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A Comparison

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Executive Summary

In this paper we compare insurance regulatory frameworks in the United States (US) and European Union (EU), focusing primarily on solvency, but also considering product and price regulation, as well as other elements of consumer protection. This comparison highlights the use of more fluid and principles-based approaches in the EU as it is developing under Solvency II, while the US continues to focus essentially on static, rules-based regulation. The discussion further notes evidence suggesting that the EU approach is more successful in promoting a financially solid insurance sector.

Our analysis leads us to recommend that US regulators move toward a more comprehensive and integrated approach to assessing the financial risk of insurance companies. Such a move would incorporate greater emphasis on a flexible, principles-based system to include qualitative aspects, such as management assessment, while placing heavy emphasis on advanced quantitative methods. Among the more advanced methods that should be considered are enterprise risk management techniques that include tools such as dynamic financial analysis.

In the US, the states have indicated a desire to move toward a principles-based approach to financial regulation, but, at present, their specific initiatives are limited and the scope and pace of a broader restructuring of a state-based solvency framework is uncertain. Significant segments of the industry favor the creation of an optional federal charter (OFC) for insurance companies. It is quite possible that, under an OFC, the federal government would adopt a principles-based

approach to insurance regulation consistent with the system being developed for banks under the Basel II accords. Indeed, the current financial crisis has added impetus to revamping the regulatory framework for all financial institutions, including insurance companies, but federalizing insurance regulation continues to face fierce political opposition from some groups. Hence, both in the US and in the EU, informed discourse will be essential to realizing the vision of a modern, efficient system for insurance regulation.

We argue in favor of a flexible scheme, where risk-based capital standards are used as guidelines—to assist insurers in managing their risk structures—rather than as absolute requirements (Eling et al. 2007). 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. Model arbitrage would be less effective, too, given that the requirements are flexible rather than rigid. US regulators are also encouraged to consider forming something similar to the Committee of European Insurance and Occupational Pension Supervisors (CEIOPS), which was created to redesign the EU regulatory framework. Currently CEIOPS is conducting public forums in which suggestions for future solvency rules are collected and discussed. In the US, the closest analog to a structure that would have any kind of real authority would be an interstate compact. This vehicle has been used to “harmonize” the regulation of life insurance products, and such a vehicle could be used to advance and harmonize other aspects of US insurance regulation.

Introduction

The United States (US) and the European Union (EU) offer an interesting and important contrast in their respective approaches to insurance regulation. In 1994, the EU enacted its first joint insurance regulations for member countries. Important elements of this first endeavor include pricing, products, and consumer protections. Solvency issues were formally addressed with the implementation of Solvency I in 2004—a set of rules focused mostly on minimum capital requirements. Following Basel II in the European banking industry, Solvency II will establish principles-based, risk-based capital standards when implemented, now scheduled for 2012. The lengthy and involved analysis phase associated with Solvency II, as well as the influence of insurers affected by it, has generated significant global interest. It may well be that Solvency II yields a model for international insurance regulation, particularly as we see movement toward international accounting standards. Insurance regulation in the US has been guided by a different philosophy, and this raises significant issues in terms of its place in the global marketplace.

The purpose of this paper is to present similarities and differences between the US and EU insurance regulatory frameworks, focusing primarily on solvency, but also extending to product, price, and other consumer protection elements. We discuss the pertinent elements of each system and review the literature that assesses their efficiency and effects on insurance markets. Our focus follows the current emphasis on solvency and enterprise risk management (ERM). First we review existing regulations and then discuss the details of the proposed Solvency II regulations. We also summarize the current knowledge about the effectiveness of various solvency regulations in limiting financial risk and insolvency costs, as well as other aspects of regulation. In some sense, our paper presents a

contrast between the “old” and the “new” in insurance regulatory systems.

During the past fifteen years, most major economies around the globe have moved from fixed capital standards for their solvency regulation to some form of risk-based capital (RBC) standards. Canada and the US were among the first to introduce these risk-based standards, in 1992 and 1994 respectively. Japan followed with the “solvency margin standard” in 1996 and Australia with the “general insurance reform act” in 2001. Europe is relatively late in developing RBC requirements; however, some EU countries already have implemented first approaches: the United Kingdom (UK) introduced their concept of enhanced capital requirement and individual capital assessment in 2004, and Switzerland enacted the Swiss Solvency Test in 2006. Currently, the EU is working toward harmonizing risk-based methods across member countries, in what is known as Solvency II. While the EU may seem to be “late to the table,” it has the advantage of being able to develop a system based on the evolution of financial risk management and the innovations of some of its members.

The timing of the EU approach is relevant in that we know much more about how to incorporate dynamic cash flow analysis into solvency regulation now than we did in 1994 when the US formula-based system was devised. Also, existing empirical investigations of the US system raise questions about its accuracy and stringency, suggesting the need for improvement. Furthermore, the influence of qualitative, as well as quantitative, elements in supporting solvency are better understood today than in 1994. The size and historical independence of the US insurance industry has likely contributed to its regulatory inertia and reluctance to embrace new methods. This position is becoming less tenable in the context of the insurance industry’s and insurance markets’ evolution, not just in the US but also around the globe,

as well as the growing importance of international trade in insurance.

The research suggests that the type of regulatory standards and monitoring systems employed in the US are deficient and could be improved by using more advanced methods. The best systems appear to employ dynamic financial analysis, as well as qualitative methods that are more common in prudential frameworks. Hence, we may be able to use the US experience to anticipate how Solvency II will produce a better regulatory system. In turn, Solvency II may well offer insights that could be used to improve US regulation.

In reviewing recent regulatory solvency approaches and related literature, three main trends can be observed: (1) a movement toward an integrated total balance sheet approach that takes into account the interdependencies between assets and liabilities; (2) a greater focus on a flexible, principles-based setting instead of fixed rules (for example, many regulators allow the use of individual risk models instead of standard models to calculate the target capital requirements); and (3) the inclusion of qualitative aspects such as assessment of management in the regulatory framework. We will highlight these elements in our discussion.

Under Solvency II, insurance regulation is organized in three pillars. The first pillar addresses quantitative regulations for capital requirements. The second pillar focuses on the qualitative elements of supervision and incorporates regulatory principles on internal risk control, pricing, and product design. To the third pillar belong considerations about market transparency and disclosure requirements, which aim at promoting market discipline. Both the Basel II accords for banking regulation and the evolution of international insurance regulatory standards embrace the three-pillar framework.

We follow the three pillars for our analyses of the US and EU insurance regulatory systems, first presenting the quantitative aspects and then fol-

lowing with the qualitative. We also discuss issues of market transparency, including an overview of product and price regulation as well as other elements of consumer protection. Empirical evidence of regulatory effects, particularly associated with solvency regulation, is also provided. Following this review of the US and EU systems, we present a discussion of differences and similarities. Because we hope that our monograph's primary audience will be those in a position to affect insurance regulatory mechanisms, we conclude the paper with a discussion of policy implications and future research.

Insurance Regulation in the United States

Insurance regulation in the US has its historical origins in the early 1800s.¹ While the regulation of other financial institutions has been largely federalized, insurance continues to be regulated by the states. The states each retain the principal responsibility for regulating insurance; the federal government has the authority to supersede state regulation when it chooses but has only done so selectively to date. Principal responsibility for the financial regulation of an insurer is delegated to its domiciliary state, but non-domiciliary states also perform some financial monitoring of all insurers licensed to operate in their jurisdictions and can suspend or revoke their licenses.² Each state also retains the principal responsibility for regulating the market practices of all insurers operating in its jurisdiction. The states use the National Association of Insurance Commissioners (NAIC) to coordinate and support their regulatory activities. There have been proposals to increase the federal role in insurance regulation, for example, through an optional federal charter (OFC) for insurance companies and agents, but the prospects for federal regulation in the near term are daunting.³

The NAIC promulgates model laws and regulations, but the states are not required to enact them. In some areas, such as risk-based capital (RBC) standards, all the states have adopted NAIC model laws and related technical specifications. In many aspects of solvency regulation, the states have adopted uniform standards developed by the NAIC, but they may differ somewhat in terms of their specific rules.⁴ In the area of market regulation, there is much less uniformity, and the states may or may not use NAIC models or modify them according to their specific preferences. States may also adopt their own laws or regulations for which there is no related NAIC model.

It is important to understand the US philosophy and approach to insurance financial regulation, which contrast sharply with the EU paradigm. The states apply a prescriptive or rules-based approach to regulating insurers' financial conditions and market practices that is oriented by an accounting perspective. This is reflected in numerous laws, regulations, rules, and other measures that govern virtually every aspect of insurers' activities and financial structure. Regulators focus on insurers' compliance with these prescriptions rather than the competence and prudence of their management and their overall financial risk. Insurers' reported accounting values and financial statements are the principal measures by which their regulatory compliance is determined. This approach permeates all aspects of solvency oversight, including capital requirements.

In earlier times, the US paradigm might have been considered appropriate given the state of the science of financial risk analysis and management. However, in our opinion, it appears to be increasingly antiquated, inefficient, and potentially irrelevant in light of the evolution of the insurance industry and management methods. It is also lagging far behind the evolution of solvency oversight in the EU and the development of international standards. This raises serious concerns about the

efficiency and effectiveness of US regulation. It also will have significant adverse implications for US insurers competing in a global marketplace.

The states have been slow to adopt anything resembling a principles-based approach (despite statements to the contrary), and this is unlikely to change without significant economic and/or political pressure or a regime change. To their credit, US regulators have sought to increase their emphasis on risk assessment within their monitoring systems and associated tools. For example, the NAIC created the Risk Assessment Working Group to guide the development of financial monitoring activities. It appears that examiners and analysts are encouraged to think about risk when they perform their tasks, but it is not clear what this means in a US context. The NAIC also has established the Principles Based Reserving Working Group to assess changes in policies and practices. The group has initially focused on principles-based reserve requirements for life insurance companies, but the group's mandate is to ultimately expand its study to other aspects of regulating life-health and property-casualty insurance companies (NAIC 2008). Still, it is unclear as to how far and how fast US regulators would be willing to embrace a principles-based approach to insurer financial regulation. Without using dynamic financial analysis and employing other practices associated with a principles-based approach guided by a prudential philosophy, there are limits to what US regulators are likely to do in terms of true risk assessment.

Quantitative Regulations for Capital Requirements

The states impose two types of capital requirements on insurers. Each state has its own fixed-minimum requirement.⁵ Insurers are also subject to uniform RBC requirements based on a complex formula developed by the NAIC. There are different formulas for property-casualty, life, and

health insurers. An insurer is required to have capital that meets or exceeds the higher of the two standards. In the RBC formula, selected factors are multiplied times various accounting values (for example, assets, liabilities, or premiums) to produce RBC charges or amounts for each item. The charges are summed into several “baskets” and then subjected to a covariance adjustment to reflect the assumed independence of certain risks. The basic formula for property-casualty insurers is shown below:

R0: Investments in affiliates

R1: Fixed-income assets (interest rate and credit risk)

R2: Equity assets (market value risk)

R3: Credit (risk associated with reinsurance recoverables)

R4: Loss reserves (risk associated with adverse loss development)

R5: Premiums (risks of underpricing and rapid growth)

The RBC formula accounts for asset risks

$$RBC = 0.5[R0 + \sqrt{R1^2 + R2^2 + R3^2 + R4^2 + R5^2}]$$

(components R1, R2, and R3) and insurance risks (components R4 and R5). There is also a component for the risk of default by affiliates and off-balance-sheet items, such as derivative instruments and contingent liabilities (R0). R1 accounts for the primary risks associated with fixed-income investments—the risk of default (that is, credit risk) and the risk of declines in asset values due to interest rate changes. In calculating R1 charges, assets are categorized by “credit quality,” and the factors applied vary inversely with quality. R2 models the risk associated with the decline in the values of other investments, such as stocks or real estate, and assigns selected factors. R3 accounts for the credit risk associated with reinsurance recoverables and

other receivables. R4 reflects the risk associated with adverse loss reserve development, and different factors are assigned for different lines of business based on their historical loss development patterns. Finally, R5 accounts for “underwriting risk,” which is the risk that premiums collected in a given year may not be sufficient to cover the corresponding claims that arise from the business that is written. Different factors are also assigned in the R5 calculation for different lines of business based on historical loss ratios. The formula is much more complex than this simplified description indicates, but delving into its complexities is beyond the scope of this discussion.⁶

The covariance adjustment assumes that the R1 through R5 risks are independent but that the R0 risk is correlated with the other risks. This is an arbitrary assumption that is not necessarily consistent with reality (Butsic 1993). Multiplying the summed RBC amounts by 0.5 might raise the curiosity of some readers. This adjustment was simply intended to increase insurers’ reported RBC ratios. As discussed later, an RBC ratio of less than 200 percent requires “company action.” Hence, the operative RBC amount is twice the formula result, which negates the effect of the 0.5 adjustment in terms of regulatory compliance. The result is a framing issue and not a substantive outcome.

The RBC formulas for life and health insurers are similar, but they contain some differences to reflect the specific kinds of risks they face. The NAIC’s life RBC formula encompasses five major categories of risk: (1) asset risk—affiliates (C0); (2) asset risk—other (C1); (3) insurance risk (C2); (4) interest rate risk, health credit risk, and market risk (C3); and (5) business risk (C4). In 2005, the NAIC did adopt a modeling approach to assessing the market risk, interest rate, and expense-recovery risk of variable annuities that are reflected in the C3 component. Insurers can use prepackaged scenarios developed by the American Academy of

Actuaries or their own internal models. The RBC formula for health insurers includes: (1) asset risk—affiliates (H0); (2) asset risk—other (H1); (3) underwriting risk (H2); (4) credit risk (H3); and (5) business risk (H4).

An insurer's calculated risk-based capital (RBC) amount is compared to its actual total adjusted capital (TAC) to determine its RBC position.⁷ Under the RBC model law, certain company and regulatory actions are required if a company's TAC falls below a certain level of RBC.⁸ Four RBC levels for company and regulatory action have been established, with more severe action required for companies coming in at the lower levels (see Table 1). An insurer falling between the highest level (company action level) and the second-highest level (regulatory action level) is required to explain its financial condition and how it proposes to correct its capital deficiency to regulators. When an insurer slips below the second level, regulators are required to examine the insurer and institute corrective action, if necessary. Between the third level (authorized control level) and fourth level (mandatory control level), regulators are authorized to rehabilitate or liquidate the company. If an insurer's capital falls below the lowest threshold, regulators are required to seize control of the insurer.

The fact that an insurer's failure to meet specified RBC levels results in certain mandatory or authorized actions has important implications. For example, this limits a regulator's discretion to some degree. Arguably, this has contributed to regulators' caution in setting the RBC bar fairly

low to avoid being compelled to take actions against an insurer that would not be warranted based on a more thorough and specific analysis of its financial condition and risk.⁹

While there has been some tweaking of the RBC formulas over the years, some of their components and factors have not been modified since their original construction. For example, the property-casualty R4 and R5 factors have not been changed since the formula was developed in 1993. In September 2007, an American Academy of Actuaries committee presented its recommendations to the NAIC for updated and refined factors for reserving and underwriting risks (American Academy of Actuaries 2007).

The complexity of the US RBC formula gives a false sense of accuracy. Most important, the US RBC formula takes a static approach based on historical, reported accounting values. Unlike systems that use some form of dynamic financial analysis (DFA), it does not look forward to consider how an insurer might fare under a range of future scenarios. Regulators rejected proposals to incorporate DFA when the formulas were being developed. Also, accounting values can either be erroneous or manipulated to obtain more favorable regulatory assessments. For example, Cummins, Harrington, and Klein (1995) observe that the formula encourages insurers to lower their loss reserves to reduce the associated RBC charge. As noted later, similar issues have existed in the EU

Further, while not all risks can be quantified, the formula omits some that can be, for example, operational risks, using methodological tools now

Table 1: Risk-Based Capital (RBC) Action Levels

Action Level	Percent of ACL	Requirements
Company Action	200	Company must file plan.
Regulatory Action	150	Commissioner must examine insurer.
Authorized Control	100	Commissioner authorized to seize insurer.
Mandatory Control	70	Commissioner required to seize insurer.

available. It is also important to note that the US RBC formula contains no explicit adjustment for an insurer's size or its catastrophe exposure.¹⁰ Factors for both were proposed in the initial development of the property-casualty RBC formula but were rejected. The NAIC is currently considering adding a catastrophe component to RBC, but this initiative is bogged down in a debate that is unlikely to be resolved any time soon.

The US RBC formula could benefit from using better methods to model some of the risks the formula attempts to measure or from developing improved factors for the formula.¹¹ Yet, while some elements of the formula could be improved, a more fruitful strategy would be to move toward some form of dynamic analysis that is tailored for a particular insurer's characteristics. Of course, there are limits to what any kind of quantitative methods can reveal, which underlines the importance of qualitative assessments in the overall solvency monitoring process. Such factors would include management competence, corporate governance, and internal risk management (Conference of Insurance Supervisory Services of the Member States of the European Union 2002).

Qualitative and Other Elements of Supervision

Capital standards are only one component of an extensive framework for the financial supervision of US insurers. This framework includes detailed rules governing virtually all aspects of insurers' financial structures and transactions, substantial financial reporting requirements, extensive monitoring, intervention against troubled insurers, receiverships, and insolvency guaranty associations. Here we primarily focus on the system of financial monitoring that augments capital standards and how regulators deal with companies that are in "hazardous financial condition." While many of these elements might not be normally associ-

ated with the second pillar of solvency regulation, they play an important role in augmenting capital standards in the US¹²

One element of US insurance regulation that is receiving considerable attention is the accounting treatment of reinsurance purchased from non-US reinsurers. Under current statutory accounting rules, non-US reinsurers must post collateral in order for US insurers to receive accounting credit for the risk transferred. The current US rules have been criticized for being unreasonable and inefficient (Cummins 2007). After a long debate, the NAIC recently adopted a new framework for determining reinsurers' collateral requirements. Under this new framework, US insurers may qualify as "national reinsurers" regulated by their home state. Non-US reinsurers may qualify as "port of entry" (POE) reinsurers by using an eligible state as a port of entry. A POE reinsurer will be subject to oversight by its port of entry supervisor. Both national reinsurers and POE reinsurers will be subject to collateral requirements that will be scaled according to something resembling a financial strength rating. Reinsurers receiving the highest rating will not be required to post collateral. US and non-US reinsurers that do not become qualified as national or POE reinsurers will remain subject to current state laws and regulations governing credit for reinsurance. An NAIC Reinsurance Review Supervision Division (RRSD) will be established to implement the new framework, including determining those states that will qualify as the supervisors for national and POE reinsurers.

Issues such as the treatment of foreign reinsurance become intertwined with solvency monitoring and regulators' assessment of an insurer's financial condition. Fundamentally, the objective of solvency monitoring is to ensure that insurance companies meet regulatory standards and to alert regulators if actions need to be taken against a company to protect its policyholders. Solvency

monitoring encompasses a broad range of regulatory activities, including financial reporting, early-warning systems, financial analysis, and examinations.¹³ In the US, insurers file annual and quarterly financial statements, which serve as the principal sources of information for the solvency monitoring process, but a number of other special reports are filed and used in regulatory monitoring.¹⁴ Accounting rules take on added importance because accounting values become the principal measures that determine whether an insurer is complying with regulatory standards. Regulators also have broad authority to compel insurers to provide other information deemed necessary to assess their financial condition.¹⁵

The reports filed by insurers are subject to a “bench,” or “desk,” audit by an in-house financial analyst or examiner who assesses the information’s accuracy and reasonableness and determines whether an insurer requires further investigation.¹⁶ Typically, an insurer’s domiciliary regulator performs the most extensive review of its financial information, but an insurer must file financial reports with every state in which it is licensed, and non-domiciliary regulators also may review these reports. Additionally, the NAIC scrutinizes insurers’ financial statements and disseminates its analysis to state insurance departments.¹⁷ This reflects the multilayered nature of financial regulation and monitoring of US insurers—the domiciliary regulator constitutes the first layer, and non-domiciliary regulators and the NAIC constitute successive layers. Some might question whether this multilayered regulation and monitoring is redundant, but in the US system it is viewed as essential to assure that domiciliary regulators are taking appropriate actions against insurers in financial distress.

US regulators rely heavily on early-warning systems and other financial analysis tools in their monitoring activities. The fact that RBC standards are relatively low make financial monitoring

particularly important because an insurer could be in financial distress and still exceed its RBC requirement. For the most part, these systems and tools are based on static, quantitative financial ratios. There is some use of qualitative information, but this appears to be limited and also may vary among the different states. The linchpins of US monitoring are the Insurance Regulatory Information System (IRIS) and the Financial Analysis Solvency Tools (FAST) system. IRIS is comprised of twelve to thirteen financial ratios (depending on the type of insurer), and its results are made available to the public. Normal ranges are set for each ratio. Ratio results that fall outside these ranges and other criteria can trigger further regulatory investigation.

In the early 1990s US regulators concluded that IRIS was inadequate, which led to the development of the FAST system. In the NAIC’s explanation of its systems, FAST comprises the full array of its solvency monitoring tools (including IRIS), but its heart is a computerized analytical routine called the “scoring system.” The scoring system consists of a series of approximately twenty financial ratios based on annual and quarterly statement data, but, unlike the IRIS ratios, it assigns different point values for different ranges of ratio results. A cumulative score is derived for each company, which is used to prioritize it for further analysis. These scores are provided to all regulators but are not available to the public.¹⁸

Importantly, NAIC analysts use these scores and other information to identify companies that deserve special attention.¹⁹ This can lead to a process in which the NAIC’s Financial Analysis Working Group will query a domiciliary regulator about a company’s status and steps being taken to address any problems it may have. If the NAIC group determines that a domiciliary regulator is taking all appropriate actions, then the group will either close the file or continue to monitor the company. If the working group determines otherwise, it can com-

pel the domiciliary regulator to take the actions the group deems necessary. The working group's power does not stem from any direct regulatory authority. Rather, its power stems from the authority of non-domiciliary regulators to suspend or terminate an insurer's license to write business in their jurisdictions. This could effectively force the domiciliary regulator's hand, as license suspensions and terminations would quickly lead to a company's demise and propel it into receivership.

Regulators use additional tools and information in their financial monitoring activities. They can use the NAIC's "Insurer Profiles System" and may also develop their own customized financial ratios. Both periodic (every three to five years) and targeted company financial examinations are conducted; targeted exams are performed to address specific questions or concerns that arise from bench audits and analysis.²⁰ Additional sources of information may be tapped, including Securities and Exchange Commission (SEC) filings, claims-paying ability ratings, complaint ratios, market conduct reports, correspondence from competitors and agents, news articles, and other sources of anecdotal information. While a wide array of information sources are available, it appears that US regulators rely primarily on quantitative data and tools, as well as financial examinations. This is consistent with a prescriptive, rules-based approach as most rules are stated in quantitative terms. Importantly, US regulators tend not to engage in consultations with an insurance company's management to assess its competence and future plans. Further, regulators do not perform any kind of dynamic financial analysis nor require companies to do so.²¹

There are two categories of regulatory actions with respect to troubled companies: (1) actions to prevent a financially troubled insurer from becoming insolvent and (2) delinquency proceedings against an insurer for the purpose of conserving, rehabilitating, reorganizing, or liquidating

the company. Actions within the first category include hearings and conferences, corrective plans, restrictions on activities, notices of impairment, cease and desist orders, and supervision. Some of these actions may be conducted informally; others require formal measures. Similarly, some actions against companies may be confidential, and others may be publicly announced. Regulators can negotiate sales or mergers of troubled insurers in order to avoid market disruptions. This is often more feasible for life-health insurers because of the embedded value of their long-term contracts.

If preventive regulatory actions are too late or are otherwise unsuccessful and an insurer becomes severely impaired or insolvent, then formal delinquency proceedings will be instituted. These measures can encompass conservation, seizure of assets, rehabilitation, liquidation, and dissolution. For many insurers, these actions are progressive. A regulator may first seek to conserve and rehabilitate a company to maintain availability of coverage and to avoid adverse effects on policyholders and claimants, as well as lower insolvency costs. The regulator, however, ultimately may be forced to liquidate and dissolve the company if rehabilitation does not prove to be feasible. This is often the case with property-casualty insurers that have already dug themselves into a deep hole by the time regulators seize control.

One question that is difficult to answer is how much leverage regulators can exercise in compelling an insurer to lower its financial risk if it greatly exceeds its RBC requirement and complies with all regulations from a quantitative perspective. In theory, regulators can act against any company deemed to be in "hazardous financial condition." However, regulators would bear the burden of proof if an insurer resisted corrective action that ultimately would have to be resolved in court. In practice, when regulators initiate formal actions, an insurer's problems are sufficiently obvious that the courts typically approve such actions. What we

cannot observe is regulators' power to impose their will in informal actions that are not subject to public disclosure.

Insurer receiverships involving liquidation can be long and protracted affairs that are largely controlled by the domiciliary regulator. An in-house or outside receiver is appointed to manage all aspects of the receivership, including the disposition of claims and the marshalling and selling of assets. Further, receiverships are typically administered through state rather than federal courts. Historically, receiverships have tended to be very opaque to outsiders, and very little information is conveyed to various stakeholders and the public. Significant concerns have been raised that receivers sometimes unnecessarily prolong and milk their receiverships for their own financial gain. It is difficult to assess the severity of this problem because of the lack of public information and oversight, but research suggests that the receivership system increases insolvency costs (Grace, Klein, and Phillips 2002b).

An insurer's liquidation can trigger the involvement of insurance guaranty associations (GAs). Each state has separate guaranty associations for property-casualty and life-health insurers. These associations cover a portion of the insolvent insurer's unpaid claims obligations. Each state's guaranty association covers the unpaid claims in that state regardless of where the insolvent insurer is domiciled.²² Only certain lines of insurance are covered, and there are limits on the amount of coverage for each claim.²³ Insurance policies purchased by individuals and small businesses tend to have greater coverage than insurance purchased by large commercial buyers.²⁴ Those with unpaid claims and other creditors stand in a long queue to seek recovery against the estate of an insolvent insurer and inevitably will receive only a portion of their claims, if anything.

All licensed insurers are required to belong to the GAs in the states in which they operate and to cover GA claims payments. Depending on state

laws and the type of insurance, insurers may be able to recoup all or a portion of these assessments through rate surcharges and premium tax credits; these recoupment provisions vary by state and the type of insurer. Insurers also may deduct residual costs in calculating their federal income taxes. Baresse and Nelson (1994) estimated that the burden of GA assessments is distributed among different groups as follows: taxpayers, 54 percent; policyholders, 21 percent; and equity holders, 25 percent.

Guaranty associations have been criticized for creating moral hazard among insurance buyers and reducing market discipline (Cummins 1988; Lee, Mayers, and Smith 1997). It is difficult to determine how severe this problem is. Personal lines buyers may be unaware of GA coverage or simply may assume that the government will make them whole if their insurer goes bankrupt. Commercial insurance buyers, presumably, are savvy and understand their exposure. Arguably, market discipline should be stronger in commercial lines markets where GA coverage is limited or nonexistent and buyers are better positioned to assess the financial risk of insurers (Epermanis and Harrington 2006). Some have proposed that US GA assessments (or premiums) should be risk based to diminish the moral hazard problem. However, these proposals have been rejected by regulators who question their feasibility and likely benefits.

Transparency and Market Regulation

In the US, transparency is a mixed bag. Insurers' financial statements and certain other reports are available to the public; however, any regulatory assessments of an insurer's financial condition and risk are confidential, and there is no distribution of any internal analysis a company may have performed. At the same time, rating agencies play an important role in informing buyers, intermediaries, and other stakeholders about insurers' "claims-

paying ability.” Rating agencies use reports filed with regulators and other information provided by insurers to grade their financial conditions. They also employ qualitative methods to a greater degree than regulators. The agencies’ ratings and analysis are made available to the public in a form that is easier to interpret than insurers’ financial statements. Hence, they are critical facilitators of market discipline. However, a significant number of insurers are not rated by a major rating agency (for example, A.M. Best only provides letter grade ratings for two-thirds of the companies listed in its Best’s Key Rating Guide).

Regulating insurance markets (such as prices, products, and trade practices) is fairly extensive in the US. Regulating an insurer’s market practices is principally delegated to each state in which it operates. Hence, each state effectively regulates its insurance markets. The scope of market regulation is broad (potentially encompassing all aspects of an insurer’s interactions with consumers), and the states’ policies vary significantly. State regulation of insurers’ prices or rates is a particularly visible and controversial topic. The rates for personal auto insurance, homeowners insurance, and workers’ compensation insurance are subject to some level of regulation in all the states, but the degree to which regulators seek to constrain prices differs.²⁵ The extent of price regulation for other commercial property-casualty lines tends to vary inversely with the size of the buyer; markets populated by large buyers are subject to less regulation. The rates for certain types of health insurance may be regulated, but the prices of life insurance, annuities, and related products are only indirectly regulated through the product approval process.

Insurers’ policy forms and products also are closely regulated, with the exception of products purchased by large firms. Regulators must pre-approve most policy forms (except those for large buyers) before they are offered in the market. Other aspects of insurers’ market activities—such

as marketing, underwriting, and claims adjustment—generally fall within the area of “market conduct” regulation. A state may impose some specific rules regarding certain practices, such as constraining an insurer’s use of certain factors in underwriting or mandating that they offer coverage to all applicants.²⁶ Beyond this, regulation tends to be aimed at enforcing fair practices based on regulators’ interpretation of what this means.²⁷ Further, intermediaries must obtain a license in every state in which they sell insurance and are subject to certain regulations regarding their conduct and continuing education requirements.

The scope, nature, and variety of market regulations raise questions about their necessity, efficiency, costs, and benefits. Most experts agree that some level of market conduct regulation is warranted, such as rules and sanctions against abusive marketing practices. Beyond that, there is considerable disagreement about other market regulations. Insurers and economists generally agree that price regulation is unnecessary (and potentially harmful) given the highly competitive nature of insurance markets, but many regulators have a different view. Excessive constraints on insurance products, including mandated benefits or coverages, raise costs and stifle choice as well as innovation. Intrusive interference with other aspects of insurers’ activities, especially underwriting and claims adjustment, create additional problems. Some of these policies may arise from regulators’ and legislators’ sincere belief they are necessary to protect consumers. Others are likely politically motivated to appeal to consumers or other interest groups.

There have been some efforts to lessen and streamline market regulation. For example, many states have deregulated commercial lines insurance rates and products that buyers, as well as insurers, have advocated. More states, in recent years, have moved to competitive rating systems for personal lines insurance. Further, the NAIC has

established centralized filing systems for property-casualty rates and policy forms, and life insurance policy forms. While these steps have been helpful, many insurers believe they are inadequate. Each state still retains its authority to impose its specific rules as well as approve the rates and policy forms that insurers are required to file.²⁸ This reality has motivated many insurers to advocate some form of federal regulation.²⁹ Even insurers that do not support federal regulation advocate deregulation of insurance prices and other aspects of their market activities.

Empirical Evidence on the Effectiveness of Regulation and Market Discipline

Empirical research and evidence on the effectiveness of insurance regulation fall into several categories. A handful of studies have looked at the effect of regulation on insolvency costs. Many more studies have tested the ability of RBC and/or regulatory early warning systems to predict insolvencies, separately or in conjunction with other predictors. And extensive research has considered the effects of price regulation in personal auto insurance and workers' compensation insurance. A full literature review is beyond the scope of this paper, but we can briefly summarize research findings and other empirical evidence.

Studies have found that the relative cost of insolvencies is much higher for insurance companies than for banks. Grace, Klein, and Phillips (2002b) estimated the average cost of property-casualty insurer insolvencies (over the period 1986–1999) to be \$1.10 per \$1 of pre-insolvency assets.³⁰ Non-regulatory factors probably account for some of the disparity; the operative question is whether regulatory policies also contribute to higher insurer insolvency costs. Willenborg (2000) and others point to the problem that regulators' ability to tap guaranty associations to cover insolvency costs could induce excessive forbearance in their deal-

ings with troubled insurance companies.³¹ Grace et al. (2002b) found evidence of three major factors contributing to higher insurer insolvency costs: (1) the financial condition of an insurer prior to insolvency and its managers' moral hazard incentives; (2) regulatory forbearance; and (3) regulatory management of insurer receiverships. They suggest that improved financial monitoring and greater transparency surrounding domiciliary regulators' intervention and receivership management could reduce insolvency costs.³² Some might also argue that measures that would facilitate greater market discipline would be beneficial and potentially would reduce the need for stricter regulatory standards, at least in certain markets (Harrington 2004; Epermanis and Harrington 2006).

This brings us to the question of the accuracy of RBC and regulatory financial monitoring systems. Numerous studies have tested various indicators or predictors of insurer insolvencies. Some of these studies have found that RBC ratios make a marginal contribution to insolvency prediction, at best. Although an insurer's RBC ratio is not intended to be an insolvency predictor, this research raises questions about the accuracy and effectiveness of RBC standards.

Using logit analysis, Cummins, Harrington, and Klein (1995) tested alternative models that employed RBC in some form to predict insolvent (and solvent) property-casualty insurers and their tradeoffs with respect to Type 1 errors (failed insurers not predicted to fail) and Type 2 errors (surviving insurers predicted to fail). They found that less than one-half of the companies that became insolvent had TAC less than the company action level one to three years prior to its failure. They also found that a model that allowed the weights of the RBC components to vary and that included firm size and organizational form produced a material improvement in the Type 1/Type 2 error tradeoff relative to a model that used an insurer's RBC ra-

tio as the sole independent variable. Cummins et al. (1995) developed further empirical evidence of the deficiencies of the RBC formula.

The NAIC's FAST scoring system has fared better than RBC in these studies, which is not surprising but is still important in assessing their relative contributions to solvency oversight. Grace, Harrington, and Klein (1998a) found that FAST scores are more accurate than RBC ratios in identifying property-casualty insurers that become insolvent. The FAST system had a success rate of between 40 and 91 percent in predicting property-casualty insolvencies, depending on the data sample used and the specified Type 1 error rate (ranging from 5–30 percent).³³ In a second study, Grace, Harrington, and Klein (1998b) found that the FAST system was somewhat less accurate for life-health insurers, but its performance might be improved by adjusting the FAST scoring system based on empirical analysis.

These and other studies have found that financial monitoring could be further improved by incorporating more information and better methods, such as financial strength ratings and cash-flow testing (Cummins, Grace, and Phillips, 1999; Pottier and Sommer 2002). The cash-flow simulation used by Cummins et al. (1999) comes closest to the DFA approach we discuss; its significant explanatory power in insolvency prediction tests lends support to its consideration in determining capital adequacy and financial monitoring. It is difficult to estimate the effect of using more qualitative methods and information, as these things do not lend themselves as easily to empirical testing. The predictive value of claims-paying ability ratings comes closest to indicating the potential contribution of qualitative analysis, which is a part of the rating process.

The empirical case against insurance price regulation is strong. There is a long line of studies evaluating the effects of rate regulation in personal auto insurance dating back to the 1970s. The

whole of the literature indicates that regulation does not benefit consumers by providing them with consistently lower premiums.³⁴ However, the evidence also shows that regulators can cause significant market distortions if they seek to substantially constrain insurers' rates. The negative effects of such policies include cutbacks in the supply of insurance, coverage availability problems, diminished quality of service, and higher claim costs.

For example, a recent study by Derrig and Tenynson (2008) found that Massachusetts's strict rate controls for auto insurance increased claims costs by 44–50 percent and regulation-imposed cross-subsidies increased claims costs in towns that were "subsidy receivers." Danzon and Harrington (2001) found similar effects in the regulation of workers' compensation insurance rates. A study by Klein, Phillips, and Shiu (2002) also found that stricter price regulation induces insurers to hold less capital that would be subject to regulatory expropriation.

When these kinds of regulatory policies are taken to the extreme, they can create severe market problems. Several state auto insurance markets experienced severe problems before the resulting crises compelled regulatory reforms. Consequently, studies have shown that deregulating prices in such markets have greatly improved the supply of insurance and their overall efficiency.³⁵

Broader studies that consider the full scope of insurance regulation and its effects in the US are harder to come by. A number of studies have looked at the efficiency of US property-casualty insurers and life-health insurers, but most have not attempted to assess the effect of regulation on insurers' efficiency. Ryan and Schellhorn (2000) found that efficiency levels in the life insurance industry did not change after RBC standards were implemented. This is not necessarily surprising, as the vast majority of insurers already met the new standards when they were implemented.

A more recent study by Pottier (2007) found

that life insurers' efficiency decreases as the number of states in which they operate increases. This inefficiency arises from several sources, including compliance costs, delays in introducing new products, regulatory barriers to entering state markets, and other constraints that inhibit competition. It also reflects the combined effects of state regulatory policies and a state-based framework. Pottier also found that a significant number of life insurers are operating below the minimum efficient scale for the industry, consistent with the findings of prior studies. It appears that most of the higher costs associated with this inefficiency are passed on to consumers through higher premiums. Grace and Klein (2007) concluded that creating an optional federal charter for life insurers would increase the industry's competitiveness and efficiency and facilitate greater consolidation that would enable more companies to achieve higher economies of scale.

Insurance Regulation in the European Union

Since the mid-1990s, the EU financial services markets have undergone significant deregulation. Specific to the insurance industry, a fundamental market change resulted from the introduction of the EU's Third Generation Insurance Directive in 1994. Prior to the directive, the European insurance business was mostly embedded in a dense regulatory network. Insurers were subjected to significant requirements on contractual characteristics leading to uniformity in products and limiting competition (for a discussion of the situation before 1994, see Farny 1999; Rees et al. 1999). Implementing the 1994 deregulation, however, yielded intensive price competition, margin erosion, and cost pressure (Hussels et al. 2005).

Quantitative Regulations for Capital Requirements

The Third Generation Insurance Directive of 1994 did not directly address solvency issues. Instead, the directive recommended that the rules-based set of minimum capital requirements introduced in the 1970s be reviewed. The European Commission, the body responsible for proposing legislation in the EU, responded with a "framework for action" for financial services. According to this plan, EU solvency regulation should be harmonized and reformed in two steps, called Solvency I and Solvency II. Solvency I regulations went into effect for member nations by January 2004, slightly modifying the existing solvency margin requirements, and mostly focusing on coordination issues (EU Directive 2002/13/EC for non-life insurers; EU Directive 2002/83/EC for life insurers; see European Union 2002a, 2002b). A limitation of these requirements is that they are derived by volume numbers such as premiums or claims, rather than being based on the insurer's specific risk situation, often leading to undesired incentives. For example, through underpricing, an insurer lowers its capital requirements because its premiums are lower even though its risk has grown, all else equal. Volume-based requirements are easy to apply, but as has been mentioned often in the literature (Farny 1997), they tend to be too crude and their theoretical foundation too weak to achieve good risk management.

Largely in response to these problems, the European Commission initiated Solvency II, with the primary goal of developing and implementing harmonized risk-based capital standards across the EU. The intent is to focus on an enterprise risk management approach toward capital standards, meaning that it will provide an integrated solvency framework that covers all relevant risk categories and the dependencies across them. Solvency II's current schedule is as follows: in July 2007,

the European Commission published a framework directive (EC 2007a), which has been under discussion in the parliament and industry. The EU parliament approved this directive's final draft in April 2009. The next step is for each member country to implement the EU rules into national law. Solvency II should then become the general norm for insurance regulation in the EU by 2012. Most parts of Solvency II are already in place, and although modifications are still possible, major changes seem very unlikely. The implementation of Solvency II is well organized and on schedule, but as the political process is not predictable, there still might be a number of obstacles that the EU regulators have to overcome before Solvency II will be the new standard. However, compared to the situation in the US where a major reform currently seems far away, there is a broad consensus among the EU countries that it is time for a broad reorganization of the solvency standards. This consensus is shared not only by regulators but also by politicians and in the industry (Steffen 2008).

A number of institutions are involved in setting Solvency II standards. Most notable is CEIOPS, which is responsible for managing the entire process. Among other efforts, CEIOPS is undertaking comprehensive consultations with all market participants, in which suggestions for future solvency rules are collected and discussed. They are also undertaking quantitative impact studies, in which the proposed rules are tested. Our view is that the institutions are providing mechanisms for interested parties to participate in rule development, as well as mechanisms to anticipate the effects of the ultimate outcomes.

All indications are that the final Solvency II regulation will be very similar to the corresponding regulation in the banking industry, Basel II (Basel Committee on Banking Supervision 2001). Both are based on three pillars: (1) quantitative requirements, (2) qualitative requirements and supervision, and (3) supervisory reporting and

public disclosure. Under the first pillar—the quantitative requirements—each insurer's available capital is compared to standards. The first level is the minimum capital requirement (MCR), a minimum amount of equity capital that an insurer must hold. The second level is the solvency capital requirement (SCR), also called "target capital," which is intended to represent the economic capital the insurance company needs to run its business within a given safety level. In the context of Solvency II, the economic capital is derived by value-at-risk at a 99.5 percent confidence level over a one-year time horizon. In determining the SCR, all relevant risk categories are covered, that is, insurance, market, credit, and operational risk. Furthermore, risk mitigation techniques applied by insurers (such as reinsurance and securitization) are taken into account. The MCR will be a fraction of the SCR, although the precise value is not yet determined. One option is for the MCR to equal one-third of the SCR, the so-called "compact approach." A second option is for the MCR to be measured as value-at-risk, similar to the SCR, but calibrated at a 90 percent confidence level instead of 99.5. This second method is called the "modular approach" (CEIOPS 2006). A minimum floor for the MCR is also established at about €2 million for life insurers and €1 million for non-life and reinsurers (European Commission 2007a, 118).

Regulators are considering several methods to calculate MCR and SCR. One is to use a standard model that is given by the regulator. Another is to use an internal model, which the insurer itself develops and which might be used for the target capital calculation after being approved by the regulator. Internal models offer a number of advantages, including that they are individualized and therefore can be made to fit the insurer's specific needs, rather than a one-size-fits-all standard model. Another advantage is that internal models might trigger innovation in insurer risk manage-

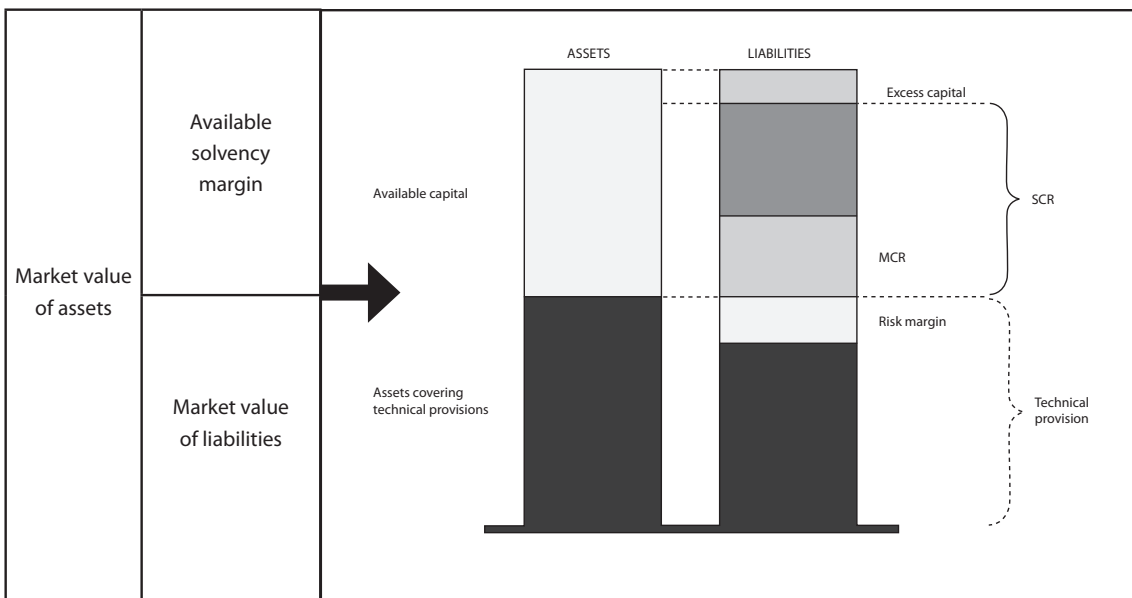
ment practices. Furthermore, the option to use internal models provides the insurer an opportunity to integrate regulatory requirements into its risk management process. Regulatory and business objectives then go hand in hand and lead to more efficient regulation and risk management (Financial Services Authority 2007). For all these reasons, large insurers are likely to use internal models. Some small insurers, however, might not have sufficient personnel and financial resources to develop such internal models, leading them to prefer a standard model. Yet even standardized models allow for some use of personalized parameters while providing standardized simplifications for small and medium-size enterprises (European Commission 2007b, 9).

Both with standard models and internal models, assets and liabilities must be estimated at market values. Relying on market values should ensure a realistic picture of an insurer’s risk capacity, especially compared to a situation where balance sheet values are used for regulatory purposes. As can be seen in the left part of Figure 1, two values need to be estimated: the market value of the liabilities

and the market value of the assets. The market value of the assets minus the market value of the liabilities gives the available solvency margin. Estimating these market values is not trivial, especially if no market prices are available. In this context, determining the market value of the assets is easier than estimating the market value of the liabilities. Calculating the market value of liabilities, referred to as the “technical provisions,” is based on their current exit value, that is, the amount necessary to transfer contractual rights and obligations today to another undertaking (Esson and Cooke 2007; Duverne and Le Douit 2007). The technical provisions are then given as the best estimate of the liabilities plus a cost-of-capital-based risk margin.

A market-consistent valuation of risk requires the implementation of sound financial methods that account for the relevant sources of uncertainty in the cash flows. Future cash flows must therefore be estimated and risk adjusted either by reducing the cash flow and discounting with a risk-free interest rate or by discounting with a risk-adjusted discount rate. Estimations of future cash flows are complicated by the number of options in the

Figure 1: Pillar I of Solvency II



insurance contracts, often requiring the use of option pricing methods to incorporate these in the estimation process. Solvency II thus supports the use of modern financial tools in insurer risk management processes.

After estimating the market values of assets and liabilities, adequate estimators to describe the risk of loss or of adverse change in the value of assets and liabilities need to be found. Under the Solvency II SCR standard formula, individual risk modules cover different risk types, that is, one module estimates underwriting risk (with three sub-modules for life, non-life, and health), a second estimates market risk, and a third estimates counterparty default risk. These three risk modules are aggregated to the so-called basic solvency capital requirement (BSCR). A capital requirement for operational risk (OpRisk) and an adjustment for the loss-absorbing capacity (LAC) of technical provisions and deferred taxes are added to the BSCR, yielding the following SCR formula (European Commission 2007a, 105 and 323):

The factor Corr_{ij} denotes different items in a

$$\text{SRC} = \text{BSCR} + \text{OpRisk} + \text{LAC} = \sqrt{\sum_{ij} \text{Corr}_{ij} \cdot \text{SCR}_i \cdot \text{SCR}_j} + \text{OpRisk} + \text{LAC}$$

correlation matrix given by the regulator (European Commission 2007a, 324). Underwriting risk, market risk, and counterparty default risk are thereby correlated among each other, but these three are independent of operational risk. All risk modules are further subdivided; for example, the underwriting risk modules for non-life and health are subdivided in two sub-modules (European Commission 2007a, 107):

- Premium and reserve risk: the risk of loss, or of adverse change in the value of insurance liabilities, resulting from fluctuations in the timing, frequency, and severity

of insured events, and in the timing and amount of claim settlements.

- Catastrophe risk: the risk of loss, or of adverse change in the value of insurance liabilities, resulting from significant uncertainty of pricing and provisioning assumptions related to extreme or exceptional events.

For life insurers, sub-modules such as mortality, longevity, disability-morbidity, or lapse risk are considered. The market risk module contains sub-modules for interest rate risk, equity risk, property risk, spread risk, concentration risk, and currency risk. When appropriate, the SCR standard formula also allows the use of insurer-specific parameters and standardized simplifications for small and medium-sized insurers.

Depending on the relationship between the amount of available capital to the SCR and MCR, there are three levels of regulatory intervention. When the available capital is above the SCR, there is no intervention. If the available capital is below the SCR but above the MCR, the regulator will take action aimed at restoring the insurer to a healthy condition. If the available capital is below the MCR, the regulator will revoke the insurer's license. This will be followed either by liquidating the insurer's in-force business or by transferring the insurer's assets and liabilities to another insurer (European Commission 2007b, 5).

Importantly, Solvency II follows a principle-based approach instead of using strict rules such as those required in the US risk-based capital standards. A major drawback of standard rules-based models is their lack of flexibility to handle individual situations, limiting the ability to assess the wide range of insurance risk profiles. Rules-based approaches also increase the possibility of a systemic problem arising from the entire industry responding to a condition in the same or similar way. Principles-based regulation should encourage greater levels of individuality. But these advantages

do not come without drawbacks. Relying upon principles increases the complexity and costs of regulation, both for the insurer, who needs time and resources to implement the principles into a model, and for the regulator, who needs sufficient resources to control all the individual models instead of one standard model. Furthermore, a lack of precise guidelines could create inconsistencies in the application of standards across organizations and thereby reduce comparability (see Toppe Shortridge and Myring 2004 for a related discussion in accounting). This problem is especially relevant if principles are not properly enforced (see Black et al. 2007 for more details on the pros and cons of principle-based regulation).

Qualitative Elements of Supervision

The developers of Solvency II recognize the need for qualitative assessment in addition to the quantitative capital requirements described in the last section (Conference of Insurance Supervisory Services of the Member States of the European Union 2002). This need is highlighted by results from a study of twenty-one insurer failures (and a larger set of near failures) in the EU, which demonstrated that the fundamental causes of insurer insolvencies are management error rather than undercapitalization (Ashby et al. 2003). Based on these findings, Ashby et al. (2003) recommend a number of regulatory responses to bolster internal controls, most of which involve on-site inspections, offering expert advice, and similar actions that respond to specific situations rather than imposing universal requirements.

Such qualitative requirements represent the second pillar of the Solvency II framework and thus one of the building blocks of the new regulatory framework. The underlying theory of the second pillar is that the risks recognized by quantitative models in the first pillar must be handled with appropriate processes and decisions in the context of a

management system. Quantitative models alone are insufficient. The central instrument of the second pillar is the supervisory review process (European Commission 2007a, 7). This supervisory review comprises an evaluation of the strategies, processes, and reporting procedures established by the insurer as well as the risks the insurer faces or may face and its assessment ability. The regulator also reviews the adequacy of the insurer's methods and practices to identify possible events or future changes in economic conditions that could have unfavorable effects on its overall financial standing.

An example of the requirements within the second pillar is that all insurers should have a regular practice of assessing their overall solvency needs with a view to their specific risk profile (referred to as the "own risk and solvency assessment"; see European Commission 2007a, 9). The supervisory authority reviews results of this internal assessment process as a part of the supervisory review process. The review process also includes outsourced activities. To do that, the supervisor must have a right to access all relevant data held by the outsourcing service provider as well as the right to conduct on-site inspections of the outsourced activity, even if the outsourcing service provider is an unregulated entity in a third country.

In order to make this supervisory process efficient, regulators again need to have sufficient resources, including a follow-up process to review their findings. Furthermore, effective regulation requires appropriate monitoring tools that enable deteriorating financial conditions to be identified and remedied. As a result of the supervisory review process, the regulator might require the insurer to hold more capital than the SCR determined under pillar one of Solvency II. The regulators can thereby compel an insurer to undertake remedial actions if the qualitative analysis reveals problems even if the insurer exceeds its SCR. This is especially relevant when the standardized formula does not entirely reflect an undertaking's specific

risk profile (European Commission 2007a, 69). The capital add-on must be reviewed at least once a year.

Although EU regulators are working diligently to prevent insolvencies, a fundamental principle of Solvency II is that regulators will not prevent insolvencies at any price. As shown, the capital requirement is based on a ruin probability of 0.5 percent. In reverse this means that the insurer will fail on average once in two hundred years (or one out of every two hundred insurers will fail this period). Of course, increasing these requirements to 0.1 percent would increase the insurer's capital requirement and its costs. To assess the benefit of increasing capital requirements, these costs should be compared to the costs of a failure. The use of guaranty mechanisms must also be considered. Solvency II does not cover guaranty mechanisms, but they are generally available in the EU member countries. An example is the Protector and Mediator Fund in Germany (for life and health insurance contracts) and the Financial Services Compensation Scheme in the UK (which covers life and most general insurance policies, such as motor, home, and employers' liability insurance; reinsurance, marine, aviation, transport business, and credit insurance is not covered). A good overview of the variation across EU guaranty mechanisms can be found in OECD (2002, 50–53). Existing guaranty schemes are not affected by the introduction of the Solvency II rules.

Market Entry, Rate Regulation, and Profit Distribution

Beyond solvency regulation, other classic fields of supervision include market-entry regulation, rate regulation, and profit regulation. Regulating market entry, premiums, and profits were very common in the EU until the 1994 deregulation. Today most of these regulations do not exist although differences continue among the EU mem-

ber countries and across some regulated fields in the national markets.

With the 1994 introduction of the so-called “country-of-destination principle,” market entry regulation has been simplified significantly throughout the EU. Once an insurer receives a license from a regulator to sell insurance products, that license is valid for all other member countries. To obtain a license, insurers must fulfill certain requirements, such as holding the absolute minimum capital required (€2 million for life, €1 million for non-life and reinsures) and submitting a business plan covering the next three years. Life insurers are also required to hire an actuary responsible for calculating premiums and reserves in line with regulations.

Direct rate regulation was common in the EU until 1994, but was then eliminated with the introduction of the Third Generation Insurance Directive. Some member countries, however, still regulate other conditions that affect the determination of insurance premiums. An example is the automobile insurance bonus-malus system in France (Dionne 2001). While there are no regulations governing the pricing of a contract, the premiums are adjusted by a bonus-malus coefficient that takes into account the driver's past experience. These bonus-malus coefficients are set by law. Even though they set barriers on insurers, these rules are completely known; insurers can anticipate them and therefore incorporate them into the pricing process, so the competition in French automobile insurance continues even if constrained.

Many country-specific differences in the EU emerge from the fact that the individual states still regulate contract law. EU legislators tried to harmonize contract law, but due in large part to the divergent histories and underlying theories of the legal systems in the EU member countries, insurance contract law has not yet been harmonized. A number of differences in contract terms, therefore, can be found in the EU countries. Examples are

the right of withdrawal, disclosure requirements, and documentation requirements that might differ among EU countries. In some lines of business the freedom of contract is restricted. An example is that in Germany, Denmark, and Italy, automobile third-party liability insurers are obliged to enter into a contract with the customer; that is, they are not allowed to refuse an applicant. Nor are insurers in these countries allowed to discriminate among customers in order to separate good risks from bad risks. Such an obligation to enter into a contract is not known in other EU automobile third-party liability insurance (Basedow and Fock 2003).

Another example is surplus participation, a kind of profit regulation that still exists in the German life insurance industry (Rees et al. 1999, 373). According to “surplus participation,” life insurers are obliged to share their annual profit between the policyholders and the shareholders in designated ways. At least 90 percent must be paid out to the policyholders, while shareholders can take no more than 10 percent. Contract terms are also strictly regulated in the German automobile insurance market, limiting competition to pricing differentials rather than to contractual distinctions. Yet even with these various regulatory constrictions, regulation in the EU insurance industry is not too extensive, especially compared to the situation before the deregulation in 1994.

Insurer receivership is another field not yet harmonized in the EU. Although the EU developed receivership rules in 2000, insurance undertakings and credit institutions were excluded from the regulation. Justification for excluding insurance and credit organizations was based on the extremely wide-ranging powers of intervention held by national supervisory authorities, as well as on the existence of special arrangements for insurance and credit institutions within country-specific legislation (Council Regulation [EC] no. 1346/2000, Article 9; see European Union 2000). Consider-

ing German law as an example, the receivership process is comparable to that in the US, especially in the dominant role of the domiciliary regulator. A major difference, however, is that the process runs through the court of bankruptcy rather than the insurance supervisor. The court nominates a representative who manages all aspects of the receivership in the case of an insurer’s failure (German Insurance Supervision Act, Article 78; see BaFin 2009). We are unaware of any research on the relative efficiency of the receivership system in the EU

Empirical Evidence on the Effectiveness of Regulation and Market Discipline

While numerous studies test the US solvency model and consider other aspects of US supervision, very few studies employ European data to analyze supervision-related questions. One exception is the field of efficiency analysis (data envelopment analysis, stochastic frontier analysis; see Eling and Luhn 2009) where a number of studies test the influence of regulation in the European insurance markets:

- Rees et al. (1999) found modest efficiency gains from deregulation for the UK and German insurance markets for the period from 1992–1994.
- Mahlberg (2000) identified decreasing efficiency for Germany considering life and property-liability insurance for the period of 1992–1996, but an increase in productivity.
- Diacon et al. (2002) observed decreasing efficiency for the years 1996–1999 considering non-life insurers from fifteen different countries.
- Ennsfellner et al. (2004) established strong evidence that deregulation had positive effects on the production efficiency of Aus-

- trian insurance companies for the period of 1994–1999.
- Cummins and Rubio-Misas (2006) found evidence of total factor productivity growth in Spain for the years 1989–1998, with consolidation reducing the number of firms in the market.
 - Hussels and Ward (2006) did not identify clear evidence for a link between deregulation and efficiency, again for the UK and German insurance markets during the period 1991–2002.
 - Fenn et al. (2008) observed decreasing costs and increasing returns to scale for a large number of EU insurance companies. They concluded that mergers and acquisitions, facilitated by the liberalized EU market, have led to efficiency gains.

The aim of the 1994 deregulation in the financial services sector was to improve market efficiency and enhance consumer choice through more competition. As can be seen from this discussion, the evidence on efficiency gains due to deregulation is quite mixed. The limited evidence for single countries and the limited number of years of data to study, however, indicates that much future research is needed to 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.

Another aspect of efficiency that has been analyzed in academic literature is the efficiency of the French pricing system, including the previously discussed bonus-malus regulation. Dionne (2001) showed that the variables used under the bonus-malus system (such as age, sex, and driving experience) efficiently deal with adverse selection. Moreover, he demonstrated that the resulting bonus-malus variable is significant in explaining both the individual distribution of accidents and

the individual choice of insurance coverage. He concludes that it represents a valuable source of information, one that should create appropriate incentives in this market. Similar results were obtained by Chiappori and Salanié (2000) and Dionne (2001).

One new and important aspect of insurance regulation under Solvency II is market transparency via disclosure requirements. The Solvency II rules require insurers to submit annually a report covering essential and concise information on their solvency and financial condition (European Commission 2007a, 10). Public disclosure constitutes the third pillar of the Solvency II framework. A transparent process with public disclosure requirements is expected to result in market participants forcing appropriate behavior. Market discipline is expected to encourage a strong and solvent insurance industry.

Today's evidence of market discipline in the EU insurance markets is still limited. For example, Elting and Schmit (2008) found some market discipline in the German insurance market, but their evidence is less clear than that for other insurance markets (see Epermanis and Harrington 2006 for an analysis of the US market) or other fields of the financial services industry (Sironi 2003; Distinguin et al. 2006). The new disclosure requirement under Solvency II could be a valuable data source for market participants, perhaps increasing market discipline. The new data might also be useful to analyze the success of the new solvency rules in the coming years.

Comparison of United States and European Union Insurance Regulation

The prior detailed discussion on insurance regulation in the US and the EU illustrates the various ways in which the two regimes are similar

to and different from one another. Here we offer a brief outline of several general themes that emerge from that discussion. In doing so, we highlight both the differences between the US and EU as well as their relationship to economic principles of efficient regulation.

Insurance regulation has long been justified by its proponents based on what constitutes good public policy or serves the public interest. Because insurance aids economic development, the argument goes, its fair operation is crucial to society. Furthermore, a competitive market may be hampered by informational limitations. Within the domain of solvency regulation, many economists have argued that agency problems and costly information offer a general rationale for governmental intervention (Munch and Smallwood 1981). When a market is hampered by agency problems and costly information, it is believed subject to “risk-shifting moral hazard,” whereby equity holders have incentives to extract value from debt holders through excessive risk taking. In the insurance context, equity holders have an incentive to take more risk than is optimal for policyholders. Although risk-taking behavior may be mitigated by the existence of franchise value (Staking and Babbel 1995), the problem is particularly acute in insurance because of the long-term nature of many insurance contracts, which allows management to increase risk after entering into contractual arrangements with its policyholders. The regulatory role in this situation is to “limit the degree of insolvency risk in accordance with society’s preference for safety” (Klein 1995). Regulators have performed this role historically by imposing minimum capital and various other financial requirements.

Until the 1990s, solvency regulation in both the US and the EU set fixed minimum capital standards. With the introduction of “risk-based capital” (RBC) in the US, a move began toward using individual insurer characteristics to de-

termine its capital requirement. While the US moved in this direction earlier than the EU, and had a shorter distance to travel, the EU appears to have caught up and surpassed the US with its recent focus on principles-based solvency regulation. RBC standards in the US remain somewhat static and focused on accounting data. In contrast, the EU is developing models that utilize dynamic financial analysis and add flexibility in incorporating individual insurer characteristics.

As presented above, most studies of the US RBC system indicate that it is a relatively poor predictor of solvency. While the US RBC formula is not intended to be a solvency predictor, its relatively subpar performance in empirical testing raises questions about its accuracy in determining capital requirements. These results suggest that using dynamic financial analysis (DFA) and qualitative methods could improve current solvency regulatory tools in the US substantially. In this sense, then, the likely results of Solvency II, which incorporate those tools, will be to improve regulators’ ability to anticipate financial weaknesses and take action early. Solvency II also is expected to encourage insurers to manage their financial risk more prudently. What is less clear is whether or not the benefits of these new rules will outweigh the costs of additional complexity (Eling, Schmeiser, and Schmit 2007). This question arises when considering the rules that will determine whether insurers will be compelled to use an internal model versus a standard model that could apply to all insurers. The standard model could incorporate DFA.

Beyond capital requirements, the US imposes many additional financial requirements in numerous forms, including many rules governing insurers’ financial structure and transactions, expectations for an array of financial ratios, extensive reporting of financial results, regular financial audits, and participation in guaranty associations. These requirements are costly and sometimes

opaque. In both jurisdictions, we believe that market transparency through easily accessible information could be improved. In the US, rating agencies and the National Association of Insurance Commissioners (NAIC) offer extensive financial information regarding most insurers. Commercial policyholders are particularly aided by such information. Still, public information available on US insurers may not provide accurate indications of their financial risk. This same type of information has not been the standard throughout the EU, but it is being considered as part of the Solvency II requirements. Indeed, with the implementation of Solvency II, the quality of information available on European insurers could be superior to that available for US insurers. Given that the economic rationale for regulatory intervention rests on informational and agency problems, a focus on removing informational barriers and supporting market discipline would appear to serve solvency objectives.

In addition to solvency requirements, the US continues to impose a variety of strict pricing regulations in many state jurisdictions. The economic justification for price regulation is much more tenuous than that for solvency regulation. Competition precludes the need for regulation to prevent excessive prices. Further, effective solvency oversight and market discipline are better vehicles to address underpricing that would threaten an insurer's solvency. Hence, there is no credible economic basis for insurance price regulation.

Prior to 1994, most pricing regulation in the EU focused on assuring prices sufficiently high to protect against insolvency. Since 1994, most price regulation has been abandoned in the EU. Today, regulation in the EU tends to allow competition to set prices. The initial change in philosophy was accompanied by numerous insolvencies in several jurisdictions, but it seems now to have settled into equilibrium (Cummins and Rubio-Misas 2006). A negative reaction such as this can

be a common initial scenario when price floors are eliminated. Markets tend to stabilize as insurers adjust to a competitive environment. Again, an effective risk-based financial regulatory system combined with market discipline is likely to discourage chronic underpricing as well as other high-risk behaviors.

Numerous additional regulations associated with policy forms, advertising restrictions, licensing, and so on can be found across the US. Some are also found within the EU. In both systems, variations across jurisdictions are being considered. The Optional Federal Chartering concept in the US is receiving considerable attention and support, along with detractors.³⁶ Within the EU, a desire to harmonize appears hampered primarily by larger issues, such as the more extensive question of contract law across borders. It may well be that within the EU, insurance regulations will harmonize more quickly than the general national contract laws.

Policy Implications and Future Research

What is the impetus for the striking difference between the static accounting system used in the US and the holistic management approach found under Solvency II? Answers to this question can be found in variations across the two markets and cultures, as well as in the timing of each system's introduction. Creators of Solvency II are able to take advantage of research that has generated a broad consensus among academics, practitioners, and policymakers that neither the European regulatory rules from the 1970s nor the current regulatory framework in the US is meeting regulatory objectives most effectively. They also have the advantage of advanced computer systems that allow for development and use of more complex models. We perceive, therefore, that much can be

learned from the process being implemented under Solvency II.

The conceptual framework for and methods to accomplish risk management within financial institutions have evolved considerably in the past two decades. We see a movement toward enterprise risk management and the use of internal risk models with emphasis placed on dynamic financial analysis (DFA). An important facilitator of this development is the improvement in computing power that was not as readily available twenty years ago. Other facilitators are the increase in the speed of communication and the amount of data that can be transferred across business parties. Such technical progress is reflected in differences between the US and EU standards.

Yet, not only has technology seen massive changes in the last twenty years, but the competitive environment in the EU has undergone tremendous modification with extensive deregulation leading to increased competition (Eling and Parnitzke 2007). Improved market transparency and the entrance of foreign competitors led to intensive price competition, margin erosion, and cost pressure. There also were substantial changes in capital market conditions, such as the stock market crash from 2000 to 2003 and the historically low interest rates. Furthermore, the convergence in the financial services sector and developments in other fields of financial services, such as Basel II in banking, have influenced the new EU regulation.

The length of the process in the European Union, however, also provides a good example of how difficult it is to introduce a new, innovative system of regulation. The disadvantages of the old EU regulatory rules have been widely discussed and understood in academia and practice for many years (Farny 1997), yet thirty years passed between the old and new systems. Political decision making takes time, and in most cases a trigger is needed to push the development for-

ward. In the EU this has been the formation of the common financial services market. The current financial market crisis that reveals the need for a regulatory reform might be such a trigger for the US

Despite the ease with which we compare developments in the EU and the US insurance regulatory systems, we also acknowledge the environmental differences that must be considered in evaluating regulatory success. The US and EU insurance markets operate in distinct economies and cultures, both of which affect regulatory approaches. Any true evaluation of the potential influence of different regulations requires focus on the respective market, limiting our ability to draw direct and clear conclusions about the two regulatory approaches.

Nevertheless, we encourage US regulators to keep in mind a variety of ideas that emerge from the Solvency II process when revising the US system. One of these is the notion of a principles-based approach. While US regulators have indicated interest in exploring the broad application of a principles-based approach, there is no indication that they are poised to pursue a comprehensive set of reforms such as those being developed in the EU. A drawback of standard rules-based models as found in the US is that these have only very limited flexibility to handle individual situations. Therefore the US model might not be very effective in assessing the wide range of insurance risk profiles (Eling et al. 2008). In comparison, the principles-based approach found under Solvency II is flexible and captures individual risk profiles, such as by using the insurer's parameters instead of those determined by the regulator. A principles-based approach could trigger innovation, as insurers are encouraged to develop and use their own risk models in order to determine the regulatory target capital. We anticipate competition among insurers to develop the best risk model in the market.

Another advantage in this context is that the principles-based approach allows the insurer to integrate regulatory requirements into its management process. Business and regulatory objectives then go hand in hand, which could lead to efficient regulation and risk management (Financial Services Authority 2007). Therefore Solvency II has the potential to improve management practices. Overall, Solvency II might create a superior atmosphere for innovation in EU insurance markets, which might also result in a competitive advantage for EU insurers compared to their US competitors.

These advantages, however, do not come without drawbacks. Relying upon principles could increase the complexity and costs of regulation both for the insurer, who needs time and money to implement the principles into a model, and for the regulator, who needs sufficient resources to evaluate all the individual models instead of one standard model. A major effort by regulators will be to assure that internal models are appropriate for the situation, and not methods to hide concerns specific to individual reasons. Such effort is costly in time and resources. For that reason we do not argue that there is a need for a centralized regulatory authority. Most academic experts believe that the efficiency of US regulation could be improved by creating a federal regulatory authority; however, the retention of a state-based system would not preclude more efficient and harmonized regulation. We should note that the idea of creating an EU-wide insurance authority with independent country (state) regulators has been discussed periodically and then abandoned. Of course, it is important to recognize that the US consists of states within one nation whereas the EU consists of sovereign countries within a unified framework. In either setting, what can be improved is the coordination between the different regulators; they therefore need to work on a mutual basis using the same principles, and they

need a fast and efficient connection to transfer information.

We therefore argue for a flexible scheme, one in which risk-based capital standards are used as guidelines to assist insurers in managing their risk structures rather than as absolute requirements (Eling et al. 2007). 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. Model arbitrage would be less effective, too, given that the requirements are flexible rather than rigid. US regulators might also consider forming something akin to the Committee of European Insurance and Occupational Pension Supervisors (CEIOPS), which has been given the task to redesign the EU regulatory framework and is conducting public forums in which suggestions for future solvency rules are being collected and discussed. In the US, the closest analog to a structure that would have any kind of real authority would be an interstate compact. An interstate compact has been used to “harmonize” the regulation of US life insurance products, and such a vehicle could be used to advance and harmonize other aspects of US insurance regulation.

Throughout this paper, we have presented specifics of a variety of insurance regulatory controls in the US and the EU. We further presented existing empirical evidence of the performance of some of those controls. Much additional research is warranted to assess the effects of recent and soon-to-be-implemented changes to those regulatory systems. Importantly, we encourage research on the effectiveness of various solvency models, the ability of market discipline to substitute for government intervention, and the ways in which insurance supervisors will be most effective in employing qualitative analyses of insurer practices. Implementation of Solvency II offers us a rich opportunity for a natural experiment on these open questions.

Notes

1. Klein (2005) provides a detailed description of US insurance regulation.

2. An insurance company must apply for a license in each jurisdiction in which it writes business. Only “surplus lines” or “non-admitted” insurers may sell insurance for certain designated lines or risks (determined by each state commissioner) without a license.

3. While large segments of the industry have been pushing for an OFC, it is strongly opposed by the states and other industry segments (for example, state and regional insurers, and local agents) that wield considerable political power. The US Department of the Treasury under the previous Bush administration supported an OFC and included it in its blueprint for revamping financial institutions’ regulation (Treasury 2008). We expect that the Obama administration will issue its own plan for financial regulatory reform that will likely also address insurance regulation and may advocate an optional federal charter. This may add some impetus for an OFC, but it still faces strong opposition and it is uncertain where insurance will stand in the queue as the regulatory framework for all financial institutions is reconsidered and revamped.

4. Regulations governing insurers’ investments provide a good example. Two NAIC model laws reflect different approaches, and the states have adopted one of these or developed their own specific rules.

5. The states’ fixed minimum capital and surplus requirements range from \$500,000 to \$6 million, depending on the state and the lines that an insurer writes. The median fixed capital requirement is in the area of \$2 million (Klein 2005).

6. See Feldblum (1996) and NAIC (2007) for more detailed descriptions of the RBC formula.

7. An insurer’s TAC is equal to its reported surplus with some minor modifications; for example, additional reserves required by regulators are added to an insurer’s surplus in calculating its TAC.

8. The NAIC developed a model law to be adopted by the states that implements the RBC standards. All states have adopted the model law so the same rules have been established in each state.

9. In statistical language, this might be labeled as a “Type 1 Error.” Conversely, a situation where the RBC formula would not require a financially weak insurer to increase its capital to an adequate level would constitute a “Type 2 Error.” Klein and Wang (2007) demonstrate that only a small fraction of insurers fall below the company-

action-level RBC requirement and that rating agency capital-adequacy tests are considerably more stringent than US regulatory standards.

10. Based on the current formula, an insurer’s RBC requirement increases proportionately with the amount of its premiums, assets, and loss reserves. However, arguably, according to the “law of large numbers,” an insurer’s risk does not increase proportionately with its size. With a size adjustment, a small insurer would have a higher relative RBC requirement than a large insurer, all other things equal.

11. For example, Feldblum (1996) suggests that better factors could be applied to the credit risk associated with reinsurance recoverables based on credit or claims-paying-ability ratings for reinsurers.

12. Regulatory activities in the US insurance system are not easily classified using the three-pillar framework. Many quantitative elements of US regulation are beyond capital standards that we discuss in this section. When it is discussed in an international context, the second pillar is more closely associated with qualitative aspects of the supervisory review, which includes an evaluation of an insurer’s strategies, processes, and reporting procedures, the risks it is or may be exposed to, and its management of those risks. US regulators may consider some of these elements when evaluating an insurer’s risk management, but their approach tends to be more quantitative and rules-based than the approach envisioned in Solvency II.

13. In the US, regulators require insurers to adhere to the NAIC’s Statutory Accounting Principles (SAP), which differ somewhat from the US Generally Accepted Accounting Principles (GAAP). SAP accounting is intended to measure an insurer’s liquidation value, while GAAP is intended to measure the value of a company as a going concern. Within the last decade, the NAIC has sought to standardize and document SAP through a series of more than a hundred issue papers that address various aspects of SAP rules.

14. These reports include insurers’ RBC calculations, actuarial opinions of reserve adequacy, CPA-audited financial statements, and management opinions. Most but not all of these reports are available for public access.

15. State laws generally authorize regulators to review all books and records of a company at any time.

16. The terms “bench” or “desk” audit refer to an in-house review of an insurer’s financial reports performed within the offices of the insurance regulator. This is contrasted with an on-site examination or audit of an insurer that is performed at the insurer’s offices and involves a review of its books and records.

17. The NAIC's analysis activities are focused on larger insurers that write business in a significant number of states.

18. A list of FAST scoring system ratios is published in Klein (2005). However, the parameters used in developing an insurer's score remain confidential. The FAST scoring system is subject to more frequent modifications than the IRIS ratios.

19. NAIC analysis is confined to "nationally significant" companies, which are defined as companies writing business in seventeen or more states and having gross premiums (direct plus assumed) written in excess of \$50 million for life-health companies and \$30 million for property-casualty insurers.

20. Examiners have been encouraged to go beyond simply verifying the accuracy of an insurer's financial reports and perform additional analysis to assess an insurer's financial risk.

21. One exception to this is mandatory stress testing by life insurers to demonstrate the adequacy of their policy reserves.

22. Klein (1995) argues that this allows domiciliary states to impose negative externalities on non-domiciliary states. This problem motivates the multilayered monitoring and regulatory system described earlier.

23. The maximum limit for property-casualty claims is typically \$300,000, but some states have higher limits up to \$500,000. Many states have also enacted provisions that exclude guaranty-association coverage for claimants with a net worth exceeding a certain amount, for example, \$50 million.

24. Workers' compensation is an exception—all workers' compensation claims are covered by GAs, and there is no limit on the amount of coverage for each claim. This policy is intended to protect the claims of injured workers.

25. State rating laws and policies vary. In some states, regulators seek to constrain overall rate levels and rate structures (for example, differences in rates between low- and high-risk insureds). In other states, regulators tend to allow the market to set rates and do not seek to constrain the prices that insurers charge.

26. For example, regulators may prohibit the use of criteria such as the value of a home in underwriting homeowners insurance. Some states are also placing limitations on the use of credit scores in underwriting and pricing personal-lines insurance.

27. The states rely heavily on consumer complaints and market conduct examinations of insurers to police insurers' market practices.

28. Thirty-three states belong to the Interstate Insurance Product Regulation Commission for the review and approval of life insurance products according to a common set of standards. States may elect to opt out of a particular standard but agree to accept all products approved by the commission.

29. In current optional federal charter (OFC) proposals, federally chartered insurers would not be subject to price regulation. Other aspects of market regulation are not specified. However, there is no guarantee that federal regulators would ultimately refrain from some of the market regulation that insurers and economists criticize.

30. Hall (2000) estimated this cost to be \$1.22 for each \$1 of pre-insolvency assets using a shorter time period, 1986–1994. These costs are substantially higher than those for US bank insolvencies, with estimates ranging between \$0.20 and \$0.30 per \$1 of pre-insolvency assets (James 1991; Kaufmann 2001).

31. See also Downs and Sommer (1999) and Hall (2000).

32. Ruhil and Teske (2003) find some evidence that investing greater regulatory resources—for example, conducting more financial examinations—reduces the number of insolvencies.

33. In calibrating models to predict insolvencies, modelers have to balance the ratio of Type 1 errors to Type 2 errors. Models can be calibrated to predict more insolvencies (that is, reduce Type 1 errors), but this raises the number of Type 2 errors. Ultimately, a maximum acceptable level of Type 1 errors has to be established for any model that might be used for regulatory purposes. More accurate models should offer better Type 1/Type 2 error tradeoffs to choose from.

34. Cummins (2002) offers a number of state-specific studies. Harrington (2002) summarizes and updates previous research on the effect of auto insurance rate regulation. Studies of price regulation in workers' compensation insurance have produced similar findings (Barkume and Ruser 2001; Danzon and Harrington 2001; Thomason, Schmidle, and Burton 2001).

35. Grace, Klein, and Phillips (2002a) analyzed the turnaround in South Carolina.

36. Proposed OFC legislation would explicitly preclude price regulation. However, the legislation is essentially silent on other aspects of market regulation. Any legislation that is enacted could contain more provisions on other elements of market regulation and/or this could be left to the discretion of federal regulatory officials. Either way, the scope

and nature of market regulation under an OFC is uncertain although its advocates are hoping for less restrictive policies.

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