Focus on

The "Financialisation" of Non-Life Insurance:
The Impact of the New Accounting and Prudential Standards

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The introduction of new accounting standards (IFRS, Conseil National de la Comptabilité in France 2007) and prudential standards (solvency II, Conference of the Insurance Supervisory Services of the Member States of the European Union, 2002) is bringing about a radical change in the operational context of insurance companies which, in order to be in fully integrated, have a great deal to do in terms of information and assimilation. Indeed, these standards are constructed from a purely financial point of view of insurance based on a portfolio approach, the components of which are valued with reference to the market – the fair value principle – and where the control of profitability/risk is the major concern. The relevance of this approach has long been recognised within the academic community of course (Biger & Kahane 1978 ; Fairley 1979 ; Loubergé 1981 ; Cummins & Chang 1983). Nevertheless, it is out of tune with a technical point of view, stemming from the weight of actuarial science within the profession, which seems to be still dominant in the area of non-life insurance. Moreover, the numerous difficulties involved in implementing these new standards have made some experts doubt their suitability (Duverne and Le Douit, 2008; Flamée, 2008), which is an additional brake on the transformation which is to take place. It seems essential today to take stock of the current situation in non-life insurance and to describe its characteristics from a financial point of view in compliance with these new standards, using portfolio theory as a reference, and at the same time to shed light on the thorny aspects of implementation.

The insurance business should be analysed in reference to financial intermediation; its specificity lies essentially in the kind of securities issued – policies – to mobilise precautionary savings and thus contribute to financing the economy. The insurance firm then is like a « double portfolio »:

- An underwriting portfolio, recorded on the liabilities side of the balance sheet, composed of obligations undertaken with policyholders
- An investment portfolio, on the assets side of the balance sheet, essentially made up of the list of securities held and other receivables

This conception is the basis of the new standards now being introduced. Each element of the balance sheet, assets and liabilities alike, is a security whose «fair value» must be determined to give a realistic picture of the company. Moreover, it clearly highlights the appropriateness of an ALM approach (Asset Liability Management, see: Crouhy & Galai 2005) based on the coordinated management of assets and liabilities so as to optimise the profitability/risk equation and determine the amount of equity necessary to ensure the company's solvency.

Presenting the insurance business in terms of this conception is nothing new; our aim here is essentially pedagogical. However, it seems not to have been entirely taken on board by practitioners and many well-informed experts are worried about a lack of preparation just when the new standards are supposed to be implemented[1].

The first part of this paper, based on an analysis of balance sheet items, will highlight the typical structure of a global portfolio managed by a non-life insurance company. Here we will emphasise the necessity of simultaneously managing assets and liabilities and of identifying the factors of profitability/risk which the company can act upon: the strategy for underwriting policies and reinsurance, investment strategy and the control of solvency by selecting an appropriate level of capital. Without overlooking the central idea that all these actions must be coordinated, we will examine each

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1. See the column « point de vue » in: « Focus sectoriel : Assurances », *Option Finance*, June 2007, n° 937.

of these three points in turn, analysing the relevance and impact of the new standards. In the second part we will give a detailed presentation of the underwriting business, identify which factors determine premiums and measure the underwriting income. The third part is devoted to underwriting risk management, emphasising the essential role of reinsurance and alternative modes of risk transfer. The fourth part will deal with investment strategy, distinguishing between securities depending on type and maturity, and taking into account the characteristics of liabilities. The last part (5) is devoted to the subject of equity requirements in relation to solvency.

I. THE INSURANCE FIRM: A DOUBLE PORTFOLIO

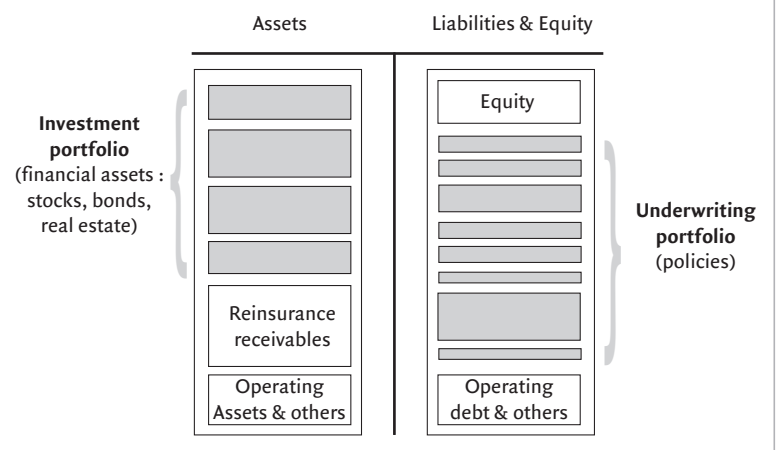
This presentation is based on a simplified version of an insurance company's balance sheet (*figure 1*). The insurer is a financial intermediary, its resources mainly come from the collection of premiums in return for policies providing guarantees and services to its clientele of policyholders. These resources are recorded as liabilities under the heading underwriting provisions – for current risks and claims to be settled – whose value, ultimately, is an estimate of the obligation contracted with the policyholders.

One of the particularities of the insurer is that its debt is uncertain, since the amount of the claims it is obliged to settle and the frequency of disbursements are uncertain. In the best case scenario, the company can infer a probability distribution based on experience and taking into account factors which might affect the level of future claims. As for the policyholder, the client holds a policy which guarantees payment of compensation in case the loss, as defined in the contract, occurs. Nevertheless, he is still exposed to a risk of default in the event that the insurer becomes insolvent – an event that the regulator tries to make unlikely by establishing a set of prudential standards.

The heading « *other debt* » covers a great variety of items mainly connected with current operations. Finally, equity and equity equivalents[2] constitute a guarantee in the eyes of the regulator, who is forever seeking to limit the risk of default. Solvency II is a new form of this requirement.

Apart from the tangible and intangible fixed assets needed for operations, the asset structure largely stems from choices made by the insurance company on where and how to invest funds collected. Also included are reinsurer receivables, where the amount indicates their share in covering risks underwritten directly[3].

Figure 1. Balance sheet of an Insurance Company



This description clearly shows the makeup of an insurance company. The insurer is a financial intermediary and as such it must manage a double portfolio: one which is recorded in liabilities – the portfolio of policies issued to attract precautionary savings – and the second, recorded in assets, containing investments and other receivables. *Figure 2* gives an even clearer picture. Assuming current assets and liabilities cancel out, we can simplify by saying that equity is equal to the value of investments minus net reinsurance provisions. This representation allows us to distinguish between the financial and underwriting components of the total portfolio held by the shareholders of the insurance company. Overall profitability and risk depend on the choices made in building these two portfolios: financial strategy on one hand, and the strategy on policy writing and reinsurance on the other, as well as any correlating effects linking the underwriting and financial parts.

Good management means taking control of the total risk through the coordinated management of financial and underwriting portfolios – hence the already mentioned importance of an ALM approach.

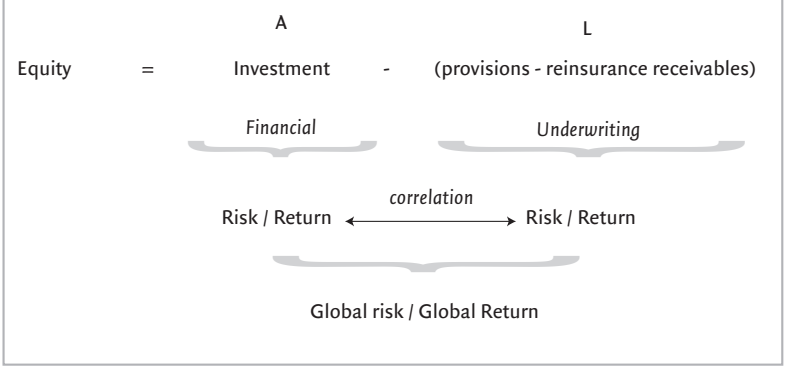
Efficient management of an insurance company rests on the principle of global optimisation. The insurer operates simultaneously on several risk market segments: capital markets and the insurance and reinsurance markets. In this perspective, it needs to seize arbitrage opportunities, taking on risks where they generate a high return and discharging them where the risk premium is lower. In practice, insurers usually follow a prudent investment policy, on the grounds that they cannot take on both an underwriting risk which is deemed very uncertain and a very volatile investment portfolio. Nevertheless, reinsurance is a way of limiting the underwriting risk, thus allowing for a bolder investment strategy[4].

2. For a more comprehensive presentation one would also have to take into account hybrid securities, especially subordinated debt, which are considered as quasi equity and contribute to the solvency margin.

3. Given that the primary insurance company remains entirely bound to the policyholders, the amount of provisions is not affected by reinsurance. The « reinsurers' share in underwriting provisions» appears therefore as a receivable on the asset side.

4. Using sophisticated forms of reinsurance and sometimes the securitisation of liability items (now common -- a set of techniques referred to under the heading ART - Alternative Risk Transfer), fits with the idea of controlling underwriting risk within an overall ALM approach. See SIGMA 11/04.

Figure 2. The insurer manages a double portfolio



Turning back to the previous presentation (*figure 2*), we can provide a clearer formulation of expected profitability and the risk taken on by the insurance company's shareholders.

We will let r represent the profitability of the investment portfolio (A), and u the rate representing the cost of insurance resources (L). The observation of a combined ratio [5] above 100% for most countries (*see Table 1*), indicating a negative underwriting margin – apart from investment income – suggests that this is indeed a cost (this point will be examined in detail later). This is not surprising, as liability items are resources and there's no reason for them to be free. Still, let's point out that this is an uncertain cost, since it depends on the amount of insurance claims.

Balance sheet items will be measured here at fair value, or market value, in compliance with the requirements of the new standards. A represents the value of portfolio investment, L is the amount of net reinsurance provisions and K is equity (*figure 2*).

Expected profitability for the shareholder, then, is:

$$[1] \qquad E\{k\} = (E\{r\}\, A - E\{u\}\, L) / K$$

Or again:

$$[2] \qquad E\{k\} = E\{r\}\,(1 + L/K) - E\{u\}\, L/K$$

Choosing variance as the risk indicator, the measure of overall risk affecting the return on equity (σ^2_k) is given as:

$$[3] \qquad \sigma^2_k = \sigma^2_r\,(1 + L/K)^2 + \sigma^2_u\,(L/K)^2 - 2\,\sigma_{ru}\,(1+L/K)\,(L/K)$$

Covariance σ_{ru} expresses the idea that there is a correlation between the cost of claims and the market index. Several early studies, (Fairley 1979 ; Hill & Modigliani 1981), have shown the existence of an inverse relation, with a negative covariance ($\sigma_{ru} < 0$). These studies confirm intuition [6]. Note, then, that it is an aggravating factor since it increases the total risk.

Notwithstanding this observation, equation [3] clearly shows the levers of risk control. There are three of them and they must be used in a coordinated fashion in a portfolio approach:

- The underwriting and retention strategy, determining underwriting risk measured by σ^2_u
- The investment strategy, generating financial risk measured by σ^2_r
- The amount of equity allocated, determining the leverage ratio *L/K*.

These three points will be the subject of the following sections, but it is necessary first to analyse in detail the factors which determine insurance premiums on which the expected underwriting income depends.

II. PRICING AND DETERMINANTS OF THE UNDERWRITING MARGIN: THE RELEVANCE OF IFRS

By taking out a policy, the client can transfer a risk to the insurer [7] who receives a premium and in return agrees to pay, in the future, an indemnity should the loss occur. For a sufficiently large population of policyholders, where the law of large numbers applies, and providing there is little correlation between the risks underwritten, the insurer can arrive at a reliable estimate of the total burden of claims to pay. It can then share this amount among all the policyholders charging a premium which corresponds to their quota share, possibly including a safety margin, to which is added a charge to cover administration and acquisition costs. Thus the function of the insurer is not to take risks in place of the policyholders, but to organise the mutualisation of risks where possible and to allow each policyholder to substitute a fixed charge – the premium – for a potential loss. If this is deemed to be impossible – which is sometimes the case for low frequency risks of extreme gravity – the insurer will be inclined to refuse to cover them [8].

This standard description of the pricing policy, on a cost-plus basis, is in fact inappropriate in the context of a competitive market, which is the implied frame of reference for the new standards. Assuming a competitive market, the premium is not really set by the insurer; it is a market constraint which must be accommodated. The question which the insurer must ask is whether this premium is acceptable given its own assessment of the risk, its administration costs and the income expectations of

5. Ratio of the cost of risks plus policy administration and acquisition costs over premiums.

6. Indeed, one can well imagine that a morose economic climate along with poor market performance might be accompanied by an increase in the amount of claims.

7. According to the new accounting standards (IFRS), the transfer of risk is a necessary condition to qualify as an insurance policy. This excludes a certain number of policies, particularly in the life insurance branch, where this transfer is not clearly established.

8. This is the case today for certain risks related to natural disasters and terrorist acts, which are very unpredictable and extremely serious. It might be deemed necessary then for the State to step in and make an appeal to national solidarity.

investors [9]. We will adopt this perspective hereafter.

We will let *PT* represent the total amount of premiums collected for a generation of policies – a set of similar policies underwritten at the same date for a homogenous population exposed to the same class of risk. The remaining amount available to cover risks, the « pure premium » component will be represented by P_o. This is the amount left after subtracting all costs other than the payment of claims (C) [10], i.e. :

$$[4] \qquad P_o = PT - C$$

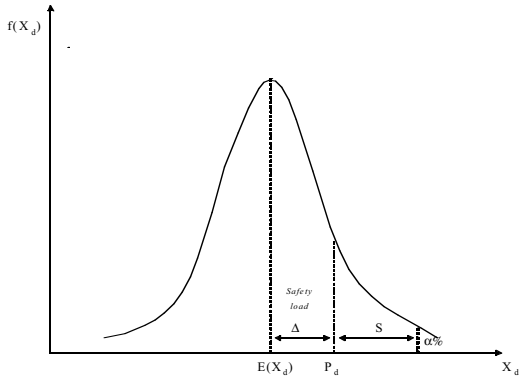
There is a time dimension to insurance whereby the initial reserve P_o must enable the future payment of claims for losses which occur during the contractual period. The underwriting risk stems from the fact that the insurer never has a certain estimate of the total amount of claims it will have to settle, nor *a fortiori* does it know the dates of the corresponding payments. At best, it has a probability distribution inferred from historical data and adjusted to take into account factors which might affect the amount of future claims.

Following the estimated claims profile, the initial reserve (P_o) is set to run out at a final date beyond which the insurer considers it has met all contractual obligations taken at the beginning of the period. For the rest of this exposé, and in order to simplify without losing too much detail, we will assume that the disbursements take place on one occasion, and are of an uncertain total amount called X_d, at the end of period *d*, assumed to be known and equal to one year [11].

If insurance conditions are ideal – a homogenous population made up of a large number of individuals exposed to the same risk, and all individual risks being independent – then it is easy to verify that the mathematical expectation of the amount of claims to settle $E[X_d]$ is a good estimate of the amount needed at the end of the period to cover claims-related charges. In reality, nevertheless, the insurer is often faced with imperfect conditions: the absence of data to infer a reliable probability law, correlation effects, asymmetry of information, moral hazard… all of these concerns prompt the insurer to include a safety margin aimed at mitigating the underwriting risk.

To represent this idea using a VaR (Value at Risk) type methodology, let's assume that the insurer knows the law of probability of X_d and wants to limit the probability of recording an underwriting loss above a certain limit S to α% for the entire risk portfolio (Graph 1). This sum corresponds to the amount of « economic capital » allocated by the insurer to cover the underwriting risk for the generation of policies in question. Once the overall amount is determined, this figure (which depends on the insurance company's degree of risk acceptance) can be allocated by sub-category following the standard procedure used by financial institutions. (Jorion 2007, part IV, Mc Neil et al. 2005)

Graph 1. Underwriting risk



With an accumulated reserve of $P_d = E(X_d)+\Delta$, the probability of an underwriting loss above S is limited to α %

To meet this objective, the insurer must hold an amount (P_d) at the end of period which exceeds the mathematical expectation of total losses:

$$P_d = E(X_d) + \Delta$$

where Δ represents the safety margin

To make things simpler, we will express this safety margin as a percentage, where:

$$[5] \qquad P_d = (1+s)\, E(X_d)$$

If the assumption of normality is accepted for X_d, then Δ is determined by the relation: $\Delta + S = \lambda_\alpha \sigma_{xd}$ (where λ_α is a coefficient associated with probability α% and σ_{xd} the standard deviation of X_d). Otherwise, and especially if the distribution of X_d is strongly asymmetric due to the possibility of extreme losses, one can imagine that the safety margin would be so high that the premium charged by the insurer would be judged dissuasive by the market.

In a competitive context where the insurer cannot set its own prices, it might consider the implicit safety margin incorporated into the market premium insufficient and the amount of capital it would have to risk excessive. Under such conditions, it might decide not to offer any cover. Of course, reinsurance may allow the transfer of a portion of the risk under conditions which might make it acceptable for the primary insurer, but then one would have to consider the capacity of the reinsurer (or henceforth the financial market through new instruments) to offer such conditions [12].

9. Mutual insurance companies are not an exception to this rule. Even though their objective is not profit, they must ensure that premiums are compatible with their financial equilibrium.

10. This amounts to favouring the «current entry value» option for evaluating underwriting provisions rather than «current exit value». We do not consider this assumption to be restrictive in the context of this presentation.

11. This period might be interpreted as the duration of underwriting obligations.

12. The asymmetry of information that characterises the relation between the primary insurer and the reinsurers, as well as the competition that reigns among the latter, indeed gives an advantage to the primary insurer, but if an abuse of this advantage leads to an accumulation of losses for the reinsurers, they will have to

Table 1. Combined ratio and underwriting margin

Country	USA	Canada	UK	Germany	France	Japan
Period	94 - 04	94 - 04	94 - 04	94 - 04	95 - 04	96 - 04
Combined ratio (%)	106,2	103,1	104,2	99,9	105,2	99,4
*Margins (%)	-6,9	-3,7	-4,7	-2,4	-6,1	0,4
Discounted Combined ratio	98,0	94,3	95,2	93,5	97,3	99,0

*standardized underwriting ratio

Source : « Measuring Underwriting Profitability of the Non Life Insurance Business », SIGMA 03/06, publication swissre.com

In general, the intensification of competition, with the resulting downward pressure on premiums, tends to reduce the safety margin and therefore to increase the underwriting risk and/or the economic capital that must be dedicated to this activity.

To understand how insurances prices are set, it is necessary to take the time variable into account. The amount collected at the beginning of the period (P_o) must be sufficient to ensure that capital is available when needed (P_d) to settle claims. Logically, the initial amount P_o invested at a risk-free rate r_f should provide the amount required P_d, at the due date *d* (here *d* is set at 1, following our assumption). Thus:

$$[6] \qquad P_o (1+r_f) = P_d$$

Or, similarly, P_o should correspond to the present value of the funds needed at the due date:

$$[7] \qquad P_o = P_d / (1+r_f)$$

Note that using a risk-free rate is justified by the fact that the risk has already been taken into account in determining the amount P_d which includes a safety margin [13].

Taking the definition of P_d from equation [5], and by approximation for sufficiently low r_f and *s* rates, we obtain:

$$[8] \qquad P_o = E[X_d] / (1+r_f - s) = E[X_d] / (1+a)$$

P_o can be interpreted as the amount of precautionary savings entrusted to the insurer by policyholders at the beginning of the period. The discount rate $a = (r_f - s)$ then corresponds to a rate of return offered to the policyholders or, symmetrically, the cost of insurance resources for the insurer [14]. Owing to the safety margin ($s > 0$), note that rate *a* is normally lower than the risk-free rate, which makes sense if we accept that the insurer is unable to remove all the risk from its policy portfolio, given that there is a non-diversifiable component. [15] This conclusion is confirmed by the facts (*table 1*) and concurs with a certain number of theoretical developments inspired by the CAPM [16] (Cummins & Harrington 1987).

The combined ratio is defined as the ratio of claims settlement costs plus administration and acquisition costs over net premiums. A ratio greater than 100% means that the amount of premiums is less than the total cost of selling policies, and is thus a negative underwriting result. This can be viewed as a « premium discount » granted to policyholders as part of their savings remuneration. Nevertheless this negative margin is a kind of accounting illusion in that it is calculated without taking into account the time elapsed between the collection of premiums and the payment of indemnities. An actuarial approach, whereby the underwriting margin is determined from the difference between the premiums initially collected and the present value at the risk-free rate of disbursements from the sale of policies, shows a positive margin (present combined ratio less than 100%) – which confirms the previous conclusion that the cost of capital for the insurer is less than the risk-free rate.

III. CONTROLLING UNDERWRITING RISK

The insurer has several means at its disposal for controlling underwriting risk. The size and degree of risk portfolio diversification are two essential factors in limiting its magnitude, but reinsurance – in all its forms – remains an indispensable tool.

Access to all segments of the insurance market is an advantage from a technical point of view, hence the relevance of a generalist insurance strategy founded on a extended network with all the necessary expertise for the analysis and selection of very diverse risks. Never-

readjust their expectations, or try to recoup their losses.

13. The P_d amount can be considered as a certain equivalent, which would correspond to particular properties of the insurer's utility function.

14. Rate *a* is a measure of the cost of capital expressed as a proportion of the amount of premiums collected (P_o). It is of the same nature as rate E{u} used in equation 2 which refers to all the underwriting capital accumulated by the insurer (L).

15. For an analysis of how the insurer handles non-diversifiable risks, see the seminal contribution of Doherthy & Dionne (1987).

16. Subject to accepting its relevance to the present context, the CAPM (Capital Asset Pricing Model) provides us with an indication of a « normal » rate a: a = rf + a (E{Rm} – rf) Namely, the risk-free rate (rf) plus a risk premium which corresponds to the product of the systematic underwriting risk (a) multiplied by the market risk premium (E{Rm} – rf). a expresses the idea that there is a relation between the claims rate and market volatility. Several studies have shown the existence of an inverse relationship, with a negative covariance, where rate a should normally be lower than the risk-free rate.

theless, the insurer will have to deal with difficulties stemming from asymmetry of information and moral hazard, which are major concerns. These issues have been the subject of numerous developments (Rothschild and Stiglitz, 1976) which are still current in the context of globalisation and the greater complexity of insurance markets.

Above and beyond these observations, reinsurance is a vital instrument. An exhaustive description of the diverse forms of reinsurance is beyond the scope of this paper (see Walhin, 2007, SIGMA 2004); it is nevertheless important to stress its utility. Three objectives are pursued:

• First of all, it allows the insurer to take on risks directly that are beyond its own retention capacity, by transferring a portion to reinsurers[17]. Reinsurance, then, is like a form of refinancing, allowing the insurer to free up its own funds, which is particularly useful during a crisis period.

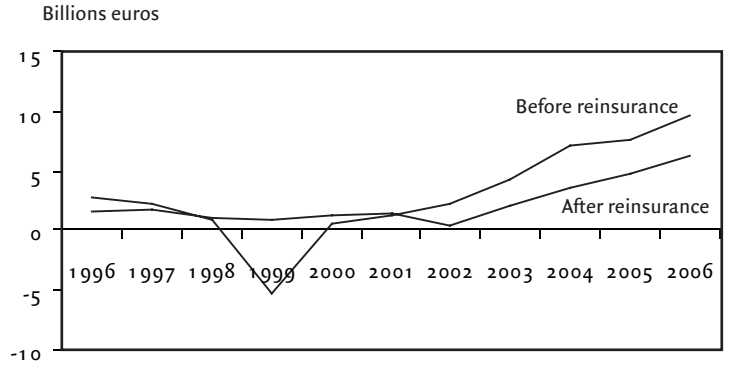
• By transferring or accepting risks through reinsurance, the company can restructure its portfolio in order to achieve better balance between lines and more effective diversification.

• Finally, reinsurance allows the company to reduce the magnitude of the hazard which characterises certain categories of risk which is hard to dilute within a diversified portfolio and which therefore constitutes a threat in terms of solvency[18]. Comparing the underwriting margins of French insurance companies before and after reinsurance clearly illustrates this last point (*graph. 2*).

In terms of finance, the reinsurer undertakes the obligation to share in covering a portion of the risks accepted directly by the insurer. This obligation appears as a receivable on the insurer's balance sheet, under the heading « reinsurers' share in underwriting provisions ». Although the main purpose of reinsurance is to reduce the burden of risks for the direct insurer, the reinsurers' credit rating still has to be assessed. Recently this question has become central (AM Best, 2001). The multiplication of catastrophic events along with market instability since the crash of 2000 has led credit rating agencies to downgrade the rating of many insurers and reinsurers, some of which found themselves close to insolvency. Whatever the case, prudence dictates the diversification of transfers to prevent the default of any single reinsurer having overly serious consequences.

Note also the growing number of securitisation operations (SIGMA 2006, Cummins 2004), the use of cat bonds for catastrophe reinsurance and the appearance of new forms of "financial reinsurance" (Krytov 2006) – all new vehicles which must henceforth be considered as alternatives to traditional reinsurance.

Graph 2. Underwriting margin, reinsurers' contribution



Source : FFSA, annual report 2007.

Fluctuations after reinsurance are cushioned. Moreover, the peak in claims in 1999 was mostly absorbed by reinsurance.

These « insurance derivatives » meet the needs of certain investors who are looking for investments that are both profitable and uncorrelated with the market – usually hedge funds. This provides insurers and reinsurers with access to capital markets and enables them to increase their capacity, which contributes to their integration in the financial sphere. (Euromoney 2008). This is a new field of financial innovation which naturally raises a lot of questions on the part of the regulator, always concerned about ascertaining the reality of risk transfers and more and more worried about their dilution within a community that is neither well identified nor very transparent. Of course this evolution is not disconnected from the effort to introduce new, more stringent standards in terms of solvency.

IV. FINANCIAL STRATEGY: IMPACT OF IFRS

Given the uncertain nature of their debt, the financial strategy of insurers is mainly governed by the principle of prudence on the grounds that one should avoid an accumulation of risks affecting both assets and liabilities. This seems even more justified considering the unfavourable correlation linking underwriting and financial results (*see equation 3*, $\sigma_{ru} < 0$).

Note also the importance of leverage, resulting from the weak structural share of equity – i.e. an elevated value of the L/K ratio in *equation [3]* – which, everything else being equal, increases the probability of default.

Data on the breakdown of French insurance companies' investments (*table 2*) confirm this prudent attitude. Investment in shares accounts for less than 30%. With only a few exceptions[19], we observe a similar

17. The capacity of an insurer is determined by the amount of equity it has at its disposal. The transfer of risk to the reinsurer -- providing it is effective -- relaxes this constraint and allows the company to expand its activities based on a given amount of equity.

18. For an analysis of how the insurer handles non-diversifiable risks, see the major contribution of Doherthy and Dionne (1987).

19. Particularly in the UK where insurers hold a much higher share proportion on the grounds of the stability of their resources and the fact that investment in shares has always outperformed in the long run. This attitude nevertheless amounts to downplaying the importance of liquidity, which is why British insurance companies suffered the most from the stockmarket downturn in 2000 at a time

Table 2. Composition of property & casualty company investments

Bonds & mutual funds fixed income	57,8 %
Equities & mutual funds variable income	29,1 %
Real estate	6,1 %
Loans & miscellaneous	7,0 %

Source : FFSA, annual report 2007.

breakdown for other countries where the insurance market has reached maturity.

In addition to an analysis based on the degree of risk inherent in the securities making up investments, one must also examine the portfolio structure in terms of maturities. For total immunisation, the basic rule is to adjust the duration of assets to fit the duration of liabilities [20], in this case the duration of underwriting provisions. But here the insurer is confronted with two difficulties. The first has to do with the fact that it may be impossible to find a perfect match, given the constraint of the securities offering. The second difficulty stems from the fact that the duration of liabilities cannot be determined accurately, owing to the uncertain nature of disbursement flows occasioned by claims. Adjusting the securities portfolio to an average provisions duration could force the insurer to trade securities sooner than it would have liked, risking a loss if it suddenly had to face sizeable disbursements. This is what obliges the insurer to maintain a certain degree of liquidity – a problem which can however be partly solved through reinsurance.

This alignment of maturity timing has become a fundamental issue today with respect to the principle of fair value. The new accounting standards call for an evaluation of underwriting provisions on an actuarial basis which explicitly takes into account the projected dates of disbursement. Under these conditions, any variation in the reference rate provokes a readjustment of the provisions [21]. As it is highly unlikely that the insurer will be in a position of total immunisation given the nature of the components of its balance sheet, it is possible that a rate variation might affect the income statement and result in an amputation of equity.

While not new, this question has taken on more importance in light of the new accounting and prudential standards. This explains the growing interest of insurance companies in financial instruments and vehicles that might shield them from rate variations. Apart from traditional hedging instruments, the securitisation of liability items has also emerged as a management method for dealing with this preoccupation.

To conclude on this point, it should be noted that the changes in the insurance regulatory framework are far from neutral regarding management methods and the financial strategy of firms. From traditional portfolio management practice, where little attention was paid to the characteristics of liabilities except for the prudence imperative not to accumulate risks, insurers must henceforth adopt an integrated view of asset and liability portfolios. We are witnessing a financialisation of the insurance business in the sense that the traditional financial instruments of portfolio managers have also become the management instruments for underwriting. Faced with the increasing severity of risks and the regulator's growing requirements in terms of equity, it seems that companies' reaction is to use these new instruments to reduce the exposure of their liabilities while adopting bolder behaviour in managing assets.

V. EQUITY REQUIREMENTS: SOLVENCY II, GREATER DEMANDS

The question of equity level is inseparable from that of solvency in that equity constitutes a safety margin in case the insurer has to face disbursements much greater than its estimates, significant losses in its investment portfolio, or the default of a reinsurer.

If we return now to the expression of variance in equity profitability (*equation* [3]), the L/K leverage ratio emerges as a determining factor in shareholders' exposure to risk. A low level of equity compared to the value of underwriting provisions, i.e. a high L/K ratio, positively affects σ^2_k, and signifies an increase in risk.

If, according to a now standard approach, the shareholder is considered as the holder of an option given his limited responsibility, it would seem to be in his interests to limit his contribution, because by increasing the risk he also increases the value of his option (Cummins, Harrington & Niehaus 1995). If the insurance market is assumed to be efficient, especially if insurers and policyholders are equally informed and not subject to limited rationality, then the risk of default would also be taken into account by the market, which would oblige the insurer to adjust premiums accordingly. A perceived high default risk should correspond to a low premium, reducing the profitability of equity by as much. The market would operate as a regulator and each policyholder would make his decisions taking into consideration the default risk of the insurer and the amount of the premium to pay.

Reality is quite different, of course. Limited rationality and lack of access to pertinent information place the policyholder in a position of inferiority that the insurer is likely to take advantage of. For this reason, the intervention of the regulator is deemed necessary, the aim being to protect policyholders by limiting the insurer's risk of default with the imposition of a minimum level of equity.

The rules for calculating the required amount of equity – or solvency margin – imposed by the regulations have long rested on a simple principle which

when the claims rate was increasing strongly. See "Poor cover for a rainy day" The Economist. 6 March 2003.

20. We will disregard the question of convexity here.

21. Note that some experts challenge the application of such a rule in that there is no real market where the liabilities components can be regularly exchanged, so that taking into account a variation in their value in the income statement seems a little artificial.

consists in demanding a minimum that corresponds to a certain proportion of premiums or the amount of claims settled in the past[22]. Given the volatility observed in financial markets, the generalised use of insurance derivatives and at the same time the worsening trend of underwriting risk, it became necessary to have a more refined approach in order to truly guarantee the solvency of the insurance system.

The current regulatory developments, following an approach comparable to Basle II are based on determining the level of capital required with respect to the insurer's exposure to risk (« Risk-Based Capital » RBC). In fact, it is the strict implementation of the portfolio approach presented above, taking into account the structure of the insurer's risk portfolios, both asset and liability, and not only the general quantities for determining standards. Note here the coherence between IFRS and Solvency II in that the application of the fair value principle theoretically permits a more accurate evaluation of balance sheet components, allowing a true monitoring of available equity.

Continuing on from previous developments, it is possible to describe how to determine the equity necessary to meet solvency requirement in keeping with the spirit of Solvency II.

We will let K_o represent the initial value of equity and K_t its value at date t, the date of the next audit. The equity expected at date t corresponds to the initial value K_o plus the profit made during the period, thus:

$$E(K_t) = K_o (1+E(k_t))$$

Assuming all other elements to be fixed, the choice of equity level K_o at the beginning of the period determines the probability distribution of K_t ($f_{Ko}(K_t)$; (*see graph 3*)

Using the assumption of normality for the simplicity of this exposé, it is possible to express the limit value K^{α}_t associated with a given probability of α%, as:

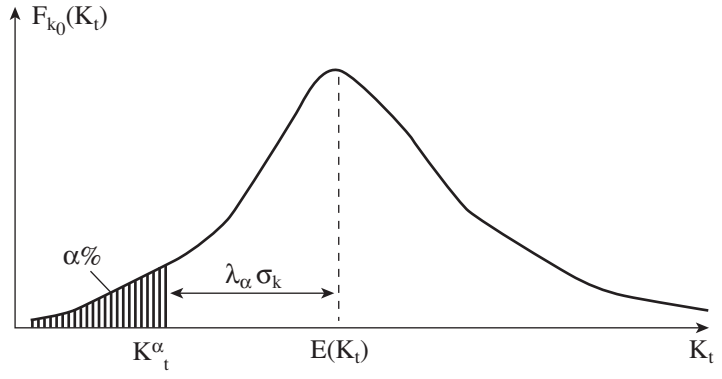
$$K^{\alpha}_t = E(K_t) - \lambda\alpha\, \sigma k$$

If K^{α}_t is negative, that means that the probability of equity being negative at the end of the period (i.e. default of the insurer) is greater than α%. In other words, everything else being equal, if the value of equity initially allocated is low, not only will the solvency margin be reduced, but on top of that σ_k will be elevated[23]: two elements which increase the probability of default. The following numerical example provides an illustration.

Numerical data for the illustration:

– Expected profitability for the investment portfolio; r = 6%

Graph 3. Equity and risk of default



The probability of equity being less than K^{α}_t at date t is α %

– Investment portfolio risk; σ_r = 7.2%
– Expected cost of underwriting reserves; u = 1.5%
– Underwriting risk; σ_r = 10%
– Correlation u,r = -0.2
– α = 1% ; λ_α = 2.33
– Value of underwriting obligations; L = 70

Table 3. Equity and solvency (simulation)

L	K_o	L/K	k	σ_k	K^{α}_t
70	30 (a)	2.3	16.5%	36.7%	9.3
70	15 (b)	4.7	27.0%	79.8%	-4.7

As this illustration suggests, the low equity allocated in case b explains the high value of σ_k (79.38% compared to 36.7%) which leads to a negative final equity value K^{α}_t = -4.7 This means that the probability of default in this case is higher than the critical threshold of 1 %.

The implementation of the RBC method requires advanced expertise in the monitoring and control of risk, permitting real-time evaluation of overall risk exposure. It must be recognised today that this is one of the more complex tasks, given the use of ever more sophisticated financial instruments whose characteristics in terms of risk and profitability are difficult to measure, and at the same time the introduction of new accounting standards which many experts agree are a source of ambiguity (CNC 2007).

In particular, it should be noted here that one of the much criticised consequences of applying the fair value principle in the context of IFRS is balance sheet volatility, i.e. the L/K ratio. In other words, not only is the implementation of Solvency II (inspired by RBC) a new constraint, and one that is complicated to implement, but the complexity of the task is exacerbated by the influence of the new standards on balance sheet volatility. It may well be that the difficulties experienced by banks – to which identical standards now apply – following the sub-

22. In France, the rule still in force requires a solvency margin of 16% of annual premiums or 23% of the average amount of claims paid over the last three years, if higher.

23. A low level of equity means high leverage which increases the risk for shareholders.

prime crisis (Euromoney 2008), and to a certain extent also by insurance firms, will lead the regulator to consider some adaptations.

CONCLUSION

The aim of this exposé was to offer a simple description of the non-life insurance business, with an essentially pedagogical objective, focusing on the financial dimension using a portfolio approach inspired by numerous existing and sometimes rather old theoretical developments. Within this context we have highlighted the impact of the new accounting and prudential standards which affect the setting of premiums and underwriting risk, the use of reinsurance, investment strategy and the control of solvency.

We have particularly emphasised to what extent using « fair value » to measure the components of assets and liabilities could lead insurers to modify their behaviour. As with banks, by increasing the volatility of balance sheet items, the fair value rule obliges insurers to pay more attention to their solvency than before and therefore to the risks they might take on and their capacity to mobilise equity.

It must be recognised that the task is a tough one, especially as the difficulties involved in implementing the new standards are numerous and complicated to solve. Significant and costly efforts are required to adapt information systems, put the appropriate tools in place, and develop the necessary expertise. Today, many experts are wondering about the real utility of these rules on an operational level and are thinking about the conditions and interpretations and also the adaptations that must be carried out so they might really be applied. The large number of reports and comments published on these questions is proof that this reflection is well underway. ■

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