European Insurance Watch

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Solvency II driven rebalancing will amplify trends in EUR rates

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- **Our Solvency II Insurance Model helps us to identify the rebalancing and hedging needs of European insurers under our Base Case, Higher and Lower interest rate scenarios**
- **In our Base Case scenario not much rebalancing would be expected in the bond portfolios in 2018. However paying flows in EUR swaps would be needed, consequently putting bear flattening pressure on the long end and ultra-long end**
- **Rebalancing in the Higher Interest Rate scenario requires duration shortening in the EGB and credit portfolio, while improvement in credit quality is needed in the latter via covered bonds**
- **In addition it will also require insurers to pay in swaps. A fundamentally driven rise in interest rates will be followed by a Solvency II driven second round effect. This enforces the upward trend with increased volatility, resulting in steepening pressure in 10s30s and flattening pressure in 30s50s**
- **A significantly lower interest rate scenario would require a decent duration extension of the EGB portfolio and an increase in the hedge ratio**
- **A sharp drop in rates will also experience a second round effect with decent receiving flows expected in 20y to 30y area in EUR swaps, resulting in significant flattening pressure in 10s30s and significant steepening pressure in 30s50s**

Navigating the rates market is quite a challenge for European insurers with the regulatory constraints they have to face

With almost EUR 7 trillion assets under management, the European insurance sector has the potential to be a strong force behind the fixed income and EUR swaps market. To this end, we follow up on our Dutch pension fund research, where we have analysed the hedging behaviour of pension funds under different interest rate scenarios. In this note we will take a closer look at the impact of three interest rate scenarios on the aggregated Solvency II balance sheet of the total European insurance sector. We have identified the four main rebalancing parameters that could be used to steer the Solvency Ratio, these are the duration of the EGB and credit portfolio, the credit quality of the credit portfolio, the EUR swap overlay and the overall hedge ratio. We then look at how their hedging and rebalancing behaviour would impact the EUR rates market.

Our 'Solvency II Insurance model' is our proxy for the European insurance sector, giving us insights in the LDI rebalancing efforts in EUR rates

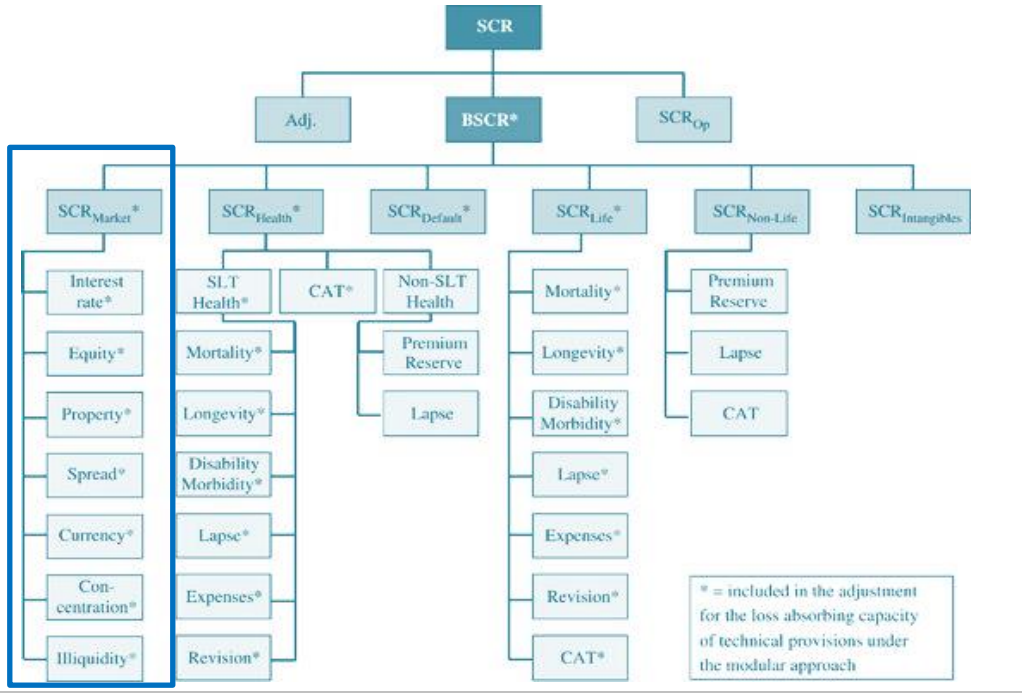
Our model combines the aggregated Solvency II balance sheets of each country in the eurozone. We then assume that the Standard Model under Solvency II is being applied for calculating the Solvency Ratio. Discussing all the details of the Solvency II regulations is beyond the scope and goals of this research note, therefore we will briefly discuss the key risk management elements of Solvency II to put our research findings into context.

What are Solvency II, Solvency Ratio, SCR, and the 'Standard Model'?

The key focus in our research is to understand how fixed income markets are impacted under Solvency II when insurance companies try to stabilize their Solvency Ratios. Solvency II aims to capture the actual risk that insurers assume and therefore to assess an insurer's financial health. The Solvency Ratio is therefore the regulatory metric that quantifies the financial health of an insurer as it incorporates all the business related risk an insurer is facing. The Solvency ratio is defined at the ratio between an insurer's 'Own Funds' and its 'Solvency Capital Requirements' (SCR) with the latter also known as the 'Required Own Funds'. The ratio therefore indicates the degree in which an insurer has a sufficient buffer on its balance sheet compared to the buffer it should hold given the amount of risk it has assumed. The SCR can be calculated with the Standard Model or according to the (partial) internal model approach. The Standard Model consists of various risk modules, with each risk module having its own capital requirements (i.e. SCR). The capital requirements of all these risk (sub-) modules are then aggregated according to specific correlation matrices.

Our Model simulates the SCR for Market Risk only and assumes other risk modules as constants

SCR Market Risk with its various market risk sub-modules (in blue rectangle)



Source: European Insurance and Occupational Pensions Authority (EIOPA)[1]

[1] '*The underlying assumptions in the standard formula for the Solvency Capital Requirement calculation*', EIOPA, 25 July 2014, https://eiopa.europa.eu/Publications/Standards/EIOPA-14-322_Underlying_Assumptions.pdf

According to EIOPA, “the standard formula for Solvency Capital requirements (SCR) aims to capture the material quantifiable risks”…and, “a standard formula is, by its very nature and design, a standardised calculation method, and is therefore not tailored to the individual risk profile of a specific undertaking.”[2] This means that whenever an insurance company uses the standard model it uses the same calculation methodology and shocks for determining the capital requirements as any other insurance company. Obviously this can result in quite stringent capital requirements given a specific companies’ risk inherent in its insurance business.

For our analysis we want to show how the Solvency Ratio of an insurance company is impacted under different interest rate scenarios and assess the likely rebalancing of a European insurer and its impact on the fixed income markets. Therefore, we focus on how the SCR for market risk changes under these scenarios. This in combination with simulating the Own Funds we are able to calculate the changes in Solvency Ratio in a particular scenario.

The more advanced insurance companies are more likely to use the (partial) internal model approach. But according to the EIOPA 2016 Insurance Stress Test Report, 81% of the insurance companies used in its sample (i.e. 236 companies from 30 countries) were standard formula users. Furthermore, the Standard Model is easiest to model as the internal model is company specific with the results being almost impossible to proxy. Therefore, we feel comfortable assuming the Standard Model as the basis for our Solvency Ratio calculations.

Our current aggregated European Solvency II balance sheet as our starting point

We have identified the key asset allocation ‘parameters’ for rebalancing the asset allocation and to stabilize our Solvency Ratio

According to our Solvency II Insurance Model, which is based on the Solvency II ‘Standard Model’, the modified duration of our simulated life insurance liabilities is 11.5, which is slightly lower than the European average of 12.1. We must note that the range in modified duration of European insurers is relatively wide ranging from 5.23 to 21.4. This clearly shows that the characteristics of the insurance policies and consequently the liabilities are quite different across European countries.

According to our model we estimate that the Solvency Ratio of our aggregated European Solvency II balance sheet is approximately 287%, vis-à-vis the European median of 210%. Given the wide range of Solvency Ratios across insurance companies, we believe that our model results are in line with expectations, especially as we have no detailed insights in the actual composition of holdings within each asset class and the exact structure of the insurance liabilities.

In our scenario analysis we assume that most of the rebalancing to protect the Solvency Ratio will materialize via adjusting the duration of the government bond portfolio, the duration of the credit portfolio, the credit quality of the credit portfolio, the swap overlay and by adjusting the (interest rate risk) hedge ratio. Furthermore, according to the Standard Model, eurozone government bonds are not accounted for in the spread risk and concentration risk sub-

[2] ‘*The underlying assumptions in the standard formula for the Solvency Capital Requirement calculation*’, EIOPA, 25 July 2014, https://eiopa.europa.eu/Publications/Standards/EIOPA-14-322_Underlying_Assumptions.pdf

module. Therefore, the credit quality of the government bond portfolio is irrelevant as a parameter that could be adjusted to stabilize the Solvency Ratio under the various interest rate scenarios.

Box 1: Portfolio rebalancing for stabilizing Solvency Ratio	
Modified Duration Liabilities	11.5
Solvency Ratio	287%
Duration EGB Portfolio	6
Duration Credit Portfolio	5
Credit Quality Credit Portfolio	2
Hedge Ratio	80%

Finally, very little information can be found regarding the use of derivatives and swaps in particular. However, given the fact that clearing has become mandatory for European insurers, additional cash needs to be held to adhere to the cash variation margin requirements. So at first glance we could expect most of the rebalancing to be executed via the bond portfolio. However, to minimize the basis risk and for liquidity purposes, we still assume that 50% of the duration matching will be achieved via swaps and 50% via bonds.

As the regulatory regime and the liability distribution of pension funds and insurance companies are distinctly different, potential market impact is as well

In our analysis of how pension funds and insurance companies hedge their liabilities and how they react to various interest rate scenarios we find opposite results. In contrast to the risk management strategies employed by many Dutch pension funds we find that Dutch and European insurers maintain a relatively high hedge ratio. We estimate this to be on average between 70%-80%. This means that there is less incentive to increase / decrease hedge ratios when interest rates rise / drop, contrary to what we have found for Dutch pension funds.

Therefore in our scenario analysis we will assume that a typical European insurer will try to stabilize the level of its Solvency Ratio while minimizing the rebalancing efforts. As we run our scenarios on an aggregated European Solvency II balance sheet, the resulting rebalancing flows are quite sizable. We would therefore like to emphasize that these rebalancing and hedging flows would occur gradually during a trend when interest rates increase or decrease and shouldn't be interpreted as an immediate rebalancing.

Solvency Ratio could be improved by shortening the duration of the government bond portfolio. Improved credit quality and shorter duration of the credit portfolio is also beneficial

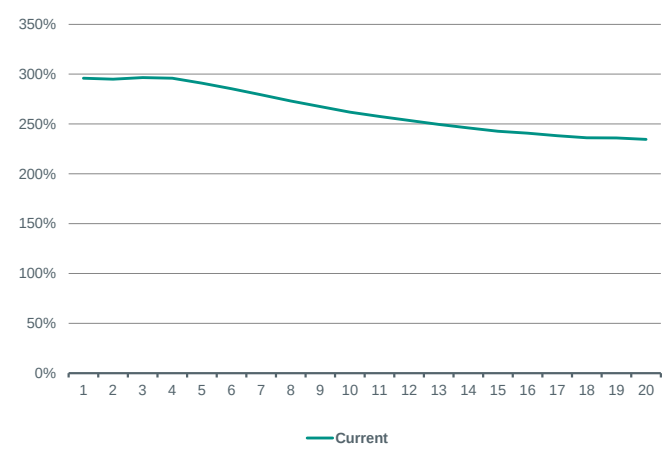
Firstly, in the graph on the left hand side we find that shortening the duration of the government bond portfolio increases the Solvency Ratio as it reduces the SCR for interest rate risk, assuming that other factors remain stable. There is a slight convex relationship between duration and the Solvency Ratio and this sensitivity will change under the different interest rate scenarios, which we will discuss shortly.

Secondly, in the graph on the right hand side we find that the sensitivity of the Solvency Ratio for the composition of the credit portfolio is dependent on changes in the credit quality (i.e. rating buckets) and the duration of the credit portfolio. The reason being is that this cascades through to the SCR for interest rate risk, spread risk and concentration risk sub-modules

under the 'Standard Model'. We can clearly see that we could maximize the Solvency Ratio by improving the credit quality - that is a lower credit quality step - and decreasing duration. Finally, we will use these graphs to indicate the changes in sensitivity of the Solvency Ratio to these parameters under the three interest rate scenarios.

Solvency ratio sensitivity to duration of government bond portfolio

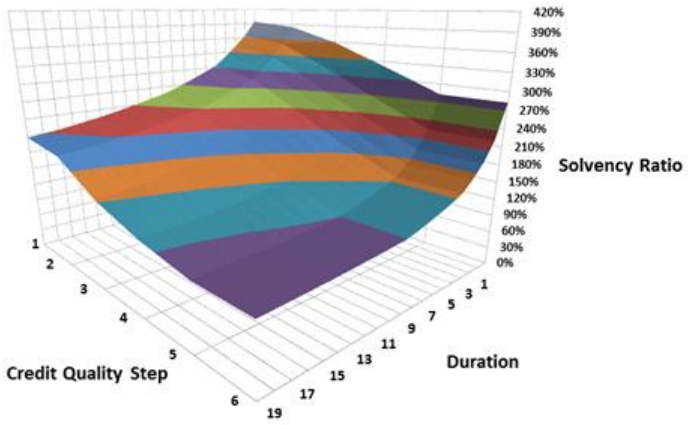
Solvency Ratio (%), duration government bond portfolio



Source: ABN AMRO Group Economics

Solvency Ratio sensitivity to characteristics of credit portfolio

Solvency Ratio (%), duration (years), credit quality step



Source: ABN AMRO Group Economics

Rebalancing could lead to realizing profits or losses and therefore have accounting and tax implications, thus our flow estimates are on the higher side of what could be expected

Stabilizing the Solvency Ratio is a delicate process where the various rebalancing parameters need to be adjusted accordingly and simultaneously for minimal rebalancing efforts and for maintaining the desired risk and return profile. We assume that profit taking will be avoided as much as possible to limit the accounting and tax implications. We also assume cash neutral rebalancing when shortening or extending duration of the bond portfolios as much as possible to reduce the additional cash needs. Additionally, the adjustments in the parameters are chosen such that it minimizes rebalancing efforts in swaps, but still helps to stabilize the Solvency Ratio.

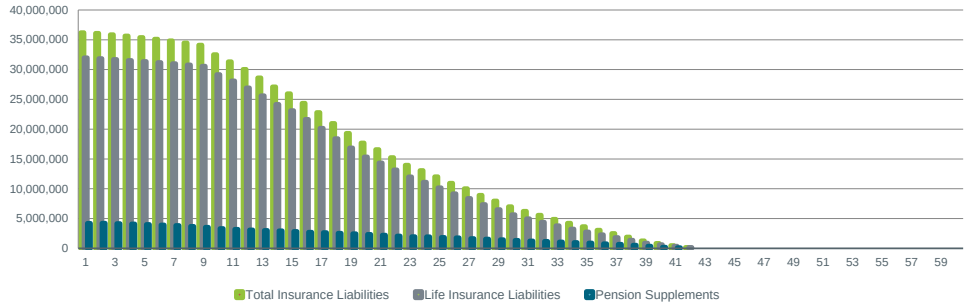
However, the rebalancing strategy is dependent on the liability distribution of an insurance company. That liability profile is distinctly different compared to a typical pension fund

Important to note is the distinct difference between the liability profile of a typical life insurer and a (defined benefit) pension fund as illustrated below. A typical (defined benefit) pension fund will guarantee the nominal pension pay out at retirement, which requires some actuarial calculations to project these future cash flows.

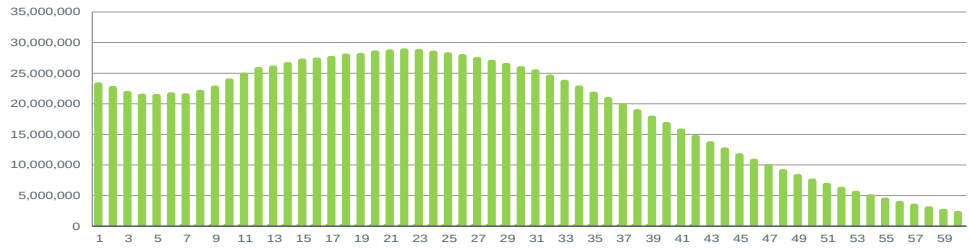
According to the EIOPA 2016 Stress Test 68% of total liabilities are life insurance liabilities. Therefore, for our Solvency II Insurance model we have assumed that the insurance liabilities are characterised by life insurance contracts that pay out at death. To simplify matters, we have also assumed the Dutch tax regime to determine the maximum allowable pension supplement that could be built up via a life insurance contract.

Projected life insurance liabilities are distinctly different from a typical pension liability

Nominal cash flows, insurance liabilities (EUR), Maturity (Years), (based on simulated population of 3,000 policy holders)



Nominal cash flows, pension liabilities (EUR), Maturity (Years), (based on simulated population of 3,000 plan participants)



Source: ABN AMRO Group Economics

We need to understand these different liability distributions in order to formulate a view on the LDI strategies in our analysis

Due to the sheer size of the total European insurance sector, we believe that under Solvency II these companies could have a potentially larger impact on EUR swaps than European pension funds, but their rebalancing and hedging strategies are not straightforward.

Firstly, under Solvency II liabilities are discounted by the UFR curve[3], which is the EUR swaps curve up to the 20y point and is extrapolated to the UFR of 4.2% using a Smith-Wilson extrapolation method (we have also assumed a 7bps volatility adjustment[4]). The way the UFR curve is derived under Solvency II is different than the one used for the Dutch pension system. The Solvency II UFR curve in combination with its distinct liability distribution will lead to different rebalancing flows in EUR swaps, as the hedging and rebalancing requirements and basis point sensitivity across the curve will vary significantly between a pension fund and an insurance company.

Secondly, a Dutch pension fund aims to achieve its target coverage ratio, which is simply the ratio between the value of its assets and the present value of its liabilities. This target coverage ratio is also a function of the amount of risk a pension fund assumes. However, under Solvency II, an insurer steers according to its Solvency Ratio and therefore the different interest rate scenarios would demand a different LDI strategy. Finally, in our Solvency II Insurance model we also take into account the rebalancing needed in the government bond and credit portfolio besides the swap overlay.

[3] '*EIOPA sets out the methodology to derive the ultimate forward rate'*, 5 April 2017, https://eiopa.europa.eu/Publications/Press%20Releases/2017-04-05%20UFR%20Press%20Release.pdf

[4] Volatility adjustment: an additional spread over the discount curve to mitigate the short term volatility in the own funds taking into account the long term characteristics of the insurance business. Average volatility adjustment for Europe as in the Risk Free Curves with VA published by EIOPA on 31 August 2017 is approximately 7bps.

All in all, we have to analyse the impact of different scenarios on the whole balance sheet to assess the rebalancing efforts in the EGB, credit and swap portfolios

After each interest rate scenario the balance sheet of an insurance company changes as the assets change in value and the liabilities are impacted as well. The Solvency Ratio changes as the SCR shocks are applied on changed balance sheet levels i.e. on the different asset classes and on the discount curves. Furthermore, as the liabilities are discounted against a UFR curve, which is relatively static compared to the swap curve and other EGB curves, and the duration of the liabilities isn't perfect matched, a mismatch in hedging the liabilities with the bond and swap portfolio will occur. Additionally, there will also be a difference in convexity between the assets and liabilities. Taking into account the fact that the SCR changes after a specific interest rate scenario and that the asset and liabilities are affected by different discount curves, we will see that a rise or drop in rates does not necessarily have an intuitive impact on the Solvency Ratio at first glance.

Transitional measures within Solvency II should be taken into account when interpreting the results of our scenario analysis

We must also mention that EIOPA allows for transitional measures to allow a smooth transition from Solvency I to Solvency II with the latter introduced in 2016. This means that – amongst other measures – the discount curve used by insurers in Europe could currently be different than the UFR curve as set forth by EIOPA. In our analysis we assume that all European insurers already discount their liabilities against the UFR curve and that they already completely following the Solvency II requirements. This in order to be able to gain a general understanding of the behaviour of the European insurance sector now and in the future.

Scenario 1: Our updated Base Case scenario for Euro rates

Not much rebalancing is expected coming year, but mind the paying flows which should accompany the rise in rates with more volatility

Following our updated base case for Euro rates we expect the first deposit rate hike in the second half of 2019. We expect the 10y Euro swap rate to rise to 1.10% and 30y to 1.75% by Q4 2018. We expect that the favourable net adjusted supply dynamics and subdued inflation expectations will put a lid on upward pressure in Bunds in 2018 and with a cascading effect on Euro swaps.

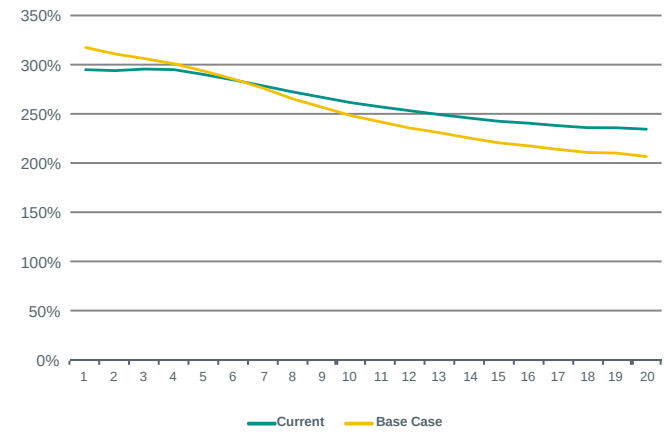
Box 2: Portfolio rebalancing for stabilizing Solvency Ratio @286%	
Modified Duration Liabilities	11.35
Solvency Ratio without rebalancing	286%
Duration EGB Portfolio	6
Duration Credit Portfolio	5
Credit Quality Credit Portfolio	2
Hedge Ratio	80%
Solvency Ratio after rebalancing	286%

Our base case scenario for the coming year implies a rise of the Euro swap curve by approximately 20bps to 30bps and a flattening in 10s30s. This rise in rates only slightly impacts the Solvency Ratio, which only drops by 1% to 286%. We find that this slightly higher interest rate scenario introduces more convexity in the relationship between the Solvency

Ratio and the duration of the government bond portfolio as can be seen in the graph below on the left-hand side. Additionally, as can be seen in the surface graph on the right-hand side, we find that the sensitivity of the Solvency Ratio for changes in the duration of the credit portfolio increases as well, while the sensitivity for the credit quality becomes less pronounced compared to the current starting point. This means that in our base case scenario - if needed - steering and stabilizing the Solvency Ratio can be achieved entirely by steering the duration of the government bond and credit portfolio.

'Convexity' appears in Solvency ratio sensitivity to EGB duration

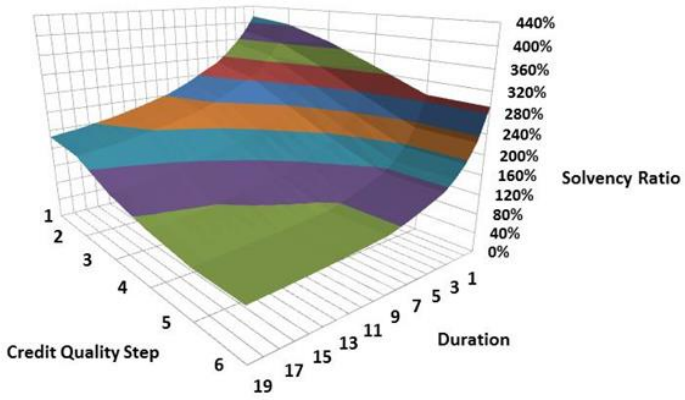
Solvency Ratio (%), duration government bond portfolio



Source: ABN AMRO Group Economics

Higher sensitivity Solvency Ratio to duration of credit portfolio

Solvency Ratio (%), duration (years), credit quality step (without rebalancing

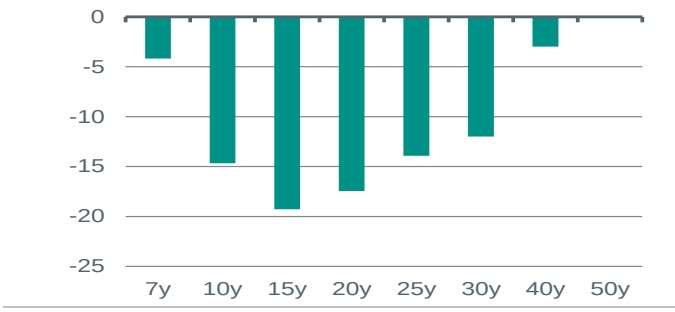


Source: ABN AMRO Group Economics

However, in order for an insurance company to keep the hedge ratio constant at 80% and to keep the government bond and credit portfolio unchanged, some paying in swaps would be needed. In the graph below on the left-hand side we find that this would result in paying flows across the EUR swaps curve, with the majority of the paying concentrated in the 10y to 25y part of the curve.

Base Case Scenario: aggregate EUR swaps rebalancing

Receiving (in Mn bpv), Maturity Buckets, (negative values denote paying)



Source: ABN AMRO Group Economics

Flattening / steepening pressure after swap overlay rebalancing

Curve Spreads EUR Swaps, Total Receiving (in Mn bpv)

7s10s	(10.48)
10s20s	(2.79)
10s30s	2.68
15s25s	5.35
20s30s	5.46
30s50s	12.00

Source: ABN AMRO Group Economics

We would expect these paying flows to materialize during 2018 as our base case interest rate scenario starts to materialize. These expected paying flows would result in steepening pressure in 7s10s and 10s20s and significant flattening pressure in 30s50s in EUR swaps.

Scenario 2: Higher Interest Rate Scenario: Return to Pre-ECB QE Environment

Even with aggressively higher rates the Solvency Ratio gets hit hard

For our higher interest rate scenario we assume the levels and shape of the EUR swaps curve prior to Mr. Draghi's Jackson Hole speech on 22 August 2014. That was when he indicated that the ECB would stand ready to launch a QE programme if downside risks to inflation materialised. We find that an aggressive rise in rates does indeed decrease the Solvency Ratio quite dramatically. There are several reason for this. Firstly, the relatively high hedge ratio decreases the value of the swap and bond portfolio when rates rise vis-à-vis the liabilities. But most importantly, the SCR for interest rate risk is calculated based on the Solvency II balance sheet after a sharp rise in interest rates. The shocks for calculating the SCR for interest rate risk - as defined in the Standard Model - are applied on lower balance sheet levels in this scenario. The change in Basic Own Funds is relatively large as after applying these SCR interest rate shocks have a larger impact on the asset side compared to the liabilities. As we are discounting the liabilities against the UFR, the liabilities decrease less compared to the asset side of the balance sheet. Consequently leading to a deterioration in the Solvency Ratio.

Box 3: Portfolio rebalancing for stabilizing Solvency Ratio @250%	
Modified Duration Liabilities	10.8
Solvency Ratio without rebalancing	158%
Duration EGB Portfolio *	**4**
Duration Credit Portfolio *	**3**
Credit Quality Credit Portfolio *	**1**
Hedge Ratio *	**75%**
Solvency Ratio after rebalancing	250%

* Adjusted parameters indicated in blue

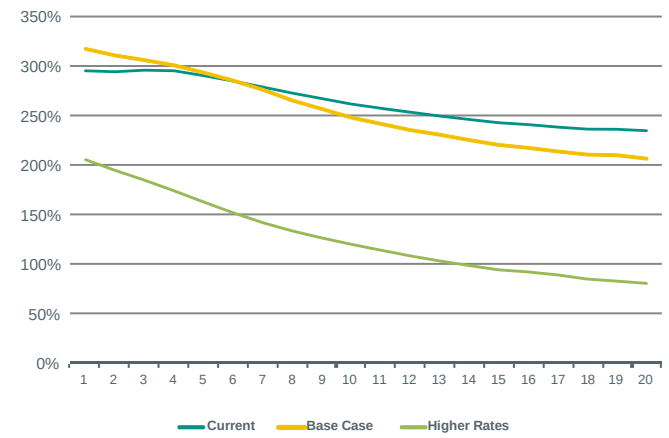
Rebalancing requires duration shortening in the government and credit portfolio, improvement in credit quality via covered bonds and paying in EUR swaps

In our higher interest rate scenario we find that the modified duration of the liabilities decreases. The government bond and swap portfolio will move roughly in line as well, however as the hedge of the liabilities via the government bond and swap portfolio is imperfect, a rebalancing on the asset side should still take place. At the same time the Solvency Ratio needs to be protected as much as possible when rates move higher.

Firstly, this can be achieved via shortening the duration of the government bond portfolio. As we find - in the graph below - that the relationship between the Solvency Ratio and the duration of the government bond portfolio becomes more convex, steering the Solvency Ratio via the duration of the government bond portfolio becomes more effective. We must note that the government bond portfolio remains important for duration matching purposes, therefore shortening the duration too drastically wouldn't be optimal.

Shortening duration of EGB portfolio helps to boost Solvency Ratio

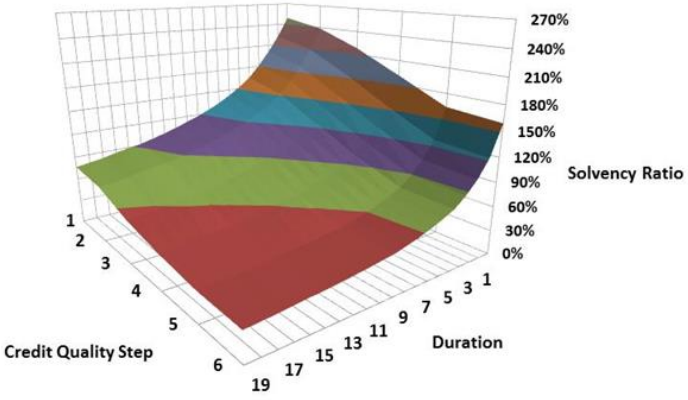
Solvency Ratio (%), duration government bond portfolio



Source: ABN AMRO Group Economics

Credit quality becomes less relevant in steering Solvency Ratio

Solvency Ratio (%), duration (years), credit quality step

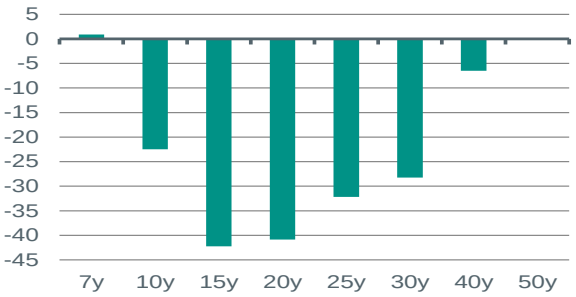


Source: ABN AMRO Group Economics

Secondly, when we look at the relationship between the Solvency Ratio and the credit quality and duration of the credit portfolio, we find that in this higher interest rate scenario duration becomes more important vis-à-vis the credit quality. We therefore shorten the duration of the credit portfolio as rates continue to move higher. At the same time we could try to improve the credit quality of the credit portfolio by moving from credit quality step 2 (A+ / A-) to credit quality step 1 (AAA / AA-). The latter would help to further increase the Solvency Ratio as well. In order to achieve this significant improvement in average credit quality one would need to overweight highly rated covered bonds as the availability of AAA to AA- rated corporate credits are relatively scarce. Additionally, the need for higher yielding paper would become less of a priority when rates rise dramatically, compared to when rates are at extreme lows.

Higher Rates Scenario: aggregate EUR swaps rebalancing

Receiving (in Mn bpv), Maturity Buckets, (negative values denote paying)



Source: ABN AMRO Group Economics

Flattening / steepening pressure after swap overlay rebalancing

Curve Spreads EUR Swaps, Total Receiving (in Mn bpv)

7s10s	(23.35)
10s20s	(18.40)
10s30s	(5.79)
15s25s	10.05
20s30s	12.61
30s50s	28.25

Source: ABN AMRO Group Economics

Thirdly, in the trend upwards in rates and following the duration shortening of our bond portfolios and the decrease in hedge ratio from 80% to 75%, the rebalancing in swaps would require a significant amount of (outright) paying. The largest paying flows are concentrated in the 15y and 20y area as can be seen in the graph above on the left hand side. This distribution of paying flows across the curve would result in significant steepening pressure in 7s10s,10s20s and 10s30s. Additionally, these paying flows would also result in significant flattening pressure in 30s50s in particular.

Scenario 3: Lower Interest Rate Scenario: Pre-Draghi Speech July 2012

Stabilizing the Solvency Ratio will mainly be achieved via the government bond portfolio and a higher hedge ratio overall

For our lower interest rate scenario we assume the shift downwards in the EUR swaps curve from 3 January 2012 to just before Mr. Draghi's "whatever it takes" speech on July 2012. We will use this as a proxy for heightened political risk in the eurozone. According to the EIOPA 2016 Insurance Stress Test Report a scenario characterised by a sharp decline in interest rates and widening of credit spreads "…almost half of the respondents signalled the intention to increase their holdings of sovereign bonds". Also 20% of the survey respondents mentioned that their market impact in sovereign bonds rebalancing would have a 'large' and 'significant' impact on the market. However, these survey results don't necessarily mention whether the duration of the bond portfolio will be extended, as we would expect as a lower interest rate environment increases the modified duration of the liabilities. Additionally, the survey results are based on a percentage of respondents, while the AUM of the respondents have not been taken into account. Nevertheless, in our rebalancing decisions we have taken these survey results as an indicator, as much as possible, of how European insurers react to volatile market movements.

Box 4: Portfolio rebalancing for stabilizing Solvency Ratio @265%	
Modified Duration Liabilities	11.9
Solvency Ratio without rebalancing	226%
Duration EGB Portfolio *	**8**
Duration Credit Portfolio	5
Credit Quality Credit Portfolio	2
Hedge Ratio *	**90%**
Solvency Ratio after rebalancing	265%

* Adjusted parameters indicated in blue

"Mind the Poverty Trap!" The credit portfolio remains crucial for return

Furthermore, the shape of our credit portfolio surface is in line with the stress test report, which states that 24% of the respondents "…signalled their intention to sell non-investment grade financial sector and non-financial sector corporate bonds" in a scenario characterised by a sharp decline in interest rates and widening of credit spreads.

Indeed, enhancing the credit quality of the overall corporate bond portfolio would be one of the approaches to boost the Solvency Ratio in this scenario, even more so than lengthening the duration to facilitate a better duration matching. However, the 'poverty trap' should not be underestimated and therefore we assume that increasing the credit quality of the corporate bond portfolio would be avoided as much as possible, regardless of its ability to significantly improve the Solvency Ratio. Having enough exposure to higher yielding assets is crucial for reaching the insurance companies' return goals.

Interestingly, the dispersion of bond holdings over the credit quality spectrum as mentioned in the EIOPA stress test shows that approximately 60% of the corporate bond holdings are held in AAA to A buckets (i.e. credit quality steps 1 and 2 respectively) mainly in financials and covered bonds, with a significant concentration in the BBB bucket (i.e. credit quality step 3) of approximately 25%. With the latter mainly consisting of non-financials. We therefore believe

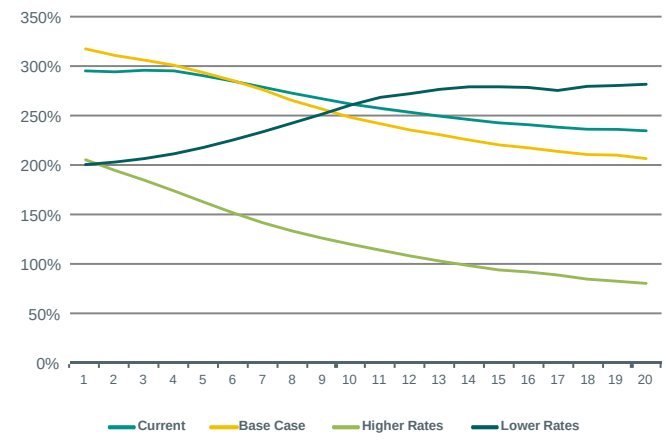
that a European insurer would leave the credit portfolio as it is to adhere to its return goals. At the same time stabilizing the Solvency Ratio could be achieved via changes to the government bond and swap portfolios.

Duration lengthening of the government bond portfolio and an increase in the hedge ratio will be needed to stabilize and limit the drop in the Solvency Ratio

To facilitate the duration lengthening of the government bond portfolio, shorter dated bonds could be sold in favour of longer dated government bonds in cash-for-cash like substitution.

Lengthen duration of EGB portfolio to boost Solvency Ratio

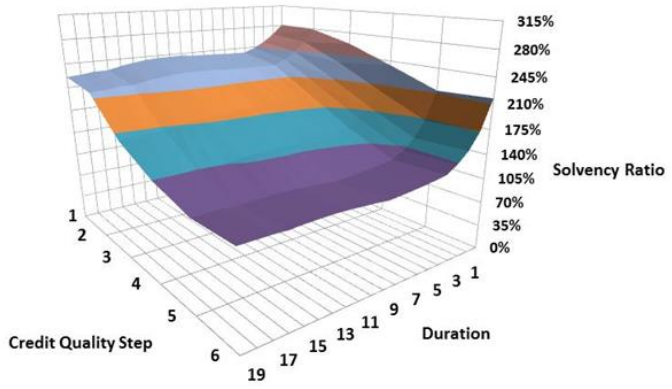
Solvency Ratio (%), duration government bond portfolio



Source: ABN AMRO Group Economics

Credit quality becomes more relevant in steering Solvency Ratio

Solvency Ratio (%), duration (years), credit quality step

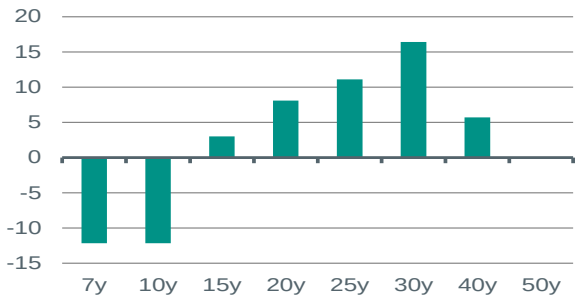


Source: ABN AMRO Group Economics

At the same time the hedge ratio would need to increase gradually during the drop in rates, which would trigger additional receiving in swaps. However, at the same time the cash need will increase as more bonds will need to be bought following the increase in the overall hedge ratio. We assume that 50% of the interest rate hedge consists of bonds and 50% is facilitated via swaps.

Lower Rates Scenario: aggregate EUR swaps rebalancing

Receiving (in Mn bpv), Maturity Buckets, (negative values denote paying)



Source: ABN AMRO Group Economics

Flattening / steepening pressure after swap overlay rebalancing

Curve Spreads EUR Swaps, Total Receiving (in Mn bpv)

7s10s	0.02
10s20s	20.25
10s30s	28.55
15s25s	8.11
20s30s	8.30
30s50s	(16.40)

Source: ABN AMRO Group Economics

All in all, the duration extension of the government bond portfolio would trigger paying in swaps when the hedge ratio remains constant. At first glance, when the duration of the liabilities increases, the overall hedge ratio would need to increase as well to stabilize the Solvency Ratio. This would require more receiving in swaps but also an increase in the size of

the government bond portfolio. However, the combined impact of duration lengthening of the government bond portfolio and consequently paying in swaps outweigh the additional swap receiving for the shorter maturities when the hedge ratio increases as seen in the graph above, resulting in paying flows up to 10y and receiving afterwards. Finally, these expected flows would result in significant flattening pressure in 10s20s and 10s30s and significant steepening pressure in 30s50s in EUR swaps.

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