Amundi
ASSET MANAGEMENT

Cross asset investment strategy

special focus

Research, Strategy and Analysis

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Asset class pro-cyclicality under Solvency II and the impact on asset allocation

Introduction

Insurance companies accuse Solvency II regulation of being too pro-cyclical; in the event of sudden adverse market movements the marked to market price asset valuation prompts them to pass the decrease in asset prices on to the value of AFR (Available Financial Resources). As a result, the insurer sees its solvency erode and may be prompted to reduce its risk by selling long-term assets at the worst possible moment. This pro-cyclicality causes insurers to be very reluctant to invest in risky assets. Aware of this problem, the regulator has introduced a dampening mechanism for equities (but not for other asset classes) that reduces the capital charge in the event of a sudden plunge in equity prices.

The primary purpose of this Special Focus is to offer a pro-cyclicality measure for assets under the solvency II standard formula. We will also make a few comparisons between asset classes.

1 How is pro-cyclicality or resistance to pro-cyclicality measured using the simple example of currency risk?

1.1 Principle

We first consider the simplest case of currency risk by calculating the impact of a downward scenario on the solvency ratio associated with a single position.

Starting with the insurer's solvency position we allocate a surplus of own capital, or AFR, proportional to the position's SCR (Solvency Capital Requirement) with a ratio equal to that of the insurer's original solvency ratio. We then apply a falling market scenario to this position and calculate the impact on the solvency ratio. Pro-cyclicality is associated with the fact that this downward scenario results in a lower solvency ratio.

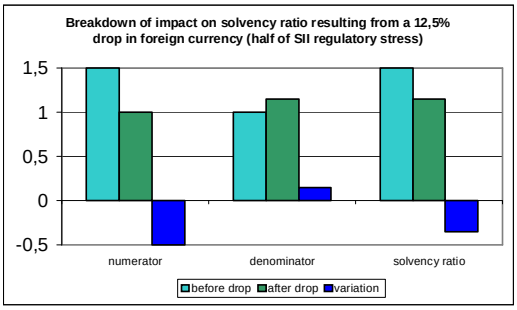
The example on the following page details how the post-shock solvency ratio is calculated.

Key points

- Under a buy and hold approach, if the SCR (Solvency Capital Requirement is representative of the risk to which an asset class is exposed, resistance to pro-cyclicality is all the greater when the asset class has a high SCR.
- Assuming the same SCR, less risky assets resist pro-cyclicality better.
- The crisis hurts "rich insurers less than poor insurers": insurance companies with a comfortable starting solvency position suffer less from such pro-cyclicality but this better resistance is noticeable only for assets with a high SCR.
- The equity dampener sharply reduces pro-cyclicality under certain circumstances and may even occasionally render the equities themselves counter-cyclical. But there is a very high degree of variability in pro-cyclicality associated with fluctuations in the dampener.
- For corporate bonds, the level of SCR plays the main role, and for the lowest ratings, downgrades lower resistance to pro-cyclicality; the convexity effect slightly reinforces this resistance.
- Taking account of the liability structure could alter the assessment of the bonds' pro-cyclicality once the rules for calculating the discount rate based on the counter-cyclical premium risk are known.
- There are indications that in the portfolio construction process controlling the SCR and pro-cyclicality are, to some extent, conflicting objectives. To optimise yield, both the SCR and pro-cyclicality must be considered.

Example

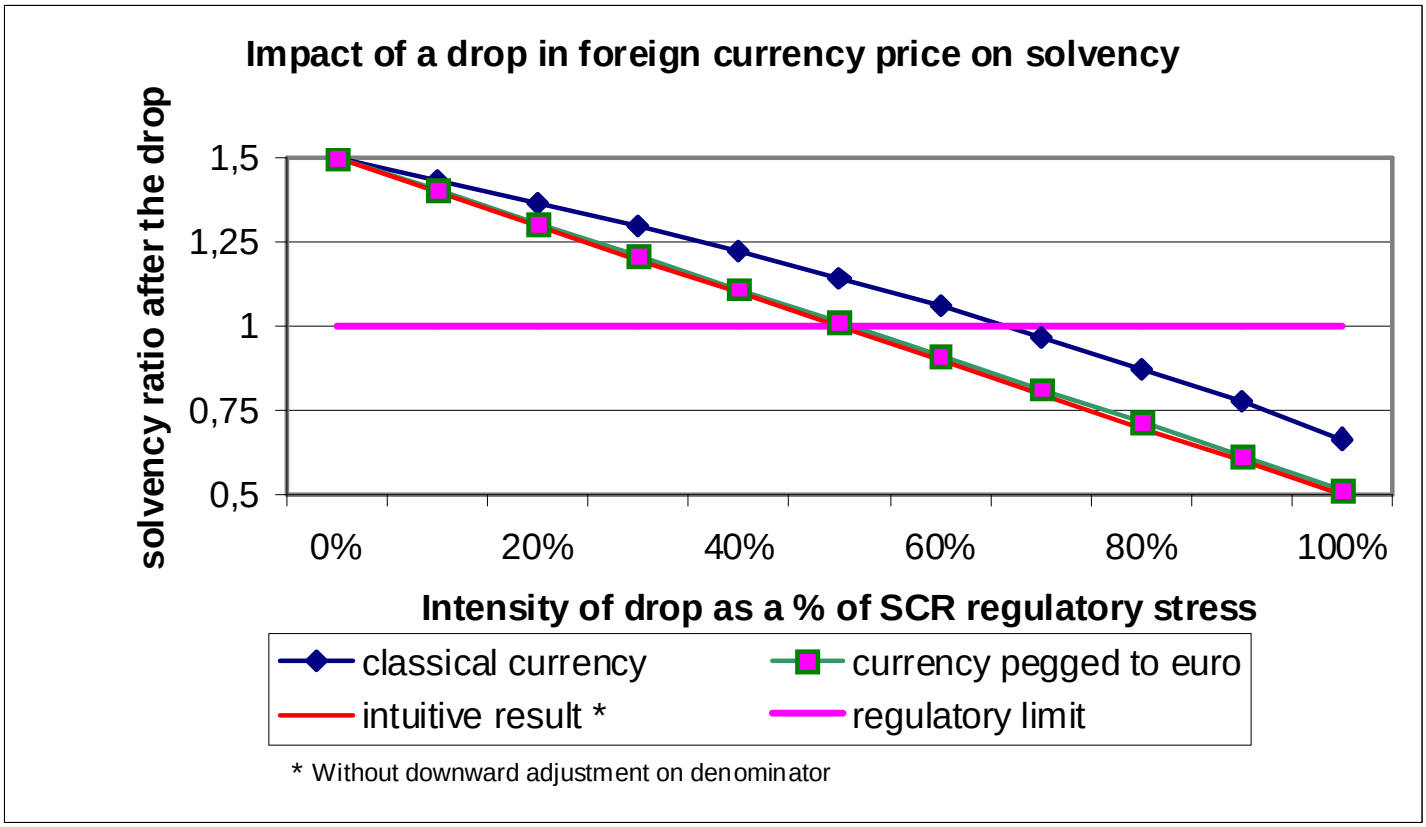
We assume that the insurer's base currency is the euro and that the insurer has a solvency ratio of 1.5. We analyse a US dollar position for which the exchange value in Euros is 100 million. The regulatory shock scenario specified for calculating the SCR for currency is 25% of the position, i.e. 25 million in regulatory capital. We assign to this position an AFR value of 1.5 * 25 (solvency ratio times regulatory capital), i.e. 37.5 million. We then isolate this position and its AFR. Suppose we now apply a 12.5% downward stress scenario (half the Solvency II regulatory stress). The fall in the value of the position will be 12.5 million. This decline is charged against AFR, which then falls from 37.5 to 25 million. The reduction in the numerator represents 50% of the SCR and, if there is no change in the denominator, the solvency ratio will fall by 0.5, decreasing from 1.5 to 1. However this is not the case, since we must also examine the denominator. Because of the falling market, the size of the position is reduced by 12.5%, falling from 100 million to 87.5 million. If there is no reallocation, the SCR on this position is 25% * 87.5 = 21.875 million. The denominator is reduced and its inverse is increased. The new solvency ratio will therefore be 25/21.875 = 1/0.875 = 1.14. The reduction in the size of the position has an impact on the denominator by limiting the erosion of the solvency ratio. Thus, for a downward shock equal to half the regulatory stress, the solvency ratio does not fall by 0.5 but by 0.36 as shown in this example. This is illustrated in the chart beside.



Source: Amundi Quant Research

1.2 - Pro-cyclical effect less pronounced than an intuitive scenario result for risky assets

We now make a calculation for a position in US dollars (regulator's shock factor of 25%) and for a currency pegged to the euro for which the Solvency II stress scenario is significantly lower (as an example, a regulatory stress scenario of 2.39% should be applied for the Danish Krone).



Source: Amundi Quant Research

The previous chart shows the post-shock solvency position for different sizes of shocks, ranging from 0% to 100% of the regulatory shock factor used to calculate the capital requirement for currency risk. The post-shock solvency ratio is shown to decrease with the size of the downward shock, reflecting the pro-cyclical nature of the regulation; however, the drop in the solvency ratio is more pronounced for the least risky currency. To fully understand the reason, one should analyse what happens to the AFR (in the numerator) and the position's SCR (in the denominator) due to the downward shock separately. In proportion to the position's original SCR, the reduction in the numerator will be the same irrespective of the size of the regulator's prescribed shock associated with the currency.

> *The post-shock solvency ratio clearly decreases with the size of the down shock...however, the drop in the solvency ratio is more pronounced for the least risky currency*

The ratio of post-shock AFR compared to the original SCR therefore falls exactly in proportion to the size of the shock applied, which can be deduced from the red line in the chart. However, the impact on the denominator of the solvency ratio, which is a term (1/(1-size*regulatory shock factor)) is no longer independent from the currency and causes the solvency curves to deviate from the red. This factor reflects the impact of the falling market on the size of the position: assuming the same shock size, the deviation is smaller when the currency's regulatory shock is small.

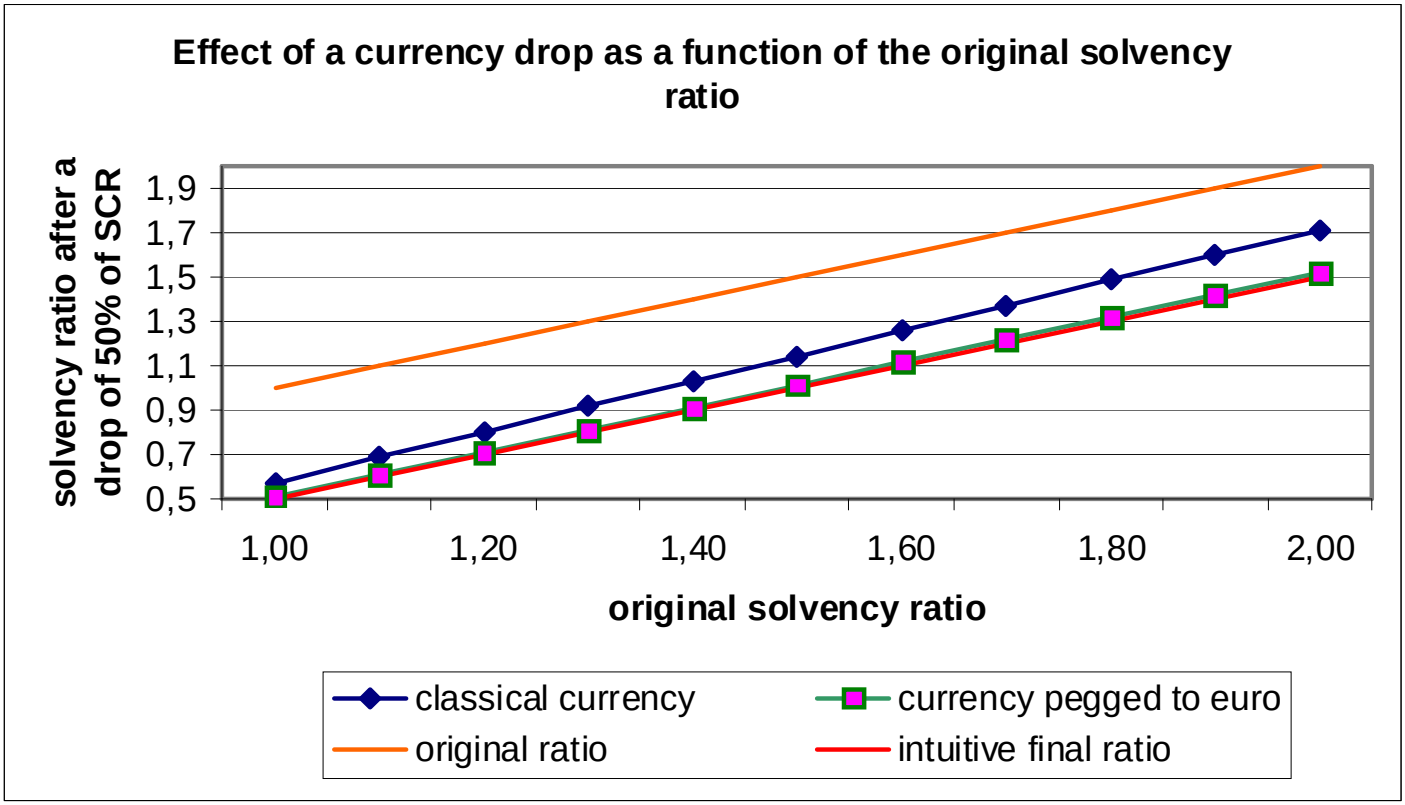
The deviation from the red line stems from the buy-and-hold assumption, more precisely from the assumption that a currency which has lost value will not be bought to rebalance back toward a target allocation. If we had recalibrated the position on the currency to its original size by buying, the denominator would have been at its original level. We would then be on the red line irrespective of the currency's regulatory shock.

1.3 Influence of effective risk on assets with an identical SCR

Let us go back to the example we used in the first section, and consider another currency that is “unpegged” to the euro. We assume its volatility and 99.5%-level Value-at-Risk to be two times lower than that of the US dollar - euro exchange rate. Since a lower level of risk is involved, in an attempt to draw a comparison between the two currencies, it makes sense to recalculate a shock for this currency that is likely to occur with the same frequency. If the risk to the second currency is divided by 2, the amplitude of the downward scenario should also be divided by 2. The equivalent of a decrease by 50% of the SCR for the US dollar would be two times lower for this currency, translating into a decrease by only 25% of the SCR. The effect of such a shock on the solvency ratio can be seen in the chart above for a shock size equivalent to 25% of the SCR, i.e., the scenario results in 1.33 instead of 1.14 for the US dollar. **Assuming the same regulatory shock, the fall in the solvency ratio is more pronounced for the asset that is most volatile.**

1.4 1.4 Effect of initial solvency position

Once again, we use the example of currencies whose risk is in line with their SCR. The initial solvency ratio also has an effect, as shown in the chart on the following page. If this solvency ratio were 2 instead of 1.5, the surplus of own capital in the numerator would fall from 2 to 1.5 and the new solvency ratio in the case of a classic foreign currency would be 1.5/0.857 = 1.71. The drop is no longer 0.5 but 0.29, which is less than the 0.36 that resulted previously. On the other hand, for an original solvency ratio of 1, the impact of the downward shock would cause the solvency ratio to fall to (1-0.5)/0.875=0.57, in other words, a fall in the solvency ratio of 0.43, which, this time, is greater than 0.36. **The observation that "the crisis hits the poorest harder" is all the more evident when the initial asset is a risky asset.**



Source: Amundi Quant Research

2 Defining resistance to pro-cyclicality

In the following we attempt to elaborate on these ideas by defining the meaning of resistance to pro-cyclicality as the impact on the solvency ratio of a downward price movement. If we want to make a comparison among assets that are very different, the question arises how to determine a consistent set of stress scenarios for these assets so that the results can be compared. The most intuitive approach would be to determine the scenarios such that this stress has the same probability of occurrence given the asset return distributions. The stress used to calculate the regulatory SCR was established with the expectation that it would represent a 99.5% VaR over a one-year period for assets but, in the interest of simplicity, the regulator has assigned to currencies that are not pegged to the euro a value of 25% for all.

> *"The most natural approach would be to apply them so that the stress has the same probability of occurring given the asset yield distribution."*

In the same way the regulator prescribes a single stress value for equities listed in countries which are members of the OECD. Thus, a small cap technology stock will be assigned the same capital charge as a low beta defensive stock or a diversified equity portfolio. Likewise, for corporate bonds, the prescribed stress will depend solely on the duration and rating of the issue. Among BBB-rated bonds spread levels are very different though, reflecting different risks. On the whole the stresses prescribed for asset classes have been designed to represent an average 99.5% VaR over time for an average asset representative for the asset class. **If we decide to stick to these average assets supposing they represent their asset class and assume that their return distributions have the same shape, it is possible to associate the frequency of a downward stress scenario with its amplitude, expressed as a % of the SCR for the asset class.**

For this first analysis, which aims to analyse the pro-cyclical nature of asset classes as a whole, we will rely on the preceding assumption for the remainder of this article.

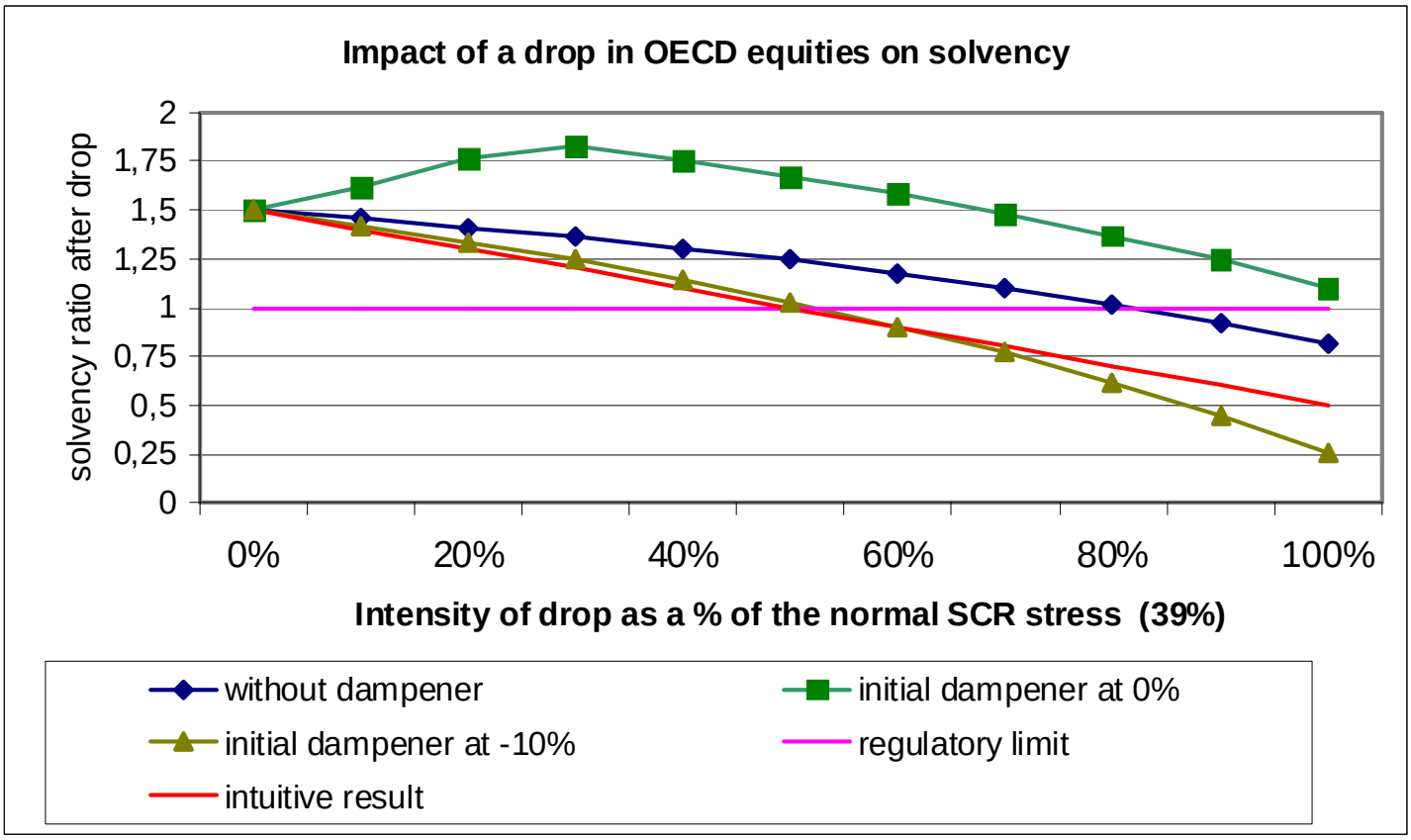
We have defined the solvency ratio obtained after a downward stress scenario equal to half the asset class' SCR stress for an insurer whose initial solvency ratio is 1.5 as a measure for resistance to pro-cyclicality. This ratio is 1 for a low-risk buy & hold position, with no dampener and without convexity, whose yield distribution does not deviate too far from the normal distribution and whose 99.5% VaR is in line with the SCR. We want to ensure that this measure is as high above 1 as possible. If the measure exceeds 1.5, the asset class is counter-cyclical. A shock equal to 50% of the SCR is equivalent to a 1 year VaR with a 90.1% confidence level and 1.29 times the annualised standard deviation if the asset return had a 1 year 99.5% VaR in line with the SCR and a normal distribution.

We next look at this resistance measure for simple asset classes which are used by insurers for diversification purposes, so that we can demonstrate the impact of differences in the nature and the treatment of these classes. In a future study we plan to show how to generalise this approach for assets that do not have these properties to justify simplification.

3 Equities and the dampener

For equities, the SCR corresponds to the impact of a downward shock of 39% (49% outside the OECD). This figure is adjusted up or down based on a dampener that ranges from -10% to +10%. The level of the dampener is calculated by comparing the value of the MSCI Europe Index in local currency to its 3-year historical average. If the market is 7% below this average, the dampener is -7% and the downward stress is 32%. If this market is 12% below its average, the dampener is capped at 10% in absolute terms and the downward scenario to be applied is -29%.

When the 3-year average is unchanged, the dampener reduces the SCR after a downward shock and increases it after an upward shock. Its impact on the solvency ratio then offsets the swing in asset value caused by equity price fluctuations.



Source: Amundi Quant Research

The previous chart shows the change in the solvency ratio based on the size of the shock for OECD equities, with and without considering the dampener. If its original value is 0 (green line), the SCR starting point is 39% and the dampener reduces the SCR to 29% post-shock. The equity dampener has a strong counter-cyclical effect as, up to a shock size equal to 75% of the standard regulatory shock, the post-downward shock solvency ratio is higher than its initial value of 1.5. The counter-cyclical impact grows as long as the downward shock does not exceed 10%. If, on the other hand, the original dampener's starting point is -10% after a first downward shock (beige line), we can see some very pro-cyclical behaviour. In fact, the reference stress factor to be applied remains 39% but the initial SCR is 29%. A 50% drop in the reference stress no longer represents 50% of the SCR but 50%*39%/29% or 67% of the initial SCR. The numerator is therefore far more affected, which explains why the decrease in the solvency ratio is below the red line.

However, the way the calculation is made is causing volatility in the dampener, which cannot be explained by recent market fluctuations alone. In fact, the dampener is calculated by comparing the level of market prices (MSCI Europe in local currencies) to its equally-weighted average over the previous three years. If the market falls sharply in a short period of time, the market average which serves as a reference value is, in general, little affected and all of the decline up to -10% is absorbed by the dampener. However, over a slightly longer horizon (one year), even in the absence of a downward shock, the dampener may also be affected by the three-year moving window due to observations which are very different from the average to be included or discarded.

When the original dampener is greater than 0, its counter-cyclical effect is added to the effect associated with equities higher risk which, in a buy-and-hold strategy, increases their resistance to pro-cyclicality. On the other hand, pro-cyclicality is sharply increased if the dampener has already been reduced. For equities, resistance to pro-cyclicality can prove to be very volatile due to the way in which the dampener is calculated.

4 Credit risk and bonds

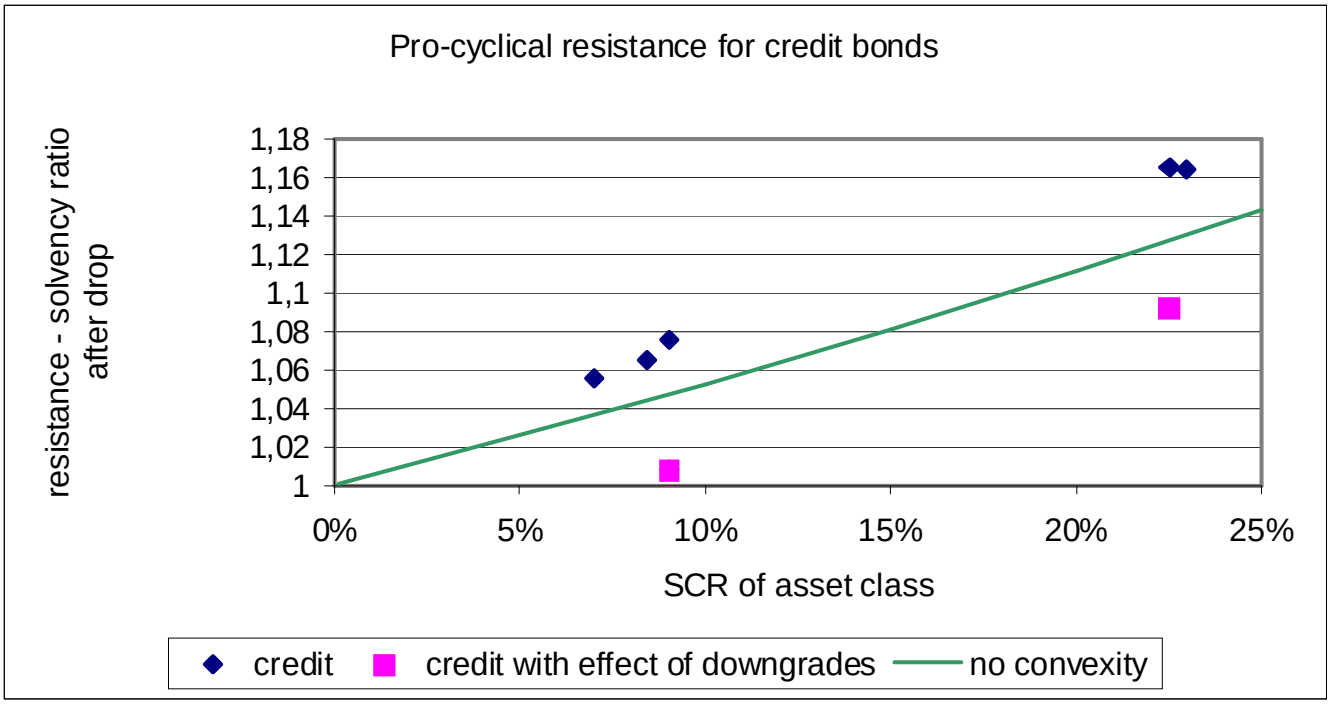
For corporate bonds that are assumed to be hedged against interest rate risk, we calculate the pro-cyclicality resistance measure defined above. We examine corporate bonds with different ratings and maturities. New factors may come into play here: potential deteriorations in the credit rating (downgrades) and convexity.

In the event of a downward shock in the bond market associated with a sharp economic slowdown, the risk an issuer runs of being downgraded by the rating agencies increases. Though such downgrades do not occur instantaneously and are subject to a time lag, their medium-term impact on a buy and hold portfolio increases, all things being equal, the SCR for the bond portfolios. In light of transition matrices, we use, for illustrative purposes, 10% as the probability of a high-yield BB-rated issue being downgraded to B.

Results are provided for different types of credit bonds in the table below.

	rating	maturity (years)	SCR	resistance
Average IG	A	5	7.0%	1.06
IG long	AA	10	8.4%	1.06
Average HY	BB	5	22.5%	1.17
HY short	BB	2	9.0%	1.08
Average HY and downgrade	BB	5	22.5%	1.09
Short HY and downgrade	BB	2	9.0%	1.01
Very long IG	AAA	23	23.0%	1.16

The chart displays these results in visual form and adds a comparison of what is obtained for assets with no convexity and the same original SCR (green line).



Source: Amundi Quant Research

The main impact on resistance to pro-cyclicality is clearly the bonds' credit risk exposure through their initial SCR. The points are located around the rising straight green line that describes this effect, discussed in the first part of this Special Focus. The deviations from the green line indicate the bond-specific effects.

The effect of downgrades has a measurable adverse effect that, especially for short-maturity issues, cancels all the effects that reduce pro-cyclicality. The solvency ratio virtually returns to 1 (resistance without beneficial effect of buy and hold).

> *The impact of downgrades has a measurable adverse effect*

Convexity has a slight positive effect since for all bonds, excluding the effects of downgrades, we are in the area above the green line representing the solvency ratio that would have been reached if there were no convexity.

5 The potential impact of considering liabilities

Insurers' liabilities are usually exposed to interest rate and currency risks. Moreover, it is likely that they also contain some exposure to credit spread risk, whose fluctuations can drive the counter-cyclical premium risk incrementally higher. Exposures to interest rate and currency risks appear to influence the overall SCRs for interest rate and currency risks. Regarding the SCR for currency risk, the conclusions should be simply put into practice by considering a net asset-liability currency risk instead of an asset currency risk. Regarding interest rate risk, the scenario outputs depend on the net sensitivity to rising and falling interest rates and, for measuring the impact of shocks, on the convexity of assets and liabilities. This is why we have not included it in our analysis so far. As regards bonds, liabilities have no impact on the SCR for credit spread risk but there is always the possibility that an unfavourable spread movement could have an impact on the discount rate applied to liabilities, which would influence the solvency ratio's numerator, if assets and hedged liabilities are considered simultaneously, and would improve the resistance to pro-cyclicality of an investment in bonds purchased to hedge long-term liabilities. The rules that define the discount rates - and, in particular, the influence of the counter-cyclical premium, have not yet been developed by EIOPA, the European Insurance and Occupational Pensions Authority.

Conclusion: the implications of considering resistance to pro-cyclicality for the overall portfolio

Obviously, an insurer's risk is never concentrated in a single position.

For any insurer implementing a buy-and-hold strategy, the effects of aggregate pro-cyclicality likely depend on the allocation of the SCR for market risk across the different asset classes. Assuming the same SCR, a situation where the SCR for market risk is more concentrated on bonds than on equities is likely to be more pro-cyclical than the reverse situation, especially for concentrations in debt issues that would prove hard to sell in the event of a downgrade. Conversely, an insurer, whose initial solvency ratio is high and whose SCR for market risk is more concentrated on equities, is in a more favourable position as regards resistance to pro-cyclicality if the dampener has not yet fallen to its lowest level. For this insurer, rebalancing the credit SCR and the SCR for equities keeping the expected return unchanged generates savings on SCRs but increases pro-cyclicality. Likewise, applying a correcting discipline to the target portfolio is, strictly speaking, a good idea but applying it when risky assets are falling, increases pro-cyclicality. Finally, we also draw attention to asset classes whose actual risk is very different from their SCR. Referring to the example of foreign currencies presented in Section 1.3, we may infer that for equities with a low beta, the resistance to pro-cyclicality would be strengthened (their SCR is unchanged but their actual risk is lower). Taking pro-cyclicality into account may therefore mean investing in low-risk equities (i.e., the minimum variance). Conversely, optimising the yield on bonds with a SCR target and a specified duration may mean that the priority will be given to the riskiest bonds within each rating, thereby reducing the portfolio's resistance to pro-cyclicality. **It thus seems that limiting pro-cyclicality and controlling overall SCR can constitute competing aims for which a compromise needs to be found.**

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