

MILLIMAN RESEARCH REPORT

Investment strategy under Solvency II

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Introduction and background

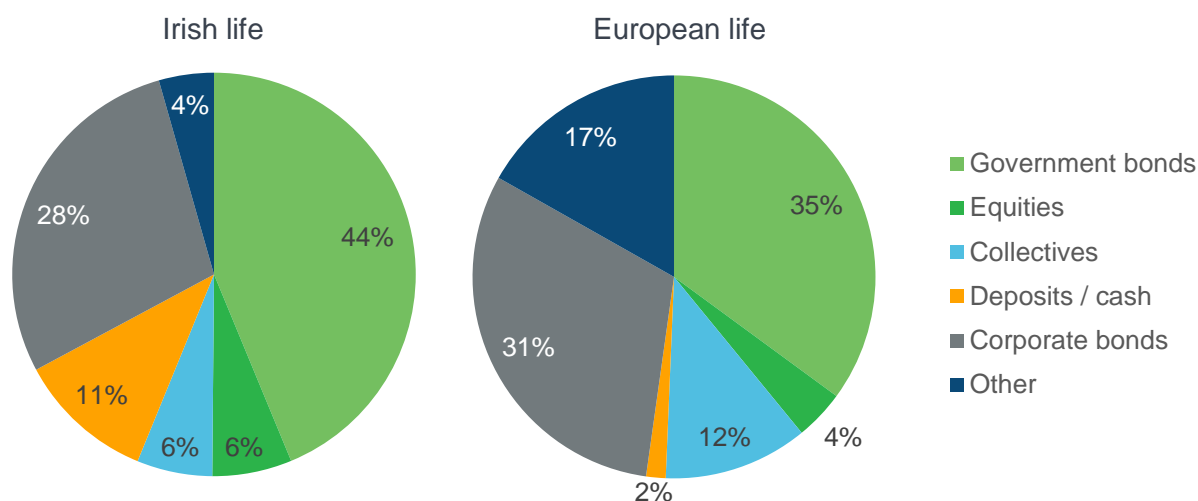
For many insurers the introduction of Solvency II created challenges that focused on successful implementation and ensuring compliance. For some, the strategic considerations arising from such a significant change in regulatory regime may have taken a back seat. For those who have not yet done so, and with the challenge of implementation over, it may now be a suitable time to consider the strategic implications of the new solvency regime. One such consideration for insurers is whether their existing investment strategies remain optimal, or even appropriate, under Solvency II. The main aims of this research paper are to examine what insurers are currently doing and what has changed from Solvency I, to identify assets and strategies that may be attractive to insurers in terms of expected return compared to their capital requirements (focusing on the standard formula requirements) and to consider the risks associated with those assets and risk mitigation options.

Current investment profiles

For the first part of our research, we analysed the end 2016 Solvency and Financial Condition Reports (SFCRs) of a wide range of insurers to provide a snapshot of the current investment profiles of insurers at a European level. It is worth noting that investment profiles vary considerably across Europe, and even across companies within individual markets, and we have only shown an overall average here. We have also shown the comparable profiles for Irish insurers.

The charts in Figure 1 show the results for life insurers, excluding unit-linked assets.

FIGURE 1: INVESTMENT PROFILE OF LIFE INSURERS

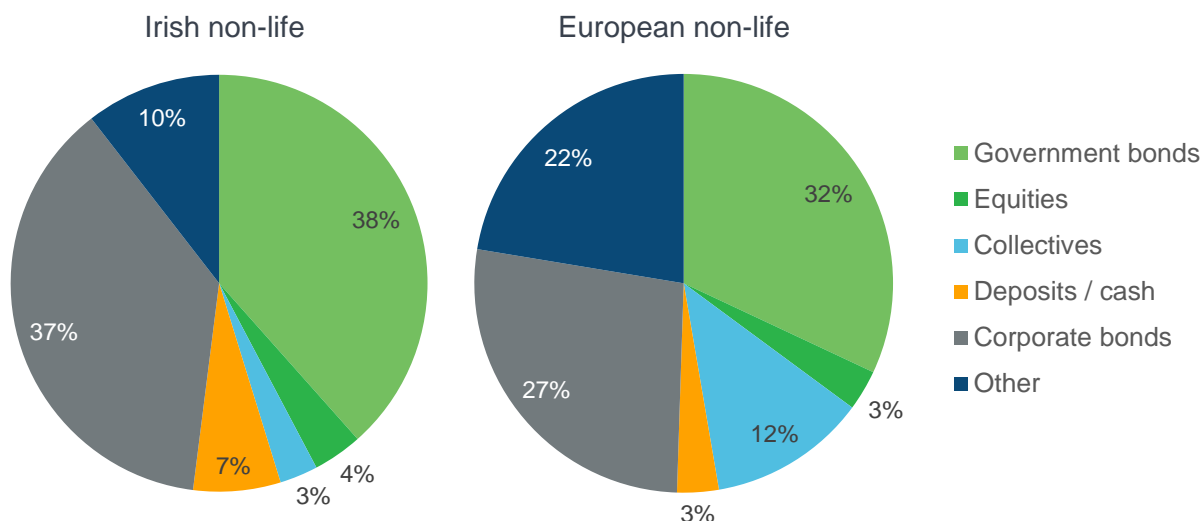


Source: Our analysis of end 2016 Solvency II returns (public QRTs)

Unsurprisingly, investment profiles for European life insurers are dominated by government and corporate bonds. Overall, Ireland is higher in government bonds and deposits than the rest of Europe. Across Europe, there are higher levels of collectives and “other” investments, which include property and holdings in related undertakings.

The charts in Figure 2 show the results for non-life insurers.

FIGURE 2: INVESTMENT PROFILE OF NON-LIFE INSURERS



Source: Our analysis of end 2016 Solvency II returns (public QRTs)

Once again, bonds dominate for European non-life insurers. Ireland has higher holdings of both government and corporate bonds relative to European peers. As with life insurers, there are higher levels of collectives and “other” across Europe than in Ireland.

Changes from Solvency I

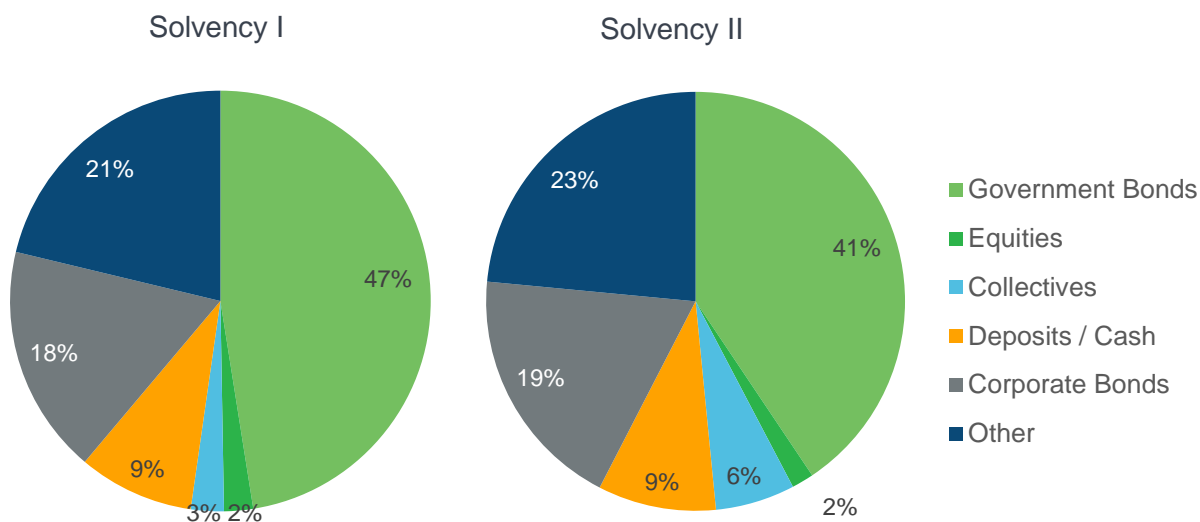
Investment strategies can change for a variety of reasons. Our hypothesis is that the change from Solvency I to Solvency II is a sufficient change in the regulatory environment to have material knock-on implications for investment strategy.

The key drivers of this are probably threefold:

1. **Changes in the liability valuation basis** under Solvency II, have resulted in a change to the liability profile (expected movement of the value of the liability over time). This has knock-on implications for investment strategy due to asset-liability matching (ALM) considerations. This would be more of a driver for life insurers, which typically have longer-duration business than non-life insurers.
2. **Relaxing of asset restrictions** that were in place under Solvency I (at least in some countries) but are replaced by the Prudent Person Principle under Solvency II.
3. **Capital requirements** are now different under Solvency II, with the aim of being more aligned with the level of risk taken.

In addition to these key drivers, there are lots of other factors that can influence investment strategy. Market conditions have changed, risk appetite may have changed and some companies may not reference regulatory balance sheets at all in their investment strategies (though they will still need to consider the Prudent Person Principle in this case).

As a case study, we carried out an analysis of the changes made by 21 insurers in the Irish market. We also supplemented the analysis with discussion of the findings with a number of the bigger companies in our sample to draw meaningful insights from the numbers we were seeing. Overall, the changes varied considerably by company, with the overall levels shown in the charts in Figure 3. For some companies, by end 2015 they had already transitioned to a Solvency II position, though mostly that reflected changes in duration on the assets rather than significant changes in asset mix.

FIGURE 3: INVESTMENT PROFILE OF IRISH LIFE INSURERS BEFORE AND AFTER INTRODUCTION OF SOLVENCY II¹

Source: Our analysis of end 2015 Solvency I returns v end 2016 Solvency II returns (public QRTs) for a sample of 21 direct life companies

Generally speaking, the level of investment in government bonds reduced following the introduction of Solvency II. For the larger domestic companies (i.e., companies writing business directly in the Irish market), the government bond exposures were actually broadly unchanged or slightly up. For the cross-border companies (i.e., Irish companies selling predominantly overseas), the government bond exposures reduced significantly on average. From speaking to a number of companies, this was driven less by capital requirement considerations and stemmed more from a reduced appetite for sovereign risk. If anything, the anomaly in the standard formula specification, which treats European Economic Area (EEA) sovereign bonds as effectively risk-free, could have been expected to push up holdings of government bonds relative to corporate bonds, but this has not generally been borne out in practice. Part of this is also likely due to the fall in yields (to negative for some government bonds) over the period, so that rebalancing into new government bonds is significantly less attractive. All of this underlines the fact that capital considerations are not necessarily the key drivers of investment strategy under Solvency II.

One of the results of the reduction in government bond holdings is a move to corporate bonds and another is the move to collective investments. In both cases, maybe most especially collectives, the lifting of Solvency I restrictions on investment choices may be a factor in allowing companies to move into those assets more freely.

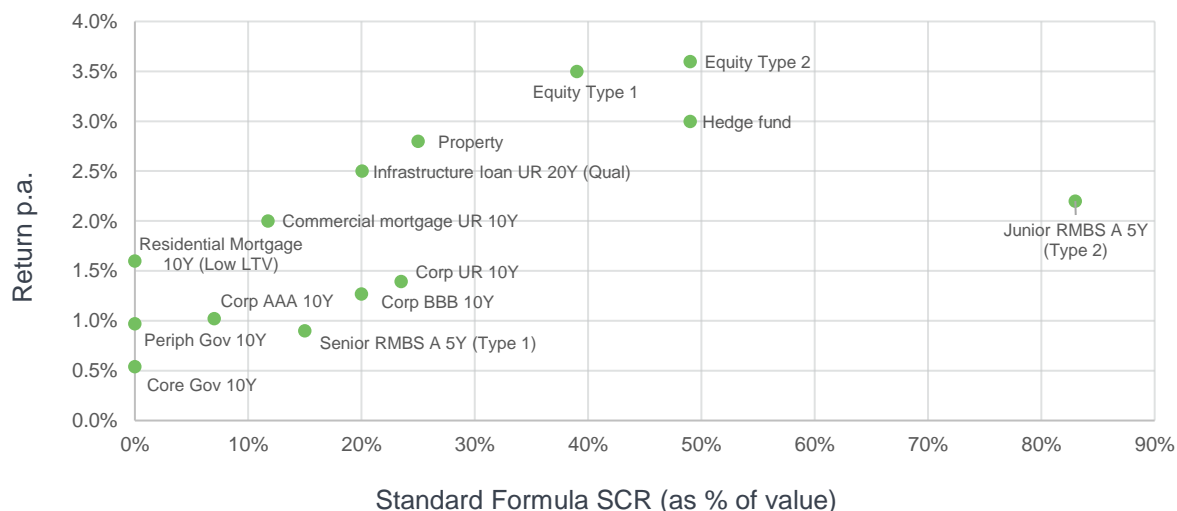
Investments in equities reduced on average but few Irish companies hold meaningful levels of equity (outside of policyholder unit-linked funds).

Return vs. capital

One area of focus in carrying out this research was to examine the expected return for a range of assets compared with the Solvency II Standard Formula (SF) Solvency Capital Requirement (SCR). The chart in Figure 4 shows spread/equity/counterparty default risk capital as relevant on an undiversified basis and focuses on EUR assets. We have excluded the equity symmetric adjustment as it will be zero on average over time. We have not included any allowance for other market risks in Figure 4 such as interest rate risk. While interest rate risk would apply to the fixed income assets in Figure 4 but not to the equity assets, there is typically a liability impact as well as an asset impact for interest rate risk. This is not generally the case for the other SCR items included so we felt that excluding interest rate risk led to a better comparison of assets. We have also assumed a reporting currency of EUR—holding additional currency risk capital would be required otherwise.

¹ The Solvency II percentages in Figure 3 do not match those in Figure 1. This is because Figure 3 is based on a sample of insurers, and focuses only on direct writers. The purpose of Figure 3 is to show the movements for those sample companies only.

FIGURE 4: EXPECTED RETURNS COMPARED TO STANDARD FORMULA SCR FOR A RANGE OF ASSETS



Source: Our analysis of a range of data sources including BlackRock, Bloomberg and Deutsche Bank

Note: Y = Year, Gov/Corp = government/corporate bonds, Core = German, Periph = BBB-rated ('peripheral') EU government bonds such as Spanish or Italian, UR = unrated, Qual = 'qualifying infrastructure investment' as defined in the Delegated Regulation, RMBS = Residential Mortgage Backed Securities, LTV = loan-to-value ratio.

The expected returns are a long-term expected total return of directly holding a typical asset of the type in question, after adjusting for expected default risk in the case of debt and loan type instruments.

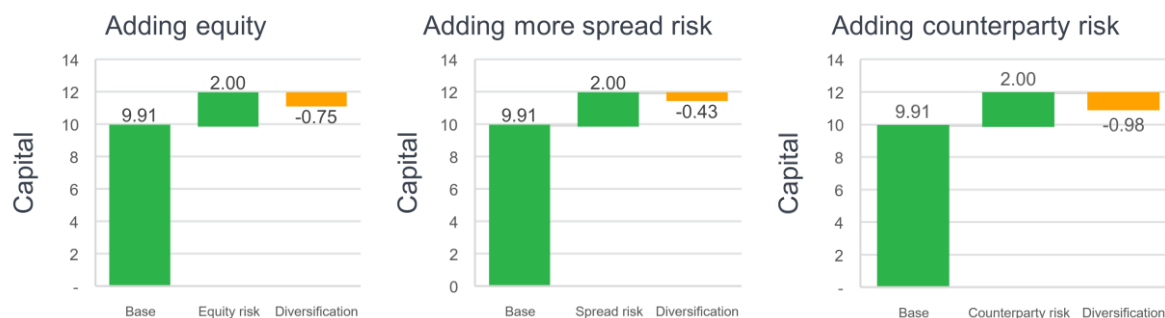
Figure 4 is not intended to be a rigorous scientific analysis of future expected returns or of historical risk premiums. Returns, within the broad asset classes described, can vary quite widely so the purpose of this chart is to provide a broad indication of how particular assets compare to each other when measured against the criteria of expected return and capital required.

The relative positions of most assets in Figure 4—particularly government bonds, corporate bonds and equities—are perhaps unsurprising. We feel it is nonetheless quite informative when shown in this manner. A number of assets stand out as interesting from an insurer's point of view. In particular, residential mortgages, commercial mortgages and infrastructure loans typically have quite attractive expected returns relative to their capital requirements. These assets are discussed in more detail later in this paper.

Note that the standard formula SCR calculation for securitisations will change from 1 January 2019, applying a different categorisation for securitisations, with different resulting capital requirements. Figure 4 reflects the current position. We have not included some asset classes such as absolute return funds in Figure 4, as the SF SCR for these assets is subject to significant variability due to the varied and flexible nature of the underlying exposures.

Given that all insurers will already have an investment portfolio, it is also worth considering what the incremental capital as well as standalone capital for particular assets would be. In some cases, this is not likely to materially change the assessment but in others it might. Clearly the incremental capital requirement for a given investment decision will depend on the existing risk profile of the insurer in question. We looked at the effect of adding different types of risk to an example insurer which already has considerable amounts of interest rate risk and spread risk, as well as some counterparty default risk.

FIGURE 5: INCREMENTAL CAPITAL FROM ADDING DIFFERENT RISKS TO AN EXAMPLE INSURER



The most diversification benefit was achieved by adding default risk and the least, unsurprisingly, came from adding more spread risk. While adding equity risk gave more diversification benefit than additional spread risk, it was perhaps not to the extent of materially changing this example insurer's view of equity from the standalone position.

Capital vs. risk

It is important to remember too that SF capital is not necessarily a good proxy for risk in all cases. There can be some assets for which the SF gives an SCR that is disproportionately high relative to the risk of that asset. This is likely the case with some Type 2 securitisations, which have very high SF SCRs, as shown in Figure 4 above. A documented number of analyses² have shown that the SF is very penal for these securitisations (noting, however, that the SF capital requirements for securitisations may change after 1 January 2019, when new rules come into effect). Another example is for third-party funds, where there is lack of information to apply look-through. These would get treated as equity Type 2 under the SCR, even where it is known that there is a large bond holding. On the other hand, the SF may give an SCR that understates the risk associated with other assets. This may be the case with government bonds, particularly lower-rated (e.g., A or lower) government bonds, and residential mortgages with low loan-to-value (LTV) ratios. In both cases, these assets may have an SCR of zero but clearly cannot be regarded as risk-free. A number of sovereign defaults in the last 20 years highlight this.

A key insight is to understand the assets for which the SF overstates the capital requirement relative to risk and either to use risk mitigation techniques (discussed in more detail in a later section of this paper) to reduce the SCR without giving up too much yield, or to avoid those assets altogether. Where the SF SCR understates risk, insurers will need to assess any extra expected returns in the context of risk appetite, any additional capital they may wish to hold through their Pillar II processes, and in the context of their applications of the Prudent Person Principle.

Alternative assets

There is a wide universe of assets available to insurers outside of traditional assets. We have considered the benefits of a selection of non-traditional assets in this paper, as well as some of the challenges associated with these assets.

INFRASTRUCTURE

Infrastructure involves investment in physical things that provide or support essential public services, such as roads, airports, bridges, ports, hospitals and energy. Both debt and equity investment are possible. The cash flows are often influenced by a regulatory regime set by a government or regulatory body, and frequently involve some element of monopolistic control. Our analysis below relates predominantly to debt investment, though some of the points would also be true of an infrastructure equity investment.

Benefits

- Potential spread relative to corporate bonds of equivalent rating and duration.
- Stable and predictable long-term cash flows, which can be a good match for long-term liabilities.
- Lower capital requirements under SF than an equivalent corporate bond where the investment meets the Solvency II requirements of a 'qualifying infrastructure investment' or 'qualifying infrastructure corporate investment.' The SF spread capital requirements for 20-year unrated investments would be:
 - Corporate bond: 35.50%.

² For example, see <http://www.riskcontrollimited.com/wp-content/uploads/2016/07/Solvency-II-Calibration-Securitisations.pdf>.

- Qualifying infrastructure investment: 20.05%.
- Qualifying infrastructure corporate investment: 22.50%.
- Good diversifier in terms of risk (though not typically in SF capital terms because the spread module is used). The investment returns can, with some exceptions (e.g., toll roads), be less correlated to the business cycle. This depends on the revenue model of a particular infrastructure project.

Challenges

- More difficult to source than traditional assets.
- Typically quite an illiquid asset, although this may not be a material problem for an insurer with longer-term liabilities.
- An infrastructure investment may be more complex to manage than traditional investments. There may, for example, be a need for specialist skills to source and manage the investment so it may not be viable for small scale allocation.

MORTGAGES

There are a number of different types of mortgages that an insurer could invest in, with residential, equity release and commercial being the main ones. It is possible for insurers to purchase portfolios of mortgages directly from mortgage providers, and differences between the capital treatment for a bank and a SF insurer (because the drivers of capital requirements are generally different) may make this an attractive proposition for bancassurance groups from an overall group capital perspective.

Benefits

- Potential spread relative to corporate bonds, as can be seen in Figure 4 above, which shows an expected return of approximately 0.25% above 10-year unrated corporate bonds and a bigger spread over high-rated bonds that in some cases may be a better comparison in terms of risk level.
- Can be a good match for long-term liabilities.
- Low capital requirements for vanilla and tracker residential mortgages where requirements are met to use the counterparty default module. The LTV ratio is the main driver of capital, though it has its limitations as a measure of risk. For example, a 65% LTV residential mortgage would have a 0% SF counterparty default SCR and a 90% LTV residential mortgage would have a SF counterparty default SCR of about 4.5% (possibly a little less depending on the impact on the insurer of changes in the underlying property value). These numbers are regardless of the duration of the mortgage.
- The capital requirements for commercial and equity release mortgages are calculated using the spread risk module. They are not as low as the capital requirements for residential mortgages but are still generally lower than corporate bonds of equivalent rating and duration. An unrated commercial mortgage or equity release mortgage of 10-year duration would have a SF spread SCR of 11.75%, and that of a 15-year duration would have a SF spread SCR of 14.75%. These two numbers would be doubled (and therefore equal to the spread SCR for equivalent corporate bonds) if the risk-adjusted value of the collateral (the underlying property) is not greater than the value of the mortgage.

Challenges

- More difficult to source than traditional assets.
- Typically quite an illiquid asset, although this may not be a material problem for an insurer with longer-term liabilities.
- Prepayment risk: Typically, mortgage holders have a unilateral right to repay their loans early, meaning the effective duration of mortgages could be shorter than the loan term. It is difficult for an insurer to have any control over prepayment risk.
- Mortgage investments may be more complex to manage than traditional investments.

CONTINGENT-CONVERTIBLE (COCO) BONDS

These investments are a particular type of bond that was designed to enhance financial stability in the banking system. They are bonds issued by banks that convert to equity if the bank's ratio of equity to risk-weighted assets falls below a predetermined level.

Benefits

- Spread over other forms of junior bank debt.
- Generally more stable returns and arguably lower risk than bank equity, though conversion occurs when a bank gets into difficulty.

Challenges

There is a relatively small market for this asset class compared to the bank debt market. Despite some early enthusiasm³ almost a decade ago, regulators did not ultimately set regulation that would make CoCos an attractive instrument for banks to issue. For example, in 2011 the Financial Stability Board⁴ decided that CoCos would not count towards the capital 'surcharge' the biggest banks would be required to hold. Only equity would count. Despite the challenges there was still \$155 billion⁵ of issuance in 2017 in dollars, euros and pounds. This compares to \$1 trillion in bank debt issued that year. CoCos are issued by around 50 banks in a dozen countries, mostly in Europe.

HEDGE FUNDS

There is a wide range of hedge fund strategies available in the market but the majority can fit broadly into one or more of three categories:

1. **Global macro:** Focuses on global macroeconomic variables such as interest rates and foreign exchange (FX) rates. They take directional bets on the market as a whole.
2. **Event-driven:** Focuses on distressed companies and companies going through events such as mergers and acquisitions (M&A), natural disasters or political turmoil.
3. **Long/short funds:** Takes no overall exposure to the market and earns a return from the relative performance of the stocks it is long compared to those it is short.

Benefits

- May be relatively low correlation between the returns on some hedge funds and other asset classes. For example, unlike simple long equity investments, long/short hedge funds are not typically exposed to general equity market movements (either up or down).
- Potential to achieve higher returns than other investment classes, but historical performance varies a lot among specific funds and depends also on the periods examined. There is also the potential of reporting bias in terms of performance.

Challenges

- Previously quite illiquid with long lock-in periods. This has changed somewhat in recent years with hedge funds keen to attract investors.
- Asset look-through is an issue, with a perception of intellectual property associated with some funds. This creates challenges for insurers' Pillar 3 reporting.
- May be high capital requirement under SF unless look-through information is available. As noted above, look-through information is a significant challenge.
- There have historically been quite high charges associated with hedge fund investment.

ABSOLUTE RETURN INVESTING

Many funds benchmark to particular indices, which can lead to short-term thinking and potentially some 'herding.' Absolute return investing is not an alternative investment as such but is a different approach to what most funds have historically taken. It tries to avoid short-term thinking and benchmark constraints, which can erode value, and instead to look over a longer-term investment horizon.

Generally, a multi-asset approach is taken with a wide range of positions, including equities, bonds, commodities and derivatives. Techniques such as short-selling and leveraging are usually allowed within the fund.

The funds typically use risk-based portfolio management and there are absolute return funds with different risk and return targets. Some funds seek equity level returns for a lower level of capital than an equivalent equity fund. Others may seek bond level returns for a lower level of capital than an equivalent bond fund.

³ For example, in 2010 Mervyn King, then the governor of the Bank of England, said he wanted contingent capital to be a 'major part of the liability structure of the banking system.'

⁴ Jones, H. (19 July 2011). Global capital surcharge to affect 28 big banks. Reuters. Retrieved 23 September 2018 from <https://www.reuters.com/article/us-fsb-banks-idUSTRE76I4UE20110719>.

⁵ The Economist (21 April 2018). Coco bonds have not lived up to their promise. Retrieved 23 September 2018 from <https://www.economist.com/finance-and-economics/2018/04/21/coco-bonds-have-not-lived-up-to-their-promise> (may require login).

Most of these features of absolute return investing could be considered positive from an insurer's point of view. On the other hand, an insurer may not necessarily be comfortable giving a fund manager such a broad investment mandate. There has also been a lot of commentary recently, in the UK particularly, on the poor performance of absolute return funds that are struggling to meet their targets. Performance relative to target has varied quite considerably by specific funds (though the wide nature of the investment mandates of these funds means this is not too surprising). There have been reports too of significant outflows from this investment sector, with poor performance and high fees often cited as key reasons. Arguably, the poor performance criticism is perhaps a little unfair at this point, given the long-term investment horizon used, and it highlights the difficulty of getting away from short-term thinking and comparisons to benchmarks. This is likely to be an enduring challenge for absolute return funds. It remains to be seen whether they can weather this difficult period and regain popularity over time.

Risk mitigation options

There are many options available to reduce the risks and capital requirements of particular investments. When it comes to investment risks, this particularly involves the use of derivatives. One obstacle is that insurers must meet onerous Solvency II risk mitigation technique requirements to allow for the risk mitigation in capital requirement calculations. These requirements include:

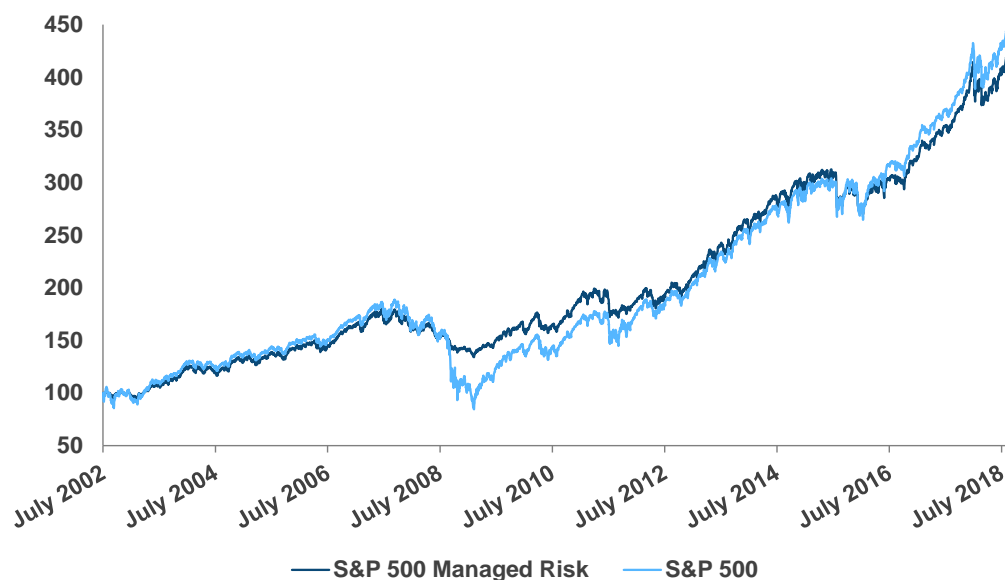
- Basis risk must be immaterial
- Ongoing monitoring of the mitigation technique
- Particular requirements around duration and/or replacement of the risk mitigation technique

There are countless examples of risk mitigation techniques in practice so we have focused here on approaches that are commonly used in the market today.

EXAMPLE 1: MANAGED VOLATILITY FUNDS

These funds sacrifice some upside return in order to remove some downside risk. This can help make traditionally quite volatile investments such as equity more attractive. It can be achieved through asset allocation or through the use of derivatives. The use of derivatives overlaying a fixed asset allocation is arguably the more cutting-edge approach and is used by the [Milliman Managed Risk Strategy](#).⁶

FIGURE 6: ILLUSTRATION OF MANAGED VOLATILITY STRATEGY



Source: Bloomberg, July 31, 2002 to August 31, 2018. Note that the results shown are historical, for informational purposes only, not reflective of any investment, and do not guarantee future results. Any reference to a market index is included for illustrative purposes only, as it is not possible to directly invest in an index. Indices are unmanaged, hypothetical vehicles that serve as market indicators and do not account for the deduction of management fees or transaction costs generally associated with investable products, which otherwise have the effect of reducing the results of an actual investment portfolio. The S&P 500 Managed Risk Index—Moderate Aggressive was launched on April 11, 2016. All information presented prior to the index launch date is back-tested. Back-tested performance is not actual performance, but is hypothetical.

⁶ See <http://www.milliman.com/MMRS/> for more information.

The chart in Figure 6 shows a benchmark index to this type of strategy. Exact performance of the strategy will depend on the specific calibration and include additional costs when executed in practice. However, the benchmark index shows how the strategy lags slightly behind the market when returns are positive. The strategy then comes into its own when there is a downturn, with a fall much lower than the market fall. The approach results in a similar or slightly lower expected return over time but there can be a significant reduction in volatility. There are therefore significant risk management benefits to these investments. There may also be a small reduction to SF capital requirements compared to funds with full market exposure, but this is generally not the key benefit from investing in these types of fund and they are not typically designed to meet the Solvency II risk mitigation technique requirements. (For an internal model company, there could be a significant SCR reduction.)

This investment option is obviously of interest as a policyholder investment as well as a shareholder one, perhaps more so. It can give policyholders downside protection with a modest reduction in upside potential. The company would then have knock-on benefits from policyholders investing in this option in terms of lower volatility of technical provisions of unit-linked business, and therefore lower volatility of Own Funds.

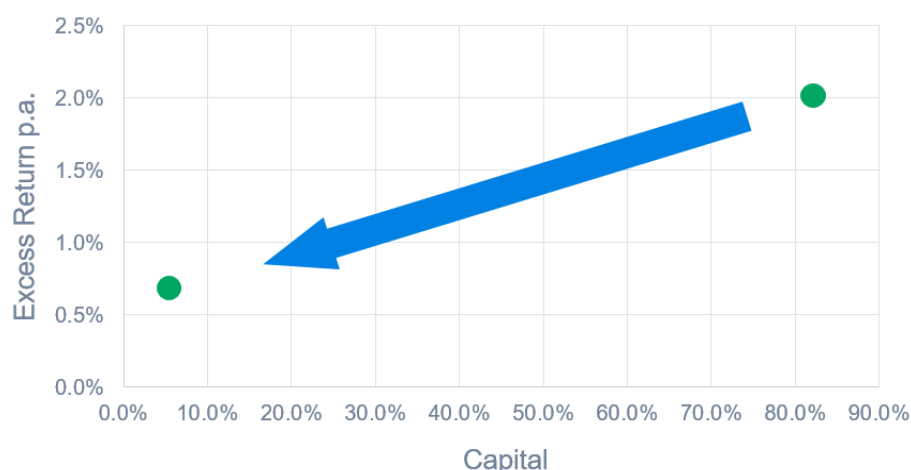
EXAMPLE 2: FINANCIAL GUARANTEES AND CREDIT DERIVATIVES

There are various options in the market to 'guarantee' the payments of a particular investment. They can include credit default swaps or financial guarantees. For the avoidance of doubt, by financial guarantee we mean an instrument that will pay out the expected cash flows of a given investment where the writer of the investment doesn't pay all or part of those cash flows in a timely manner. For example, a financial guarantee on a particular corporate bond would pay to the purchaser of the guarantee any shortfall between the expected coupons (and capital repayment) and the actual cash flows received from the bond issuer.

All of these options will require a company to give up some of the spread earned on a particular asset. This leads to the replacement of high spread risk with (hopefully) lower counterparty default risk. This can significantly reduce the SF SCR on assets that otherwise have prohibitively high capital charges, such as some securitisations.

The chart in Figure 7 illustrates how the expected return of an investment and its capital requirement may change when a financial guarantee is purchased. The green dot in the top right-hand corner may represent a Type 2 securitisation, which has a decent expected return but a very high SF SCR. Purchasing a financial guarantee on this asset will give some protection in terms of the expected income from the investment. This will come at a cost in the form of a premium payment for the guarantee. The overall investment (securitisation + financial guarantee) may now be represented by the green dot in the bottom left-hand corner. This means a reduced SF SCR but a lower expected return due to the purchase price of the financial guarantee.

FIGURE 7: ILLUSTRATION OF FINANCIAL GUARANTEE IMPACT ON EXPECTED RETURN AND SCR (ILLUSTRATIVE NUMBERS ONLY)



A key consideration of course is whether the remaining spread after purchase of the risk mitigation is sufficiently high on the investment as a whole (underlying investment + mitigation) for that investment to remain attractive to the insurer. While it varies for particular assets, it is likely that the majority of the spread will be given up to purchase the mitigation. However, there is some anecdotal evidence of the remaining spread on particular investments still being attractive relative to government or corporate bonds.

It is also worth noting that there have been some historical issues with instruments of the types described in this example. As is well documented, the insurer AIG got into difficulty in 2008 having written huge quantities of credit default swaps, in particular on collateralised debt obligations (CDOs). AIG was bailed out by the US Federal Reserve and so purchasers of the credit default swaps escaped relatively unscathed. Another company, Ambac Financial Group, previously one of the largest bond insurers in the US, filed for bankruptcy⁷ in 2010 following the huge losses it suffered on guarantees it wrote on mortgage assets. Some purchasers of the guarantees suffered losses. These cautionary tales highlight the importance of insurers having a clear understanding of the counterparty risks they are exposing themselves to as part of the investments in derivatives such as these.

Cash holdings

Many insurers regard cash less as an investment category and more as a necessary requirement for operational reasons (i.e., it is generally necessary for a company to hold a certain level of cash to run the business and meet short-term liabilities). While this paper focuses on investment strategy under Solvency II, we did also consider whether insurers are likely to find any benefits in exploring different cash options. As part of this, we looked at returns and capital requirements for cash holdings of different ratings. In a low interest rate environment, in particular, insurers are often faced with a choice between negative returns on cash or, alternatively, a zero or positive return but a significantly increased capital requirement (and increase in risk) as shown in the table in Figure 8.

FIGURE 8: CAPITAL REQUIREMENTS FOR CASH HOLDINGS

CREDIT RATING	CAPITAL REQUIREMENT	RETURN	ALLOW FOR COC
AAA	1.3%	-0.37%	-0.45%
AA	3.0%	-0.36%	-0.54%
A	6.7%	-0.34%	-0.74%
BBB	14.7%	-0.28%	-1.16%
BB	54.4%	-0.02%	-3.29%
B and under	100%	0.29%	-5.71%

The returns have been estimated based on equivalent rated 3-month corporate bonds, which may not be reflective of deposit rates in the market. Cost of capital (COC) is based on the 6% prescribed under Solvency II but clearly a company's own view may change these numbers.

The main observation is that capital rises steeply with decreasing counterparty credit rating, whereas returns are only marginally better for lower ratings. Once an allowance is made for the cost of capital, holdings with lower-rated counterparties do not look attractive compared to higher-rated ones. Even allowing for varying cost of capital measures, higher-rated counterparties tend to provide better returns after allowing for the cost of capital.

Figure 8 assumes a cash holding with a single counterparty. It is possible to reduce the counterparty default capital charge by dividing holdings across more than one counterparty. The table in Figure 9 shows the broad impact of diversifying cash holdings across multiple banks:

FIGURE 9: IMPACT OF DIVERSIFICATION ON CAPITAL REQUIREMENT FOR CASH HOLDINGS

NUMBER OF COUNTERPARTIES	REDUCTION IN CAPITAL REQUIREMENT
2	16%
3	23%
4	26%
5	28%

Practical challenges and diminishing marginal benefit may suggest that diversifying across two or three counterparties is optimal.

⁷ Hals, T. (8 November 2010). Bond insurer Ambac files for bankruptcy. Reuters. Retrieved 23 September 2018 from <https://www.reuters.com/article/us-ambac/bond-insurer-ambac-files-for-bankruptcy-idUSTRE6A75EW20101108>.

Note that the capital treatment here focuses on cash or cash equivalents, which are subject to the SF default risk module. The treatment of deposits where there are limitations on the company's ability to access the deposit will be subject instead to the spread and concentration risk standard formula modules, which can give rise to differences in the capital required.

Should we think about the matching adjustment?

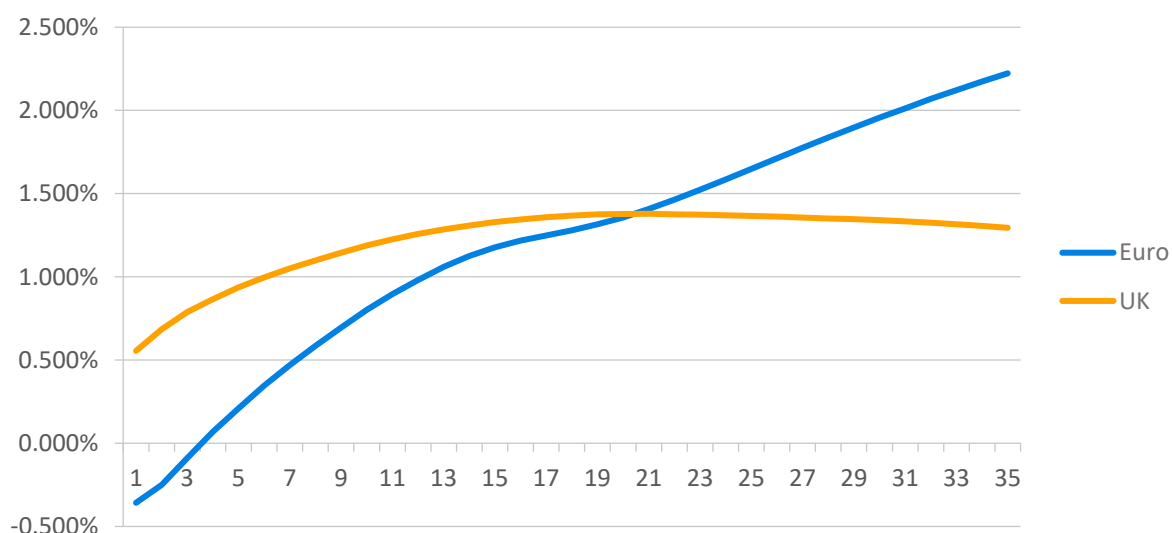
For insurers writing annuity liabilities, the matching adjustment (MA) is a potentially valuable way to use higher-yielding assets to generate higher discount rates, as long as the spreads are sufficient to justify the extra overhead involved. However, the MA is not being used by any Eurozone companies to date (aside from some companies in Spain, as discussed further below).

On the other hand, the MA is used by 23 companies in the UK. Our analysis showed that, for UK annuity liabilities, the MA that could be achieved was higher than for euro annuity liabilities, for two main reasons:

Firstly, for a given risk level (i.e., a particular credit rating), the spread available on UK assets was typically higher (by approximately 40 basis points at 31 December 2017 based on our analysis of a number of corporate bonds) compared with spreads on similarly rated euro assets. So a UK insurer could construct a portfolio of corporate bonds that generated a spread over risk-free rates, and take credit for some of this spread through the matching adjustment, whereas for an insurer with euro liabilities the spread would be lower, and hence the matching adjustment would be lower.

The second reason relates to the last liquid point under Solvency II. The chart in Figure 10 might be helpful to look at in the context of these comments. In simple terms, the MA reflects the difference (or at least some of the difference) between the yield on the matching assets and the risk-free yield under Solvency II. For the euro risk-free curve, however, the last liquid point is 20 years. This means that the yields for the first 20 years of the yield curve reflect actual market rates (based on swap rates), but after 20 years the Solvency II risk-free curve starts to converge towards the ultimate forward rate (currently 4.05%). By contrast, for the sterling risk-free curve, the last liquid point is 50 years, so the risk-free curve reflects market rates for longer. In Figure 10 you can see the euro curve start to steeply increase after 20 years. This means that the risk-free euro curve is artificially high at durations over 20 years, unlike the sterling curve. Because of this, the matching adjustment would be lower for euro liabilities because, at longer durations you are comparing the yield on the asset portfolio to an artificially high risk-free rate.

FIGURE 10: EIOPA RISK-FREE YIELD CURVES AT 31 DECEMBER 2017



The ultimate forward rate for the euro will come down over the coming years (this process has started) and this may make the MA more attractive to Eurozone insurers. The MA might also become more attractive were the last liquid point to increase from the current level of 20 years. The last liquid point may be revisited by the European Insurance and Occupational Pensions Authority (EIOPA) at some point but we are not aware of any current proposals to change it.

While the MA is not being used in the majority of the Eurozone, it is worth noting that it is being used in Spain. This appears to be largely due to the fact that Spain had a strong asset-liability matching regime for annuity liabilities that predated Solvency II, and a large market for over-the-counter swaps to match annuity cash flows has developed there. The application of the MA for these portfolios is a natural continuation, though the level of MA generated is currently lower than the equivalent level for UK insurers.

Our conclusion is that, for most of Europe, and at least for now, the MA isn't expected to be a significant influence on investment strategy.

Conclusion

Solvency II provides greater freedom for insurers from an investment strategy perspective, but also promotes a greater focus on the implications of investment decisions on risk profile and capital requirements. While insurers' investment profiles have changed somewhat since the introduction of Solvency II, there may be opportunities for many insurers to move towards optimisation of their investment strategies.

In the context of a low interest rate environment, insurers can struggle to find assets providing a sufficient yield while meeting capital and risk appetite criteria. Our research suggests that there can be assets which provide additional yield without significantly increasing capital requirements from an insurer's point of view. In fact, some alternative assets can help diversify risk profiles while generating yield pick-up.

We hope that our research provides helpful insights for insurers considering these issues, as well as for European insurers considering the use of the matching adjustment, and for insurers looking to strike an optimal balance between the return on cash deposits and the associated capital requirements.



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