



Society of Actuaries in Ireland

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## **Deriving Financial & Economic Assumptions**

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## Agenda

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- Purpose of the note
- Setting assumptions
- Estimating the equity premium
- Next steps

## Purpose of the Note

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- Consistency
- Starting point
- ASPs...
- ...but other work too

The reason Council asked the Finance & Investment Committee to produce the note originally was to ensure consistency between ASPs. That is, while it is reasonable for different actuaries to have different opinions, it would not be reasonable for the Society's guidance to be inconsistent between different areas.

The note is a starting point for the different practice committees to use when setting their ASPs. The practice committees can then tailor the assumptions allowing for relevant circumstances, such as the purpose of the assumption (for example, best estimate or prudent) or any legislation or regulations.

The note can also be used as a starting point for individual actuaries where a financial or economic assumption is required for work not covered by an ASP. The note is not mandatory; however, any actuary deviating materially from it should have sufficient back-up for so doing.

## Assumptions

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- Interest rates
  - yields on highest-rated euro government bonds
- Equities
  - 2.0% to 5.5% per annum above long-term cash
- Cash
  - maximum implied by lowest-risk yield curve

For lowest-risk interest rates, the current note recommends actuaries use the yields on the highest-rated eurozone government bonds of appropriate term. Alternatively, interbank swap rates could be used if these are considered lower risk. Similar curves should be used for other currencies. As with all the assumptions, this recommendation does not apply if the actuary does not have a free hand in deciding the discount rate to use.

For equities, the recommended assumption is between 2.0% and 5.5% per annum above cash. This is a change from previous years, where the assumption was 0% to 4% per annum above the relevant yield from the curve described above. But please note that the cash return is not the current interest rate available on cash: Rather, it is the long-term expected return on cash. It should be subject to a maximum of the rate implied by the yield curve used for interest rates, although it could be reduced to allow for any term or illiquidity premiums.

## Estimating the Equity Premium

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- Simple model
- US equity & cash for past c. 150 years
- Some correlation between equity returns & GDP growth
- Some correlation between cash returns & inflation

The original note was largely based on opinion and the study performed by Dimson, Marsh, & Staunton (DMS) on equity premiums over the past century. The note has not changed materially over the years. For the current note, we incorporated some data from the financial & economic data set the Society commissioned in 2012. Considerable work is still required to analyse this data set, but we wanted to see whether we could learn something from a high-level look at it.

We built a simple model based on the cleanest and easiest-to-use data from the set. We used annual US equity & cash returns from 1871 to 2009. Other data was available, but we felt US data was the most relevant.

We assumed equity returns were correlated with GDP growth, and cash returns with inflation. The US data supported this assumption for equities somewhat—as did some Irish data—especially over longer terms and using older data. For cash, the support was not as conclusive, and the UK data we had showed zero or negative correlation.

## Estimating the Equity Premium

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- European GDP & inflation data over c. 400 years
- DMS data over past c. 100 years for equity & cash returns
- 2.0% to 5.5% represents range of defensible central estimates, not a confidence interval

The data set has GDP & inflation data for Europe from about 1500 to 1900, but it does not include equity or cash data. Therefore, despite the data set's lacklustre support for our assumptions about correlations, we used these assumptions anyway, so that we could incorporate the European data.

We also used the DMS data over the past century for equity & cash returns. The DMS study looked at about 20 different developed economies, including the world as a whole.

Depending on which time periods and which economies we used, the equity premium over cash ranged from about 2.0% to 5.5% per annum. So, rather than being a confidence interval, the 2.0% to 5.5% represents a range of defensible central estimates.

## Estimating the Equity Premium

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- Companies completely different now...
- ...but maybe details do not matter
- Industrial, electronic, & data revolutions...
- ...but maybe revolutions changed not only GDP but GDP growth also
- Survivorship bias

You could construct many arguments for either the more recent data or the longer data.

For example, the companies operating over the period the note applies to—probably the next 40 or 50 years at most—are unlikely to resemble in any way those the longer data was taken from, so we should discard this data and use the more recent data.

On the other hand, even during the more recent period, the types of company changed radically—for example, from manufacturing to services—so a bottom-up approach is not appropriate, and what actually applies is a top-down approach assuming people will spend their money on things they want—whatever form that takes—so the longer data is as relevant as the more recent data.

Or, the more recent data includes the effects of the industrial, electronic, & data revolutions—all of which increased GDP markedly—and given it is unlikely we shall continue to see revolution after revolution after revolution, the equity premium from the more recent data is too high an estimate of the future premium.

Or maybe the revolutions not only increased GDP but also increased the ability to grow GDP, so the future equity premium will probably exceed the historical one.

Finally, all the data was necessarily based on economies or markets that survived for the entire period, so it includes a survivorship bias, which probably overstates the equity premium. (Similarly, the DMS data excludes Germany during the years of hyperinflation following the First World War.)

## Next Steps

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- Better model...
- ...maybe Bayesian hierarchical
- More data
- Integrate equities, cash, interest rates, & inflation
- But always, how reliable is the past as a guide to the future

We could build a better model, making fewer heroic assumptions. One option is a Bayesian hierarchical model.

We could incorporate more of the data set and maybe some more data not in that set.

We could integrate all elements of the note: equities, cash, interest rates, and price & wage inflation.

But the problems mentioned on the previous slide will always remain, and we shall never be able to determine just how reliable the past is as a guide to the future.