

Capital requirements for insurers: Solvency II and Italian market

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1. Introduction

Capital requirement for European insurers is the solvency margin².

It depends only on underwriting risk: required margin comes from fixed factors applied to life provisions and non-life premiums/claims.

The other types of risk are beyond the solvency margin. They are: market risk and reserve risk. The first is measure by investment limits to assets covering technical provisions while the second with valuation principles.

European current framework is therefore based on solvency margin, investment limits for assets and valuation principles for provisions.

Today it's necessary capital requirements depend on undertaking risk management: they must become flexible (what types of risk?) and overall (what is overall insurer risk?).

2. Capital requirements revision: drivers and standard model

The aim of capital requirements is to verify the adequacy of insurer resources in respect of managed risks.

Actually the methodologies to measure capital adequacy have been revised.

Proposals were born from:

- ✓ an activity of capital requirement control of supervisors;
- ✓ an activity of risk management process standardising of insurers organisations;
- ✓ an activity of completing the single market in financial services of European Commission.

¹ University of Naples "Parthenope". The first part of this paper is inspired to paper was published in DEA Anno XLVII Fasc. 4-2005.

² One third of required solvency margin constitutes the guaranteed fund.

In the first group of proposals there is also Solvency II project.

For comparing different proposals, instead of internal models, we utilize a model for all insurers (standard model) because in the solvency review process this model for capital requirements assessment accomplish a fundamental task: it's a measure of principal sources of risk.

For a good application of standard model it should be summarize the exposures at different types of risk in few parameters.

For a good assessment of standard model the model setter should seek the equilibrium between the degree of parameters performance and the cost of model implementation.

When the solvency revision process will be finished standard model will have a specific scope because it likely is simple, available for applications and dynamic.

It will therefore be utilized:

- ✓ to compare domestic market with other countries;
- ✓ to compare insurance sector with other financial sectors;
- ✓ to assess capital requirement for small and medium companies;
- ✓ to benchmark capital requirement for large companies with their internal models.

3. A classification of revision proposals

Different proposal may be classified on the ground of the degree of dynamism: what are parameters for the approximation of risks? What methodology of approximation?

On the ground of parameters the solvency assessment may concern accounting data or price of variables. In the first way the assessment should be dependent on accounting practices and the distance from the insurers best practices while in the second way the estimation should be qualify by methodologies for calculating cash flows.

The solvency assessment methodology may be prescribed by rules or principles but rules could become rapidly obsolete while the enforcement of solvency principles could be representative of the best practices.

On the ground of degree of dynamism we may place all the models for the solvency assessment in a matrix (see Figure n. 1).

Solvency requirement assessment methodologies	Principles- based	SOLVENCY II standard model FSA model FTK SST (IV)	Solvency II compliant internal models (III)
	Rules- based	(I) RATING AGENCY SOLVENCY I AUSTRALIA model CANADA model NAIC model	(II) Internal models
		Accounting-based	Cash-flow-based
			Sources of data

AUSTRALIA model: Australian Prudential Regulatory Authority (APRA, 2002)

CANADA model: Office of Superintendent of Financial Institutions (OSFI, 2004)

NAIC model: National Association of Insurance Commissioners (NAIC, 2004)

FSA model: Financial Services Authority (FSA, 2004)

FTK model: Dutch National Bank (DNB, 2004)

SST model: Federal Office of Private Insurance (FOPI, 2006)

Figure n. 1 - A classification of revision proposals

In the first quadrant we may put “static” models while in the third quadrant we may place “dynamic” models.

For the “static” models the parameters, which are accounting data, and the methodologies are prescribed under rules.

Some examples of these models are rating agency models and so-called “traditional” models (Australia, Canada and USA).

“Dynamic” models identifies prices of variables while the solvency assessment is inspired by principles of valuation.

In this quadrant it may be classified Solvency II compliant internal models.

In the second and the fourth quadrant we may be classified the “ibrid” models. In particular in the fourth quadrant the nature of data is counter-balanced by the application of several scenarios: every scenario simulates the effects of display of risks. Here we may place Solvency II project.

4. Supervisors revision proposals

Here we analyse only the supervisors proposals while in the next paragraph we will treat the project of European Commission. We don't analyse insurers organizations proposals because they have own scope in European solvency review process.

Why authorities have formulated own solvency revision proposals?

Fundamentally for two reasons:

1. to get ready insurers for Solvency II owing to the revolution in risk management;
2. to qualify in own perspective Solvency II process through the Lamfalussy methodology³.

We will analyse with attention models of the fourth quadrant in Figure n. 1 because they represent the present and the next future of capital requirement.

We analyse, therefore, standard versions of:

- ✓ the model proposed by Dutch supervisory authority for life business (FTK model);
- ✓ the model appointed and utilized by Financial Services Authority (FSA model);
- ✓ the model tested by Swiss supervisory authority (SST model).

In the next paragraph we will analyse the Solvency II standard model.

To point out the dynamic characteristic of these models we try to estimate:

- ✓ what methodologies are available for the risks assessment?
- ✓ what kinds of risk are covered by capital requirements through scenarios⁴?

³ The objective of lamfalussy approach is a rapid and flexible adoption of legislation and supervisory convergence in its implementation. For insurance sectors see EC (2002).

- ✓ what elements are necessary for the solvency requirement assessment?

Every model employs scenarios but in different manner (see Table n. 1): Dutch model uses scenarios only for one type of risk (financial risks), English model only for one type of business (life with option for the minimum requirement), Swiss model only for the ordinary management (while for extraordinary events it identifies ruin hypotheses).

Table n. 1 - Risk assessment methodologies

	FTK model	FSA model	SST model
Factors	Non-financial risks	Non-life Life without options	-
Scenarios	Financial risks	Life with options (minimum requirement)	Scenarios for assets and provisions
Stochastic hypothesis	-	Life with options (individual requirement)	Catastrophe scenario for non-life

Each model specifies three types of non-financial risks: underwriting risk, lapse risk and operational risk (see Table n. 2). The Dutch model allocates factors for capital charges estimation. Owing to the difficulties of operational risk assessment and business sensitivity to this type of risk every model specifies a standard factor for capital charge.

Table n. 2 - Non-financial capital charge

⁴ All types of risk are monitored but only for the most relevant it's necessary capital charge. The sum of risk charges is capital requirement.

	FTK model*	FSA model	SST model
Underwriting risk	Factors for type of policy	0,3% for life 10% for non-life	Factors for type of business
Lapse risk	Factors for type of policy	+35% of surrenders	+10% of surrenders
Operational risk	Standard factor	Standard factor	Standard factor

* This model allocates factors instead of scenarios. It's only applied to life business

Models specify four type of financial risk (interest rate risk, equity risk, real estate risk and credit risk) and for each of covered risks every model specifies one scenario (see Table n. 3).

The scope of specific scenario is different for each model. For interest rate risk the models refer to yield curve drawn up by authorities while for credit risk they refer to credit spread with respect to government interest rate.

Table n. 3 - Financial risk charges

	FTK model	FSA model	SST model
Interest rate risk	Yield curve authority ($\Delta\sigma = \pm 25\%$)	Yield curve authority ($\Delta\sigma = \pm 15\%$)	± 100 b.p. for 9 buckets ($\Delta\sigma = 10\%$)
Equity risk	- 40% maturity market - 45% others ($\Delta\sigma = \pm 25\%$)	- 20% ($\Delta\sigma = -50\%$)	- 10% ($\Delta\sigma = -10\%$)
Real Estate	$\pm 20\%$	-12%	-10%

risk

Credit
risk

+60% current
credit spread

shock depends
on duration

+10% current
credit spread

Solvency capital requirement comes from:

- The capital charges for each risk through predetermined scenarios;
- The way of aggregation among risk with supervisory linear correlation matrix;
- The way of aggregation among scenario with supervisory linear correlation matrix;
- The capital distribution (confidence level for probability of losses which required capital is intended to cover and time horizon to protect against losses).

Risk aggregation is inspired to linear correlation. There is no correlation between financial risks and non financial risks (see Table n. 4).

It's necessary to analyse the relationship between scenarios aggregation methodology and safety margin⁵. Dutch model applies the 75th percentile approach for each of non-financial risks, consequently for the solvency assessment it considers only one scenario in which all shocks happen. Instead of English model calculates every charge at capital level, consequently we may analyse the effects of aggregation at this level. Swiss model is effective seek but it's difficult to implement because for every risk we must analyse effects of run-off.

Table n. 4 - Solvency assessment components

	FTK model	FSA model	SST model
Risks aggregation	0,8 between interest rate and equity + real estate	Supervisor linear correlation matrix	Zero in every instances

5

	Zero in other instances		
Safety margins	Market Value Margin of 75th percentile of probability distribution	There is no safety margins because charges are on capital	Risk margin in case of run-off
Scenarios aggregation	One scenario for all shocks	Scenarios plus catastrophe hypotheses	Aggregation of six scenarios

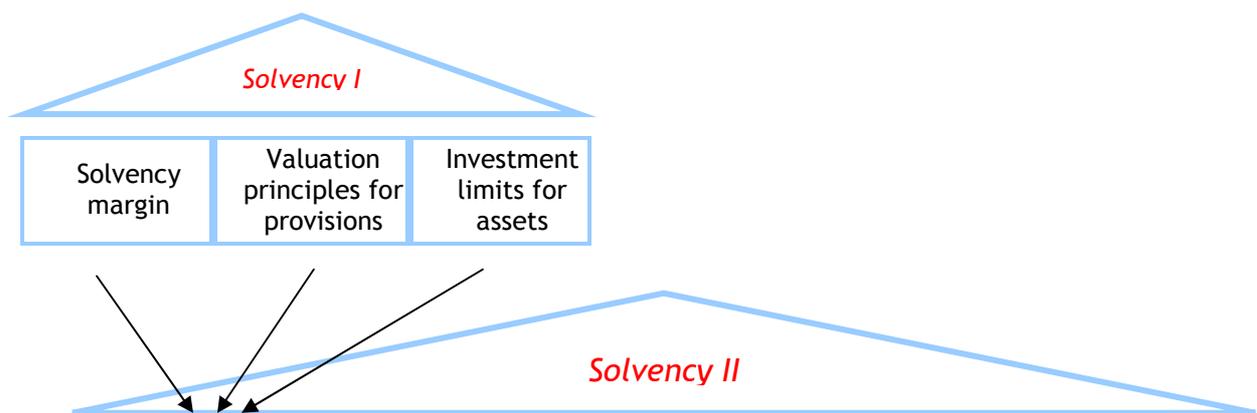
5. Solvency II framework

At the end of 2003 on the ground of a set of reports on the insurance sector it begins the second phase of Solvency II project⁶.

The aim of this project is a revision of solvency requirement.

At the end of July of 2007 European Commission have proposed the solvency Directive: in 2012 the directive will come in force.

Solvency II has adopted a framework with three pillars as Basel II (Figure n. 2).



⁶ See EC (2003).

SCR		
Valuation principles for liabilities and assets covering technical provisions	Supervisory control Internal control	Trasparency Market dicipline

Figure n. 2 - Pillars of Solvency I and Solvency II

The first Pillar identifies capital requirements. At the same time it concerns the stock of capital available for solvency capital requirement (SCR)⁷ and valuation principles for assets covering technical provisions and liabilities.

It should be highlighted that:

- on the contrary of Solvency I framework European Commission proposal specifies capital charges also for insurers liabilities through safety margins (so-called risk margin) and for assets through market risk charge;
- SCR is a measure of capital at risk. It's a value of distribution that relates the values of capital to the levels of loss with specified time horizon and predetermined confidence level.

The second Pillar is dedicated to internal (of insurer) and external (of authority) control.

The third Pillar is dedicated to transparency and communication to market of the risk management practices.

Every pillar it was been objective of consultations and quantitative impact studies: according to Lamfalussy practices European Commission is helped by committee of supervisors (CEIOPS for insurance sector) and operators (EIOPS for insurance sector) in the solvency Directive process. The aim of these practices is to abate the distance between the rules body and the insurers practices.

The aim of standard model for SCR⁸ is to allow a transition to partial or full internal model.

⁷ MCR is a level of capital requirement that can't be over: in this instance there is an automatic intervention of authority because the policyholders interests could to be in peril.

⁸ Standard model for SCR assessment is drawn up by CEIOPS in the consultation paper n. 7 and n. 20.

This model can be placed in the fourth quadrant of the matrix in Figure n. 1 because the input is derived by accounting system⁹ but the methodology is inspired to scenarios¹⁰.

For every scenario CEIOPS ha proposed (see Table n. 5) a capital charge factor derived through scenarios techniques (risk margins) and some correction factors in order to take into account the firm specifics.

The standard model considers four types of risk: two non financial risks (underwriting and operational risks) and two financial risks (market and credit risk).

Solvency II project use largely correlation matrix both among risks (and sub-risks) and among LOB.

Table n. 5 - Solvency II standard model

Risk assessment methdology	Scenarios and correction factors (market share and duration)
Types of risks	Two non-financial risk (underwriting and operational) and Two financial risk (market and credit)
Solvency requirement assessment	Risk margins and correlation matrix among risks, sub-risks and lines of business

The impact of life scenario takes into account the profit sharing effects, for example for index linked products (Figure n. 2).

⁹ When International Financial Reporting Standard for insurer will be definitive (see IASB, 2007) it's necessary reallocate SCR standard model in the third quadrant of Figure n. 1.

¹⁰ Scenario is a deterministic variation of relevant variables (risk parameters) because there isn't a probability of fulfilment as stochastic models.

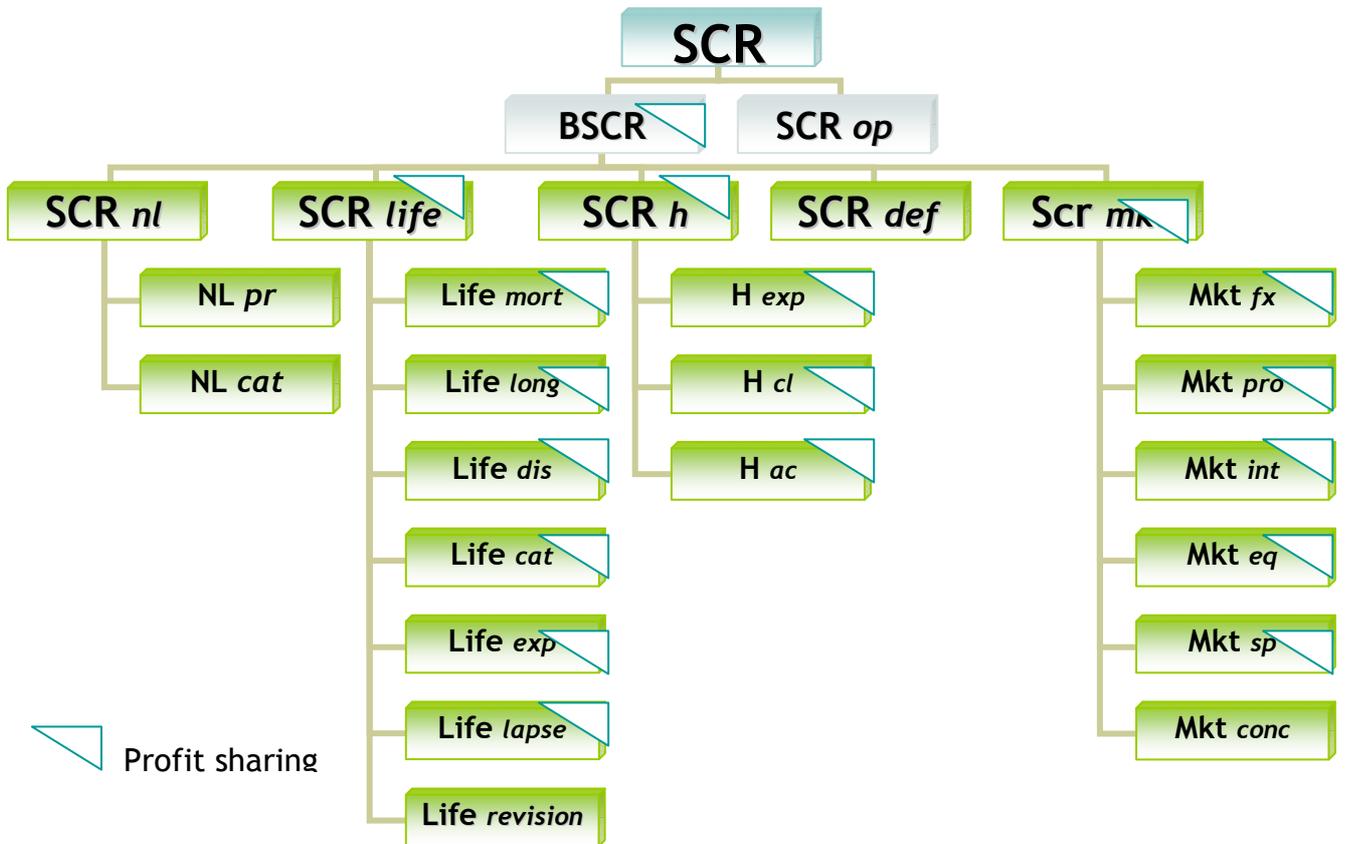


Figure n. 3 - Solvency capital requirement: standard formula

The charge for market risk arise from the net asset value variation that is obtained as difference between sensitivity asset and sensitivity liabilities owing to level and variability of five risk factors: equity, interest rate, currency, credit spread, real estate and concentration in respect of the same issuer of shares and bonds.

For example the volatility interest rate charge depends on the most important net asset value variation related to upward scenario and downward scenario. These scenarios are assessed with reference to CEIOPS yield curve.

The charge for equity risk is only conducted for systemic risk because idiosyncratic risk, the residual part of market risk, can be reduced through effective diversification policy. The equity risk charge is calculated by markets indexes (the correlation between market portfolio and net insurer portfolio is equal to one, that is beta is one. This charge is equal to the net

asset value variation corresponding to market index shock of 32% for maturity markets while for emerging market or alternative investments (private equity, ...) is equal to 45%. If the equity portfolio is linked at several indexes it's necessary to take into account the correlation among markets.

For the approximation of property price volatility CEIOPS suggests a 20% fall in real estate benchmark. It's necessary to take account direct (properties) and indirect (real estate funds) exposures.

In QIS3 the participants may tested another approach for the calculation of equity and property risks based on duration of assets and liabilities.

The credit spread risk is a sub-risk of market risk. It's derived from volatility of difference between corporate interest rate and government interest rate with the same duration. The charge for credit spread risk is assessed from the rating and duration of exposures. It can't confuse with default risk or interest rate volatility risk.

The concentration risk is derived from the degree of idiosyncratic risk with reference to the same issuer. What is the weight of the exposure with the same issuer? The difference between the exposure and the threshold can be mitigated by rating of corporate counterparty.

Counterparty default risk is the risk of providers of mitigating contracts therefore that is the risk of default for reinsurance and the risk of settlement for financial derivatives (CDS included).

This risk is assessed through three measures:

1. probability of default that is produced from rating on the ground of matrix appointed by CEIOPS;
2. cost of counterparty replacement (taking into account all additional expenses);
3. correlation among reinsures (correlation is directly obtained by Herfindahl index).

As for financial risk also for non financial risk we account sub-risks and scenarios for the charge assessment.

Life underwriting risk is subdivided into seven typologies of which five sub-risks belong to biometric risk (mortality, disability, longevity, catastrophe and revision) while other two risks are related to policyholder behaviour (lapse risk) and insurers management processes (lapse risk).

The charge is assessed through analysis of NAV variation corresponding to CEIOPS shocks: for example for mortality sub-risk CEIOPS suggests a growth of 10% for each age apart from the undertaking demographic tables.

For non-life underwriting risk CEIOPS suggests two sub-risks:

- premium and reserve risk. CEIOPS identifies two sources of risk: 1) hypothetical difference between received premiums and the sum of incurred and to be incurred losses plus expenses to service the contracts; 2) level (mean value) and variability (standard deviation) of future claim payouts. The underwriting charge assessment depends on exposure at risk and standard deviation of combined ratio;
- catastrophe risk.

6. An application to Italian market¹¹

Design

Solvency II compliant assessment of technical provisions is based on distinction between hedgeable and non hedgeable risks because not all risks may be deemed on principles-based methodology (market-consistent basis).

Hedgeable risks can be perfectly hedged or replicated on a market: assessment is equal to the value of replicating portfolio or the hedge.

Non-hedgeable risks haven't price because there isn't "*a sufficient deep, liquid and transparent market*" and can't be managed with derivatives. The assessment of non-hedgeable risks corresponds to the sum of:

- best estimate. It equals to the expected preset value of all future potential cash-flows based on all information available. Cash-flows must be discounted with risk-free interest rate term structure because the probabilities can't be influenced by undertaking creditworthiness and its risk aversion.
- risk margin. It's a safety measure because it covers uncertainty linked to future cash-flows of provisions. For its determination in QIS3 CEIOPS proposals cost-of-capital approach instead of percentile approach. By the first methodology the risk margin is the capital available for run-off. It's equal, therefore, a surcharge

¹¹ We don't analyse underwriting risk for health business but only for life and non-life.

that another undertaking should require if it's necessary to transfer the policyholders obligations.

There are two aspects that must to be highlighted for non-hedgeable risks calculation in life and non-life: what is the way for business segmentation? And, consequently, what is the aggregation methodology for solvency capital requirement?

For life business CEIOPS suggests at least six risk factors and requires explanation of management and policyholders behaviour beyond options and guarantees of contracts.

For application we account that:

- Management behaviour doesn't modify asset allocation of indexed policies for the time horizon because for the aim of application market conditions are stable. Management behaviour doesn't recognize extra-benefits.
- Policyholders behaviour is similar to that at the end of 2006 (surrenders rate of 2006).

The costs of any option and guarantee are the prices of their hedge.

For non-life CEIOPS suggests at least 12 lines of business and for each of these line CEIOPS recommends the calculation of premium provision and outstanding technical provision.

Premium provision (stand-ready obligations) substitutes current unearned provision and unexpired risk provision. It should assess risk of insured event occurring with varying severity.

The adequacy is tested through the comparison between expected expenses (payments derived from claims and management expenses in the coverage period) and unearned premiums.

For application we have lower expected expenses than unearned premium provision.

Post-claims technical provisions is outstanding claims provision. It should assess the risk of incurred claim varying in amount and timing of payment.

We have accounted motor-third-party liabilities, ... as claims with low uncertainty: the assessment is the result of sound statistical method applied from undertaking (by additional information of 2006 accounting); while for aviation,...are treated as claims with significant uncertainty: the assessment is the result of run-off triangle.

SCR standard formula is divided into modules because it must to be transparent every capital charge and the effect of profit sharing, diversification and discretionary benefits. SCR is overall standard formula capital charge and is determined as sum of basic SCR (BSCR) and capital charge for operational risk.

The basic SCR combines:

- capital charges for market risk, default risk and underwriting risk for every type of business (life, health and non-life) while operational risk is beyond the basic assessment for its complexity;
- correlation between every capital charge and each other¹². The correlation between type of business is equal to zero;
- mitigation instruments, that are profit sharing (only for SCR life, SCR health and SCR market) and future discretionary benefits (only for SCR life).

It's evident that CEIOPS appoints correlation among risk mitigation effects as for SCR.

It's desirable that there is coherence between SCR and risk margins to avoid the "circularity" problem (its solution is one of aims of QIS3)¹³.

Number and scope of predefined scenarios is variable. For example CEIOPS suggests two scenarios for market risk in which every rate of term structure is modified in reason of shock.

European Commission monitors implementation of solvency capital requirements and safety measures through solvency review process: it isn't a simple control because supervisor can interfere if the underwriting capital requirement is over a predefined thresholds.

Sample

What undertakings?

We analyse a sample of Italian undertakings for two reasons:

- Actually Italian market is sufficiently solid: by current rules available margin is higher than required margin. But in the next future? Will the order of European innovation have negative

¹² Linear correlation between SCR non life and SCR default risk is equal to 0.5 owing to the role of reinsurance for non life-business.

¹³ CEIOPS (2007) and CEA (2007).

repercussions on Italian insurance supply? And are Italian policyholders sufficiently covered?

- There isn't an Italian "way" of solvency: the Italian supervisor (ISVAP) doesn't have formulated a revision proposal and Italian associations don't set own risk management standards. This behaviour likely depends on accounting tradition which produce a higher reservation rates

We account only a sample of Italian market: the sample is shaped from listed undertakings at the end of 2006. It represents 75% of non-life market and 60% of life market.

Main results

Application of standard model to *non-life* business involves a consistent growth of solvency requirement (Figure n. 4).

Non-life solvency margin under Solvency I is only derived from one risk but Solvency II involves also a capital charge for providers of mitigation contracts because if the impact of reinsurance is considered when CEIOPS prescribes net provision calculation as Solvency I it's necessary to consider reinsurers creditworthiness for an effective management of non-life underwriting risk.

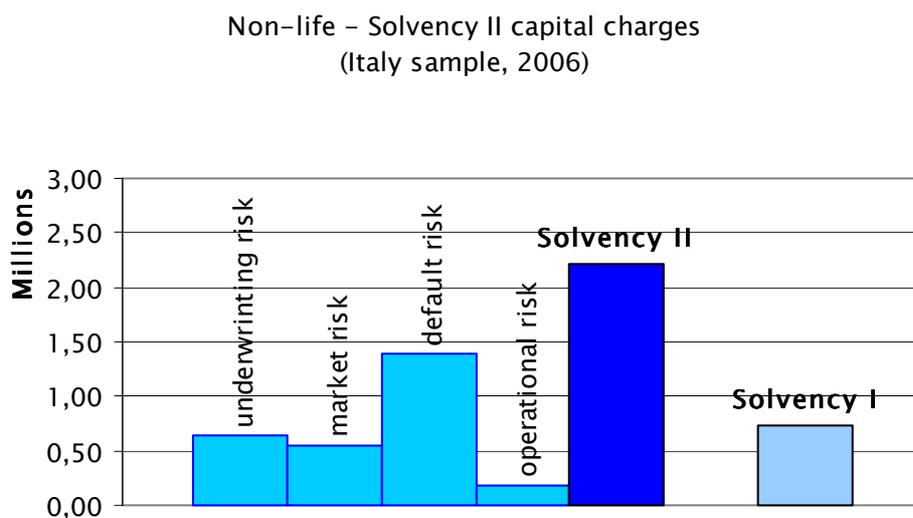


Figure n. 4 - Solvency II and non life Italian insurers

For life the difference between solvency capital requirement under Solvency II and current requirement is less considerable than the difference between Solvency II and Solvency I for non-life (Figure n. 5).

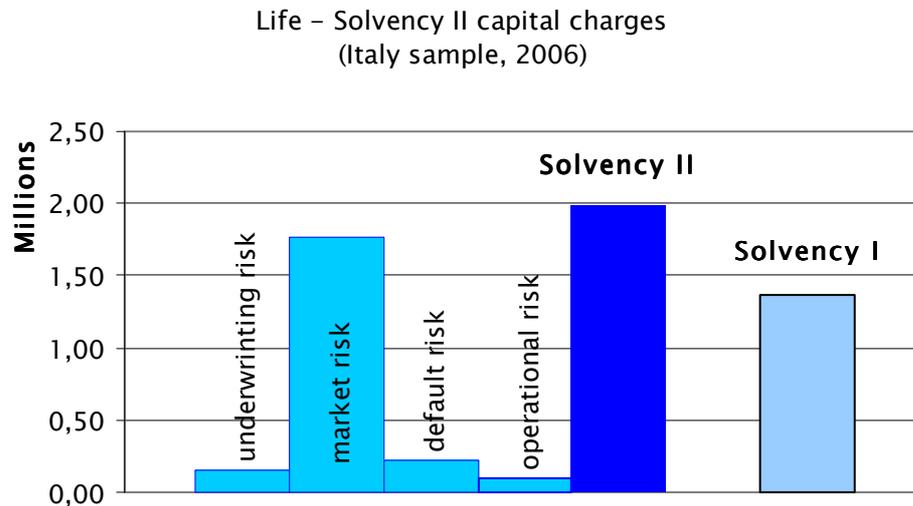


Figure n. 5 - Solvency II and life Italian insurers

The most important life capital charge is for underwriting risk but capital charge for market risk is considerable for two reasons:

- The number of sub-risks: normally real estate risk and credit spread risk don't belong to market risk category;
- The concentration sub-risk is derived from excess exposure in respect of concentration threshold (for example AA-AAA issuers is 5%) and the exposure value on market-consistent basis. Italian sample undertakings portfolio is over weighted on two asset classes: real estate and investment grade bonds.
- The reduced impact of mitigation effects of profit sharing. When policyholders bear investment risk there is a lower capital charge in term of market risk and underwriting risk.

It's important to disarticulate underwriting risk in sub-risks: every type for sub-risk, except revision sub-risk, is mitigated by profit sharing (Figure n. 6).

Life – Sub-riks of underwriting risk
(Italy sample, 2006)

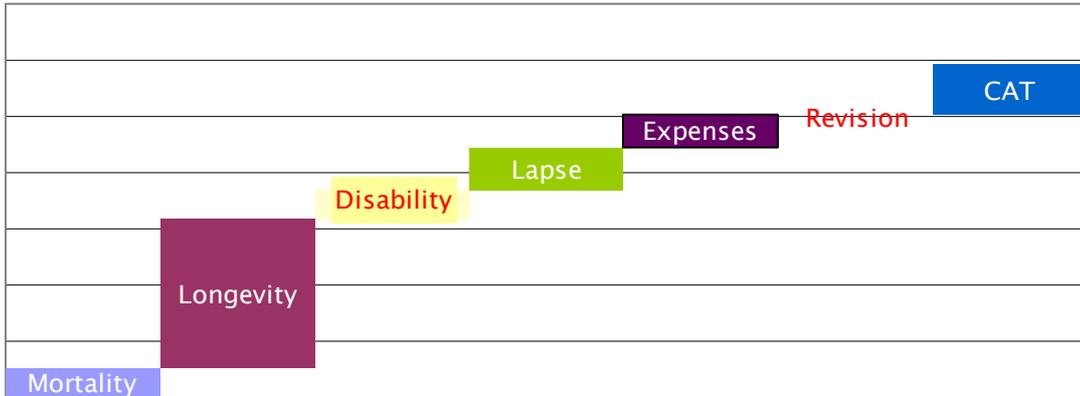


Figure n. 6 - Life Italian insurers: sub-riks of underwriting risk

It's necessary to compare these outcomes with current regime in term of provisions for life and premium for non life: we have a likely assessment of next future capital requirements (Figure n. 7).

Solvency margin and SCR
(% of 2006 provisions for life and
% of 2006 premiums for non-life)

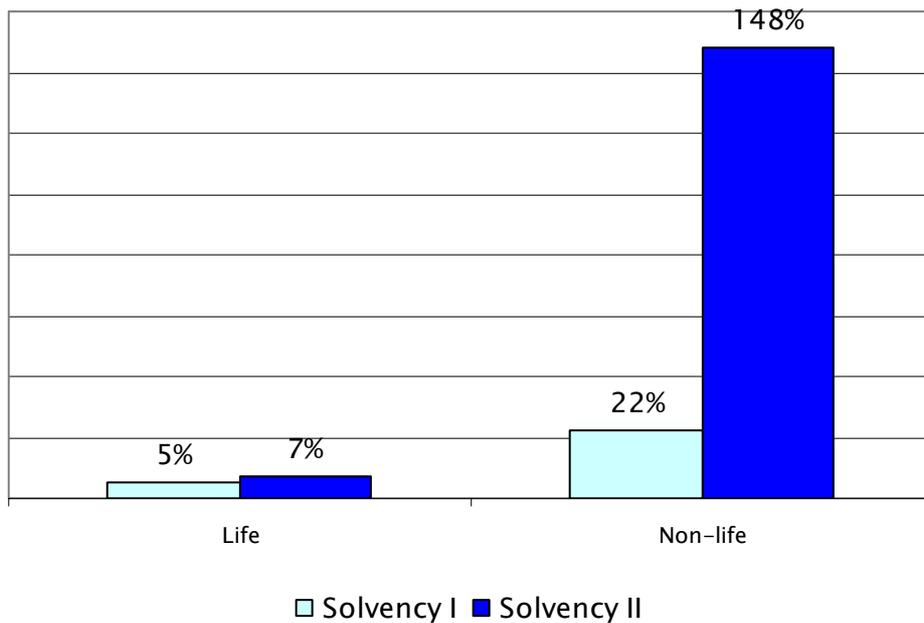


Figure n. 7 - Solvency I and Solvency II

The outcome was foreseeable because there are some capital charge beyond underwriting risk instead of aseptic requirement as Solvency I, but it's necessary to outline the growth of requirement for non life. Why? Is Italian non life supply sufficiently robust?

This outcome suggests a revision of reinsurance policy and a screening of future business in force.

7. Conclusions

Capital requirement for insurers is based on the attitude to meet policyholders obligations.

The sophistication of risks of financial system derived from the change in act in financial system (globalisation, technologies innovations, ...) involves revision of conditions to operate: capital requirement must become "flexible" and "overall".

Some supervisors have proposed some models for capital requirement assessment. These proposals amplify the number of risks for which is identified a capital charge, but mainly they adopt scenarios techniques of risk assessment for the major of sources of risk.

The aim of Solvency II is to encourage the adoption of risk management formalized processes. When these procedures satisfy the conditions established under rules undertaking can obtain a reduction of solvency requirements. It's an important goal of review process mainly if it accounts the group solvency requirement (that is beyond the scope of this paper). From this point of view standard model application is a step on the way of full internal model.

The application of Solvency II standard model to a representative sample of Italian supply shows a consistent growth of capital requirement mainly for non-life business owing to risk transfer instruments. This precludes two big transformations: a major meaningfulness of resources who satisfy capital requirement and a strong incentive to risk management for better pricing of risk as for banking sector with Basel II.

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