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PERSPECTIVES ARTICLES

THE SOLVENCY II PROCESS: OVERVIEW AND CRITICAL ANALYSIS

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ABSTRACT

As early as the 1970s, European Union (EU) member countries implemented rules to coordinate insurance markets and regulation. However, with the more recent movement toward a general single EU market, financial services regulation has taken on new meaning and priority. Solvency I regulations went into effect for member nations by January 2004. The creation of risk-based capital standards, the main focus of Solvency II, now appears likely sometime after 2007. The purpose of the discussion presented here is to outline the specifics of Solvency II as they currently stand and suggest important areas of future research.

INTRODUCTION

In 1998, in response to an increasingly complex financial services market and the growing likelihood of a true single market, the European Commission created a "framework for action" for financial services. The stated aims for this framework were "enhancing consumer confidence by promoting full financial market integration while ensuring high levels of consumer protection" (European Commission, 1998, p. 1). Consumer solvency protection in the insurance markets is being undertaken in two stages—Solvency I, effective as of January 2004, and Solvency II, currently being developed. Solvency I addressed many of the coordination issues across regulatory bodies and provided an initial rules-based set of minimum capital requirements (see EU Directive 2002/13/EC for nonlife insurers and EU Directive 2002/83/EC for life insurers). Solvency II will focus on an enterprise (or holistic) risk management approach toward capital standards. Solvency I offered relatively modest modifications to the capital standards originally introduced in the 1970s; Solvency II likely will require major changes.

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The purpose of this article is to outline the specifics of Solvency II as they currently stand and suggest important areas of future research. Toward this aim, we present various aspects of the EU's efforts to develop a harmonized set of insurer solvency regulations. Included are discussions and descriptions of (1) the process being followed in development of these regulations; (2) existing regulatory systems and empirical evidence of how successful they have been; and (3) specifics of Solvency II, along with an evaluation of the various options currently being considered. We hope to provide a basic understanding of Solvency II and also encourage additional research on best practices for successful risk-based capital standards.

The remainder of the article is organized as follows. The process leading to Solvency II regulations, as well as the outcomes of that process, are described in the next section. We then discuss regulatory benefits and detriments, including specific consideration of existing regulatory schemes such as those in Germany, Switzerland, the United States, and elsewhere, as well as various options being considered for Solvency II. Recommendations for the European Commission are also considered. A summary of the article and a call for additional research are presented in the last section.

SURVEY OF SOLVENCY II

Organization of Solvency II in Two Steps

The Solvency II project is organized in two phases (see European Commission, 2003a, p. 1). In the first phase, May 2001 to April 2003, fundamental arrangements were specified, a general framework was defined, and several studies were ordered by the European Commission. In the second phase (beginning December 2003 and ending sometime after 2007), these fundamentals are being developed into specific rules and guidelines, with frequent opportunities for input from member states and relevant stakeholders. Not only is input possible, but it is specifically sought by the EU as part of the regulatory development process.

Studies of Insolvency Issues. The first phase of Solvency II involved analyses of the current situation, discussion about possible principles and concepts of the future system, as well as specification of the fundamentals of the future supervisory system. Two important studies were commissioned as part of the initial analysis. Discussion of these studies is relevant to understanding how the Commission has reached the conclusions it has and why it is moving in the direction it is.

The first study conducted at the Commission's request, the KPMG study, concluded with recommendations for a three-pillar structure of insurance supervision. This structure was adapted from a three-pillar structure for the banking sector as found in the "New Basel Capital Accord" (see Basel Committee on Banking Supervision, 2001). It involves (1) quantitative requirements; (2) supervisory activities; and (3) supervisory reporting and public disclosure (see KPMG, 2002, p. 20). Each of these pillars is discussed more fully in "Three-Pillar Structure for Insurance Undertakings."

The second and more focused study is known as the Sharma Report, named after chairman of the Conference of Insurance Supervisory Services working group, Paul Sharma. To conduct its study, this working group surveyed all member state regulatory bodies. Detailed recommendations resulted from the responses to this survey. The survey consists of three parts.

The initial section of the survey queried regulators about the early intervention efforts available to them. The Sharma Report concludes that regulators use early intervention mechanisms more often than is generally believed, and that these efforts have been useful in limiting insurer failures. There is quite a bit of variation across jurisdictions, though, which the working group considers less positive for the system as a whole. Thus, some of the working group's recommendations are clearly directed at limiting cross-jurisdictional variations.

Part 2 of the survey inquired about actual failures. These were categorized by regulatory actions into groups including "restoration plans" and "short-term financing schemes" (70 firms), actual "withdrawal of authorization" (15 firms), and "safeguard measures," such as freezing assets (30 firms). Through analyses of these firms, the working group concluded that weak firms virtually never recover without some capital infusion. Further, the primary risks for nonlife insurance firms, as reported by the regulators, were underpricing and mispricing. Asset risks were considered to be secondary influences on solvency.

In the final part of the survey, regulators were asked about "near misses." More than 100 near misses were reported, from which 21 case studies were selected and analyzed in detail. These case studies led to greater understanding of the full range of solvency issues, including underlying causes of financial strain as well as information regarding early detection and preventive tools. In fact, this final element of the survey was the basis for the majority of the Sharma Report recommendations. These recommendations, which are extensive and wide-ranging, in turn provided the foundation for Solvency II. A summary of the recommendations calls for a regulatory scheme that addresses risk in three main ways (Conference of Insurance Supervisory Services of the Member States of the European Union, 2002, p. 70):

1. It needs to ensure that insurers are able to cope financially with the effects of the risks to which they are exposed; [*capital adequacy and solvency*]
2. It needs a range of early-warning indicators and other diagnostic and preventative tools that help detect and correct potential threats to the solvency of insurers before their full effects materialize; [*availability of a broad range of tools to cover full causal chain*]
3. Finally the regime needs to pay more attention to internal factors such as the quality and suitability of management, adequate corporate governance practice and codes, and an insurer's risk management systems. [*assessing management quality and adequacy of internal systems*]

Interestingly, response to the Sharma Report has focused on the first paragraph above, with development of holistic risk management capital models as part of Pillar I. We note, however, that the report itself did not focus on this result and, in fact, highlighted the importance of internal controls as a key element of insolvency prevention. Cautionary comments regarding the cost of regulation run through the report.

Development of Detailed Regulations. The second phase of Solvency II is to develop detailed regulations. The new rules are being created following the Lamfalussy comitology

(or "committee") procedure, by which the Commission receives detailed opinion reports on draft legislation from committees prior to any official implementation. In preparing these opinion reports, the committees conduct comprehensive consultations with all market participants. In the first step, working groups of the Committee of European Insurance and Occupational Pension Supervisors (CEIOPS) are conducting public forums in which suggestions for future solvency rules are collected and considered. These suggestions will be bundled by the solvency working group into a Solvency II framework directive, which is to be submitted for resolution by the EU parliament in July 2007. In the second step, starting in 2007, the CEIOPS working groups will be given the task of concrete implementation of Solvency II. The second phase ends with acceptance of the final directive, which then must be converted into national law by each member country.

Solvency Regulation Proposed in Solvency II

Three-Pillar Structure for Insurance Undertakings. As mentioned above, KPMG in 2002 proposed a three-pillar structure for insurance solvency regulation, very similar to the banking regulatory framework called Basel II. By accepting the KPMG recommendation (see European Commission, 2002b, p. 28), the solvency working group is moving toward convergence of insurance and banking regulatory systems. A significant difference between the two, however, is that Solvency II focuses more heavily on a holistic risk management approach rather than on management of single risks independently.

The first of the three-pillars contains quantitative regulations for insurance company capital requirements (see also Linder and Ronkainen, 2004, pp. 466-470). Along with technical provisions, there are rules for determining the minimum capital required and the (usually higher) target capital. Conditions for internal and standardized risk models are included in this process, incorporating both asset (investment) and liability (pricing, reserving, etc.) risks, although not necessarily including asset–liability matching (see European Commission, 2002b, pp. 30-42). There are four controlling and monitoring-relevant risk categories specified for consideration (see European Commission, 2004b, p. 22; International Actuarial Association, 2004, pp. 29-34):

- Underwriting risks, particularly from premium calculations and claims reserves;
- Credit risks arising from debtor default;
- Market risks resulting from the fluctuation of all relevant market prices, including stocks, bonds, and exchange rates; and
- Operational risks, which result from inadequate or failed internal processes, people and systems, or from external events (see Basel Committee on Banking Supervision, 2001, p. 96).

Sharma Report recommendations provide the foundation for the second pillar, which focuses on the qualitative elements of supervision (see Linder and Ronkainen, 2004, p. 471). The risks recognized by quantitative models in the first pillar must be handled with appropriate processes and decisions in the context of a risk management system. Principles for internal risk management and internal risk control, along with associated supervisory interventions, are the main elements of the second pillar. Given that the quality of internal risk management systems will be supervised in the future, such

factors as internal controls, administrative organization, and reporting systems become important (see European Commission, 2002b, pp. 43-55).

To the third pillar belong considerations about market transparency and disclosure requirements, which promote market discipline (see KPMG, 2002, p. 20; Linder and Ronkainen, 2004, pp. 471-472). A transparent process will require less regulation as market participants themselves force appropriate insurer behavior. Several additional objectives are to be considered, such as discouraging publication of competition-distorting information. Furthermore, coordination should be sought where appropriate with international financial reporting standards (IAS/IFRS) and other relevant disclosures (see European Commission, 2002b, pp. 56-57).

Two-Level Approach to Capital Requirements. Capital requirements are defined in Pillar I. Two levels are specified (see European Commission, 2003a, p. 3, 2004a, p. 31). The first level is a standard rules-based minimum capital defined in Solvency I (see EU Directive 2002/13/EC for nonlife insurers and EU Directive 2002/83/EC for life insurers). The absolute minimum capital required (referred to as the "minimum guarantee fund") depends on the insurer's line of business. In the case of a nonlife insurer, thresholds based on premiums are 18 percent of the first €50 million and 16 percent above that amount. The margin based on claims, which is 26 percent on the first €35 million and 23 percent above that amount, will be used if these amounts exceed the minimum equity capital requirements determined by the premium-based calculation. Life insurers are subject to other requirements based on investment and actuarial risks, with rules that are dependent on a greater multitude of conditions than is the case for nonlife insurance lines of business. These requirements are a foreshadowing of the intended risk-based approach of Solvency II (details are found in EU Directive 2002/83/EC).

The second level of capital requirements is the crux of Solvency II. It is a required "target capital" (or solvency capital) based on market value. The target capital should correspond to the economic capital an insurance company needs for running its business within a given safety level, and is determined by the probability of insolvency or by using the tail-value-at-risk or another similar measure (see Artzner et al., 1999, for a discussion of these risk measures). Falling below the safety net will result in sanctions being imposed; however, contravention of the target capital leads only to discussions between the supervisor and the insurer (see European Commission, 2002b, pp. 18-19).

One of the most important innovations of Solvency II is the possible use of internal, instead of standard, risk models to determine the target capital. An internal model is one constructed by the insurer for its specific needs; a standard model is designed by the regulator and used uniformly across insurers. Internal models are expected to result in more accurate analysis, control, and management of the insurer's financial situation than do the more generic standard models (see European Commission, 2002a, p. 16). To be eligible to use an internal risk model, an insurer must have its model certified by the supervisor, a process that requires detailed documentation of the selected model and its underlying assumptions (see European Commission, 2002a, pp. 18-20). Periodic examination of the model is also required to ensure that the model is properly adjusted to the dynamic financial environment. Therefore, standards for the structure and validation of internal models are essential. If an internal model is used, the resulting target

capital should not be lower than the minimum capital requirements provided under Solvency I rules (see European Commission, 2005, p. 2). Furthermore, regulators can require the use of an internal model if the insurer's particular conditions differ widely from assumptions made in the standard model (see European Commission, 2003b, p. 38, 2005, p. 2).

Insurers who choose not to use an internal model, or whose internal model is unacceptable to supervisory authorities, must calculate their target capital using a standard risk model. Design of the standard model is still in process. Current discussions are focused on defining a simple but holistic model, one that covers all four of the risk categories mentioned above.

One possibility for this model is the standard formula developed by the German Insurance Association (2005). This model is an individualized market value and risk-based factor model that incorporates all controlling and monitoring-relevant risk categories but focuses particularly on asset–liability mismatch risks, reinsurance default risks, and extreme events (e.g., resulting from natural hazards). Similar to the Risk-Based Capital Standards in the United States, the model includes interactions among these risk categories by using a root formula in aggregating different risk categories. The model differs from other factor-based models in the way it incorporates the insurer's claims experiences; that is, the standard deviation of the loss and expenses ratio for the last 15 years is multiplied with the premiums over the same period. Trial calculations and a field test calibrate and validate the model.

The standard model under Solvency II is likely to be similar to the German model just described or resemble the Japanese or U.S. models, which are not too different from the German version. For the internal model, existing systems recently implemented in several European nations are likely to be relevant. The Individual Capital Adequacy Standards of the United Kingdom Financial Services Authority (FSA), the Swiss Solvency Test of the Swiss Federal Office of Private Insurance (BPV), and the Financial Assessment Framework of the Dutch Pension and Insurance Supervisory Authority (PVK) all contain some elements of dynamic cash-flow, an aspect we would expect to be included in Solvency II internal models.

ANALYSIS OF SOLVENCY II

When and How Much Solvency Regulation Is Appropriate?

Although it is clear that some form of insurer solvency regulation will exist in the EU, a complete evaluation of possible systems requires that we consider the general question of when and what form of regulations tend to be most effective. Regulations sometimes have effects contrary to their intent, as shown in Grabowski et al. (1989). As a foundation for evaluating current options being considered for Solvency II, we present a very brief discussion of some of the literature that offers both theoretical and empirical analyses of regulatory influences.

In general, economic theory suggests that regulation of any industry may be appropriate when market distortions exist. That is, regulation can be useful when excess power and/or information asymmetries prevent markets from clearing appropriately. Regarding the insurance industry, an extended argument is sometimes made that regulation is appropriate because "insurance is vested in the public interest," thereby suggesting that

even if markets are competitive, the public needs government protection. The idea that policyholders depend on insurance to such an extent that insurer failure is unacceptable supports this argument.

The concept that the public needs protection beyond an economically competitive market is a philosophical one that we will not address here. Instead, we focus on the economic arguments often referred to as "public interest theory" (see Klein, 1995). According to public interest theory, the (insurance) market is imperfect and the role of regulation is to address those imperfections. The imperfections generally arise from agency problems and costly information. Under this theory, the need for solvency regulation is based on the classic agency problem of differing incentives between firm owners and debtholders. Insureds are, in essence, firm debtholders and, under certain conditions, are subjected to excessive risk taking by the owners. Information could alleviate agency problems but its acquisition is costly, particularly when debtholders attempt to assess the insurer's product quality, including willingness and ability to pay claims. Furthermore, an insurer can alter its financial strength after a policyholder has paid premiums but before the coverage period ends (Munch and Smallwood, 1981). Such situations can be used to justify solvency regulation.

An important question, then, is to ask the extent to which these informational and agency problems exist within the EU. The answer will show the extent to which solvency regulation is necessary and in the public interest. Regulation can improve market efficiency, but it also can yield distortions that ultimately harm the consumer by shrinking supply and/or raising prices (Phillips and Shiu, 2002).

Harrington (2004) recommends consideration of three points in deciding whether solvency regulation is needed: (1) the risk sensitivity of demand, (2) the value of intangible assets and bankruptcy costs, and (3) other signals of insolvency, such as rapidly rising premiums and/or inadequate pricing. In general, Harrington considers the insurance market to demonstrate significant market discipline and therefore concludes that "the benefits of stringent risk-based capital requirements, which will have limited accuracy under the best of circumstances, will be small" (2004, p. 18). He further argues that any capital requirements implemented should be kept relatively simple. Evidence from the United States suggests that more complex regulations are not necessarily better (Cummins et al., 1995; Grace et al., 1998; Pottier and Sommer, 2002).

If it is decided that regulation is appropriate, the points raised above will need to be considered in designing the regulations. Inappropriate solvency regulations can result in unnecessarily high prices for consumers if insurers hold more capital in reserves than is efficient for their level of risk (Cummins and Nini, 2002). Badly designed regulations also can result in too much risk if consumers are given a false sense of security and therefore do not impose efficient market discipline. There is a fair amount of research on the effectiveness of various regulatory systems for early identification of financially weak companies, but we are not aware of much research that measures the actual costs and benefits of such regulation.[1]

[1] Grace et al. (2003) estimate the costs of receivership itself. They do not, however, measure costs of the regulatory system to identify financially weak insurers nor to rehabilitate them. Their focus is on the inefficiencies associated with liquidation itself.

What Can We Learn From Other Solvency Systems?

As a basis for our input on Solvency II, we look at both the general evidence regarding regulatory effects discussed in the prior subsection and specific evidence from other existing solvency systems. A variety of solvency regimes have been implemented around the globe, ranging from prescribing general ethical guidelines in New Zealand to sophisticated dynamic cash-flow-based models in several European nations. A survey of these different systems is presented below, along with empirical evidence on their predictability power. Although some empirical evidence about the costs and benefits of several of these systems exists, a full evaluation is hampered by the limited number of studies in which European data are analyzed.

As a first step, we present the full spectrum of solvency regimes. In Table 1, 15 solvency systems are classified by their model typology into four groups.

The first group of systems requires no specific level of capital and therefore has no model. Such a system is found in New Zealand, where insurers are required only to comply with the Fair Insurance Code. According to the Code, insurers must act ethically and disclose an external rating given by Standard & Poor's, AM Best, or Fitch (see http://www.icnz.org.nz for New Zealand's regulatory environment).

The second group requires use of static factor models. The current Solvency I regime is not risk-based, as the rules are not oriented toward the insurer's risk structure; rather, they are oriented toward the insurer's business volume. Before the 1990s, many countries followed such non-risk-based capital rules, but in the last 10 years most of them switched to risk-based capital factor models. An interesting example is Australia, which had rules very similar to Solvency I until 2000 (see Australian Prudential Regulation Authority, 1999). However, following the General Insurance Reform Act 2001, Australia switched to a risk-based capital standards system. The Australian experience should be very helpful to European supervisors as they develop Solvency II. Also included in the group of risk-based capital factor models are the U.S. Risk-Based Capital (RBC) Standards, the Japanese Solvency Margin Standards, and several insolvency prediction proposals of private (AM Best's Capital Adequacy Ratio) and public institutions (German Insurance Association model, the National Association of Insurance Commissioners (NAIC) Financial Analysis Solvency Tools (FAST)).

The third group of models requires use of dynamic cash-flow-based models. These can be divided into scenario-based and principle-based models. The scenario-based models analyze the effects of various adverse scenarios, such as a stock market crash or a natural catastrophe that results in large claim payments, on the insurer's solvency. An example is the stress testing conducted by the German supervisory BaFin in 2002. Principle-based cash-flow models take a more general approach. These models use assumptions about future economic conditions and insurer reactions to them for purposes of simulating likely insurer financial conditions over time. The models proposed by Cummins et al. (1999) and Schmeiser (2004) belong to this group.

The fourth group of models requires a combination of static factor and dynamic cash-flow-based models, such as the UK Individual Capital Assessment and the Swiss Solvency Test. In the United Kingdom, individual capital assessments (ICA) are derived

TABLE 1
Overview of Solvency Systems

Model Typology		Model Name	Introduced By	Introduced In
No model		Fair Insurance Code,	New Zealand	2001
		Insurance Companies Act		1994
Static factor models	Not risk-based	Solvency I	EU	2004
		Insurance Reform Act	Australia	1973
	Risk-based	General Insurance Reform Act	Australia	2001
		Risk-based capital standards	USA	1994
		Solvency margin standard	Japan	1996
		Financial analysis solvency tools	(Proposal of) NAIC	1994
		Capital adequacy ratio	(Proposal of) AM Best	1994
		German Insurance Assoc.-Model	(Proposal of) German Insurance Assoc.	2005
Dynamic cash-flow-based models	Scenario-based	Stress testing	Germany (BaFin)	2002
		Financial assessment framework	Netherlands	2006
	Principles-based	Cash-flow model	(Proposal of) Cummins, Grace, and Phillips	1999
		Cash-flow model	(Proposal of) Schmeiser	2004
Combination of static factor models and dynamic cash-flow-based Models		Enhanced capital requirement, Individual capital assessment	UK	2004
		Swiss solvency test	Switzerland (BPV)	2006

from scenario tests and individual risk models, but companies are also required to calculate an enhanced capital requirement (ECR), which is based on a standardized risk-based factor model. With the Swiss Solvency Test, market, credit, and insurance risks are calculated by standardized factors models, whereas extreme events, such as those caused by a pandemic, are determined by scenario analysis.

In which form will Solvency II be implemented? The standard model will very likely be a risk-based capital model comparable to those already in use in Japan and the United States. The most frequently proposed internal models are cash-flow-based models as described in Cummins et al. (1999) or Schmeiser (2004). Thus, we expect that Solvency II will belong to the fourth group, combining static factor and dynamic cash-flow models. But what are the benefits and the costs of these models?

To answer this question, we present empirical evidence from four studies on the predictability power and the costs of the various solvency models.[2] Using U.S. data from 1989 to 1993, Cummins et al. (1995) find that the predictive accuracy of the RBC Standards is very low when the ratio of RBC to actual capital is the sole independent variable in a logit analysis. Accuracy improves significantly when the components of the formula and variables for firm size and organizational form are used as regressors. Based on a similar data set of U.S. firms from 1989 to 1991, Grace et al. (1998) find that RBC ratios are less powerful than FAST scores in identifying financially weak insurers. They also find limited evidence that RBC ratios and FAST scores are jointly more powerful in identifying weak insurers than are FAST scores alone. Again using U.S. data from 1990 to 1995, Cummins et al. (1999) examine RBC Standards, FAST scores, and a cash-flow simulation. They conclude that the FAST system dominates RBC, but that the cash-flow simulation can add significant explanatory power. Finally, Pottier and Sommer (2002) compare RBC Standards, FAST scores, and AM Best's Capital Adequacy Ratios using U.S. data from 1995 to 1998. They also include the capital to asset ratio as a proxy for a simple nonrisk-adjusted capital ratio. Surprisingly, they find that the capital to asset ratio performs as well or better than RBC ratios and conclude that the risk measures produced by the private sector (AM Best) are superior in predictive ability to the measures produced by regulators (which are RBC Standards and FAST scores).

Following the results of Cummins et al. (1999), a combination of RBC Standards and cash-flow model might be looked upon with favor, as this framework gives better predictability power than the rules currently used in the United States and Japan. Yet, one must also consider costs. Generally, higher levels of regulation lead to higher associated costs, a point made repeatedly by the Sharma Report. Van Rossum (2005) also points out the positive connection between the degree of regulation and costs, highlighting the particularly strong effect on small insurers specialized in certain products and niches. These companies might be pushed out of the market or consolidated, resulting in less competition.[3] In addition to the direct costs of regulation, such as the time and effort expended on developing internal models, are the indirect costs, which may be even larger. For instance, the misclassification of a financially weak insurer may result in a company failure. The costs of any resulting insolvency must be taken into account when evaluating the usefulness of solvency regulation. Misclassifying a sound firm as distressed also results in enhanced costs, which similarly must be considered (see Pottier

[2] Many other studies focus on the factors and the methodology necessary to predict solvency. Browne, Carson, and Hoyt (1999) investigate 11 factors that are related to life health insurer insolvencies. Chen and Wong (2004) examine 16 factors that affect general and life insurer financial health. Many methodologies also have been used to study insolvency, for example, multiple discriminant analysis (Carson and Hoyt, 1995), neural networks (Brocket et al., 1994), and cascaded logistic regressions (Baranoff et al., 1999). See Carson and Hoyt (2000) and Chen and Wong (2004) for a brief overview of these topics.

[3] It is also important to note that the suitability of different solvency regimes depends on the level of competition in the industry. Adams and Tower (1994) suppose that limited competition results in limited regulation, whereas regulated markets have more firms engaged in greater competition. The regulatory environment also depends on the type of contracts written (life vs. nonlife) and the type of risk considered (market risk vs. operational risk).

and Sommer, 2002, p. 102; Lamm-Tennant et al., 1996). Furthermore, regulations often produce unintended and unwanted market distortions, such as the shrinking supply of coverage with the imposition of rate regulation (see Grabowski et al., 1989).

Given the relatively high costs of compliance for many of the models, as well as their seemingly poor ability to predict insolvency, these issues should be given serious consideration before regulatory implementation. Moreover, even the best models provide only a simplified reflection of reality and many important factors that have significant solvency implications cannot be measured and modeled (see European Commission, 2004a, p. 32). Thus, European regulators should study different solvency regimes, the experience of countries implementing them, and the state of competition in the European insurance market as they try to find the right balance between the costs (in terms of transaction costs) and benefits (in terms of predictability power) of regulation.

Unfortunately, however, although numerous studies focus on the U.S. market, very few studies employ European data to test solvency models. Exceptions include Segovia-Vargas et al. (2003) and Cummins and Rubio-Misas (2006). Segovia-Vargas et al. (2003) use rough sets to predict insolvencies of Spanish nonlife insurance companies; Cummins and Rubio-Misas (2006) use frontier efficiency analysis to find improved efficiency and consolidation in the Spanish insurance industry following deregulation in the 1990s. These studies are very useful in understanding systems outside the United States, but they do not provide general evidence regarding European systems and/or experiences that would provide useful input in developing an appropriate European solvency regime. Thus there is need for further research.

What Are the Pros and Cons of Standard Models Versus Internal Models?

In addition to questions about which capital standards model(s) are most effective and efficient, Solvency II gives us occasion to consider the value of using two levels of models: a standard model and an internal model, as described in "Two-Level Approach to Capital Requirements." Although we lack empirical evidence regarding the effectiveness of this process, several theoretical concepts may be informative and help direct future empirical research.

We anticipate that the models with greatest predictive power will be highly complex, likely including some aspects of dynamic cash-flow. Complexity itself, however, does not guarantee a good model. Also, even if the model is reasonably successful at identifying financially weak companies, such ability does not necessarily justify its costs. Complexity tends to require more data and results in higher costs to develop and maintain the resulting system, for both the insurers and the regulators. Although we do not yet know the final version of the EU standard model, we do know that one of the European Commission's main requirements is that the model should be easy to use, thus ruling out a high degree of complexity. In contrast, internal models are usually very detailed and insurer-specific, leading to the conclusion that internal models may be more accurate but have correspondingly high transaction costs. Smaller insurers are likely to be especially adversely affected by high transaction costs and may need to exit the market either by dropping out or being acquired. Loss of these insurers could result in a less competitive and, therefore, less efficient market.

In addition to the potential benefit of lower transactions costs associated with a standard model, another potential benefit of the standard model is that insurers who use it can be compared to one another, whereas internal models are by definition specific to individual insurers. In determining the value of such specificity, one needs to consider both the degree of difference across insurers as well as the extent of improvement in prediction offered by internal models. We do not believe that this problem can be solved simply by defining certain model requirements (e.g., the risk measurement used) or by using back-testing methods.

Internal models might also present opportunities for "model arbitrage," through which insurers manipulate their models in order to shed the best possible light on their financial strength. Clearly, there are different ways to model the main risk drivers, such as assumptions about the number of claims as well as the claim size distributions. Just as clearly, insurers have an incentive to manipulate data due to the requirement that they provide stakeholders with specifics about their safety level. These requirements are highlighted in Pillar III, discussed in "Three-Pillar Structure for Insurance Undertakings."

One argument against the standard model is possibility of some "systematic risk." With a standard model, an unusual event in the capital or insurance market could encourage all insurers to take the exact same response, thereby causing a run in the market. The 2001 response to capital market shifts is an example. The reader is referred to Cummins and Doherty (2002, pp. 6-8) for a general discussion of this issue. Thus, it might make sense to have multiple solvency models, allowing market competition to determine which work best.

What Conclusions Can We Draw From This Discussion?

A number of conclusions can be drawn from the preceding discussion about regulation generally and Solvency II specifically. One of the most important is that model complexity does not always yield improvement in outcomes. As Pottier and Sommer (2002) discovered, sometimes an incredibly simple measure, the capital to asset ratio in their case, is at least as good as very complex systems, such as RBC Standards. It is tempting to focus on complex models in an attempt to identify a near perfect model. And yet, available evidence indicates that no perfect model exists. We appreciate the Commission's early guidelines of a solvency regulation mechanism that is "easy to use."

A flexible scheme, perhaps something similar to the Swiss system (See Luder, 2005 for a discussion of the Swiss Solvency Test), also seems warranted. A flexible structure where risk-based capital standards are used as guidelines to assist insurers in managing their risk structures rather than as absolute requirements addresses a number of regulatory issues discussed above. For example, flexibility is likely to yield a variety of risk strategies, limiting the possibility of systemic risk inherent in using a single standard model for all or even most insurers. Similarly, flexibility is likely to encourage innovation, and make small insurers more competitive because they will not suffer the disadvantage of not being able to afford internal models. Model arbitrage would be less effective, too, given that the requirements are flexible rather than rigid.

Furthermore, the causes of insurer insolvency seem to extend beyond capitalization. As Ashby et al. (2003) discover in their analysis of 21 insurer failures, even well-capitalized firms are at risk of failure. They note that "certain insurance companies are

more vulnerable or prone to failure, and that this vulnerability is not simply a result of the capital that they hold . . . the root of most insurance company failures is management, and typically, poor management" (2003, p. 4). Ashby et al. recommend a number of regulatory responses to their findings, most of which involve on-site inspections, offering expert advice, and similar actions that respond to specific situations rather than impose universal requirements.

Along with these types of focused regulatory efforts, those directed at greater market discipline through increased transparency are likely to be of particular value. As demonstrated by Harrington (2004), market discipline is often far more successful in creating a strong and solvent insurance industry than is stringent regulation. Increased transparency places greater market pressure on insurers to maintain an appropriate level of risk.

Increased transparency also provides a way to evaluate regulatory and other systems over time. One of the primary reasons there is so little research on insurance capital standards in European markets is that the data are not as readily available for such analyses as they are in the United States. With more data generally available, tests of the effects of regulatory, economic, and other factors can be made and thereby provide feedback, leading to more effective operations.

We anticipate that implementation of International Accounting Standards (IAS) throughout the EU as of 2005 will yield valuable databases similar to those holding U.S. data and made available through the NAIC, the AM Best's Reports, and the Center for Research in Security Prices (CRSP). Such public availability of data tends to encourage market discipline. It also provides opportunities to assess the effectiveness of various regulatory actions through academic research. As the "3 Level 3 Committees," consisting of the Committee of European Securities Regulators (CESR), the Committee of European Banking Supervisors (CEBS), and CEIOPS, work together for greater transparency and consistency across their regulatory endeavors, one important outcome could be the creation of consistent, extensive, widely available data. The first-listed objective of the "3 Level 3 Committee's" Joint Protocol is "sharing information in order to ensure compatible sector approaches are developed" (CERS/06-059, Joint Press Statement, February 6, 2006). Such sharing of information provides a natural opportunity to make the information available to the public as well, thus encouraging greater levels of market discipline.

Our study of the literature on the causes of insolvency, effectiveness of market discipline in yielding desired consumer protection, and the success (or lack thereof) of complex risk-based capital models in predicting insolvencies leads us to recommend a two-pronged approach for solvency regulation. We recommend the use of risk-based capital models as guidelines, rather than as strict requirements. These guidelines would offer insurers expertise in modeling their risk exposure for purposes of managing that exposure effectively. Personalized expert assistance would occur through on-site supervisor inspections and discussions with management. In addition, we recommend that general public reporting of insurer financial information become the norm.

SUMMARY AND FUTURE RESEARCH

Insurance supervision in the EU is undergoing significant change as the European Commission works toward harmonization across member countries as well as

implementation of standards that are appropriate for a rapidly changing marketplace. Current efforts are focused on Solvency II regulations, which are due for consideration sometime after 2007 and implementation likely sometime after 2008.

Similar to the European banking regulatory framework known as Basel II, a three-pillar structure for solvency regulation will be implemented. The first pillar is centered on enterprise-level capital standards. Relatively simple calculations are used to determine the absolute minimum requirements, below which regulators must take overt action to assist the insurer. More complex calculations are being developed for what is referred to as "target capital," those amounts that are desired but not absolutely required and that if unmet set off regulatory scrutiny, but not direct action. These target amounts are to be calculated using various risk-based measures, perhaps discounted cash-flow or other dynamic mechanisms. Some insurers will be allowed to create their own (internal) models whereas others will need to follow a standard model.

The purpose of the discussion presented here has been to outline the specifics of how the first pillar of Solvency II is being developed, focusing primarily on models already available. Although the evidence suggests that the most successful models are likely to be complex, including aspects of dynamic cash-flow, numerous complex models are not especially valuable. We also note the costs involved in developing highly complex models, costs that must be considered in the ultimate model choice.

We further observe the importance of Pillars II and III in the regulatory scheme. Pillar II focuses on insurer internal controls and management, areas that the Sharma Report indicates cause the majority of insurer financial distress. Pillar III efforts are those focused on enhancement of market discipline. As discussed above, the potential effects of market discipline are significant and often the most successful in creating an efficient and effective insurance market. Increased transparency, including greater general availability of insurer financial information, is encouraged. The better these market mechanisms function, the less relevant is the influence of direct solvency regulation.

Toward that end, we conclude with suggestions for future research. More work is called for in understanding the success or lack thereof of different solvency models in measuring financial distress. Existing evidence suggests that the U.S. Risk-Based Capital Standards are not especially successful. The proposal of German Insurance Association, the existing Swiss model, and the models employed in the United Kingdom and the Netherlands may be better systems. We will not know which is best, however, until the research is undertaken. Furthermore, research on the influence of market factors, such as rating agencies, should be considered. U.S. experience suggests that rating agencies have been more successful in identifying financial distress than has the regulatory framework. The evidence also suggests that insurers respond to rating agency models in ways that fortify their financial strength. It may well be that the influence of rating agencies makes the regulatory mechanism less critical. Because of the complexity of risk-based models currently under discussion, it is very easy to be caught up in development of a true "best" model. We wonder, though, if it might be better to leave flexibility in the model design while encouraging the market to find the best mechanism for capital evaluations.

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