

Insurance Solvency Regulation in the Shadows: Evidence and Effects of Informal Regulatory Intervention

Abstract

In this proposal, we discuss how we intend to extend previous research on the incidence and effects of regulatory interventions with troubled or insolvent property-casualty insurance companies. This research has focused solely on *formal, public* regulatory interventions (FPRI). Generally, prior studies have found that greater regulatory forbearance (i.e., more time between the first intervention and the liquidation of a company) tends to increase the cost of insurance insolvencies as measured by guaranty association (GA) assessments. What has not been examined is the incidence and effects of *informal, nonpublic* regulatory interventions (INPRI). Our initial analysis suggests that such interventions are common; in some cases, they precede formal actions and in other cases no formal action occurs. Among the questions we wish to explore is whether INPRI is more often associated with better outcomes (e.g., companies not being liquidated, lower GA costs) than worse outcomes. In other words, does such intervention mean that regulators are acting more proactively, or does it mean that they are either putting off the inevitable or letting companies dig themselves deeper into a whole. The answers to these questions may be that "it depends" on the specific circumstances of a given company as well as the nature of the INPRI. Regardless, we contend that the measurement of regulatory forbearance ideally should consider both categories of interventions as well as their timing. We develop a measure of INPRI based on insurer financial statements. Using this measure, we find evidence that INPRI are associated with a higher probability of eventual FPRI. However, we also find preliminary evidence that when a firm's RBC ratio is not below its Company Action Level (CAL) risk-based capital (RBC) requirement, INPRI can reduce the probability of entering FPRI. Our initial results suggest that U.S. insurance regulators exercise broader authority and discretion with respect to troubled insurers than what has been recognized in the extant academic literature.

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1. Introduction

State insurance regulation in the U.S. (and other countries) serves two primary purposes: 1) limiting the financial risk of insurance companies (solvency), and 2) mitigating the adverse effects of asymmetrical information between insurance buyers and companies in the sale and servicing of insurance products (market conduct). Our main focus here is on the former and, more specifically, the solvency regulation of property-casualty insurance companies.

Solvency regulation in the U.S. encompasses a number of regulations and activities pertaining to capital adequacy, investments, reinsurance, transactions with affiliates, financial monitoring and analysis, examinations, intervention against high-risk or companies in financial distress, and insolvency guarantees, among others (Klein, 1995; 2014). While all aspects of solvency regulation are important, we are particularly interested in how state regulators deal with insurers that are (or should be considered) at high risk of defaulting on their obligations to their policyholders and/or are in financial distress. Further, there are questions as to how different regulatory strategies and tactics in dealing with high-risk and distressed companies affects the ultimate outcomes for these companies (e.g., whether they are rehabilitated or become insolvent, the costs of the insolvencies that do occur, etc.).

These strategies and tactics encompass what we label as "regulatory forbearance" (RF). Here we use a broader notion of what is encompassed by RF than how this term is commonly understood in the literature on the regulation of banks, insurance companies, and other financial institutions. As this term is more commonly used, RF refers to regulators allowing a financial institution to continue to operate rather than shutting it down. For us, RF pertains to how quickly (or not) regulators begin addressing the

problems of high-risk and distressed insurance companies, the specific actions that they take (or force companies to take), and how the receiverships of companies are managed. Generally, we interpret greater RF as either regulators taking more time in implementing their interventions and/or employing interventions that are less severe or restrictive.¹

A key question here is whether greater or lesser RF increases or decreases the costs of insolvencies and results in more positive outcomes (e.g., rehabilitation with a return to the market) or less positive outcomes (e.g., liquidation), all other things equal. The answer to this question may depend upon the specific circumstances surrounding a company and its situation at different points in time. In other words, in some cases, greater RF (e.g., slower or less aggressive regulatory action) may result in lower costs and more positive outcomes and the opposite in other cases. In the main body of this proposal, we offer hypotheticals to illustrate how greater RF could produce a better outcome under one scenario and a worse outcome under a different scenario.

Previous studies (see, for example, Grace et al., 2002) examine how RF has affected the cost of insurer insolvencies. Grace et al. (2002) find that greater forbearance in the liquidation of single-state insurers imposes higher costs on state GAs, consistent with possible rent seeking by these single-state insurers, and subsequent leniency shown by home-state regulators. They further surmise that earlier intervention into the affairs of a troubled insurer, all other things equal, seems to generate better information regarding regulatory closure, which reduces the ultimate costs to guaranty associations. We note that Grace et al. (2002) measure RF using the First Event Year (FEY) for an insolvent

¹ For example, what could be viewed as fairly restrictive actions against a distressed insurer would be regulatory actions that force a company to exit certain lines of business or sell certain assets. Less restrictive actions could be allowing an insurer to continue to write its lines of business but perhaps requiring the company to raise its rates and/or tighten its underwriting.

company (which they define as the first year of formal regulatory action against a troubled company; these actions can include formal orders of conservation, rehabilitation, or liquidation).

However, there are a much broader set of actions that regulators can take that fall into the categories of formal, public regulatory interventions (FPRI) and informal, non-public regulatory interventions (INPRI). Actions in the latter category include, but are not limited to, conferences, nonpublic hearings, corrective plans, and restrictions on a company's activities. The informal process can start with regulators meeting with the management of a company to get answers to questions that the regulators have and to determine if the management is competent and has a good understanding of their company's condition. Regulators could come away from such a meeting with the conclusion that a company is not in financial trouble or that any difficulty it is having is being adequately addressed by its management. Alternatively, such a meeting can lead regulators to conclude that more aggressive action is required on their part. Indeed, these informal actions can progress from those that are relatively benign to those that constitute considerable regulatory control over a company's activities. Regulators also may call a targeted financial exam of a company to gain a better understanding of its financial conditions and any problems it may have.

Formal intervention can occur if informal intervention proves to be unsuccessful or if a company's financial condition is so perilous or deteriorating so rapidly that informal intervention is off the table. Formal interventions can also progress from conservation to rehabilitation to liquidation and dissolution. Regulators may also skip the earlier steps in this process if they determine it is already too late for such steps to be

successful. Additionally, either during the informal intervention phase or the formal intervention phase, regulators can arrange for the sale or merger of a distressed company.² We note here that regulators may often prefer informal intervention when possible to avoid signaling to the market that a company is in trouble and is under some form of supervision. Once a company's problems become public (or even if there is a perception that it is in trouble) this can create self-fulfilling prophecy in that the company's policyholders may desert it and its ability to write new business is effectively quashed.

Both informal and formal intervention can be triggered by a number of things. Essentially, if regulators observe anything in an insurer's financial and other reports as well as other sources of information that give them reason for concern, they can initiate some form of investigation that can progress if needed. The National Association of Insurance Commissioners (NAIC) provides a number of tools for regulators for this purpose known as the Financial Analysis Solvency Tools (FAST) that encompasses the Insurance Regulatory Information System (IRIS), the Scoring System, the Insurer Profiles System, and other reports. Hence, an insurer need not fall below one or more of its Risk Based Capital (RBC) levels for regulators to act.

The important point we are seeking to make here is that in understanding the full scope and progression of regulatory intervention it is desirable to consider both informal and formal regulatory actions. We say this with noting that it is very difficult for outsiders (e.g., academics) to determine if regulators have employed informal

² Additionally, a company may offer to voluntarily sell itself or dissolve.

intervention against a company.³ Our task then becomes finding ways to identify and measure informal regulatory actions as well as their nature and timing. Success in this regard then lays the foundation for analyzing the effects of both informal and formal intervention on the outcomes for distressed companies and the costs of their insolvency.

We seek to extend the extant literature on regulatory strategies and tactics with respect to high-risk and troubled insurers in several ways. First, and perhaps most importantly, we are employing broader measures of regulatory action (or the lack of it) than have been employed previously as described above and further discussed below. Second, our measures of the timing of regulatory actions are more granular in that we use the specific dates (not just the years) of such actions. Third, the timeframe for our analysis is 1994-2016 and, hence, reflects more current data on regulatory solvency actions, industry conditions, and regulatory outcomes.⁴

We note that state solvency regulation has continued to evolve since the time period used by previous studies as state regulators and the NAIC are adopting and employing new and stronger measures in their supervision of insurance companies (e.g., the NAIC's Solvency Modernization Initiative (SMI)) that we discuss below.⁵ Hence, regulators, in more recent years, may have refined and improved their strategies and tactics in dealing with distressed companies. If this is the case, we should see the effects of such improvements and refinements in the more recent data.

³ We do know such informal intervention occurs based on our discussions with financial regulators. Additionally, when two of the authors were on the staff of the NAIC, there was a confidential survey of state regulators (conducted in 1994) with respect to both their informal and formal actions against specific companies. This survey revealed that informal action is common and, in some instances, does not progress to formal action. Recent discussions with regulators indicate that this is still the case.

⁴ The events and conditions reflected in our data include major catastrophes (e.g., Hurricane Katrina and other hurricanes that occurred during 2004-2005, Superstorm Sandy) and the fallout from the 2008 financial crisis.

⁵ Klein (2013) and Brown and Klein (2015) discuss the SMI and other measures that have been employed to strengthen state solvency regulation.

Our proposal proceeds as follows. In the next section, we provide some further background and discuss the literature relevant to our analysis. This is followed, in Section 3, by a description of our data and a discussion of our empirical methodology. We provide some examples of INPRIs in Section 4 and provide preliminary results in Section 5. We briefly conclude in Section 6 where we also discuss how we intend to take our analysis going forward.

2. Background and Literature

Framework for Insurance Solvency Regulation

It is helpful here to briefly describe the framework for insurance solvency regulation in the U.S. and some of its recent enhancements. The economic rationale for regulating insurer solvency arises from market failures created by costly information and agency problems (Munch and Smallwood, 1981). It is costly for consumers to properly assess an insurer's financial strength in relation to its prices and quality of service. Principal-agent conflicts also exist in that insurers can increase their risk after policyholders have purchased a policy and paid premiums and it would be difficult (if not impossible) for them to prevent or rectify such a problem. Some believe that moral hazard is exacerbated by insolvency guarantees that further reduce buyers' incentives to consider the financial strength of insurers when making purchase decisions (see, for example, Cummins, 1988; Lee et al., 1997; Bohn and Hall, 1999; and Hall, 2000).

In theory, solvency regulation should limit the degree of insolvency risk and the magnitude of insolvency costs in accordance with societal preferences. However, there are also costs associated with more stringent solvency regulation. Regulation affects the range of possible values of the risk-return tradeoff involved with insurance transactions

among which buyers might choose. Greater flexibility with respect to solvency requirements allows insurers to offer a wider range of possible product/price options and allows consumers to incur greater risk in return for receiving lower prices and/or greater benefits. Tighter solvency standards will tend to reduce the supply of insurance and increase its price. Hence, in theory, regulators should seek to enforce an optimal balance between insolvency costs and regulatory costs. However, in practice and as suggested by the literature on regulatory behavior, regulators may employ policies that tip this balance towards higher insolvency costs because they gain politically from such a policy at the expense of the ultimate bearers of insolvency costs.

In the U.S., each state has power to regulate insurers operating within its borders. This includes company and agent licensing, insurer solvency, contract terms and rates, market practices, and the disposition of impaired and insolvent insurers. In the area of solvency regulation and insolvency administration, an insurer's domiciliary state plays the primary role but other states in which the insurer operates can also exercise some authority. The NAIC encourages uniformity and coordination among the states, but ultimately each state has the discretion to determine its regulatory policies and actions. Hence, solvency and insolvency policies may vary to some degree among the states.

In recent years, state regulators and the NAIC have instituted a number of enhancements to solvency regulation. The process that led to these enhancements began before the financial crisis, but were further propelled and influenced by it. There have been two primary initiatives: 1) the Risk Focused Surveillance Framework (RFSR), and 2) the Solvency Modernization Initiative (SMI). It would be reasonable to expect that

these enhancements have improved the quality and efficiency of solvency regulation but whether this actually has been the case is a matter for exploration.

The RFSF encompasses several elements including risk-focused financial examinations (fully implemented in 2010), off-site risk-focused financial analysis, the review of internal/external changes regarding companies, the creation of a priority system for identifying insurers warranting further review, and the creation of a supervisory plan for companies determined to need one (Vaughn, 2009). The main theme of this initiative is to have regulators focus more on an insurer's financial risk and less on simply verifying the accuracy of its financial reports.

The SMI also encompasses several elements. These elements are: capital requirements, corporate governance and risk management, group supervision, statutory accounting and financial reporting, and reinsurance. It is probably fair to say that areas where real changes have occurred are regulatory requirements concerning insurers' risk management, group supervision, and reinsurance. With respect to risk management, an important development has been the requirement that insurers file an Own Solvency Risk Assessment (ORSA) annually; this has only been recently implemented and, hence, its effects will not be reflected in our analysis.⁶ Regarding group supervision, state insurance regulators have substantially enhanced their review of the transactions among affiliated insurers and their communications with all of the regulators of the entities within a holding company that included insurance companies. In the area of reinsurance, the changes that have been made have more to do with making regulatory accounting for reinsurance transactions more efficient and not necessarily more stringent.

⁶ The NAIC adopted its ORSA model in January 2015. Given the time that it takes for each state to adopt this model act, we would not expect this requirement to become effective until 2016 at the earliest.

We should also note that the NAIC, beginning in 2002, embarked on a mission to reform the system for insurance company receiverships. This initiative responds to concerns that many receiverships were mismanaged (e.g., the Mission Group). It includes providing better guidance to receivers and facilitating greater transparency in the management of receiverships. One outcome of this initiative has been the creation of the NAIC's GRID database. If this initiative has substantially improved the management of receiverships, we should be able to see this in our analysis when we compare the costs of pre-2002 receiverships to post-2002 receiverships.⁷

In theory, as stated above, the regulatory goal should be to minimize the social costs of insolvency. This is accomplished in two ways: 1) actions to prevent a troubled insurer from becoming insolvent; and 2) actions against an insurer for the purpose of conserving, rehabilitating, reorganizing, or liquidating the insurer. Actions within the first category include hearings/conferences, corrective plans, restrictions on activities, notices of impairment, cease and desist orders, and supervision. As discussed above, some of these actions may be conducted informally; others require formal measures.

If preventive regulatory actions are too late (or unsuccessful) and an insurer becomes severely impaired, then formal proceedings will commence. 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 its policyholders and claimants, as well as to reduce insolvency costs. However, the most common scenario ends in the liquidation of a seized insurer whether liquidation was inevitable or caused by the way that its receivership was managed. Regulators also may

⁷ Since developing these reforms was a long, tortuous process, we may not see their effect (if there is any) until sometime after 2002.

seek to find a buyer for a distressed company; this would constitute a different kind of liquidation than simply shutting a company down and selling its assets.

It is helpful here to delve more deeply into how regulators "should" deal with high-risk and distressed insurers. This process begins with identifying companies that are high-risk or distressed. This is accomplished with the analysis of insurers' financial reports, early-warning systems (e.g., the NAIC's Financial Analysis Solvency Tools (FAST)), Risk-Based Capital (RBC) results, financial examinations, and other devices.⁸ In this process, insurers that set off red flags *should* be subject to further regulatory scrutiny. The RBC system requires insurers to automatically submit remediation plans when their capital levels fall below certain trigger points, and in more severe instances, provides the regulator with the authority to institute the necessary steps to place the firm under regulatory control. Even at the less stringent trigger points, there should be some form of contact between regulator and the firm and that would include meetings with their managers. The result of such scrutiny and meetings could be a determination that "everything is fine" or a determination that a company is having problems and/or is being mismanaged. In the latter case, regulators would be expected to work with a company to ensure that any problems it may be having are being properly addressed. This can be done informally and without any official or public regulatory action other than oversight.

It is likely that there are many quiet "regulatory successes" with these companies given the number of firms that trigger one or more of the RBC action levels and then subsequently return to the "no action" level. In other words, problems are fixed and

⁸ In addition to FAST, the NAIC also has its own financial analysis division that reviews "nationally significant" insurance companies. Together with the NAIC's Financial Analysis Working Group, this division identifies insurers warranting further scrutiny. This effectively constitutes a peer review process for the domiciliary regulators of distressed companies that can motivate these regulators to be more proactive than they might be otherwise (Klein, 2014).

companies that were high-risk or distressed are returned to the fold of the sound and the stable. Regulators often negotiate sales or mergers of troubled insurers in order to avoid market disruptions. Regulators indicate that a large number of troubled insurers subject to regulatory action are never publicly identified because their problems are resolved before more drastic action is required (Klein, 2014).

However, for those companies that are not so fortunate, regulatory actions would be expected to escalate. There can be orders of conservation that are formal (legally binding), but not public. If non-public conservation is unsuccessful, then the process will further escalate to formal and public regulatory actions such as conservation, seizure of assets, rehabilitation, liquidation, and dissolution. A regulator may ultimately be forced to liquidate and dissolve a company if rehabilitation does not prove to be feasible. Regulators typically need court approval for such actions, which may be challenged by the troubled insurer.⁹ In the course of receivership, regulators may seek to use conservation and rehabilitation in order to prevent a company from becoming insolvent and return it to the market or at least make it possible to sell the company. Regulators may also place a company into "run-off" as a means to discharge its obligations without a formal order of liquidation.¹⁰ However, as discussed further below, RF in the management of some receiverships may actually increase the costs of the insolvency of a company if it ultimately has to be liquidated and dissolved.

The interaction between receiverships and the state GAs also warrants some elaboration. GAs have been established in each state to cover an insolvent insurer's

⁹ For example, the liquidations of Security Casualty Company (*Washburn v. Dyson*, 127 Ill. 2d 434) and Main Insurance Company (*Schacht v. Main Insurance Company*, 122 Ill. App. 3d 826) in Illinois were contested by the owners of these companies.

¹⁰ In a run-off, the existing claims of an insurer are adjusted and paid but no new business is written.

financial obligations, within statutory limits, to the insurer's policyholders and claimants in the state. Most states limit coverage of property-liability claims to \$300,000, although there is some variation among state provisions.¹¹ GAs cover many property-liability lines (but not all) and typically assume the job of adjusting and paying claims for insolvent insurers. Each GA, in turn, must assess its members (i.e., licensed insurers in its state) for the net cost (after any recoveries) of covering an insolvent insurer's obligation in the state. Regulators work closely with the GAs in their respective states in arranging for the payments of covered claims for insolvent insurers that will be liquidated and dissolved.

Given that the primary focus of our analysis is RF and how this is reflected in informal and formal regulatory interventions, it is helpful here to elaborate on what we are evaluating. One can posit two different regulatory strategies that represent the opposite ends of a spectrum of possible strategies and tactics. Consider a strategy in which regulators are very aggressive and quick to act against high-risk insurers in some form of financial distress. In this scenario, regulators would be very proactive in dealing with insurance companies that they are concerned about. To be more specific, insurers that are coming close to falling below the Company Action Level (CAL) of their RBC requirement or that would set off other regulatory flags should be subject to at least some form of informal regulatory action. This could include consultations with the company regarding its financial condition and what it may be doing to remedy any problems that it may be having.

Generally, such informal regulatory actions would not be expected to make a bad situation worse, but could motivate a company to fix things that need to be fixed. The game changes, however, when regulators institute formal and public regulatory actions

¹¹ There is typically no limit on the coverage of workers compensation claims.

such as an order of conservation. When this happens, insurance buyers and their intermediaries are alerted to the fact that a company is having difficulty (or at least they may believe this is the case) and, consequently, may begin terminating their business with the company. Additionally, the ability of the company to write new business would be highly constrained. These developments could ensure and hasten a company's demise, rightly or wrongly. Alternatively, more timely and aggressive regulatory action could increase the likelihood that a distressed insurer is rehabilitated or lower the cost of its insolvency if it is ultimately liquidated.

Now consider a very lenient strategy by regulators. In this scenario, regulators either act late or defer informal or formal regulatory action even if a company falls below one or more of its RBC action levels. One possible outcome of such a lenient strategy is that a distressed insurer is able to right the ship (with or without the help of regulators) and avoid insolvency. In other words, by not constraining a company too much, it is able to work through its problems remain viable. Alternatively, such regulatory leniency could make it more likely that a troubled company will become insolvent and hasten its demise as well as increase the cost of its insolvency.

In essence, regulators are forced to balance the estimated costs/benefits of more aggressive versus less aggressive action at different points in time. In some (perhaps many) cases, the right decision is clear cut but we suspect that there will be cases where the "right" decision, given the information available, is not obvious. We can theorize that, in an almost perfect world, regulators would optimally balance these tradeoffs in determining the time and nature of their actions. Of course, we do not live in such a world so the primary thrust of our analysis is to: 1) identify and measure both informal

and formal regulatory actions against high-risk and distressed insurers; and 2) evaluate how the timing and nature of these actions affects the ultimate outcomes for the companies subject to these actions. While we will not be in a position to second guess regulators' actions (or lack of them) in any given case, we hope to be able to determine when greater RF tends to lower costs and when it does the opposite.

Related Literature

The studies that have examined RF in insurance, implicitly or explicitly, have primarily focused on what appears to be the high cost of insurance insolvencies relative to costs of the insolvencies of other financial institutions(e.g., banks).¹² While there are several valid reasons for why insurance insolvencies are costly that having nothing to do with regulation, there is the concern that regulators fail to act quickly enough in dealing with troubled insurers and/or that insurer receiverships are unnecessarily prolonged and mismanaged.¹³

Grace et al. (2002) conduct a comprehensive analysis of the regulation and cost property-liability insurer insolvencies over the period 1986-1999. They examine three potential sources of insolvency costs: 1) the financial condition of an insurer prior to

¹² Hall (2000) estimates that cost of property-liability insurer insolvencies over the time period 1986-1994 was \$1.22 for each \$1 of assets an insurer possessed prior to its bankruptcy. Grace et al. (2002) estimate that the cost of property-liability insurer insolvencies over the time period 1986-1999 was \$1.10 per \$1 of pre-insolvency assets. In both studies, the cost of an insurer insolvency was measured as the net assessments it generated for state guaranty associations (GAs); net assessments reflect the total claims payouts by state GAs minus any recoveries of assets from the estate of the insolvent insurer. Hence, using the net GA assessments is a conservative measure of an insolvency's cost as they do not reflect claims not paid by GAs nor losses borne by other creditors. Even with these conservative estimates, the estimated costs of insurer insolvencies are considerably higher than that for banks which ranged between \$0.20 to \$0.30 per \$1 of pre-insolvency assets during the 1980s and 1990s (James, 1991; Kaufmann, 2001).

¹³ Arguably, the claims obligations of property-liability insurance companies can be complex. Additionally, some of the assets of insolvent insurers can be difficult to sell in a short period of time without taking a substantial haircut. These factors can prolong the supervision of troubled insurers and the management of insurer receiverships even when regulators are doing their jobs properly.

insolvency and the moral hazard incentives of its managers, 2) regulatory forbearance, and 3) regulatory management of insurer receiverships. They find strong evidence that factors associated with all three areas significantly affect insurer insolvency costs. More specifically, they find that greater RF (as measured by the number of years between the first formal regulatory action against an insurer and the year it is liquidated) increases insolvency costs, all other things equal. Further, they find that certain factors related to the management of insurer receiverships (e.g., the insurance commissioner is elected in a state, a state budget deficit, etc.) tend to increase their costs. They acknowledge the limitations to their ability to measure the effects of state-specific and insolvency-specific factors. In a more recent study, Leverty and Grace (2017) find evidence that regulators delay interventions before elections and that this delay increases the ultimate costs of insurer failures.

Lai et al. (2015) examine the effects of RF for property-casualty companies in the U.S. for the period 1994-2002 using companies' RBC results as an indicator of their financial condition. They find that companies' RBC ratios are inversely correlated with the costs they impose on state GAs, but these ratios are not correlated with the likelihood that an insurer will become impaired. They also find that greater forbearance, as indicated by the amount of time between the year of the first formal regulatory action and the year when an insurer is deemed insolvent, is associated with higher GA costs. From their results, they draw the implication that RBC restricts regulators' ability to act more proactively against insurers in poor financial condition. They conclude that regulators should be given more flexible intervention rules.

Lai et al. (2015) imply that U.S. regulators are restricted in their ability to act against distressed companies with RBC ratios above 200 percent - this is the Company Action Level (CAL). It is not clear to us that this is truly the case, but it is something that warrants evaluation. U.S. regulators, however, contend that RBC does not constrain their authority and ability to instigate corrective action against troubled companies with RBC ratios above their CAL (Vaughn, 2009). It may be the case that some regulators lean on RBC too much (i.e., they choose to wait till a company trips its CAL or worse before they take any action). The data show that regulators do institute formal regulatory actions against companies that exceed their CAL but such actions are more likely when a company triggers one or more of the RBC thresholds. Our analysis also reveals that many companies that exceed their CAL RBC are subject to informal regulatory action.¹⁴This indicates that there is much "grist for the mill" in terms of further research with respect to regulators' ability and inclination to intervene against insurers in trouble in a proactive manner.¹⁵

Our review of the extant literature highlights the importance of accounting for both informal and formal regulatory intervention in measuring RF as well as its effects. The assertion of Lai et al. (2015) regarding RBC is correct at least in the sense that it gives regulators stronger standing to take action against a company, especially formal action. However, we also know that it is wrong to presume that regulators are doing

¹⁴ The average value of our *Intervention Index* variable (which we explain below and is intended to capture non-public regulatory interventions) is 0.9660 for firms with RBC ratios greater than two and 1.4308 for firms with RBC ratios less than two. While this indicates that firms are more likely to be subject to non-public regulatory interventions if they have lower RBC ratios, it also suggests that some firms with relatively high RBC ratios are subject to non-public regulatory interventions. 26.2 percent of firms with RBC ratios greater than two have index values of two or greater

¹⁵ We note here that U.S. regulators have been under some pressure to adopt the European approach to insurer solvency regulation as reflected in Solvency II which places much greater weight on strict capital requirements and less emphasis on regulatory discretion (Brown and Klein, 2015).

nothing if they are not taking formal action. Hence, our objective is to consider the full scope of regulatory interventions and how they play out when a company gets into financial difficulty.

This warrants some discussion of the considerations and motivations of regulators in dealing with high-risk and distressed insurers, as well as companies in receivership, beyond the tradeoffs discussed above. It is not just a matter of the authorities and tools that regulators have, it is also a matter of how they choose to use them. Whether appointed or elected, regulators are politicians and, hence, must consider how their actions (or lack of them) will affect their political support. Based on the literature of the political economy of regulation (see, for example, Stigler, 1971; Peltzman, 1976; and Meier, 1988; 1991), we would expect that insurance regulators would respond to the pressures of the insurance companies, other interest groups, and consumers, among other stakeholders.

We can offer two hypotheses here. The first hypothesis is that regulators will act quickly and decisively against high-risk and distressed insurers, and efficiently manage insurer receiverships, to minimize insolvency costs. For this to be the case, the lobbying of interest groups would need to be aligned with the interests of stakeholders that bear insolvency costs. Additionally, if insurer insolvencies were salient for consumers, this could further pressure regulators to be very proactive in attempting to prevent them or lower their costs.

The alternative hypothesis is that regulators will not act quickly and decisively against high-risk and distressed insurers, nor will they efficiently manage insurer receiverships. For this to be the case, the interest groups that benefit from greater RF or

unnecessarily prolonged receiverships would need to prevail in their efforts to influence regulators. It is worth noting that insurers may be large employers in their domiciliary states and regulatory actions against such insurers when they have incurred excessive risk or are in financial distress could have an adverse effect on their employment. This may discourage regulators from acting as quickly and decisively as they ought to. Further, at least in the 1980s and 1990s, some people in the insurance industry raised concerns that some receivers prolonged the receiverships that they managed in order to receive more fees. It is also reasonable to surmise that solvency regulation is not a salient issue among consumers and the general public. Hence, if there are negative political repercussions associated with forbearance arising from consumers, they may arise only after an insolvency occurs.¹⁶

In sum, the literature essentially tells a story in which greater RF tends to increase insolvency costs and excessive forbearance occurs often. We believe that the reality is more complex than this. There may be circumstances when greater RF does tend to result in more adverse outcomes and lead to higher insolvency costs and circumstances where the opposite is true. Additionally, much may depend on how regulators exercise forbearance in a given set of circumstances. Further, if regulators are getting better at doing their jobs (and this is a big "if"), then this should be reflected in more recent data than that employed in prior studies. Our objective is to peel back more layers of the onion by examining the incidence and effects of both informal and formal interventions.

¹⁶ The people and firms that will be most adversely affected by insurer's insolvency will be its policyholders, third-party claimants, and its other creditors. Consequently, there may be some negative political fallout from an insolvency but it will occur after the fact which may cause regulators to discount its impact before the fact. Further, the domiciliary regulator will likely only be concerned about the political fallout in his/her state and not other states in which an insurer does business.

3. Data and Methodology

Data

Our data come from a number of sources. Our financial data are from annual statutory filings made with the National Association of Insurance Commissioners (NAIC). These data include items such as insurers' surplus, premiums written (by line and by state), total adjusted capital (TAC), and Authorized Control Level (ACL) capital (these items are used for insurers' risk-based capital (RBC) requirements). In addition, we use these data to construct each insurer's Insurance Regulatory Information System (IRIS) ratios for 1994 to 2016.

For data regarding regulatory actions and the status of companies we use the NAIC's GRID database which records formal regulators actions for 1983-2018. We intend to supplement these data with information from the National Association of Insurance Guaranty Funds (NCIGF) on guaranty association assessments for insolvent companies by state. We should note that the information on insurer impairments from the three sources cited above is incomplete and inaccurate for some impairments. Hence, we have supplemented the information from these sources from other public sources (regulatory filings, news reports, trade press articles, state insurance department websites, and guaranty associations).

Methodology

In our analysis, we first identify insurers that became financially distressed, financially impaired, or insolvent during our sample period (1994-2016). The distinction is important to our analysis. Insurance rating agencies classify insurers as "financially impaired" when they are both financially distressed and subject to formal, public

regulatory intervention. Firms that are financially distressed but not under public regulatory control still pose a threat to stakeholders. As previously discussed, those firms may be subject to nonpublic regulatory intervention, and that intervention may or may not reduce the probability of insolvency or the total cost of insolvency, should it occur.

Our second step will be to develop ways to detect informal regulatory actions. We start with constructing an "Intervention Index" that estimates the probability that a company was subject to informal intervention or should have been subject to informal regulatory action. Our index is based on knowledge of specific actions that regulators would require distressed firms to take or at least actions taken by firms with the approval of regulators. The index is the sum of six indicator variables meant to capture signs of regulator intervention. The first variable is equal to one if a firm is in the lowest ten percent of net premium written growth in a given year and zero otherwise. The second variable is equal to one if a firm's one-year loss reserve development is above the ninetieth percentile in a given year and zero otherwise. The next two binary variables that we include are related to exiting states and lines of business. Specifically, we include one binary variable equal to one if a firm had more than a 75 percent decrease in net premiums written in at least one of their 25 lines of business and zero otherwise.¹⁷ For exit from a state, we include a binary variable equal to one if a firm had more than a 75 percent decrease in gross premiums written in at least one state and zero otherwise. The fifth component of our intervention index is a binary variable equal to one if the ratio of a

¹⁷Data on premiums written across lines of business are from the Underwriting and Investment Exhibit, Part 1B — Premiums Written in the annual statutory statements. The 25 lines of business we use in this study are defined as follows: accident and health, aircraft, auto, boiler and machinery, burglary and theft, commercial multiple peril, credit, earthquake, farmowners, financial guaranty, fidelity, fire, homeowners, inland marine, international, medical malpractice, mortgage, ocean marine, other, other liability, products liability, reinsurance, surety, workers compensation, and warranty.

firm's assets invested in stock to assets invested in bonds is below the tenth percentile in a given year and zero otherwise. Finally, we include a binary variable equal to one if a firm was above the 90th percentile for capital contributions from affiliates in a given year and zero otherwise.¹⁸ We sum each of these six variables to construct our intervention index. The things that these component variables reflect are things that would be associated with regulatory pressure on a company to take decisive steps to correct its problems and secure its viability, e.g., exiting risky lines of business or states, increasing its reserves (correcting reserve deficiencies), selling risky assets, etc.

We can then examine companies with high index values to further probe their financial and other data to find indications of informal regulatory actions such as a decrease in an insurer's premium writings, its exit from certain lines of business, substantial increases in its reserves, assets sales, and capital infusions from a parent.¹⁹

The third step in our analysis will be to determine how the timing and nature of regulatory actions (as inferred from our indicators) affects the outcomes of insurer impairments and insolvencies. In other words, do quicker and more aggressive regulatory actions tend to lead to better outcomes, all other things equal, or the opposite? In this sense, a company that becomes impaired but is subsequently returned to the market through conservation or rehabilitation would be considered to be a good outcome. On the other hand, a company that becomes impaired and is ultimately liquidated would be considered a bad outcome, albeit unavoidable in some circumstances. As indicated

¹⁸ Data on internal capital market transactions are from Schedule Y of annual statutory statements.

¹⁹ To elaborate, although the details of RBC calculations are not made public, the formula is public and many of the component pieces can be measured from the financial statement data, including the reinsurance RBC, the reserve RBC and the written premium RBC.

earlier, the answer to this question may "it all depends" which then will lead us to the question of "depends on what."

Regardless of whether the liquidation of a company was inevitable or due to the timing and nature of regulatory actions, the cost of the company's insolvency is a matter of interest. For insurers that become insolvent and are liquidated, we will use the GA assessments for these companies in relation to their pre-impairment assets or liabilities as a measure of the costs of their insolvencies.²⁰

To examine the impact of *informal* regulatory action on firm insolvency we use a logit model to estimate the probability of a firm being subject to *formal* regulatory action. Specifically, we estimate the following model:

$$\Pr(\text{Formal}_{i,t+j} = 1) = F(\beta \text{Intervention Index}_{i,t} + X_{i,t}\psi + \epsilon_{i,t}) \quad (1)$$

where $\text{Formal}_{i,t+j}$ is equal to one if firm i is subject to formal regulatory action in year $t+j$ where j is equal to one, two, or three. We define formal regulatory action as the earliest year that a firm is subject to conservation, rehabilitation, or liquidation. *Intervention Index* $_{i,t}$, as previously described, is the sum of six binary variables which are indicators of informal regulatory action. Higher values of *Intervention Index* $_{i,t}$ indicate a higher likelihood of informal action being taken against a firm. $X_{i,t}$ represents a vector of control variables hypothesized to predict insolvency. By controlling for additional factors that

²⁰ We have obtained data from the NCIGF for GA assessments for many but not all insolvent companies. Up until around 2008, the NCIGF published data on assessments by company. After 2008, the NCIGF no longer did this and only published assessment data by year. The reason for this that some state GAs are reluctant to have their assessment data by company made public. To develop more complete data by company, we will need to contact these state GAs and persuade them share their by company assessments with us with promise that we will not make this public. The more states we can get to cooperate on this, the less we need to be concerned with selection bias. This said, we will need to control for selection bias if some states do not share their data with us.

predict insolvency, we can isolate the impact of informal regulatory action, as measured by *Intervention Index*_{*i,t*}.

Our additional control variables (contained in $X_{i,t}$) include firm-level control variables measure firm size ($\ln(\text{Assets})_{i,t}$), leverage ($\text{Liabilities}/\text{Assets}_{i,t}$, $\text{Losses}/\text{Liabilities}_{i,t}$, $\text{Unearned Premium Reserve}/\text{Liabilities}_{i,t}$), profitability ($\text{Net Income}/\text{Assets}_{i,t}$, $\text{Net Income}/\text{Surplus}_{i,t}$), organizational structure ($\text{Mutual}_{i,t}$, $\text{Non-Stock}/\text{Mutual}_{i,t}$, $\text{Group Member}_{i,t}$), and regulatory capital ($\text{RBC Less Than } 2_{i,t}$, $\text{RBC Between } 2 \text{ and } 3_{i,t}$, $\ln(\text{Adj Surplus}/\text{ACL RBC})_{i,t}$, $\text{ACL RBC}/\text{Assets}_{i,t}$, $\text{Adj. Capital} < \$1\text{mill}_{i,t}$). Additionally, we control for a firm's IRIS ratios as well as whether a firm's ratios were in the "unusual range" in a given firm-year.²¹ Standard errors are clustered at the firm level.

If non-public interventions are effective, we would expect to see a negative statistical relationship between *Intervention Index*_{*i,t*} and the likelihood of public intervention ($\beta < 0$). This finding would provide evidence that by non-publicly intervening, regulators are often able to "fix" distressed firms and, therefore, prevent formal, public action. Alternatively, if non-public interventions are merely delaying the inevitable, we would expect to observe a positive and statistically significant relationship between *Intervention Index*_{*i,t*} and the likelihood of public intervention ($\beta > 0$).

In addition to examining the direct impact of informal regulatory action, we also include interactions between *Intervention Index*_{*i,t*} and binary variable representing

²¹. The NAIC publishes "normal" range values for each IRIS ratio, e.g., the normal range for Investment Yield is 3.0 - 6.5 percent. Values outside the normal range are flagged and regulators will determine if the abnormal value indicates that there is a problem or not. The more abnormal a company's IRIS ratios are, the more likely regulators are to be concerned that is in financial trouble and in need of intervention. We omit IRIS ratio 8 since this ratio was added during our sample period. We would like to also use the Scoring System results for each company but the NAIC does not make these results public and has not made the System's specifications available to academic researchers since the early 2000s.

whether a firm has a relatively low RBC ratio. Specifically, we interact *Intervention Index*_{*i,t*} with both *RBC Less Than 2*_{*i,t*} and *RBC Between 2 and 3*_{*i,t*}. Since we view it as likely that firms with RBC ratios in these ranges have at least had discussions with regulators, looking specifically at how informal regulatory action for these firms can provide insight into whether informal, non-public actions have an influence on whether or not a firm ultimately receives a formal, public intervention.

4. Some Examples and Statistics

We offer two examples of the importance and implications of informal regulatory action or the lack of it. Four of the six members of the Eagle Insurance Group were placed in non-public regulatory supervision in 2001 following a disputed reinsurance arrangement. The financial statement data for these firms clearly indicated that they had changed their operations. For example, the reinsurance program took a radical shift and the firms ceased writing new business. Two other subsidiaries, domiciled in other states, were not placed under control and continued to operate normally. As the four financially distressed companies entered voluntary runoff, regulators sought buyers for some of the group's assets.

Over the next five years, these efforts were unsuccessful and the four insurers were placed in public rehabilitation in early 2007 and into liquidation later in that same year as the adverse development of their reserves made the sale of the firm's assets untenable. During the interim between the imposition of nonpublic supervision and the eventual imposition of public supervision, the parent had taken an illegal loan from two of the remaining subsidiaries to meet its payroll expenses. These loans to the parent were

uncollectible following the liquidation order for the parent, and within a month the two subsidiaries were also ordered into liquidation.

In this case, the RF was meant to preserve the assets of the parent firm and allow for an orderly runoff, and it was projected that the eventual outcome would have no impact on the guaranty funds. Instead, the cost of the insolvency, including the intangible costs of the disruption to the policyholders of the two otherwise solvent subsidiaries, was increased because of the delay.

Conversely, the Interboro Insurance Company was placed into rehabilitation in April 2004 and eventually released from regulatory supervision in February 2007 following the purchase of the company by a third party and an injection of new capital. In that instance, RF was justified and the outcome was that a temporary capital shortfall was alleviated with little disruption to the marketplace. Although the public rehabilitation order was issued in 2004, the firm's 2002 financial statement indicated that the company had fallen below the Authorized Control Level Risk-Based Capital requirement. Presumably, regulators had taken nonpublic action in early 2003.

Table 1 provides a breakdown of the RBC ratios (Total Adjusted Capital divided by Authorized Control Level RBC) for a set of financially impaired companies over the period 1994-2016 classified by where they fell in terms of the RBC ratio ranges and the number of years preceding their "Event Year" (the year a company was subject to its first *formal* regulatory action). We use the notation EY-X where EY is the Event Year and X is the number of years preceding the Event Year. For example, 11 impaired insurers fell below their Mandatory Control Level (MCL) RBC three years before their EY (EY-3), which requires that the regulator take steps to put the company under regulatory control.

For companies falling below their MCL RBC, this number increases to 32 for EY-2 and 73 for EY-1. 19 companies were below their MCL RBC in their Event Year. The pattern indicated by these data is that impaired companies are more likely to fall below one or more of their RBC levels the closer they are to when they are subject to formal regulatory action.

Nonetheless, these data also indicate that a substantial percentage of impaired companies were below their Authorized Control Level (ACL) RBC (the point at which a regulator may take steps to place the firm under control) one to three years before they were seized by regulators. At the Company Action Level (ACL) RBC and at the Regulatory Action Level (RAL) RBC, insurers are required to automatically file an action plan to remedy the situation that led to the insurer triggering the RBC level. While we do not know how many of these companies were subject to informal regulatory action, the implication is that regulators were officially informed of the event, reviewed the remediation plan with the insurer, and still exercised considerable forbearance in dealing with these companies, at least in terms of formal regulatory action.

A quick look at some RBC results shows some of the differences in the strategies used to salvage financially distressed companies. New American Insurance Company was ordered into Rehabilitation in July 2004 and was released in December 2010. The firm ceased writing insurance and began running off its reserves. As its business wound up, the firm's surplus was restored as its losses were paid out and its reserves reduced. We also note that the firm's 2003 RBC ratio prior to intervention (600%) was

substantially worse than its 2004 RBC ratio after intervention (-600%).²² In this instance, there does not appear to be any early, nonpublic intervention.

In contrast, Interboro, which was placed into Rehabilitation in April 2004, may have triggered nonpublic intervention in the prior year. The firm's 2003 RBC results, which would have been reported in March 2004, clearly show negative surplus. However, the firm triggered the Authorized Control Level standard in 2002, and it would be assumed that regulators would have instituted some form of direct communications with the firm. However, Interboro continued to write new business and to generate material amounts of RBC, although its Total Adjusted Capital was nowhere near sufficient to support the firm's operations. The R5 component, which is based on written premiums, was cut in half over the period of supervision, suggesting that one of the regulatory interventions was to recommend changes in the underwriting of new business. However, it was only after the infusion of \$15 million of new capital brought it back up to appropriate levels that it was released from supervision. By examining the financial and demographic variables of these two companies, we should be able to identify indicators that provide insight into which firms are viable going concerns and which firms are prime candidates for runoff.

5. Estimations

Summary statistics for our sample of firms are presented in Table 2.²³ We note here that the mean value of *Intervention Index_{i,t}* is 0.9790 while the median is one. While

²² New American's reported surplus declined from \$3.8 million in 2003 to -\$1.2 million in 2004. We should mention here that it is not uncommon for a company's financials to be substantially changed after it is seized by regulators. This is because insurers in distress often "cook their books" which then are corrected when regulators arrive on the scene.

we expect higher values of *Intervention Index* $_{i,t}$ to be representative of a higher likelihood of regulatory intervention, we are not suggesting that over 50 percent of our sample has had non-public interventions. Firms with a value of one for the index could have made decisions to, for example, exit a line of business on their own. To provide further evidence of the construct validity of our instrument, we perform tests to see if *Intervention Index* $_{i,t}$ is particularly informative when we have a good idea that regulators are looking at a particular firm, but have not been placed it under some form of regulatory control.

In Table 3, we provide some evidence that our measure of informal, non-public intervention, *Intervention Index* $_{i,t}$, is an appropriate proxy for capturing the likelihood that regulators are involved with a firm. To do so we estimate *Intervention Index* $_{i,t}$ as a function of the *RBC Less Than 2* $_{i,t}$ binary variables using ordinary least squares. Due to the nature of RBC regulation, we know that firms with RBC ratios less than two (i.e., CAL level) are going to attract the attention of regulators. We would, therefore, expect to see *Intervention Index* rise following a firm's RBC dropping below two if we are accurately capturing non-public interventions. We include three lags of *RBC Less Than 2* $_{i,t}$ in these models. We estimate the models with and without state and year fixed effects. Standard errors are clustered at the firm level.

We observe in Table 3 that current-year and prior-year coefficient estimates for *RBC Less Than 2* $_{i,t}$ are positive and significant at the one percent level in all three specifications. This indicates that firms falling below the CAL RBC threshold tend to experience a higher likelihood of informal, non-public regulatory intervention, as proxied

²³ Note that all IRIS ratios are calculated exactly as described in the NAIC's instructions. These instructions typically require multiplying by 100 which is why the values for the IRIS ratio variables appear larger than the other variables used in our analysis.

by the *Intervention Index* $_{i,t}$. This result is consistent with regulators taking a look at firms who have fallen below the CAL RBC threshold, and either requiring them to take certain actions captured by the index (e.g., exit a line of business, receive capital from an affiliate) or to have firms take actions with the approval of regulators (which would similarly be captured by the index). We find limited evidence that having the RBC ratio fall below two, two years ago has an impact on the *Intervention Index* $_{i,t}$. We attribute this finding to regulators acting quickly to take action in an effort to address any financial weakness in insurers.²⁴ Overall, we interpret the results in Table 3 as consistent with *Intervention Index* $_{i,t}$ serving as an adequate measure of non-public regulatory interventions.

Table 4 presents results of our logit estimation of equation (1) using logit models. The dependent variables are binary variables indicating if a firm had a formal, public regulatory intervention three years, two years, and one year ahead (presented in columns (1), (2), and (3), respectively). Positive coefficient estimates indicate a higher likelihood of insolvency while negative values indicate a lower probability of insolvency. These models also include indicator variables equal to one if each of a firm's IRIS ratios was in the unusual range in a given year and zero otherwise. We omit these coefficient estimates to conserve space. Standard errors are clustered at the firm level.

The coefficient estimates on *Intervention Index* $_{i,t}$ are positive and significant in all three models presented in Table 4. If we interpret *Intervention Index* $_{i,t}$ as a proxy for non-public regulatory interventions, this result indicates that non-public interventions are

²⁴ The third year lag of *RBC Less Than 2* $_{i,t}$ is negative and significant in all three specifications in Table 3. While we do not view this result as being inconsistent with our contention that *Intervention Index* $_{i,t}$ is an appropriate proxy for non-public interventions, there are a number of possible interpretations of this result that we cannot currently rule out. One possibility is that regulators are able to "fix" firms that fell below two three years ago, though further tests are required to address this possibility.

more likely to lead to public interventions, all else equal. Given that our sample is the universe of P/C firms, this result is consistent with regulators making non-public interventions into higher-risk firms.

In column (1), the interaction term *Intervention Index*RBC Between 2 and 3*_{*i,t*} is negative and statistically significant. This result is consistent with non-public interventions resulting in a *lower* chance of formal regulatory intervention for firms with RBC ratios between two and three. What this result implies is that informal interventions can be effective if regulators intervene when RBC ratios are relatively low (e.g., less than the average), but not below the CAL RBC threshold (i.e., less than two). Moreover, since this result is only significant in column (1) — where we are estimating insolvency three years out — but not in columns (2) or (3), a possible interpretation is that non-public interventions can be effective in reducing the necessity of public intervention, but only if regulators act early enough.

Overall, the results in Table 4 provide some initial evidence that our measure of non-public intervention is predictive of a higher probability of public regulatory interventions. In addition, we find preliminary evidence that non-public interventions can help to reduce the probability of public interventions if regulators are proactive in intervening.

6. Summary and Conclusions

In this proposal, we provide background and an initial empirical analysis of non-public regulatory interventions in the property-casualty insurance industry. While prior studies examining solvency regulation in the insurance industry have relied on measures of *public* regulatory interventions, we propose that *non-public* regulatory interventions

are an important missing consideration. We, therefore, first attempt to identify non-public regulatory interventions by constructing an index using financial statement information for insurers in our sample. Our measure is validated by looking at firms below the CAL RBC threshold of two — firms are likely to have a higher index value after dropping below this level, which is consistent with greater regulatory scrutiny for firms with relatively low RBC levels. We then examine whether firms with higher probabilities of non-public regulatory intervention are more likely to be subject to formal, public regulatory interventions. We find that, overall, firms with a higher likelihood of non-public interventions are more likely to be subject to formal regulatory interventions, which is consistent with regulators intervening against riskier firms. Additionally, however, we find evidence that if regulators make non-public interventions early on firms with RBC ratios between two and three (i.e., ratios that are relatively low, but not below the CAL RBC threshold), these firms are less likely to be subject to formal, public regulatory interventions. This finding is consistent with public interventions essentially “fixing” firms before their financial strength is too weakened for regulators to be able to turn them around.

Going forward, we plan to implement several extensions and additional analyses. We plan to create additional components of our *Intervention Index* to ensure that our measure is robust. Notably, we plan to include more variables related to firm investments beyond what we currently include looking at stock versus bond investment. We will also perform additional analyses to attempt to identify situations where INPRIs were effective versus when they were not. These tests will involve looking at firms with high measures of our non-public intervention index and examining which firms did and which firms did

not eventually have formal regulatory interventions. Finally, we ultimately plan to examine the actual costs/benefits of INPRIs by looking at guaranty fund assessments. Ideally, we can also identify cases where firms would likely have gone insolvent in the absence of an INPRI and attempt to quantify the benefit to intervening early.

Overall, our study will contribute to the literature examining the political economy of regulation, broadly, and the regulation of solvency regulation in the insurance industry, specifically. Our preliminary results indicate that non-public interventions can reduce the probability of a firm having a public regulatory action, which indicates that, in some cases, state insurance regulators are effectively reducing the costs of insolvency by not being forced to take public action against a firm. These preliminary findings suggest that further exploration of the incidence and effects of informal, nonpublic (as well as formal, public) regulatory interventions against high-risk and troubled insurers could provide interesting and important insights into how insurance solvency regulation is conducted and affects the public interest. Contrary to what has been stated or implied in prior studies, it appears that U.S. insurance regulators do have the discretion to act against troubled companies that have not yet tripped any of their RBC thresholds and exercise this discretion. In other words, there appears to be less regulatory forbearance than what the prior research suggests.

In further work, beyond refining our measurement of informal actions, we will seek to gain a better understanding of how the process of regulatory intervention can play out under different circumstances and when greater forbearance is more likely to lower insolvency costs and it is more likely to increase these costs and why. For the longer term, beyond this year's meeting, we also hope to develop a better understanding of what

causes or motivates regulators to exercise greater or lesser forbearance. Is this simply a matter of regulators doing the best they can under conditions of uncertainty, or are political-economic considerations also affecting their behavior as suggested by Grace et al. (2002) and Leverty and Grace (2017)?

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Table 1
RBC Ratios for Impaired Insurers 1994 to 2016

This table reports the number of impaired firms in the years leading to impairment by their RBC level. The Event Year is the earliest year of formal regulatory intervention (conservation, rehabilitation, or liquidation). Percent Triggering RBC is the percent of firms in a given column with RBC ratios less than 2.0.

RBC Level	RBC Ratio Range	EY-3	EY-2	EY-1	Event Year
No Action	> 2.0	229	195	94	10
CAL RBC	1.5 to 2.0	19	31	17	0
RAL RBC	1.0 to 1.5	15	23	22	1
ACL RBC	0.7 to 1.0	5	8	7	0
MCL RBC	< 0.7	11	32	73	19
	Total	279	289	213	30
Percent Triggering RBC		17.9%	32.5%	55.9%	66.7%

Table 2
Summary Statistics

This table reports summary statistics for our sample of firms from 1994 to 2016. *Intervention Index* is a measure of the likelihood of non-public interventions that takes on values between 0 and 6. Other variables include firm-level financial variables, IRIS ratios, and binary variables indicating if a firm's IRIS ratio is in the unusual

	Mean	Std. Dev.	25th Pctl	Median	75th Pctl
<i>Intervention Index</i>	0.9790	1.0445	0.0000	1.0000	2.0000
<i>ln(Assets)</i>	18.2001	1.9035	16.8261	18.0914	19.4634
<i>Liabilities/Assets</i>	0.5370	0.1959	0.4269	0.5801	0.6813
<i>Losses/Liabilities</i>	0.4094	0.2068	0.2651	0.4159	0.5512
<i>Unearned Premium Reserve/Liabilities</i>	0.2707	0.1993	0.1229	0.2391	0.3871
<i>Net Income/Assets</i>	0.0219	0.0539	0.0010	0.0237	0.0458
<i>Net Income/Surplus</i>	0.0421	0.1639	0.0026	0.0552	0.1126
<i>Mutual</i>	0.1870	0.3899	0.0000	0.0000	0.0000
<i>Non-Stock/Mutual</i>	0.0998	0.2998	0.0000	0.0000	0.0000
<i>Group Member</i>	0.6742	0.4687	0.0000	1.0000	1.0000
<i>ln(Adj Surplus/ACL RBC)</i>	2.1480	0.9259	1.5756	2.0405	2.5596
<i>ACL RBC/Assets</i>	0.0307	0.0364	0.0001	0.0216	0.0516
<i>Adj. Capital < \$1mill</i>	0.0083	0.0907	0.0000	0.0000	0.0000
<i>RBC Ratio less than 2</i>	0.0278	0.1644	0.0000	0.0000	0.0000
<i>RBC Ratio between 2 and 3</i>	0.0580	0.2337	0.0000	0.0000	0.0000
<i>Longtail</i>	0.6542	0.3084	0.5392	0.7123	0.9032
<i>GPW/Surplus</i>	221.0308	290.4609	70.3630	145.1079	268.4038
<i>NPW/Surplus</i>	100.5224	88.6032	37.9415	82.1056	139.5116
<i>Change NPW</i>	14.9611	89.5406	-6.4088	3.6756	15.8006
<i>Surplus Aid to Surplus</i>	2.6324	8.4409	0.0000	0.0082	0.8727
<i>Operating Ratio</i>	95.3373	99.3777	77.1829	89.8716	99.0542
<i>Investment Yield</i>	3.9333	1.8168	2.6385	3.9574	5.2370
<i>Change Surplus</i>	8.8031	26.3114	-0.9631	5.9027	14.3784
<i>Liquid Liabilities to Assets</i>	68.8506	41.8816	48.5134	67.1165	82.4217
<i>Agents Balance to Surplus</i>	10.0669	17.3936	0.6779	4.5258	12.3454
<i>One Year Development</i>	-1.3980	14.2048	-5.7060	-1.3335	1.2352
<i>Two Year Development</i>	-2.4487	21.6939	-9.0354	-1.9729	1.9882
<i>Reserve Deficiency/Surplus</i>	-3.1322	34.7618	-10.7706	-1.5556	2.6807
<i>Flunk IRIS 1</i>	0.0220	0.1466	0.0000	0.0000	0.0000
<i>Flunk IRIS 2</i>	0.0283	0.1658	0.0000	0.0000	0.0000
<i>Flunk IRIS 3</i>	0.2226	0.4160	0.0000	0.0000	0.0000
<i>Flunk IRIS 4</i>	0.0490	0.2159	0.0000	0.0000	0.0000
<i>Flunk IRIS 5</i>	0.2293	0.4204	0.0000	0.0000	0.0000
<i>Flunk IRIS 6</i>	0.4479	0.4973	0.0000	0.0000	1.0000
<i>Flunk IRIS 7</i>	0.1560	0.3628	0.0000	0.0000	0.0000
<i>Flunk IRIS 9</i>	0.1069	0.3090	0.0000	0.0000	0.0000
<i>Flunk IRIS 10</i>	0.0420	0.2007	0.0000	0.0000	0.0000
<i>Flunk IRIS 11</i>	0.0448	0.2068	0.0000	0.0000	0.0000
<i>Flunk IRIS 12</i>	0.0730	0.2602	0.0000	0.0000	0.0000
<i>Flunk IRIS 13</i>	0.0798	0.2710	0.0000	0.0000	0.0000

Table 3
Determinants of Intervention Index

This table reports ordinary least squares regressions estimating the determinants of *Intervention Index*. *RBC Less Than 2* is a binary variable equal to 1 if a firm's risk-based capital ratio was lower than 2.0 and zero otherwise. Standard errors, presented in parentheses beneath each coefficient estimate, are clustered at the firm-level. ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels, respectively.

Dependent Variable: <i>Intervention Index</i>						
	(1)		(2)		(3)	
<i>RBC Less Than 2</i>	0.5284	***	0.5382	***	0.5257	***
	(0.0610)		(0.0589)		(0.0586)	
<i>Lag 1 RBC Less Than 2</i>	0.5278	***	0.5448	***	0.5376	***
	(0.0575)		(0.0561)		(0.0560)	
<i>Lag 2 RBC Less Than 2</i>	-0.0895	*	-0.0635		-0.0639	
	(0.0530)		(0.0512)		(0.0511)	
<i>Lag 3 RBC Less Than 2</i>	-0.3214	***	-0.2796	***	-0.2749	***
	(0.0582)		(0.0561)		(0.0556)	
Intercept	1.0159	***	1.0133	***	1.0558	***
	(0.0139)		(0.0131)		(0.0248)	
State FE	No		Yes		Yes	
Year FE	No		No		Yes	
R ²	1.57%		5.92%		6.37%	
F-Stat	49.91		52.17		13.66	
Observations	37,990		37,990		37,990	

Table 4
Determinants of Formal Impairment

This table reports logit models estimating the determinants of formal regulatory intervention in 3, 2, and 1 year. Standard errors, presented in parentheses beneath each coefficient estimate, are clustered at the firm-level. ***, **, and * denote statistical significance at the 1, 5, and 10 percent levels, respectively.

	Dependent Variable: <i>Impairment</i>		
	t+3	t+2	t+1
	(1)	(2)	(3)
<i>Intervention Index</i>	0.3123 *** (0.0828)	0.2478 *** (0.0839)	0.3450 *** (0.1101)
<i>RBC Less Than 2</i>	0.2542 (0.4585)	0.4674 (0.3982)	0.9286 * (0.4972)
<i>RBC Between 2 and 3</i>	0.7425 *** (0.2779)	0.6439 ** (0.3054)	-0.2469 (0.5287)
<i>Intervention Index*RBC Less Than 2</i>	0.0363 (0.1436)	0.0646 (0.1255)	-0.1313 (0.1438)
<i>Intervention Index*RBC Between 2 and 3</i>	-0.2035 * (0.1214)	-0.1513 (0.1319)	0.0193 (0.1858)
<i>ln(Assets)</i>	-0.3706 *** (0.0527)	-0.3440 *** (0.0513)	-0.4065 *** (0.0689)
<i>Liabilities/Assets</i>	0.7961 ** (0.3119)	-0.0694 (0.4730)	-1.0499 (0.6422)
<i>Losses/Liabilities</i>	-0.0060 (0.0280)	-0.1566 (0.1127)	-0.0060 (0.0230)
<i>Unearned Premium Reserve/Liabilities</i>	0.0857 (0.1884)	-0.3015 (0.3499)	-0.5493 (0.5941)
<i>Net Income/Assets</i>	-0.1356 (0.1985)	0.0212 (0.2296)	-0.3011 *** (0.0947)
<i>Net Income/Surplus</i>	-0.0439 (0.0384)	-0.0274 (0.0187)	-0.0131 (0.0088)
<i>Mutual</i>	-0.5007 ** (0.2456)	-0.5358 ** (0.2384)	-0.3274 (0.3196)
<i>Non-Stock/Mutual</i>	-0.3139 (0.2291)	-0.2615 (0.2246)	-0.2849 (0.2969)
<i>Group Member</i>	-0.4027 ** (0.1734)	-0.4470 ** (0.1748)	-0.3226 (0.2305)
<i>ln(Adj Surplus/ACL RBC)</i>	-0.3686 *** (0.0784)	-0.2833 ** (0.1102)	-0.3517 *** (0.1088)
<i>ACL RBC/Assets</i>	-0.0032 ** (0.0015)	-0.0027 ** (0.0014)	-0.0027 * (0.0015)
<i>Adj. Capital < \$1mill</i>	-0.9411 * (0.5213)	-0.6874 * (0.4132)	-0.8862 * (0.5346)
<i>Longtail</i>	0.6296 ** (0.2637)	0.7893 *** (0.2657)	0.2446 (0.3212)
<i>GPW/Surplus</i>	-0.0001 (0.0002)	-0.0001 (0.0002)	-0.0001 (0.0000)
<i>NPW/Surplus</i>	0.0001 (0.0002)	0.0001 (0.0002)	0.0001 (0.0000)
<i>Change NPW</i>	-0.0001 (0.0000)	-0.0001 (0.0000)	-0.0001 (0.0000)
<i>Surplus Aid to Surplus</i>	-0.0001 (0.0000)	-0.0006 (0.0018)	-0.0001 (0.0000)
<i>Operating Ratio</i>	-0.0001 *** (0.0000)	-0.0001 *** (0.0000)	-0.0001 *** (0.0000)
<i>Investment Yield</i>	0.0082 *** (0.0014)	0.0039 (0.0037)	-0.0007 (0.0056)
<i>Change Surplus</i>	-0.0005 (0.0007)	-0.0075 ** (0.0031)	-0.0001 (0.0001)
<i>Liquid Liabilities to Assets</i>	-0.0001 *** (0.0000)	-0.0001 *** (0.0000)	-0.0001 *** (0.0000)
<i>Agents Balance to Surplus</i>	-0.0025 (0.0023)	-0.0008 (0.0011)	-0.0001 (0.0000)
<i>One Year Development</i>	-0.0008 (0.0008)	-0.0009 (0.0008)	-0.0001 (0.0001)
<i>Two Year Development</i>	-0.0006 *** (0.0001)	-0.0006 *** (0.0001)	0.0001 (0.0000)
<i>Reserve Deficiency/Surplus</i>	0.0001 *** (0.0000)	0.0001 ** (0.0000)	0.0001 * (0.0000)
<i>Intercept</i>	0.4276 (0.9667)	-0.1186 (0.9856)	0.5479 (1.2664)
<i>Flunk IRIS Controls</i>	Yes	Yes	Yes
<i>Pseudo-R²</i>	17.93%	26.70%	35.42%
<i>Chi2</i>	848.53	1073.11	810.62
<i>Observations</i>	43,065	43,293	43,428