Some Issues in Risk-Based Capital

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1. Introduction

Risk-based capital is employed in two different contexts. Firstly, it is used within a regulatory framework to determine an acceptable minimum level of capital which an insurance company must hold as part of its solvency assessment. Secondly, it is used in financial planning and control within an insurance company to help determine the overall optimum level of capital for an insurance company and to provide a basis for allocating this capital across its various activities or operations. Hence, from the regulatory perspective, risk-based capital represents a minimum level of capital, whereas in the financial management of an insurance company the concern is with the optimum level of capital and its efficient allocation. An optimum level of capital implies that an insurance company can have too much capital as well as too little capital. Having too little capital is not just concerned with an adequate level to absorb the risks of the business and to finance future growth but that it is also sufficient to meet the expectations of consumers and intermediaries. On the other hand, if an insurance company holds too much capital, the rate of return on shareholder capital will be lower than it needs to be, since there is a cost to holding capital, i.e. the differential between rate of return that shareholders of the insurance company could earn on alternative investments with a similar level of risk and the after-tax rate of return earned on the investment of the capital by the insurance company. Hence the share price of the insurance company will be lower than it would be if the capital held were at an optimum level.

2. Measuring capital

The measurement of capital from the regulatory standpoint differs from that for internal company management purposes. A regulator seeks to measure the level of capital in order to see whether it exceeds the predetermined minimum level under a worst scenario, viz. the state of liquidation. On the other hand, company management must adopt a more realistic valuation basis, using the more likely scenario that the company will remain 'a going concern' and will not thus be forced to sell investments at short notice or to pay claims at higher levels or more speedily than would tend to be the case in a state of liquidation. It is inappropriate here to go into technical details regarding the differences in the measurement

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of capital from the regulatory and from the company standpoint. Suffice it to say that the measurement of capital will be significantly different between the two, with the regulatory value placed on the capital deemed to be held by an insurance company being less, usually considerably less, than the capital that the management itself considers it possesses. Whether measured from a regulatory or management perspective, the framework to determine capital within which a valuation basis takes place can follow an accounting approach or an actuarial/economic approach. But under either framework capital is measured as a residual in the asset/liability equation.

Table 1: Framework for measuring capital (simplified form)

Accounting framework:	
Assets	Liabilities
Investments	Technical provisions
	Other liabilities
Other assets	Capital
Actuarial/Economic framework:	
Assets	Liabilities
Present value of future stream of stochastic cash inflows from investments and other assets.	Present value of future stream of stochastic cash outflows to policyholders and others.
	Capital

3. Risk-based capital within the US regulatory framework

Let us first of all look at risk-based capital from the regulatory perspective. Risk-based capital for insurance companies is a relatively recent phenomenon, having emerged in the United States in the early to mid 1990’s, first for life and health insurance and then for non-life (property and casualty) insurance. The spur to the introduction of risk-based capital systems in the United States arose from pressure in the federal government to have a more formalised system of capital adequacy, following the failures of one or two major US insurance companies.

Within the various states, insurance regulators, and indeed the National Association of Insurance Commissioners (NAIC), already had for many years informal guidelines relating to capital adequacy. They clearly realised the importance of capital but were aware that there are a variety of other factors that can contribute to the insolvency of an insurance company, apart from capital adequacy.

The NAIC had in place a sophisticated early warning system based on a multi-factor model to determine potential insurance insolvency, with capital being one of the factors. But it was political pressure that led to working parties being set up (under the auspices of

the NAIC) to come up with a more formal system. The concept of a risk-based capital adequacy system came from the US banking sector which had had such a system since the 1950's and had subsequently evolved into a wider international standard under the auspices of the Bank of International Settlements. Hence, it was the existence of risk-based capital in the banking sector which led to its extension to insurance.

The introduction of a risk-based capital system for life insurance and health insurance was introduced relatively quickly, since there were no major disagreements within the insurance industry about the determination of the risk factors and the details of implementation. The fact that sufficient flexibility existed in the actuarial valuation basis for solvency assessment was a key factor in achieving this consensus between the regulatory authorities and the insurance industry. However, problems arose in respect of non-life business, not least in determining the risk factors for loss reserves (outstanding claims provisions) and the underwriting risks attached to new business: the liabilities side of the balance sheet. In addition, the correlation between assets and liabilities were also more complex. For example, the system would have to cope with determining the correlations between capital market movements and the underwriting cycle if it were to provide a credible measure of capital adequacy.

It is not the purpose here to go into detail on the various risk factors which make up the risk-based capital system in the United States. There is little doubt that the conceptual framework underpinning the system is sound. The problem arises in trying to translate the framework into criteria which can be embodied into a clear set of regulatory rules that are equitable and operational. Neither is it the intention to detail the various risk factors and how they are calculated. The main risk factors are: asset (investment) risk; credit risk, essentially reinsurance recoverables; loss (claims) reserving and settlement cost risk; new underwriting business risk and off-balance sheet risks, (e.g. open positions in derivatives etc.). But there are certain omissions that should be mentioned. It has not been possible to adequately capture cross balance sheet correlations between assets and liabilities. One clear omission is the failure to explicitly recognise any potential for currency mismatching, probably because the international transactions of US insurance companies, with a few notable exceptions, are not major, and so this risk factor was ignored. Nevertheless, a comprehensive system should cover these risks. The potential aggregation of risk is also not adequately captured in the risk model framework, when it is clear that this is a major cause of potential loss in the non-life insurance business.

The risk framework is also essentially retrospective in nature, being based on statistical data at both the industry and company level over a preceding time period. It is self-evident that risk factors in the future, including the correlation between the factors, can differ from those in the past. This is a criticism that can, of course, be levelled at any statistical analysis and thus it must be kept in perspective. Experience of past insurance company failures shows that the competence and honesty of the management is a key factor, especially in a dynamic market situation. Management risk is not measured, although it would clearly have been difficult to do so.

One weakness of the US risk-based capital model is that the groupings of the risk factors and their weightings are somewhat arbitrary. It was self-evident to those drafting the risk-based capital rules that all the adverse outcomes would not occur simultaneously. Indeed this would be adopting a too pessimistic a scenario since the joint probability of occurrence would be extremely low and thus would have imposed an unrealistically high

capital requirement on companies. To allow for this, a covariance adjustment was introduced which is essentially a square root rule, implicitly assuming that the risk groupings are statistically independent of each other. This independence assumption is a serious oversimplification. Further work needs to be done on the correlations across the various risk factors in order to come up with a more appropriate adjustment. The fact that the covariance adjustment has such a significant effect in practice on the final level of capital adequacy means that the issue is not a trivial one. The problem with the adjustment arises from the construction of the model, which quantifies individual factors and then seeks to aggregate them into an overall measure. Risk is, by definition, not additive and hence one cannot aggregate risks into an overall measure, unless one has a detailed idea of the underlying covariance (correlation) structure. But at the same time it is necessary to have information about the individual risk factors in order to measure them accurately. Herein lies the core of the problem.

In addition to defining a minimum threshold for each insurance company, the new US system has introduced a more detailed set of regulatory responses that are triggered, if the capital base of an insurance company (measured by conservative valuation criteria under state regulation) falls below these thresholds. As can be seen in Figure 1, there are four thresholds which trigger a regulatory response with differing degrees of severity. These pre-determined regulatory responses contrast with a more flexible system which existed in the United States previously. Indeed, it also contrasts with the regulation within the European Economic Area, where there are two threshold at which a formal regulatory response would occur: the required margin of solvency and the guarantee fund. In practice, within western Europe, regulatory authorities would tend to make approaches to an insurance company before its capital base reached the required margin of solvency, depending on the prevailing economic and market situation.

Figure 1: United States system

Figure 2: EEA system

4. Lessons for a system for the European Economic Area

With the introduction of risk-based capital in the United States and subsequently in Canada, these are current debates on whether such a system might be extended into the European Economic Area and indeed into regulatory systems elsewhere in the world. Just as in North America, banks within western Europe currently adhere to risk-based capital adequacy rules and so there is a *prima facie* case for extending the concept to insurance. Moreover, the solvency margin system in Europe has now been in operation since the 1970's and it is generally agreed that it is ready for a reappraisal. The underlying theoretical models which underpin the solvency margin system, both for life and non-life, are not sophisticated ones. Although they purport to have a risk-theoretic basis, the models do not assess the risks faced by insurance companies in any systematic way. One major weakness of the solvency margin model is that investment risks are not adequately allowed for, when it is self-evident that investment risks are an important part of the overall risk which an insurance company faces. For life insurance, the immunisation of assets and liabilities is only partially allowed for in the solvency assessment. Moreover, in relation to non-life insurance, the risks implicit in the outstanding claims provisions, and indeed those attached to underwriting new business, are only loosely captured; only if claims experience over the preceding three years is particularly high is underwriting risk captured in the minimum capital adequacy benchmark, i.e. the required margin of solvency.

In comparing the current European solvency margin system with the US risk-based system, one must conclude that the European model is inadequate. How should one proceed to draw the best from the North American models which are conceptually superior, without having the complexities, rigidities and costs of these systems? There is no simple answer to this question. One solution that suggests itself is a more collaborative approach between regulators and company management. Under such a system the regulatory authority would

define risk models that would be acceptable, but would leave the detailed modelling to the companies themselves, with the oversight of an approved internal audit function within the company. Hence it would be possible to combine sufficient rigour without undue cost and inflexibility. An internal audit team combining actuarial, accounting, underwriting and economic expertise would seem appropriate for non-life insurance; perhaps an actuary alone would be sufficient for life insurance, since the task is less complex. The role of the regulatory authority would be to approve the models and to monitor the output of the models against benchmark standards.

5. Risk-based capital as part of financial planning and control system

Recently, there has been a growing interest within insurance companies to adopt the concept of risk-based capital for internal financial planning and control purposes. There is little doubt that the introduction of risk-based capital for regulatory purposes has been a key factor in encouraging this process. As North American insurance companies were having to collect information in order to comply with the new regulatory requirements, they realised that this information could be used for other purposes within the company. This extension of risk-based capital for financial planning and control has now extended outside North America and different models are being developed by many of the major insurance companies. There has also been a growing literature on asset-liability management by actuaries and financial economists on which companies can draw inspiration in helping them to design these models.

The purpose behind risk-based capital within a financial management context is to help companies decide on the optimum level of capital which they should hold and how this capital can be allocated to those activities (operations) that are effectively using it. Those activities which by their nature are more risky will tend to need proportionately more capital than those that are less risky. It is not just an issue of the efficient allocation of capital but it is also that those activities that use more capital resources to underpin their operations should earn higher profits to pay for the use of this capital. The particular definition of an activity for the allocation process will vary according to the insurance company's organisational structure and management style; the basis could be by business units, by classes of business or by distribution channels.

One central problem that needs to be addressed is that the optimum level of capital held by an insurance company will not just be determined by the overall riskiness of the activities of the company. There are other reasons for holding capital. The two most important of which are: (a) to finance future growth, either organically or through acquisitions; and (b) to give a signal of the financial strength of the company to insurance brokers and buyers of insurance. This latter signalling effect of capital is important but as it is determined by the psychology of the market, decisions on the extra capital required for this purpose, (i.e. above what is operationally needed to run the company) is more subjective in nature. Hence, in allocating capital, a key management issue to be addressed is whether the capital allocation process is based solely on the riskiness of the various activities or on the larger level of capital which embraces these other two purposes.

Here the analysis will be restricted to the allocation of capital on the basis of the riskiness of the various activities alone. A key issue that must be recognised in such an allocation is that the capital needed at the level of the firm as a whole will be less than the capital needed to support the sum of the various individual activities, if they were to be free-standing

operations. This again derives from the fact that the risk is not additive and that the correlation between the activities will determine the relationship between the total capital of the firm and the capital needed by the individual operations. Moreover, some risk aspects relate to decisions which are taken at the level of the firm as a whole, e.g. investment and reinsurance decisions. Hence, in practice there must be both a top-down and a bottom-up approach in the capital allocation process. A bottom-up analysis would look at the riskiness of the various activities as if they were separate enterprises, in order to determine the capital to support them and then to aggregate these capital needs into an overall level of capital, with a rescaling to reflect the correlations between the various activities. At the same time, there has to be a top-down analysis to incorporate these higher level decisions which influence the riskiness of the company and hence its capital requirements. There will inevitably be some mismatch between a bottom-up and a top-down approach, but attempts to reconcile these can be made.

The process does not stop with the allocation of capital. If capital is allocated to the various activities across the firm, it is therefore possible to calculate rates of return on capital that are earned on these activities. In other words, the profits generated by each activity can be related to the notionally allocated capital. In effect, one can decompose the overall rate of return on capital of the company into sub-components at the level of the individual activities. Clearly, there are cost accounting problems to be overcome, such as allocating investment income, central expenses etc., but it is possible to calculate rates of return for each of the activities, based on not unreasonable assumptions. The overriding concept behind the process is that, whereas the stockmarket looks at the overall rate of return on capital of an insurance company as a means of judging performance in order to allocate capital resources at the macro level, so an insurance company itself can extend this financial discipline to its internal activities.

To complete the process, it is necessary that there are target rates of return for each activity so that the actual rate of return earned can be assessed. These target rates of return will vary for different activities, reflecting again their risk characteristics. But there is a difference here in what risk is being considered. The risk implicit in the target rates of return will reflect the risk compensations which are demanded by shareholders. Even though shareholders of an insurance company hold shares in the company as a whole, one can assume for this purpose that they are investing in each activity separately. Thus, the risk compensation and hence the rate of return required by shareholders will differ between each activity. The risk factors associated with the capital allocation and the risk compensation factors for shareholders will be correlated, but they will not be the same. The reason is that the portfolio of risks facing the shareholders, of which an individual activity of the company is a part, is not the same as the portfolio of risks faced by the insurance company itself. The degree of portfolio diversification differs and hence the risk differs.

6. Conclusion

This paper has sought to provide an overview of the role of risk-based capital reflecting two different purposes. One is to determine the minimum capital adequacy for insurance companies from a regulatory standpoint and the other is to assist in the financial planning and control within insurance companies. The emergence of these two approaches has evolved side by side, with the introduction of risk-based capital for regulatory purposes in the United States being the main driver of change.

Figure 3: Risk-based Capital as part of Financial Planning and Control

Risk-based capital systems for capital adequacy are now being considered by regulatory authorities in various parts of the world. What lessons can be learnt from the US experience? One of the lessons is that however conceptually sound an approach is, one must consider the problems of implementation, not least the cost of compliance to the insurance companies. If insurance companies are forced to incur significant costs in calculating risk-based capital measures, these costs will be passed onto policyholders over time in competitive markets. Moreover, the US system is not only complex but is very prescriptive in that it has a detailed set of regulatory responses which are triggered if the capital base of an insurance company falls below the minimum risk-based capital level. One can argue that this degree of detail builds undue rigidities into the regulatory process. Within the European Economic Area, and indeed other parts of the world, the methods for determining capital adequacy for insurers and reinsurers are far from adequate. Current research is being carried out within Europe to investigate if a risk-based capital system could replace the solvency margin system that has been in operation for some 20 years.

One unanticipated problem with the US system is that undue attention has been placed by the financial press on the capital base. As is well known, capital is a key aspect of the security of an insurance company but there are other factors that must also be taken into account, not least the adequacy of premiums, the adequacy of reserving and the adequacy of reinsurance, not to mention the competence and honesty of management. Indeed, in the United States, "beauty competitions" have arisen with insurance companies being ranked in order of their capital relative to their minimum risk-based capital requirement. Hence, there has been pressure on insurance companies to hold more capital than they should do and, as noted earlier, holding too much capital will over time be costly to shareholders and to policyholders. A solution is needed which captures the basic logic and coherence of the US system but which is simpler and more flexible in operation. One way forward is for there to be an extension of the collaborative approach which exists in certain countries in respect of the regulation of life insurance companies, whereby actuaries within the company act as internal auditors but are accountable to the regulatory authority. An extension to non-life insurance would require that the internal audit responsibility to be more interdisciplinary in nature, because of the greater complexity in this area of business.

Across the insurance industry, there is a growing recognition that better ways are needed for deciding on the optimum level of capital that an insurance company should hold and for allocating this capital across the enterprise. The risk-based capital framework is the most persuasive approach available. It also offers wider financial management benefits in that it can be extended to measure rates of return on capital for various sub-divisions within the company and thus it is possible to develop a financial performance system consistent with that imposed on the insurance company as a whole by the stockmarket. With insurance companies becoming larger, there is increasing pressure on top management to decentralise decision-making. A financial performance system based on rates of return on capital across the enterprise is entirely consistent with an effective decentralised organisational structure.

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