond might be struggling with their own revenue challenges. As a result, GDP-linked securities offer good asset-liability management opportunities to the issuer (i.e., typically the government), but since they do not meet the needs of investors, especially the growing segment of retirement investors, the demand is likely to be limited and a possible explanation for the performance of the 2017 CTPM.

<sup>8</sup> [https://www.igcp.pt/fotos/editor2/2019/Boletim\\_Mensal/02\\_BM\\_fev.pdf](https://www.igcp.pt/fotos/editor2/2019/Boletim_Mensal/02_BM_fev.pdf)

## SELFIES as a Potential Solution

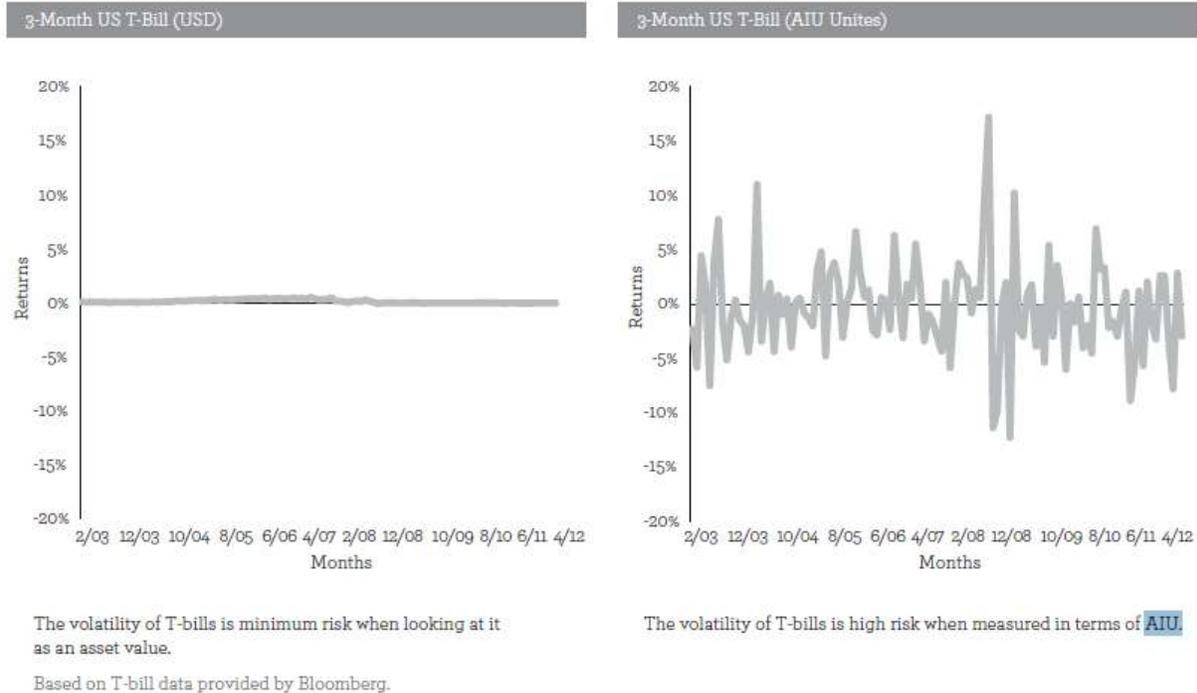
Given the unique circumstances of Portugal, as a member country of the EU, but also one facing severe challenges of aging and a high debt/GDP ratio (and limited duration of the debt), the need for reform and innovation is critical and could be addressed through a single innovation. As noted earlier, the risk for retirement will need to be transferred to individuals as DB pension plans cannot be offered by governments or companies given the high current cost and probably the inability to expand DB coverage. Therefore, individuals will need to be increasingly moved into DC pension plans, where they will be responsible for an increasing share of their retirement resources. Even if individuals are not (mandatorily) enrolled in DC plans, given the low and declining levels of payments from Social Security DB systems relative to a reasonable standard-of-living, individuals will need to save in personal accounts to complement current benefits.

For optimal portfolio management, members of DC plans should focus on maximising funded status or retirement income (not wealth, as in traditional investment approaches). Further, unlike multigenerational DB plans, DC plans must achieve their objectives in a single lifetime, and the decisions are extremely complex for the average individual (see Bodie et al 2008 and Bodie et al 2010). Further, it is hard to pool DC risks across multiple individuals and cohorts because these plans are inherently flexible: (a) participation is often voluntary; (b) participants may require liquidity; (c) retirement ambitions, risk tolerance and life expectancy vary; and (d) employment patterns change over time (i.e., the gig economy does not tether an individual to a single company).<sup>9</sup> A new financial instrument is needed to enable financial security for retirees in the current environment (Muralidhar 2016; Muralidhar, Ohashi and Shin 2016). DC investors seek to ensure a guaranteed, real income, ideally from retirement to death (Merton 2007; Merton 2014). It is also reasonable to assume they would want to lead a lifestyle comparable to pre-retirement. Investing in existing assets (stocks, bonds, or real estate) is risky because these do not provide a simple cash flow hedge against desired retirement income. For example, viewed through the

---

<sup>9</sup> Muralidhar (2018).

retirement income lens, a portfolio of traditional, 'safe' government securities, unless heavily financially engineered, would be risky because of the cash flow (and potential maturity) mismatch between traditional bonds and the desired income stream. Figure 2 shows that T-bills, the traditional "safe asset" from the perspective of volatility as the measure of risk (or capital preservation) is actually a risky instrument when measured in terms of annuity income units (or the annuity income such a bond would buy on different dates).



Source: Merton (2014)

**Figure 2: Measuring the Risk of T-Bills from an Absolute and Relative Volatility Perspective**

One might assume that an annuity might be the "safe" investment in DC retirement portfolios but there is an annuity puzzle (Modigliani 1986b); namely, that despite the attractive cash flow profile an annuity provides to a retiree, their utilization in retirement portfolios is extremely low. Many have attributed this to the fact that annuities can be complex, costly, illiquid, and potentially do not allow for bequests. More recently, research has shown that individuals do not

buy annuities because they perceive them as being unfair<sup>10</sup> in that individuals who die early (i.e., below the average life expectancy) run the risk of not enjoying a long stream of payments for which they believe they may have contributed.

There is thus a need for governments to issue a new 'safe' bond instrument, which we call SeLFIES (Standard-of-Living indexed, Forward-starting, Income-only Securities). These will ensure retirement security and the government is a natural issuer (Merton and Muralidhar 2017a, 2017b).

### **The Innovative SeLFIES Design**

A default-free bond offers certainty about two characteristics critical for DC retirement portfolios: (i) a commitment to pay over a particular time horizon (how/when one is paid); and (ii) a specific cash flow (what is paid). DC investors require a guaranteed cash flow that protects their real purchasing power in retirement. Two simple innovations could create the 'perfect' instrument.

The first innovation addresses (i) 'how/when one is paid' by creating forward-starting, income-only bonds. These would start paying investors upon retirement, paying coupons-only for a period equal to the average life expectancy at retirement (e.g., Portuguese bonds would pay for 20 years).<sup>11</sup> Investors saving for retirement do not need coupon payments while still employed (which have to be re-invested and thereby engender interest rate risk), or a stub principal payment at the end, but rather a smooth stream of real cash flows (as in Figure 3). SeLFIES are designed to pay people when and how they need it. SeLFIES blend accumulation and decumulation by incorporating the retiree's desired annuity-like cash flow profile in the payout phase.

---

<sup>10</sup> <https://www.anderson.ucla.edu/faculty-and-research/anderson-review/annuities-fairness>

<sup>11</sup> <https://www.europeandatajournalism.eu/News/Data-news/Life-expectancy-after-retirement-a-very-unbalanced-Europe>

The second innovation addresses (ii) 'what' is paid, by indexation to per-capita consumption. Preserving standard of living requires inflation-protected payments. With increasing longevity, a fixed standard of living may not be adequate, because cumulative increases in the standard of living can leave a retiree feeling 'left behind', much like inflation causes nominal fixed income retirees to experience a decline in standard of living (see Figure 3).

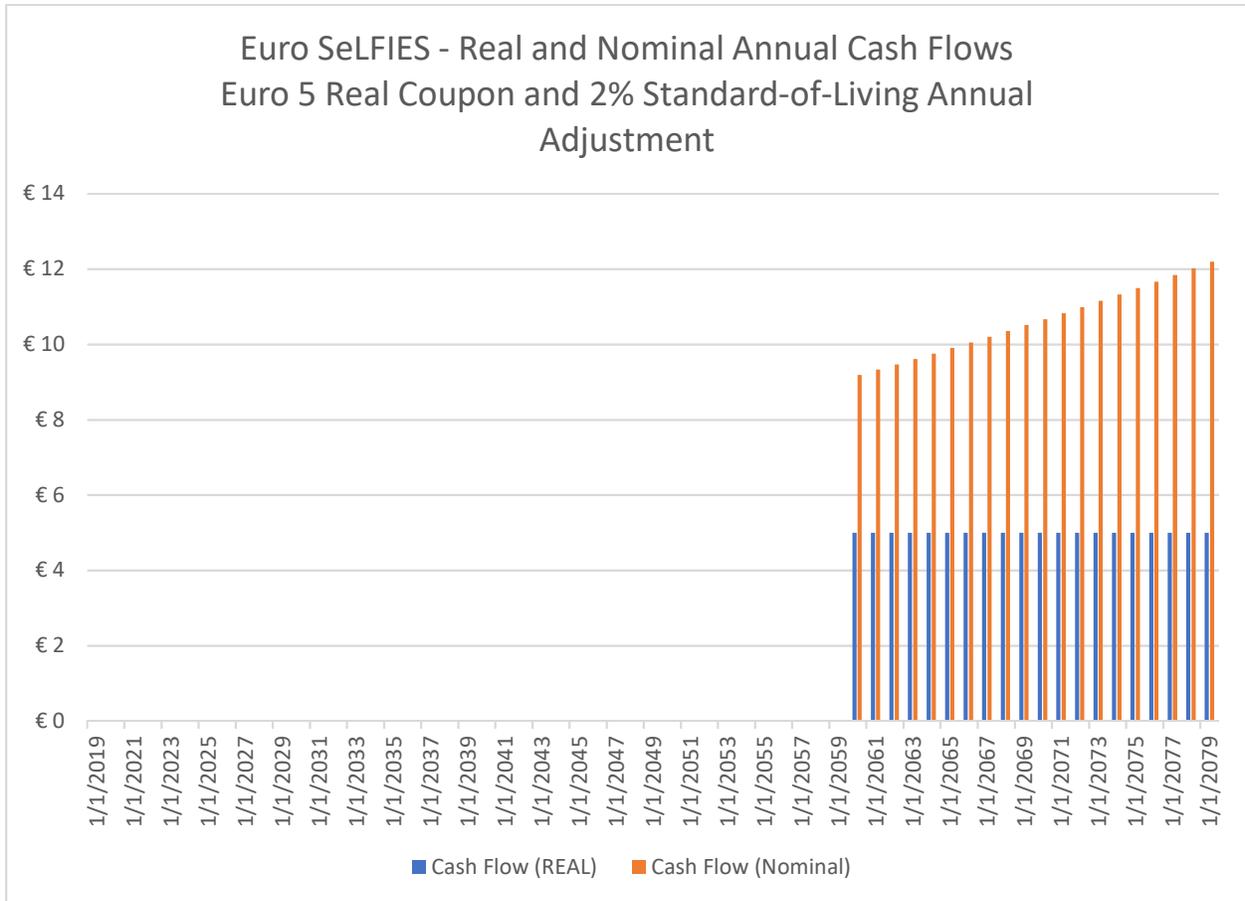
So, instead of a Treasury inflation protected securities (TIPS)-like adjustment, solely focused on inflation, SeLFIES would cover both the risk of inflation and the risk of standard of living improvements. This coupon would be ideal for people who assess their economic well-being on the basis of their standard of living relative to those around them. Figure 3 provides a simple chart of a SeLFIES bond targeted to a 25 year old in 2019, who retires at that age of 66 (2060), and then seeks a steady stream of real Euro 5/per year till 2080. The set of columns fixed at euro 5 reflect the real coupon and the set of columns rising from 2060 to 2080 reflect the nominal coupon assuming a standard-of-living indexation of 2% p.a.

### **How SeLFIES foster self-reliance and work for those not financially literate**

In effect, SeLFIES would pay the holder annually for 20 years, starting at a fixed future date, a fixed amount (say €5), indexed to aggregate per capita consumption. So, 55-year-olds in 2019 would buy the 2029 bond, which would start paying SeLFIES coupons upon retirement at 66 in 2030, and keep paying for 20 years, through 2050. In this case, unlike Figure 3, the positive columns will start at year 2030, for just 20 years, so each SeLFIES bond will have its own unique cash flow profile that caters to the individual cohort.

These innovations ensure even the most financially illiterate individual can be self-reliant with respect to retirement planning (without requiring a forecast of expected returns, optimisers/retirement calculators, or even intermediaries). For example, if investors want to guarantee €3,000 annually in supplementary pensions, risk-free for 20 years in retirement, to

maintain their standard of living, they would need to buy 600 SeLFIES (3,000 divided by 5) over their working life.



**Figure 3 – Example of real and nominal cash flow from SeLFIES**

The complex decisions of how much to save, how to invest, and how to draw down as in Bodie et al (2008) are simply folded into a calculation of how many SeLFIES to buy. In addition to being simple, liquid, easily traded, and with low credit risk, SeLFIES can be bequeathed to heirs (spouses and children), unlike current pensions for surviving spouses or high-cost, inflexible and illiquid annuities (which are not common in the context of continental EU). The inheritability of SeLFIES overcomes investor fears that premature death means leaving money on the table. Buying SeLFIES would be similar to creating an individual DB scheme, with the guaranteed pay-out determined simply by the number purchased.

SeLFIES greatly simplify retirement investing by allowing participants to be self-reliant in managing their portfolios. It is easy to see why these bonds would be preferable to inflation-linked or GDP-linked bonds which Portugal has issued,<sup>12</sup> or even the current practice of investing in target-date/lifecycle funds in the United States and United Kingdom (which rotate into traditional bonds, or annuities with age). Asset pricing models greatly simplify when the numeraire for measuring returns is consumption (versus either wealth or real wealth).<sup>13</sup> So bonds denominated in consumption units are a natural asset for investors.

Moreover, SeLFIES could become the safe asset in any pension portfolio and even in these target-date strategies. They could also be used as safe, liability-hedging assets in dynamically managed target-income strategies (Levitan and Merton 2015) – allowing investors to target a higher retirement standard of living/income by investing in risky assets early in their life cycle, but dynamically locking in gains by investing in SeLFIES later in life when gains have been made in the portfolio. Further, simple account statements would illustrate the level of real, locked-in retirement standard of living, based on the number of bonds purchased. In today's DC plans, account statements focused on wealth accumulated give investors no sense of retirement standard of living, or what to do to achieve their retirement objectives. Locking in a wealth level, does not automatically translate into stable and reliable retirement cash-flows and SeLFIES address this problem by focusing entirely on ensuring stable and reliable cash flows.

### **Demand from other investors**

Additionally, there is a substantial and natural buyer for SeLFIES within the State itself. This would be under the social security system, the “Fundo de Estabilização Financeira da Segurança Social (FEFSS)”. This Social Security Financial Stabilization Fund was created in 1989 with the purpose of contributing to the financial stabilisation of the social security system through a security

---

<sup>12</sup> Admittedly, this is not a fair comparison as proponents of GDP-linked bonds have tried to use this bond to create PAYGO like pension plans, and ensure counter-cyclical payments (ie, high returns when market rates of interest are low or negative). See Frijns, van der Klundert and van Nunen (2016).

<sup>13</sup> D.T. Breeden (1979).

cushion that could be activated to pay pensions in the event of a breakdown of the current resources in the *PAYGO* system. This has not happened yet, but only because the system gets an annual injection from the State's general budget. FEFSS currently holds assets equivalent to 1.3 years of pensions paid out by the social security system, still less than the 2 years required by law. 72.4% of FEFSS' assets are Portuguese state bonds and guarantees. In 2013, the law was amended instructing FEFSS to replace OECD countries debt with Portuguese sovereign debt. SeLFIES could be included in such holdings and would provide a much better hedge against potential pension payments as noted in Figures 2 and 3. Given that life insurance companies and pension funds also have to match the duration of long-term obligations potentially with short term assets, they too would find the ultra long maturity of SeLFIES an attractive alternative to traditional long term assets.

### **Advantages for governments**

SeLFIES would be advantageous for the Portuguese government, making them efficient issuers. Given the volume of current debt issuance, some of the current bonds could easily be replaced by SeLFIES. First, SeLFIES will give Portugal (or any other EU government) a natural hedge of revenues against the bonds, as revenues earned from value-added-taxes (VAT) are essentially proportionate to consumption. This means less risk, more control, and perhaps higher ratings for the EU government to issue consumption-linked rather than inflation-linked or GDP-linked bonds. Investors from all parts of the lifecycle would find them attractive. Interestingly, Uruguay has issued a wage-indexed bond targeted to pension funds and insurance companies to allow them to offer wage-indexed pensions and the initial indications are that this bond was well received by the market (i.e., oversubscribed) and has led the government to issue additional bonds as well.

Second, as governments struggle to finance infrastructure, bonds with steady payments and forward-starting payment dates offer an effective mechanism to finance such needs. Cash flows from SeLFIES offer governments an effective way to collect monies today for upfront capital

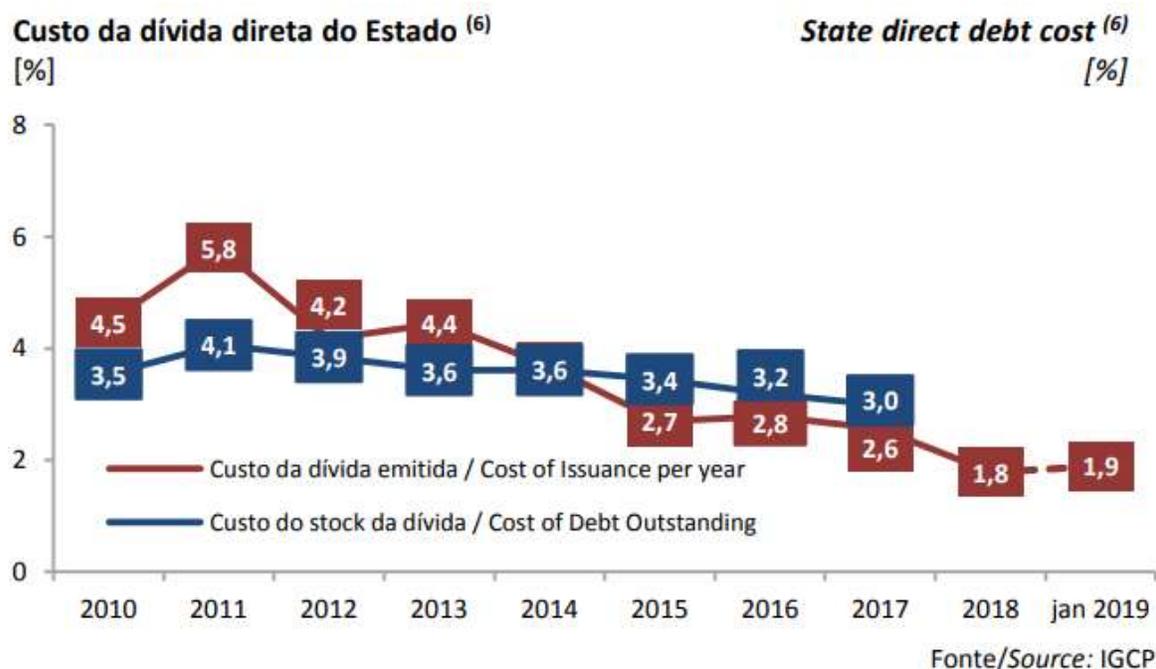
expenditures for infrastructure projects, and pay these back in the future, once the projects generate revenues.

Third, Portugal has benefitted from low rates post the GFC as shown in Figure 4. With SeLFIES, there is the potential to tap a new investor segment, not just in Portugal but also across the entire EU as DC pension plan participants in other countries can easily purchase Portuguese SeLFIES for their DC plans. This then adds the potential for lower funding costs – especially with the first few governments that issue SeLFIES before they become mainstream. The fact that Portugal is a member of the EU makes SeLFIES a Pan-European solution to the EU pension crisis (and may lead other countries to issue such debt). There is clearly some credit risk to lending to a foreign government, but at least there would be no currency risk for EU investors. However, the foreign holders of Portuguese SeLFIES might benefit from the fact that it is highly unlikely that the Portuguese government would default on a bond that provides the livelihood for its aging population. In effect, one could argue that there is a pecking order of default that might be created by SeLFIES, with governments more likely to default on bonds held by foreign (speculative) investors than to default on retirees in the EU.

Fourth, if DC plan investments do not facilitate safe and adequate outcomes, the Portuguese government will be forced to bail out participants, thereby privatising gains but socialising risks. SeLFIES potentially reduce those additional costs and risks to the Portuguese government.

Furthermore, SeLFIES could be valuable to the insurance industry, since it allows them to offer new low-cost annuities, with an improved ability to hedge liabilities.

In this fashion, the government can not only help to complete financial markets, but also improve their overall sovereign debt management operations (through better hedging of revenues and bond payments and potentially extending duration), while also lowering the future cost of many retirees which under the current set up will retire poor.



**Figure 4. State Direct Debt Cost (Source: IGCP 2019)<sup>14</sup>**

### **Additional issues**

Simple or dynamic investments in SeLFIES will not solve issues like insufficient savings (resulting in low retirement income), insufficient income growth (which locks in a low standard of living in retirement), or hedging longevity risk. Longevity risk is potentially handled through complex measures, such as trading longevity swaps or bonds. Alternatively, Muralidhar (2018b) suggests the creation by governments of a new LIVE (Longevity Indexed Variable Expiration) bond that addresses longevity risk by cohort. However, since longevity for cohorts changes slowly (low-frequency), it may be adequate to periodically review the change in longevity and adjust the portfolio goal. SeLFIES hedge the relatively rapidly changing (high frequency) interest rate, inflation, and standard of living growth risks, which are important as one nears retirement, until the retiree chooses to purchase a life annuity, providing longevity risk protection. For longevity risk protection, participants could purchase long-deferred annuities that pay out beyond the age of 85 (and hopefully these markets develop in Portugal with the introduction of SeLFIES). The

<sup>14</sup> [https://www.igcp.pt/fotos/editor2/2019/Boletim\\_Mensal/02\\_BM\\_fev.pdf](https://www.igcp.pt/fotos/editor2/2019/Boletim_Mensal/02_BM_fev.pdf)

deferred annuity approach combined with SeLFIES, would be an efficient way to hedge individual longevity risk while preserving financial flexibility and control, and can be incorporated into a well-designed target income product. However, annuities are not very popular in the non-Anglo Saxon world, and hence it will be interesting to see what innovations such a new instrument might foster. Fabian et al (2018) have argued that social security systems are better suited to handle longevity risk, with DC arrangements handling retirement income through average life expectancy (and hence SeLFIES would be well suited to this approach proposed for Spain). As a result, there are multiple approaches to handling the residual micro longevity risk.

SeLFIES would require an appropriate measure of consumption to be articulated for the index; specifically, how consumer-durable purchases are treated and whether or not to include leisure time, not normally included in consumption. If a simple per-capita consumption index is hard to calculate, another alternative might be to use nominal VAT receipts divided by the population and VAT tax rate. In another variation, a wage index, as in Uruguay, may be considered for this bond. Many of these same challenges are embedded in TIPS or GDP-linked bonds. In any case, SeLFIES are materially closer to covering inflation and standard of living changes than nominal bonds. Of course, further work is needed to establish other technical design details of SeLFIES (eg, are they paid semi-annually or annually? Are bonds re-opened monthly, quarterly or less frequently when DC contributions are collected? Is €5 an optimal size of real coupon or should it be double that to make calculations simpler and require fewer purchases?). These are not insurmountable, given the potential benefits of the bonds to the concerned parties. As an initial solution, the current technical approach used in TIPS or the GDP-linked bonds can be adopted.

## **Conclusion**

The looming retirement crisis in Portugal needs to be addressed by timely innovation, because the longer governments wait, the higher the cost will be. SeLFIES are a safe and sound solution for governments, especially for Portugal given worsening demographics and a declining monthly payout from the PAYGO DB system. As Portuguese citizens will increasingly feel the need to join a Complementary DC system, they will bear increasing risk unless there is innovation in the financial markets that allows them to achieve their goals at relatively low cost and with relative ease given the levels of financial literacy. We have shown that SeLFIES give investors more control over their retirement planning and lower costs, complexity, risks, and illiquidity of retirement outcomes relative to existing or other conceived options. It is critical to ensure effective retirement outcomes as the population ages. To quote the famous Portuguese saying, "*Mais vale prevenir do que remediar*" ("*Better to plan ahead than to improvise*"). Unless the Portuguese government is willing to plan ahead and innovate to complete the markets, it will run the risk that many will not receive safe and reasonable pension benefits and have to bail them out.

## **Acknowledgements**

*Thanks to Adam Kobor, Herman Kamil for help and feedback. All errors are our own. These are the personal views of the authors.*

## References

Bodie, Z., R. Fullmer, and J. Treussard. 2010. Unsafe at Any Speed? The Designed-In Risks of Target-Date Glide Paths, *Journal of Financial Planning*, March 2010, pp 42-48.

Bodie, Z., J. Treussard, and P. Willen. 2008. The Theory of Optimal Life-Cycle Saving and Investing, *CFA Research Foundation Publications* 2008, no. 1 (February). CFA Institute.

Breeden, D.T. 1979. AN INTERTEMPORAL ASSET PRICING MODEL WITH STOCHASTIC CONSUMPTION AND INVESTMENT OPPORTUNITIES, *Journal of Financial Economics* 7, 265-296. North-Holland Publishing Company

Cabral, N., 2017. A Sustentabilidade da Segurança Social, in *Justiça entre Gerações: perspectivas interdisciplinares / coord. J. P. da Silva e G. de A. Ribeiro – Lisboa: Universidade Católica*, pp 352-260

European Commission. 2018a. The 2018 Ageing Report, Underlying Assumptions & Projection Methodologies, Institutional Paper 065, November 2018, Brussels.

[https://ec.europa.eu/info/sites/info/files/economy-finance/ip065\\_en.pdf](https://ec.europa.eu/info/sites/info/files/economy-finance/ip065_en.pdf)

European Commission. 2018b. Pension Adequacy Report 2018, Current and Future Income Adequacy in Old Age in the EU, Vol. 1, European Commission, Directorate-General for Employment, Social Affairs and Inclusion, 2018, Brussels

<https://ec.europa.eu/social/main.jsp?catId=738&langId=pt&pubId=8084&furtherPubs=yes>

Fabián, I. D., P. Devolder, F. del Olmo García, and J. A. Herce. 2018. A Two-Step Mixed Pension System: How to Reinvent Social Security with the Help of Notional Accounts and Term Annuities. *Retirement Management Journal* 7, no. 1: 31–40.

Frijns, J., T. van der Klundert and A. van Nunen. 2016. Why the Netherlands Should Issue Retirement Bonds. *Investment & Pensions Europe*, August 2016.

IGCP Monthly Bulletin, Instituto de Gestão da Tesouraria e da Dívida Pública, Lisbon, February 2019. [https://www.igcp.pt/fotos/editor2/2019/Boletim Mensal/02 BM fev.pdf](https://www.igcp.pt/fotos/editor2/2019/Boletim_Mensal/02_BM_fev.pdf)

Klapper, L., A. Lusardi, and P. van Oudheusden. 2015. Financial Literacy Around the World: Insights from the Standard & Poor's Ratings Services Global Financial Literacy Survey. World Bank Development Research Group (November). Washington DC.

Levitan, S. M., and R. C. Merton. 2015. Defined-Contribution Retirement Fund Investment Strategies: An Appropriate Default? Presented at the Actuarial Society of South Africa's 2015 Convention, November 17–18, 2015, Johannesburg, South Africa. <http://www.colourfield.co.za/defined-contribution-retirement-fund-investment-strategies-an-appropriate-default>.

Merton R.C. 2007. "The Future of Retirement Planning." In *The Future of Life-Cycle Saving & Investing*, Z. Bodie, D. McLeavey, and L.B. Siegel (eds.). Research Foundation of the CFA Institute, 2007, Charlottesville, VA.

———. 2014a. Funding Retirement: Next Generation Design. *JASSA Finsia Journal of Applied Finance* 2012, no. 4: 6–11.

———. 2014b. The Crisis in Retirement Planning. *Harvard Business Review* (July-August). <https://hbr.org/2014/07/the-crisis-in-retirement-planning>.

Merton, R.C. 2018. *SeLFIES— A Globally Applicable Bond Innovation to Improve Retirement Funding and Lower Government Financing Cost. Presentation at the World Knowledge Forum – Seoul, Korea.* October 18, 2018 - <https://jinrong.swufe.edu.cn/info/1127/3901.htm>

Merton, R. C., and A. Muralidhar. 2017a. Time for Retirement SeLFIES. *Investment & Pensions Europe* (April): 3–4.

----- . 2017b. Selfies Can Improve the Nation's Retirement Security. *Plan Sponsor Magazine*, November 20, 2017.

— — — . 2018. SeLFIES for India: These Long-Term Bonds Can Fund India's Infrastructure Needs and Improve Retirement Security. *The Times of India* (February 5). <https://blogs.timesofindia.indiatimes.com/toi-edit-page/selfies-for-india-these-long-term-bonds-can-fund-indias-infrastructure-needs-and-improve-retirement-security/>.

Merton, R. C., A. Muralidhar and L. Martellini. 2017. Pour la création “d’obligations retraite”. *Le Monde*, April 4, 2018. [https://www.lemonde.fr/idees/article/2018/04/06/pour-la-creation-d-obligations-retraite\\_5281686\\_3232.html](https://www.lemonde.fr/idees/article/2018/04/06/pour-la-creation-d-obligations-retraite_5281686_3232.html)

Modigliani, F. 1986a. “Life Cycle, Individual Thrift, and the Wealth of Nations.” *The American Economic Review* Vol. 76, No. 3 (Jun., 1986), pp. 297-313

Modigliani, F. 1986b. Life Cycle, Individual Thrift and the Wealth of Nations. *Economic Sciences (based on Lecture on receiving Nobel Prize in Economics)*. Pp 150-170.

Modigliani, F. and A. Muralidhar. 2004. *Rethinking Pension Reform*. Cambridge University Press, London, UK.

Muralidhar, A. 2015. New Bond Would Offer a Better Way to Secure DC Plans. *Pensions & Investments* (December 14). <http://www.pionline.com/article/20151214/PRINT/312149974/new-bond-would-offer-a-better-way-to-secure-dc-plans>.

Muralidhar, A. 2018. Managing Longevity Risk – The Case for Longevity-Indexed Variable Expiration (LIVE) Bonds (October 10, 2018). Available at SSRN: <https://ssrn.com/abstract=3224236> or <http://dx.doi.org/10.2139/ssrn.3224236>

Muralidhar, A. and Ohashi, K. and Shin, S. H. 2016. The Most Basic Missing Instrument in Financial Markets: The Case for Forward-Starting Bonds. *Journal of Investment Consulting* 16, no. 2: 34–47.

PORDATA (N/A) – Base de Dados Portugal Contemporâneo by Fundação Francisco Manuel dos Santos, Lisbon. <https://www.pordata.pt/en/About+Pordata> by <https://www.ffms.pt/en>

Sharpe, W. and L. Tint. 1990. Liabilities – A New Approach. *The Journal of Portfolio Management*, Winter 1990, Vol. 16, No. 2: pp. 5-10.