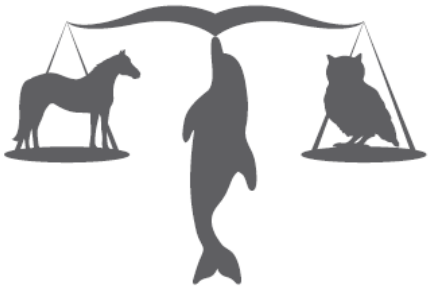
Documentation note



Capital Information

IV quarter 2008
Inconsistent measure of non-life insurance risk under QIS IV and III

INDEX

1. Introduction 3
2. Executive summary 3
3. Description of the Calculation of SCR non-life in the QIS III and IV Models 4
4. Brief Comment 5
5. Examples of Strategic Decisions or Events that have Drastic Consequences for the SCR non-life Calculation 5
6. Discussion 8

Comments on the standard model's calculation of Non-Life Insurance Risk as descript in QIS III and IV.

1. Introduction

One of the primary goals of the Solvency II process was to establish solvency requirements that would reflect the individual company's real economic risk. Many of the risks included in the solvency requirement calculations can be difficult to describe mathematically, for example operational risk, extraordinary events, and changes in practice due to court decisions. The latter should in the context of a model mean a shift to an entirely new model that more correctly describes the new methods the sector must take on. The creation of a new model in this case can in itself be a challenging task as the territory is new.

The majority of the remaining risks are of a nature that are more easily described and which the actuarial profession has a great deal of experience describing and quantifying, namely frequently occurring claims. These claims are included in the QIS model in the SCR non-life module.

This paper seeks only to comment on this particular calculation and not how this calculation fits into the model as a whole. It should be emphasized that this module has a significant effect on a non-life insurance company's total solvency requirement given that the company is not dominated by catastrophe or market risk. The corresponding module for life and pension companies is not nearly as influential in their total solvency requirements.

The authors would like to acknowledge that this paper's comments break with the traditions in the academic world where critic, though serious in nature, is usually given in short comments and generally takes a back seat to the more positive comments. Though the authors would under normal circumstances make use of this tradition, they realize that this paper will be used as a part of a political process where it is necessary to express oneself in a much more direct manner. The authors would like to apologize beforehand, as it is not our intention, if any highly educated individuals are offended by the directness of this paper.

The goal of these comments is to emphasize the relevance of the calculations in relation to the company's risk. The authors are not suggesting that the standard model should be precise, as this cannot be expected of any standard model. However, the authors consider it to be unacceptable if the model is misrepresenting the risk it is meant to describe.

This was, in the author's opinion, in fact the case, based on his experience calculating the QIS III model for 17 Danish non-life insurance companies. These 17 companies made up 3% of the total non-life participants in Europe.

Keywords QIS, SCR non-life, modeling and examples of the difference between being imprecise and misrepresenting the risk.

2. Executive summary

It must be concluded that future events, like past events, will create unnecessary turbulence. Therefore, a single event can cause large losses, increase the company's measured standard deviation, and thus also their capital requirement. When a prudent leadership chooses to reestablish the company's capital using a premium increase, they will be met with a larger standard deviation and therefore, increase their capital requirement even further.

The consequence of a loss costing capital cannot be avoided and a simultaneous increase in the capital requirement may in some cases be the correct consequence. However, an increase in capital requirement as a result of a justified premium increase seems directly inappropriate. We are

in effect building up a system where the second wave is just as dangerous as the first. This is not just disappointing when great efforts have been made to produce a system that will reward prudency, but seems unprofessional and unnecessary.

We are ignoring basic statistical rules. **We cannot measure the variation without first establishing the correct mean value.**

If legislation in the form it has in QIS III or IV is passed, it will have the following consequences:

1. The regulatory risk is significant. All business decision that can influence the future expected net loss ratio must be carefully calculated to ensure that the company can afford to make the 'right' decision.
2. Access to capital will become an important competitive parameter because the regulatory capital requirement, as calculated by the model, does not behave as intended.
3. Mutual and other business forms which only have access to capital through earnings, will be forced to take extraordinary precaution in the future.
4. The board's focus is drawn away from understanding various risk descriptions. The proper adjustments needed to reduce many risks will lead to such a significant increase in their capital requirement that they can be forced to close the business. In many cases the company would be able to continue from a regulatory standpoint if it just ignores these risks.

3. Description of the Calculation of SCR non-life in the QIS III and IV Models

The calculation of SCR non-life is fundamentally based on the fixed assumption of what the standard deviation of the net loss ratio is for each line of business. This is adjusted using the historical deviations of the net loss ratio. The greater the number of years of historical data the more credibility is given to the company's values.

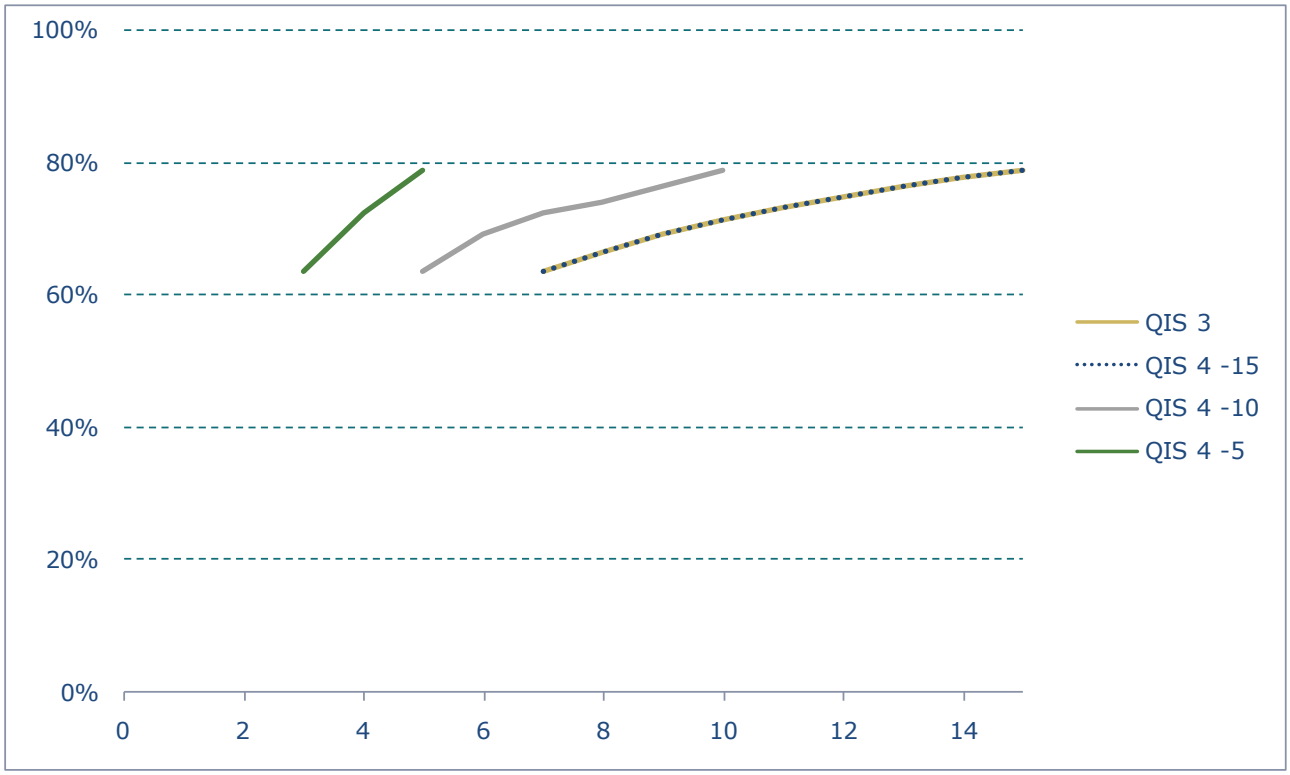
The experience based variance (σ^2_b) for line of business b is estimated as follows:

$CR_{i,b}$ is the observed net loss ratio (Claims Ratio) in year 'i' and for line of business 'b'.
$P_{i,b}$ is the premium from year 'i' for line of business 'b'.

$$\sigma^2_b = \sum_{i=1}^{n}(CR_{i,b} - CR_{\cdot,b}/n)^2 * \left(\frac{P_{1,b}}{P_{\cdot,b}}\right) \qquad hvor\ CR_{\cdot,b} = \sum_{i=1}^{n} CR_{i,b}\ og\ P_{\cdot,b} = \sum_{i=1}^{n} P_{i,b}$$

This result is weighted with the standard variance for each line of business ($\sigma^2_{b\text{-expected}}$) to form the final variance ($\sigma^2_{b\text{-result}}$) as follows:

$\sigma^2_{b\text{-result}} = (1-\alpha)\sigma^2_{b\text{-expected}} + \alpha\sigma^2_b$ where α is based on the number of historical years available as follows:



When the reserve risk is calculated the risk is assumed to be half the premium risk per unit of reserved risk.

4. Brief Comment

If σ^2_b is estimated correctly this method can seem quite reasonable. For lines of business with a longer run-off period it is natural that the number of historical years should be larger before more credibility is assigned to the company's own observations. The credibility weights are pre-determined and are exclusively based on the number of historical years. This seems a bit random. The randomness of the weights does not, in the author's opinion, appear to give a systematic error in the calculation but it is, however, a source of imprecision.

However, in the case variance estimation it is basic knowledge that the variance will be overestimated when the model for the expected mean value is too poor (in this case $CR_{,b}/n$). This type of overestimation could be misconstrued as an extraordinary safety measure but in the following we will explain what types of regulatory risk this overestimation can result in.

5. Examples of Strategic Decisions or Events that have Drastic Consequences for the SCR non-life Calculation

This section will examine a number of realistic scenarios that will all result in an overestimation of SCR non-life. The examples include calculations which can be obtained in spreadsheet form from psv@capitalinformation.dk should the reader be interested. We will consider the following situations:

1. The fact that the calculation does not consider the premium quality of the company
2. A premium increase
3. Purchase of a more comprehensive reinsurance contract
4. Catastrophic events
5. Radical changes in reserves
6. Reserving using a link ratio (an academic protest)

5.1. The Model lacks an evaluation of the Premium Quality

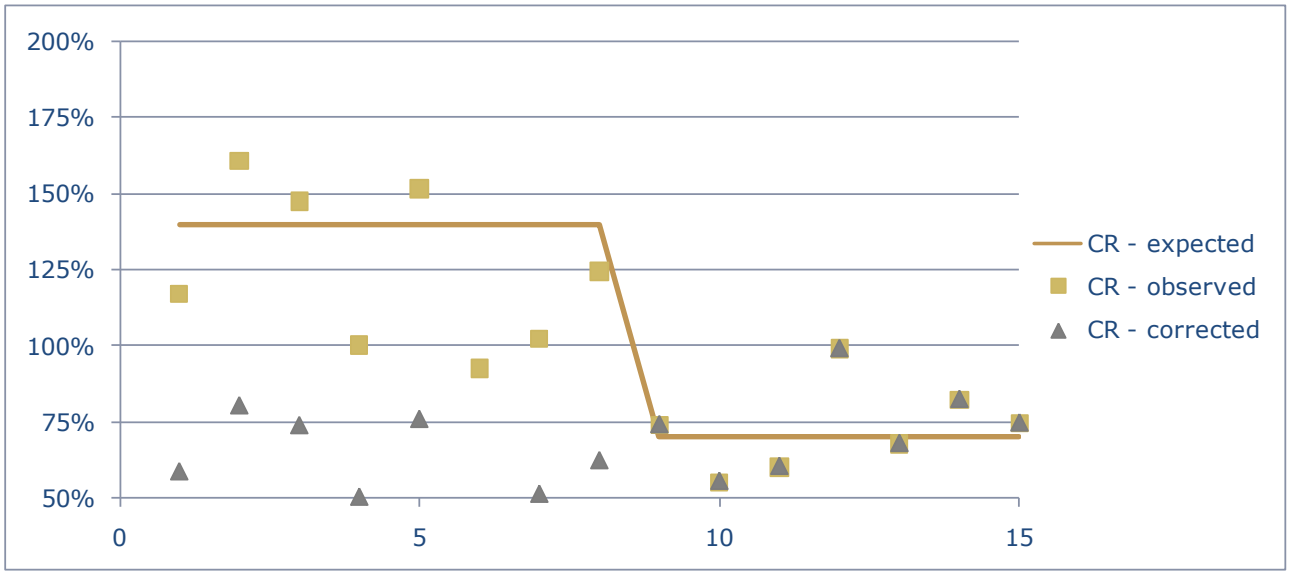
It is not unusual that the regulatory capital requirement influences the company's internal capital allocation. Examples can be found in the solvency I framework, where the capital requirement followed the premium levels, where companies have managed their capital based on the regulatory requirements. Likewise, there are examples of reinsurance companies who have increased their position in the marked with falling premiums while having to decrease their position in periods of increasing premiums.

Therefore, 15 years of volatile, but large profits, will result in a large capital requirement while a similar period with more stable but heavy losses will have a much smaller capital requirement. It is possible for companies to exploit this discrepancy in their internal capital allocation to likewise receive a lower capital requirement.

5.2. Changes in the Premium Level

A company changes its expectations for combined ratio when it changes the premium levels, unless the company expects a similar change in its claim expenses.

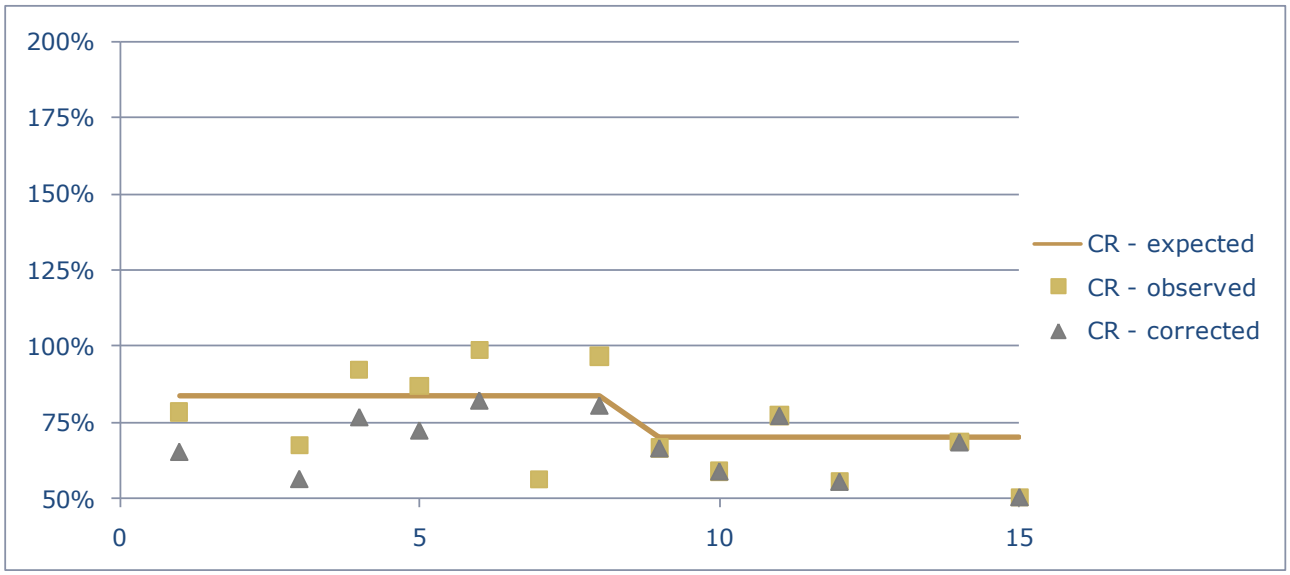
A line of business that does not have sufficient premiums to cover the corresponding claims should be seen as a capital consuming line of business. If the premium level is adjusted to a more correct level the capital requirement should follow to a lower level to reflect this strategic improvement. The standard model in both QIS III and VI, does not adjust the expectations the future mean value and net loss ratio when the premium is adjusted. This results in the following effects (the example is taken from the above mentioned spreadsheet):



The example shows a line of business where the combined ratio was reduced from 140% to 70% 7 years ago because of premium increase. The observed data is simulated. The mathematical standard deviation of the simulation is 15% as determined by the underlying distribution. In the above example, the standard deviation is measured to be 14% when the proper adjustments are made for the premium change. The standard deviation as calculated by the QIS III and IV models is 34% using the higher premium. If the company had not adjusted its premium the standard deviation would have been 28% of the lower premium (which is equal to 14% of the higher premium).

This simulation has been performed a number of times and the conclusion is clear. The company is punished for adjusting its premium to a more prudent level by a capital requirement that is more than double that which they would have had otherwise. This is not imprecision; this is a **severe misrepresentation of risk**.

The following is a similar example where the premium was increased by 20% 7 years ago. This is, however, a different simulation.



The QIS III and IV models measure the company's standard deviation to be 20% of the higher premium. The mathematically correct standard deviation is 15%. If the company had not increased their premium the standard deviation would have been measured to be 15% of the high premium.

A higher premium reduces the risk of a company not being able to meet its claim payments. From a risk point of view, the standard deviation is being measured incorrectly and it is directly misrepresenting the risk present. If one considers the probability of ruin over a multi-year period the models inability to take the factors presented in 5.1 and 5.2 into account leads to results that are **drastically misrepresentative** of the risk.

5.3. The Purchase of Reinsurance

Increasing company's reinsurance coverage will in many situations also lead to a change in the company's combined ratio expectations. When these expectations change, the QIS model will systematically overestimate the standard deviation as was shown in the examples in section 5.2. Again, this is an example of where the model is **misrepresentative** of the risk not imprecise. In addition, it is problematic that the model will be very slow to credit the reduction in risk that is present when the reinsurance coverage is expanded.

5.4. Catastrophic Events

In the event of a catastrophic event, the reinsurance deductible is part of the net loss ratio and therefore, the standard deviation calculation. In principle, this portion of the claims is already included in the catastrophe non-life calculation, which means that this deductible is included twice in the total calculation if a catastrophic event has occurred in the time period in question. If the reinsurance limit has been exceeded, this can lead to a further significant increase in the capital requirement. A company who has experienced a breach of their reinsurance limit has likely lost a great deal of money and may react by increasing their reinsurance coverage. The latter would actually further increase their capital requirement despite the fact that it would be decreasing their risk. This is again a **misrepresentation** of the company's risk.

5.5. Radical changes in a Company's Reserves

Radical changes in a company's reserves will affect the combined ratio thereby, creating a greater variance and leading to a higher capital requirement. Therefore, a company will increase their future capital requirement by increasing their reserves. **This misrepresents the risk.** It should be acknowledged that the lines of business where a sudden increase in the reserve is relevant are

often more risky. However, it seems intuitively incorrect that the company should increase the reserve slowly over several years as this will minimize the impact on the capital requirement, when the reserve is actually least risky when it has been strengthened (increased) the most.

A similar situation can occur if a company begins to include IBNER in their property reserves. These are often negative and can have a significant influence on the combined ratio in a given year thus, increasing the variance on a line of business.

5.6. Reserving using a link ratio (an academic protest)

Reserves that are controlled by a link ratio reserve model can lead to instances where the combined ratio on a line of business is constant thus, falsely indicating that the business is risk free. Reinsurance like financial contracts can then be used to remove any unfortunate run-off results. Aside from the advanced thought process suggested in the previous sentences, there is a concrete example of bankruptcy in the Danish market that can be attributed to similar models. Therefore, risk free is **far from representative** of the actual risk in companies using these techniques. The use of these slightly suspect reinsurance contracts opens for the possibility of regulatory arbitrage.

6. Discussion

It does not make sense to measure fluctuations away from an average unless that expected average is constant over the time period considered. It is worth considering if the net loss ratio gives a picture of risk. Historically, the net loss ratio can indicate whether it has been easy to earn a profit on a particular line of business. However, this information is not utilized in the SCR non-life calculation. On the other hand just about every strategically prudent business decision that can be made by the leaders of a company will be met with an increased SCR non-life. It is very difficult for Capital Information to see how this is promoting a prudent risk approach in the sector.