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October 30, 2003

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ABSTRACT

Historical evidence shows insurer insolvencies are, on average, three-to-five times more expensive than those of other financial institutions. Using a unique dataset of insurer insolvencies from 1986 to 1999, we examine the cost of insolvency resolution and the factors driving these costs. We find firms in relatively better shape before being seized impose lower costs on the insolvency system. Further, we find evidence consistent with non-benevolent behavior by regulators, both before and after the firm fails, which adds significantly to the resulting costs of the insolvency.

I. Introduction

Although there have been almost 700 property-liability insurance company insolvencies since 1970, the number and cost of the insolvencies that occurred from 1984-1993 were particularly significant. Over 400 property-liability insurers failed during this time period (A.M. Best, 2002) and the majority of the $6.9 billion that has been paid by state guaranty associations from 1969-2000 were made for the companies that failed during this same time period (NCIFG, 2000). While insurer insolvencies dropped sharply in the mid-1990s, experience indicates the potential vulnerability of the industry to economic shocks and changes in market conditions. Most recently, the number and projected cost of property-liability insurers insolvencies have again begun to rise rapidly. The recent failure of several large insurers and the financial troubles besetting several others will likely result in insolvency costs that will eclipse all previous records.

Prior research suggests resolving the new round of insolvencies will be especially expensive. Historically, resolution costs incurred for property-liability insurance company insolvencies have been significantly larger than the costs incurred for other failed financial institutions of comparable size. Hall (2000) reports the average net cost to the guaranty associations for property-liability insurers failing over the time period 1986-1994 was $1.22 for each $1 of assets the insurer possessed prior to bankruptcy.[1]

[1] The net cost to the guaranty fund equals the total claims paid to policyholders minus the proceeds of assets sales turned over to the guaranty fund associations by the liquidator of the insurer. This net cost figure does not include losses to owners and creditors of insurers with claims not covered by guaranty associations.

Our own analysis, based on a larger sample of insurers and over a longer time period 1986-1999, puts the average cost of insolvencies accessing the guaranty funds at $1.10 per $1 of pre-insolvency assets. These costs are orders of magnitude larger than losses realized in the typical bank failure, which during the late 1980's averaged around $0.30 per $1 of pre-insolvency assets (James, 1991) and more recently has average around $0.20 for banks that failed from 1995-2001 (Kaufmann, 2001). Further, the size and complexity of future insurer insolvencies will likely result in substantially higher costs than those suffered previously (Oster, 2002).

The magnitude of losses realized in property-liability failures relative to other financial institutions is known and raises serious questions about the effectiveness of the state insurance regulatory apparatus to minimize the externalities imposed on the policyholders of solvent insurers through guaranty fund assessments and, more broadly, on taxpayers through future tax offsets. What is not well understood is why the cost of resolving insurance company insolvencies is so large relative to other financial institutions and what factors underlie the differences across insurers. Although interesting, we do not address directly the question of why bank and thrift failures are less costly to resolve than property-liability insurer insolvencies. Instead we investigate the latter issue and conduct an empirical analysis of the determinants of losses realized in property-liability insurance insolvencies over the time period 1986-1999. Our interest is to determine the extent to which these costs are driven by the incentives of insurance company managers prior to becoming insolvent versus the incentives regulators have to minimize costs by closing down troubled insurers and efficiently managing the liquidation of a failed insurer.

From a policy perspective, the answer to this question is critical in order to develop recommendations that would meaningfully reform the current system. A finding that management incentive problems drive much of the differences in cost would suggest that changes in the monitoring tools used by regulators are required in order to reduce the costs of insolvencies. A finding that regulator incentives to minimize costs are weak would suggest meaningful reform can not take place without

changing the structural framework that governs regulators' behavior to motivate them to promptly close troubled insurers and/or to efficiently manage the resolution of insurer insolvencies.

We are not the first to consider the question of what determines differences in the losses realized in insurance company insolvencies. The most prominent earlier work was conducted by Hall (2000) whose principal hypothesis was that misalignment in the incentive structure among the various stakeholders of the guaranty fund system leads to a *regulatory free cash flow* problem. The hypothesis predicts that regulators have incentives to prolong receiverships and inflate costs as doing so confers private benefits to the regulators at the expense of various principals who have little ability or, due to free-riding problems, incentives to control this behavior. Unfortunately, Hall's attempt to identify variables that can be used to explain the differences in resolution costs across a sample of insurers that failed (over a time period that ends five year before ours) revealed very little. Hall concludes that there is a striking lack of correlation between regulatory controls and outcomes. Further, he states that poor outcomes are invariant with respect to budgets or regulatory governance structures. Our results stand in stark contrast to this earlier work.

The goal of this paper is to re-examine the determinants of loss due to insurance company insolvencies. We add to the literature in at three principal ways. First, the data set we employ consists of almost 250 insurers that failed over the time period 1986 -1999. Thus, our data set is approximately three times larger than was employed in previous studies. Second, we adopt a different estimation methodology than was used previously. Specifically, we use censored regression techniques to account for the fact that a number of insurers that were liquidated over this time period had enough financial resources so that all claimants (that would have otherwise qualified for guaranty association coverage) were paid without having to access the guaranty fund system. Thus, the dependent variable for our analysis is observed only if the insurer imposed a positive cost on guaranty funds. [2]

[2] Barth, Bartholomew, and Bradley (1990) adopt a similar methodology to investigate the determinants of U.S. savings and loan thrift resolution costs.

The third way we add to an understanding of the costs of resolving insurance company failures is by employing a broader conceptual framework to guide our hypothesis development and variable selection.[3] Specifically, we hypothesize there are three potential components or sources of insolvency costs: 1) the financial condition of an institution at the time it receives increased regulatory attention and the moral hazard incentives company management has to increase the expected costs to the guaranty fund at that time; 2) the additional costs incurred, known as forbearance costs, which arise due to regulatory incentives to forgo dealing with a troubled institution before it is subject to formal regulatory actions; and 3) the additional costs generated after an institution has been seized by regulators due to disincentives to minimize the costs of resolution.

We have two principal hypothesis related to insurance company management incentives – both related to the incentives of the owner's of a troubled insurer to take advantage of asymmetric gains of risk-taking due to the limited liability protection. The first hypothesis is drawn from Merton's (1974) seminal work on the pricing of corporate liabilities which suggests the value of the option for management to put the firm's assets to the guaranty fund at a fixed price increases as the insurer's capital position weakens – the so-called "go for broke" strategy. Thus, insurance company managers in firms more highly levered in the year prior to bankruptcy have stronger incentives to increase risk at the expense of the guaranty funds.

The second insurance company management hypothesis follows the organizational form literature which predicts the managers of a troubled stock insurer have increased incentives, relative to the owners of a mutual insurer, to take advantage on additional levels of risk when the firm is financially impaired. Although this moral hazard incentive exists for all insurers, Lee, Mayers and Smith (1997) suggest the owners of a stock insurer have stronger incentives to adopt this strategy since their claim on the assets of the firm is strictly one-sided.

[3] Osterberg and Thomson's (1995) paper on the cost of resolving the insolvencies of failed U.S. banks most closely resembles the framework developed here. However, we extend their analysis by investigating the potential agency costs of non-benevolent regulators.

The development of our regulatory hypotheses comes from theoretical work which considers the possibility of regulatory capture in the presence of private information (Laffont and Triole 1991; and Laffont and Martimort 1999). This literature stresses the role of regulators as the privileged collectors of information about the entities they oversee and their incentives to use what they learn to under take two possible actions: first, the regulator can favor one interest group over another by concealing that information; and second, regulators can attempt to divert funds towards activities that yield private benefits extracted from the regulated entity itself. Thus, this newer literature builds on the older regulatory capture models of Stigler (1971) and the interest group pressure theory of Becker (1983) both of which view the regulator as a passive participant in the regulatory game who can be influenced to favor the interests of one interest group over another through lobbying efforts. We find several aspects of the U.S. receivership system that could lead to incentive conflicts between regulators, receivers and other stakeholders and find evidence consistent with non-benevolent behavior by regulators who take advantage of their private information. This framework and our empirical results enable us to draw policy implications with respect to how the structure of insurance regulation could be reformed to lower insolvency costs.

This paper also adds to the understanding of regulatory decision making and incentives for the overseers of other sectors of the financial services industry. The heterogeneity of resolution methods and solvency-monitoring tools, and the differing incentives for regulators across jurisdictions to use these tools allows us to test a number of the hypotheses that are difficult to investigate using data from the banking industry. For example, it is well known the amount of losses from failed banks dropped significantly following passage of the Federal Deposit Insurance Corporation Improvement Act (FDICA) in 1991. One possible explanation for the favorable experience were the prompt corrective action provisions included in the act which hardens the regulatory closure rule for bank's whose capital ratios decline. These provisions apply to banks operating in all states and so it is difficult to ascertain whether the recent experience is due to the strong economy that existed during most of the 1990's or due to the

adoption of this new regulatory standard (Eisenbeis and Wall 2002). Given the heterogeneity of closure rules and practices across states and across time, our data allow us to more carefully investigate whether a policy of early intervention leads to lower resolution costs as well as other hypotheses.

The paper is organized as follows. In the next section we review the economic principles and related legal concepts underlying the resolution of insurance company insolvencies. Our goal is to highlight the major institutional framework for insurer receiverships in the U.S. and to consider potential sources of incentive conflicts between the various stakeholders in an insurance company insolvency. Section III describes the sources for our data, our estimation methodology, and the development of our hypotheses. The results of the analysis are presented in Section IV and we also discuss the policy implications of our work. We conclude in Section V.

II. The Insurance Regulatory and Receivership Framework[4]

1. Principles of Solvency Regulation and Insolvency Resolution

The economic rationale for regulating insurer solvency arises from market failures created by costly information and agency problems (Munch and Smallwood, 1981). Owners have diminished incentives to maintain a high safety levels to the extent that their personal assets are not at risk for un-funded obligations to policyholders that would result from insolvency.[5] 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.

[4] See Grace, Klein and Phillips (2002) for a more detailed review of the system for insurance company receiverships.
[5] The insolvency literature notes that financial institutions have an incentive to voluntarily limit the risk of insolvency to the extent the firm will lose their investments in the intangible assets of the firm in states of the world where the firm fails. See Demsetz and Saidenberg (1996) for evidence of how investments in bank charter values impacts the risk-taking incentives of managers from the banking industry. Grace, Harrington and Klein (1998) also investigate the possibility of decreased risk-taking incentives by insurers that have large investments in what they call "reputational capital" but find limited evidence of a relationship.

Moral hazard is exacerbated by insolvency guarantees which further reduce buyers' incentives to consider the financial strength of insurers when making purchase decisions.[6] In theory, solvency regulation limits the degree of insolvency risk and the magnitude of insolvency costs in accordance with social 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. 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 lower prices and/or higher 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.

2. General Framework for Insurance Regulation

In the U.S., each state has power to regulate insurers operating within the state. 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 NIAC encourages uniformity and coordination among states, but ultimately each state has discretion to determine its regulatory policies. State solvency and insolvency policies may, as a result, vary significantly among the states.

In theory, the regulatory objective 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. If preventative 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

[6] Deductibles, coverage limits, and net worth exclusions are intended to mitigate the moral hazard created by insolvency guarantees, but these provisions are still relatively generous and it is questionable whether they have any significant effect on incentives (see Klein, 1992).

regulator may first seek to conserve and rehabilitate a company to maintain availability of coverage and to avoid adverse effects on policyholders and claimants, as well as to reduce insolvency costs. However, the regulator may ultimately be forced to liquidate and dissolve the company if rehabilitation or sale does not prove to be feasible.[7]

3. Framework for Receiverships

State laws governing insurer receiverships are currently based on one of two model laws. One model is the National Association of Insurance Commissioner's (NAIC) *Insurers Rehabilitation and Liquidation Model Act* (IRLA) (NAIC 2003). The second is the National Conference of Commissioners of Uniform State Laws' *Uniform Insurers Liquidation Act* (UILA) (NAIC 2003). Further, there is a proposed Uniform Receivership Law (URL) to modernize the receivership process.[8] The URL is intended to be used by states participating in an interstate compact for insurer receiverships. However, the URL has not yet been enacted by any state so existing state laws are based on the older models, with numerous state-specific variations.

The interaction with the receivership and the state guaranty associations warrants some elaboration. Guaranty associations have been established in each state to cover an insolvent insurer's financial obligations, within statutory limits, to the insurer's policyholders and claimants in each state.[9] Most states limit coverage of property-liability claims to $300,000, although there is some variation among state provisions. Guaranty associations cover most property-liability lines. and typically assume the job of adjusting and paying claims.

The receiver also must provide information on the assets and other liabilities of the insurer and remit any residual funds after settling the estate to guaranty associations to offset their claim payments. Each guaranty association, in turn, must assess its members (i.e., licensed insurers in its state) for the net

[7] Rehabilitation and sale is more common for life-health insurers because of the embedded value of their long-term contracts.
[8] See Illinois's rendition of the URL at http://www.legis.state.il.us/legislation/legisnet92/hbgroups/PDF/920HB2995.pdf.
[9] See Duncan (1987), Wilcox (1996) and Harris (1999) for more detailed information on property-liability guaranty associations and their history.
[11] New York is the only state with a pre-funded guaranty association for property-liability insurance. All other states impose assessments after an insolvency occurs and funds are needed.

cost of covering the insolvent insurer's obligation in the state.[11] In turn, insurers subject to assessments can pass these assessments to their policyholders through rate surcharges or to state and federal taxpayers through tax deductions.

4. Priority of Claims. The claims priority rule warrants description because of its implications for regulatory incentives. The IRLA provides for the following order of liquidation.

- Class 1: expenses of administration
- Class 2: expenses of guaranty associations
- Class 3: all claims under policies
- Class 4: claims of the federal government not included in Class 3
- Class 5: reasonable employment expenses
- Class 6: general creditors
- Class 7: claims of state or local government for penalty or forfeiture
- Class 8: surplus notes or contribution notes
- Class 9: shareholders

This scheme differs from traditional bankruptcy law in that the customers of insurers have a higher priority. In fact, under the U.S. Bankruptcy Code, unsecured creditor claims have a higher priority over customer (policy) claims. The IRLA reflects the strong emphasis on protection of policyholders (and their beneficiaries and claimants) in the U.S. While customer protection is common when there is a significant fiduciary relationship, the prioritization of customer claims can have significant implications for bankruptcy management. As we will explain, regulators are more likely to resort to liquidation to trigger guaranty association coverage for policyholders and insurance claimants, rather than seeking work out plans that will reduce losses to lower priority claimholders.

III. Data, Hypothesis Formulation, and Methodology

In this section we discuss the data sources, the construction of the dependent variable for our study and our estimation methodology. This is followed by a discussion of the development of our principal hypotheses. We begin by discussing the risk-taking incentives of managers for troubled insurers and the implications ownership form and the firm's capital structure may have on managerial behavior.

We then turn to the development of our hypotheses related to the incentives regulators have to act promptly to close a troubled insurer before its economic net worth drops below zero. The section concludes with a discussion of incentives for regulators to minimize costs once the insurer is in the bankruptcy process and develops the hypotheses.

1. Data

Our data come from several sources. First, we compiled a list of insolvent insurers from a number of publications produced by the NAIC, including the *Report on Receiverships* for various years and the *Status of Single-State and Multi-State Insolvencies* (various years). We also obtained the list of insolvent insurers provided in a report by A.M. Best Company (A.M. Best, 2002), which lists all property-liability insurers that failed from 1969-2001. Taken together, these resources indicate the universe of U.S. property-liability insurance company insolvencies that occurred from 1969-2001. The final list contains 700 single-state and multi-state insurance insolvencies.[12]

2. Dependent Variable and Estimation Methodology

Our dependant variable is the cost of liquidating an insurer. The data used to construct this variable come from the *Assessment and Financial Information Report* published by National Conference of Insurance Guaranty Funds (NCIGF, 2000). The report documents the cumulative payments, recoveries, and net cost through 1999 for each insolvency triggering a guaranty fund assessment since 1969. Payments are funds paid to policyholders with covered claims against the insolvent insurer. Recoveries are the proceeds from sales of the defunct insurer's assets (that are available to guaranty associations before lower priority claimants) and the net cost is the difference between the payments and the costs recovered on asset sales. If a given insolvency generates any net cost, then by implication, claimants following guaranty associations in priority would receive nothing in terms of recoveries against the estate of the insurer.

[12] We should note that we use the term "involvencies" here to encompass both insurers with negative net worth, i.e., truly insolvent, as well as insurers that were sufficiently impaired to prompt regulatory seizure.

The next step in the construction of our dependent variable was to obtain a size measure for the insurer prior to its insolvency. Consistent with the prior literature (e.g., Grace, Harrington, and Klein, 1998), we define the year of insolvency as the year the regulator takes the first formal regulatory action against the troubled insurer and refer to this as the firm's first event year (FEY). The first action typically involves an order of conservation, rehabilitation or liquidation. Since we are interested in the costs of liquidation in receivership, we exclude from our analysis those insurers that had an order of conservation or rehabilitation and were subsequently released.

After determining the insurer's FEY, we then link the insurer's balance sheet and revenue data from the NAIC's annual statement filings for each insolvent insurer in the year just prior to the firm's FEY.[13] Since useful financial data in digital format are not available from the NAIC prior to 1985, our analysis is limited to insurers with FEYs after 1985. Insurers that did not file annual statements with the NAIC, or that did not have data available either one or two years prior to their FEY, were excluded from the sample. Of the 316 firms with FEYs after 1985 and were ultimately put into receivership, 247 insurers have data that meet our requirements for inclusion in our analysis.

The dependent variable we employ as our measure of liquidation cost is the ratio of cumulative net guaranty association assessments from the insolvency as of 1999 relative to the assets of the firm prior to its FEY. This measure of cost is an imperfect proxy for the cost of resolving insurer insolvencies for at least two reasons. First, there are several effects related to the time between the insurer's FEY and the year 1999. For example, general inflation over time makes cash flows and asset size comparisons across insurers that fail in different years problematic. This would be an easy problem to fix except information on the timing of the payments by the guaranty funds over time is not available. In addition to this problem, Hall (2000) reports that the payments by the guaranty fund and the recoveries from the asset sales of the defunct insurer occur over many years. Thus, the majority of costs that will be borne in

[13] We use annual statement data from two years prior to the firm's FEY if we are unable to find data in the year just prior to its FEY. We exclude all other insurers for which the only data that is available is greater than two years prior to the firm's FEY.

liquidation are likely to be known for more mature insolvencies than they are for an insurer that has a FEY later in our sample period. We control for both timing effects in our regressions by including dummy variables equal to one for the insurer's FEY.

The second issue related to our dependent variable is that we only have estimates of the resolution costs for firms with insurance claims (covered by guaranty associations) that exceed the funds that can be marshaled from sales of the firm's assets. Thus, we are not able to directly observe the net costs when the assets of the insurer provide more resources than are necessary to pay covered insurance claims. Accordingly, the underlying linear regression of the latent variable is of the form:

$$y_i^* = \alpha + \boldsymbol{\beta}_c' \boldsymbol{X}_i + \boldsymbol{\beta}_{rf}' \boldsymbol{X}_i^{rf} + \boldsymbol{\beta}_{ra}' \boldsymbol{X}_i^{ra} + \varepsilon_i \qquad (1)$$

where y^*_i = latent resolution cost variable for insurer i equal to the ratio of net cumulative guaranty assessment by 1999 – to – insurer i's total assets in year FEY-1,
$\mathbf{X_i}$ = vector of insurer specific variables for firm i in year from year FEY-1,
$\mathbf{X^{rf}_i}$ = vector of regulatory variables in the insurer's FEY to test regulatory incentives to minimize ex-post resolution costs for firm i associated with regulatory forebearance,
$\mathbf{X^{ra}_i}$ = vector of regulatory variables in the insurer's FEY to test regulatory incentives to minimize ex-post resolution costs for firm i associated with the administration of the receivership,
α = estimated intercept term,
$\boldsymbol{\beta_c}, \boldsymbol{\beta_{rf}}, \boldsymbol{\beta_{ra}}$ = estimated parameter vectors,
ε_i = random error term .

The observed variable y_i is $y_i = y^*_i$ whenever $y^*_i > 0$ and is $y_i = 0$ otherwise. Thus, the observed variable is censored at 0 so we estimate (1) using censored regression techniques.

2. Insurance Company Incentives

In this section we develop the hypothesis regarding insurer incentives. A significant component of the resolution cost for the failure of an insurance company will be affected by prior decisions made by managers leading to the insurer's demise. Absent a guaranty fund protecting the policyholders from losses due to the insurer's failure, and in a market where policyholder's have good information about the financial quality of the insurer, there would be little incentive for insurer managers to increase risk at the expense of policyholder's contingent claims against the firm's assets. Policyholders would rationally

predict that insurers have an incentive to increase risk following the issuance of policies and would therefore lower the premiums they are willing to pay *ex ante* due to the increased likelihood of receiving less than fair value in some states of the world.[14]

The incentives for risk-taking, however, change in the presence of a guaranty fund system protecting policyholders from loss should their insurer become insolvent. The primary impact on policyholders is to reduce or eliminate monitoring incentives since they are afforded protection when the insurer becomes insolvent. This provides insurance company owners incentives to increase risk due to the convex nature of their ownership claim to the extent they will not be fully penalized by policyholders. Lee, Mayers and Smith (1997) suggest these incentives are likely to have a greater impact on stock rather than on mutual insurers for a couple of reasons[15]. First, the increase in value of a mutual policyholder's ownership claim is somewhat muted because there is no opportunity to trade these inalienable claims. Thus, there is no ability capitalize immediately on the increase in value. Second, because the ownership and customer claim is bundled in a mutual, increases in the value of ownership will be offset by a corresponding reduction in the value of the policy to the extent guaranty fund protection is not complete. Finally, even absent guaranty fund protection, the managerial discretion literature (e.g., Mayers and Smith 1988) predicts the costs associated with risk-taking by mutual insurers are larger than for stock insurers. Thus, taking on additional levels of risk, in order to take advantage of the guaranty fund protection, will force the mutual insurer to incur various agency costs associated with owner's limited ability to monitor insurance company management.

In addition to the organizational form of the insurer providing differing risk-taking incentives for insurers, we also hypothesize a relationship will exist between ex-post resolution costs and the capitalization of the insurer prior to bankruptcy. Besides the obvious reason that firm's with higher leverage have less capital available to absorb unexpected losses, we also expect a positive relationship

[14] Evidence of market discipline in insurance markets is provided by Cummins and Danzon (1997), Phillips, Cummins and Allen (1998), Sommer (1996) and Grace, Klein and Kleindorfer (2002).
[15] Mutual corporations are limited liability corporations where the owners of the firm are the corporation's customers (policy owners).

because insurance company owners have stronger incentives to increase the riskiness of the firm when they have little left to lose – the so-called "go for broke" strategy. Option pricing theory predicts that as the underlying asset of an option approaches the strike price, the relationship between the volatility of the asset and the option value becomes larger. In our case, the owners of the insurer hold a put option where the underlying asset is firm value. Thus, the sensitivity between firm volatility and the right to put the firm's assets to the guaranty fund at a fixed price increases as the insurer's capital position weakens. Prior evidence of increased risk-taking by thinly capitalized insurers is presented in Downs and Sommer (1999) and in Hall (2000). Both arguments suggest a leverage variable – equal to the insurer's total liabilities divided by its total assets – will be positively related to resolution costs.

In order to isolate the impact of ownership structure and firm capitalization on the resulting resolution costs of insurance company insolvencies, we must first control for financial condition of the insurer prior to its seizure by regulators. We use several variables to proxy for the asset quality of the firm. The percentage of the firm's assets in stocks, investment grade bonds and cash is hypothesized to have a negative association with the cost of resolution. This is because receivers will likely be able to sell financial assets for an amount close to their stated value when they are liquidated to pay claims. The percentage of assets in home office real estate is included as a separate variable because receivers may have particular difficulty selling these properties at their annual statement value. Hence, we expect to find a positive relationship between the proportion of real estate assets and insolvency costs. Our final asset variable is a control for firm size equal to the log of total assets. We expect this variable will be negatively related to resolution costs to the extent there are are fixed costs associated with the liquidation process.

We include several variables to control for the structure of an insurer's liabilities and the riskiness of the business the insurer underwrote. The first variable equals the percentage of the firm's reserves in lines with complete guaranty association coverage. Lines with more complete guaranty association coverage are personal lines of insurance (such as personal automobile liability or

homeowners insurance) and workers' compensation. We expect a positive relationship between lines with more complete coverage and the costs imposed on the guaranty association system for two reasons. First, coverage limits for these lines are higher so a greater percentage of the firm's obligations for claims will be eligible for payment by the guaranty fund. Second, policyholders have weaker incentives to monitor the insurer's risk-taking incentives when they have more complete coverage. Thus, the managers of a troubled insurer will likely face less market discipline by adopting a risk-enhancing strategy.[16]

The second liability variable measures the "maturity" of an insurer's reserves. Reserves for claims which will not be fully paid for several years or more, i.e., long-tail claims, may be positively related to the cost of insolvency as the additional time required to settle liability claims may increase the administrative costs associated with the receivership. Reserve maturity is calculated by multiplying the percentage of the firm's reserves in a given line by the average time to payout for a dollar of loss incurred during the accident year, summed over each line of insurance. Payout tail proportions were calculated using the Taylor Separation Method (Taylor 1977) and industry aggregated data from A.M. Best's *Aggregates and Averages* for a midpoint year in our sample period - statutory year 1993.[17]

Finally, we include an indicator variable equal to 1 for an insurer establishing a provision for uncollectible reinsurance. Insurance companies that find it difficult to collect on their reinsurance payments due may be pushed into bankruptcy and, once in liquidation, reinsurers often resist making payments to the estates of a defunct insurer until all claims have been identified and paid for fear of becoming a deep pocket for by the liquidator.[18]

We incorporated several variables to control for the riskiness of the lines of insurance the company underwrote prior to its FEY. The first variable is a proxy for the volatility of the loss ratio of

[16] Evidence of differential market discipline across lines of insurance is presented in Phillips, Cummins and Allen (1998) and in Grace, Klein and Kleindorfer (2002).
[17] We choose to use the mid-point of our time period as reserve maturities change very little on a year to year basis.
[18] This is the reason why the Mission -Transit insolvency of 1985, one of the largest and most complex, is still open and is not projected to close for another 18 years. See Missouri's Insurance Department's website at http://www.insurance.state.mo.us/companies/receiv.htm.

the insurer. Loss ratio volatility was calculated by multiplying the percentage of the insurer's net premium written in a line of insurance by the standard deviation of the loss ratio for the line estimated using industry aggregated data over sample period 1986 – 1999. These weighted volatilities were squared (to calculate a weighted variance) and then summed together. We take the square root of the portfolio variance as the final step to calculate the insurer's loss ratio volatility. Essentially we are calculating the volatility of the loss ratio for the portfolio of lines the insurer was engaged in assuming independence across the lines. We expect this variable to be positively related to resolution costs.

We have two variables designed to control for differences in the geographical and line of business diversification of the insurer prior to its insolvency - the number of different lines of insurance the company wrote prior to its FEY and the number of different states in which the company wrote business. Insurers were defined to be in a line of insurance (or writing in a state) if its direct premiums written in that line/state exceeded $100,000. We have competing hypotheses for these two variables. First, more diversified insurers should be less susceptible to short-term pricing pressures or adverse loss experience in a given state or line of business than are more concentrated insurers. By this reasoning we would expect greater diversification to be associated with lower resolution costs. An alternative hypothesis suggests these variables may serve as proxies for the complexity of the insolvent insurer. The insolvencies of more complex insurers are expected to be more costly to resolve, all else equal.

Our final line of business variable equals the percentage of an insurer's exposure subject to catastrophic loss shocks. This is necessary because some of the insurers in our sample were literally "blown out of the water" by Hurricanes Andrew, Hugo and Iniki while others were significantly impacted by earthquakes in California. Using this control variable allows us to better isolate the effects of other factors on the costs of these particular insolvencies. The variable equals the percentage of the insurer's premium written in Gulf Coast and Atlantic Coast states in all property lines of insurance plus the percentage of premium volume in earthquake insurance.

3. Ex-Ante Regulator Forbearance

In this section we develop hypotheses designed to determine whether regulators exhibit regulatory forbearance against certain insurers and to determine the extent to which that leniency leads to additional resolution costs in bankruptcy. Our first forbearance measure is an indicator variable equal to 1 if an insurer's FEY occurred after the adoption of risk-based capital (RBC) requirements by the NAIC. We distinguish insurers with FEYs after 1994 when the states began enacting the NAIC RBC requirement. One of the primary features of the RBC model law is the mandatory actions that domestic regulators must take against insurers with RBC ratios that fall below certain thresholds (see Klein, 1995). Thus, RBC arguably reduced the amount of discretion individual regulators possessed to deal with troubled insurers (to the extent an insurer's RBC ratio is correlated with its true economic viability).[19] We also note other regulatory initiatives to strengthen solvency monitoring and regulation were implemented in the early 1990s, such as the accreditation of the quality of a state's financial regulation and improved early warning systems (Klein, 1995). Hence, our post-1994 indicator variable may capture the effects of these other initiatives, as well as RBC.

Our second proxy for the cost of forbearance is an indicator variable set equal to 1 if the insurer wrote business in only one state. Single-state insurers are subject to oversight by only one regulator and potentially have a greater ability to lobby the local regulator for leniency regarding possible solvency related regulatory intervention. Insurers writing in multiple jurisdictions are subject to oversight by multiple regulators which limits the amount of discretion the domiciliary regulator can exercise regarding seizure and closure of a troubled insurer (Klein, 1995; Laffont and Martimort, 1999). Prior empirical evidence of the value of sharing regulatory responsibility among multiple regulators is provided in Willenborg (2000) who conducts an empirical investigation of the likelihood of regulatory intervention in a sample of financially-distressed insurers. Willenborg finds evidence that the likelihood of a

[19] Several researchers have found that insurance RBC systems have weak if any power to predict insurance company insolvencies (Grace, Harrington and Klein 1998; Cummins, Grace and Phillips 1999). The implication for our work here is that the closure rule to deal with troubled insurers may not be any stronger even after adoption of the RBC systems to the extent they are not perceived by regulators as providing information that can be used to discriminate between solvent and insolvent insurers.

solvency-related regulatory action is significantly and positively related to the number of states in which the insurer writes business and there was no relationship between firm-size and resulting regulatory action. Interestingly, when he conducts a similar test on a sample of single-state insurers, he finds a significant and inverse relationship between the likelihood of regulatory intervention and firm size. Both results support the hypothesis that the regulators of insurers show greater leniency toward larger more prominent firms in their state, but their ability to do so is limited when multiple regulators can also obtain the same private information as the domiciliary regulator.[20] As such, the ability for the domiciliary regulator to utilize this private information is weakened because the regulator is unsure what other states' regulators may know about the true condition of the insurer. We define an insurer as being a single-state insurer if 95 percent of its net premiums written are in one state. For the reasons stated above, we expect a positive relationship between the insolvency costs and single-state insurers.

Our third forbearance variable is equal to the year an insurer is placed into liquidation minus its FEY. This value will be zero if the first formal regulatory action against the insurer is an order of liquidation and will be positive when the regulator issues an order of conservation or rehabilitation prior to the firm being liquidated. Higher values of this variable could either suggest greater regulatory forbearance or could signal a willingness to reveal the poor financial condition of the insurer. We have two competing hypotheses for this variable. First, delaying the liquidation of the insurer may signal greater leniency by the regulator during which there is a risk the insurer will hemorrhage more money, certain assets may lose value, or the cost of certain liabilities could increase. On the other hand, this variable also may reflect quicker regulatory action to seize the company (i.e., an earlier FEY) and prevent losses that would occur if it remained under the control of its owners/managers. In addition, by issuing an order of conservation or rehabilitation, the regulator publicly reveals that there is concern about the financial condition of the insurer and therefore loses any opportunity she might have had to

[20] Insurance companies are required to provide the same reports to non-domiciliary and domiciliary regulators as well as submit to examinations and demands for information from both. As a matter of practice, the primary monitoring effort is delegated to the domiciliary jurisdiction but non-domiciliary regulators, with the assistance of the NAIC, can increase their monitoring and investigation of an insurer if warranted.

conceal that information in order to extract private rents. The latter argument suggests there will be a negative relationship between early intervention and ex-post resolution costs. Hence, the expected sign on this variable is ambiguous.

4. Ex-Post Regulatory Administration

Our final set of variables is intended to control for differences in the administrative characteristics of insurance regulation in different states that may have implications for insolvency costs. Ideally, we would like to have data specific to the administration of each receivership. For example, a given state may use insurance department employees to administer one receivership and appoint an outside receiver to administer another. Also, the level of regulatory oversight of outside receivers may vary among states and among receiverships in a given state. Unfortunately we were unable to locate a reliable source of this information for the majority of the insolvencies in our data set. Consequently, we employ several variables designed to proxy for the procedures used to resolve the insolvency and to capture differences in the amount of transparency imposed on the resolution process.

Our first administrative measure is an indicator variable equal to 1 for cases where ancillary receivers are appointed in non-domiciliary states in addition to the primary receiver being appointed in the insurer's state of domicile. Besides the additional administrative costs of having multiple receivers, the establishment of one or more ancillary receivers can lead to jurisdictional conflicts that may increase the costs of resolution. Further, even when all the states are operating under the same model receivership statute, conflicts can arise from different interpretations of receiver's authority which, in some cases, has led to prolonged litigation (Krohm, 1992). For both reasons we expect the sign on this variable to be positive.

Our second administrative measure is an indicator variable equal to 1 if a state had adopted the NAIC's model receivership law by the time of the insurer's FEY. As this law is intended to promote efficiency and bring states' procedures into greater conformity, we expect it to have a negative effect on

insolvency costs. However, the NAIC employs a relatively liberal definition of what constitutes adoption of the model act, i.e., states so identified may have provisions differing significantly from the model act.

Our third administrative measure is equal to the ratio of a state's insurance department budget to the assets of the companies domiciled in the state at the time of the insurer's FEY. It is possible that greater resources make regulators more effective in monitoring troubled insurers and managing insurer insolvencies. Alternatively, resources could be misused. Hence, we lean towards a hypothesis that greater regulatory resources will lower insolvency costs, but acknowledge that we may find no effect or even a positive effect.

Our fourth administrative variable is an indicator variable equal to 1 if a state has an elected insurance commissioner. Elected commissioners are presumed to be more sensitive to political considerations associated with troubled and insolvent insurers (Besley and Coate, 2001). The effect of this variable on insolvency costs could be positive or negative. An elected commissioner may be slower to seize or liquidate an insurer because of the influence of economic interests in the state that would be adversely affected by such actions. Also, receiver appointments could be used for political patronage, which could increase insolvency costs if receiver expertise and efficiency is less of a consideration in making such appointments. In contrast, an elected commissioner may be motivated to act more quickly because of the potential for negative voter reaction to perceived excessive forbearance. This would decrease insolvency costs if quick action involved seizing an insurer to stem its losses. However, a greater tendency to place companies into liquidation rather than rehabilitation could increase or decrease insolvency costs depending on the specific circumstances involving a troubled insurer.

The final two variables we include are designed to control for differences in the level of external monitoring and influence of the insurance department by the larger state government. We do this by taking advantage of the heterogeneity regarding the sources of revenue to finance insurance department operations and the ability the department has to gain financial independence from state government resources. Insurance department funds come primarily from two sources (NAIC 2002) – general

appropriations from the overall state budget or through fees and assessments imposed on the industry which flow directly to the department. In addition to differences in the source of funds, a significant number of departments operate in a system known as dedicated funding whereby the department has the ability to establish a cash reserve that can be built up over time. The funds for this reserve may come in the form of additional fees and assessments on the industry or they can be residual funds from a previous year's general appropriation which did not revert back to the state.

The dedicated funding mechanism arguably gives the insurance commissioner greater financial independence from the state budget process and therefore limits some of the ability for the legislature and/or the governor to influence the operations of the insurance department. Stated in another way, state governments have stronger incentives to oversee the operations of an insurance department that receives the majority of its funds through general appropriations and does not have the access to additional resources. We include two variables to test whether resolution costs are related to the manner in which the department is funded. The first is an indicator variable set equal to 1 if the insurance department receives more than 50 percent of its funding through the general appropriation process and does not have access to dedicated funding. Consistent with the increased incentives of the principal (the state) to monitor its agent (the regulator) we expect this variable to be negatively related to resolution costs given the reduced ability for the regulator to conceal private information.

We also include an indicator variable set equal to 1 if the state's overall discretionary budget is running a deficit at the time of the insurer's FEY.[21] We have two rationales for the including this second variable. First, the fiscal condition of state government is an indicator of the macro-economic environment in the state and, to the extent the profitability cycle for property-liability insurance tracks the general business cycle (Grace and Hotckiss, 1993), the indicator may be positively related to the resolution costs for an insolvent insurer. Alternatively, the variable may be negatively related to

[21] Data for the construction of this variable came from the *Statistical Abstract of the United States* (various years) in the table entitled "State Resources, Expenditures and Balances." The table reports funds available for appropriation to support any state governmental activity except funds earmarked for particular purposes such as Highway Trust Funds and Federal Funds.

resolution costs to the extent the legislative and executive branches of government impose greater fiscal discipline and monitoring in times when budgets are tight. The latter argument suggests a negative relationship between resolution costs and the budget deficit indicator. Of course, the degree of influence states have on the insurance department will be a function of the type of departmental funding mechanism. Therefore, we also include an interaction variable equal to the general funding indicator times the state budget deficit indicator. The coefficient on this variable will measure the marginal effect of increased incentives for external monitoring by the state for an insurance department whose operations are financed by direct appropriations from the state in times of fiscal constraint. We expect a negative relationship between this interaction term and ex-post resolution costs.

To control for residual effects of factors in a given state that we cannot measure directly, we include a set of indicator variables – each variable is equal to 1 for the domestic insolvencies in a given state and equal to 0 for all other insolvencies. Hence, there is one indicator variable for each of the 38 states represented in our sample of insolvencies. The estimated coefficients for these variables measure the extent to which insolvency costs are higher or lower in a given state relative to the average, after controlling for all of the other factors that are specified in our model. Thus, our most fully specified models can be thought of as full fixed-effects panel data regressions controlling for both first event year and state of domicile effects.

IV. Estimation Results

This section presents the results of our tests of the determinants of resolution costs for insurer insolvencies. We begin by discussing the summary statistics for the data used in our analysis. Table 1 reveals the average cost to resolve the insolvency for firms that enter the guaranty fund system is approximately $1.09 for every dollar of pre-insolvency assets. Even the median cost of resolution, $0.54 per dollar of pre-insolvency assets, is substantially larger than the cost to resolve bank and thrift insolvencies which averaged around 30 percent for a sample of banks which failed during 1985-1989

(James, 1991) and 20 percent for banks that failed in the late 1990's (Kaufmann, 2001). The table also reveals the typical insurance company failure is relatively small with an average (median) asset base of only $37 million ($11 million) in the year prior to its FEY. While a substantial portion of failing insurers are small, there has been an increasing number of large insurer failures. A significant number of failed insurers have provisions for uncollectible reinsurance on their balance sheets (33 percent of our sample) and many of the sample insurers have significant premium volumes written in lines of insurance subject to catastrophic loss shocks.

Further, if we look at the forbearance variables we see an order of liquidation is the first formal regulatory action taken against over half of the insurers our sample. Thus, the typical pattern is for many insurers to go straight to liquidation bypassing conservation or rehabilitation attempts– suggesting one possible reason for the high cost of resolution in the insurance industry. Turning to the administration variables, we see the heterogeneity of the funding mechanisms used by the states as 27 percent of the firms which fail were in domiciled in states with insurance departments primarily funded from annual general fund appropriations.

Finally, Table 1 also reveals that we were able to locate annual statement data in the year just prior to an insurer's FEY for 75 percent of our observations. For the remaining 25 percent of the sample insurers we had to use data from two years prior to their FEY.

Figure 1 reveals one of the econometric challenges we faced in conducting this study – the extreme skewness of the dependent variable due to several insurance company failures which were the result of catastrophic events. The skewness of the dependent variable, for the 186 firms which access the guaranty fund system, is 8.6. In the standard linear regression model this would not be a serious problem since least squares estimates will be unbiased and consistent even when the assumption of normality for the error term is violated (although the estimates are generally not efficient). However, the situation is quite different in the Tobit model where it is well known that maximum likelihood estimates produce inconsistent estimates when the disturbances are non-normal (Arabmazar and Schmidt, 1982).

We have two econometric strategies to control the extreme skewness of the dependent variable. First, we include all 247 observations and estimate equation (1) via MLE assuming the disturbances are drawn from a logistic distribution. The logistic distribution is a heavy-tailed distribution that will better handle the skewness of the dependent variable. Second, we remove from our sample the 13 observations above the 95th percentile of the dependent variable (i.e., liquidations with cumulative net guaranty association assessments greater than 3.03 times the pre-insolvency assets of the insurer were eliminated). The skewness of the remaining 173 non-zero observations drops to 1.32 by eliminating the extreme observations. We then estimate equation (1) using the standard assumption of normality for the error term of the latent variable. We compare the results across the two estimation methodologies to check their robustness.

The estimated regression models that include all 247 observations are presented in Table 2 and the results of the models based on the reduced sample of 234 observations are presented in Table 3. The results are substantially similar so we focus our discussion on the results in Table 3 and highlight any differences between the two estimation strategies.

Table 3 contains three different regression estiamtes. Model 1 includes neither the FEY dummy variables nor State of Domicile (SOD) dummy variables. Model 2 includes FEY dummy variables but not SOD dummy variables. Model 3 includes both FEY and SOD dummy variables.

The Tobit regression results are consistent with a number of our hypotheses. Looking to our insurance company incentives variables first we see strong support for the hypothesis that more highly leveraged companies are more costly to resolve in bankruptcy and some support for the hypothesis that the owners of a mutual organization have weaker incentives to increase risk at the expense of the guaranty funds. The estimated coefficient on the leverage variable is positive and significant at 1 percent for all models consistent with highly leveraged companies having few resources to garner in bankruptcy. This result also supports the hypothesis that the managers of a thinly capitalized insurer have an incentive to "go for broke" since the downside of increasing risk is passed on to the guaranty fund and

thus lends support to prior research by Downs and Sommer (1999). The coefficient on the mutual indicator variable is negative and significant at the 5 percent level in Models 1 and 2 and at the 10 percent level in Model 3. Thus, we have some support for the hypothesis that the owners of a mutual organization have weaker incentives to increase risk at the expense of the guaranty funds.

Many of the coefficients for the financial quality control variables are also consistent with our expectations. The coefficient on the percentage of assets held as stocks, investment grade bond and cash is negative and significant at the 5 percent level in Models 1 and 2 but is not significant when we include the state of domicile indicators. Thus, we have mixed evidence that insurers with more liquid assets are less costly to resolve. The coefficients for the percentage of assets in owned real estate variable are positive but not statistically significant. The size variable, log of total assets, is negative and significant in all models consistent with the existence of fixed costs associated with resolving insurer insolvencies. The sign may also be consistent with there being more stakeholders involved in the resolution process making it difficult for the principal receiver to conceal private information for the purposes of diverting funds towards activities that yield private benefits.

The percentage of a firm's reserves held in lines of insurance with more complete guaranty association protection is positive and strongly significant in all models. This is consistent with the hypothesis the guaranty funds afford greater protection for policyholders with workers' compensation and personal lines insurance claims and with policyholders in these lines of insurance having weaker incentives to discipline risk-taking behavior by insurers. The reserve maturity variable is positive but not significant in all model specifications. Thus, we do not find evidence consistent with resolution costs being associated with long-tail lines of insurance once we control for other factors. The coefficient on the dummy variable for the provision of unrecoverable reinsurance is positive and statistically significant consistent with the hypothesis that reinsurance plays a significant role in determining the net cost of resolution for property-liability insurance insolvencies.

The degree of exposure to catastrophe losses is positive and significant at the 10 percent level in Model 1 and is not statistically significant in the other estimations. Interestingly, in Table 2, where we include the outlier observations and estimate the model using the logistic distributional assumption, the catastrophe exposure variable is positive and significant in all models. This difference reveals the value of eliminating the 13 extreme observations of insurers bankrupted by hurricanes in the sample used to estimate the results shown in Table 3. It is also interesting to note that the estimated coefficient is smaller and weaker in significance when we include both the FEY and state of domicile dummy variables (Model 3 on Table 2), suggesting the indicators are absorbing some of the effect of geographic catastrophe exposure.

Turning now to the variables that proxy for the geographical and line of business diversification of the firm, we see the estimated coefficients on both the log of the number of states and the log of the number of lines are positive and significant. These results are consistent with the hypothesis that greater complexity increases insolvency costs and not consistent with the hypothesis that greater diversification is associated with lower costs of resolution by reducing the volatility of the firm's earnings stream. Thus, we have strong evidence that insolvencies involving policyholders and claims in multiple lines of insurance in multiple states are more costly. As we discuss above, insurers operating in many states and multiple lines impose greater transactions costs to access guaranty association coverage and to coordinate the activities among the various states and guaranty associations.

We included three variables to control for the costs of regulatory forbearance. The indicator variable for FEYs after 1994 is not significant and thus provides no support for the hypothesis that the adoption of RBC requirements and other initiatives limited the discretion regulators have to deal with troubled insurers. Admittedly, this is a somewhat crude measure of improved regulatory monitoring given that a series of initiatives were adopted by the states at different times over the late 1980s and early 1990s and there were relatively few insolvencies between 1994 and 1999.

However, we find strong evidence that the cost of resolving the insolvencies for single-state insurers is significantly higher than the costs associated with resolving multi-state insurer insolvencies. This supports the hypothesis that distressed insurers subject to monitoring and oversight only by their domiciliary regulators may be more successful in persuading the domiciliary commissioner to delay regulatory actions.

It is possible our single state indicator variable is capturing a non-linear relationship between firm size and resolution costs since the average single state company had total assets of $15.9 million versus $61.5 million for the average multi-state insurer – a difference that is statistically significant. To test this alternative hypothesis we estimated different models where we replaced the size variable, log of total assets, with other non-linear proxies for firm size. Specifically, we estimated models in which we included total assets and total assets squared, and models in which we included asset-size quartile indicator variables. We also estimated models in which we included the asset size quartile indicators along with the log of total assets variable. In all cases, for all models, the single state indicator variable remains statistically significant at levels of significance similar to those reported in the paper (including becoming more significant in a couple of instances). Thus, consistent with Willenborg's result that domestic regulators show leniency towards single-state insurers regarding regulatory closure, we have strong support for the hypothesis that the regulators of multi-state insurers, the failure of which can impose costs in several jurisdictions, may exert peer pressure on the domiciliary regulator – forcing the domestic regulator to intervene before the financial condition of the distressed insurer deteriorates further.

The estimated coefficient for the variable reflecting the amount of time that elapsed between the FEY and when an order of liquidation was issued is negative and strongly significant across all models in both tables. There are several possible explanations for this. First, we should note that guaranty associations are generally not triggered until an insurer is placed into liquidation. Once an insurer is under regulatory control, major financial hemorrhaging may be stopped and the regulators may use the

time to increase the amount of recoveries and to adjust the liabilities before the insurer is actually liquidated. Also, we would expect that companies showing greater potential for rehabilitation will tend to be in better financial condition than insurers that are liquidated shortly after they are seized. Another possible explanation is that the public act of issuing an order of conservation or rehabilitation reveals the domiciliary regulator's private information, which limits their ability to extract rents for private benefits.

In general we have mixed evidence suggesting that differences in regulatory administration affect insolvency costs. The ancillary receiver indicator is positive and significant in Model 1 at the 5 percent level, not significant in Model 2 and weakly significant (at the 10 percent level) in Model 3. Thus, we have limited support for the hypothesis that employing multiple receivers may increase the administrative costs associated with an insolvency due either to greater overhead costs or possibly due to costs associated to resolve conflicts between receivers in multiple jurisdictions. An alternative interpretation is that the ancillary indicator is actually a proxy for more complex insolvencies. Under this interpretation, the variable is not measuring costs due to conflicts between receivers, but instead is picking up additional costs associated with insolvencies where non-domiciliary states have substantial interests. This latter interpretation is less likely to be true, however, if the other variables in the model are capturing the costs associated with more complex insolvencies (e.g., the number of states and lines of business and the financial quality of the insurer prior to regulatory seizure).

The presence of an elected commissioner is positive but weakly significant in Models 1 and 2 and insignificant when we include the fixed effect state of domicile indicator variables. The result is not surprising since there is little time series variation in the method used to select the regulator in the state and the state fixed effects tend to absorb the impact of this variable. We find no relationship between the relative size of the budget for the insurance department or whether the state adopted the NAIC's *Model Receivership Act* and resolution costs.

The administration variables most highly correlated with ultimate resolution costs relate to the manner in which the insurance department is funded and the fiscal health of the overall state budget for

the domiciliary state. The indicator variable for states running a budget deficit at the time of the insurer's insolvency is positive and significant in all models in Table 3, consistent with the hypothesis that the state macro-economic environment is correlated with the profitability of the insurance industry. The general funding indicator variable is generally positive but not significant suggesting that, in general, the manner in which the department is funded is not related to resolution costs. However, the interaction term between the insurance department being funded by the general appropriation process and the state government running a current budget deficit is negative and strongly significant in all models in Table 3 and in Models 2 and 3 in Table 2. The result suggests the sort of regulatory free-cash flow result that Hall was looking for in his research. In times of fiscal constraint, the legislative and executive branches of government more closely monitor the activities of various governmental units, including insurance departments, in an effort to identify activities that may confer private benefits for the manager of that department at the expense of maximizing social welfare. The result suggests there is a significant lack of transparency in the resolution process that gives insurance regulators the opportunity to garner resources from the liquidation process that yield private benefits. However, when the principal has greater incentives to uncover the private information possessed by the regulator, the costs of resolution are significantly lower.

V. Conclusions and Policy Implications

This paper examines the cost of insurance insolvency resolution. We find that there are three main determinants of these resolution costs: The pre-insolvency condition of the firm, the degree of regulatory forbearance; and the transparency of post-insolvency administration. In terms of the pre-insolvency condition of the firm, we find that firms in better shape financially (or those that were smaller or less complex organizations) before liquidation impose lower costs on the insolvency system, all other things equal. Greater forbearance in liquidation of single state firms imposes higher costs on the guaranty fund system consistent with possible rent seeking by these single state insurers and subsequent

leniency shown by home-state regulators. However, earlier intervention into the affairs of a troubled insurer in general seems to generate better information regarding regulatory closure, which reduces the ultimate costs to guaranty funds. Finally, post-receivership administrative actions by regulators have an effect on the size of guarantee fund assessments. We find mixed evidence that ancillary receivers and the presence of elected commissioners are associated with higher costs, as is also the case for the presence of a state budget deficit. The strongest result regarding administration was the significant reduction in the size of the guarantee fund assessment for cases when states with budget deficits funded the insurance department through general appropriations. This result is consistent with our notion that tight fiscal conditions strengthen the incentives of the legislature and administration to monitor the performance of the insurance department and its receiverships.

Our results suggest a number of policy implications that also arise from our earlier work in assessing the structural and procedural efficiency of the system for insurer receiverships (see Grace, Klein, and Phillips, 2002). First, more transparency and accountability are needed. The fact that insurance department oversight during tough budget times for the state was significant suggests that responsiveness to oversight can reduce receivership costs. This is only one aspect of the need for further transparency. For example, the limited public information available on insurer receiverships did not allow us to discern receiverships managed internally by insurance departments from receiverships managed by outside receivers. Further, in cases where we suspected that outside receivers were appointed, we were not able to determine their method of selection. Thus, further transparency and accountability may improve resolution efficiency. Finally, we were surprised at the paucity of accounting data available to assess the performance of receiverships. The NAIC instituted a voluntary system for reporting financial data on insurer receiverships in the early 1990s, but we found that consistent and complete data were reported for only a minority of receiverships. Many observers and stakeholders have complained loudly about the secrecy and lack of disclosure associated with insurer

receiverships. In turn, regulators and presiding courts should be held accountable for their performance in managing insurer receiverships.

Our results strongly suggest that earlier regulatory intervention, before an insurer actually becomes insolvent or generates large deficits, will lead to dramatic cost savings. The source of the benefits would come from reduced risk-taking incentives by insurance company managers, better information for supervisors regarding the true economic worth of the firm, and increased transparency through sharing of private information by the domiciliary regulator. This last measure should be emphasized given our findings regarding the increased costs associated with the resolution of single state insurers and the reduced costs associated with insurance departments funded through general appropriations during times of fiscal constraint.

Similarly, there is a lack of uniformity among the states in how receiverships are set up, how receiverships operate, and a lack of ability to judge the efficiency of the receivership. Ideally, a benefit to a federal system is competition between ideas as to how one should properly regulate or administer a particular state function, compelling states to adopt the best methods. However, one supposes that there is a competition of ideas that is constantly influencing state behavior. Insurance receivership administration often receives insufficient attention from the executive and legislative branches and thus there has been a call for reform in only a handful of states and even less has been accomplished. We found three states in which there were auditor general reports between 1986 and 2000 regarding state receivership practices. In each case the reports were highly critical of department practices but they did not result in major structural reforms.

There is also the problem of ancillary receiverships. The interstate aspect of insurance company failures is dealt with in a haphazard manner among the states. Some states will open an ancillary receivership. This appears to increase costs of insurer resolution. While we are not able to determine why a state opens an ancillary receivership one could hypothesize several possible rationales, all of which are troubling. The first is that the state that operates an ancillary receivership does not trust the

domiciliary state to treats its claimants fairly. This lack of trust increases costs. A second possible reason is that the state with the ancillary receivership is acting opportunistically to take control of assets under a favorable state law. This also increases costs as there may be a jurisdictional dispute at some point. This suggests that interstate receiverships may need a common method of insolvency resolution to reduce the externalities imposed by lack of trust or opportunism.

Given the high cost of insurer insolvencies and its greater order of magnitude relative to banking resolution costs, a reasonable conclusion is that a new approach should be considered that has as its focal point transparency, accountability and efficiency. An interstate compact that has been proposed but only three states currently are members (Nebraska, Illinois and Michigan) and the compact has not been implemented. There has been strong political resistance to reform by interests that extract rents from the current system. Such resistance can only be overcome by exposing and increasing public awareness of the flaws of the system. Since the end of our study period to the end of 2002 another 98 companies have been placed under regulatory supervision, including several large insurers with substantial unpaid liabilities. The deficiencies of the receivership system will exacerbate the costs of resolving these insolvencies and it is possible that the revelation of these costs will increase political support for reform.

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Figure 1
Distribution of U. S. Property & Casualty Insolvency Resolution Costs: 1986 - 1999

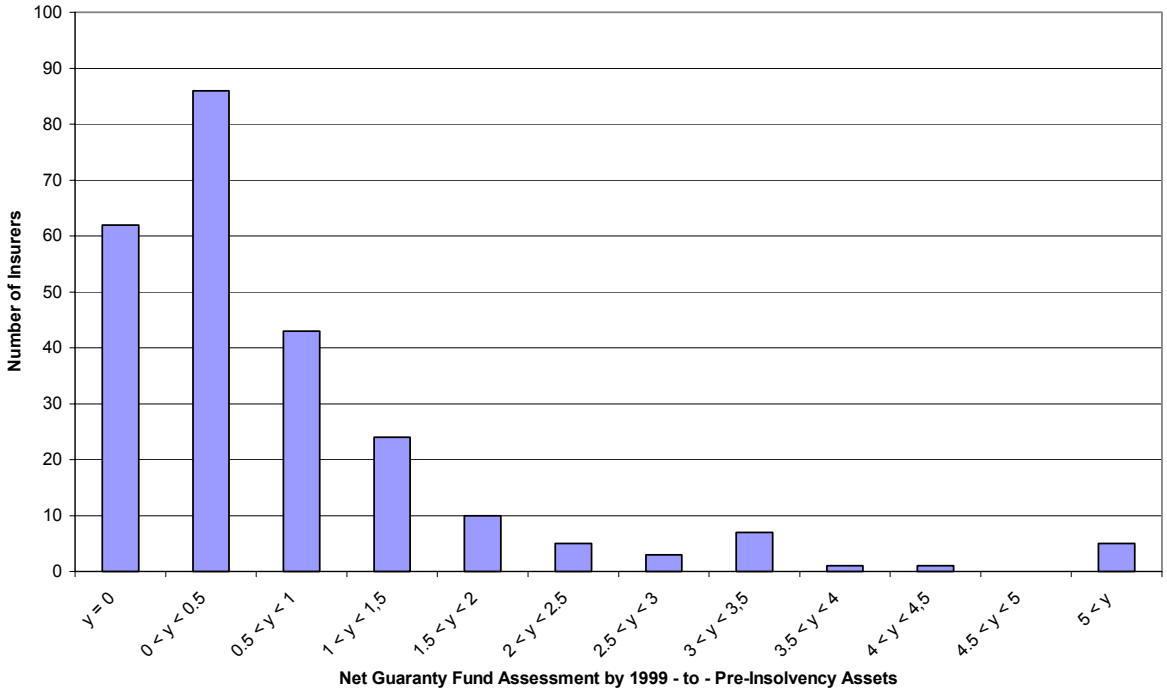

Table 1
Summary Statistics: U.S. Property & Liability Liquidations 1986 - 1998

Variable	Num	Mean	Median	Std. Dev	Min	Max
Net GF Assessment by 1999/Pre-insolvency Assets						
All Observations	247	0.818	0.320	2.090	0.000	27.914
Only Insurers that access the Guaranty Funds	186	1.086	0.535	2.349	0.000	27.914
Accounting Statement Year	247	1989.94	1990	3.1397	1985	1997
First Event Year	247	1991.19	1991	3.1183	1986	1998
First Event Year - Statement Year	247	-1.255	-1.000	0.437	-2.000	-1.000
Insurance Company Variables						
% Assets in Stocks, Investment Grade Bonds and Cash	247	66.52%	70.00%	21.62%	2.88%	100.00%
% Assets in Occupied Real Estate	247	2.47%	0.00%	7.80%	0.00%	71.70%
Total Assets ($)	247	$ 37,587,074	$10,887,382	$ 105,358,781	$ 99,247	$ 1,193,831,520
Indicator = 1 if Co. has a Provision for Reinsurance	247	0.328	0.000	0.470	0.000	1.000
% Reserves in Lines with Complete GF Coverage	247	48.82%	53.00%	37.29%	0.00%	100.00%
Reserve Maturity	247	2.512	2.450	0.768	1.070	5.270
Liabilities - to - Assets ratio	247	0.821	0.770	0.480	0.009	5.002
# States writing business	247	5.883	1.000	9.482	1.000	49.000
# Lines writing business	247	3.591	3.000	2.513	1.000	12.000
Loss Ratio Volatility	247	0.215	0.170	0.339	0.086	5.390
% Premiums in Catastrophe Prone Lines/Areas	247	16.72%	4.00%	23.29%	0.00%	100.00%
Indicator = 1 for Mutual Insurer	247	0.162	0.000	0.369	0.000	1.000
Forebearance Variables						
Indicator = 1 if First Event Year > 1994	247	0.142	0.000	0.349	0.000	1.000
Indicator = 1 if Single State Co.	247	0.510	1.000	0.501	0.000	1.000
Liquidation Year - FEY	247	0.506	0.000	1.100	0.000	8.000
Administration of Receivership Variables						
Ancillary Receiver Indicator	247	0.158	0.000	0.365	0.000	1.000
Indicator = 1 if State Passed Receivership Model Law	247	0.202	0.000	0.403	0.000	1.000
State Ins. Budget/Domestic Industy Assets	247	0.207	0.090	0.475	0.004	5.540
Indicator = 1 for Elected Ins. Comm. in Domicile	247	0.296	0.000	0.457	0.000	1.000
Indicator = 1 if State Discretionary Budget Running Deficit	247	0.109	0.000	0.313	0.000	1.000
Indicator = 1 if Ins. Dept. Funded from General Fund	247	0.271	0.000	0.446	0.000	1.000

Table 2
Cost of Liquiding Property & Liability Insurers: 1986 - 1998
Tobit Regression Results Using Logistic Distributional Assumption

	Model 1	Model 2	Model 3
First Event Fixed Effects	No	Yes	Yes
State of Domicile Fixed Effects	No	No	Yes
Outliers Present	Yes	Yes	Yes
Distributional Assumption for Error Term	Logistic	Logistic	Logistic
Number of Obs	247	247	247
Variable			
Intercept	2.069 *	2.153 *	
	(1.091)	(1.227)	
Insurance Company Variables			
% Assets in Stocks, Investment Grade Bonds and Cash	-0.271	-0.273	0.205
	(0.356)	(0.358)	(0.372)
% Reserves in Lines with Complete GF Coverage	0.470 **	0.609 ***	0.617 **
	(0.219)	(0.225)	(0.242)
% Assets in Occupied Real Estate	0.774	0.834	0.644
	(1.062)	(0.988)	(0.983)
Log(Assets)	-0.192 ***	-0.213 ***	-0.180 ***
	(0.069)	(0.069)	(0.060)
Reserve Maturity	0.085	0.126	0.201
	(0.117)	(0.119)	(0.126)
Indicator = 1 if Co. has a Provision for Reinsurance	0.113	0.224	0.287
	(0.165)	(0.164)	(0.175)
Liabilities - to - Assets ratio	0.290 **	0.290 **	0.295 **
	(0.143)	(0.140)	(0.145)
Log(States)	0.215 *	0.219 *	0.180
	(0.120)	(0.119)	(0.133)
Log(Lines of Business)	0.268 **	0.249 **	0.266 **
	(0.123)	(0.122)	(0.135)
Loss Ratio Volatility	0.267	0.246	0.097
	(0.192)	(0.190)	(0.206)
% Premiums in Catastrophe Prone Lines/Areas	0.843 **	0.831 **	0.791 *
	(0.387)	(0.385)	(0.450)
Indicator = 1 for Mutual Insurer	-0.118	-0.152	0.043
	(0.226)	(0.224)	(0.266)
Forebearance Variables			
Indicator = 1 if First Event Year > 1994	-0.014		
	(0.209)		
Indicator = 1 if Single State Co.	0.499 **	0.523 **	0.379
	(0.229)	(0.229)	(0.256)
Liquidation Year - FEY	-0.153 *	-0.146 *	-0.206 **
	(0.082)	(0.083)	(0.091)
Administration of Receivership Variables			
Ancillary Receiver Indicator	0.167	0.126	0.138
	(0.216)	(0.216)	(0.244)
Indicator = 1 if State Passed Receivership Model Law	-0.071	-0.058	0.718
	(0.193)	(0.195)	(0.456)
State Ins. Budget/Domestic Industy Assets	0.033	-0.017	1.568
	(0.140)	(0.142)	(1.746)
Indicator = 1 for Elected Ins. Comm. in Domicile	0.214	0.223	-0.357
	(0.172)	(0.182)	(0.454)
Indicator = 1 if Ins. Dept. Funded from General Fund	-0.180	-0.075	1.508 ***
	(0.178)	(0.180)	(0.517)
Indicator = 1 if State Discretionary Budget Running Deficit	0.380	0.419	0.516 *
	(0.265)	(0.277)	(0.295)
Interaction term: General Funding x Budget Deficit	-0.648	-0.942 *	-1.355 **
	(0.495)	(0.509)	(0.577)
Log Likelihood Function Value	-354.70	-345.38	-330.37

Note - ***, **, and * significant at the 1 percent, 5 percent, and 10 percent level, respectively. Standard errors reported in parantheses.

Table 3
Cost of Liquiding Property & Liability Insurers: 1986 - 1998
Tobit Regression Results Eliminating Outliers and Using Normal Distributional Assumption

	Model 1	Model 2	Model 3
First Event Fixed Effects	No	Yes	Yes
State of Domicile Fixed Effects	No	No	Yes
Outliers Present	No	No	No
Distributional Assumption for Error Term	Normal	Normal	Normal
Number of Obs	234	234	234
Variable			
Intercept	1.257 *	1.471 **	
	(0.675)	(0.744)	
Insurance Company Variables			
% Assets in Stocks, Investment Grade Bonds and Cash	-0.456 **	-0.468 **	-0.288
	(0.227)	(0.226)	(0.231)
% Reserves in Lines with Complete GF Coverage	0.296 **	0.379 ***	0.398 ***
	(0.139)	(0.139)	(0.148)
% Assets in Occupied Real Estate	0.721	0.815	0.473
	(0.638)	(0.630)	(0.611)
Log(Assets)	-0.121 ***	-0.137 ***	-0.133 ***
	(0.043)	(0.043)	(0.038)
Reserve Maturity	0.062	0.077	0.127
	(0.077)	(0.076)	(0.079)
Indicator = 1 if Co. has a Provision for Reinsurance	0.138	0.218 **	0.289 ***
	(0.105)	(0.104)	(0.109)
Liabilities - to - Assets ratio	0.317 ***	0.318 ***	0.290 ***
	(0.093)	(0.091)	(0.092)
Log(States)	0.145 *	0.147 **	0.104
	(0.076)	(0.075)	(0.082)
Log(Lines of Business)	0.226 ***	0.207 ***	0.180 **
	(0.080)	(0.078)	(0.085)
Loss Ratio Volatility	0.571	0.488	0.102
	(0.370)	(0.362)	(0.382)
% Premiums in Catastrophe Prone Lines/Areas	0.419 *	0.339	0.381
	(0.251)	(0.246)	(0.275)
Indicator = 1 for Mutual Insurer	-0.281 **	-0.275 **	-0.276 *
	(0.146)	(0.143)	(0.168)
Forebearance Variables			
Indicator = 1 if First Event Year > 1994	0.125		
	(0.134)		
Indicator = 1 if Single State Co.	0.416 ***	0.416 ***	0.279 *
	(0.148)	(0.145)	(0.158)
Liquidation Year - FEY	-0.161 ***	-0.150 ***	-0.173 ***
	(0.057)	(0.055)	(0.058)
Administration of Receivership Variables			
Ancillary Receiver Indicator	0.247 **	0.222	0.257 *
	(0.140)	(0.138)	(0.150)
Indicator = 1 if State Passed Receivership Model Law	-0.069	-0.048	-0.003
	(0.125)	(0.125)	(0.318)
State Ins. Budget/Domestic Industy Assets	0.005	-0.018	1.391
	(0.092)	(0.094)	(1.099)
Indicator = 1 for Elected Ins. Comm. in Domicile	0.200 *	0.191 *	-0.090
	(0.110)	(0.114)	(0.288)
Indicator = 1 if Ins. Dept. Funded from General Fund	-0.037	0.023	0.534
	(0.115)	(0.114)	(0.348)
Indicator = 1 if State Discretionary Budget Running Deficit	0.381 **	0.447 **	0.548 ***
	(0.170)	(0.175)	(0.182)
Interaction term: General Funding x Budget Deficit	-0.759 **	-1.004 ***	-1.066 ***
	(0.332)	(0.333)	(0.373)
Log Likelihood Function Value	-211.98	-202.07	-181.12

Note - ***, **, and * significant at the 1 percent, 5 percent, and 10 percent level, respectively. Standard errors reported in parantheses.