

MILLIMAN RESEARCH REPORT

Capital efficient products in the European life insurance market

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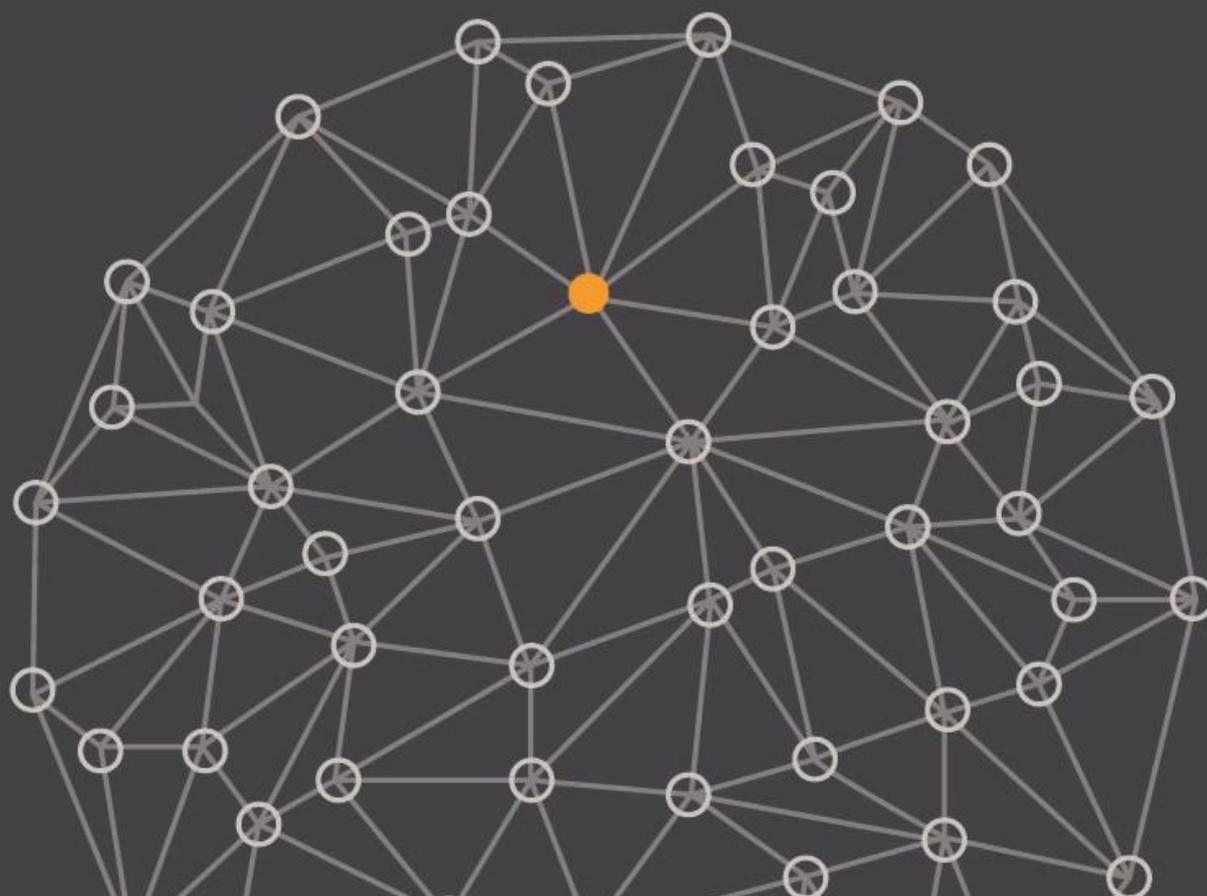




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1. INTRODUCTION TO THE EUROPEAN LIFE INSURANCE MARKET IN A LOW-INTEREST ENVIRONMENT

With Solvency II having become effective on January 1, 2016 and the low interest rate environment persisting (see Figure 1), European life insurers face tremendous economic and regulatory pressure due to the structure of their books. This is exacerbated in some countries where companies sold products on a large scale with high, but often completely unhedged guarantees, in times of more benign market conditions. However, 2015 has marked a turnaround in product strategy, and the offerings of many large life insurance companies have changed. For instance, in Germany:

- AXA Lebensversicherung AG, ERGO Lebensversicherung AG, Generali Lebensversicherung AG and Talanx AG have announced plans to exit the traditional life insurance market by no longer selling classical guarantee products and by revamping their product line ups to reduce exposure to financial guarantees¹.
- Allianz Lebensversicherung AG will not actively promote their classical guarantee products, but will focus on their innovative “Perspective” product².

One reaction to this change is a strong trend towards innovative structured products. For example, products linked to investments in a transparent fashion, but potentially still offering certain guarantees. European life insurers have introduced a variety of new so-called ‘capital light products’ in their product portfolio, which are aimed at consuming less capital under Solvency II requirements.

There are a range of approaches, and a range of terms used to describe these new products. Variable annuities, index-linked products, unit-linked products with guarantee mechanism, CPPI (Constant Proportion Portfolio Insurance) in underlying funds, individual CPPI, static and dynamic hybrids, and ‘Select’ products (index-linked surplus) are only a few examples and we expect this trend to expand over the next years.

To put this in context, Figure 1 illustrates the historical yields on ten-year government bonds for selected European countries in comparison to the euro-area average over the last 15 years. At the same time, Figure 2 shows the duration mismatches and negative investment spreads in the European life insurance market. This indicates that most European countries face similar challenges, such as high and yet unhedged guarantees in an economically challenging environment and with Solvency II in place.

¹ <http://www.finanzen.de/news/14954/altersvorsorge-mit-neuen-garantien-bei-ergo-allianz-und-axa>

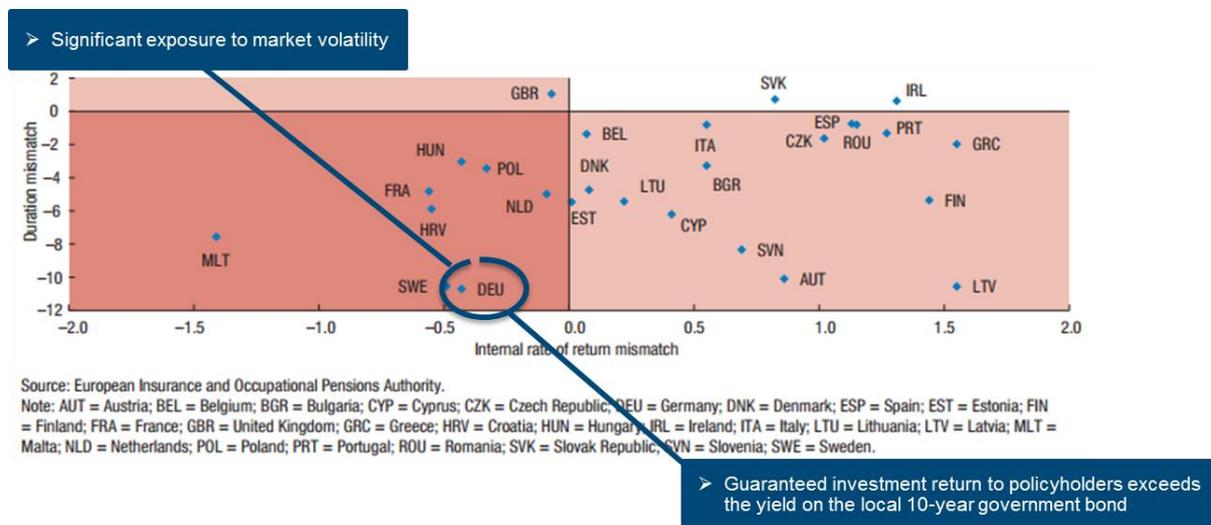
² http://www.focus.de/finanzen/versicherungen/lebensversicherung/aus-der-klasischen-lebensversicherung-allianz-verabschiedet-sich-vom-garantie-zins_aid_1035872.html

FIGURE 1: HISTORICAL YIELDS FOR EUROPEAN GOVERNMENT BONDS WITH TEN-YEAR DURATION



Source: OECD Data (<https://data.oecd.org/interest/long-term-interest-rates.htm>)

FIGURE 2: DURATION MISMATCHES AND NEGATIVE INVESTMENT SPREADS IN THE EUROPEAN LIFE INSURANCE MARKET



Source: International Monetary Fund: Global financial stability report. April 2015, p.23, Figure 1.13. Life Insurance Industry Characteristics.

In Europe, Switzerland and Germany are currently most affected by low interest rates, with government bond rates below or at zero for durations less than 20 years. But other European countries are also struggling with the current interest rate environment and they have experienced comparatively large drops in interest rates during 2016 given the latest economic and political developments in Europe—for example Brexit in Great Britain. Moreover, many European insurance policies contain generous return guarantees, which are unsustainable in today’s low interest rate environment. According to the European Insurance and Occupational Pensions Authority (EIOPA), more than half of European life insurers are

guaranteeing an investment return to policyholders that exceeds the yield on the local 10-year government bond, thereby incurring undesirable negative investment spreads. European countries that suffer from both large duration mismatches and negative investment spreads are particularly vulnerable to a prolonged low-interest rate environment. According to EIOPA, Germany and Sweden suffer from both duration mismatches of more than 10 years and negative investment spreads (see Figure 2). In contrast, countries, such as Ireland, with positive duration gaps (reflecting a higher share of saving- and unit-linked products) are less sensitive to the risks arising from low or falling interest rates. They may, however, face other vulnerabilities, including high volatility in equity markets.

In summary, European life insurers are under enormous pressure as long term investors seeking the following:

- Appropriate returns to cover their in-force liabilities including their embedded guarantees
- Not facing enormous capital charges for these investments under Solvency II
- Simultaneously offering attractive products to their customers in a highly competitive market.

EFFECTS OF LOW INTEREST RATE ENVIRONMENT

There are essentially three ways falling interest rates impact European life insurers.

1. When interest rates fall, the overall willingness of people to enter into long term insurance contracts declines, since customers are less willing to potentially lock their money and their future premiums into contracts offering an expected low return. Most customers drift to alternative investment approaches, such as short-term savings vehicles (the 'wait-and-see-approach') or directly invest in other asset classes, such as real estate. Thus, insurers' new business volumes are progressively coming under pressure. This is more apparent in traditional insurance markets within Europe that have historically favoured bond investments to back policyholder liabilities.

2. The second challenge is the value proposition. Many European markets still want insurance guarantees although returns of traditional products are less than zero after deduction of underlying costs. Hence providing insurance products that include guarantees by simultaneously offering the potential for attractive returns is impossible. For instance, market research³ has shown that more than 43% of European insurers were unable to price new guaranteed investment products at competitive rates. In addition, the higher capital charges under Solvency II for investments other than government bonds add to this dilemma.

3. Finally, there is the problem of managing in-force economics. Insurers are acutely aware of compressed spreads on bonds and the risk that spreads might further decrease to zero. In managing the in-force book, insurers need to reinvest their maturing bond assets into lower rates in order to meet their long-term liabilities—a huge challenge for both the company's profitability and its financial stability under Solvency II.

EUROPEAN LIFE INSURERS' RESPONSES

To handle this hazardous environment, European life insurers approach these challenges in two different ways. One approach tries to undertake an 'incremental optimisation' on a slow and steady basis. This is the preferred approach for the majority of the continental European insurers. The other approach attempts a 'fundamental strategic shift' of their business, which

³ Standard Life Investments: *European Insurance – Unprecedented pressure and change (November 2015)*

is mostly evident within insurance groups from the United Kingdom (UK) and Nordic countries, such as Sweden and Norway.

More precisely, the incremental optimisation approach takes a market perspective based on the idea that observed low interest rates are a temporary phenomenon. This is combined with an argument that long-term insurance liabilities are somehow uniquely illiquid, which suggests liabilities can be marked down for an illiquidity premium. Based on this train of thought, insurers continue to offer insurance products including (at least partial) guarantees while simultaneously focusing on the reduction of their cost base in order to reduce the guarantee product's capital intensity. They also reshape their distribution channels for both their new and in-force business as part of effective in-force management. So these companies are not fundamentally changing their product strategy and they are relying on the expectation that one day the economic environment will recover and interest rates will again increase to higher levels.

On the other hand, the second approach takes the perspective that insurance companies are currently not rewarded for taking the investment risk of offering guarantees and low interest rates might persist for a longer period. These companies respond to the current economic environment with a more fundamental re-evaluation or a so-called 'strategic shift' of their life insurance business.

More precisely, insurers move away from products with "unmanageable" long-dated guarantees and significant interest rate risk (e.g. by using run-off solutions or, at the extreme, by selling these parts of their portfolio) and prospectively focus their new business strategy on protection and unit-linked products with lower capital intensity. Some of these companies have also expanded their own asset management capabilities in order to generate at least some investment management margins in-house. For instance, there are fewer guarantee writers in the UK than before. Those that do offer guarantees must de-risk the customer fund (either by lowering equity exposure and/or using CPPI) or offer a low-level of guarantee to be competitive. Whereas other large insurance companies, such as Standard Life or Legal & General, have already built up significant asset management divisions to capture the investment management component of the overall value chain.

RECENT PRODUCT DEVELOPMENTS

Given these approaches, insurers are trying to develop their product offerings accordingly. Two major product categories are clearly emerging within the European insurance market. The first category can be described as the pure unit-linked products bearing no investment risk for the insurer. However, many European policyholders are not comfortable with taking the full investment risk and are consequently seeking insurance products that include at least some kind of guarantee. The second product category consists of the traditional life insurance products with fixed guarantees. However fixed guarantees are very capital intensive under Solvency II. In general, the impact of Solvency II is determined largely by life company exposure to interest-rate risk, which typically accounts for approximately 50 to 60 percent of the company's overall market risk, and is driven by the mismatch between future asset-and-liability cash flows (duration mismatch).

Traditional life insurance products with long-term guarantees have the greatest exposure to investment risk. They are very costly unless insurers can reduce the duration mismatch, which usually entails high hedging costs and higher fees for the customer.

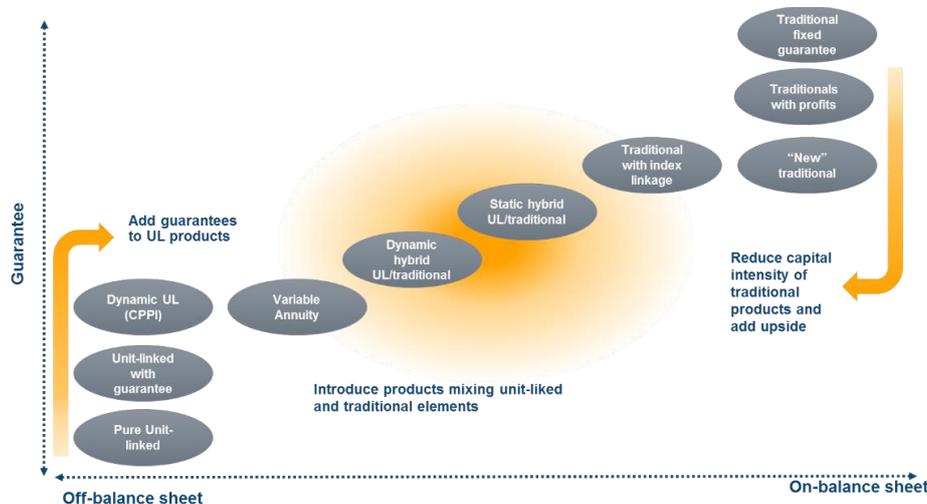
Therefore, this product type has become unattractive over the last decade for both the issuer (given the regulatory requirements combined with the outlook of a long-lasting market environment with low of negative interest rates) and the customer (given that the level of guarantees have been steadily declining and potential upside returns are very limited).

European insurers have expanded their product portfolios with hybrids of unit-linked and traditional products by mixing unit-linked and traditional product features. The challenging trend towards innovative investment-linked products offering certain guarantees while simultaneously requiring less risk capital under Solvency II has been approached from two directions (see Figure 3), where many different competing concepts come together. However, the level of complexity increases.

The first direction starts with a pure unit-linked (UL) product where the policyholder takes the investment risk. However, from an insurer’s perspective there is no value-add compared to a pure asset manager and this is, therefore, less attractive for the customer due to the large expense loadings inherent in these products. This pure UL product is then enriched by adding guarantees in such a way that one portion of the customer’s money is invested in funds directly (and the policyholder takes all investment risk) and another portion is treated as a traditional product with a certain minimum guaranteed sum assured. These developments result in so called ‘static’ or ‘dynamic’ hybrid products, such as dynamic UL products (e.g., CPPI), variable annuities or UL products with guarantees.

The other direction starts with a traditional product including fixed guarantees. These products are gradually modified towards ‘traditional products with profits’ or so-called ‘New Traditionals,’ including an optional index participation or smaller but more flexible guarantees. Capturing potential short-time upsides of the market while retaining some floor guarantee level makes these products more attractive in terms of potential value for the customer. They can also have less capital intensity under Solvency II for the insurer. Therefore, new traditional products are characterised as traditional products bearing a guarantee of zero (or at the most a percentage premium guarantee) and a potential for participating in upside movements of the market via index investments. Within the insurance company, this construction is typically manufactured using derivative financial instruments.

FIGURE 3: SUBSTANTIAL INNOVATION ACTIVITY—MANY DIFFERENT COMPETING CONCEPTS



The following sections give a high-level overview of two comparable insurance markets. They discuss how the German market (see Figure 4) and the Swiss market (see Figure 5) are dealing with the challenges discussed above. This might also serve as a blue print for other life insurance markets. Within recent years, a series of product innovations have been introduced in Switzerland and Germany. However, these developments are not simply a consequence of the innovative talent of the German or Swiss insurers, but are mainly a logical outcome of the incredibly low interest rates in these countries (see Figure 1).

PRODUCT INNOVATIONS IN THE GERMAN INSURANCE MARKET

The German insurance market was heavily wedded to long-term guarantees. In the past, the regulatory environment was based on a philosophy of long-term stability in yields and markets. Given the rapid change to the current market environment and the legacy within the books of German life insurers, it is no wonder that product innovations in the German market have been particularly mature and they display a relatively high degree of market penetration over the last five to six years.

However, given German customers' ongoing strong demand for guarantees, product innovation in Germany has been mainly targeted at bringing more upside potential/return into existing traditional products while simultaneously reducing their regulatory capital intensity. For example:

- Leading companies such as Allianz Deutschland AG, HDI Lebensversicherung AG (life insurance subsidiary of Talanx AG) and Generali Lebensversicherung AG have already introduced traditional products with index-linked components where the annual bonus is invested into certificates linked to an index.
- Allianz Lebensversicherung AG, as well as other life insurance companies such as AXA Lebensversicherung AG, Alte Leipziger Lebensversicherung AG and Nürnberger Lebensversicherung AG, have successfully started selling hybrid products with a static or dynamic allocation in two or three baskets.
- Zurich Germany has successfully moved away from its traditional business over the last 6 years. Its German subsidiary Zurich Deutscher Herold Lebensversicherung AG mainly focuses its new business (almost 70% of new business) on UL products with a guarantee mechanism 'iCPPI' using their unique distribution channel Deutsche Bank AG. This concept has gained attractiveness in the low interest rate environment.

FIGURE 4: PRODUCT INNOVATIONS (GERMAN MARKET)

Product Innovations	Examples (German Market)	Insurers
Traditional with Index Linkage	Traditional with profits product and lower guarantee	
	Bonus invested into certificate linked to index	 
Hybrids	Combination of traditional and UL product	 
	Static or dynamic allocation 2 or 3 baskets	 
Variable Annuities	UL product with guarantee	
	Guarantee is hedged or reinsured	
	Has remained niche so far	
UL iCPPI	UL product with dynamic asset allocation	
	Guarantee given by third party	

PRODUCT INNOVATIONS IN THE SWISS INSURANCE MARKET

A similar trend can be seen in Switzerland where Swiss life insurers have launched similar product innovations. However, insurers are living under slightly different market characteristics in addition to negative interest rates. As Switzerland offers extensive company pension coverage (pillar 2), the private pension (pillar 3) is largely discretionary, characterised by a relatively high risk appetite and receptiveness to UL products. The Swiss subsidiary AXA Winterthur introduced a new traditional product with reduced guarantees in return for higher upside investment potential. The Swiss entities of Zurich Insurance Group and Helvetia Insurance Group launched enhanced traditional products with links to stock indices, where, for example, bonuses are invested in certificates linked to an index. The Swiss subsidiaries of SwissLife Group and Baloise Group also launched innovative variable annuity products as UL products, with a guarantee that is either hedged or reinsured. However, these products have remained niche so far.

FIGURE 5: PRODUCT INNOVATIONS (SWISS MARKET)

Product Innovations	Examples (Swiss Market)	Insurers
New Traditionals	<p>Traditional products with reduced guarantees in return for higher upside</p> <hr/> <p>Reduced guarantees possible, e.g., in form of lower guaranteed rate (0%) only</p>	
Traditionals with Index Linkage	<p>Traditional with profits product with bonus invested into a certificate linked to index</p> <hr/> <p>Usage of levered certificates in order to increase exposure level</p>	 
Variable Annuities	<p>UL product with guarantee</p> <hr/> <p>Guarantee is hedged or reinsured</p> <hr/> <p>Has remained niche so far</p>	 

All these innovations in life insurance products acknowledge the circumstances that German and Swiss life insurance companies need to handle arising from the conflict between low interest rates and the customer's pursuit of a certain security level, while simultaneously limiting the level of complexity as part of an effective distribution strategy.

2. RECENT PRODUCT INNOVATIONS—INSIGHTS

To get a deeper understanding of how such product innovations work and are designed, we present, analyse and compare three selected innovative and capital efficient products from the German life insurance market below. While this analysis is not exhaustive (and cannot be exhaustive within the scope of any such paper) in terms of all the different product designs and features in the market, it serves as an illustrative look into the engine room of modern product development.

Product	Company		Product Type
Perspektive	Allianz Lebensversicherung AG		New Traditional
Index Select	Allianz Lebensversicherung AG		Index-Linked
VorsorgeInvest Premium	Zurich Deutscher Herold Lebensversicherung AG		Dynamic Hybrid w/o traditional cover fund

PERSPEKTIVE BY ALLIANZ LEBENSVERSICHERUNG AG

In July 2013, one of the largest life insurance companies in the German market, Allianz Lebensversicherung AG (AZL), launched their pension product 'Perspektive', aiming for 'balancing risk return assumptions and risk appetite'. The design of this product is close to traditional life insurance products.

It includes a security component represented by a premium guarantee for both the annuity phase and—in case of death during the deferment period—a guaranteed minimum annuity. The premiums after deduction of costs are invested in the coverage assets of Allianz Lebensversicherung AG. Because of a modified guarantee level compared to the traditional products from the Allianz product portfolio, the client has the chance of an increase of the annual running bonuses by 0.1% and an increase of the terminal bonuses by 0.2%⁴.

Here, the annually declared running bonuses increase the guarantee (lock-in) and consequently the guaranteed capital exceeds the premium guarantee (to date). Another main feature of this product is the fact that the determination of the annuitization is performed at the end of the contracts deferment period, based on the actuarial assumptions effective for new business at that date. This product feature might be an advantage for clients signing a contract within the recent low interest rate environment, since the actuarial interest rates might be significantly higher in the future. Of course, the guaranteed annuity also offers a minimum floor throughout the contract.

The product is also characterized by a conventional actuarial reserve, a guaranteed minimum annuity and a guarantee of paid-in premiums, where the latter is increased annually by the profit participation (lock-in).

INDEXSELECT BY ALLIANZ LEBENSVERSICHERUNG AG

The second selected product, 'IndexSelect', is another pension product from Allianz Lebensversicherung AG (AZL), which was first launched in 2007. Classified as a traditional product with an index-linkage, it offers a more individual approach for the customer. The policyholder has the right to control the investment strategy up to a certain degree. More precisely, once a year the policyholder can shift between receiving 100% of the returns from

⁴ Source: Marketing material for 'Perspektive', published by Allianz Lebensversicherung AG.

The underlying index participation or receiving a fixed annual return. Percentage mixtures of both concepts is also possible.

The IndexSelect product also includes a security component, characterised by a premium guarantee at the beginning of the annuity phase and in case of death within the deferment period. It also includes a minimum annuity guaranteed from the beginning of the contract. Similar to Perspektive, the IndexSelect annuity rate will be determined at the end of the deferment period. Currently this is seen as a positive feature if you believe interest rates will be higher in the future.

The returns for IndexSelect are linked to two components, the EuroStoxx50 Index, which provides the policyholder with a participation in the European equity market and a guaranteed annual interest rate. At the beginning of each year, a cap will be determined, which specifies the maximum level of monthly returns (e.g. 4%) the policyholder can receive from the development of the EuroStoxx50 Index. In case the index performance exceeds the cap level, the policyholder receives the capping level and the excess performance (in this example 4%) belongs to the insurer. Negative returns will be floored at 0% such that the policyholder return cannot be negative. But even in a case of one year of total loss on the markets, the policy holder can receive positive returns by choosing to receive his returns not only from the index but also from a guaranteed interest rate. The policyholder can control the composition of the returns annually, as he is able to determine the proportions of both components in increments of 25%.

VORSORGEINVEST PREMIUM BY ZURICH DEUTSCHER HEROLD LEBENSVERSICHERUNG AG

The third selected product 'VorsorgeInvest Premium' by the German life insurance subsidiary of Zurich Group Germany is a UL pension product based on the so-called iCPPI (individual Constant Proportion Portfolio Insurance) investment strategy, which is managed by DWS Investments, the investment company of the Deutsche Bank Group. With launching this innovative product in September 2008, Zurich Deutscher Herold Lebensversicherung AG (ZDHL) was one of the pioneers in offering unit-linked pension products in the German insurance market.

With VorsorgeInvest Premium, ZDHL provides a premium guarantee (given by DWS Investments) but also offers a high level of flexibility via the option to choose between regular or single premium payments. Moreover, there are numerous additional features for the customer, e.g. the opportunity for dynamic premium increases, premium deferments, optional additional payments and capital withdrawals.

VorsorgeInvest Premium is a unit-linked product including a premium guarantee (formerly 100% that has since been reduced by ZDHL to 75%). This dynamic hybrid with two baskets enables an investment in equities while simultaneously securing a guaranteed minimum benefit indemnified via an active management of the underlying assets instead of using a traditional cover fund. The management of the assured minimum guarantee sum is carried out by monitoring and, if necessary, shifting the fund balance between the so-called 'protected assets' (bond funds) and 'performance assets' (equities, derivatives, money market instruments) following the individual Constant Proportion Portfolio Insurance (iCPPI) mechanism. See section 3.2 for more details as executed by DWS Investments.

The underlying investment strategy is monitored daily in order to reduce the customer's volatility risk while allowing investment in risky assets. The customer chooses the level of security for his selected fund. After six years, the customer has the possibility to increase its guaranteed minimum level on a yearly basis if the balance is either greater than the paid-in premiums or greater than the contractual guaranteed minimum benefit at the annuity payment date.

COMPARISON OF SELECTED PRODUCTS

To compare these products properly, the following key parameters will be considered:

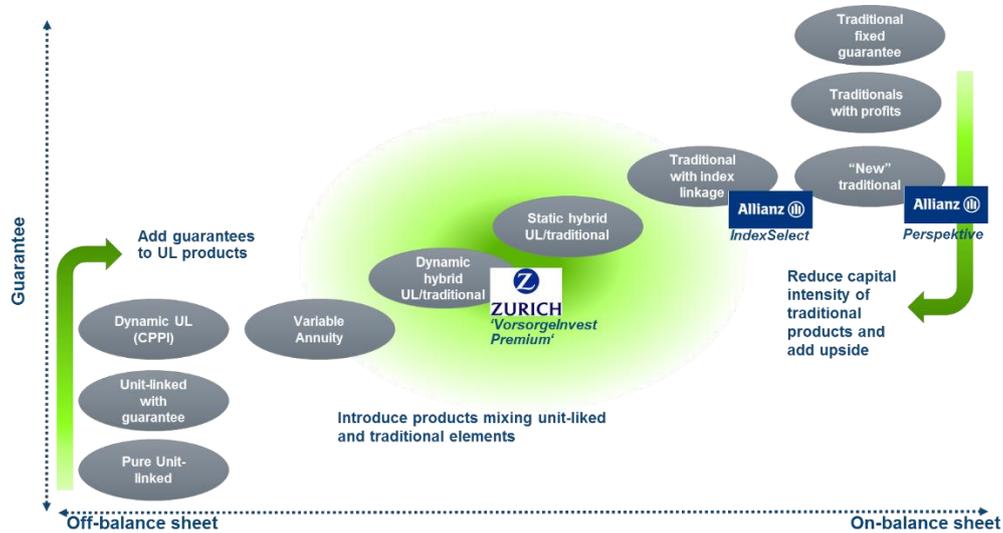
- Focusing on the liability side of the contract, we analyse the provided guaranteed benefits of each product in terms of the surrender values and the different forms of guarantees for the policyholder.
- From an asset-side perspective, we answer the question of where the policyholders' premiums are invested and how the guarantees assigned to the contracts are financed.
- We also focus on the cost component of each product.
- And finally, we look at why each product leads to a higher capital efficiency in terms of capital lockup.

FIGURE 6: COMPARISON OF SELECTED INNOVATIVE CAPITAL EFFICIENT LIFE INSURANCE PRODUCTS

	Perspektive (Allianz)	Index Select (Allianz)	VorsorgeInvest Premium (Zurich)
Lapse	Guaranteed surrender values Lock-in of declared bonuses	Guaranteed surrender value (premium guarantee)	Guaranteed surrender value (premium guarantee)
Forms of Guarantees	Annual guarantee on actuarial reserve (before profit participation) Initially 1.25% annual guaranteed interest rate until the sum of paid-in premiums is reached. After that, the guaranteed interest rate decreases according to individual contract conditions; 0.00% guaranteed interest rate (related to the conventional reserve including running bonuses) or in short: 'lock-in'	Premium guarantee, Guaranteed minimum annuity, Guaranteed fixed yields (annually determined) on declared bonuses Guaranteed minimum return of 0% from EUROSTOXX50 Index on declared bonuses	Premium guarantee (100% at product launch, but decreasing to 75% as of October 2016) Annual lock-in possible Peak-Fund Value Guarantee ...
Investment vehicle	Security Assets of Allianz	Coverage assets of Allianz Lebensversicherung AG Bonuses invested into EUROSTOXX50 Index-linked funds and fixed yield at the following possible compositions: 100/0, 75/25, 50/50, 25/75 or 0/100 (Based on policyholder's decision invested in two partitions)	Mutual funds managed by DWS Investments / DeAWM Investment GmbH
Financing of Guarantee	Traditional reserving via security assets	Traditional reserving via security assets	Fund values of the 'protected' assets (not via traditional cover fund)
Costs	Administration costs	Administration costs Management fees	Administration costs Management fees
Capital Efficiency	Lower and more flexible guarantees on both conventional reserve, both including and excluding bonuses, leads to a slightly higher capital efficiency	Lower and more flexible guarantees on conventional reserve, both including and excluding bonuses, leads to a slightly higher capital efficiency	Lower and more flexible guarantees on conventional reserve, both including and excluding bonuses, leads to a slightly higher capital efficiency

We have shown where these products sit within the spectrum of product offerings in the European market in Figure 7 below.

FIGURE 7: PERSPEKTIVE, INDEXSELECT, VORSORGEINVEST PREMIUM IN THE CURRENT PRODUCT INNOVATION LANDSCAPE



3. ASSET MANAGEMENT IDEAS IN PRODUCT DESIGN

In the current low interest rate environment, insurers are struggling with the question of what, if any, long-term guarantees can be offered to customers. In recent years, some European life insurers were badly hurt by products promising guarantees that were impossible to meet when markets and interest rates fell.

However, guaranteed products remain in vogue in the European life insurance market, with customers recognising the value of guarantees in times of economic turbulence, thus putting insurers in a difficult dilemma. In an investment environment characterised by low yields and high volatility, the costs involved in providing a guarantee and hedging the risk from the underlying fund can be very high and prohibitive.

At present, as insurers work on developing the next generation of long-term savings and investment products (as discussed above), volatility-control overlay mechanisms have emerged as one way to further reduce the costs of hedging guarantees.

A typical overlay strategy is characterised by several features, including:

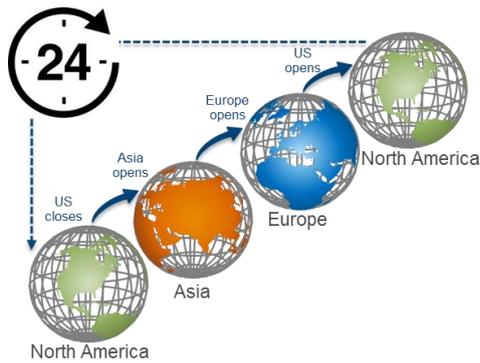
- The use of a dynamic asset-management approach to vary participation in a range of risky assets in response to these assets' estimated future volatility.
- Applied to a traditional equity/bond fund, for instance, the overlay would dial down the allocation to equities into cash or cash-like instruments, if expected fund volatility exceeds the predefined target.
- If expected fund volatility falls below the target, an overlay would use leverage to increase the fund's equity holdings and increase its volatility exposure. This leverage is typically capped at 100% of fund value.
- The adoption of a sophisticated, dynamic risk managed approach would invest heavily in equities to maximize return during periods of relatively calm markets, but then limit exposure during periods of volatility.

These techniques have been used by insurers for several years to protect their own balance sheets. A prominent example of this approach is the '**Milliman Managed Risk Strategy**'⁵ (MMRS) as one of the most common risk-managed funds on variable annuity platforms in the United States. However, the MMRS does not just manage volatility, but it combines with a capital protection hedging technique (see CASE STUDY—CPPI vs. MMRS section).

In terms of effective dynamic asset management, these types of strategies require frequent monitoring of the global equity markets.

⁵ <http://us.milliman.com/Solutions/Services/Milliman-Managed-Risk-Strategy/>

FIGURE 8: EXAMPLE FOR 24-HOUR MONITORING



For an illustrative example, consider the mutual funds market on a single trading day.

Currently, mutual funds trade across many investment strategies (especially in the fields of dynamic hybrids or investment-linked products using a CPPI or other related dynamic asset allocation mechanism). The trades are typically executed once during each trading day. The primary source of risk is that a strategy will “break,” meaning the underlying funds will fall by an amount greater than the pre-

specified tolerance. Intraday trading risks are even more evident when you take a global perspective. Time zone differences mean local working hours limit the trading window for some funds and assets. However global markets and futures markets on broad equity indices like the Dow Jones Eurostoxx 50 Index and the S&P 500 Index are trading throughout the European and US day even when the local markets for the underlying stocks have closed.

Capital markets are highly globalized and risk can occur at any point during the day. For dynamic strategies that depend on movements in price, the strategy becomes more efficient (assuming transaction costs are small) when gap risk is diminished by reducing the lag time between a market event happening and responding with a rebalancing trade. Therefore, continuous monitoring of the markets is necessary in order to be prepared to trade more frequently than once per day. This could take the form of:

- Checking the market levels multiple times per day, and being prepared to rebalance at least once during each of the European, North American and Asian trading days.
- Continuous monitoring of global markets and executing trades as often as necessary to maintain the client’s risk within pre-specified thresholds.

These strategies can typically supplement once-per-day mutual fund trading with more frequent monitoring and possible “top-up” trading of futures contracts based on market indices that are closely linked with the mutual funds underlying the strategy.

These forms of risk management and hedging strategies might also be an effective option for European insurance companies managing their products by providing dynamic asset management for capital light products in terms of Solvency II risk capital and product profitability.

CASE STUDY—CPPI vs. MMRS

Within the following section, we analyse how the MMRS might impact European life insurers’ product design by combining the strategy with a simplified German investment-linked annuity product in comparison to the well-known CPPI mechanism.

THE MILLIMAN MANAGED RISK STRATEGY™ (MMRS)

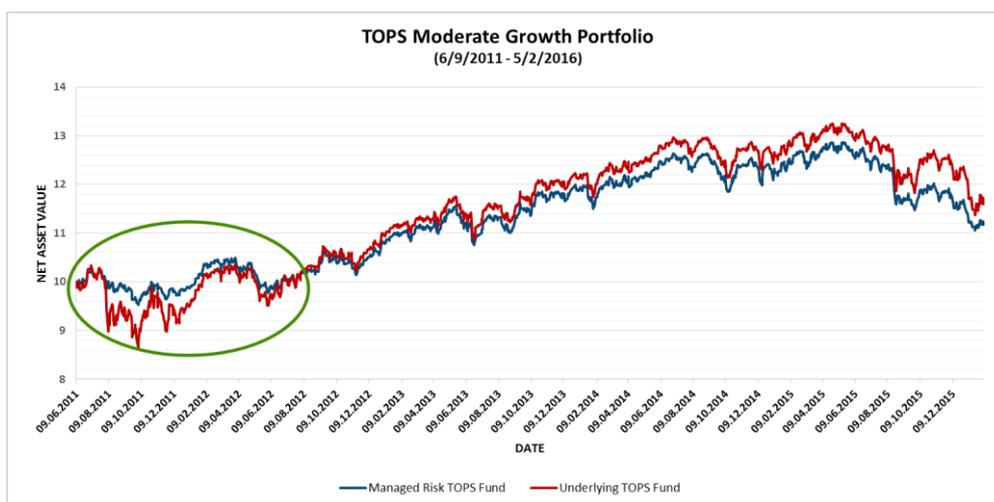
The technique Milliman Financial Risk Management (Milliman FRM) LLC⁶ applies within their risk monitoring offering is the so called MMRS. This technique reduces downside exposure and provides much greater certainty that investors can achieve funding objectives using two sophisticated risk management techniques, the ‘Volatility Management’ and the ‘Capital Protection Strategy’. Both are typically implemented in a Milliman’s overlay strategy using exchange-traded future contracts. These contracts are typically used because they trade on a deep and liquid market and they avoid adding additional counterparty risk if only using investment bank supplied over the counter options or swaptions.

Volatility Management does not use a constant equity allocation as the equity allocation serves as a proxy for risk and traditional constant equity allocations result in wildly different risk profiles during periods of calm or crisis. Accordingly, the Volatility Management technique uses a target volatility asset allocation, aiming directly for a specific volatility level via another future overlay. Each fund is managed to a specific level of volatility as determined by a specialist investment advisor and implemented by Milliman.

The second technique, the Capital Protection Strategy, seeks to reduce losses in severe adverse market environments by explicitly cushioning losses in market down turns and using simple liquid exchange-traded hedge instruments to replicate a five-year rolling maturity put option. Moreover, this technique keeps protection relevant by automatically increasing the level of protection in rising markets to preserve market gains and simultaneously decreasing the level of protection in falling markets to harvest protection strategy gains.

Hence, this strategy prevents portfolio volatility from increasing dramatically during a financial crisis, as seen in Figure 9. This shows the performance of two funds, one fund with and one without the MMRS overlay. The MMRS approach shows the dampening effect on the fund in falling markets, whilst still participating to a large extent in the upside.

FIGURE 9: MMRS—ACTUAL PERFORMANCE EXPERIENCE ⁷



⁶ Milliman Financial Risk Management LLC (Milliman FRM), a SEC-registered investment advisor, is a global leader in financial risk management to the retirement savings industry. It provides investment advisory, hedging, and consulting services on more than \$169 billion in global assets (as of December 31, 2015). Established in 1998, the practice includes more than 150 professionals operating from three trading platforms in Chicago, London, and Sydney. Milliman FRM is a subsidiary of Milliman, Inc. For more information, see <http://us.milliman.com/FRM/>.

⁷ Source: Milliman Financial Risk Management LLC, 6/9/2011 – 5/2/2016.

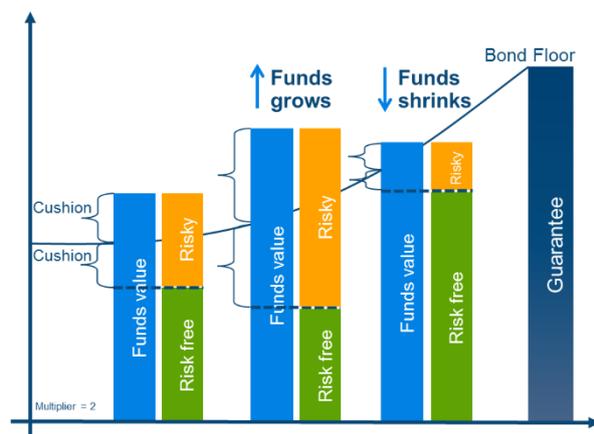
The performance shown is historical, for informational purposes only, not reflective of any investment, and does not guarantee future results. The performance figures do not reflect charges specific to an individual's contract, such as cost of insurance, mortality and expense risks charges, riders and sales charges, which would negatively affect performance. Shares of the Portfolio are sold only through variable policies and are not available to the general public. Investment return and principal value of an investment will fluctuate so that an investor's shares, when redeemed, may be worth more or less than their original cost. Current performance may be lower or higher than the performance data quoted.

In practice, MMRS is basically an asset management mandate for Milliman FRM to execute a hedge overlay. Thereby, the hedge overlay comes on top of usual asset mandates, which has the advantage of leaving the assets invested, with only occasional rebalances between the hedge overlay cash fund and the underlying fund. These rebalancing actions typically involve buying the underlying fund on market dips and selling underlying fund assets at market peaks. The mandate includes a fund- or entity-specific set of deliverables (targets) with respect to downside protection and volatility reduction. Contrary to many of today's risk management strategies, Milliman FRM's approach relies on the simplest, most liquid hedge assets available, and the firm provides complete and continuous transparency with all of its clients regarding the status of the hedges.

THE CONSTANT PROPORTION PORTFOLIO INSURANCE STRATEGY (CPPI)

The CPPI is a dynamic portfolio investment strategy, allowing the investor to maintain an exposure to the upside potential of risky assets while providing a capital guarantee against downside risks. The portfolio is invested in both low-risk assets (such as bonds or money market funds), which are also called 'protected assets' in order to ensure the preservation of invested capital, and high-risk assets (such as equities or stock indices), which are also called 'performance assets'.

FIGURE 10: CPPI INVESTMENT STRATEGY



The proportion of both investment components is monitored on a regular (daily) basis such that the current market movements can be managed by dynamic (daily) reallocation between the protection assets and the performance assets. The objective is participation in rising markets and limiting the risks of losses in declining markets.

The essential determining factors of the CPPI strategy are the 'floor,' which is defined as the present value of the guaranteed benefit and the 'buffer,' which is defined as the difference between the actual fund value and the floor. The ultimate important parameter is the 'multiplier,' which is an input parameter, defined by the client based on his personal level of risk appetite and by determining the portion of the buffer invested into risky assets.

The CPPI algorithm has been established as a useful mechanism for investment strategies underlying numerous investment-linked life insurance products in the European market and it is also a well-known approach in standard literature, so it serves as a suitable benchmark mechanism for the purpose of this analysis.

CASE STUDY—MMRS vs. CPPI

This case study aims at analysing the differences between the CPPI described above and MMRS using the following simplified sample insurance contract of an annuity product with a premium guarantee and profit participation.

We assume a sample contract of a 30-year-old person with a contract term of 30 years and an annual premium payment of EUR 1, which is invested in a fund as listed in Figure 11. After 30 years, the policyholder either receives the guaranteed amount of paid-in premiums

in case the fund value is less than the paid-in premiums or the guaranteed amount of paid-in premiums and 90% of the generated profits in case the fund value is larger than the paid-in premiums. For the sake of simplicity, we assume that the policyholder will not cancel during the lifetime of the contract.

FIGURE 11: SAMPLE CONTRACT-UNIT-LINKED ANNUITY PRODUCT WITH PREMIUM GUARANTEE

PARAMETER	CHARACTERISTIC
ENTRY AGE	30 years
CONTRACT TERM	30 Years
ANNUAL PREMIUM	EUR 1 (invested into the fund)
PAYMENT AT MATURITY	<p>fund value < paid-in premiums: policy holder receives the guaranteed amount from paid premiums. The gap has to be closed by the shareholder</p> <p>fund value > paid-in premiums: the generated profit is split between the policyholder (90%) and shareholder (10%), i.e. the policyholder receives the paid premiums plus the amount resulting from profit participation</p>

Given the contractual conditions of this sample UL annuity product, both strategies have been calibrated using the following parameters, ensuring a fair risk/return comparison (see Figure 12).

FIGURE 12: CALIBRATION OF MMRS AND CPPI MODEL

STRATEGY	PARAMETER	CALIBRATION
CPPI	Multiplier	2
	Bond Floor	100% actuarial reserve
MMRS	Volatility Target	8% p.a.
	Capital Protection	5-year rolling term
	Strike	100% at-the-money (with dynamic resets)

The parameters are set at levels reflective of typical products on the European market. Whilst MMRS is not yet available in any insurance guarantee product in Europe⁸, it is set to provide a similar risk profile to fund risk management in UL guarantee products in the UK market, which have target volatility parameters ranging from 5% to 9%. On the other hand, the CPPI calibration reflects a common approach used in numerous investment-linked products, such as ZDHL's VorsorgeInvest Premium, which was introduced in the previous chapter.

Based on a stochastic simulation with 1,000 real world scenarios containing realistic future market developments starting from a reference date as of 30 June 2015 (see Figure 13), we generated returns for both investment strategies and compared the results from both the shareholder's and the policyholder's perspective in terms of the expected return.

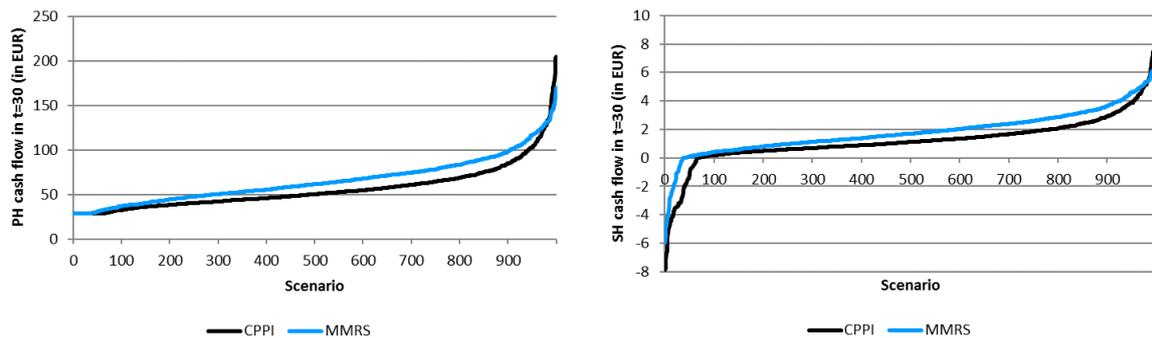
⁸ However, it is available through Sanlam Asset Management Ireland in a non-guaranteed UCITS fund.

FIGURE 13: ECONOMIC ASSUMPTIONS FOR THE CASE STUDY

PARAMETER	CHARACTERISTIC
Valuation Date	30.06.2015
Assets	- 10-year Government Bond - EUROSTOXX Index
Volatility	20 % p.a. for EUROSTOXX 8% p.a. for 10-year Government Bond
Time Step	daily
Currency	euro

The results from these simulations show that both strategies result in different distributions of cash flows for shareholders and policyholders. For example, if we compare the distribution of cash flows at maturity (year 30), the MMRS strategy results in higher cash flows for both the policyholder and the shareholder, in almost each stochastic scenario (see Figure 14). More precisely, in Figure 14 the scenarios are ranked by performance for each strategy. Then, the Nth scenario for MMRS is better than the Nth scenario for CPPI.

FIGURE 14: CASE STUDY—DISTRIBUTION OF POLICYHOLDER (PH) AND SHAREHOLDER (SH) CASH FLOWS AT T = 30



In the following, we analyse two exemplary real world scenarios, one 'good' scenario and one 'bad' scenario (characterized by their impact in terms of CPPI results) in order to compare the results of the CPPI strategy and the MMRS strategy. Figure 15 and Figure 16 shows the assumed underlying market performance.

FIGURE 15: EUROSTOXX-‘GOOD’ AND ‘BAD’ SCENARIO OVER THE LIFETIME OF THE CONTRACT

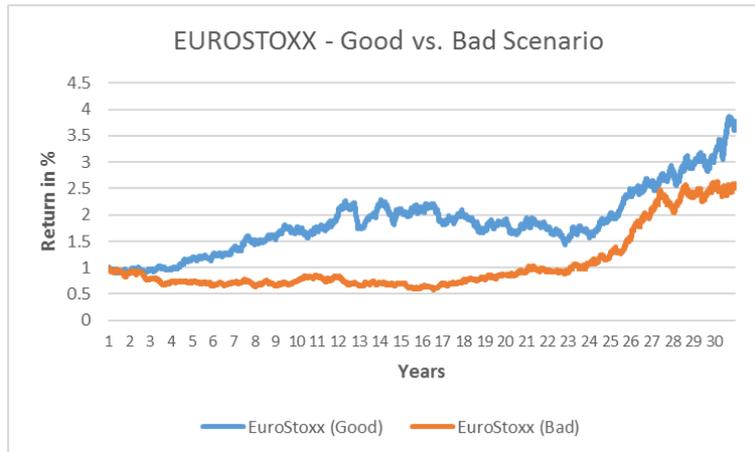
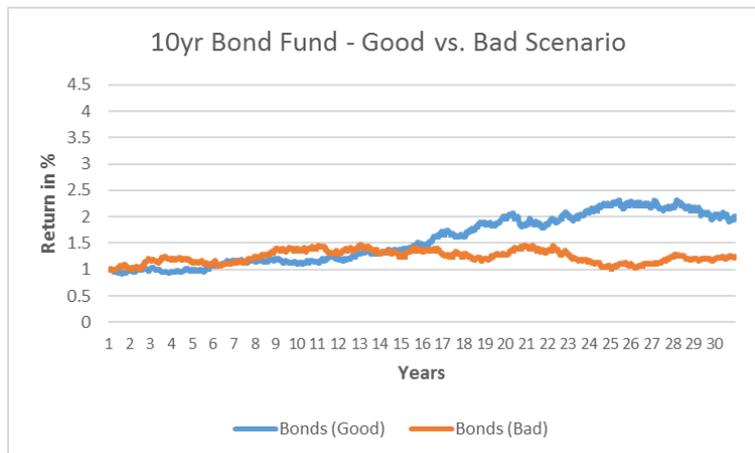
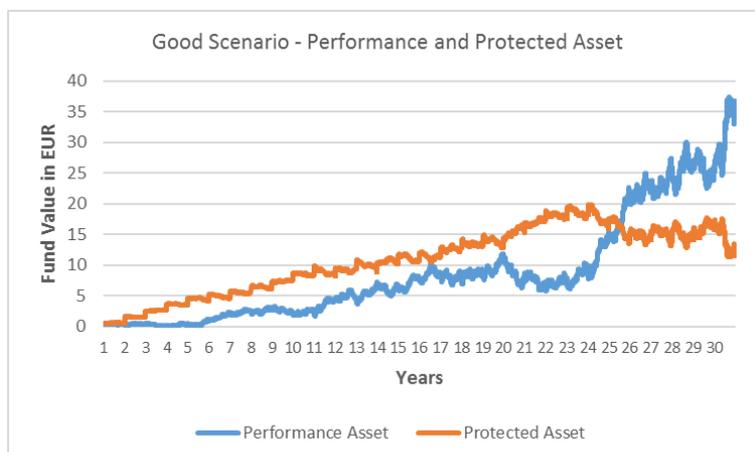


FIGURE 16: 10YR BOND RETURNS-‘GOOD and ‘BAD’ SCENARIO OVER THE LIFETIME OF THE CONTRACT



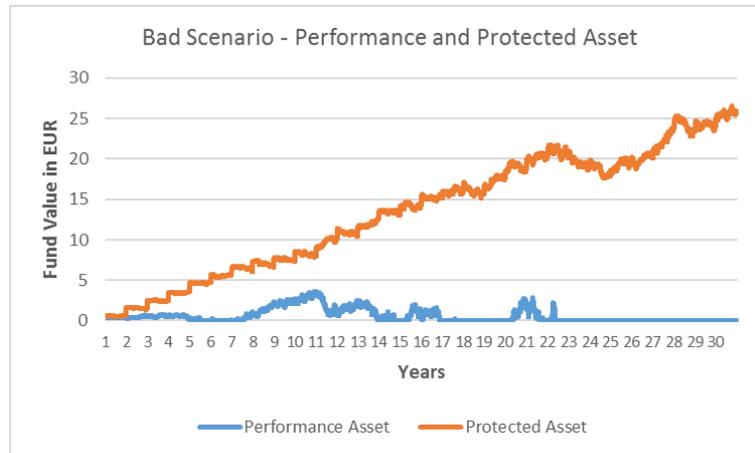
Given these economic conditions, the investment strategies react differently. In the ‘good’ scenario, the CPPI algorithm shifts a relatively large share of the total assets into the ‘performance asset’ and thus participates in the strong market performance (see Figure 17).

FIGURE 17: CPPI STRATEGY-RETURNS OF ‘PERFORMANCE ASSET’ AND ‘PROTECTED ASSET’ IN THE ‘GOOD’ SCENARIO OVER THE LIFETIME OF THE CONTRACT



Considering the 'bad scenario' on the other hand, the CPPI algorithm shifts almost the total fund value into the 'protected asset' to avoid the risk of participating in poor equity market performance (see Figure 18).

FIGURE 18: CPPI STRATEGY—RETURNS OF 'PERFORMANCE ASSET' AND 'PROTECTION ASSET' IN THE 'BAD' SCENARIO OVER THE LIFETIME OF THE CONTRACT



Overall the CPPI algorithm leads to the following total results:

- In the good scenario, the CPPI algorithm results in a total fund value of EUR 48.35 (see Figure 19) at the end of the contract term.
- In the bad scenario, the CPPI algorithm ends up with a total fund value of EUR 25.66, which is less than the premium guarantee assigned to the contract (see Figure 20). In this case, the shareholder is forced to inject the remaining balance to fulfil the premium guarantee of EUR 30 at maturity.

In contrast to the CPPI, the MMRS strategy generates a total fund value of EUR 43.88 in the good scenario (see Figure 19) and a total fund value of EUR 50.59 in the bad scenario (see Figure 20), which shows that MMRS significantly reduces the downside risk but at the expense of additional returns on the upside.

FIGURE 19: GOOD SCENARIO—FUND VALUE CPPI vs. MMRS OVER THE LIFETIME OF THE CONTRACT

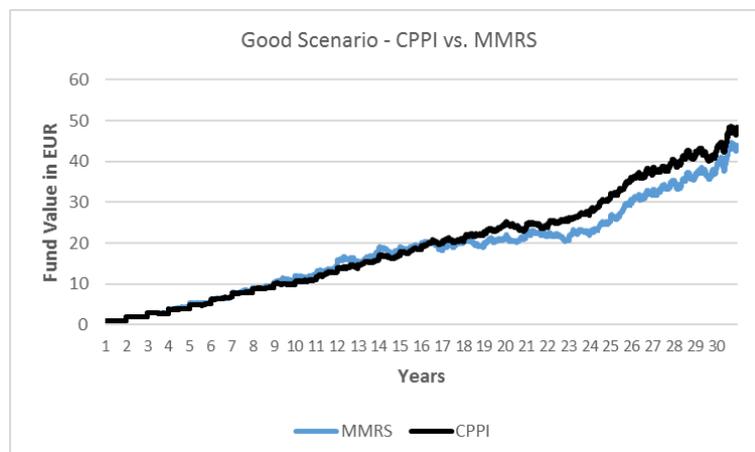
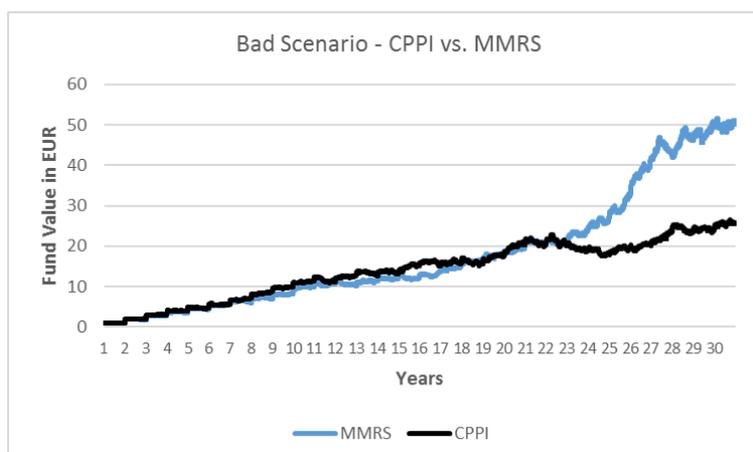


FIGURE 20: BAD SCENARIO–FUND THE VALUE CPPI vs. MMRS OVER THE LIFETIME OF THE CONTRACT



In total, the performed stochastic calculations over 1,000 simulations based on the sample insurance contract introduced above provide the following results (see Figure 21):

FIGURE 21: RESULTS OF THE SAMPLE CONTRACT BASED ON CPPI AND MMRS STRATEGIES

Parameter	CPPI	MMRS
Number of scenarios where:		
- the policyholder solely receives the guarantee	66 (6.6%)	38 (3.8%)
- the insurance company suffers a loss		
Policy holders perspective		
Average receivable amount at maturity for the policy holder	EUR 56.13	EUR 65.47
Shareholders perspective		
Average receivable amount at maturity for the shareholder	EUR 1.23	EUR 1.83

On average, the MMRS strategy outperforms the CPPI strategy over 1,000 stochastic simulations. This observation holds true from both the policyholder's perspective and shareholder's perspective. In a bad scenario or more precisely a scenario with poor fund performance compared to average fund performances, the MMRS strategy significantly outperformed the CPPI strategy at maturity. The fund value under CPPI amounts to less than EUR 30 at maturity, so shareholder capital injections are necessary in order to fulfill the guarantee of paid-in premiums to the policyholder. Given the poor performance of equities, the CPPI has to shift the invested money into bonds and is not able to participate in the upside of the market ('cash lock-in' risk of CPPI). Whereas MMRS, by design, forces the fund to reinvest in equity and avoid cash-locking through:

1. the nature of reallocation when volatility subsides
2. the reduction in the capital protection hedge when prices recover
3. physical reinvestment of cash payoffs from hedges that are reinvested in the underlying fund

In contrast, the performance of both strategies in the good scenarios, when equity returns are rather high, the CPPI strategy outperforms the MMRS, since the CPPI strategy better partakes in this given positive performance, whereas the MMRS reduces volatility at the expense of additional returns. Nevertheless, MMRS has more parameters to calibrate and so more flexibility to refine the strategy to specific desired risk/return preferences.

The reader should be aware that this case study does not claim to be complete in terms of possible outcomes when amending the underlying assumptions. The results and views expressed herein are those of the authors only and are based upon the specific outline scenarios. For instance, other outcomes could occur with regular withdrawals and/or the allowance for contract termination within the contractual period.

4. CAPITAL EFFICIENCY UNDER SOLVENCY II

In addition to low interest rates, and knock-on effects on new business volumes and the profitability of European life insurers, the implementation of the revised supervisory regime “Solvency II” in January 2016 is another central driver for recent product innovations in the European life insurance industry. Solvency II has led to a need for more capital efficient products. This section is dedicated to the benefits in terms of capital efficiency and the effects on the Solvency II risk capital applying the standard formula of the innovative insurance products from chapter two as well as MMRS from chapter three.

In terms of capital efficiency under Solvency II, the risk modules for equity, interest rates, asset default, and underwriting are the key components of the overall regulatory risk capital. The following table compares the effects of the three sample products, as discussed in chapter two, Perspektive and Index Select by Allianz Lebensversicherung AG and ‘VorsorgeInvest Premium’ by Zurich Deutscher Herold Lebensversicherung AG and their overall impact onto the market-value balance sheet under Solvency II.

FIGURE 22: COMPARISON OF CAPITAL EFFICIENCY FOR THE INNOVATIVE PRODUCTS IN GERMANY

	Perspektive (AZL)	Index Select (AZL)	VorsorgeInvest Premium (ZDHL)
Market Value Balance Sheet (MVBS)	Reduction of time value of the guarantee due to lower and flexible guarantees	Reduction of time value of the guarantee due to lower guarantees	Significant reduction of time value of the guarantee due to lower guarantees and lower duration gap because of investment in funds
	Slightly lower risk margin due to lower underwriting stresses (see below)	Slightly lower risk margin due to lower underwriting stresses (see below)	Slightly lower risk margin due to lower underwriting stresses (see below)
Equity Risk Capital	No impact (see capitalization)	Slight increase due to guarantee on bonuses invested in equity	Slight increase due to additional investment in equities
Interest Rate Risk Capital	Lower due to lower guarantees	Lower due to lower guarantees	Significantly lower due to lower guarantees and partial investment in equities
Default Risk Capital	No impact (see capitalisation)	No impact (see capitalisation)	No impact
Underwriting Risk Capital	Slightly lower longevity risk and potentially lower lapse risk (in case of lapse down risk)	Slightly lower longevity risk and potentially lower lapse risk (in case of lapse down risk)	Slightly lower longevity risk and potentially lower lapse risk (in case of lapse down risk)

In summary, both products from AZL appear to be very similar to traditional products bearing slightly less guarantees and thus result in marginal advantages in terms of capital efficiency compared to pure traditional products. However, ZDHL’s UL product with guarantee mechanism i-CPPI significantly reduces the time value of options and guarantees and the risk margin. Therefore, VorsorgeInvest Premium is, in comparison, more capital efficient than both of the Allianz products, from a Solvency II perspective, even if the equity risk capital for ZDHL’s product slightly higher.

MMRS AND CAPITAL EFFICIENCY

The case study in the previous chapter has shown that Milliman FRM's MMRS might also be a competitive strategy for UL products in European countries. Therefore, we will integrate a MMRS based product into the comparison, as shown in the prior chapter and answer the question of how the MMRS strategy acts under Solvency II.

Based on the selection of innovative products in the German life insurance market introduced in chapter two, the CPPI-based product emerged to be potentially the most profitable and capital efficient, and it will serve as the reference product for our subsequent analysis below.

With respect to profitability, the case study has shown that applying MMRS can significantly increase the product's value as compared to a CPPI-based product (see Figure 14). The case study outlined that in poor market environments the MMRS strategy results in higher returns for both the policyholder and the shareholder. Even if the profitability of the MMRS strategy ranks behind the CPPI strategy in a benign or increasing market environment, on average the overall profits applying the MMRS strategy outperform the CPPI strategy.

However, in the context of Solvency II the profitability of a product cannot solely be the only driving force when weighing the total impact of a product to an insurance company. The product's capital consumption can influence an insurer's capital capacity to write new business, so it needs to be taken into account. For a suitable evaluation of an MMRS-based product's capital efficiency, it is necessary to evaluate the impact on each main driver for an insurer's risk capital and their impact on the market value balance sheet (MVBS) as well (as conducted in the prior comparisons above). Therefore, we compare the related impact of the CPPI-based product and the MMRS-based product, respectively, to the still predominating traditional life insurance products available in the German life insurance market (see Figure 23).

Since the MMRS strategy does not shift gross parts of the asset portfolio into bonds to avoid losses in bear markets, as seen for CPPI-based products (see Figure 18), but rather relies on an efficient hedging strategy mainly rebalancing between equity and cash, the interest-rate risk will be reduced significantly under poor market conditions. On the other hand, in increasing markets the interest-rate risk will remain almost at the same level as under a CPPI strategy, such that the impact in total will be an additional reduction of the interest-rate risk capital compared to traditional products and CPPI-based products.

On the other hand, the equity risk capital will be slightly higher in bear markets under MMRS and will remain on the same level in bull markets, with the same argumentation as for the interest-rate risk capital resulting in a slightly higher equity risk capital in total. Moreover, the MMRS strategy will, in comparison to the other products, generate slightly higher default risk capital (as the algorithm typically works on the basis of hedge instruments which introduce more counterparties), which will cause an additional default risk capital. The underwriting risk capital, however, will remain on the same level as under a CPPI algorithm.

Briefly, the impact of an MMRS-based insurance product could potentially help give some significant balance-sheet optimisation. It can help release interest-rate risk capital, as it places less reliance on bonds for risk-management purposes. In addition, MMRS can significantly reduce the time value of guarantees as a part of the MVBS, more so than the compared CPPI-based product. This is because the embedded 'capital protection' hedging strategy helps to significantly reduce the number of scenarios in which capital injections are necessary to provide the guarantee (see Figure 14).

FIGURE 23: COMPARISON OF THE CAPITAL EFFICIENCY—CPPI AND MMRS vs. TRADITIONAL PRODUCTS

	CPPI based product	MMRS based Product
Market Value Balance Sheet (MVBS)	Significant reduction of time value of the guarantee due to lower guarantees and a lower duration gap because of investment in funds Slightly lower risk margin due to lower underwriting stresses (see below)	Significant reduction of time value of the guarantee due to lower guarantees and a lower duration gap because of investment in funds Slightly lower risk margin due to lower underwriting stresses (see below)
Equity Risk Capital	An increase due to additional investment in equities, which is variable and dependent on market environment.	An increase due to additional investment in equities, which is variable and dependent on market environment.
Interest Rate Risk Capital	Significantly lower due to lower guarantees and partial investment in equities	Significantly lower due to lower guarantees and partial investment in equities, Significantly lower than under CPPI due to avoidance of a shift to bonds in bear markets
Default Risk Capital	No impact	Slightly increased due to a hedging strategy based on derivatives
Underwriting Risk Capital	Slightly lower longevity risk and potentially lower lapse risk (in case of lapse down risk)	No impact compared to CPPI based products (based on product configuration, but no impact through MMRS)

From a solvency perspective, both the CPPI and the MMRS strategy can lead to higher volatility in terms of risk capital compared to a traditional insurance product, which is due to more frequent variation in risk exposures.

However, besides reducing the solvency capital requirement (SCR), the MMRS can help stabilize the guarantee best estimate liability (BEL) by valuing the guarantee BEL with a constant volatility assumption, and bring stability to the Solvency II balance-sheet over time. When experiencing severe market stress, the insurer benefits from the protection provided by the hedge assets used to execute the MMRS strategy, which deliver cash payoffs to offset the fall in fund value that drives the reduction in value in force VIF.

For more detailed information on the MMRS under Solvency II, in particular using a (partial) internal model or standard formula and possible treatment of the overlay strategy as an alternative solution in the context of capital efficiency, please refer to “Milliman Managed Risk Strategy: A Capital Efficient Alternative Under Solvency II” by Neil Dissanayake.

5. CONCLUSION

In this paper, we have focused on the problems and possible solutions of recent developments in the European life insurance market arising from a set of different factors stemming from the current economic and regulatory environment of European life insurers. More precisely, the area of conflict arises from the current low interest rate environment combined with a new supervisory regime, Solvency II, which came into effect on 1st January 2016, combined with the typical European life insurance business, predominated by traditional life insurance products, including high and long-term guarantees sold over past decades.

The majority of European life insurance companies have responded to this challenging situation with a gradual adaptation of their product portfolio by moving away from traditional life insurance products in favour of both capital efficient products on the one hand and profitability on the other hand for their future new business strategy. By using the example of the German life insurance market, where interest rates have dropped significantly over recent years, we have analysed three examples of recently launched innovative life insurance products and classified their impact with respect to their capital efficiency. Our analysis suggests two of these innovative products are still broadly traditional products with slightly lower guarantees, and with only limited improvement in terms the capital efficiency. However, the CPPI-based UL product showed (in comparison to traditional life insurance products with fixed guarantees) a notable positive effect on the corresponding risk capital charges through a significant reduction in the companies' time value of guarantees.

We also highlighted that product innovation in the European market is tending strongly towards protected UL products, as well as the new traditional product with an index linkage providing lower guarantees and more flexibility, while also giving upside investment return opportunities.

In addition to these insights, our survey has shown another viable way to respond to the actual situation within the European life insurance market. Using the example of a simplified investment-linked annuity contract, our case study outlined that the integration of other competitive dynamic hedging strategies besides the CPPI mechanism, i.e. the 'Milliman Managed Risk Strategy™' (MMRS), can add an additional positive value for both the overall potential returns for policyholders and shareholders and also deliver product capital efficiency.

As a result, the application of dynamic asset allocation using effective hedging strategies for investment-linked life insurance products can provide an efficient solution for European life insurers to answer to the current economic and regulatory environment that is putting increasing pressure on profitability and on the in-force books. By providing opportunity for upside returns in a low interest rate environment, by checking the global markets more frequently and, if necessary, rebalancing underlying assets multiple times during a trading day, these instruments simultaneously enable insurance companies to offer attractive new innovative life insurance products with an upside potential that sustainably cushions capital intensity under Solvency II.



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