友邦保險控股有限公司
香港中環干諾道中一號
友邦金融中心三十五樓

AIA Group Limited
35/F, AIA Central
1 Connaught Road Central
Hong Kong
T: (852) 2832 6166
F: (852) 2838 2005
AIA.COM

Recognition of an Equity Risk Premium in Insurance Contract Liability Valuation

By J Peter Duran and Grant Knapman

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Introduction

The Three Bucket Approach proposed in the Insurance Capital Standard (ICS) currently does not include any allowance for a spread over the risk-free rate earned by equity type assets. This is despite the fact that it is widely accepted that equity assets earn higher returns than risk-free assets in the long term.

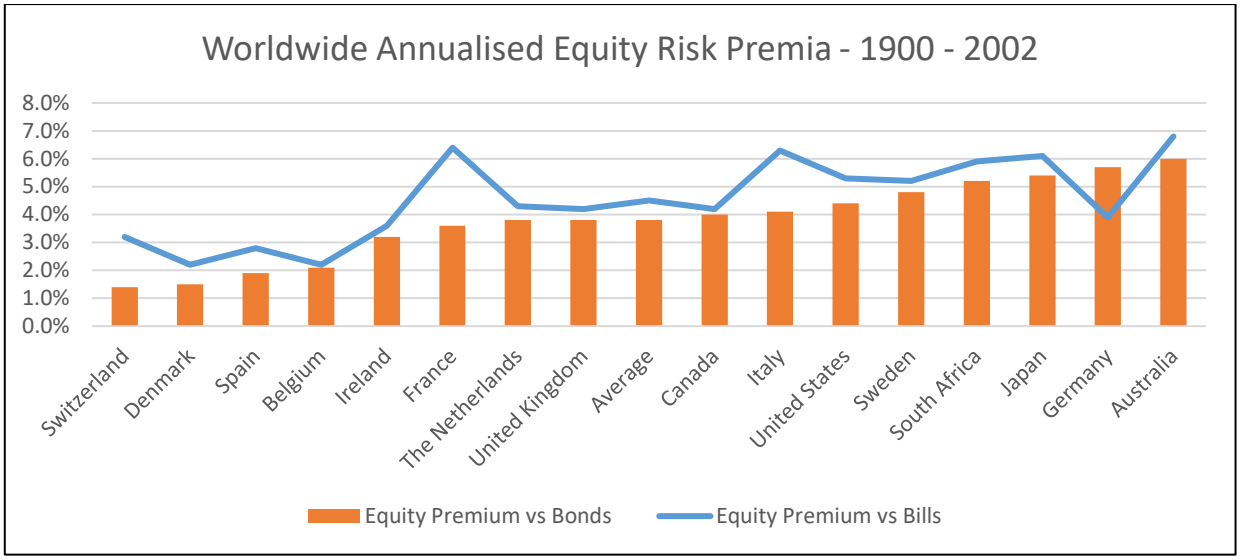
This spread earned over the long term is commonly referred to as the equity risk premium (ERP). It has been referenced frequently in academic writings ever since the concept was elaborated by Mehra and Prescott (1985)[1]. The purpose of this note is to demonstrate, with references to this and similar papers and articles produced by financial economists and other experts, that the equity premium exists and to argue for its recognition in liability valuation under the ICS.

The Equity Risk Premium

Mehra and Prescott (1985) demonstrate that for the US in the period 1889-1978 the average real annual yield of the Standard & Poors 500 Index was 6.98%, compared to a 0.80% return on relatively riskless short-term securities (90-day government treasury bills and historically equivalent securities prior to their existence). For this 89-year period, the ERP has therefore been 6.18%[2]. Since publication of this seminal paper extensive academic discussion of the ERP has continued to the present day.

Dimson, Marsh and Staunton (2003)[3] expand the study to 16 developed economies, including Australia, Belgium, Canada, Germany, Denmark, Sweden, South Africa and Switzerland. They study returns over a 103-year period (1900 – 2002). The below graph shows the equity risk premia calculated in this paper. The blue line measures the equity premia relative to treasury bills or the nearest equivalent short-term instrument; the orange bars show the same equity premia relative to the return on long-term government bonds. Both are based on arithmetic averages of annual ERP's. As posited by Dimson, Marsh and Staunton, it can be observed that the experience of a positive, sizeable risk premium is not an experience unique to the United States or the UK. Note that the average result represents an unweighted average of all countries' risk premia.

[1] https://www.academicwebpages.com/preview/mehra/pdf/The%20Equity%20Premium%20A%20Puzzle.pdf
[2] Note that the ERP is typically calculated as an arithmetic average of monthly differences between the total return on an equity index, such as the S&P 500 and the short-term risk-free rate. Other definitions are possible and for liability valuation purposes we take a somewhat different approach as will be discussed later in this paper.
[3] https://papers.ssrn.com/sol3/papers.cfm?abstract_id=431901



** Data for Germany excludes 1922-1923*

Salomon and Grootveld (2003)[4] take this one step further and show empirically that the equity risk premium is present in emerging economies also, and can be larger than in developed economies. They examine the period from January 1976 to December 2001 and construct an arithmetic average of the equity risk premia for seven developed markets (G7) and 24 emerging markets. By doing this, a longer history is available for the emerging markets and the impact of country specific issues is reduced. They calculate a mean monthly equity risk premium for both indexes of 0.30% and 1.04% respectively.[5] Please see Appendix 3 for a full list of markets included in this paper. To convert monthly risk premia into annual risk premia one needs to know both the equity return and risk-free rate, or equivalently, the monthly ERP and the monthly risk-free rate. However, using a range of reasonable risk-free rates, we can conclude that the annual ERP for developed countries studied by Salomon and Grootveld is on the order of 3.8% for the seven developed markets and 13.8% for the 24 emerging markets. See Appendix 4 for details of the conversion from monthly to annualized ERP's

Furthermore, Donadelli and Prosperi (2012)[6] completed a study of 32 markets – 13 developed and 19 emerging – and compared the equity risk premia of the developed and emerging markets, as well as different regions. Please see Appendix 3 for a full list of markets included in this paper. In a similar approach, they take an arithmetic average of the equity risk premia in developed and emerging markets, as well as the emerging markets in different geographical regions (i.e. Asia, Latin America, Eastern Europe and Africa & the Middle East). The table below summarises the mean

[4] https://ssrn.com/abstract=535662

[5] For both the Salomon and Grootveld paper and the Donadelli and Prosperi paper, equity returns are converted to US dollars and compared to US risk-free instruments. It is unclear whether this is also the case for the Dimson, Marsh and Staunton paper

[6] https://ssrn.com/abstract=1893378

monthly equity risk premia that they observed for these indices over the period from January 1988 – December 2010.

Monthly ERP's as Developed by Donadelli and Prosperi (1988 – 2010)

Developed Markets	Emerging Markets				
	Asia	Latin America	Eastern Europe	Africa	Average
0.62%	0.97%	2.07%	2.40%	1.41%	1.71%

Approximate annualized ERP's corresponding to the above monthly ERP's are shown in the table below. Again, details of the conversion can be found in Appendix 4.

Approximate Annualized ERP's based on Donadelli and Prosperi (1988 – 2010)

Developed Markets	Emerging Markets				
	Asia	Latin America	Eastern Europe	Africa	Average
8.0%	12.5%	28.5%	34.0%	19.0%	22.5%

More recently, in 2001, Ivo Welch[7] conducted a survey of 510 finance and economics professors for the estimates of the equity risk premium over the short-term interest rate. The mean and median estimates of the arithmetic 30-year ERP were 5.5% and 5.0% respectively. The 25th and 75th percentiles were 4% and 7% and respectively. Note that none of the responses to the survey expected a negative premium.

Relevance to Liability Valuation under the ICS

For long term insurance liabilities, the MAV discount rate should reflect a prudent view of long-term returns. The risk of short-term volatility in equity assets is separately addressed in the ICS equity risk charge. The exclusion of equity based on the view that they are inherently risky overestimates the risk of market correction by incorporating allowances into the liability valuation when it is already catered for by the risk charges.

Our contention is that a reasonable equity risk premium should be recognized in the valuation of long term insurance liabilities. To be clear, this is not based on a market consistent view of liability valuation where insurance contracts are considered financial liabilities that can be traded in a deep and liquid market and are therefore valued based on no arbitrage principles, a condition far

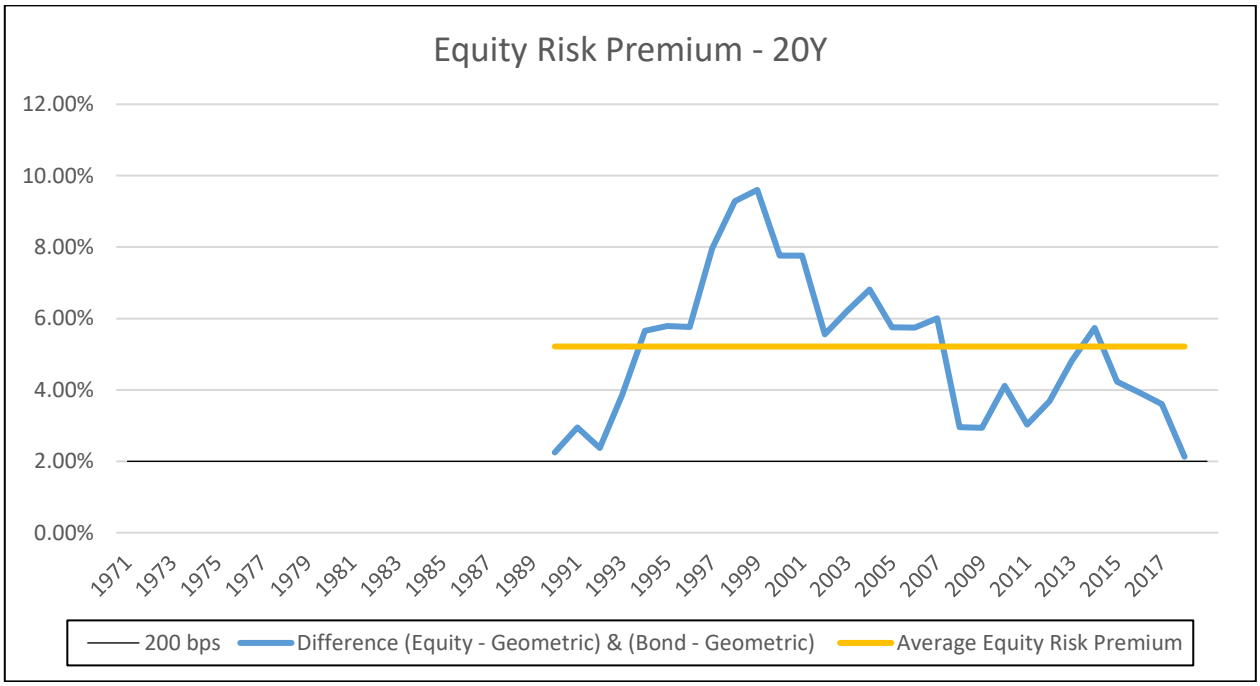
[7] https://ssrn.com/abstract=285169

removed from reality. Rather, we take the opposite view where the valuation is based on what the insurer can reasonably expect to earn on the supporting assets.

In our own analysis, we have considered a more recent period to ensure relevance and have demonstrated that 20 years appears to be a sufficient timeframe over which a reasonable ERP (of 2%) emerges. To do this, data was sourced from Bloomberg for the:

- S&P 500 Total Return Index from January 1, 1970 to December 31, 2018, with dividends reinvested since 1970
- US 10 Year Treasury Bonds over the same period[8].

The 20-year returns were calculated for each instrument and annualised i.e. a geometric average of annual 20-year returns. The difference between the annualised returns of the two instruments yields the premium an investor would have earned over bonds in a 20-year period. The graph below shows this difference for each 20-year period from the end of December 1970 to the end of December 2018 i.e. a 20-year equity risk premium that is rolled forward each year.



As can be seen from the graph, the 20-ERP is consistently above 2.00%. The average (yellow line) is 5.1%. For liabilities with a substantial portion of cash flows more than twenty years from the current valuation date an assumption of a 2% ERP on supporting equity assets seems a safe minimum for the purposes of the ICS.

[8] Note that we have based the risk-free rate on 10-year bonds. This is more appropriate than a short rate in the context of liability valuation. Also, as noted, our ERP's are based on geometric, rather than arithmetic averages. In general, the geometric averages are lower than the arithmetic averages.

Note that even over shorter time frames, a similarly high average ERP can be observed. However, as would be expected, there is more variation in the results. The following table shows the average, minimum, maximum and standard deviation of these 20-year rolling geometric ERP's.

Metric	5 Years	10 Years	15 Years	20 Years	25 Years
Average	4.7%	4.6%	4.8%	5.1%	5.3%
Minimum	-7.5%	-5.8%	0.5%	2.1%	3.6%
Maximum	22.8%	12.7%	11.9%	9.6%	9.0%
Std. Deviation	7.3%	4.4%	3.0%	2.0%	1.2%

Specific Proposals

Many insurance liabilities are very long-tailed with cash flows extending substantially more than 20 years. For such liabilities insurers often invest in equities to capture the ERP they expect to realize. One way of recognizing the ERP would be to assume a 2% spread on the supporting equity assets, but only if the proportion of liability cash flows more than 20 years into the future exceeds the proportion of equity assets in the portfolio. For example, if 15% of cash flows are more than 20 years in the future, then a 2% spread would be recognized on the supporting equity assets provided they represent no more than 15% of supporting assets. If all cash flows occur within the first 20 years, no spread would be recognized. Linear interpolation could be used for intermediate positions. This spread could be added to the forward rate and combined with the three-bucket approach discount rate (i.e. only considering fixed income assets) as a reasonable way to incorporate equities into the ICS discounting framework. (See Appendix 5 for a complete description.)

This approach recognises the important part equities play in the context of an insurer's asset-liability management and their contribution to the sustainability of long-term liabilities without compromising the integrity of the valuation or the three-bucket approach.

Summary

It is clear that over the long term equities earn more than the risk-free rate. As such, to exclude this spread from the liability discount rate produces liabilities that are overly conservative, makes the provision of long-term business to policyholders less sustainable and discourages equity investment in both developed and emerging economies.

We therefore urge the ICS to consider the considerable empirical evidence for the equity risk premium and to incorporate it into the Three Bucket Approach.

Peter.Duran@aia.com
Grant.Knapman@aia.com

Appendix 1 - References

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Ivo Welch (2001).

Appendix 2 – 20 Year Equity Risk Premium Graph – Supporting Data

Equity Risk Premi

Appendix 3 – List of Countries Considered

Salomons & Grootveld	Donadelli & Prosperi
G7 - Developed	**G7 and Other Developed**
Canada	Australia
France	Canada
Germany	France
Italy	Germany
Japan	Italy
United Kingdom	Japan
United States	Netherlands
Asia - Emerging	Norway
China	Singapore
India	Spain
Indonesia	Switzerland
Korea	United Kingdom
Malaysia	United States
Pakistan	**Asia - Emerging**
Philippines	China
Taiwan	India
Thailand	Indonesia
Latin America - Emerging	Malaysia
Argentina	Philippines
Brazil	Korea
Chile	**Latin America -Emerging**
Colombia	Argentina
Mexico	Brazil
Peru	Chile
Venezuela	Colombia
Africa/Middle East - Emerging	Mexico
Egypt	**Africa/Middle East - Emerging**
Israel	Egypt
South Africa	Morocco
Eastern Europe - Emerging	South Africa
Czech Republic	**Eastern Europe - Emerging**
Hungary	Czech Republic
Poland	Hungary
Russia	Poland
Turkey	Russia
	Turkey

Appendix 4 – Conversion of Monthly to Annualized Risk Premia

The basic conversion formulas are as follows:

$$rf_{monthly} = (1 + rf_{annual})^{1/12} - 1$$
$$ERP_{annual} = \left(1 + rf_{monthly} + ERP_{monthly}\right)^{12} - (1 + rf_{annual})$$

Using this formula and starting with various assumed risk-free rates and monthly ERP's we can convert ERP's from a monthly to an annual basis.

Results for the Solomon and Grootveld study are as follows:

Conversion of Solomon and Grootveld Monthly ERP's

Assumed Risk-Free Rate	Corresponding Annual ERP		
	Developed Markets	Emerging Markets	
1.0%	3.7%	13.3%	
2.0%	3.7%	13.5%	
3.0%	3.8%	13.6%	
4.0%	3.8%	13.7%	
5.0%	3.8%	13.8%	

Results for the Donadelli and Prosperi study are as follows:

Conversion of Donadelli and Prosperi Monthly ERP's

Assumed Risk-Free Rate	Corresponding Annual ERP					
	Developed Markets	Asia	Latin America	Eastern Europe	Africa	Emerging Markets
1.0%	7.8%	12.4%	28.1%	33.2%	18.5%	22.2%
2.0%	7.8%	12.5%	28.4%	33.5%	18.6%	22.4%
3.0%	7.9%	12.6%	28.6%	33.8%	18.8%	22.6%
4.0%	8.0%	12.7%	28.9%	34.1%	19.0%	22.8%
5.0%	8.1%	12.8%	29.1%	34.4%	19.1%	23.0%

Appendix 5
Incorporation of the ERP into the Middle Bucket

The specific approach to recognise the equity spread could be performed as follows:

(1) For each projection year i, Calculate X_i = sum of undiscounted liability cash flows > 20 years in the future / total undiscounted liability cash flows at year i. This will yield a number that gradually grades to zero over time.

(2) Calculate *Y* = current market value of equity assets / total current market value of all eligible assets at the valuation date.

(3) The factor $MIN(1, X_i/Y)$ is multiplied by the proposed 2% spread to determine the final spread over the risk free in respect of equity at time i. As $X_i$approaches zero, so will too the factor modifying, ensuring that a spread on equities is only recognized where appropriate.

This approach limits the amount of spread recognised for liability portfolios with the bulk of cash flows in the next 20 years. If all the cash flows were to occur within the first 20 years, no spread would be recognised (*X* would be equal to zero). In the opposite case, if the proportion cash flows after 20 years in the future was larger than the allocation of equity within the asset portfolio, the full 2% spread would be recognised (the total factor would be floored at 1).

In between these two examples, the factor is less than 1 but greater than zero to moderate the size of the spread attributable to equity assets. By using a factor that rolls forward each year, the equity spread is also moderated as the liability cashflow pattern changes.

A discount curve can be derived by adding this equity spread to the risk-free rate. After which, a final curve can be derived by taking a weighted average of this curve and the curve derived considering only fixed income assets (weighted by the proportion of equity assets in the portfolio).

Note that 20 years and 2% are placeholders. There are reasonable arguments for lowering the 20-year threshold and increasing the 2% spread.

Likewise the criteria for inclusion of a liability portfolio within the middle bucket could be modified so that equity sales are recognized as cash flows that could be used to meet liability out flows.