Low investment returns and the expected impact on retirement provision

- How low investment return expectations impact the retirement savings planning of the person-in-the-street –

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1. Introduction

This paper explores, from an actuarial point of view, the impact of the current low interest rate environment on the retirement planning of the average person-in-the-street in four "rich" countries (or currency areas): the Eurozone, Japan, the UK and the US. In particular, an attempt is made to quantify just how much the sustained reduction in the real rate of return can cost the person-in-the street.

In the following Section 2 the model used to prepare the results outlined in this paper is described. For the purposes of considering the issue based on a real-life example Section 3 first narrows the focus on a single country, Germany. To the extent deemed appropriate, that approach is then extended to the Eurozone as a whole. In Section 4 the paper goes on to extend the findings separately to the other major currency areas: Japan, the UK and the US. Section 5 considers the issues in a global context. Finally, Section 6 summarizes the main findings and attempts an outlook on expected future developments.

2. Description of the model

In its most simplified form, a funded life-long pension payable from a given retirement age can be considered as an arrangement under which financial resources are accumulated ("savings" or "accumulation" phase) and then successively discharged up to the point of the final beneficiary's death ("pension" or "decumulation" phase) – see Figure 1 overleaf.

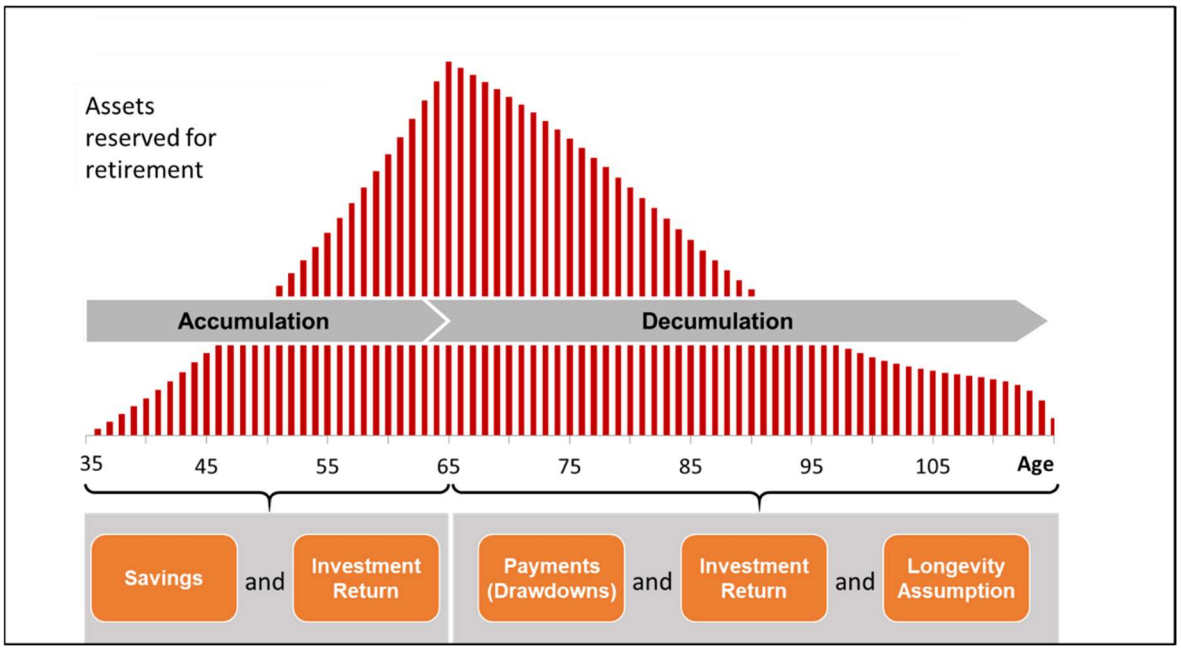
In practice, the arrangement can be significantly more complex, e.g. if the two phases are superimposed for some time or when there is a temporary surging or subsiding in the accumulation and/or the decumulation phases.

Clearly, the arrangement is primarily dependent upon the following two parameters:

- Amount of ingoing and outgoing payments over the course of the two phases; and
- Investment return during both phases.

The influence of the above two factors will be greater the longer the combined time periods of the two phases will be.

Figure 1: The idealised accumulation and decumulation principle



To simplify the model further, it is assumed that an annual premium, increasing continuously with inflation, is paid from age 35 to retirement commencement (65 in Figure 1). As at that time, an annual draw-down, also increasing continuously with inflation, commences. The draw-down has an attaching contingent spouse's continuation of 60% of the full pension.

When considering projections over time investment return and inflation are typically considered together, since there is some mutual dependency between these two parameters. From experience, nominal investment returns will tend to be high when inflation is high and vice versa. The key variable is thus the real rate of return, that is the nominal investment return reduced by inflation.

If, as our model suggests, all monetary amounts are inflation-linked then we can perform the calculations using a single real rate of return for each generation being analysed. This allows a simple calculation that should be familiar: A level annual premium for the same retirement benefit is calculated at age 35 on each assumption set and is defined here as "cost".

The Appendix displays the real rates of returns used in the calculations and their source as well as the development of generally assumed retirement ages over the 20-year period being analysed.

The model applied in this paper is very simple in that it assumes that

- The real rate of return expected at age 35 will hold true for the entire period until capital depletion upon the death of the last beneficiary (a period averaging approximately 55 to 60 years, i.e. from age 35 to age 90 to 95 of the first beneficiary);
- A build-up from, and draw-down to, zero reserves i.e. a build-up from scratch followed by a perfect depletion of funds without considering a surplus or deficit at the end of the decumulation phase;
- A continuous and smooth increase in savings and draw-down amounts changing only with inflation; and
- That a deterministic approach is sufficient to attain both a sufficient understanding of the main issues involved and a reasonable grasp of the main effects; a possibly more suitable stochastic analysis can be performed in further work.

As to the first premise made, the validity of making this will be commented on once the data has been analysed (see Section 3.2). Regarding the second supposition, the trade-off between the desire to have sufficient funds until death, i.e. to have one's spending needs met, and the desire to leave some surplus after death, i.e. to leave an inheritance to one's descendants, is dealt with in many papers, most recently by Anderson/Empedocles [1]. Together with the third and fourth hypotheses these should be borne in mind by the reader when using the results presented in this paper.

Notwithstanding the shortcomings of the model discussed and analysed here, it may be of some use in attaining a basic understanding of the main issues involved and enabling a first order quantification of the development of costs due to the downward shift in the long-term expectation of real investment returns.

3. Focus on Germany and the Eurozone

3.1 Background

Everybody knows that Germany was the first nation to introduce a formal and broad-based social security program for its citizens. But probably less known is that it is not amongst the most generous systems in place. Far from it. For example, Germany's first pillar pension grants a replacement ratio of only slightly above that of the US [2]. Nevertheless, perhaps surprising from an overall adequacy point of view, the level of corporate pensions in Germany is significantly lower than that in the US.

Based on statistics collected in 2011, Germany's state-run retirement arrangements still accounted for some 80% [3] of the average pensioner's retirement income. Only 10% comes from the second, i.e. occupational pillar, while the remaining 10% is from personal savings. Ten years earlier, in 2001, the German state pension was fundamentally reformed upon the initiative of the then operating minister of labour, Walter Riester (the legislative steps taken were later dubbed "*Riester Reform*"). One of the two cornerstones of this Reform was the

[1] *Anderson/Empedocles,* „The Retirement Income Frontier and its Application in constructing investment strategies at retirement", Paper submitted to the ICA 2018.

[2] *Allianz Global Investors*, 2016 Pension Sustainability Index, (2016).

[3] Numbers as per 2011: http://www.bpb.de/politik/innenpolitik/rentenpolitik/162456/altersicherungssysteme-in-deutschland-infografiken.

gradual reduction in the long-term level of state pension by between 10 and 20%. The second cornerstone of the Reform was the simultaneous introduction of incentives for the person-in-the-street to fill this shortfall by means of voluntary own contributions via funded company ("second pillar") or personal ("third pillar") arrangements. For higher income earners these contributions were tax-deductible, for lower income earners they were significantly subsidised by additional direct cash contributions by the state to such contracts. This, if only slight, shift away from the state pay-as-you-go system to funded arrangements was generally applauded at the time, since it reinforced the then current conventional wisdom, that funded arrangements were more durable and efficient for long-term savings than the pay-as-you-go approach. Since the effects of the big financial crisis of 2007 have continued with some persistence, however, this premise is not looking as durable today as it did then. Indeed, this paper goes some way to show just how hollow a presumption it was.

With the *Riester Reform* having laid the foundation for a long-term reduction in the level of state pension by the 10 to 20% mentioned above, assuming an unchanged retirement income target, this translates into a required increase of approx. 40 to 80% of retirement income from the second and third pillars combined.

Assuming current contribution levels to the three German pension pillars remain the same in real terms in future, retirement income in the long-term can therefore generally be expected to decrease from all three sources: driven in the first pillar by the *Riester Reform* and market-driven in the second and third pillars. The impact on the second pillar may be mitigated in those situations where a considerable portion of an employee's corporate benefit promise is defined benefit rather than defined contribution in character and is thus not directly affected by capital market returns, at least not if the employer alone is charged with funding for the promise made. This has put such corporate pension plans under pressure, because the sponsoring employers are typically required to meet their commitments despite very significant cost increases in comparison with the situation at the time they made these commitments. So, even in the case of defined benefit plans, there is pressure to either reduce the level of benefit promised or reduce future benefit accruals for future service. There are various ways this has actually been done in Germany as in other countries: by reducing levels of benefits for new entrants, for existing employees in respect of future accruals or even, in exceptional circumstances, by a reduction of benefits that were already accrued. Obviously, the latter two routes can be problematical if the existing and extensive relevant labour laws and court rulings are not carefully taken into account.

With the low real interest rate environment expected to persist for some time to come, the second and third pillars have become more expensive to fund or provide lower benefits with unchanged contributions whether they are the primary source or an augmentation to the pay-as-you-go state benefits. The level of poverty in old age can therefore be expected to increase in Germany too.

How much more the cost of pension provision has increased over the last 20 years is the subject of this article. Even if some very complex themes are dealt with here from "high-altitude", the fundamental results hold largely true or can be adjusted as appropriate in the simple model described here.

3.2 Germany: Impact on the cost of pension provision for the person-in-the-street

Apart from the key variable already identified, the real rate of return, i.e. the nominal investment return adjusted for inflation, the other key variables are the assumptions regarding mortality and the retirement age.

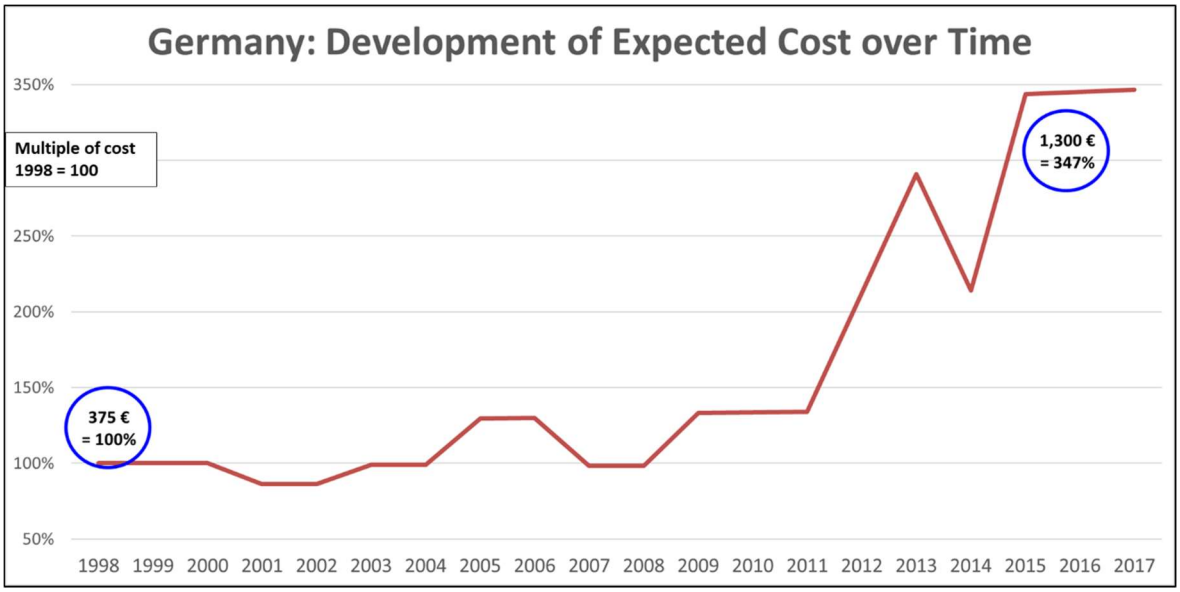
For Germany, these core parameters have changed over the course of the last 20 years, i.e. from 1998 to 2017 as follows:

- Financial markets' expectations: real investment return from around 3% p.a. (or more) in 1998 ("then") to around minus 1.5% p.a. in 2017 ("now"), where the real investment return expectation is the yield on government-issued long-term inflation-indexed bonds averaged over each calendar year;
- German actuaries' best estimates of longevity assumptions typically applied in valuations of occupational pension plans from the "Heubeck 1998" (period tables) then to "Heubeck 2005" (generation tables)" now; and
- Actuaries' best estimates of the expected retirement age from age 63 then to age 67 now.

The Appendix displays the real rates of returns used in the calculations and their source as well as the development of generally assumed retirement ages over the 20-year period analysed.

To consider the effect of these changes over time, further assumptions made are that the person being analysed begins saving at age 35 and that the expectations [4] prevailing at the beginning of the accumulation period apply for the entire period of the arrangement, with the following results:

Figure 2: Expected cost a 35-year-old faces for € 1,000 pension with attaching 60% contingent spouse's pension (all annual amounts and linked to inflation)



[4] Of course, not all actuaries in Germany have the same expectations. However, the author believes that they represent a consensus of a large number, quite possibly a majority, of actuaries in Germany.

Figure 2 shows the increase in the person-in-the-street's expectation of annual cost for the same annual € 1,000 inflation-protected retirement pension from 1998 to 2017 based on conditions prevailing in Germany at each of the times shown. It traces the amount a 35-year-old person, male or female, would have expected to have to save annually to fund a retirement income payable from the expected retirement age with an attaching 60% contingent spouse's pension. The graph shows that, in 1998, the expected inflation-linked cost to a 35-year-old up to the point of retirement for an inflation-protected pension of € 1,000 p.a. was very roughly € 375 per annum. This increased to an expectation of € 1,300 since 2015 – that is 3.5 times the level of cost expected in 1998.

The total factor of 3.5 can be broken down into its constituents as follows (assuming the same order chosen below):

a) Real rate of return: 3.52
b) Retirement Age: 0.76
c) Mortality improvements: 1.31
d) Total: 3.50

The model used has now delivered a first order estimate of the change in cost of a unit of retirement pension over the last 20 years. It now remains to include this in the consideration that there has also been an increase in the pensions gap, i.e. taking into account its approx. 40 to 80% increase. The above estimates will therefore increase correspondingly i.e. the factor of 3.5 thereby increases to between 5 and 6!

Apart from absorbing the magnitude of this increase (a multiple of between 5 and 6 is huge by any measure), it should be considered that saving at all for retirement is not something that every person is in an actual or perceived position to do. In Germany, a third of the population is not in a position to save [5]. Another, probably also large proportion, perceives itself not being able to or not requiring to do so. But even for the remainder that are able and understand the necessity to provide for themselves, the drop in real investment returns has made the expectations formidably more expensive in comparison with the situation 20 years ago. It is rather sobering to think that the cost increases estimated here are for consideration only for the "privileged", i.e. only for those that are in a position to save at all.

For persons just attaining their retirement age, i.e. age 63 then and 67 now, the corresponding costs will "only" have increased to 1.7 times the level expected in 1998. The reason that the increase in cost at retirement is lower that the increase applicable to a younger person is because the duration of the entire arrangement is shorter than that of the 35-year-old.

Having stated at the outset that these results are rough estimates only and that other assumptions and methods may lead to different results, there should nevertheless be agreement that the effect – primarily of the real rate of return – is very high.

Now critical readers will note that at least two of the assumptions made are particularly "heroic": first, that of expectations existing at savings' or retirement commencement will

[5] Anita Tiefensee, "How long do assets last during loss of income?", WSI Distribution Report No. 37e, 2017.

remain the same until the end of the decumulation period and, second, that an individual will consider only government bonds as an investment medium.

Both criticisms are valid.

Regarding the first point, the stress that the markets have been under since 2007, and in the Eurozone especially so since the sovereign debt crisis starting around 2010, has been prolonged with only little hope of a speedy return to the pre-2000 levels any time soon. If stress is defined as a real rate of return of zero or less, then the stress has been experienced for a period of more than six years, namely from 2012 onward. As at the end of 2017 this is already around 10% (approx. 6/55 to 6/60 of the entire accumulation and decumulation phases together) of the total time for the saver and around 22% (approx. 6/23 to 6/28) of the total time for the freshly retiring pensioner. So even if there is a quick return to the stability of the level of real returns before 2000, the effect on savings will already have been significant.

Regarding the second point, an individual will indeed not fund his/her pension using government bonds only but will rather invest in a mix of real assets (e.g. equities, commodities or real estate) and nominal investments (e.g. traditional insurance policies or nominal bonds). However, assuming an unchanged asset allocation, the cost increase may be considered to apply similarly here too, since the reduction in expected real investment returns will be of the same order. This is because the expected returns on the different classes of bonds (starting with investment grade going down to junk status) or on real assets are normally expressed as a differential on the real government bond yield. If these differentials have not changed significantly over the years, and that is the hypothesis in this paper, then the cost increases computed for real returns on government debt will be of similar order for any mix of assets, provided that stays constant over time.

3.3 Extension of the results to the Eurozone

What has been said above for Germany can be extended in principle to the remainder of the Eurozone provided that this is done with due circumspection.

Regarding the development of real yields, the situation within each country participating in the Eurozone is similar but not identical with that of Germany. This is because the actual inflation experienced as well as the inflation expectations are different in each country. However, assuming the Eurozone stays intact, the long-term expectation of inflation for the large majority of the Eurozone countries can be taken to be of the same order as that in Germany.

With respect to the expected retirement age, this will probably be different in each country and would have to be taken into account appropriately.

Regarding mortality assumptions, it is generally known that those used by actuaries in each Eurozone country differ, even if not dramatically. The differences are typically due to different approaches taken to defining populations for which mortality experience is to be measured, e.g. use of populations statistics or data gathered from insurers, on the one hand and due to different mortality improvement projections used in each country on the other. Having said that, average mortality experience in each Eurozone country, at least for the populations as a whole, should broadly be of the same order.

Finally, the difference over time in the development in the pensions gap, i.e. the difference between the target pension and that provided by compulsory systems such as state-run systems and essentially compulsory occupational systems, needs to be taken into account appropriately.

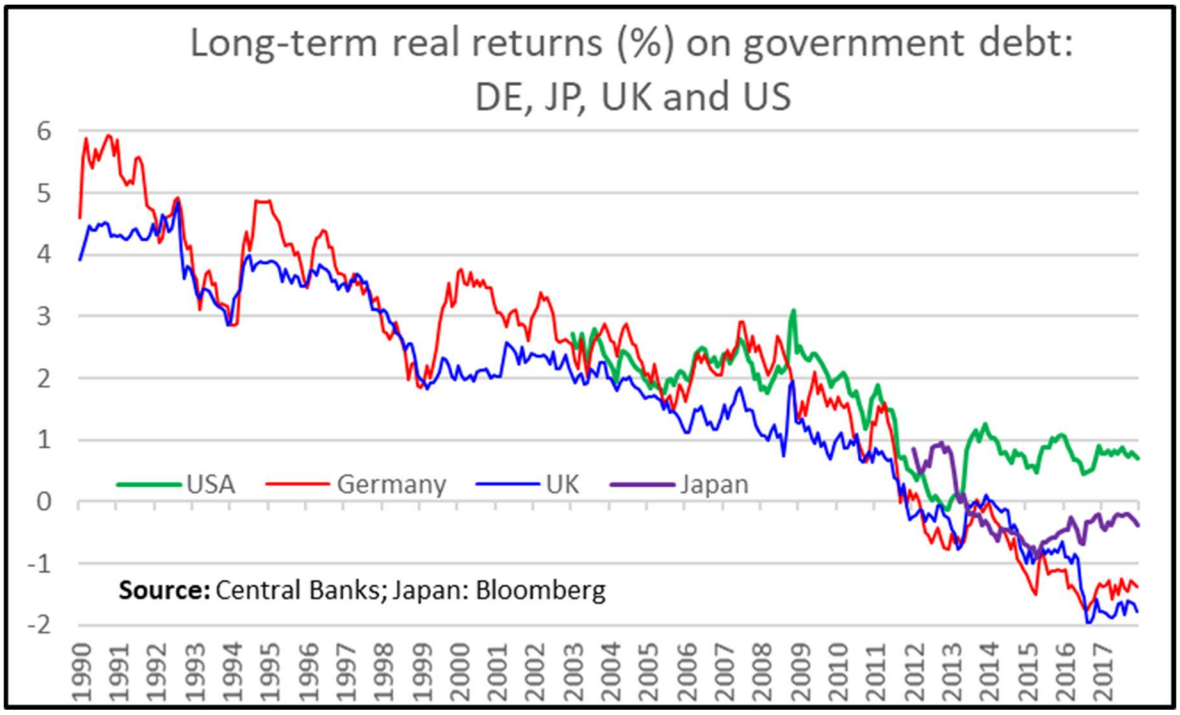
One can therefore probably conclude that the 3.5-fold increase in expected cost due to the development of real rates of return estimated for Germany should apply to most of the Euro-zone countries too. In contrast, the step-up to the range of 5 to 6-fold increase due to the widening of the pensions gap in Germany cannot easily be transferred because of the different levels of state-run and compulsory corporate retirement arrangements as a proportion of total retirement income and their respective development over time in each country. To complete the picture, the ancillary factors of mortality and retirement age expectations require due consideration.

4 Focus on Japan, the UK and the US

4.1 Real yields on long-term government bonds

Based on data made available on the websites of the central banks of these four countries [6] as well as additional information collected for Japan [7], the following graph shows the development of real long-term returns on government debt over the time period indicated.

Figure 3: Long-term rates of return of Government Debt of selected countries (derived from market data)



[6] Bank of Japan, Bank of England, Federal Reserve Bank and Deutsche Bundesbank.

[7] Japan Bond Trading Co., Bloomberg LLP and own estimates.

4.2 Extension of results to Japan, UK and US

We have seen that the impact on the cost of saving for retirement is mainly dependent on real investment returns. This paper assumes that a starting point can be the real return on government bonds. Considering Figure 3, the real rates of return for each country can be said to have shifted as follows:

- Japan: The evidence appears inconclusive due to the lack of reliable data for significant periods of time;
- UK: The development seems broadly in line with that of Germany, so that we can assume a similar reduction from a 3% (or more) expected return 20 years ago to minus 1.5% today; and
- US: The development appears to have started with a real return of some 2.25%, as the average over the seven years 2003 to 2009, to roughly 0.75% as the average over the five years 2012 to 2017.

Comparing the shift in cost multiple of 3.5 determined in Section 3.2 above for Germany, the same multiple appears appropriate for the UK too, whereas the multiple for the US would amount to "only" about 1.6, applying a retirement age of 65 and German mortality assumptions for both assessments.

As was stated for the Eurozone in Section 3, additional work could be performed regarding the application of appropriate mortality and retirement age assumptions and their development over time. The same applies to taking due account of the person-in-the-street's other sources of retirement income.

5 The real rate of return for the G7 countries as a whole

In an article published in October 2017, The Economist, a weekly newspaper, commented on the effect that real returns on government debt have had on asset prices in the G7 countries excluding Italy [8]. The article pointed to research by Campbell/Shiller/Viceira from 2014 [9] in which they developed a "world" long-term real interest rate for the G7 countries excluding Italy for the period between the mid-1980s to 2013 and extended those results by own projections for the period to 2017 (see Figure 4 overleaf).

For the 6 countries included in the study the consolidated drop in real rates from a pre-2000 average level of about 4% (or more) can be seen to have dropped to around minus 0.5% by 2017. The G7 countries' central banks' response to the global financial crisis can probably not account for the entire drop, since the downturn (excepting Japan) appears to have started around the year 2000 or even earlier. However, the action taken by the central banks since then are generally thought to have played a significant role in the persistence of the low level of real rates since then. As to the causes the said article states: "*The reasons for the decades of decline in real interest rates are not fully understood, and certainly not agreed on. Different people give more or less weight to three different factors: an increased appetite for saving; a structural change in the economy; and the actions of central banks. What, if*

[8] *The Economist*, „Asset Prices – The bubble without any fizz", 7 October 2017.

[9] *Campbell/Shiller/Viceira*, "Understanding inflation-indexed bond markets", Working Paper 15014, National Bureau of Economic Research (2014).

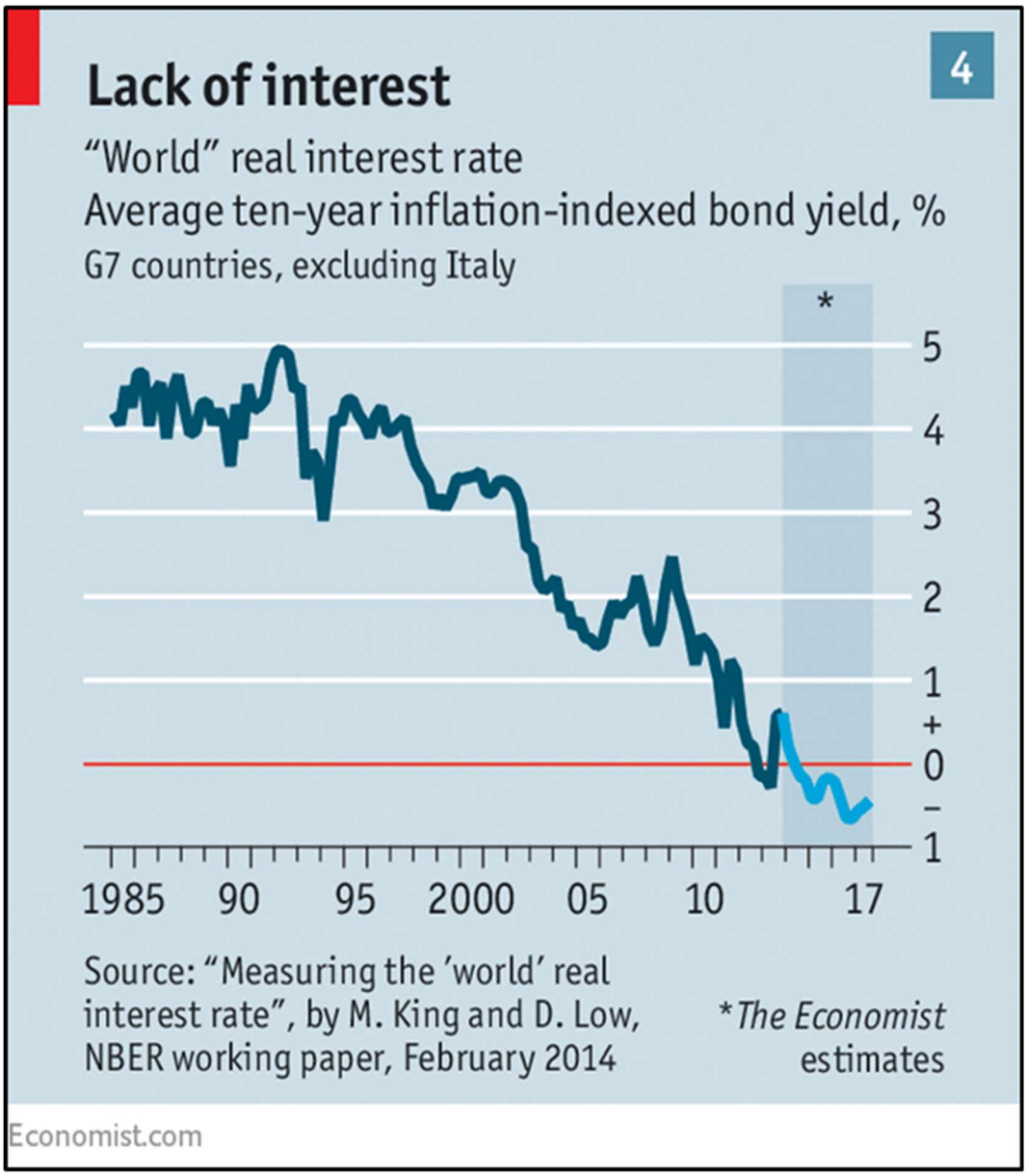
anything, needs to be done depends in large part on which factor you choose to give most weight to."

Considering Figure 4, the real rates of return have shifted as follows:

- G7 ex Italy: The extent of the drop is broadly in line with that of Germany, namely from 4% (or more) by 4.5%age points to minus 0.5%.

This would also imply a 3.5-fold increase in the level of cost as was calculated for Germany.

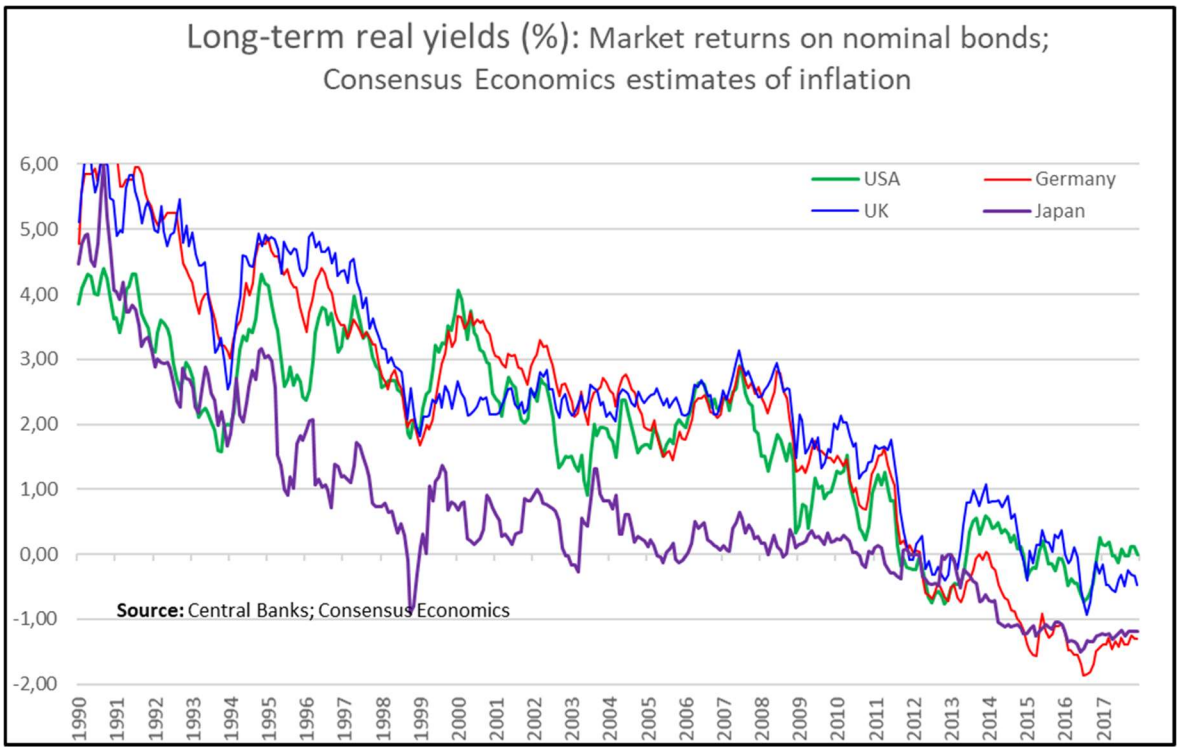
Figure 4: "World" real long-term interest rate in % for G7 countries, excluding Italy



6 Additional data regarding inflation expectations

As mentioned in Sections 3 and 4 it appears useful to compare the information on market expectations of long-term inflation with that based on a consensus view of economists' expectations of long-term inflation. Such data is available and was provided by Consensus Economics Inc.[10] for the period from 1990 to year end 2017 for all the four currency areas mentioned. This was then applied to the nominal spot rates available for each of the four currency areas for the entire period 1990 to year end 2017 to obtain the implied real yield on sovereign debt.

Figure 5: Long-term real rates of return on Government Debt of selected countries (derived from market data)



Most strikingly, the comparison reveals that the real market yields observed in the UK apply the UK Retail Price Index (RPI) as a measure of inflation. As the RPI was held not to meet international statistical standards, the Office for National Statistics in the UK took the decision in 2013, to no longer classify it as a "national statistic", emphasising instead the consumer price index instead.

The appropriately revised results can be summarised as follows:

[10] Consensus Economics Inc. is a macroeconomic survey firm that offers – amongst other macroeconomic survey data – a consensus of economists' long-term inflation expectations. See alsoh www.consensuseconomics.com.

Currency Area	Average Real Yield p.a.	Since when (years)	Comments
Germany	-1.4%	3	Broadly in line with market data
Japan	-1.2%	4	Longer history than market data
UK	-0.0%	6	Market data based on RPI; CPI more comparable measure of inflation
US	-0.1%	6	Broadly in line with market data

For purposes of this paper, the inflation data from Consensus Economics appears more robust and internally consistent for Japan, UK and US. Considering Figure 5, the real rates of return for each country can be said to have shifted as follows:

- Japan: The era of real yields being consistently around or above 3% ended around 1992. For an extensive period, namely 2005 to 2012, they remained at around zero and dropped further thereafter, ending up at levels similar to those of Germany;
- UK: The development seems broadly in line with that of the US, so that we can assume a similar reduction from a real yield of around or above 3% expected 20 years ago to an average zero for the period commencing 2012; and
- US: Until 2001 the real return averaged closer to 3% than was the case for the other currency areas and subsequently dropped to levels comparable with the UK.

Comparing the shift in cost multiple attributable only to the drop in real yields, the factor 3.5 determined in Section 3.2 above for Germany appears broadly appropriate, if a little lower, for Japan too, whereas the multiple for the US and UK amounts to a little less than 2.5. In determining these factors an unchanged retirement age of 65 and German mortality assumptions were applied throughout for consistency purposes.

7 Summary of findings and outlook

The paper outlines a simple model to estimate the development of cost over the last 20 years for a young person-in-the-street's provision for retirement.

As the analysis in Section 6 showed, only the market data for Germany remained largely unchanged when including data from Consensus Economics. For the other currency areas the latter appeared more robust than the market data collected. Based on the analysis of Section 6, therefore, and taking only the downward shift in real rates of investment return into account, the expected long-term cost was estimated for Germany and Japan to increase to approx. 3.5 times the level expected 20 years ago. The multiple is similar for the G7 countries taken together (although excluding Italy) and "only" approx. 2.5 for the UK and US.

Narrowing the focus on Germany alone, the development of other relevant circumstances over the 20-year period was also taken into account. In a first step, the changes in the expectations in both retirement age and longevity over the period were included in the model, leading to an unchanged result of 3.5, i.e. the effect of the two additional factors neutralised each other. In a second step, the change in the expectations of young savers resulting from the Social Security Reform effected in 2001 were taken into account. On the assumption of an ambition of the same level of total retirement income, the factor of 3.5 increased formidably to between 5 and 6.

Finally, for persons just attaining their retirement age in Germany the corresponding cost will "only" have increased to 1.7 times the level expected in 1998.

The dismantling of defined benefit plans globally as well as the trend towards lower first and second pillar provision has created gaps in younger peoples' retirement income expectations. The steps policy makers have made to shift the responsibility and initiative to private, third pillar savings to fill these gaps has generally not reached the mindset of those that have the greatest need to do so [11]. Even in rich countries, a large proportion of the population is not in a position to save. Another, probably also large proportion, perceives itself not being able to or not requiring to do so. But even for the remainder that are able and understand the necessity to provide for themselves, the drop in real investment returns has made the expectations hugely unattractive in comparison with the situation 20 years ago. Structuring products to meet these needs is underway but by no means completed [12]. The message to governments, institutions and individuals alike must be: face the issue or ignore it at their peril.

As always, the significance of the assumptions made in deriving the results reported here need to be clearly understood before making use of them. The paper discusses the implications and points out areas that lend themselves to further work.

[11] e.g.: *World Economic Forum*, "We'll live to 100 – How can we afford it", WEF White Paper, 2017.

[12] e.g.: *Anderson/Empedocles*: see footnote 1. *Paul Sweeting*, "Fact and Fiction", The Actuary, May 2017. *Thinking Ahead Institute, WillisTowersWatson*: "The search for a long-term premium", willistowerswatson.com, 2017.

Appendix

Input Data used for Germany			
Year	Expectation of Retire-ment age	Annual aver'ge real return on long-term gov'nt	Assumed aver'ge real return on long-term gov'nt
	(yrs)	(%)	(%)
1998	63	2,7	3,0
1999	63	2,0	3,0
2000	63	3,8	3,0
2001	65	3,1	3,0
2002	65	3,2	3,0
2003	65	2,3	2,5
2004	65	2,6	2,5
2005	65	1,9	2,0
2006	65	1,8	2,0
2007	67	2,5	2,5
2008	67	2,2	2,5
2009	67	1,6	1,5
2010	67	1,6	1,5
2011	67	1,5	1,5
2012	67	0,1	0,0
2013	67	-0,7	-1,0
2014	67	-0,2	0,0
2015	67	-1,3	-1,5
2016	67	-1,4	-1,5
2017	67	-1,4	-1,5

Sources:

1. Retirement Age: Own experience
2. Websites of: Bank of Japan, Bank of England, Federal Reserve Bank, Deutsche Bundesbank. For Japan in addition: Japan Bond Trading Co., Bloomberg LLP and own estimates. Monthly data used to determined annual averages shown in the third column.
3. Assumed rates: Annual averages rounded