WHAT DO WE KNOW ABOUT MARKET DISCIPLINE IN INSURANCE?

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Martin Eling*

Abstract

The aim of this paper is to summarize the knowledge on market discipline in insurance and other financial service sectors. Market discipline can be defined as the ability of customers, investors, intermediaries (agents, brokers), and evaluators (analysts, auditors, rating agencies) to monitor and influence a company’s management. Looking at banking is especially interesting, since market discipline in this field has been studied extensively. Based on existing knowledge, we develop a framework for researching market discipline in insurance that includes its most important drivers and impediments. The results highlight a significant need for continuing research. The findings are of relevance not only for European insurers and regulators, but for institutions outside Europe.

1 Introduction

An important new dimension of the regulatory environment in banking and insurance is explicit reliance on market discipline. Market discipline—the influence of customers, investors, intermediaries (e.g., agents), and evaluators (e.g., rating agencies) on firm behavior—is a central element of both Basel II and Solvency II. Market discipline has been a perennial topic of research in the financial services sector since the 1970s (see Flannery, 2001). Likely due to the fact that Basel II has been in force for several years, most research into market discipline’s ability to regulate financial services has focused on banking (see, e.g., Martinez Peria and Schmukler, 2001; King, 2008), but some research has also been conducted for the insurance sector.1 Solvency II should add even more impetus to the study of market discipline. It is thus

* Martin Eling is professor of insurance management and director at the Institute of Insurance Economics at the University of St. Gallen, Kirchlistrasse 2, 9010 St. Gallen, Switzerland (martin.eling@unisg.ch). The author is grateful to Christian Biener, Dieter Kiesenbauer, Sebastian Marek, and Jan-Philipp Schmidt for helpful comments and suggestions. Special thanks to Peter Schlosser for his excellent research assistance.

1 Related papers, such as Harrington (2004, 2005) and Nocera (2005), will be discussed in detail throughout this paper. Another excellent introduction to market discipline in the German language is Hartung (2005). Furthermore, Solvency II’s approaching effective date has resulted in several recent empirical studies on market discipline in insurance (e.g., Eling and Schmit, 2011). Also, experimental evidence from behavioral insurance (Wakker, Thaler, and Tversky, 1997; Albrecht and Maurer, 2000; Zimmer, Schade, and Gründl, 2009; Zimmer, Gründl, and Schade, 2009) is relevant for market discipline. Furthermore, the European Commission conducted research when designing Solvency II (see CEIOPS, 2009 and other information on
important to consider what is already known about market discipline in the insurance and related sectors.

To that end, this paper summarizes extant knowledge on market discipline in insurance and other financial services sectors. Looking at banking is especially interesting, since market discipline has been studied extensively in this field and much can be learned from that work. Based on existing knowledge, we develop a framework for researching market discipline in insurance that includes its most significant drivers and impediments. Our results also highlight a significant need for future research.

The results provide a clearer understanding of how market discipline works as a direct and indirect mechanism for monitoring and influencing by customers, investors, intermediaries, and evaluators. There are significant differences between banking and insurance with regard to market discipline. We also identify important differences between lines of business and legal forms in the insurance industry, which reveal that market discipline might be weak in some areas (e.g., in personal lines with complex products or with mutuals) and strong in others (e.g., in commercial lines or with stocks). We thus find a number of reasons why a “one-model-fits-all” approach might be inappropriate for market discipline in the insurance industry. The results of this analysis will be useful for insurers, regulators, and policymakers involved in revising regulatory standards both in Europe and in other markets. The article is not meant as an argument in favor of any particular type of regulation, but as an outline of potential impediments regulators may face in their efforts to enhance market discipline.

This paper is organized as follows. In Section 2 we review definitions and characteristics of market discipline that highlight differences between insurance and other financial services sectors. In Section 3 we take a look at the extant literature, especially that involving the banking field, and derive drivers of and impediments to market discipline in insurance. Section 4 concludes with potential policy implications and a summary of future research needs.²

2 Definition and measurement of market discipline

2.1. Definition of market discipline

There are several definitions of market discipline currently in use. For example, in the banking literature, there is widespread agreement that market discipline involves two distinct components (see Flannery, 2001; Bliss and Flannery, 2002, Forssbæck, 2009): (1) the ability of
market participants to accurately assess the condition of a firm (monitoring) and (2) their ability to impact management action in a way that reflects that assessment (influencing). Market discipline thus has both an indirect and direct dimension (see Forssbæck, 2009). Monitoring captures the information aspect of market discipline, i.e., current and prospective bank claimants inform themselves about the bank’s condition and set prices for their claims accordingly. Influence refers to the mechanism by which banks, in order to avoid the adverse consequences of stronger discipline (such as higher financing costs and, ultimately, liquidity problems) decrease their risk exposure or avoid increasing it in the first place.\(^3\)

In the insurance field and with regard to the first component (monitoring), intermediaries (agents, brokers), evaluators (auditors, analysts, rating agencies), and regulators assess the financial strength and service quality of insurers. Due to the post-insolvency assessment funding mechanism of many guaranty funds and potential contagion effects of financial problems among insurers, insurers in selected lines also have an incentive to monitor each other (see Downs and Sommer, 1999). Overall, it thus seems that there are enough market participants willing to monitor risk taking in insurance. Guarantee schemes and the opaqueness of some insurers, however, could limit the willingness and ability to observe insurer behavior (see Lee, Mayers, and Smith, 1997; Babbel and Merrill, 2005; Pottier and Sommer, 2006; Zhang, Cox, and Van Ness, 2009).

The second component, influencing, is difficult to evaluate. The finance literature contains numerous reasons why we should be skeptical about the ability of market participants to influence managers (see Bliss and Flannery, 2002), including asymmetric information, costly monitoring, principal-agent problems, and conflicts of interest among stakeholders. Another impediment to market discipline is a legal environment that makes shareholder activism, e.g., a hostile takeover, difficult. From the shareholders’ perspective, monitoring and incentive contracts can be combined to mitigate the agency problem, and there are also other mechanisms that may induce managers to act in the shareholders’ best interests, such as reputational concerns, competitive labor markets, and the threat of takeover, dismissal, or bankruptcy (see Aggarwal and Samwick, 1999). The insurance sector has a number of characteristics that might limit the influencing component. For example, there is a relatively small risk of a bank run, at least in selected lines.\(^4\) Furthermore, especially in personal lines, individual policy-\(^3\) Compared to the neoclassical definition of market discipline in a complete and frictional market with symmetric information (leading to different willingness to pay depending on the default put option value; see Doherty and Garven, 1986), these definitions typically emphasize the aspect of asymmetric information, which is reduced by increasing market transparency.

\(^4\) In non-life insurance, payments are linked to claim events and insurers are funded in advance. In life insurance, surrendering a contract has disadvantages, such as lapse costs, and thus the policyholder has an incentive not to terminate the contract. See Eling and Schmeiser (2010). In countries with low lapse costs and higher mobility of capital, there could be a risk of an “insurance run,” at least in selected insurance sectors.
holders are relatively small in terms of contract volume, which limits their ability to affect decisions. It thus seems that the influencing component of insurance sector market discipline is not without difficulties and needs more study.

While most definitions of market discipline in the banking context include the monitoring and influencing components, Harrington (2004) and Nocera (2005) add another interesting dimension that is especially relevant in the insurance context. They differentiate between investor-driven market discipline, i.e. financial market discipline, and customer-driven market discipline, i.e. the extent to which demand by policyholders is sensitive to insolvency risk and thereby motivates insurers to manage their risk. In creating an insurance-specific definition of market discipline, it is also important to recognize the other monitoring and influencing elements (in addition to customers and investors), i.e., intermediaries (agents, brokers) and evaluators (analyst, auditors, rating agencies) that are involved in the buying decision. We thus define market discipline in the insurance sector as the ability of customers, investors, intermediaries, and evaluators to monitor and influence the management of insurance companies.

2.2. Measurement of market discipline

Table 1 contains a review of the different facets of market discipline and derives measures for quantifying it. Based on the definition developed in the last section, we distinguish between “direct” and “indirect” monitoring and influencing. While in theory, customers and investors directly influence management decisions, intermediaries and evaluators have both a direct and an indirect influence. For example, customers or investors react to market signals set by evaluators (e.g., changes in ratings)—a direct influence by customers; an indirect influence by evaluators. However, given that evaluators’ indirect influence can lead to direct influence by customers and investors, they might also have an opportunity to exert a direct influence themselves if, for instance, managers are keen to do anything possible to avoid a rating downgrade.

<table>
<thead>
<tr>
<th>Who?</th>
<th>Customers and investors (direct monitoring and influencing)</th>
<th>Intermediaries and evaluators (direct and indirect monitoring and influencing)</th>
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<tr>
<td>Customers</td>
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<tr>
<th>How?</th>
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<td>Relevance in insurance</td>
<td>High</td>
<td>Limited</td>
<td>Limited</td>
<td>High</td>
<td>Limited</td>
<td>High</td>
</tr>
</tbody>
</table>

Table 1: Facets of market discipline

In the banking literature, investor-driven market discipline is usually studied either by analyzing stock prices or yields on debt instruments (see, e.g., Martinez Peria and Schmukler, 2001; See DeAngelo, DeAngelo, and Gilson (1994) with regard to the collapse of First Executive in the United States in the early 1990s.
King, 2008). However, the insurance sector is different from the banking sector, especially as to business models and financing. Regarding legal form, in banking and insurance both, many companies are mutuals and many stock companies are not traded on the capital market. Furthermore, for many of the insurance companies that are traded on the stock exchange, there are no liquid markets, since only a small fraction of the stocks are in free float. Stock prices are thus of only limited use when evaluating risk sensitivity in insurance.5 Furthermore, the financing of insurers is different from that of other providers in the financial sector in that debt instruments typically are not traded (the reserves of the policyholders are the major debt instruments). The debenture spreads typically considered as market elements disciplining management behavior for the banking industry thus, for the most part, do not exist in the insurance industry.6/7

An alternative way to measure market discipline is by looking at it as customer-driven. To this end, the studies on market discipline in insurance consider premium growth and lapse. Epermanis and Harrington (2006) and Eling and Schmit (2011) analyze premium growth around rating changes as a proxy for market discipline. Zanjani (2002) considers changes in lapse rates following rating changes. But there are also limitations in measuring customer-driven market discipline. For example, premiums are not the price of insurance, but the price times quantity. Typically, we cannot observe insurance prices, i.e., the premium rates per unit of coverage, and even if such information were available, it would be very difficult to compare insurers since the underlying expectations of claims costs used for calculating rates might be very different and are not observable (see Harrington, 2004). A proxy for insurance prices sometimes used in literature is the relation of insurer premiums to realized claims (see Sommer, 1996; Phillips, Cummins, and Allen, 1998).

From the above discussion, we conclude that in the insurance sector, market discipline focuses on the risk sensitivity of customer demand (for insurance coverage) and investor willingness to pay (for equity and debt). To measure market discipline, we thus need to identify market signals that affect the risk sensitivity of customers or investors. The second step is then to evaluate whether this signal has a significant impact on our measures of market discipline, i.e., demand and willingness to pay. Table 2 reviews a selection of potential signals.

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5 Reinsurers are different from insurers in that many of them have stocks traded on capital markets. Furthermore, many large holdings, such as Allianz SE, are listed on the capital market. Overall, however, the number of liquid stocks is very limited. A broad empirical analysis based on stock prices is thus difficult.

6 There are some debt instruments, for example, credit-default swaps or hybrid instruments (e.g., participating certificates), but the number of observable instruments and the number of companies involved in such transactions is, again, very small. Catastrophe bonds or other forms of alternative risk transfer are not suitable since these are issued in special purpose vehicles and thus are not linked to the default risk of the sponsor.

7 There are other important differences between insurance and banking. For example, the insurer’s assets and liabilities are stochastic, particularly in the non-life sector. In banking, questions of duration (which do not play a large role in non-life insurance) and asset risk are the main risk factors. In life insurance, duration is also of high importance; additionally, insurers’ liabilities often embed many options and guarantees.
Market signal with regard to risk situation | Signal given by | Market reaction
--- | --- | ---
(input variable) | (output variable) |

**Investor-driven market discipline**
- Annual and interim reports with outlook: Company
- Ad-hoc disclosure: Company
- Director's dealings: Company
- Analysts' comments: Analysts
- Company financial strength ratings: Rating agencies
- Takeover bids: Competitor

**Customer-driven market discipline**
- Product ratings: Rating agencies
- Surplus participation: Company
- Complaint statistics: Regulator
- Statistics published by associations: Insurance associations

### Table 2: Measuring market discipline

Table 2 can be used to formulate hypotheses with regard to the disciplining impact. For example, we might expect that a better company rating has a positive influence on equity prices (i.e., an increase in price) and a negative influence on the debt yields (i.e., the spread over the risk-free interest rate decreases).\(^8\) We consider three main sources of market signals: the company, the evaluators (analysts, rating agencies), and the regulator (other sources of information such as consumer protection institutions or recommendations by friends are also important, but are not discussed in this paper). Table 2 also allows us to identify elements unique to the insurance sector that might be used to measure market discipline. Among these are product ratings, surplus participation, complaints, and other published statistics.

### 2.3. Discussion of market discipline in the context of other regulatory measures

Basel II and Solvency II are two examples of how market discipline research is relevant to regulatory problems. In both systems, market discipline is the third fundamental pillar. The expectation is that a transparent market will require less overt intervention by regulators as market participants themselves force appropriate firm behavior. The third pillar of Solvency II will be composed of public disclosure and reporting requirements that are intended to facilitate more rigorous and uniform analysis of capital adequacy across firms and across national borders. Improved market discipline is the hoped-for result. The extent to which market discipline can be relied on for successful regulation, however, depends on the strength of its influence.

Different mechanisms have been employed during the last decades in an effort to limit default probability in the financial services sector. Historically, solvency regulation focused on different types of safety nets, including deposit insurance schemes in banking (such as the Federal Deposit Insurance Corporation (FDIC) in the United States after the Great Depression) and guarantee funds in insurance. Until the early 1990s, many countries in the European Un-

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\(^8\) As we will discuss below, typically the downside risk of a bad market signal is greater than the upside potential of a good market signal. See, e.g., Hong, Lim, and Stein (2000) and Halek and Eckles (2010). The direction of impact also depends on the signal. For example, a takeover bid might be a signal that the stock is underpriced because of poor management.
ion addressed default risk by limiting competition via market entry restrictions and price and product regulation (see Eling, Klein, and Schmit, 2009). Rules for capital adequacy—imposing certain minimum capital requirements—on either an absolute or a risk-adjusted basis (e.g., Solvency I, U.S. RBC Standards) have also been introduced (see Eling, Schmeiser, and Schmit, 2007, for an overview).

None of these market interventions is without disadvantages. Safety nets can create moral hazard since the risk reduction the parties face leads them to take riskier actions or fail to take precautionary measures (see Demirgüç-Kunt and Detragiache 2002; De Ceuster and Masschelein, 2003). Distortions of competition, such as price and product regulation, decrease efficiency and limit innovation. Capital adequacy rules might be subject to adverse incentives, as illustrated in the recent financial crisis, e.g., by AIG and its credit default swap business, which was motivated by regulatory and rating arbitrage (see Eling and Schmeiser, 2010).

Recently, regulators have begun to incorporate a new market-based element into regulatory regimes by increasing transparency and disclosure requirements. Basel II’s inclusion of “market discipline” among its three regulatory pillars is the most notable example. Regulators see two main advantages to market discipline, which is, theoretically, brought into play by greater disclosure requirements. First, stakeholder monitoring should improve due to the availability of more information and, second, this improved monitoring is expected to influence insurer behavior, i.e., the stakeholders are expected to use their market power to influence management decisions with regard to risk taking.

Which of the different regulatory mechanisms is best is a question yet to be answered. In the case of Solvency II, regulators advocate a combination of capital adequacy (Pillar 1) and market discipline (Pillar 3). This provides the opportunity to integrate different approaches, but has several disadvantages too, one of which is cost: requiring insurers to employ extensive financial models (Pillar 1), as well as increased reporting requirements (Pillar 3), are both going to impose a substantial financial burden on insurers. The cost of regulation might outweigh its benefits. This argument is especially relevant for small insurers that might be pushed out of the market by requirements too costly to meet.

Market discipline cannot completely replace regulation. In a perfect and arbitrage-free market, where providers and policyholders have perfect information, one might argue that policyholders should be free to purchase insurance with a lower safety level as long as the contract pricing is fair, i.e., the net present value is zero (see Doherty and Garven, 1986; Gatzert and

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9 There is no clear evidence as to whether the costs of Solvency II are higher than its benefits. The EU Commission demands an assessment of the costs of regulation for each new tool, including Solvency II. See, e.g., CEA (2007) for estimations of the administrative costs. Problems that arise are: (1) only direct costs (companies’ costs of implementation and future use) are considered and no indirect costs (inefficiency, effects on premiums and their result on other markets that depend on the insurance sector) and (2) potential benefits are described, but not quantified in any way.
Schmeiser, 2008). In this world, the policyholder, being fully informed, could choose to accept the default risk and hence there would be no need for capital regulation. However, in the insurance context, there is a “third-party problem”, i.e., the policyholder may cause an injury to a third party. This third party has no ex-ante contractual relationship with either the insurer or the policyholder, and hence cannot agree to some possibly low safety level in regard to the insurer’s default, with a consequent lower premium. In this situation, there is still a need for solvency requirements and regulation that cannot be replaced by enhanced market discipline per se.

Furthermore, there are interactions between the different pillars of Solvency II that need to be kept in mind when designing the regulation, especially regarding incentives. One important interaction is between the risk-based capital requirements in Pillar 1 and market discipline in Pillar 3. Under Pillar 3, insurance companies must publish their solvency testing results, thus informing the stakeholders and making the insurer’s safety level a competitive factor in the market. However, since internal risk models can be used for this purpose (as long as they are approved by the regulator), insurance companies may have an incentive to use internal models that “make them look safe” instead of models that would more accurately reflect their true risk situation (for a more detailed discussion on the pros and cons of internal models, see Eling, Schmeiser, and Schmit, 2007).

3 Evidence for market discipline (including facilitators and impediments)

We consider 62 peer-reviewed empirical studies on market discipline in financial services. For the field of insurance, we also include recent material presented at peer-reviewed conferences so as to increase the number of studies. Twenty of the 62 studies address the insurance industry; the other 42 studies are from the banking literature, reflecting the fact that, at least in terms of research questions and countries analyzed, more work has been done in banking field. However, as we highlight in the following discussion, some of the insights from the banking studies might be transferable to the insurance industry, e.g., with regard to safety nets.10

3.1. Evidence for market discipline in banking

There is a vast literature on market discipline, especially for the banking industry; research on the topic in this field dates back to the 1980s (see Table 3). The motivation for all this work is that innovation, e.g., in financial engineering, enabled financial intermediaries to become in-

10 The 16 oldest papers in banking are also summarized in Gilbert (1990). We also identified studies in other sectors of financial services, such as mutual funds (see, e.g., Dangl, Wu, and Zechner, 2008), but to reduce the complexity of the review, did not include them. Given the broadness of literature on market discipline in banking, we also cannot claim that our collection of 62 studies is complete, but we believe that the most important studies are included. Also note that experimental evidence, such as Wakker, Thaler, and Tversky (1997), is mentioned in our paper but is not included in the tables.
volved in complex financial operations that were very costly to monitor. Furthermore, excessive risk taking in the 1980s resulted in the failure of some depository institutions, which raised concern over safety and prompted calls for stricter regulation. Thus, by the 1980s, banking regulators had market discipline on the policy agenda (see Park and Peristiani, 1988). Research in this area was given another boost when market discipline was made one of the three pillars of Basel II.

There are two main empirical results in regard to market discipline found in the banking literature. First, there is evidence of market discipline in banking over the last decades across a variety of measures and countries, i.e., with regard to stock prices (e.g., Baer and Brewer, 1986), debt (Avery, Belton, and Goldberg, 1988; Sironi, 2003), and deposit growth (Park and Peristiani, 1998).11 Second, investors in bank stocks have the strongest incentives to be risk sensitive,12 while market discipline in debt is often hampered by safety nets. Safety nets of all kinds create moral hazard and reduce market discipline (Billett, Garfinkel, and O’Neal, 1998; Demirgüç-Kunt and Huizinga, 2004; Nier and Baumann, 2006). There is evidence that reducing safety nets increases market discipline (Flannery and Sorescu, 1996). A potential policy implication is that regulators should enforce modifications of existing guarantee schemes to bring market discipline into play. In this context, a number of authors (e.g., Benink and Wihlborg, 2002) advocate for banks to issue a substantial amount of uninsured deposits in order to enhance market discipline.

In addition to these two main results, we identify four other aspects from the banking literature that might be of relevance to the insurance industry. First, the strength of market discipline depends on the line of business. Morgan and Stiroh (2001), e.g., show differences for credit card, commercial, and industrial lending, all of which carry a penalty in terms of higher spreads. Second, Sironi (2003) found differences depending on ownership structure, i.e., less discipline was found for government-owned institutions. This is an important finding in light of the traditional separation of stock, mutual, and public companies in the insurance industry and the resulting differences in agency conflicts (see, e.g., Eling and Luhnen, 2010). Third, Nier and Baumann (2006) emphasize that market discipline depends on the level of competition, i.e., market discipline is more effective in curbing the greater risk taking that arises in the face of competition in those countries or industries where the competition is strong. Finally,

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11 There are also authors who find no evidence of market discipline (Gorton and Santomero, 1990) but, compared to the number of papers that do find such evidence, they are few in number. Of special relevance to Solvency II because of the focus on European data is the work by Sironi (2003), who finds that European banks’ debenture spreads reflect risk. More recently and also using European bank data, Distinguin, Rous, and Tarazi (2006) observe that the accuracy of models in predicting bank financial distress through use of stock market information depends on the extent to which bank liabilities are tradable. Models that account for these nuances, therefore, will be more valuable.

12 In spite of their residual claimholder position and risk of total loss, this result is not trivial, since with limited liability, equity holders might have an incentive to increase risk taking, as shown by Merton (1977). One might thus argue that equity holders are less suitable monitors. Empirically, however, and also in more complex theoretical models, this risk-increasing influence is not clear. See De Ceusters and Masschelein (2003).
Pop (2006) finds international differences in market discipline and argues that much work needs to be done, especially in Japan and certain European countries, to level the playing field so that market discipline can operate. Thus, there might be variation in the effectiveness of market discipline depending on the regulatory and cultural environment. The findings also highlight the potential for regulation to undermine market discipline (see, e.g., Billett, Garfinkel, and O’Neal, 1998).

Finally, it should be noted that almost all studies in the banking sector address the monitoring element of market discipline; that is, they test whether investors accurately understand changes in the firm’s condition and incorporate these into prices. Such testing, however, reveals nothing about the influencing component of market discipline, i.e., the response of firm managers to investor feedback. Bliss and Flannery (2002) is one of the few studies that directly measures this component by developing an influence regression using equity returns and expected managerial behavior. Their results show that market influence is weak. More research into the influencing component would be extremely useful.

3.2. Evidence for market discipline in insurance

Market discipline in insurance has not been as extensively researched as it has in the banking field and what work there is on the subject rarely employs non-U.S. data. Table 4 presents an overview of this research, dividing it into three categories: investor-driven market discipline (equity prices), customer-driven market discipline (price of insurance contracts, sum of premiums, number of contracts, lapse), and selected other aspects (impact of guarantee funds, studies on opaqueness).
<table>
<thead>
<tr>
<th>#</th>
<th>Authors</th>
<th>Title</th>
<th>Country</th>
<th>Main results</th>
<th>References</th>
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<td>1</td>
<td>Beighley, Boyd and Jacobs (1975), J of Bank Research</td>
<td>Bank Equities and Investor Risk Perceptions: Some Entrainments to Capital Adequacy</td>
<td>US</td>
<td>evidence for MD in stock prices</td>
<td>Share prices of bank stocks are estimated as a function of capital ratios, earnings and growth of earnings, asset size, and loss rates; banks with higher capital ratios and lower loss rates tend to have higher share prices.</td>
</tr>
<tr>
<td>2</td>
<td>Petrov (1986), J of Financial and Quantitative Analysis</td>
<td>Potential Insolvency, Market Efficiency, and the Bank Regulation of Large Commercial Banks</td>
<td>US</td>
<td>evidence for MD in stock prices</td>
<td>Considering several large banks that failed, returns to shareholders are simulated for several years prior to their failure. Returns on the stocks of banks that failed decline relative to simulated returns two years before failure.</td>
</tr>
<tr>
<td>3</td>
<td>Brewer and Lee (1986), Economic Perspectives</td>
<td>How the Market Judges Bank Risk</td>
<td>US</td>
<td>evidence for MD in stock prices</td>
<td>Betas are estimated as functions of accounting ratios; some of the measures chosen to reflect risk have positive, significant regression coefficients.</td>
</tr>
<tr>
<td>4</td>
<td>Cornell and Shapiro (1986), J of Banking and Finance</td>
<td>The Reaction of Bank Stock Prices to the International Debt Crisis</td>
<td>US</td>
<td>evidence for MD in stock prices</td>
<td>Percentage of Latin American loans to total assets has a significant, negative impact on returns in 1982; energy loans had a negative impact in 1982-83. Loans purchased from Penn Square Bank had a negative impact on returns in the month in which that bank failed.</td>
</tr>
<tr>
<td>5</td>
<td>Smirlock and Kauffold (1987), J of Business</td>
<td>Can the Market Evaluate Asset Quality</td>
<td>Europe</td>
<td>evidence for MD in stock prices</td>
<td>Evaluates the effect of the Mexican debt crises on bank value; banks were not required to disclose their Mexican debt at the time of the 1982 moratorium; nevertheless investors were able to discriminate among banks with different levels of exposure.</td>
</tr>
<tr>
<td>6</td>
<td>Randall (1989), New England Economic Review</td>
<td>Exposure to Banks’ Business</td>
<td>US</td>
<td>evidence for MD is weak</td>
<td>Stock prices of the banking holding companies that reported relatively large losses declined relative to market average stock prices only after the problems became public knowledge, not during the periods which the banks began assuming relatively high risk.</td>
</tr>
<tr>
<td>7</td>
<td>Distinguin, Rous, and Tarazi (2006), J of Financial Services Review</td>
<td>MD and the use of stock market data to predict bank financial distress</td>
<td>Europe</td>
<td>evidence for MD in weak stock prices</td>
<td>Variability of stock prices help explain CD rates; Even when banks are solvent, the deposit market does charge riskier banks more; weak evidence for MD in uninsured deposits; coefficients on risk measures used by bank supervisors not significant.</td>
</tr>
<tr>
<td>8</td>
<td>Park and Petrisani (2007), J of Banking and Finance</td>
<td>Are bank shareholders enemies of regulators or a potential source of MD?</td>
<td>Japan</td>
<td>evidence for MD is weak</td>
<td>Stock prices of the banking holding companies that reported relatively large losses declined relative to market average stock prices only after the problems became public knowledge, not during the periods which the banks began assuming relatively high risk.</td>
</tr>
<tr>
<td>9</td>
<td>Flannery and Sorescu (2005), J of Financial Intermediation</td>
<td>Evidence of bank MD in subordinated debt yields</td>
<td>US</td>
<td>evidence for MD in subordinated notes and debentures</td>
<td>The rate premium is estimated as a function of the capital ratio of banks and other variables; the coefficient on the capital ratio is not significant.</td>
</tr>
<tr>
<td>10</td>
<td>Distinguin, Rous, and Tarazi (2006), J of Financial Services Review</td>
<td>MD and the use of stock market data to predict bank financial distress</td>
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<td>11</td>
<td>Goyal (2005), J of Financial Intermediation</td>
<td>Does the MD hypothesis make sense?</td>
<td>US</td>
<td>evidence for MD in subordinated notes and debentures</td>
<td>The rate premium is estimated as a function of the capital ratio of banks and other variables; the coefficient on the capital ratio is not significant.</td>
</tr>
<tr>
<td>12</td>
<td>Pop and Pop (2009), Quarterly Review of Economics and Business</td>
<td>Reforming MD and the specter of TBTF in Commercial Banks</td>
<td>Japan</td>
<td>evidence for MD is weak</td>
<td>The functioning of MD in Japanese banking may no longer be valid in the post-Resona period (bailout); the too-big-to-fail doctrine created a hostile environment for effective MD; incentives to monitor and influence risk taking behavior are comprised.</td>
</tr>
<tr>
<td>13</td>
<td>Avery, Belton, and Goldberg (1997), J of Finance</td>
<td>Market Tests of Capital Adequacy of Large Commercial Banks</td>
<td>US</td>
<td>evidence for MD in subordinated notes and debentures</td>
<td>The rate premium is estimated as a function of the capital ratio of banks and other variables; the coefficient on the capital ratio is not significant.</td>
</tr>
<tr>
<td>14</td>
<td>Beighley (1977), J of Bank Research</td>
<td>Bank Equities and Investor Risk Perceptions: Some Entrainments to Capital Adequacy</td>
<td>US</td>
<td>evidence for MD in subordinated notes and debentures</td>
<td>The rate premium is estimated as a function of several measures of risk including a loss ratio and a leverage ratio; the coefficients on the loss and leverage ratios are positive and significant.</td>
</tr>
<tr>
<td>15</td>
<td>Fraser and McCormack (1978), J of Finance and Quantitative Analysis</td>
<td>Large Bank Failures and Investor Risk: Perceptions: Evidence from the Debts Market</td>
<td>US</td>
<td>evidence for MD in subordinated notes and debentures</td>
<td>The rate premium is estimated as a function of the capital ratio and the variability of profits divided by total assets; none of the independent variable has a significant coefficient.</td>
</tr>
<tr>
<td>16</td>
<td>Avery, Belton, and Goldberg (1988), J of Money, Credit and Banking</td>
<td>MD in regulating bank risk: New evidence from the capital markets</td>
<td>US</td>
<td>evidence for MD in subordinated notes and debentures</td>
<td>SD risk premiums are weakly related to Moody’s and Standard and Poor’s ratings, but uncorrelated with the FDIC Index and any balance-sheet variables. Moreover, the FDIC Index of bank riskiness is found to be negatively related to the bond ratings.</td>
</tr>
<tr>
<td>17</td>
<td>Flannery and Sorescu (2005), J of Finance</td>
<td>Evidence of bank MD in subordinated debenture yields; 1883-1891</td>
<td>US</td>
<td>reduction of safety in subordinated debt yields</td>
<td>SD yields become more closely correlated with indicators of bank risk as regulatory treatment of failed banks’ debentures became more harsh; Investors have rationally reflected changes in the government’s policy toward absorbing private losses in the event of failure.</td>
</tr>
<tr>
<td>18</td>
<td>Morgenstern and Stinch (2001), J of Financial Services Research</td>
<td>MD of banks: The asset test</td>
<td>US</td>
<td>evidence for MD in subordinated notes and debentures</td>
<td>The rate premium is estimated as a function of the capital ratio of banks and other variables; the coefficient on the capital ratio is not significant.</td>
</tr>
<tr>
<td>19</td>
<td>Smirlock and Kaufold (1987), J of Banking and Finance</td>
<td>Equity market information, banking company risk, and MD</td>
<td>US</td>
<td>evidence for MD in subordinated notes and debentures</td>
<td>SD risk premiums are weakly related to Moody’s and Standard and Poor’s ratings, but uncorrelated with the FDIC Index and any balance-sheet variables. Moreover, the FDIC Index of bank riskiness is found to be negatively related to the bond ratings.</td>
</tr>
<tr>
<td>20</td>
<td>Sironi (2002), J of Banking and Finance</td>
<td>Strengthening banks’ MD and leveling the playing field: Are the two compatible</td>
<td>US</td>
<td>evidence for MD in subordinated debt contracts</td>
<td>The rate premium is estimated as a function of the capital ratio of banks and other variables; the coefficient on the capital ratio is not significant.</td>
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<tr>
<td>21</td>
<td>Sironi (2002), J of Banking and Finance</td>
<td>Testing for MD in the European banking industry: Evidence from subordinated debt contracts</td>
<td>Europe</td>
<td>evidence for MD in subordinated notes and debentures</td>
<td>The rate premium is estimated as a function of the capital ratio of banks and other variables; the coefficient on the capital ratio is not significant.</td>
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<tr>
<td>22</td>
<td>Goyal (2005), J of Financial Intermediation</td>
<td>MD of bank risk: Evidence from subordinated debt contracts with restrictive covenants</td>
<td>US</td>
<td>evidence for MD in subordinated notes and debentures</td>
<td>The rate premium is estimated as a function of the capital ratio of banks and other variables; the coefficient on the capital ratio is not significant.</td>
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<td>23</td>
<td>Ashcraft (2008), J of Financial Intermediation</td>
<td>Does the MD hypothesis make sense?</td>
<td>US</td>
<td>evidence for MD in subordinated notes and debentures</td>
<td>The rate premium is estimated as a function of the capital ratio of banks and other variables; the coefficient on the capital ratio is not significant.</td>
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Table 3: Results of literature review for banking (CD: certificate of deposit, J: journal, MD: market discipline, SD: subordinated debt)
<table>
<thead>
<tr>
<th>#</th>
<th>Authors</th>
<th>Title</th>
<th>Country</th>
<th>Main results</th>
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<tr>
<td>25</td>
<td>Crane (1976), J of Bank Research</td>
<td>A Study of Interest Rate Spreads in the 1974 CD Market</td>
<td>US</td>
<td>evidence for MD is weak in uninsured deposits</td>
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<tr>
<td>26</td>
<td>Hannan and Hanweck (1988), J of Money, Credit and Banking</td>
<td>Bank Insolvency Risk and the Market for Large Certificates of Deposit</td>
<td>US</td>
<td>evidence for MD is weak in uninsured deposits</td>
</tr>
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<td>27</td>
<td>Cargill (1989), J of Financial Services Research</td>
<td>CAM EL Ratings and the CD Market</td>
<td>US</td>
<td>evidence for MD is weak in CD rates</td>
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<tr>
<td>28</td>
<td>Ellis and Flannery (1992), J of Monetary Economics</td>
<td>Does the debt market assess large banks’ risk? Time series evidence from money center equations</td>
<td>US</td>
<td>evidence for MD is weak in large time deposits</td>
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<td>29</td>
<td>Park (1995), Quarterly Review of Economics and Finance</td>
<td>MD by depositors: evidence from reduced-form equations</td>
<td>US</td>
<td>safety nets reduce insured deposit are impediments to MD</td>
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<tr>
<td>30</td>
<td>Billett, Garfinkel, and O’Neal (1998), J of Financial Economics</td>
<td>The cost of market versus regulatory discipline in banking</td>
<td>US</td>
<td>evidence for MD is weak in debt and deposit (in thrift institutions)</td>
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<td>31</td>
<td>Park and Peinastian (1998), J of Money, Credit and Banking</td>
<td>MD by Thrift Depositors</td>
<td>US</td>
<td>evidence for MD is weak in partial deposit insurance</td>
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<td>32</td>
<td>Momschean and Opiela (1999), J of Financial Services</td>
<td>Bank time deposit rates and MD in Poland: the impact of state ownership and deposit</td>
<td>Poland</td>
<td>evidence for MD is weak in safety nets do not reduce MD</td>
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<td>33</td>
<td>Martinez Peria and Schmukler (2001), J of Finance</td>
<td>Do depositors punish banks for bad behavior?</td>
<td>cross-country</td>
<td>evidence for MD is weak in MD, deposit insurance, and country safety nets reduce MD</td>
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<td>34</td>
<td>Demirgüç-Kunt and Huizinga (2004), J of Monetary Economics</td>
<td>MD and deposit insurance</td>
<td>cross-country</td>
<td>evidence for MD is weak in safety nets reduce MD</td>
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<td>35</td>
<td>Imas (2009), J of Banking and Finance</td>
<td>MD and deposit insurance reform in Japan</td>
<td>Japan</td>
<td>evidence for MD is weak in part of insurance reform on partly insured time</td>
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<tr>
<td>36</td>
<td>37</td>
<td>Speigel and Yamori (2007), J of Banking and Finance</td>
<td>Japan</td>
<td>evidence for MD is weak in market price accounting and depositor discipline: The case of Japanese regional banks</td>
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<tr>
<td>38</td>
<td>Uchida and Satake (2009), J of International Financial Markets</td>
<td>Deposit insurance, MD and off-balance sheet activities, safety nets</td>
<td>Japan</td>
<td>evidence for MD is weak in outstanding deposits / more</td>
</tr>
<tr>
<td>39</td>
<td>Hassan, Karalis, and Peterson (1994), J of Banking and Finance</td>
<td>Deposit insurance, MD and off-balance sheet banking risk of large US commercial banking</td>
<td>US</td>
<td>evidence for MD is weak in off-balance sheet activities</td>
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<tr>
<td>40</td>
<td>Koppenhaver and Stover (1994), J of Banking and Finance</td>
<td>Standby letters of credit and bank capital: Evidence of MD</td>
<td>US</td>
<td>evidence for MD is weak in off-balance sheet contingent liability</td>
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<tr>
<td>41</td>
<td>Blais and Flannery (2002), European Finance Review</td>
<td>MD in the governance of US bank holding companies: Monitoring vs. Influencing</td>
<td>US</td>
<td>evidence for MD is weak / there focus on influence (market influence is weak) / safety nets reduce MD reduce MD</td>
</tr>
<tr>
<td>42</td>
<td>Eiber and Baumann (2006), J of Financial Intermediation</td>
<td>MD, disclosure and moral hazard in banking</td>
<td>cross-country</td>
<td>evidence for MD is weak in safety nets reduce MD / government safety nets reduce MD / in option grant patterns related to agency-costs</td>
</tr>
<tr>
<td>43</td>
<td>Carow, Herrn, Lie, and Neal (2009), J of Corporate Finance</td>
<td>Option grant backdating investigations and capital MD</td>
<td>US</td>
<td>evidence for MD is weak in option grant patterns related to agency-costs</td>
</tr>
</tbody>
</table>

Table 3: Results of literature review for banking (CD: certificate of deposit, J: journal, MD: market discipline, SD: subordinated debt) (continued)
Regarding the impact of rating changes on equity prices (investor market discipline), the early study by Singh and Power (1992) and the recent studies by Halek and Eckles (2010, 2011) find conflicting results. Singh and Power (1992) find no price reaction to rating changes, whereas Halek and Eckles (2010, 2011) document asymmetric responses (downgrades cut share prices, upgrades have little effect). Halek and Eckles (2010) attribute these differences to the structure of the ratings data, the event study methods, and the timing of the data. Other work on the impact of market signals on equity prices (Fenn and Cole, 1994; Brewer and Jackson, 2002) is more in line with Halek and Eckles (2010, 2011), so that overall it seems that there is evidence for market discipline in insurer stock prices.

The work on price of insurance offers implications rather than direct tests of market discipline. For example, studies from the 1990s (Sommer, 1996; Phillips, Cummins, and Allen, 1998; Cummins and Danzon, 1997) find a negative relationship between price proxies and firm risk in the property-casualty industry. This finding is consistent with market discipline, but as lower prices could also cause greater risk, it is difficult to identify the cause and effect relationship in this case. Also in a property-casualty context and using simple experiments, Wakker, Thaler, and Tversky (1997) show the risk sensitivity of policyholders in that an increase in default risk severely affects policyholder willingness to pay. Similar experimental evidence is found in Albrecht and Maurer (2000), Zimmer, Schade, and Gründl (2009), and Zimmer, Gründl, and Schade (2009). An important result of these studies is that in a transparent setting, market discipline will work, since knowing about differences in default risk severely affects policyholder behavior.

As to consumer influences, Zanjani (2002) uses A.M. Best ratings as a risk measure to study their relationship with life insurer lapse rates and finds some evidence of market discipline, with a positive relationship between risk (i.e., ratings) and lapse. Epermanis and Harrington (2006) consider insurer ratings in a property/casualty context and observe significant premium declines following rating downgrades, particularly for firms that had low ratings even before the downgrade. They also note the concentration of premium declines in commercial lines, which tend not to be protected by guarantee associations. In line with these findings for property-casualty insurance, Baranoff and Sager (2007) find that life insurance demand declines after a rating downgrade. Eling and Schmit (2011) confirm this finding for the German market. They find premium declines as well as increased lapse rates following rating downgrades. All these studies document asymmetric responses to positive and negative news.

Moreover, three studies from the 1990s (Lee, Mayers, and Smith, 1997; Brewer, Mondschean, and Strahan, 1997; Downs and Sommer, 1999) show that the establishment of guarantee funds increases risk taking. The establishment of guarantee funds might hamper risk sensitivity, especially that of policyholders.
### Equity prices

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<tr>
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<th>Authors</th>
<th>Title</th>
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</thead>
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<tr>
<td>1</td>
<td>Singh and Power (1992)</td>
<td>The Effects of Best’s Rating Changes on Insurance Company Stock Prices</td>
<td>US</td>
<td>no evidence for MD in stock prices</td>
</tr>
<tr>
<td>2</td>
<td>Fenn and Cole (1994), J of Financial Economics</td>
<td>Announcements of asset-quality problems and contagion effects in the life insurance industry</td>
<td>US</td>
<td>evidence for MD in stock prices</td>
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<tr>
<td>3</td>
<td>Brewer and Jackson (2002), Fed. Reserve Bank of Chicago</td>
<td>Effects of Financial Distress Announcements: Inter-Industry Contagion and the Competitive Bond Markets</td>
<td>US</td>
<td>evidence for MD in stock prices</td>
</tr>
<tr>
<td>4</td>
<td>Halek and Eckles (2010), J of Risk and Insurance</td>
<td>Effects of Analysts’ Ratings on Insurer Stock Returns: Evidence of Asymmetric Responses</td>
<td>US</td>
<td>evidence for MD in stock prices</td>
</tr>
<tr>
<td>5</td>
<td>Halek and Eckles (2011), Working Paper</td>
<td>Determinants of Abnormal Reactions to Insurer Rating Downgrades</td>
<td>US</td>
<td>evidence for MD in stock prices</td>
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### Price of insurance

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<tr>
<td>6</td>
<td>Sommer (1996), J of Risk and Insurance</td>
<td>The Impact of Firm Risk on Property-Liability Insurance Prices</td>
<td>US</td>
<td>evidence for MD in the price of insurance</td>
</tr>
<tr>
<td>9</td>
<td>Carson, Dorian, and Dumm (2017), Risk Man. and Ins. Review</td>
<td>MD in the Individual Annuity Market</td>
<td>US</td>
<td>evidence for MD in the price of annuities</td>
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### Sum of premiums/number of contracts/lapse

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<th>Title</th>
<th>Country</th>
<th>Main results</th>
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<tbody>
<tr>
<td>10</td>
<td>Zarjani (2002), Federal Reserve Bank of New York</td>
<td>MD and Government Guarantees in Life Insurance</td>
<td>US</td>
<td>evidence for MD in lapse</td>
</tr>
<tr>
<td>11</td>
<td>Epermanis and Harrington (2006), J of Money, Credit and Banking</td>
<td>MD in Property/Casualty Insurance: Evidence from Premium Growth</td>
<td>US</td>
<td>evidence for MD in premium growth</td>
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<tr>
<td>12</td>
<td>Baranoff and Sager (2007), Working Paper</td>
<td>MD in Life Insurance: Insurers’ Reaction to Rating Downgrades in the Context of Enterprise Risk Management</td>
<td>US</td>
<td>evidence for MD in premium growth (number of policies), life insurance</td>
</tr>
<tr>
<td>13</td>
<td>Eling and Schmit (2019), Generali Risk and Insurance Review</td>
<td>Does Surplus Participation Reflect Market Discipline?</td>
<td>Germany</td>
<td>evidence for MD in premium growth/lapse</td>
</tr>
<tr>
<td>14</td>
<td>Eling and Kiesenbauer (2019), J of Financial Services Research</td>
<td>Does Surplus Participation Reflect Market Discipline?</td>
<td>Germany</td>
<td>evidence for MD in premium growth/lapse</td>
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### Other (safety nets, opacityness)

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<th>Title</th>
<th>Country</th>
<th>Main results</th>
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<tbody>
<tr>
<td>15</td>
<td>Lee, Mayer, and Smith (1997), J of Financial Economics</td>
<td>Guaranty funds and risk-taking: Evidence from the insurance industry</td>
<td>US</td>
<td>safety nets reduce impact of guarantee funds</td>
</tr>
<tr>
<td>16</td>
<td>Brewer, Mondschean, and Strahan (1997), J of Risk and Insurance</td>
<td>The Role of Monitoring in Reducing the Moral Hazard Problem Associated with Government Guarantees: Evidence from the Life Insurance Industry</td>
<td>US</td>
<td>safety nets reduce impact of guarantee funds</td>
</tr>
<tr>
<td>17</td>
<td>Downs and So mmer (1999), J of Risk and Insurance</td>
<td>Monitoring, Ownership, and Risk-Taking: The Impact of Guarantee Funds</td>
<td>US</td>
<td>safety nets reduce impact of guarantee funds</td>
</tr>
<tr>
<td>18</td>
<td>Liu, Epermanis, and Cox (2005), Working Paper</td>
<td>Agency Conflicts and MD: Evidence from Guaranteed Investment Contracts</td>
<td>US</td>
<td>evidence for MD in guaranteed investment contracts</td>
</tr>
<tr>
<td>19</td>
<td>Putzier and So mmer (2006), Risk Man. and Ins. Review</td>
<td>Opacityness in the Insurance Industry: Why Are Some Insurers Harder to Evaluate Than Others?</td>
<td>US</td>
<td>some insurers are difficult to evaluate</td>
</tr>
<tr>
<td>20</td>
<td>Lin, Oppenheimer, and Chen (2008), Risk Man. and Ins. Review</td>
<td>Intangible Assets, Going-for-broke and Asset Risk Taking of Property and Liability Insurance</td>
<td>US</td>
<td>evidence for MD regarding asset risk and ratings</td>
</tr>
</tbody>
</table>

Table 4: Results of literature review for insurance (J: journal, GIC: guaranteed investment contracts, MD: market discipline)
Recently, some studies have documented the opaqueness of insurers, which might limit the monitoring element of market discipline. For example, smaller insurers, stock insurers, insurers with greater stock investments, and more diversified insurers are, in general, more difficult to evaluate (see Pottier and Sommer, 2006). The willingness to monitor insurers might particularly depend on the line of business considered. Zhang, Cox, and Van Ness (2009) find evidence that differences among insurers in the opacity of lines of business (life vs. non-life, long vs. short tail) affect adverse selection for investors in the market for insurer equities, which should directly affect market discipline.

3.3. Derivation of trends, consensus, and notable conflicts in the subject areas

Looking at the relevant work published over the last few decades reveals that the definition of market discipline has evolved from simply considering the risk sensitivity of debt prices and spreads to accounting for the effects of this risk sensitivity on managerial decisions (see Covitz, Hancock, and Kwast, 2004). Market discipline is thus not an easy-to-measure one-dimensional construct, but is, instead, multifaced. These different facets are reflected in how market discipline is defined in the insurance context (see Section 2.1). Both in banking and insurance almost all studies focus on the monitoring component of market discipline, which is easier to measure than its influencing component (see Bliss and Flannery, 2002).

Overall, it appears that market discipline is reasonably strong in most insurance markets, but that there is some variation when it comes to legal form (Liu, Epermanis, and Cox, 2005), lines of business (Epermanis and Harrington, 2006), and countries (Eling and Schmit, 2011). All these results are confirmed on a broader empirical basis in the banking sector (see, e.g., Morgan and Stiroh, 2001; Sironi, 2003; Pop, 2006).

Moreover, and again for both banking and insurance, there appears to be a consensus that informational limitations and the regulatory environment play a major role in the level of market discipline, especially with regard to incentive conflicts between principals (stockholders, debtholders) and agents (managers). Agency problems are far stronger in those cases where market discipline is undermined by informational limitations. For example, agency effects are more common among mutual insurers, which generally have lower informational requirements than stock insurers. This result might be interpreted to mean that market discipline is an appropriate approach in some contexts, but that regulatory efforts will work better in others. In particular, regulatory efforts are likely more appropriate where informational limitations exist, while market discipline might be more effective when much information is available (see Eling and Schmit, 2011).

Another aspect is the asymmetry in findings regarding positive and negative news. The downside risk of sending a bad market signal is typically greater than the upside potential of a good market signal. Examples in the insurance sector are papers by Epermanis and Harrington
(2006), Baranoff and Sager (2007), and Halek and Eckles (2010). These results are consistent with those found in the finance literature on the effects of negative and positive news (see, e.g., Chan, 2003; Hong, Lim, and Stein, 2000).

There is thus a great deal of similarity between banking and insurance when it comes to findings from market discipline research. However, there are also notable differences between the two fields, especially regarding the relevance of debt instruments, which can be traced back to differences in the business models of these two financial institutions. For example, Zhang, Cox, and Van Ness (2009) discuss differences in opaqueness between banking and insurance that might affect market discipline. They argue that some sources of information opaqueness for banks and insurers are common, but that others are unique to insurers. In banking the liabilities are typically well-defined with respect to duration and amounts. In insurance there is greater asymmetric information because of the less certain duration of claim payments and the difficulty to predict loss amounts. Babbel and Merrill (2005) note in this context that the opaqueness and complexity of insurance contracts allow managers to create illusory values. Colquitt, Hoyt, and McCullough (2006) show that property-liability insurers are able to use greater discretion in setting loss reserves. Polonchek and Miller (1996) find greater information asymmetries with respect to the assets and liabilities of insurers compared to banks. Also Morgan (2002) provides evidence that insurers can be more opaque than banks, in his case considering disagreements among rating agencies.

Harrington (2005) directly compares market discipline in banking and insurance. He argues that market discipline is greater in insurance than in banking and concludes that capital requirements should be less stringent for insurers. Based on an analysis of risk sensitivity, buyer sophistication, search costs, and franchise value, he argues that overall market discipline is highest in reinsurance, moderate in life and non-life, and low in banking (see Table 1 in Harrington, 2005).

3.4. Derivation of facilitators and impediments to market discipline in insurance

The discussion has shown that market discipline is strongly affected by outside factors that can either facilitate or impede it. Recent government rescue efforts and direct intervention in the insurance and, especially, banking markets has created a great deal of distortion that has affected market discipline to a significant degree. These interventions give rise to some complicated, but highly interesting, questions involving moral hazard, the role of guarantee funds, the structure of rescue operations, the obligations of the firm being rescued, and the impact intervention has on competition. The most important impediments to market discipline in insurance are the following.

1. Work on banking finds that guarantee associations are an impediment to market discipline (see, e.g., Demirgüç-Kunt and Huizinga, 2004). Without guarantee schemes, bank manag-
ers have strong incentives to avoid risky loans and risky investments; however, mandated deposit insurance eliminates much of the risk involved in these activities. There are also several insurance studies that observe increased risk taking following the establishment of guarantee associations (see Lee, Mayers, and Smith, 1997; Downs and Sommer, 1999). One study also finds that risk levels increase when the amount of insurance sold increases in jurisdictions where guarantee associations exist (Brewer, Mondschean, and Strahan, 1997). These findings are in line with the expectation that the establishment of guarantee funds reduces monitoring incentives and thus negatively affects market discipline. There could thus be differences in market discipline between different lines of business or different regions, depending on the insurance guarantee fund design in place.

2. In addition to these direct market distortions, there might also be indirect or implicit market distortions. An example is bailout schemes, such as the “too-big-to-fail” concept, where governments feel obliged to rescue a troubled bank or insurer because they fear financial contagion.

3. The financial crisis revealed specific impediments to market discipline, e.g., the complexity of financial products. Financial institutions are often highly complex both in their ownership structure and in the nature of their business. For example, many insurers have dozens of reinsurance arrangements primarily intended to diversify risk, but these also reduce transparency and can sometimes mask financial problems (see Harrington, 2004).

4. Harrington (2004) mentions the judgment-proof problem as an impediment to market discipline. Under a compulsory insurance regime (e.g., auto liability, workers’ compensation, or professional liability), individuals with few assets to insure might simply buy the cheapest insurance they can find, with no regard to insolvency risk. The combination of compulsory insurance and judgment-proof buyers reduces the risk sensitivity of demand.

There are thus a number of reasons to expect differences in market discipline depending on the line of business. (1) The judgment-proof problem that arises in the case of compulsory insurance impedes market discipline. (2) Government or privately organized fund guarantees of all insurance claims and benefits destroy all incentives for market discipline. Reducing coverage, however, could be quite conducive to market discipline. (3) Differences in lines of business due to products and business complexity affect the degree of market discipline. Standardized products make it easier to identify differences between insurers, but this is more difficult when it comes to complex products and businesses. (4) An increase in financial leverage increases company risk. Life insurers typically have a much higher leverage than non-life insurers and this might affect the risk sensitivity of investors. (5) Market discipline could be stronger in commercial lines compared to personal lines. Policyholders in personal lines have less resources and competence (e.g., in terms of education to read financial reports) to
engage in efficient monitoring than do policyholders in commercial lines, which are usually larger and have more resources. On the other hand, personal line insurance decisions directly affect an individual’s own wealth, whereas commercial insurance decisions do not usually have much of a personal impact on the decision maker. This situation can create moral hazard problems, which lowers the efficiency of monitoring in commercial lines. Nonetheless, evidence indicates that market discipline in commercial lines is stronger than in personal lines (Epermanis and Harrington, 2006).

In this context, we would also expect more market discipline in reinsurance than in insurance because reinsurance covers only commercial business, while insurance covers both commercial and personal lines. An implication for policymakers is that when comparing personal and commercial insurance, it appears that market discipline is weak in some areas and strong in others.

This last point is also true when it comes to legal form. Insurers listed on the stock market are subject to more extensive reporting requirements than are mutual insurers. Liu, Epermanis, and Cox (2005) document that agency effects are more common among mutual insurers, which generally have lower informational requirements than do stock insurers. These results can be interpreted to mean that relying on market discipline is appropriate in some areas, but that formal regulation will work better in others. In particular, formal regulation is likely to be the more effective course in the presence of informational deficits (i.e., with mutuals). Market discipline will be more effective when information is generally available (i.e., with stocks).

When it comes to facilitating market discipline, the availability and quality of information is crucial. In this context, an important result from the experimental literature (Wakker, Thaler, and Tversky, 1997; Zimmer, Gründl, and Schade, 2009) is that if all necessary information is available, customers will discipline insurance companies by changing their demand. However, more information is not necessarily better information. In a theoretical world, Holmström (1979) shows that in moral hazard problems more information about the agent is never detrimental to the principal and, under mild assumptions, is always actually beneficial. In the “real” world, however, things can be quite different, especially when the cost of information is taken into consideration. Furthermore, more information can be useful only if it is consistently accessible and provided in a standardized form so that market participants can understand it and make appropriate comparisons between insurers. Standardization, consistency, and accessibility are thus important requirements for effective market discipline.

In conclusion, an effective market discipline framework needs to encompass the following. Stakeholders need to consider themselves at risk and they need to be able to observe risk efficiently, i.e., at reasonable costs. Reasons why risk sensitivity might be limited include guarantee schemes, anticipation of “too-big-to-fail” effects, compulsory insurance and judgment-
proof buyers, and product and business complexity. Even if stakeholders consider themselves at risk, monitoring will be hampered when the necessary information is too difficult and/or too costly to obtain. Furthermore, adverse selection could occur if some stakeholders have more information than others. Only if stakeholders consider themselves at risk and are able to observe risk efficiently will market discipline work. Market discipline will then manifest in either a reduction in willingness to pay (price effect) or in a reduction in demand for insurance from a particular provider (quantity effect). This might result in an influencing effect that can manifest directly, by managers shifting their risk exposure, or indirectly, by regulators acting on the signal.

4 Conclusions and future research

Market discipline focuses on the risk sensitivity of customer demand for insurance products and on investor willingness to pay for equity and debt. Evidence from the banking sector shows that market discipline can work very efficiently. However, the banking sector is different from the insurance sector in some aspects, so not all findings from banking may be generalizable to the insurance industry.

There are not enough insurance sector market discipline studies to conduct an in-depth impact assessment, but those that do exist indicate that market discipline appears to vary in terms of strength between the German insurance market (Eling and Schmit, 2011) and the U.S. market (Epermanis and Harrington, 2006). Furthermore, there are important drivers of (standardization and accessibility) and impediments to (market distortions such as guarantee funds) market discipline that regulators should keep in mind when attempting to enhance it. If market participants are not aware of risk and/or are unable to evaluate risk at a reasonable cost, there will be no market discipline.

There are many avenues future research can take. There is a great need for empirical tests of the risk sensitivity of policyholder demand, especially for countries other than the United States. Regarding potential investor-driven market discipline, it might be interesting to analyze spreads of credit default swaps, data that are available, at least for large insurers and reinsurers. For large insurers and reinsurers listed on stock markets, analyzing stock prices might be useful. It also would be interesting to see how risk sensitivity varies across countries, by comparing data from different regions and countries, and across different legal forms, by comparing mutual and stock insurer data. Such empirical tests could then be compared with results from other insurance and banking studies.

Another interesting task would be to measure the influence of market discipline in insurance with the methodology employed by Bliss and Flannery (2002). We also need more theoretical studies on market discipline in insurance, e.g., models that analyze the implications of market discipline on competition or models on the role of franchise value in insurance and how this is
affected by risk. These theoretical models could then be tested with empirical data to increase our knowledge of market discipline in the insurance industry.
References


