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The European solvency margin: an update for Italian non-life insurers

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This paper analyses the main underlying quantitative approach of the European Solvency I requirement for non-life insurance companies. In the light of the discussion on the forthcoming implementation of the Solvency II regime, we provide an update of parameters, based on the Italian market for years 2001-2006. The results strongly support the evidence on the inefficiencies of the current methodology in assessing the financial strength of non-life insurance companies. The limited recognition of risk factors, the excess of simplification and the gap from the true exposure of insurers is underlined also by their decisions on the level of capitalisation.

Field of Research: insurance and risk management, solvency regulation, supervision of insurance companies

1. Introduction

The current European insurance solvency model (Solvency I), introduced in the 70s, adopts a quantitative approach developed in the first half of the 19th century, in a framework aimed at fostering the stability and harmonisation of the common market and the protection of policyholders. The model was not subject to significant changes thereafter, excluding some minor updates of parameters and thresholds, mainly due to inflation, and a more comprehensive definition of available capital. At the same time, other countries (such as the US, Canada and Australia) have developed risk-based solvency systems, as single EEC members have undergone studies and analyses of their internal frameworks (f.i., the UK and Scandinavian countries). A review of the whole European system was carried out by the Müller commission, concluding that it proved to be effective and remitting to a more comprehensive reform the achievement of a risk-based solvency regime (Solvency II). Despite these conclusions, only a few of the improvements proposed by the commission have been included in the following update of the framework.

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As the new model is achieving its final stage of development, with full implementation expected in 2012, third countries (f.i., Switzerland) and EU members (f.i Denmark, the Nederlands and the UK) improved their own systems, establishing more strict and risk-based rules. Although some improvements in solvency supervision of insurance companies have been developed in other areas, the European framework will require until 2012 a solvency margin based on an approach developed more than 50 years before. Meanwhile, the competitive environment expressed a great tendency to a severe and rapid evolution. This paper summarises the original formulation of non-life insurance, providing an update to the estimation of parameters for the Italian non-life insurance market in 2001-2006: we try to identify whether actual solvency margins bear a growing distance from their economic foundations.

We find a significant gap between regulatory requirements and updated parameters, accordingly to the main literature that focused on this issue for other countries. We identify the potential risks in assessing the financial strength of insurers relying on the current misestimated required margin, and we drive our conclusions comparing the results to the average solvency margin established within the Italian market. This paper is organised as follows. In Section 2 we provide a short literature review, especially referred to the original solvency framework and the following criticism expressed by some authors. In Section 3 we describe our methodology and the research design, focusing on the data that we used to update Campagne's model and the preliminary results driven from them. In Section 4 we show and discuss in more detail our findings, comparing our conclusions with the behaviour expressed by Italian non-life insurers and arguing some explanations to these occurences. Finally, in Section 5, we provide our concluding remarks.

2. Literature Review

The first (EEC, 1973), second (EEC, 1988) and third (EEC, 1992) non-life directives provided a solvency assessment regulatory framework based on a simple factor-based approach. It was recently updated (EU, 2002), after a comprehensive review (EU, 1997), to take account of inflationary effects and bringing some minor changes to the calculation of the available margin. The model requires non-life insurers to calculate the higher of two results, one based on premiums and the other on claims, applying a two-tier fixed-percentage (a simplified inclusion of size-effects) and with a limited recognition of reinsurance contracts. Then, a company should hold enough eligible capital to give cover to such amount (assets of the insurance undertaking free of any foreseeable liabilities, less any intangible items). This approach is based on the contribution of Campagne (1957 and 1961), aimed at providing an early-warning system for European supervision of insurance companies. For the non-life sector, the author proposed that companies should hold a margin equal to 25% of their net earned premiums (plus a 2,5% of ceded premiums for credit risk of reinsurance), subject to an absolute minimum floor. This conclusion was based on a cross-country analyses of P&L account's relationships of insurance companies, for years 1952-1957.

The author grounds its simplified model on average ratios: the mean of the expense ratio in each country is subtracted from 100% (representing the overall inflow from premiums), providing a figure that represents the amount left for claims payment. Then, the value-at-risk of the loss ratio, approximated through a beta-distribution with a given confidence level (the proposed ruin probability is 0,03% in one year), is added: the amount exceeding 100% represents the percentage of premiums that should be held as a margin to guarantee the company's survival. Not surprisingly, the original calibration obtains a significant degree of heterogeneity across countries (Table 1): the resulting proposed threshold represents a conservative average. Considerable criticism emerged on this approach, mainly focusing on underlying hypothesis, data used, the excess of simplification assumed, as well as the need to update regularly the parameters, taking account of the evolution of loss and expense ratios to keep results. More importantly, the methodology explicitly excludes assets' risks from calculations (e.g. market risk and liquidity risk).

In their paper, De Wit and Kastelijn (1980) provide a first update of parameters for the Dutch market, however based on three accounting years. Their findings support a considerable increase in required margins (60% from 31%), as well as in standard deviation of data (20% from 9%), that significantly influences the calculation of the value-at-risk. Authors also underline the weakness of the adjustment of the data needed for loss ratios greater than 100% to fit the bounds of the beta distribution. Finally, they tested other distributions to fit their data (as the Weibull distribution), as well as the maximum likelihood methodology instead of the method of moments adopted by Campagne, finding significant similarities comparing the two results. Ramlau-Hansen (1982) commented on the previous study and suggested some improvements based on the credibility method: findings, on the same dataset, led to even greater figures for VaR and solvency margins, due to the use of more skewed distributions. However, the author underlines one major critical point about Campagne's model: all observed loss ratios are assumed to be stochastically independent and identically distributed with the same distribution, leading to the introduction of a greater variance into the data. The author also stresses the importance of the inclusion and exclusion of companies from the dataset used, since if loss experiences diverge greatly, a significant effect on the final result could be played by a limited number of companies. Finally, he concludes suggesting a more comprehensive analysis of companies for solvency purposes: lines of business, portfolios, claim experience, reinsurance arrangements and macro-economic factors (inflation and interest rates).

Also, Sandström (2006) conducted the same research on the Swedish market, for years 1996-2003, obtaining comparable results (the margin increased to 101% for individual companies) and extending the methodology to insurance groups, finding significantly lower figures (margin of 71% of NEP), despite the average expense ratios have not been subject to major changes in 50 years.

TABLE 1: Non-life solvency margin calculation for some European countries (1952-1957)

	Denmark	France	Germany	U.K.	Italy	Netherlands	Sweden	Switzerland
Premiums	100	100	100	100	100	100	100	100
Av. Exp. ratio	35	38	35	41	44	53	32	42
Av. Loss ratio	51	49	44	50	43	43	61	46
VaR(L.R.)	74	97	68	72	83	78	90	83
Av. E.R. + VaR(L.R.)	109	135	103	113	127	131	122	125
Margin	9	35	3	13	27	31	22	25

Source: Campagne, 1961

The author, in particular, underlines the importance assumed by investments' risk-return profile and the evolution of underwriting and reserving practices, as the main drivers of model's ineffectiveness: he argues that the greater loss ratios experienced in more recent studies are linked to an increase in the impact of investment yields.

3. Methodology and Research Design

In this paper, applying the aforementioned methodology, we update Campagne's parameters, using Italian non-life market data for the period 2001-2006. Our aim is to measure how far is the current regulatory solvency margin, as originally calculated, from its theoretical size, keeping the approach unchanged. Using the database 'Infobila 2007', published by ANIA, we built the sample used for our calculations. We refined the data on the whole market keeping only entities active in all examined years, omitting those interested by particular events (f.i., M&A) that were reflected in the underwriting and loss experience, or with missing data.

This led to a final sample of 73 companies, for a total of 438 data points: measured by net earned premiums, our sample represents nearly 80% of the Italian market.
For these companies, we calculated each year's expense and loss ratios as follows:

- expense ratio: expenses and commissions, after deduction of the commission received from reinsurers, expressed as a percentage of the net earned premiums;
- loss ratio: total claims paid, net of reinsurers' share, expressed as a percentage of the net earned premiums.

These two measures are slightly different from those adopted by Campagne and De Wit and Kastelijn, due to data availability issues:

- we adopted earned premiums net of reinsurance, whereas Campagne used received premiums and De Wit and Kastelijn gross premiums;
- we adopted net expenses and commissions, whereas De Wit and Kastelijn used gross data;
- we adopted net claims paid, whereas De Wit and Kastelijn adopted gross incurred claims.

Results are summarised in Table 2. The structure of our sample is also summarised, through box-wiskers plots, in Figures 1 and 2. Comparing our results with those of Campagne, we find a significant decrease in expense ratios (from 44% to less than 30%) and a sharp increase in loss ratio (from 43% to almost 66%), in line with De

Wit and Kastelijn (1980). We attribute the first effect to the increasingly attention paid by insurers to the cost-effectiveness of underwriting processes, after the significant reduction in investment returns experienced in recent years. The second effect is due to a more complex set of reasons, such as the consolidation of the insurance market, the impact of non-life cycles and a more severe competitive environment affecting the profitability margin. We also experienced an increase in standard deviation, compared to Campagne (1961), consistent with the aforementioned studies. We then fit our data to a beta-distribution, through the method of moments. As illustrated before, a transformation of the sample is needed (the beta-distribution is defined only between 0 and 1): we experienced a maximum loss ratio of 121,9%, and therefore applied a factor of 1,5 as in Campagne (1961) and De Wit and Kastelijn (1980).

The estimated parameters of the beta-distribution are α=5,66 and β=7,22.

TABLE 2: Expense and loss ratio for Italian non-life insurers (2001-2006)

	Expense ratio		Loss ratio	
Year	Mean	St. dev.	Mean	St. dev.
2001	32,721%	20,653%	69,912%	21,909%
2002	28,803%	13,214%	66,125%	20,436%
2003	27,984%	13,156%	65,822%	19,321%
2004	30,190%	18,239%	65,308%	20,647%
2005	30,092%	16,330%	64,512%	17,094%
2006	29,440%	13,845%	64,025%	19,601%
2001-2006	29,871%	16,219%	65,951%	19,981%

TABLE 3: Non-life solvency margin calculation for Italian insurers (2001-2006)

	Ruin probability					
	10%	5%	1%	0,1%	0,03%	0,01%
Premiums	100	100	100	100	100	100
Av. Exp. ratio	29,87	29,87	29,87	29,87	29,87	29,87
Av. Loss ratio	65,95	65,95	65,95	65,95	65,95	65,95
VaR(L.R.)	123,32	132,96	149,58	165,27	171,17	175,59
Av. E.R. + VaR(L.R.)	153,19	162,84	179,45	195,14	201,04	205,46
Margin	53,19	62,84	79,45	95,14	101,04	105,46

FIGURE 1: Box-wiskers plot of expense ratios for Italian non-life insurers (2001-2006)

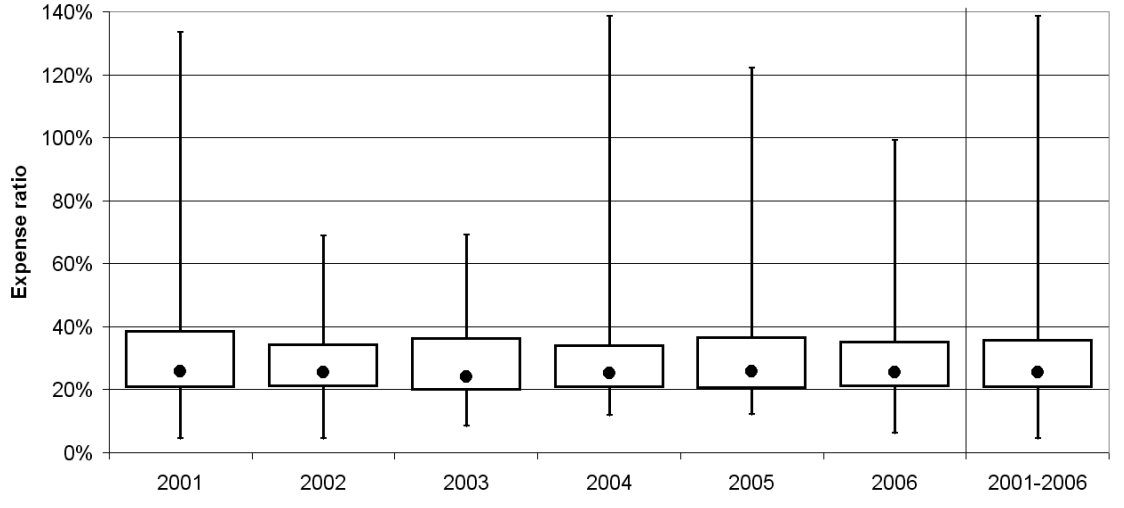


FIGURE 2: Box-wiskers plot of loss ratios for Italian non-life insurers (2001-2006)

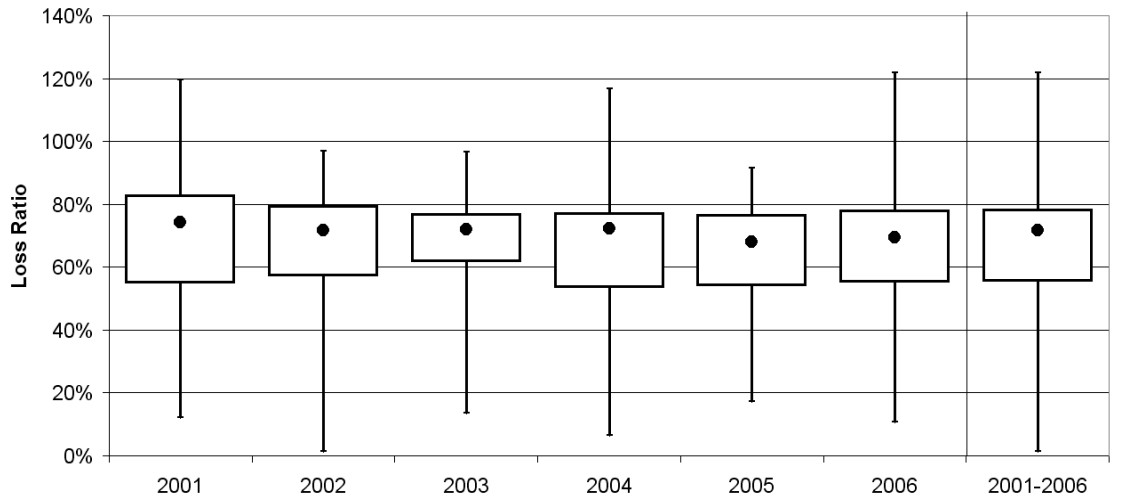
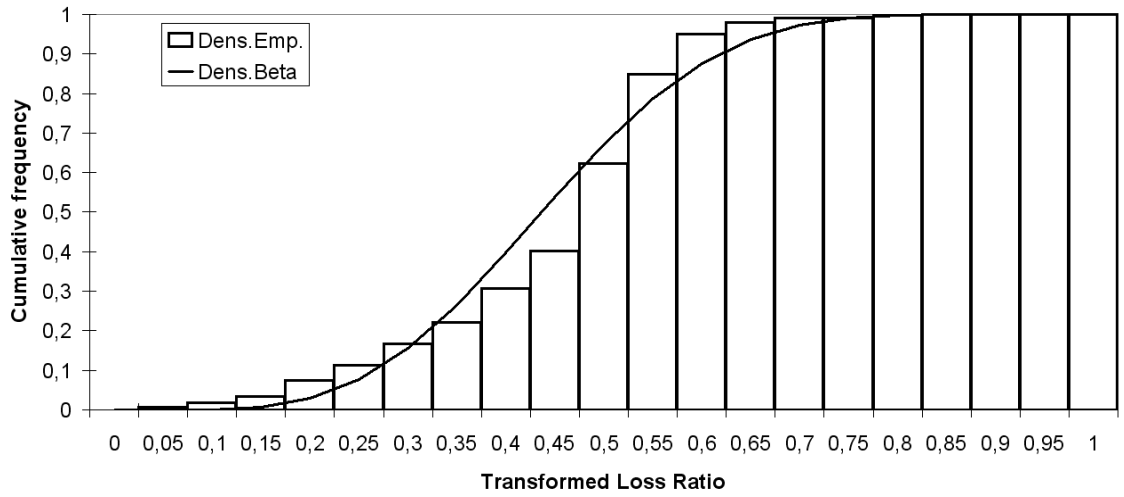


FIGURE 3: Probability density function of transformed loss ratio (empirical and beta)



Results are represented in Figure 3, where we compare the cumulative frequency of the transformed sample and the beta-distribution. The fit is relatively poor, with an underestimation of companies with lower or greater loss ratios, as well as an overestimation of values closer to the mean: this is due to sharp differences in kurtosis and skewness of the two distributions. At this stage, we need to calculate the value-at-risk of the loss ratio distribution. We compare six ruin probabilities (10%, 5%, 1%, 0,1%, 0,03% and 0,01%): results are summarised in Table 3. At the confidence level originally used by Campagne (0,03%), we find that companies should hold a margin that is more than twice their net retained premiums, and almost four times the hypothetical percentage calculated for Italy in 1961 (27%).

The identified solvency margins are significantly greater than those in De Wit and Kastelijn (that measured a margin of 60%) and in line with Sandström (101% for individual companies). We provide also a representation of the relationship between ruin probabilities and derived solvency margins (Figure 4): sensitivity of results is

weaker for greater ruin probabilities, but the value-at-risk approach greatly influences the size of required margins for values closer to zero. Given the gap existent between the original parameters and the estimation that we provide for recent Italian data, we were interested in evaluating if discrepancy also exists between regulatory requirements and insurers' behaviour. We therefore compared our results to the average level of required solvency margins for Italian non-life insurers (ANIA, 2007b). The ratio of available funds to required solvency margins for years 2001-2006 shows a structural and increasing overcapitalisation of Italian insurers, measured by the Solvency I requirement (Figure 5). Companies hold, on average, from 2,5 to 3,5 times the European regulatory, based on the approach examined above. This is mainly imputable to the inadequacy of the solvency margin to identify the true risk-profile of insurers, compared to other binding or self-imposed requirements (for instance, those expressed by financial markets or rating agencies, or the economic capital identified by companies to support their operations).

Particularly interesting is the comparison of the level of these margins to the net retained premiums, that allows a backtesting of the incidence of the requirement and the effective size of insurers' capitalization (Figure 6). We can identify a stable ratio of the required margin to premiums, comparable to the results of our update, around 16% and significantly lower than the figure originally identified by Campagne (25%) and underlined by our update (101%). Finally, insurers hold, on average, an available margin that accounts for 40-60% of net retained premiums, showing the same pace as the available-to-required-margin ratio identified above.

4. Discussion of Findings

Using recent data from the Italian non-life insurance market, we found that the stability of parameters used to identify a common factor-based approach for non-life insurance solvency is a weak assumption. In line with other studies, our sample shows a significant increase in the cost-effectiveness of non-life insurers, 50 years after the original approach of Campagne. The sharp evolution of insurance business, competitive environment and financial markets worldwide underlines one of the weak hypothesis of the current approach, namely the stability around the average of expense ratios. Companies have shown an increasing attention to their underwriting: the reduction in financial returns, the impact of investment risks and the increasing costs of claims are among the main reasons of this focus. The consolidation of the insurance sector determined also an increased size of players and number of products, leading to a greater variability in expenses and loss experiences.

This volatility greatly impacts the results of the VaR methodology used in this study, as already underlined in De Wit and Kastelijn (1980). The method of moments led to a relatively poor fit for our loss ratios, as stated by Ramlau-Hanses (1982). The choice of a beta-distribution appears inadequate, in the light of the skewness and kurtosis of our data: improvements, suggested and examined by other authors, mainly led to an increase in the theoretical required solvency margin. Moreover, the features of the beta-distribution require to transform the loss-ratio data arbitrarily, when values are greater than 100%: Sandström (2006) argues that this method is weak especially for this reason, due to the smoothing effect played by the transformation to the data.

FIGURE 4: Ruin probabilities and solvency margin for Italian non-life insurers (2001-2006)

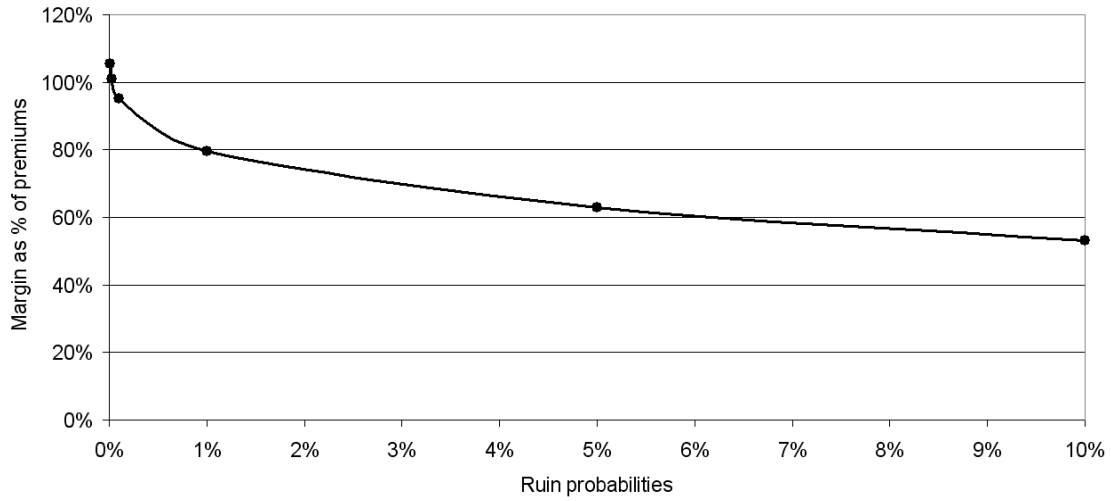


FIGURE 5: Available and required solvency margin for Italian non-life insurers (2001-2006)

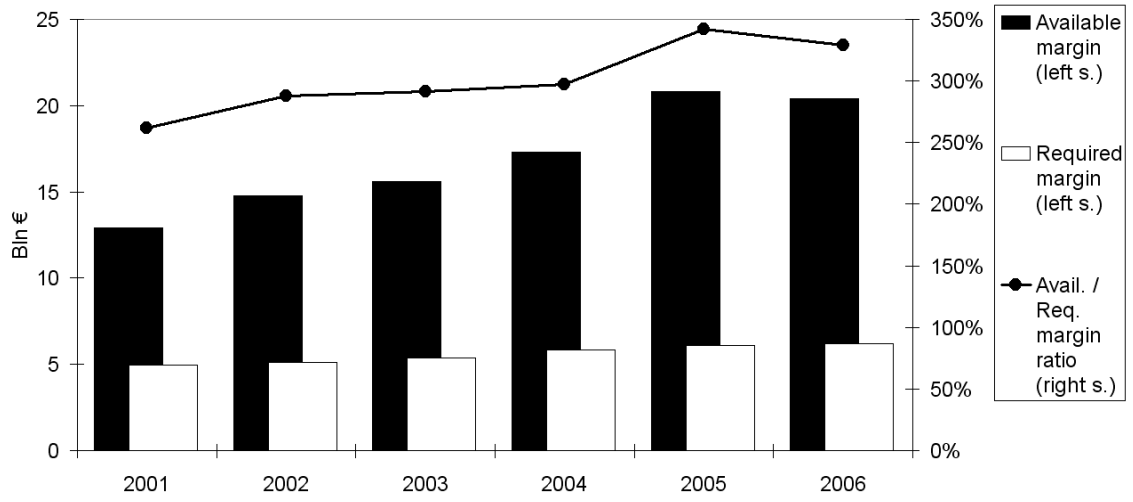
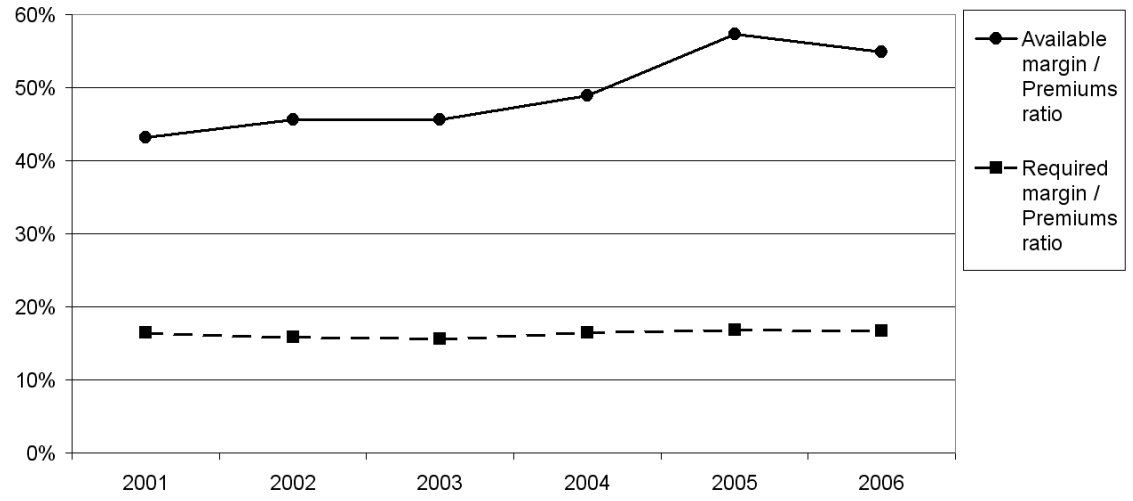


FIGURE 6: Solvency margin to premiums ratio for Italian non-life insurers (2001-2006)



Applying average expense and loss ratios calculated at market level to all companies produces an adverse effect, rewarding companies with lower levels of efficiency with lower capital requirements, than theoretically applicable. Moreover, despite the increasing connections and interdependency across entities and countries, the approach assumes that loss ratios are identically and independently distributed: therefore, the measure of variability used penalises countries with more competitive and heterogeneous markets. Finally, the methodology captures only a limited and retrospective view of insurers' risk-profile, whereas the latter is composed by many exposures that are closely linked and mutually interdependent. The intended aim of the original model was to provide an early-warning system for an harmonised supervisory evaluation of European insurance companies. This capability decreased through time, despite the system as a whole proved its effectiveness in reducing number and size of insurance failures (EU, 1997).

It is questionable, however, whether this result should be attributed entirely to the supervisory approach: companies have been pushed to hold greater levels of costly capital by requirements set directly or indirectly by other players, such as rating agencies and financial markets, showing awareness towards the insufficiency of the regulatory solvency margin. The wide excess of eligible capital expressed by insurers may be therefore due to a more in-depth analysis of the specific risk profile carried out by external players and, internally, for strategic purposes, accounting also for other exposures such as market, credit and catastrophe risks. Commonly, the European insurance industry is regarded as well-capitalised, and the Italian data supports this position. However, the available solvency margin should be compared to a more risk-based measure, such as the economic capital, to provide a good picture of the actual level of capitalisation. The most recent quantitative impact study carried out for the future Solvency II framework (CEIOPS, 2007) shows an average ratio of the new proposed risk-based capital requirement to the Solvency I margin, for non-life companies, between 50% and 350%; at the same time, many companies in several countries express values of this ratio up to 900%. Despite these conclusions, however, European insurers will be subject to a simple, retrospective and widely insufficient factor-based capital requirement at least until 2012.

5. Conclusion

In this paper we updated the parameters of the current European solvency framework with recent data from the Italian non-life insurance market. We have underlined the weaknesses of the original approach and the significant difference from required margins and their theoretical level, adopting the same methodology, also with reference to the effective amount of capital held by Italian insurers. The early-warning function of the margin has seen its importance reduced by the evolution of insurance and financial markets. Nonetheless, Campagne underlined how the hypothesis behind the proposed approach lead to a lower accuracy in measuring the actual solvency of insurers: supervisors should use these proxies as complementary to a qualitative and comprehensive review of each insurance company. In this regard, greater results are expected from the Solvency II reform. On one side, the measure of the required margin will be sensitive to the true risk profile of companies and to all quantifiable risks; on the other, a closer relationship

between companies and supervisors represents one of the pillars on which the new framework will be based. Moreover, greater convergence towards a common set of accounting principles and actuarial practices is part of the new framework, focusing on transparency and comparability across countries and sectors. We conclude underlining that, at the current stage, the reform process is heavily focused on quantitative issues and on measures applicable to the solvency margins: given the evolutionary pace expressed by the financial sector world-wide, we suggest to extend this attention to qualitative requirements and to the aforementioned dialogue between supervisors and insurers, to achieve a greater level of convergence and a long-term effectiveness of insurance supervision. Otherwise, the model is subject to the same risk of ineffectiveness examined in this paper, with costs that are finally borne by markets, consumers and policyholders.

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