Financial and Economic Assumptions and Principles

Finance & Investment Committee
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This paper was approved by the Finance & Investment Committee and Council of the Society of Actuaries in Ireland in February 2022.

Introduction

In 2005, the Society's Council first asked the Finance & Investment Committee to establish a standard set of principles to be used as a starting point for setting financial assumptions in Actuarial Standards of Practice (ASPs)[1] across the different practice areas. This is now a specific activity set out in the Committee's Terms of Reference: "The Committee shall annually review the base financial & economic assumptions for use by Practice Committees in setting assumptions in ASPs and make recommendations to Council".

This paper sets out the principles that Practice Committees are expected to take into account in setting financial assumptions in ASPs. There may be differences between the pure economic assumptions and the final financial assumptions included in ASPs for a variety of reasons — for example, policy guidelines advised by regulators. Such differences should be noted explicitly in the assumption-setting process.

Note that, unless explicitly stated otherwise, the assumptions set out in the sections below are long-term best / central estimates, and do not allow for current market conditions at the date of this paper. Practice Committees should consider how these assumptions should be adjusted to reflect current market conditions where the relevant timescale is short. These assumptions make no allowance for the effects of expenses or taxation. Practice Committees should consider whether an adjustment for prudence is required in each assumption, given the purpose for which it is being used, and also the direction and size of any adjustment. Where assumptions are based on market driven data, the Practice Committees should decide on the appropriate level of precision, and also the size of change in market rates which would warrant a change in their ASPs. Where an adjustment is made to a market observable assumption, the rationale should be documented.

Unless otherwise noted, the gross return assumptions quoted are geometric, and should be interpreted as returns per annum in Euro terms on a portfolio (either actively or passively managed) over the relevant period. Where an assumption is required relating to a non-Euro currency, similar principles should be applied, with an allowance made for the anticipated euro return and cost of currency hedging if appropriate.

Much of the content of this paper focuses on **long-term** best / central estimates of expected returns, and the relative risks associated with these returns are not addressed. Practice Committees should be aware of the risks of different asset classes and consider how the implications and scale of such risks may be communicated to the ultimate audience. They should consider using more prudent assumptions where it is likely that their central

[1] The primary ASPs which currently include specific financial assumptions are ASPs LA-8, Pen-3, Pen-4, Pen-12 and PRSA-2.

recommendation will be taken unchallenged and there is low tolerance of downside risk. The principles of the assumptions underlying this paper are deterministic in nature. It is left to the Practice Committees to consider whether the use of stochastic modelling may provide insights into the dispersion of returns around the long-term best estimates.

This paper makes reference to a number of risks which may lead to adjustments being made to the assumptions outlined by the Practice Committees. No explicit reference or adjustment has been made to incorporate what degree Environmental, Social and Governance (ESG), including climate change, risks might impact on the assumptions outlined. Where Practice Committees seek to make adjustment to the assumptions to account for ESG risks, the rationale should be documented (see the Sustainable Investment section for further references).

Target Audience

The target audience for this paper are members of the Society of Actuaries in Ireland who have an understanding of investment markets and who are responsible for developing investment assumptions and models for use in actuarial calculations and projections. It is acknowledged that the paper is publicly available and may be accessed by non-actuaries.

Disclaimer

If actuaries and/or others use these assumptions for their own work, they will need to exercise judgment on the appropriateness and suitability of the assumptions for their particular purposes. Actuaries should also note the requirements of ASP PA-2, including those relating to reliance on others set out in section 2.3 of this ASP. The Society of Actuaries in Ireland does not accept responsibility or liability for any loss to any person or body as a result of any decision or action taken on foot of information or opinions set out in this paper.

Governance

This paper has been prepared in accordance with the Society's ASP PA-2 (General Actuarial Practice) and Code of Professional Conduct. It is approved annually by the Finance and Investment Committee, and subsequently by Council as a Society paper. A Governance Document outlines or references, as appropriate, the governance and associated process controls relating to this paper. Authors of this paper consist of members of the Finance and Investment Committee who are Fellows of the Society, and details of the authors are recorded in the Governance Document.

Timescales

The main focus of this paper is on long-term assumptions. Practice Committees should consider how these assumptions should be adjusted to reflect current market conditions where the relevant timescale is short.

In determining investment assumptions, a distinction may be made between setting assumptions that reflect current market conditions (i.e. are market consistent) and those that are intended to reflect the long-term average for a particular asset class. Practice Committees

should consider the purpose of a particular assumption in determining which approach is appropriate. For example:

(a) at one extreme strong justification would be needed to deviate from current conditions if one is setting an assumption for the return over a short period, for example, where an accumulated fund is due to be drawn shortly.
(b) an intermediate case would be a new regular premium policy, where the premiums are expected to be paid over a period of years, so that the investment term for these premiums commences on average in the reasonably near future[2]
(c) an in-force regular premium policy with a substantial accumulated fund is effectively a combination of (a) and (b), and may need to be treated in this way for the purpose of assumption setting
(d) at the other extreme, an assumption for the purchase of an annuity many years into the future should be based on long-term expectations for returns on fixed-interest assets.

It is important to carefully consider the assumption setting approach when combining short-term (current conditions) and long-term (long-term average expectations) investment assumptions. Particular care should be taken when there are discontinuities between the assumptions pertaining to these different time horizons, and where these discontinuities may need to be bridged through a blending approach or otherwise.

In setting an assumption for equity returns, the timescale of the investment should be considered in the context of whether current market conditions would justify an adjustment to the equity risk premium over the near term.

Sustainable Investment

Sustainable investment involves the consideration of Environmental, Social and Governance (ESG) factors as part of the investment decision-making process. It is recognised that investors are increasingly considering sustainability as part of the investment process, based on the growing recognition that ESG factors can affect the risk and return of investments.

The amount of regulation in this area has accelerated in recent times such as the EU's Taxonomy Regulation and Sustainable Finance Disclosure Regulations (SFDR), as well as varying degrees of oversight from industry supervisory bodies such as EIOPA, the Central Bank of Ireland and the Pensions Authority. It is beyond the scope of this paper to cover the breadth and depth of these regulations however, as long-term investors and risk managers such developments are of crucial interest to actuaries.

A Sustainable Investment section is being included in this paper, which will be built on over time, given it is a rapidly evolving area. At this time, the following are noted:

[2] This is an example of "Euro cost averaging", which dampens the effect of volatility compared to the investment of a lump sum amount.

- This paper sets out how assumptions can be derived for asset classes at a high level. There is no reason why all assumptions in this paper would not also be applicable for sustainable investments within each of the respective asset classes.
- There is broad acknowledgement across the investment industry that including sustainability as part of the investment process provides a wider perspective on risk, potentially reducing volatility and enhancing risk-adjusted returns.
- Climate change is an area of increasing focus from an investment perspective, both as a risk to potential returns as well as an investment opportunity. When considering long-term returns, climate scenario modelling may be used, to give additional insights into climate-related risks and opportunities.
- The paper has not evaluated whether it would be reasonable to adjust the assumptions for sustainable investment strategies. However, some areas of sustainable investment may provide exposure to different areas of the investment market, potentially increasing the diversification benefit.

Given the varied uses of this paper as well as the nature of work for our members, members are pointed to the following additional resources:

- The Society of Actuaries in Ireland has a website dedicated to sustainability with some useful information (https://web.actuaries.ie/press-publications/sustainability-and-climate-change-steering-group).
- The IFoA has a comprehensive and detailed website dedicated to sustainability (https://www.actuaries.org.uk/practice-areas/sustainability) with very useful practical guides for the various practice areas (https://www.actuaries.org.uk/practice-areas/sustainability/sustainability-practice-area-practical-guides).
- Climate modelling frameworks such as the Task Force on Climate-Related Financial Disclosures (TCFD) (https://www.fsb-tcfd.org/) – seen as best practice for financial disclosures on climate change risks. Large UK pension schemes face regulatory requirements to disclose climate change risks like the TCFD disclosures.
- Papers prepared by the Climate Risk Task Force of the International Actuarial Association (IAA) https://www.actuaries.org/iaa/IAA/Publications/Papers/Climate_Issues/IAA/Publications/Climate_Issues.aspx

Risk-free Interest Rates

Risk-free interest rates of the appropriate duration and currency should be used to value liability cashflows, unless there are regulatory or other constraints as noted previously. Risk-free interest rates are also the starting point for the approach to valuing assets as set out in subsequent sections.

The assumptions for risk-free Euro interest rates are generally taken to be:

(i) The current market yields on the highest-rated Eurozone government bonds of appropriate duration. The ECB publishes a curve of such yields every day: http://www.ecb.europa.eu/stats/money/yc/html/index.en.html; similar curves are also usually available elsewhere for other currencies

Or

(ii) Current swap rates such as €STER / EURIBOR of appropriate duration. In the case of the latter, EIOPA publishes monthly risk-free curves for the Euro as well as a number of other currencies. The latest curves and historical ones can be found at the following webpage: https://www.eiopa.europa.eu/tools-and-data/risk-free-interest-rate-term-structures_en .

If the relevant period commences in the future, then forward rates should be inferred using either spot rates or forward swap rates.

Equivalent principles, using available bond or swap curves, should be applied if non-Euro interest rates are required. However, where exposure to currency movement exists, allowance should be made for the cost of currency hedging if this is employed in the investment strategy. Under Interest Rate Parity theory, an investor investing in equivalent quality assets in their domestic market and an overseas market should receive the same return where the currency risk on the overseas asset is hedged. If not there exists an arbitrage opportunity. Therefore, the return impact of currency hedging should be closely related to interest rate differentials.

A level of mean reversion of interest rates over time may be assumed, either in absolute terms or in terms of the shape of the yield curve. Consideration should be given to the appropriateness of any mean reversion assumption and where used; corresponding adjustments should be made to the investment return assumption.

Fixed Interest Securities

The starting point for returns on fixed interest securities should be the risk-free interest rates for the relevant term and currency, as set out in the previous section. This would apply either to a bond to be held to maturity, or a portfolio of bonds regularly traded to keep a constant duration. In some circumstances it may be appropriate to add a risk premium due to:

(a) Credit quality; provided that the excess yield is greater than the expected loss due to downgrade or default (e.g. by reference to credit ratings and / or the Credit Default Swap market), or

(b) Illiquidity; provided that it is expected that the securities will be held to maturity.

If there is no evidence to justify inclusion of an appropriate risk premium to incorporate any of the factors outlined above, the yield on the highest rated government bonds denominated in the appropriate currency and of an appropriate maturity should be taken as the assumed expected return on fixed interest securities.

Additionally, where currency hedging is employed, the cost should be included in any assumption on the overall return.

Irish Price inflation

The Consumer Price Index (CPI) is the most commonly used measure of inflation in Ireland while the Harmonized Index of Consumer Prices (HICP) is the measure of price changes calculated by each Member State of the European Union. Both indices are calculated from the same basic price data and use the same methodology in compiling and aggregating the indices. The HICP differs from the CPI in its coverage of goods and services and the treatment of insurance. The most significant difference is the exclusion of mortgage interest from the HICP due to the fact that owner-occupied housing is not within its scope.

As such, CPI is a more representative measure of inflation in an Irish context while HICP is appropriate for intra EU comparisons.

Examining 25 years of comparable Irish HICP and CPI data between 1997 and 2021 from https://www.inflation.eu/ reveals that Irish CPI has exceeded HICP by approximately 0.13% p.a. This modest differential does not reflect the considerable deviations observed year-to-year, with CPI exceeding HICP by over 2% whilst HICP has exceeded CPI by 2.8% in certain 12-month periods.

Additional information on the differences between CPI and HICP is available on the CSO website:
(https://www.cso.ie/en/media/csoie/methods/consumerpriceindex/comparecpiandhicp16.pdf
along with further details of the methodologies employed in calculating both indices.
(https://www.cso.ie/en/methods/prices/consumerpriceindex/methodologydocuments/)

Determining price inflation

Either a swap or bond approach can be used to determine a price inflation assumption.

Swap approach: The swap curve from the Euro inflation swap market provides spot inflation rates across a wide range of terms. A swap-based approach has a number of subtle advantages:

- The inflation swap market provides spot estimates of inflation over a specific term and may be preferable to inflation expectations derived from the gross redemption yields on nominal and real bonds (i.e. average yields based on the bonds' cashflows). The latter approach can be sensitive to arbitrary factors such as the size of the coupon of the relevant bonds.
- The term of liquid inflation swap instruments is longer than currently available in the bond market.

Market-implied, or break-even, inflation derived from the swap market may also reflect an inflation risk premium, in addition to a credit risk premium.

Bond approach: Because of the lack of a deep and liquid market[3] in Irish inflation linked assets it is recommended that high rated Non-Irish Euro HICP ex Tobacco Inflation Linked bonds are used as a benchmark. A market-implied, or break-even, inflation rate should be based on the differential between the yield on a nominal bond and that on an inflation-linked bond of matching duration. It should be noted that the duration of inflation-linked bonds is typically longer than the duration of a nominal bond of the same maturity. It should also be noted that a market-implied inflation rate depends heavily on duration, so careful consideration should be given when deciding which reference bonds to use.

The observed rate differential may also reflect an inflation risk premium and / or a credit risk premium, where the cashflow profiles of the nominal and inflation-linked bonds differ. While the credit risk premium may be observable in the Credit Default Swap market or by comparing a bond's yield to a least risk alternative (e.g. German Bund), the inflation risk premium is not observable. The inflation risk premium is a function of relative supply and demand for the transfer of inflation risk. This is volatile through time as flexible supply meets evolving demand. Given the short history of the Euro inflation market it is not possible to derive any statistically credible inferences on the inflation risk premium. As the supply and demand balance is unique to each currency, international comparison cannot provide meaningful insight into any structural bias in the Euro inflation-linked bond market's forecasting of Euro inflation expectations. Therefore, in the absence of meaningful data to quantify or verify the existence of an inflation risk premium in the Euro bond and swap market, caution should be exercised in making any adjustment in market break-even rates for an inflation risk premium.

Both a swap and bond approach are valid. However, consideration should be given to the technical considerations outlined above and how these may give rise to different estimates of future price inflation.

Consideration should also be given to the ECB's primary objective of price stability, as expressed in its explicit inflation target (See ECB price stability definition: https://www.ecb.europa.eu/mopo/strategy/pricestab/html/index.en.html), particularly in instances where this differs greatly to the market implied inflation level.

Both the CPI and the HICP can be used as measures of price inflation. If, as is often the case, inflation-linked assets are indexed with reference to HICP ex-tobacco and liabilities are referenced to CPI, the basis risk between a CPI-linked liability and HICP ex-tobacco asset should be noted and understood.

Due to the limited number of Irish inflation-linked assets, it will often be necessary to use non-Irish Eurozone assets to set Irish inflation assumptions. This raises additional complexity. Consideration should be given whether any adjustment should be made if Eurozone HICP (excluding tobacco) government bonds are used to determine an Irish price inflation assumption.

[3] While the NTMA has issued Irish inflation linked bonds through two private placements in 2017 and 2019, there is currently no secondary market and therefore it is not considered to be a liquid and transparent market. Therefore, in the absence of a developed market it is unlikely to be suitable to derive inflation expectations.

Due to the existence of a European single market as well as a common monetary policy in the Eurozone, there should be price convergence within the Eurozone. Additionally, long term inflation rates in Ireland and other Eurozone countries should be broadly aligned in the long term. For HICP rates in both Ireland and the Eurozone from 2002 to 2021 (https://ec.europa.eu/eurostat/data/database) this appears to hold true. The total compounded inflation over the 20 years was 6.8% lower in Ireland than the Eurozone, or an average annual difference of 0.3%. However, the standard deviation of Ireland's figures exceeded the standard deviation of the Eurozone HICP data over the same period by 0.8%.

Therefore, Euro inflation may be adjusted before arriving at an assumption for Irish inflation, and where assumptions cover shorter time periods it would be reasonable to make larger adjustments guided by, among other inputs, recent inflation results by country, central bank guidance and differences in known drivers of inflation in each economy.

While this section deals specifically with Irish price inflation, the principles outlined above can be utilised to set price inflation assumptions for other economies both within and outside the Eurozone.

Earnings inflation

There is very limited data available to set any specific range for earnings inflation. For a distinct group such as members of an occupational pension scheme or group of employees, it may be appropriate to consider the particular features of the population in question, potentially in conjunction with the employer, in order to set the earnings inflation assumption. Factors to be considered include age profile of membership, sector specific prospects, general economic outlook and national wage agreements, noting that some of these factors may themselves have a short-term influence.

Broad national and sector specific data in relation to earnings is available on the CSO website (https://www.cso.ie/en/releasesandpublications/ep/p-hes/hes2015/aiw/). According to the CSO, earnings exceeded CPI by 2.0% based on analysis from 1938 to 2015. Therefore, in the absence of any specific reasons to assume otherwise, we recommend that earnings be assumed to inflate at a range of CPI +0.5% to CPI + 2%. A promotional scale may be required in addition to earnings inflation, to the extent it might apply to any particular group.

Capped and Floored Inflation Assumptions

Both statutory revaluation of, and in some cases post-retirement increases to, defined benefit pensions may be linked to inflation but subject to caps and / or floors. There is no universally accepted way for making allowance for caps / floors in addition to setting a base inflation assumption.

A method for setting base inflation expectations over a particular time period and key issues to consider have been outlined in the Irish Price Inflation section. An option pricing approach can be used to price in the effect of caps and/or floors for a base inflation assumption, using an inflation standard deviation assumption.

An inflation standard deviation assumption can be calculated using a market consistent or historical approach.

- A market consistent approach involves inferring the volatility based on the market price of inflation swaps with an appropriate cap / floor, with the implied volatility being a function of supply and demand for the various inflation caps and floors.

- A historical approach is based on historic inflation volatilities with consideration of how inflation volatilities might develop in future. For Irish and Eurozone HICP inflation over the period 2002 to 2021, the standard deviations of the annual figures are 1.74% and 0.94% respectively, while the standard deviation of Irish CPI over this period was 2.20%.

A best estimate inflation standard deviation assumption should reflect the expected inflation volatility in each future year, the serial correlation between successive years (uncertainty increases year to year over a projection), the shape of the distribution of inflation in each future year and the manner in which caps / floors are applied.

While data on Euro inflation options is difficult to access, it is available – however, there is some concern regarding the validity of a "market consistent" value derived from an infrequently traded market. There will be higher volatility for short time horizons as these will be more prone to short term shocks such as an oil price spike but also for less common caps such as an inflation cap above 5%. Additionally, despite a long-term expectation of convergence of inflation in the European single market, consideration should be given to the spread between Irish inflation volatility and that implied from a "Euro"- based derivative.

In order to derive a pragmatic and transparent assumption for implied market consistent volatility of Irish inflation we can use Eurozone inflation options and apply adjustments based on observed historical differences in volatility between Irish and Eurozone inflation.

An average of 4 evenly spread data retrievals over 2021 implied the Eurozone market consistent volatility for a 2% inflation cap over a 10-year tenor was 0.60%, while historical analysis shows a 0.80% volatility spread between Ireland and Eurozone inflation. Applying this methodology suggest that 1.5% is a reasonable assumption for the implied standard deviation of Irish HICP inflation.

This example is based on a set of inflation cap rates and point-in-time data and is for illustration purposes only. Considering the market consistent volatility over a number of cap/floor variables and averaging volatilities over longer periods of time would reduce the spiking effect of thinly traded markets.

Standard option pricing techniques (e.g. Black Scholes) can then be used to provide the required adjustment to the base inflation assumption. For illustration, in Appendix 2 to this paper we provide a table of capped and / or floored inflation increases for a variety of assumed inflation rates and standard deviations based on a Black Scholes methodology.

Cash

Cash returns rely on the future development of short-term rates. This will be driven by, inter alia, central bank monetary policy and realised and expected price inflation which are hard to predict, but some information can be gleaned from the capital markets by examining the yield curve.

In theory the return on a 10-year zero coupon government bond should be consistent to the expected return from reinvesting a series of 3-month zero coupon bonds by the same issuer. However, in practice some differences will exist due to term and illiquidity premiums. The impact of these premiums and spreads tends to increase the further out the yield curve one goes. Therefore, the risk-free yield curve can act as a starting point for calculating the expected cash return rather than as the final answer. In this manner taking a yield of appropriate term on the highest rated Eurozone government bonds may be thought of as providing an initial cash return assumption, with adjustments made for illiquidity premium and term premium as appropriate.

Equities

While there are other ways to set assumptions for the return on equities, for consistency with other assumptions we recommend the approach of using an equity risk premium (ERP) over the return on risk-free assets of the appropriate duration, to allow for the additional expected return from taking on the relatively higher risk of the equity market. If a different method is used, then careful consideration should be given to the reasonableness of the method and the underlying assumptions; for example, whether the growth rate used in a dividend-growth model is consistent with future inflation implied in the inflation swap curve.

ERPs may be expressed as the difference in the geometric average return or the difference in the arithmetic average between equities and the risk-free rate. The risk-free rate used may be long or short dated. Using different historical data — either different stock markets or different periods — produces significantly different estimates for the ERP, and there appears to be no fundamental reason to choose a particular market or period over any other. This means there is considerable uncertainty about what an appropriate ERP is. In particular, where the investment term is relatively short, market volatility may be a much more significant factor, and the level of uncertainty is therefore greater. There is also considerable risk that an ERP can be applied to a scenario in a manner which is inconsistent with how that ERP was derived.

Appendix 1 lists a number of sources of historical and prospective estimates of the ERP. Based on these, and noting the uncertainties mentioned above, we would consider that a reasonable long-term best estimate for the ERP over multiple market cycles, and not taking into account current conditions, would be in the range of an additional 3.0% to 5.0% geometric return, subject to the caveats below. The corresponding risk-free rate should be the rate for the appropriate duration, as described in the section on Risk-free Interest Rates.

In arriving at assumptions for the ERP and / or equity returns, Practice Committees should be cognisant of the range of outcomes observed historically, and whether they expect the

economic conditions on which the above range is based to prevail over the relevant investment period. As the ERP is just one element in determining an overall equity return assumption, the appropriateness of the overall assumption should also be considered.

When deciding whether an ERP is appropriate, and what ERP (if any) to use, the Practice Committee should take into account, inter alia, what the ERP is being used for, the likely financial knowledge of the recipient of the advice or communication, and whether the risk and uncertainty associated with equities are being allowed for or communicated.

Property

As a real asset with inherent risks, a risk premium for property assets over the risk-free return can be expected, similar to the equity risk premium. Compared to equities in general, property also has the potential for severe falls in value and limited liquidity. In the absence of evidence for a sustained return in excess of equities, we would recommend that the risk premium for a well-diversified portfolio of property should not be higher than the equity risk premium.

The nature of the property investment is also relevant, in particular where it is concentrated in a small number of assets, or higher risk assets such as development sites. In such cases, Practice Committees should consider specifying that such assets should be treated as set out in the Other Assets section below.

Where property is held on a geared basis, see also the section on Derivatives, Borrowings and Geared Funds.

Other Assets

Other assets may include commodities, infrastructure, and other “alternative” assets.

Caution should be exercised in assigning assumptions for the returns on such assets. The approach should reflect the availability of data, nature of the investment(s) and the economic rationale for the continuation of any historically observed risk premium. It is advisable to seek long-term historic performance data (ideally at least 10 years of relevant information for the structure or form of asset in question) to support any assumption of returns in excess of cash. Where there is an allocation to more than one alternative asset class, the historical correlation between those asset classes should be considered (see also the section on Diversification and Multi-Asset Funds below). The increasing popularity of alternative assets may impact forward looking expected returns and correlations, and therefore a degree of prudence should be applied when analysing historic data.

If a risk premium is included in the assumed return, this should reflect a systematic risk premium, for example a reward for illiquidity, credit risk or for providing insurance, and should not reflect an expected excess return from active management (i.e. tactical asset allocation and stock selection).

Strong justification would be needed for any risk premium on the aggregate alternative assets to exceed the equity risk premium. In the absence of historic evidence and /or a theoretical

rationale to support the existence of a systematic risk premium, a risk-free return should be assumed.

Derivatives, Borrowings and Geared Funds

It is important that the economic effect of any derivatives and gearing on fund performance should be understood and taken into account.

Where the use of derivatives is an integral part of the strategy of a fund, there should be a "look through" to the underlying economic exposure, and the current and expected long-term asset mix on this basis. However, there are certain derivative-based products where the benefit profile is not a smooth function of underlying investment returns, and particular care is required if these are part of the investment approach.

Borrowings should be treated as negative holdings of cash. However, the rate of investment return applied to borrowings should be based on the expected rate of interest payable on such borrowings, and therefore higher than the rate of return on positive cash holdings over the same term.

The assumed rate of return on a geared fund or portfolio should not be higher than for the same gross assets on an ungeared basis.

Diversification and Multi-Asset Funds

Diversification across different asset classes in a fund or portfolio will in general reduce its volatility. Diversification benefit[4] (or "diversification bonus" as it is sometimes referred to) is a term used to describe the fact that a portfolio containing assets which do not all behave in the same manner is expected to provide a better return than would be implied by taking a simple weighted average of the returns of the individual asset classes. The rate of return on a mixed portfolio of assets will vary from year to year, reflecting the volatility of the underlying assets. Because of the compounding of year-on-year asset returns, portfolios with lower volatility will result in higher realised return. The greater the diversification of the underlying assets, the higher the compounded returns expected to be achieved.

The extent of diversification benefit depends on correlations between returns, frequency of rebalancing and mean reversion. Assuming zero correlation, annual rebalancing and no mean reversion, the arithmetic mean return of the portfolio will be a simple weighted average of the arithmetic mean return of the asset classes, but the geometric mean return of the portfolio will exceed the weighted average of the geometric means.

Diversification benefit may be quantified using a stochastic projection of a portfolio's expected return including the effect of rebalancing (i.e. comparing the simple weighted average of the expected return against the expected return generated by a stochastic projection), using assumptions for the distribution of returns from each asset class, the volatility of these returns, and their correlations.

[4] For further background on diversification benefit, see https://www.effisols.com/basics/rebal.pdf

It is important that any assumption in relation to diversification benefit across different asset classes is not overly optimistic and appropriately reflects the portfolio held. For example, correlations may increase in times of stress reducing the anticipated diversification benefit. Also, as traditionally low / uncorrelated assets become increasingly mainstream, they become prone to capital inflows and outflows in 'risk-on' and 'risk-off' environments. While diversification benefit is theoretically justifiable and can be observed, in practice it is small in absolute terms (and relative to e.g. the equity risk premium), and so for the reasons outlined above, we do not recommend including any allowance for diversification benefit in ASPs.

Multi-asset funds invest in a number of different asset classes to provide a greater degree of diversification than investing in a single asset class. There are a number of distinct types of multi-asset fund:

(a) Where the asset mix is reasonably well defined and expected to remain broadly stable over the period of the projection, a weighted average of the growth rates for the different asset classes will generally be appropriate.

(b) Where the asset mix is expected to change over time in a specific way (e.g. "lifestyling" funds), the growth rate in each future year should reflect the expected asset mix at that time.

(c) In many "diversified growth funds" or "absolute return funds", the investment manager has broad discretion, and the current asset mix at a given time may not be representative of the long-term average asset mix. In these cases, the growth rate should be based on the expected average long-term asset mix. No specific allowance should be made for manager skill in the asset allocation.

Appendix 1

Please note that all external references and links were tested as the time of paper review. These may stop working over time.

References relating to the equity risk premium (historical and prospective):

1. The Society's Economic and Financial Dataset (https://web.actuaries.ie/news/11/11/economic-financial-dataset) includes data on equity returns for a number of countries. Historical equity risk premiums can be derived for:
   (a) Ireland – based on equity and cash returns up to 2001 (sourced from work by Shane Whelan), the equity risk premium was approximately 7.0% p.a. over 50 years and 6.4% p.a. over 100 years.
   (b) The USA – based on the difference between the returns including dividends on the S&P 500 index, and either short-term or long-term interest rates, over periods to end 2009, giving equity risk premiums of approximately 4.1% p.a. and 1.7% p.a. respectively over 50 years, and 6.0% p.a. and 3.5% p.a. over 100 years.

2. National Bureau of Economic Research Working Paper "The Rate of Return on Everything, 1870-2015": (https://www.frbsf.org/economic-research/files/wp2017-25.pdf)
   This found that in most peacetime eras over this period, the risk premium for equities and residential property has been stable at about 4-5%.

3. Credit Suisse Global Investment Returns Yearbook 2021 Summary Edition (https://www.credit-suisse.com/about-us/en/reports-research/studies-publications.html)

   This states that over the 121 years from 1900, the world equity index had an annualised equity risk premium of 4.4% relative to Treasury bills, and 3.1% relative to long government bonds.

4. A Damodoran (NYU Stern) (www.stern.nyu.edu/~adamodar/pc/datasets/histretSP.xls):

   Returns on the S&P 500 including dividends, compared to 3-month Treasury Bills, show annualised equity risk premiums of 6.69% for 1928-2021 and 6.70% for 1972-2021, calculated as the difference between the geometric means of the returns on these assets. Using 10-year Treasury Bonds instead of 3-month Treasury Bills, the equivalent figures are 5.13% and 4.47%.

5. Federal Reserve Bank of New York, 2015 (https://www.newyorkfed.org/medialibrary/media/research/epr/2015/2015_epr_equity-risk-premium.pdf?la=en)

   This shows a mean ERP of 20 retrospective and prospective models (including long-run and 5-year historical averages, and CFO surveys) as 5.7%, with a range from -1.0% to 14.5%. The historical mean from January 1960 to June 2013 is 9.3%.

6. KPMG Netherlands makes regular estimates of prospective ERP, taking the risk-free rate as the return on 30-year AAA-rated bonds. (https://indialogue.io/clients/reports/public/5d9da61986db2894649a7ef2/5d9da63386db2894649a7ef5)

   "We recommend the use of an equity market risk premium ("MRP") of 5.0% as per 31 December 2021." Their recommendation at 31 December 2020 was 6.25%.

7. Duff & Phelps, a Kroll business, issue recommendations for US equity risk premiums and corresponding risk-free rates to be used in computing cost of capital. (https://www.duffandphelps.com/insights/publications/cost-of-capital/duff-and-phelps-recommended-us-equity-risk-premium-decreased-december-2020)

   With effect from 9 December 2020, they recommend a US equity risk premium recommendation of 5.5%, with a normalized 20-year U.S. Treasury yield of 2.5% as the assumed risk-free rate.

8. A good introduction and review of different approaches to the equity risk premium is "The Equity Risk Premium: A Contextual Literature Review", by Laurence B Siegel, published by the CFA Institute Research Foundation, 2017 (https://www.cfainstitute.org/research/foundation/2017/equity-risk-premium).

Appendix 2

Table of capped and / or floored inflation-linked increases. The analysis is based on an assumed standard deviation of inflation ranging from 0.5% to 2.0%.

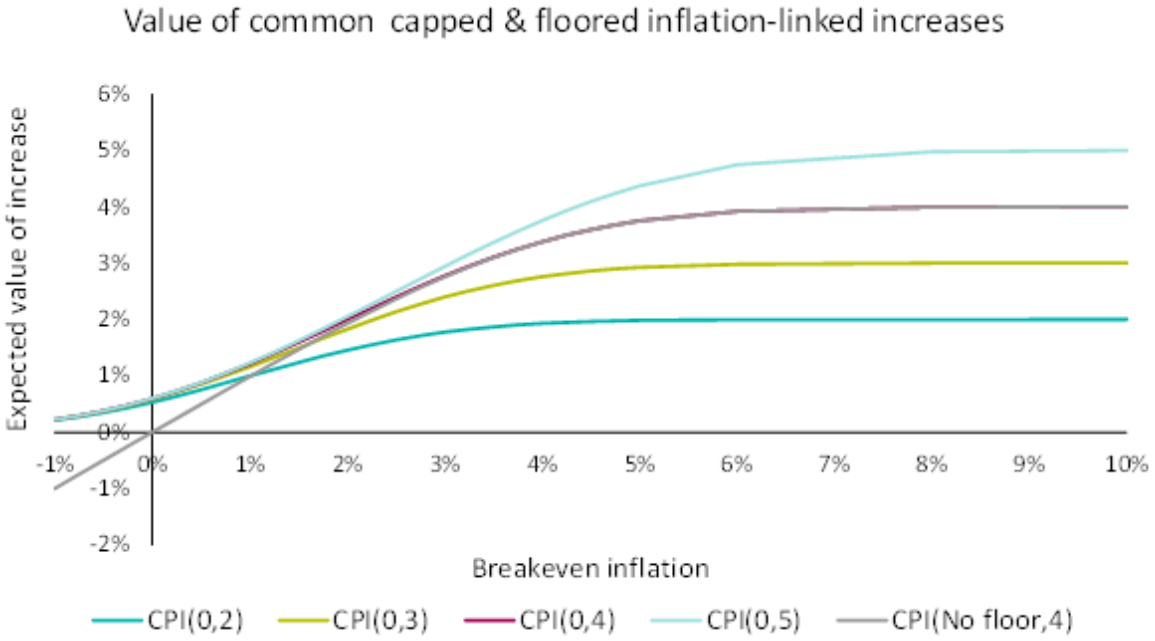
The value of capped and floored inflationary increases is based on the following formula:

Assumed capped and floored inflation rate (Floor X%, Cap Y%) =
Assumed inflation + Value of put on inflation with strike price X%
- Value of call on inflation with strike price of Y%

First figure in the brackets represents the floor, the second the cap.

Volatility	**0.50%**														
Assumed Inflation	**-1.00%**	**-0.50%**	**0.00%**	**0.50%**	**1.00%**	**1.25%**	**1.50%**	**1.75%**	**2.00%**	**2.25%**	**2.50%**	**2.75%**	**3.00%**	**3.50%**	**4.00%**
CPI (0.0%, 2.0%)	0.00%	0.04%	0.20%	0.54%	1.00%	1.24%	1.46%	1.65%	1.80%	1.90%	1.96%	1.98%	2.00%	2.00%	2.00%
CPI (0.0%, 3.0%)	0.00%	0.04%	0.20%	0.54%	1.00%	1.25%	1.50%	1.75%	2.00%	2.23%	2.45%	2.65%	2.79%	2.95%	2.99%
CPI (0.0%, 4.0%)	0.00%	0.04%	0.20%	0.54%	1.00%	1.25%	1.50%	1.75%	2.00%	2.25%	2.50%	2.75%	2.99%	3.45%	3.79%
CPI (0.0%, 5.0%)	0.00%	0.04%	0.20%	0.54%	1.00%	1.25%	1.50%	1.75%	2.00%	2.25%	2.50%	2.75%	3.00%	3.50%	3.99%
CPI (no floor, 4.0%)	-1.00%	-0.50%	0.00%	0.50%	1.00%	1.25%	1.50%	1.75%	2.00%	2.25%	2.50%	2.75%	2.99%	3.45%	3.79%
Volatility	**1.00%**														
Assumed Inflation	**-1.00%**	**-0.50%**	**0.00%**	**0.50%**	**1.00%**	**1.25%**	**1.50%**	**1.75%**	**2.00%**	**2.25%**	**2.50%**	**2.75%**	**3.00%**	**3.50%**	**4.00%**
CPI (0.0%, 2.0%)	0.08%	0.19%	0.39%	0.67%	1.00%	1.17%	1.33%	1.47%	1.60%	1.71%	1.80%	1.86%	1.91%	1.97%	1.99%
CPI (0.0%, 3.0%)	0.08%	0.20%	0.40%	0.70%	1.07%	1.28%	1.50%	1.71%	1.92%	2.12%	2.29%	2.45%	2.59%	2.79%	2.91%
CPI (0.0%, 4.0%)	0.08%	0.20%	0.40%	0.70%	1.08%	1.30%	1.53%	1.76%	2.00%	2.24%	2.47%	2.69%	2.91%	3.29%	3.59%
CPI (0.0%, 5.0%)	0.08%	0.20%	0.40%	0.70%	1.08%	1.30%	1.53%	1.77%	2.01%	2.25%	2.50%	2.75%	2.99%	3.47%	3.91%
CPI (no floor, 4.0%)	-1.00%	-0.50%	0.00%	0.50%	1.00%	1.25%	1.50%	1.74%	1.99%	2.23%	2.47%	2.69%	2.91%	3.29%	3.59%
Volatility	**1.50%**														
Assumed Inflation	**-1.00%**	**-0.50%**	**0.00%**	**0.50%**	**1.00%**	**1.25%**	**1.50%**	**1.75%**	**2.00%**	**2.25%**	**2.50%**	**2.75%**	**3.00%**	**3.50%**	**4.00%**
CPI (0.0%, 2.0%)	0.21%	0.35%	0.53%	0.75%	1.00%	1.12%	1.24%	1.35%	1.46%	1.55%	1.64%	1.71%	1.78%	1.87%	1.93%
CPI (0.0%, 3.0%)	0.22%	0.37%	0.58%	0.85%	1.16%	1.33%	1.49%	1.66%	1.83%	1.99%	2.13%	2.27%	2.40%	2.61%	2.76%
CPI (0.0%, 4.0%)	0.22%	0.38%	0.60%	0.88%	1.21%	1.40%	1.59%	1.79%	1.99%	2.20%	2.39%	2.59%	2.77%	3.10%	3.38%
CPI (0.0%, 5.0%)	0.22%	0.38%	0.60%	0.88%	1.23%	1.42%	1.62%	1.83%	2.05%	2.27%	2.50%	2.72%	2.94%	3.36%	3.75%
CPI (no floor, 4.0%)	-1.00%	-0.50%	0.00%	0.49%	0.99%	1.23%	1.47%	1.70%	1.93%	2.15%	2.36%	2.57%	2.76%	3.10%	3.38%
Volatility	**2.00%**														
Assumed Inflation	**-1.00%**	**-0.50%**	**0.00%**	**0.50%**	**1.00%**	**1.25%**	**1.50%**	**1.75%**	**2.00%**	**2.25%**	**2.50%**	**2.75%**	**3.00%**	**3.50%**	**4.00%**
CPI (0.0%, 2.0%)	0.33%	0.47%	0.63%	0.80%	0.99%	1.09%	1.18%	1.27%	1.36%	1.44%	1.52%	1.59%	1.65%	1.76%	1.84%
CPI (0.0%, 3.0%)	0.37%	0.54%	0.74%	0.97%	1.22%	1.36%	1.49%	1.63%	1.76%	1.89%	2.01%	2.13%	2.24%	2.44%	2.60%
CPI (0.0%, 4.0%)	0.39%	0.56%	0.78%	1.04%	1.33%	1.49%	1.66%	1.82%	1.99%	2.16%	2.32%	2.49%	2.64%	2.93%	3.19%
CPI (0.0%, 5.0%)	0.39%	0.57%	0.79%	1.06%	1.38%	1.55%	1.73%	1.91%	2.10%	2.30%	2.49%	2.68%	2.88%	3.25%	3.59%
CPI (no floor, 4.0%)	-1.00%	-0.51%	-0.02%	0.46%	0.93%	1.16%	1.39%	1.61%	1.82%	2.02%	2.22%	2.40%	2.58%	2.90%	3.17%

Chart of capped and / or floored inflation-linked increases, based on 1.5% volatility


Value of common capped & floored inflation-linked increases
Expected value of increase
6%
5%
4%
3%
2%
1%
0%
-1%
-2%
-1%
0%
1%
2%
3%
4%
5%
6%
7%
8%
9%
10%
Breakeven inflation
CPI(0,2)
CPI(0,3)
CPI(0,4)
CPI(0,5)
CPI(No floor,4)

Appendix 3

Sources of market and other relevant data would include the following:

Yields on Eurozone Government bonds	https://www.ecb.europa.eu/stats/financial_markets_and_interest_rates/euro_area_yield_curves/html/index.en.html https://www.bloomberg.com/markets/rates-bonds
Inflation forecasts	https://www.ecb.europa.eu/stats/ecb_surveys/survey_of_professional_forecasters/html/table_hist_hicp.en.html
€STER & EURIBOR	https://sdw.ecb.europa.eu/quickview.do?SERIES_KEY=438.EST.B.EU000A2X2A25.WT https://www.euribor-rates.eu
Historical Inflation data	https://www.cso.ie/en/statistics/prices/consumerpriceindex/ https://ec.europa.eu/eurostat/data/database https://www.inflation.eu/
Irish earnings data	http://www.cso.ie/en/statistics/earnings/