

The Economic Impact of Protracted Low Interest Rates on Pension Funds and Insurance Companies

by

Pablo Antolin, Sebastian Schich and Juan Yermo*

A period of protracted low interest rates is a feasible, even if not the most likely, scenario going forward and such a scenario would adversely affect pension funds and insurance companies. Protracted low interest rates affect investment opportunities and have a potentially significant adverse effect on life insurance companies and institutions whose liabilities consist of a fixed investment return or benefit promises, such as is the case for defined-benefit pension funds. It cannot be ruled out that the financial institutions affected engage in “gambling for redemption” in an attempt to match the level of return promised to beneficiaries when financial markets were more elevated.

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Keywords: Low interest rates, life and non-life insurance companies, pension funds, return promises, fixed benefits, “gambling for redemption”.

* Pablo Antolin, Sebastian Schich and Juan Yermo are principal economist, and principal administrators, respectively, in the OECD Directorate for Financial and Enterprise Affairs. Comments from Timothy Bishop, André Laboul, and Stephen Lumpkin are gratefully acknowledged. An initial version of this paper was prepared for the meeting of the Analytical Group on Vulnerabilities of the Financial Stability Board in November 2010 and subsequent versions were presented to the OECD Insurance and Private Pension Committee and its Working Party on Private Pensions in December 2010. The current version of this paper reflects comments from participants at those meetings. All remaining errors are those of the authors. The work is published on the responsibility of the Secretary-General of the OECD. The opinions expressed and arguments employed herein do not necessarily reflect the official views of the Organisation or of the governments of its member countries.

I. Introduction

This paper discusses the impact of protracted periods of low interest rates

This paper discusses select issues regarding the impact of protracted periods of low interest rates on pension funds and insurance companies. While no set time period is associated with the word “protracted”, in this article we define protracted as lasting for at least several years. Certain other empirical studies on the same topic have used time horizons of more than 10 years in their simulations.¹

A scenario of protracted low interest rates is to be distinguished from a scenario where interest rates are rising or declining. Actually, a scenario of protracted low interest rates essentially requires that interest rates have already fallen, namely to low levels, where they might stay for some time.

At the outset, it should be noted that the scenario of protected low interest rates may not be the most likely one. In fact, judging by the recent pricing of interest rate futures, market participants’ expectations indicate a gradual increase in nominal interest rates going forward. Rating agencies and other observers point out that the main interest-rate risk is that rates will rise rapidly in anticipation of higher inflation, especially if this change occurs more quickly than expected and is built into the interest-rate and risk-management models maintained by insurance companies. Nonetheless, a protracted period of low interest rates is a feasible scenario for a number of countries currently, with potential severe effects for pension funds and some insurance companies.

Protracted low interest rates could affect both the assets and liabilities of pension funds and insurance companies

Such a scenario would affect pension funds and insurance companies on both the asset and the liability sides of their business. They would increase the liabilities of pension funds and insurance companies, to the extent that the decline in rates has not been fully reflected in liability reporting, and it would reduce future investment returns. As a result, the solvency status of insurers and pension funds – which was badly damaged during the crisis - could fail to improve or even show some deterioration. Protracted low interest rates will impact pension funds and insurance companies by affecting re-investment returns on their fixed-income portfolio. If low interest rates are expected to be permanent, lower interest income in particular will impact insurers with long-term liabilities and shorter-term assets. To the extent that lower interest rates reflect a lower-growth environment, returns on investments in general – and equities in particular - would also be expected to be lower. Consequently, pension funds offering defined-benefit promises and life insurance companies that have sold products with high-return guarantees may have difficulty fulfilling these promises.

The magnitude of this effect depends on the type of entity

The precise magnitude of this effect will depend on the type of entity. Adverse effects are more likely to arise for life (as compared to non-life) insurance companies, and the effects would differ for defined-benefit (DB) pension funds versus defined-contribution (DC) funds. The impact will also depend on the level and type of guarantees offered by these institutions. Insurers offering high minimum-interest-rate guarantees in their insurance policies and deferred annuities will be the worst affected, as well as defined-benefit pension funds and funds offering minimum-return guarantees. Where guarantees are reset on a regular basis, the impact will be more subdued.

A combination of low interest rates and increases in life expectancy compounds the problem

The combination of a low-interest-rate environment and increased life expectancy raises additional concerns, as low interest rates magnify the present value of future increases in longevity, further worsening the solvency situation of annuity providers and DB pension funds. As a result, these institutions are likely to scale back future benefit promises, with negative implications for retirement income adequacy.

Insurers and pension funds have various tools to address the risk of persistently low interest rates

Insurers and pension funds have various tools to address the risk of persistently low interest rates. First, if they expect a further downward slide in interest rates, they can seek to increase the duration of their assets in order to ensure a better duration match between assets and liabilities. Second, insurers can alter the terms of new policies (lowering guaranteed rates), thereby progressively lowering liabilities, while pension-plan sponsors could close down the plan and offer less attractive terms to new employees. Third, in the case of DB pension funds, pension-plan sponsors – and where relevant, plan members – could increase contributions to the pension fund. Fourth, and as a last resort, insurers and pension funds in some countries may be able to renegotiate or unilaterally adjust existing contracts. In some countries, for instance, pension-plan sponsors or the pension funds themselves have discretion regarding the level of indexation of pension benefits, and in some cases they can also reduce accrued benefits. In this last-resort scenario, international diversification could be further promoted, and the adjustment of expectations would call for appropriate communication with the beneficiaries.

Pensions and insurance supervisors should step up monitoring

A protracted period of low interest rates calls for proactive regulatory initiatives, drawing on regular monitoring by pension and insurance supervisors. Stress tests should further reflect the impact of protracted low interest rates. In particular, the impact on annuities providers and DB pension funds should be closely monitored. At the same time, policymakers should avoid putting excessive pressure on institutions to correct funding deficits at a time of market weakness. In DC pension funds, plan members should be allowed flexibility as to when they retire and when they annuitise their account balances so as to avoid members having to lock in future pension benefits at an inopportune time.

Search for higher yield may lead to problems of financial stability

From the perspective of financial stability, the main concern is that insurers and pension funds affected by the lower interest rates will seek higher yields via riskier investments (for those under solvency pressure, this would mean “gambling for redemption”). Such action is more likely to affect DB pension funds and insurers offering return guarantees, except in countries where pension funds are subject to solvency regulations similar to those for insurers penalising risky investments. A second major concern is that interest-risk-hedging activities sparked by an expected drop in interest rates could put further downward pressure on bond yields, further worsening the solvency of both pension funds and life insurers. Finally, protracted low rates will have an important impact on insurers that rely on interest income to maintain profitability; for instance, insurers that are operating in highly competitive environments with compressed margins.

II. How changes in interest rates affect pension funds and insurers

Future cash flows are discounted using long-term interest rates

In general, when calculating liabilities, DB pension funds and insurance companies discount future cash flows by using a discount rate linked to long-term interest rates. A reduction in long-term interest rates means that the liabilities, or the discounted value of future cash flows of a pension plan or an insurance company, would increase.² At the same time, the value of pension fund and insurer bond portfolios would rise, given a fall in interest rates.

The overall effect depends on the duration of assets and liabilities

The overall effect depends on the duration of assets and liabilities. It can be expected that DB pension funds and life companies with long-dated, interest-rate-sensitive liabilities will, unless they are hedged, have a negative duration gap (duration of liabilities greater than the duration of assets), in contrast to banks, which generally maintain a positive duration. Thus, DB pension funds and life insurers will be negatively affected by a reduction in long-term interest rates. Furthermore, when the interest rate shock is negative, insurance policyholders tend to stick to their (generous) contracts, unless insurers can convince them otherwise by encouraging them to switch to new contracts (but this raises market conduct issues). Some DB funds and life insurers might have longer-term assets, and thus they may have effectively hedged through asset-liability management, or may have hedged in some other manner (*e.g.*, long-term swap arrangements with bank counterparties offering fixed-interest payments, or an option to enter into such arrangements).

Pensions funds increasingly engage in maturity matching and hedging of interest rate risk

Similarly, pension funds in some countries (*e.g.* Denmark and the Netherlands) are increasingly engaging in maturity-matching and the hedging of interest rate risk. Such approaches substantially reduce the negative impact of a drop in interest rates. For open DB pension funds, however, such hedging techniques can be difficult to implement, especially if the liabilities are linked to salary growth, for which there is a lack of effective hedging instruments.

The structure of non-life insurers' liabilities will affect interest-rate sensitivity

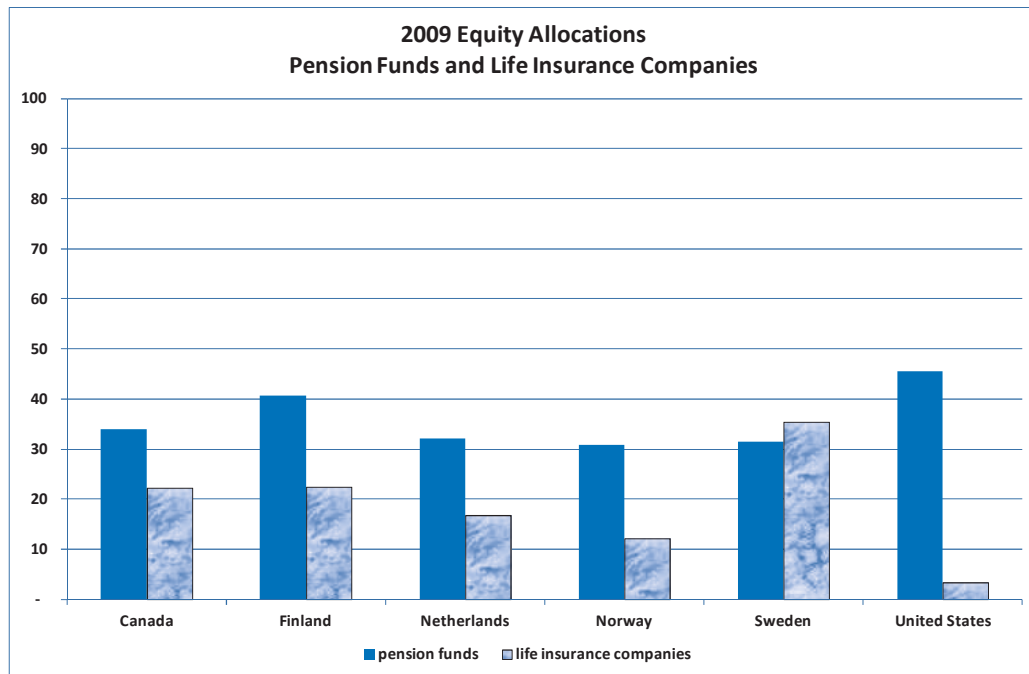
The structure of non-life insurance liabilities (*i.e.*, the expected timing of payouts from loss events) will affect interest rate sensitivity. Non-life insurers with short-tailed liabilities can be expected to have lower interest-rate sensitivity than insurers with longer-tailed risks, whose claims would be paid further into the future. Overall, in comparison with life insurers, one would expect non-life insurers to have a smaller negative duration gap; therefore, they would be less affected by a drop in interest rates.

Insofar as lower rates benefit banks and other corporations, this would benefit insurers and pension funds by reducing the credit risk in their investment portfolios.

The impact of low interest rates on returns depends on the structure of the portfolio

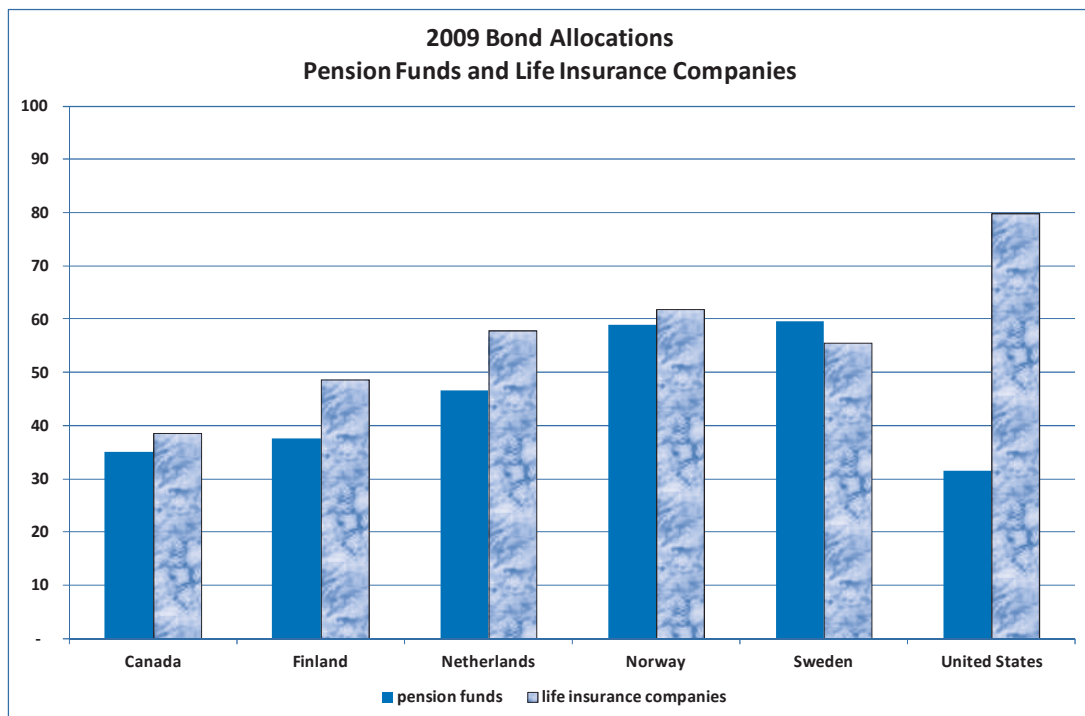
The impact of lower interest rates on investment portfolio valuations and returns also varies, depending on the allocation to bonds, and how the returns on equities and other asset classes are affected by lower interest rates. In general, pension funds have lower allocations to bonds, and higher allocations to equities, relative to life insurance companies (see Figures 1 and 2).

Figure 1. **Equity allocation among pension funds and life insurance companies**
As percentage of total assets, 2009



Source: OECD Global Pension and Insurance Statistics.

Figure 2. **Bond allocation among pension funds and life insurance companies**
As percentage of total assets, 2009



Source: OECD Global Pension and Insurance Statistics.

DC pension funds will experience valuation gains

DC pension funds, to the extent they offer no guarantees regarding returns or benefits, will experience gains in their bond holdings from the drop in interest rates, the size of which will again depend on the duration of their assets and the slope of the yield curve. Hence, DC pension funds will, in general, see a temporary improvement in investment performance. For DC pension fund investors close to retirement, however, the gain in asset value is likely to be offset by the lower annuity values they will get as a result of lower interest rates.

III. Impact of protracted low interest rates on life and non-life insurance companies

The question addressed in this section is what might be the overall impact on the insurance sector of a prolonged period of low interest rates. A scenario of protracted low interest rates is one whereby interest rates stay at (relatively) low levels for prolonged periods of time. At the outset, it should be noted that it is hard, if not impossible, to generalise about the insurance sector as a whole, as individual companies have different mixes of assets and liabilities, and operate in different environments, so that the implications of protracted low interest rates would differ from company to company. That said, a distinction can be made between the life and non-life insurance sectors, with adverse effects more likely to arise for life as compared to non-life insurance companies.

1. Implications for life and non-life insurance companies

The need to distinguish between life and non-life insurance companies arises because the structure of assets and liabilities of these two sectors typically differs. Many non-life insurance contracts are rather short-term, extending over one year (although they are typically tacitly renewed), with payouts for short-tailed risks expected to be paid in the short to medium term.

Life insurance companies have more long-term liabilities

By contrast, life insurance companies have more long-term liabilities, which could stretch even over several decades. Additionally, they have made explicit return guarantees, such as guaranteed interest-rate returns, guaranteed minimum income (annuity) streams, or other guarantees that could be difficult to fulfil in an environment of protracted low interest rates on government bonds and stagnating or deteriorating capital-market valuations.

Consequently, the duration of liabilities of life and non-life insurance companies differ

As a result of these differences, the duration of liabilities of life versus non-life insurance companies differs. The (average) duration of liabilities is relevant, as the asset choices of many financial firms are driven by asset-liability management considerations, in particular by attempts to limit the mismatch between assets and liabilities. As a consequence of the structure of their liabilities, life insurance companies tend to invest in longer-duration assets than non-life insurance companies, although there are exceptions to this general observation for particular companies.

Some life insurers implement hedging strategies based on derivatives, such as swaps and options that allow them “to lock in” higher interest rates. However, such strategies also pose risks, given that any lengthening of the time horizon required for the hedging strategy tends to increase the counterparty risk involved.³

A period of low interest rates raises asset-management challenges when the duration of liabilities exceeds that of assets

As a general rule, where the duration of liabilities exceeds those of assets, a period of low interest rates poses challenges for asset-liability management in that current lower-yielding assets are expected to meet the return assumptions made in the past. Interest income falls as coupon payments from fixed-income instruments and the principal from maturing debt must be rolled over into lower-yielding debt. The extent of this reinvestment risk depends on the extent of the mismatch between the duration of the insurer's liabilities (its effective investment horizon) and the duration of the insurer's assets.

Obviously, the increase in government bond spreads for some lower-rated European issuers may provide some offset, as they promise higher nominal returns, but this offset comes at the price of increased credit risk. The same argument applies to using corporate bonds or any other portfolio reallocation that involves moving out on the credit curve.

Challenges arise where insurance companies have made explicit return guarantees

An important challenge arises when insurance companies have made explicit return guarantees or provided embedded options to their policyholders. Such embedded options include guaranteed floors in unit-linked contracts and options for renewing contracts at guaranteed interest rates, which may become more "in-the-money" as time progresses and interest rates stay low.

Many insurers have adjusted the pricing of variable annuities and/or their specific features so as to reduce their exposure to rising hedging costs. Such retrenching means that life insurers could de-emphasise the strategic importance of one potentially lucrative business activity segment, which is to make increasingly elaborate minimum-return promises to ease Baby Boomers' concerns about the adequacy of their retirement income (given that life expectations are expanding and traditional defined-benefit pensions are on the decline). These changes will likely be reflected in insurance companies' balance sheets and profit-loss statements only gradually, however.

Important consideration: the contribution of investment income to overall profitability

A significant consideration regarding the impact of protracted low interest rates relates to the contribution of investment income to overall profitability. When the portfolio allocation to bonds is high and profitability is driven by interest income, lower interest income is likely to mean reduced profitability. Therefore, profitability would then depend (to a larger extent than before) on underwriting, premium income, claims experience, and lapse rates. In other words, insurance companies will have to place a sharper focus on their core business activities.

The outlook for this core insurance business is overshadowed, however, by the likely macroeconomic developments, although there are considerable differences in this respect from one market to another, reflecting both the economic outlook and some specific insurance-sector characteristics. A protracted low interest rate environment lasting more than three or four years is usually associated with low growth or recession. To the extent that low interest rates coincide with a period of low growth, there are likely to be additional negative effects on insurers insofar as premium growth is linked to economic growth.

The ratings agencies would expect earnings to come under pressure in several insurance sectors. That said, the (average) ratings outlook for the insurance sector as a whole seems to have stabilised after a period in which rating downgrades significantly outnumbered upgrades.

Accounting rules may delay recognition of lower interest rates' impact on insurance liabilities

Accounting rules may delay or even preclude recognition of the impact of lower interest rates on insurance-contract liabilities. The current IFRS allows insurers to follow local GAAP, which may, in some jurisdictions, permit the discounting of insurance liabilities based on the rates prevailing when the policies were first issued, or using the returns on the assets backing the contract liabilities. Thus, there may be a delayed or progressive recognition of the interest rate shock. However, any interest rate shock would have an immediate effect on investment contracts and any other financial liabilities of the insurer (*i.e.*, any liabilities classified as financial instruments). The new IFRS draft on insurance contract exposure, published in July 2010, proposes a new model for the valuation of insurance liabilities, which gives more weight to current market rates. Expected to be effective by 2013,⁴ the new IFRS is thought to be of great importance as it will increase the sensitivity of insurance-company liabilities to interest rates.

2. The risk of “gambling for redemption”

Particularly disturbing is the risk of “gambling for redemption”

There is a particularly disturbing risk associated with sustained periods of low interest rates, which has long been recognized: the risk of “gambling for redemption”. For example, the BIS Annual Report had already noted in 2004 the following: “*However, a more disturbing effect of the lower bond yields is that they may have induced a growing appetite for risk. In the case of insurance companies, with contractual obligations to pay high rates of return on their liabilities, such behaviour became almost a matter of survival. After a period of declining interest rates, the guaranteed rates started to exceed the yields available on highly rated government bonds. The resulting funding gap led such institutions to invest in higher-yielding, higher-risk instruments. Even in those countries with no guaranteed rates, changes in the value of liabilities tended to lead to risk-seeking behaviour.*”

It cannot be excluded that some life-insurance companies might face this temptation to shift portfolio allocations. In particular, when the nominal yields of lower-rated government bonds are higher than those of higher-rated European sovereigns, no additional capital buffers would have to be mobilised. Even Solvency II – which in general requires capital charges to be risk-based – would not require insurers to hold more capital to offset the higher risk exposure, as it does not distinguish between different EU governments in terms of capital requirements.

However, it is difficult to identify clear cut evidence of this activity

Clear-cut systematic evidence that “gambling for redemption” is a significant factor in insurance company asset allocations is difficult to identify. For example, a recent Banque de France study,⁵ looking at detailed statements of more than 150 insurance companies in France, concluded that these entities’ portfolios’ have recently exhibited a significant shift toward long-term debt to the detriment of equity investments. This development is not clear evidence of a move out on the risk curve. Unless the long-term debt securities are of lower

credit quality (including increased amounts of lower-rated European government debt), this evidence is not indicative of a shift towards riskier assets (*i.e.*, gambling for redemption). A recent BIS study⁶, which drew on meetings with insurers and pension funds, also failed to identify an industry-wide movement toward higher risk asset classes.

IV. The impact of protracted low interest rates on pension funds

The impact depends on the type of pension plan

The impact of a low-interest-rate environment on pension funds depends first of all on the type of pension plan, that is, whether it is a defined-benefit (DB) or defined-contribution (DC) plan, or a mix of the two. In general, regardless of the plan, investment performance and funding ratios are likely to suffer.⁷

1. Defined Benefit (DB) pension funds

The liabilities of a DB plan equal the discounted value of the stream of future cash flows promised

The liabilities of a DB plan are equal to the discounted value of the promised cash flows. If the discount rate is based on long-term interest rates, a protracted low-interest-rate environment implies a higher ongoing level of liabilities. The impact of protracted low interest rates on DB pension funds is largest when future benefits are fixed, which is the case for some pension funds offering a guaranteed return on pension fund contributions that is not linked to salaries or inflation. Also, the longer the duration of the liabilities, the greater the impact.

The situation is different for pension funds that offer benefits linked to salaries or inflation

The situation is different for pension funds that offer benefits linked to salaries or inflation. To the extent that protracted low interest rates anticipate future economic conditions characterised by low growth, low inflation (in both prices and salaries) and low returns on investment, future pension benefits may also be lower. However, protracted low interest rates combined with lower inflation would also reduce wages and thus future benefits to be paid. Consequently, the impact of protracted low interest rates when benefits are not fixed would be reduced over time.⁸

Wage adjustments could be sluggish since long-term term interest rates may reflect global economic conditions, while wage conditions depend more on domestic factors. Furthermore, protracted low interest rates may be driven by temporary factors (special interventions by the monetary authorities, excess demand for bonds) and not necessarily reflect a lower growth and lower inflation environment. Hence, the adjustment in cash flows need not necessarily occur, or at least it is unlikely to fully offset the impact of protracted low interest rates. In such circumstances, low nominal interest rates will translate into very low or even negative real interest rates, which could create major funding pressures on DB plans offering benefits linked to salaries or inflation.

The actual impact of low interest rates on reported DB funding ratios depends on the

The actual impact of low interest rates on reported DB funding ratios will also depend on the valuation method used. Defined-benefit plans can have several different funding levels, depending on the purpose: for financial reporting purposes; for regulation (to be used by supervisors in determining minimum required contributions, the regulatory solvency funding level); for tax

valuation method used

reporting; and for termination purposes (to be used upon plan closing or the buy-out of accrued benefits with an insurance company. The reason that the funding level would differ for each of these purposes is that the requirements for each tend to be different. For example, the discount rate and other assumptions, the actuarial funding method for valuing liabilities, as well as whether the assets are priced at market value or using some other measurement could be different for each of these distinct purposes.

Two key questions to determine the effect of a protracted low-interest rate environment on a defined-benefit plan's liabilities are the following:

- To what extent are the plan's future promised cash flows dependent on future wages, inflation and bond yields, and to what extent are these variables (future wages, inflation and bond yields) already reflected in the expected future cash flows used to value the plan's liabilities? All else being equal, lower expected future cash flows means lower liability for a defined-benefit plan.
- Once the expected future cash flows of a plan have been determined, they need to be discounted to the valuation date using a specific discount rate. To what extent is that discount rate based on prevailing bond yields? All else being equal, a lower discount rate means higher liability for a defined-benefit plan.

Regulatory solvency purposes

In some countries, the level of liabilities used to determine minimum required contributions (the regulatory solvency level) is calculated as if the pension fund were to be terminated as of the valuation date. Therefore, the cash flows would be fixed based on salaries and indexation as of the valuation date; hence, the impact of protracted lower interest rates would be quite large (as there would be no downward adjustment to future expected cash flows due to lower wage growth and inflation expectations).

Some countries set regulatory solvency levels for liabilities and minimum required contributions based on a fixed discount rate not explicitly linked to actual bond yields; as such, the effect of a drop in bond yields would not be immediately felt. Certain other countries, such as Japan and the United States, also apply smoothing mechanisms to market rates when calculating the discount rate to be used in pension valuations. Canada also recently revised its measure for determining funding ratios. Effective January 1, 2011, the solvency ratio for federally regulated plans is being calculated using a three-year average. In general, such smoothing measures would tend to limit or at least delay the effects of a low-interest rate environment on reported funding values.

Accounting purposes

For accounting purposes, methodologies are much more consistent across countries than is the case for regulatory solvency purposes. For accounting, discount rates tend to reflect actual bond yields, while future salary growth is included in benefit estimations. The assumptions used for inflation and future salary growth are, however, usually adjusted only gradually. A lower discount rate would increase liabilities and charges to plan sponsors' profit-loss statements, but to the extent that inflation and salary growth expectations are adjusted downward over time, the impact of protracted lower interest rates

would be reduced due to lower expected future benefits. In practice, the anticipated inflation and salary levels used by pension funds are not adjusted often. Small pension funds and annuity providers, for instance, may not have the resources to have a full actuarial model and to change the cash flows assumptions regularly. Instead, they would use their central bank's long-term inflation target to calculate liability levels (for example, the recent European Central Bank inflation target of 2%) and adjust their assumptions only when the central bank revises inflation expectations.

Increases in longevity will be more heavily felt in low-interest-rate environments

It should be noted that in a low-interest-rate environment, cash flows due to be paid far into the future by a pension fund are more heavily weighted in determining liabilities, contributions and costs. This means that, all else being equal, increases in longevity will be more heavily felt in a low-interest-rate environment, as compared to a higher or more "normal" interest rate environment.

Protracted low interest rates may also affect the asset side of pension funds' balance sheets. To the extent that protracted low interest rates reflect lower economic growth, and thus lower profits, returns on different asset classes, and therefore on portfolio investment, could also be lower.

2. Defined-contribution plans

To the extent that protracted low interest rates reduce returns on investments, pension plan assets will be directly affected

Defined contribution plan assets will also be directly affected by a period of protracted low interest rates. The aggregate size of the effect will depend on the fund's investment strategy and the extent to which the equity part of the portfolio also suffers from a low-interest-rate environment. Over the long-term, lower investment returns will translate into lower benefits, unless employees and employers contribute more to these plans in order to attain the same level of retirement benefits that would have been achieved in a more "normal" interest rate environment, or take on more risk in their investment portfolios. Furthermore, low interest rates are likely to lead to higher annuitisation costs, making it more expensive for members to transform their defined-contribution savings into annuity benefits.

If the defined-contribution plan contains a minimum-return guarantee (in effect, a cash-balance approach), then depending on the rate at which the guarantee is activated and the level of interest rates, this may raise the cost of providing the guarantee.

3. Implications for financial stability

Two main concerns

From a financial stability perspective, the two main concerns regarding pension fund operations are the following:

Intensification of the search for yield

First, pension funds, particularly defined-benefit (DB) ones, may intensify their search for yield, buying higher-risk products, including some that may have limited liquidity and transparency. In their drive for profitable investment opportunities, they may intensify asset price bubbles, causing severe dislocations in investment flows and asset prices. The herd-like behaviour often observed

among pension funds may further exacerbate this problem. There is some evidence that such a trend is well under way, with a continuing and growing appetite for alternative investments (hedge funds, private equity and commodities), as well as emerging-market bonds and emerging-market equities. Such a trend has even been observed among the generally more conservative pension funds of countries such as Denmark and the Netherlands (see Table 1 and Figure 3). Actual allocations to hedge funds and private equity have increased in recent years in other countries, such as Ireland (from 0.8% in 2005 to 2.4% in 2008) and Switzerland (from 2.8% in 2005 to 4.3% in 2008), though part of the increase is due to valuation effects.

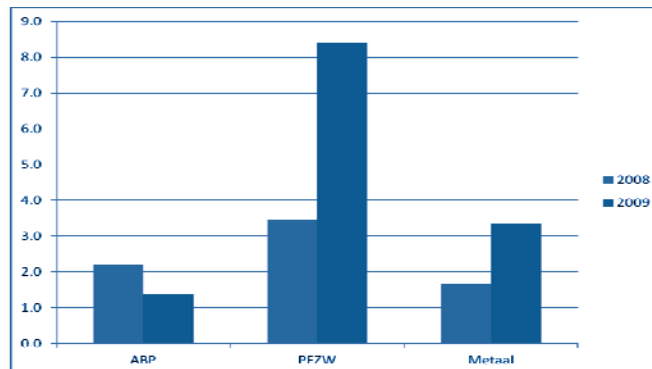
Table 1. **Asset allocation of select pension funds**

	ABP	PFZW	PFA	Metaal Bedrijven
Equities	33.1%	31.7%	8.6%	23.5%
Bonds	40.3	29.9	84.3	54.7
Real estate	9.4	14.5	5.0	8.2
Hedge funds and PE	9.9	7.4	2.1	12.3
Commodities	2.9	6.3	0.0	0.4
Cash and deposits	0.7	4.1	0.0	0.0
Other	3.7	6.2	0.0	0.9

Source: OECD Pension Markets in Focus, 2010.

Figure 3. **Dutch pension funds' reallocation into alternative investments**

Net cash flow into real estate, commodities, hedge funds and private equity as percentage of total assets under management at the beginning of the year



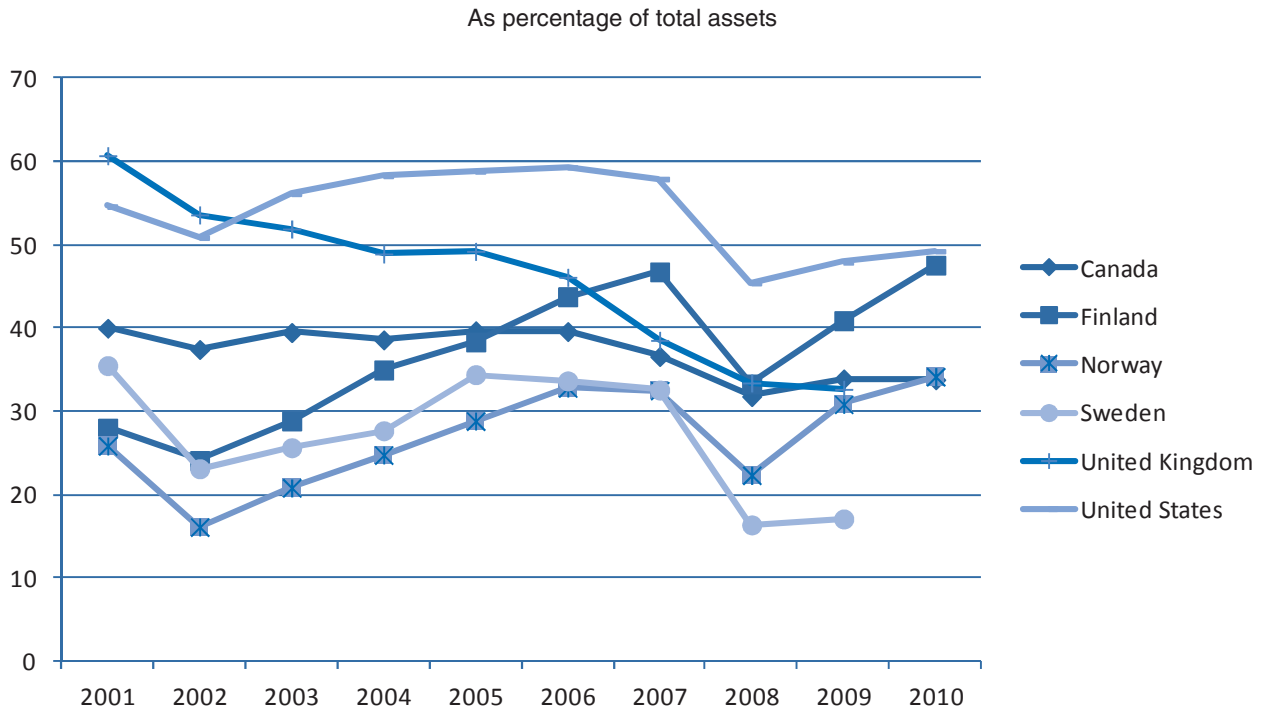
Source: OECD Global Pension Statistics.

*A diminished
appetite for more
traditional equity
risk*

This trend has also coincided with a diminished appetite for more traditional equity risk in some countries, which stems partly from the experience of two market shocks in the same decade, as well as changes in accounting practices. As shown in Figure 4, pension funds' equity allocations were reduced prior to the 2008 crisis in various countries, such as the United Kingdom and the United States. In particular, DB pension funds in the United States reduced their equity portfolios by 14% (before valuation effects) in 2008, relative to their equity holdings at the end of 2007, and by 17% in 2009 (relative to their

holdings at the end of 2008). However, the positive return to equities in 2009 meant that the actual allocation to this asset class at market prices increased in 2009 relative to 2008. On the other hand, in some countries such as Turkey, decreased expectations for bond performance has led to a slight shift towards equities and time deposits.

Figure 4. **Equity allocation among pension funds in select OECD countries**



Source: OECD Global Pension Statistics.

Pension funds may seek to hedge interest-rate risk by increasing bond allocations and portfolio duration and via derivative transactions

Second, pension funds may seek to hedge interest-rate risk by increasing their allocation to bonds and by increasing the duration of their investment portfolios, as well as engaging in derivative transactions in a large and coordinated way, creating further downward pressure on bond yields. Such effects are likely to be strongest in countries with quantitative, risk-based funding regulations, such as Denmark and the Netherlands. For example, the use of market prices for calculating pension assets and liabilities (especially the application of spot discount rates) and the implementation of quantitative, risk-based funding requirements appear to have aggravated pro-cyclicality in pension fund investments during the 2008 financial crisis, in certain countries such as Denmark, Finland and the Netherlands. While in Denmark and Finland regulatory changes were made to ward off the massive sale of equities, mortgage bonds and other securities, pension funds in the Netherlands fell into a vicious circle due to their use of the spot swap curve to value liabilities. Their heavy demand for long-term swaps put downward pressure on the long swap rate, which further intensified this demand.⁹

V. Conclusions

Lower interest rates affect pension funds and insurance companies on both the asset and the liability side of their balance sheets

In conclusion, lower interest rates will impact pension funds and insurance companies on both the asset and the liability side of their balance sheets. While lower interest rates increase the value of fixed-income securities, they increase the liabilities of pension funds and insurance companies, with the extent of the impact depending on: (1) whether future cash flows are fixed; and (2) to what extent benefits to be paid in the future are being adjusted to reflect the new economic environment. Protracted low interest rates reflective of a lower-growth economic environment will reduce the returns on portfolio investments. Thus, lower long-term interest rates could lead to pressure to adjust pension promises or guarantees downwards, or to adjust contributions and premiums upwards in order to pay for the pension and insurance promises that become more expensive to provide in a protracted low-interest-rate environment.

Protracted low interest rates affect investment opportunities

Protracted low interest rates will have an effect on the investment opportunities of insurance companies, and the level of this effect will depend on the structure of the entity's liabilities and assets. Those insurers with guaranteed payouts to be made far into the future, but holding a portfolio of assets largely comprised of short- to medium-term fixed-income securities, will be more affected by reinvestment risk than insurers with a better duration match between assets and liabilities. In this regard, a distinction naturally arises between life and non-life insurance companies, given the typical difference in the structure and duration of their assets and liabilities.

Other things equal, one would expect a potentially greater impact on life insurance companies, given that the core of their business involves promises that extend over long periods and entail fixed payments or contain embedded options. The need to find adequate fixed-income returns to match these promises may, under a scenario of protracted low interest rates, prompt institutions with particularly high levels of mismatching to significantly alter the risk profile of their investments. While the risks of such a strategy being adopted are non-trivial, it is difficult upon casual inspection to identify specific examples.

The "search for yield" may have an impact on financial stability

A "search for yield" without due consideration of risk raises concerns from both a prudential and a financial stability perspective. The temptation to resort to such practises is likely to be particularly pronounced in the case of DB pension funds and those offering return guarantees, although in some countries pension funds are, or will soon be, subject to solvency regulations similar to those of insurers that penalize risky investments. One specific concern is that interest-risk hedging activities could put further downward pressure on bond yields, thus further worsening the situation of pension funds and life insurers.

Need for closer monitoring of life insurers and pension funds

Overall, a protracted period of low interest rates calls for proactive regulatory initiatives, and greater supervisory scrutiny in the form of regular monitoring by pension and insurance supervisors. Such monitoring should include stress tests that reflect the impact of protracted low interest rates.

Notes

1. See Kablau and Wedow (2011).
2. For example, for a typical defined-benefit pension plan, a 100 basis point drop in long-term bond yields could mean, all else being equal, an immediate increase of liabilities in the order of 20%.
3. Schich (2008) draws attention to the fact that financial institutions offering long-term annuities at fixed rates may face considerable counterparty credit risk when trying to hedge long-term interest rate risk. The collapse of Lehman Brothers was an example of the materialisation of that type of risk, as that entity had been counterparty to interest rate swaps.
4. IFRS (2010).
5. Lekehal *et al.* (2010).
6. BIS (2011).
7. The risks associated with a protracted low-interest-rate environment on pension funds were recently discussed in several forums, for example at the International Organisation of Pension Supervisors (IOPS). IOPS members discussed the impact of protracted low interest rates at their November 2010 meeting. They agreed that persistently low interest rates are not only an accounting problem. Their main message was “*the need to adjust expectations to this potential low growth environment*”.
8. In a world of perfect equilibrium, the impact of protracted low interest rates would be offset by changes in the value of cash flows or liabilities due to downward adjustments on wages and the inflation-linked indexation of benefits.
9. Yermo and Severinson (2010).

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Annex A.

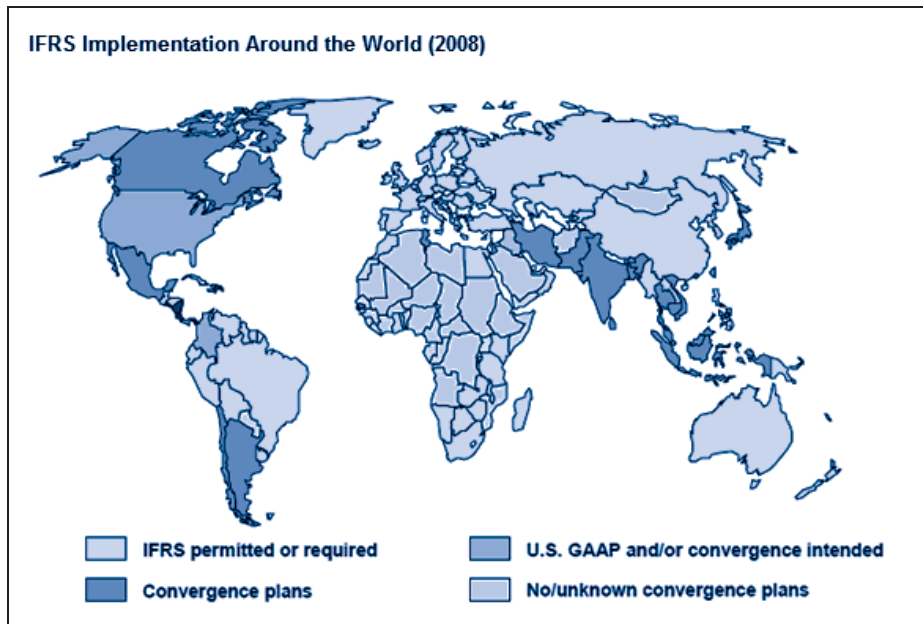
Valuation of funding levels for DB pension funds: a comparison of approaches

The assets, liabilities and funding levels of a DB plan can differ widely, as can its sensitivity to low interest rates, depending on the type of valuation method used and its purpose. Following is a description of the two main types of valuation methods used for accounting purposes and for regulatory solvency purposes.

1. Accounting funding levels

The expected future cash flows, assets, liabilities, and therefore the funding level of a defined benefit plan (at least for those sponsored by exchange-listed companies), tend to be calculated on a standardised basis in a large number of countries due to the prevalence of international accounting standards (the IFRS and US GAAP have similar requirements for the calculation of assets and liabilities in defined-benefit pension plans). The following map shows the global use of IFRS and US GAAP, as well as those countries with convergence plans to IFRS, as of 2008.

Figure A.1. IFRS implementation around the world



Source: KPMG (http://us.kpmg.com/jnet/English/Archives/2009/Issue1/Index_Print.asp).

Under international accounting standards, pension plan assets are required to be measured at their market value. As mentioned above, under a protracted low interest rate scenario, pension plan assets would likely have lower future returns, and this would be reflected in the market value of plan assets over time.

International accounting standards require that the expected future cash flows that form the basis of a pension plan's valuation be determined using best-estimate assumptions, including best estimates of future wage growth and inflation. To discount these expected future cash flows, international accounting standards typically require defined-benefit plans to be valued using a discount rate equal to the yield on long-term, high-quality domestic corporate bonds. In countries where there is not a deep market in corporate bonds, the yields on long-term domestic government bonds are typically used. Defined-benefit plans located in Canada, the Euro area, the UK and the USA are typically valued using long-term, high-quality corporate bond yields as these markets are considered deep. Practice is mixed in Japan, Korea, Malaysia, Mexico and Switzerland; for countries other than these, the markets are not typically considered deep, so government bond yields are used.¹

Changes in bond yields, and hence the discount rate, can have a significant impact on a plan sponsor's balance sheet and profit-loss statement. A 100 basis point drop in bond yields could mean, all else being equal, an immediate increase in liabilities in the order of 20% for the typical defined-benefit plan and an even bigger increase in the annual service cost, which directly affects a company's annual corporate profits.

Prolonged low interest rates could have a significant financial impact on the balance sheet and profit-loss statement of the employer sponsoring the defined-benefit plan. In some countries such as the UK, when calculating liabilities for accounting purposes, it is fairly common to adjust the inflation assumption on an annual basis, based on the yields of index-linked sovereign bonds; therefore, if the yields on such bonds were also to go down, this would offset some of the impact of a decrease in yields. The reason for this is that many plans in certain countries, including the UK, have benefits that increase each year based on wage growth and the increase in inflation. If the assumption as to future inflation expectations were to be adjusted downwards, then these benefits would not be expected to increase as much in the future, and hence the associated liability would be lower. That said, plan sponsors in many countries do not tend to adjust the inflation assumption from year-to-year, but set it equal to their central bank's expectations which do not tend to change often. In such cases, there would be no downward or upward adjustment to the inflation assumption in most years, and as such, the full effect of the bond yield drop would be reflected in the plan's liabilities, and hence in the financial statements. Over time, however, as actual wage and inflation levels decline relative to what is reflected in the financial statements, a lower level of liabilities would correct for the overly high inflation assumption used.

2. Regulatory solvency funding levels

As discussed above, requirements for determining assets, liabilities and funding levels for accounting purposes are quite standardized across many countries. By contrast, the regulatory requirements used to establish statutory minimum contributions for pension funds (based on a determination of assets

1. IASB (2009); the data presented were provided by the International Actuarial Association.

minus liabilities) are much more diverse. The reason for this is that the assumptions and methodology used to determine assets and liabilities are very different across countries. For example, in some countries, the expected future cash flows that form the basis for the valuation of a defined-benefit plan's liabilities are based on current salaries, whereas in other countries, the liabilities are based on salaries projected for when participants are expected to leave or retire from their plans – these different approaches could have a large impact on the level of reported liabilities, and hence the minimum contribution levels required. Furthermore, some countries (such as Belgium, Canada and Japan) require regulatory funding levels to be calculated using a market discount rate, such as the yield on government bonds. Others require a fixed discount rate (Finland, Ireland, Germany, Norway, Portugal and Spain) or a rate chosen prudently, taking into account, if relevant, an appropriate margin for adverse deviation, based on either or both (1) the yield and expected future return on assets held; and (2) the redemption yield on government or other high-quality bonds equal to the future expected return on plan assets (the United Kingdom). All else being equal, those countries using market discount rates would have a higher sensitivity to a drop in bond yields compared to those countries using a fixed discount rate. The table below summarises the requirements for calculating pension liabilities for regulatory solvency-reporting purposes.

Table A.1. Requirements for calculating pension liabilities

Country	Accrued liabilities / Technical Provisions	Discount rate and other economic assumptions
Belgium	The calculation of technical provisions must be prudent and take into account the risk profile of the pension fund. Furthermore, the technical provisions must at least equal the vested reserves, which are determined by the pension plan rules and the Social and Labour law. When Belgian social legislation is applicable, the technical provisions must at least be the maximum of vested rights as defined in the plan rules and own contributions accumulated, with an interest rate of 3.75%. Minimum vested rights are calculated on the basis of current salaries with an interest rate of 6% and specific mortality tables (MR 88-90 tables for males and the FR 88-90 table for females).	Belgian prudential legislation: the discount rate for the calculation of the technical provisions has to be chosen in a prudent manner and take into account: (i) the return on covering assets, as well as future returns; and/or (ii) the return on bonds of a Member State or other high-quality bonds.
Canada¹	Plan termination liability (current unit credit). Effective 1 January 2011, the solvency ratio for federally regulated plans will be calculated using a three-year average.	Interest rate of “x”% per annum for 10 years and “y”% per annum thereafter. The rate “x” is equal to the annualised market yield on 7-year Government of Canada benchmark bonds plus 90 basis points. The rate “y” is a more complicated blend of market yields on such 7-year bonds and on long-term Government of Canada benchmark bonds, again plus 90 basis points. Lower interest rates apply when the plan provides indexation of pensions; the formulas are specified in the CIA Standards of Practice.
Finland	Accrued benefits calculated under current	3.5%-3.8% depending on the plan

Country	Accrued liabilities / Technical Provisions	Discount rate and other economic assumptions
	unit credit method.	
Germany	The technical provisions are the present value of the future liabilities minus the present value of the future premiums. The valuation of liabilities includes salary increases or inflation revaluation between the valuation date and retirement age if these are included in the pension promise.	The maximum discount rate for <i>Pensionskassen</i> and <i>Pensionsfonds</i> (if the latter offer insurance-like guarantees) is currently 2.25% for new plans. <i>Pensionsfonds</i> can use market interest rates on a best-estimate basis if they offer no insurance-like guarantees.
Ireland	Plan termination liability (current unit credit), including mandatory revaluation of benefits with 4% cap, until retirement	(a) a pre-retirement discount rate of 7.50%; (b) a long-term, post-retirement discount rate of 4.50%; (c) a pre-retirement price inflation rate of 2.00%; and (d) a post-retirement long-term rate of price inflation of 2.00%.
Japan	Plan termination liability (current unit credit)	80-120% of 10-year government bonds issued during the previous 5 years.
Netherlands	Accrued benefits calculated under current unit credit method	Discount rate for the valuation of liabilities is based on swap rates. Smoothing is allowed for determining contributions.
Norway	Accrued benefits calculated under current unit credit method	4% discount rate until 1993. For contributions due after 1 January 2004 and pension funds established after 1993, the maximum rate is 3%; 2.75% for new contracts after 2006.
Portugal	Accrued benefits calculated under current unit credit method. If indexing of pensions is contractually guaranteed, then an allowance for the effect of future indexing must be included in the calculation of the accrued liabilities	4.50%
Spain	Projected Benefit Obligation (including salaries at retirement - projected unit credit method)	The maximum rate is fixed every year according to the average of Spanish public debt in the last quarter of the year. In 2011 it was set at 4.81%. Inflation assumption of 1.5-2.0%.
Switzerland	Accrued benefits calculated under current unit credit method	
United Kingdom	Accrued benefits must be calculated on a prudent basis	The discount rate in the UK can broadly be described by the following equation: discount rate = risk free rate + risk premium A suitable government bond yield is typically used for the risk-free rate. Any spread over the risk-free rate is typically based on a prudent assessment of the potential for additional return given the investment strategy. The investment strategy and any allowance for additional return should take into account the ability of the employer to cover the risks taken.
United States (Single Employer Plans)	Accrued benefits calculated under current unit credit method	Modified yield curve (three segments) based on a two-year average of top three levels of high-grade corporate bonds of appropriate duration.

1. The information for Canada in this table applies to defined-benefit pension plans regulated at the federal level. Provincially regulated plans may have different requirements, particularly for the maximum allowable amortisation period.



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