The Insurance Industry and Systemic Risk: Evidence and Discussion
Martin F. Grace

Abstract: The financial market events in September 2008 seem unprecedented in modern times. While other systemically important events happened in the last thirty years affecting U.S. markets, the one month turmoil and government response is without equal. As a result, insurance industry economists have been dusting off dictionaries and looking up what systemic risk really means. Further, there are other policy analysts who are linking the insurance industry to systemic risk with a potential goal of changing the governmental level at which the entire industry is regulated. Systemic risk and the role insurers play in the market is of concern to both state regulators and Congress. This paper presents evidence regarding systemic effect of insurers and will discuss this in light of the rationale for federal regulation of the insurance industry

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I.   Introduction: What do we mean by systemic risk?

There are different definitions of systemic risk. For example, the Group of 10 (2001) refers to it as "the risk that an event will trigger a loss of economic value or confidence in a substantial segment of the financial system serious enough to have significant adverse effects on the real economy."   Kaufman (1999, 2000) examines the definition more carefully and comes up with three specific, real economy effects. Kaufman's definitions of systemic risk, at some level, consistently describe the recent economic crisis. First, "Systemic risk refers to the … breakdown in an entire system.   … This … risk … is evidenced by a high correlation and clustering of … failures."[1] A second definition concerns contagion. One failure by an institution leads to a failure of another. This chain reaction requires linkages among firms, markets or sectors. Finally, a third definition focuses on an externality caused by a shock to one firm which creates uncertainty about other firms. For example, a firm suffers a loss and the market then becomes uncertain about the value of similar firms.

It is interesting to look at these definitions, as Kaufman does, in terms of causation and correlation. The first definition is about correlation as evidenced by temporally correlated failures. It could also be thought of as an increase in "risk." Firms can be substantially weakened and become riskier without actually failing. In contrast, the second definition is about causation. One firm directly causes the failure of others due to its economic linkages. The third definition has institutional failure indirectly caused by a shock. We do not see a contagion but we see correlations in the results. The tests presented below attempt to provide some evidence about correlation and to a lesser extent, causation. In fact, Kaufman's third definition using the notion of indirect causation and correlation is an important part of the analysis below. As a result, systemic risk is likely to be found if firms react negatively to certain negative events *and* the returns are correlated with a systemically important firm.

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[1] Kaufman (1999), p. 19. See also the Committee on Capital Markets (2009) for a similar definition.

Historically in the United States, traditional insurance firms are almost never part of a systemic failure in the economy. In the Great Depression, traditional insurers did well relative to the rest of the economy (Bernanke, 1983). However, mortgage insurers did not (Jaffe, 2006). In fact, there were significant mortgage insurer, as well as mortgage provider, failures. As a result of these failures, there were no new real private mortgage insurers until the 1950s, when Wisconsin allowed the first monoline private mortgage insurer to commence business.   Other states followed along with the monoline restriction because of the memory of the failure of the mortgage industry during the Great Depression (Jaffe, 2006). Other monoline insurers were set up to cover title and bond insurance. In fact, these bond insurers were the insurers suffering significant losses in the late 2007 and early 2008 (Saft, 2008). However, while their losses were symptomatic of other problems in the economy, they did not appear to be initially systematic in a "contagion sense," as these insurers impairments did not directly lead to failures of other firms. It is possible that their failures indirectly lead to future problems in other markets in the sense that those firms with significant investments in mortgage-backed securities suffered losses as the real value of bond insurance provided by the insurers was reduced. In addition, as a result of the monoline insurers' decline, other companies making similar types of investments in mortgage-backed securities or other types of collateralized debt obligations faced increasing market scrutiny which, in turn, affected their ability to raise capital and their credit worthiness. This is the position facing many firms, including American International Group (AIG), in 2007.

As a result of the overall crisis, including the bailout of AIG, there have been numerous Congressional hearings on what systemic risk is, who should regulate it and what a systemically important company actually is.[2] Because of AIG's prominence in the September 2008 market collapse, there is a concern that other insurers should be subject to the jurisdiction of a federal risk regulator. This question of

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[2] One of the better responses to congressional questions concerning who is systemically important is when Scott Harrington testified he didn't know a priori, but he hoped he would know it when he saw it. See "How Should the Federal Government Oversee Insurance?: Hearing Before the Subcommittee on Capital Markets, Insurance, and Government Sponsored Enterprises," 111th Congress, May 19, 2009, p.39. http://www.house.gov/apps/list/hearing/financialsvcs_dem/111-32.pdf.

a federal regulator then became tied up with the industry's push to have a federal insurance charter option. The insurance industry was arguing for the right to obtain a federal charter, which would have freed the industry, according to federal chartering proponents, of costly regulations brought about the duplicative nature of concurrent state regulation.[3] Now Congress is considering whether to remove the optional choice for insurers and mandate that certain ones be subject to oversight by a systemic risk regulator. While certain insurers have suffered capital and surplus reductions after the market collapse, the question that necessarily comes to mind is whether there is another AIG waiting to explode. As will be made clearer below, U.S. insurers are not likely to be thought of as systemically important and worthy of a risk regulators oversight. In fact, the Financial Stability Board (FSB) was alleged to have published a list of systemically important financial institutions and insurers.[4] The FSB denied there was such a list, but the list that was produced in the press (which to be fair may have only been someone's wish list rather than an official document) did not have one U.S. insurer.[5] This is some evidence that the typical U.S. insurer is different in a fundamental way from the insurers on the "list."

This paper attempts to look at whether there is enough evidence to think that insurance is worthy of systemic risk regulation. While AIG evidently became systemically important during September of 2008 (in the sense that the government extended it a significant bailout), it is important to question whether all insurers or a subset of insurers are truly systemically important.[6] If the industry or individual firms are systemically important, does the level at which the company is regulated lead to higher or lower social

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[3] See, for example, papers from the conference held in July 2008 in Grace and Klein (2009).

[4] See Jenkins, Patrick and Paul J. Davies (2009), "Thirty financial groups on systemic risk list," *Financial Times*, November 29. http://www.ft.com/cms/s/0/df7c3f24-dd19-11de-ad60-00144feabdc0.html?ftcamp=rss&nclick_check=1. Among others, the list included AXA, Swiss RE, Aegon, Allianz, Aviva and Zurich.

[5] See e.g., Greenwood, John (2009), "Regulator denies it has risk ranking," *National Post*, December 1, FP4.

[6] Not all agree that AIG should have been bailed out. The government even considered letting it go bankrupt which suggests that the government did not have a definition of systemic risk or too big to fail. See e.g.. Barnes, Peter (2009), "AIG Apparently Was Not 'Too Big To Fail'," *FOXBusiness*, June 29, http://www.foxbusiness.com/story/markets/industries/government/exclusive-treasury-considered-letting-aig-file-bankruptcy/ .

costs? The next section discusses some of the rationales why insurers are different from banks for the purposes of regulating systemic risk.

II.   Why is Insurance Different?

Banks are presumed to have an exposure to systemic risk while insurers almost never are. In fact, the entire regulatory system for banks arguably grew out of the perception of systemic risk from the Great Depression. However, while significant bank failures occurred during the recent (2007-2010) economic downturn and there has been discussion of new banking regulations, there does not seem to be evidence of the contagion that people recall from the Great Depression. Contagion, according to Kaufman (1994), is more likely in banking than in other industries and, when it does occur; it is a more serious problem. However, one can make the argument that, since the advent of the Federal Deposit Insurance Corporation (FDIC), the stereotypical bank run is a thing of the past. Banks, though, are still exposed to a systemic risk in the sense that, if they are all undertaking the same strategy depending upon the success or failure of a specific asset (real estate), then a decline in the value of that specific asset has a systemic effect. The difference between the problems of today and the past is that we no longer have bank runs, but rather a call to the federal deposit insurer.

Before examining how insurers differ from banks from a systemic risk perspective, it is illustrative to look at AIG for comparison purposes. AIG was more than just an insurer. It had traditional insurance products (in the U.S. and internationally), retirement products, aircraft leasing, consumer finance, and its Financial Products subsidiary. This Financial Products subsidiary is where AIG's trouble was realized. The credit derivative products sold in the Financial Products subsidiary created a "network" of interconnected institutions which created a significant counterparty exposure. Further, this significant exposure was not backed by the risk capital (or reserves) of the insurance companies within AIG and, according to Harrington (2009), the credit derivatives were definitely priced too low ex post and perhaps ex ante. Harrington also

suggests that the reason buyers traded with AIG knowing that their prices were too low was that AIG was too big to fail. [7]

In addition, AIG, a holder a vast asset portfolio, also engaged in securities lending of its assets backing its insurance. This allowed AIG to lend its assets to others for cash collateral which AIG would then invest. A securities lender could invest in safe assets like government securities or, for a higher return, a company like AIG could invest the collateral in mortgage-backed securities (MBS). If the MBS lost value, then AIG would be have to pay back the borrowers with AIG's own money. This created a further liquidity problem for AIG. Losses from these transactions were themselves an additional $19 billion over the Federal Reserve's (Fed) initial infusion of $85 billion.[8] A further problem is that these assets which were lent were from AIG's subsidiaries and, when allocated back to the subsidiaries, would have exposed the insurers to increased solvency risk. Some state regulators were unaware of the significant size of the lending operation due to the off balance sheet nature of the transactions.[9]

The National Association of Insurance Commissioners (NAIC) noticed the issue prior to September of 2008, and in July was already amending its accounting and reporting rules.[10] However, by the summer of 2008, AIG had already started to suffer losses from its securities lending business. Securities lending is mostly a life insurer phenomenon, as life insurers are more likely to have larger amounts of equities than property-liability insurers. Further, property-liability insurers have short-tail lines of coverage and are unable to lend for significant periods of time any equities they do hold. Many insurers had reduced their risk

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[7] One can also think the real question is not whether a firm is systemically important, but whether it is too big to fail. These are often thought of as the same thing.

[8] Ng, Serena and Liam Pleven (2009), "An AIG Unit's Quest to Juice Profit Securities-Lending Business Made Risky Bets. They Backfired on Insurer," *Wall Street Journal*, February 5, http://online.wsj.com/article/SB123380106666350625.html.

[9] Weiss, Miles (2008), "AIG to Absorb $5 Billion Loss on Securities Lending (Update 3)," *Bloomberg.com*, June 27 http://www.bloomberg.com/apps/news?pid=20601103&sid=aoGjre8ctFFk&refer=us.

[10] See e.g. State of New York Insurance Department Circular Letter No. 16 (2008), July 21, http://www.ins.state.ny.us/circltr/2008/cl08_16.htm.

(in terms of using MBS rather than treasuries) in this business in 2007 and the rating agencies were aware of the fact.[11]

Holding the special case of AIG aside, it is important to understand that traditional insurers are unlike banks in their interconnectedness and product risks, and these two points lead directly to the level of systemic risk imposed by each type of firm in the economy. One of the major differences is illustrated in Figures 1 and 2. Figure 1 shows the number of FDIC impairments compared to insurer impairments.[12] Note that this last year has seen a tremendous growth in FDIC-covered impairments, while the number of insurer impairments is quite low. It is likely that insurer impairments will pick up due to the general economic slowdown, but the number will not likely come close to the banks' experience. A further sign of the size of the losses in the banking system is that the FDIC estimates that it will cost about $100 billion to cover all the losses at failed banks from 2007 to 2013.[13] In particular, the insured loss payouts from 2009 totaled about 37.4 billion.[14] Another comparison might be the size of the 1980s-1990s savings and loan (S&L) crises. According to Curry and Shibut (2000), the total cost to the taxpayer of bailing out the S&Ls was $128.4 billion (approximately $170 billion in 2008 dollars). This is in contrast to AIG's $100 billion plus bailout and the overall Troubled Asset Relief Program (TARP) commitment of up to $700 billion.

Figure 2 shows another difference between banks and insurers. This shows the total assets of impaired insurers, which in 2009 totaled approximately $3 billion. While similar data could not be obtained from the FDIC in summary form, current bank impairments are bigger than insurer impairments and this is due, in part, to the types of risks large and small banks were exposed. Washington Mutual for example,

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[11]Homa Zaryouni (2008), "Securities lending leads to losses in life," SNL Financial, April 23, http://www.snl.com/interactivex/article.aspx?id=7659789&KLPT=6.

[12] An impairment means that the FDIC has determined that the assets of the bank is less than its cost basis or the state insurance regulator has made an official order of insolvency, conservatorship, rehabilitation or receivership for the insurer.

[13] Dash, Eric (2010), "At F.D.I.C., Bracing for a Wave of Failures," *New York Times*, February 23, http://www.nytimes.com/2010/02/24/business/24fdic.html .

[14] FDIC (2009), *Quarterly Banking Profile* (4th Quarter), http://www2.fdic.gov/qbp/2009dec/qbp.pdf.

when it was put into receivership in September 2008, had about $2 billion in assets and $13 billion in
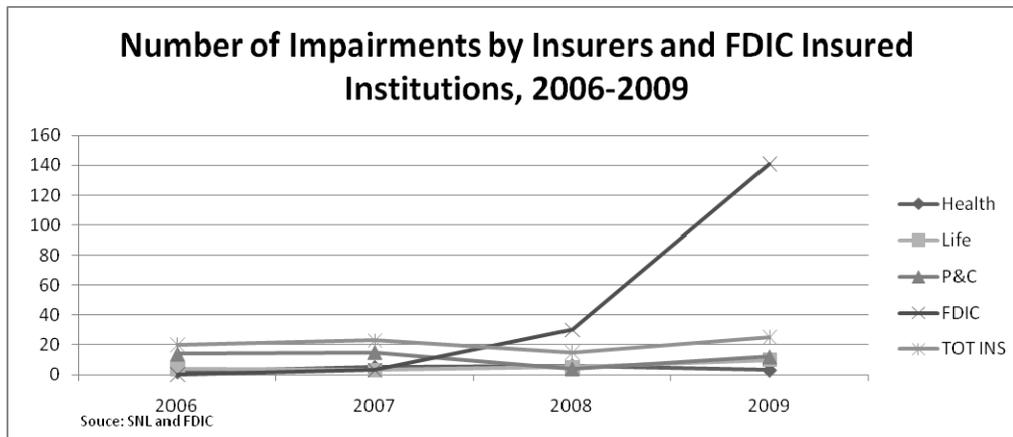
liabilities.[15]

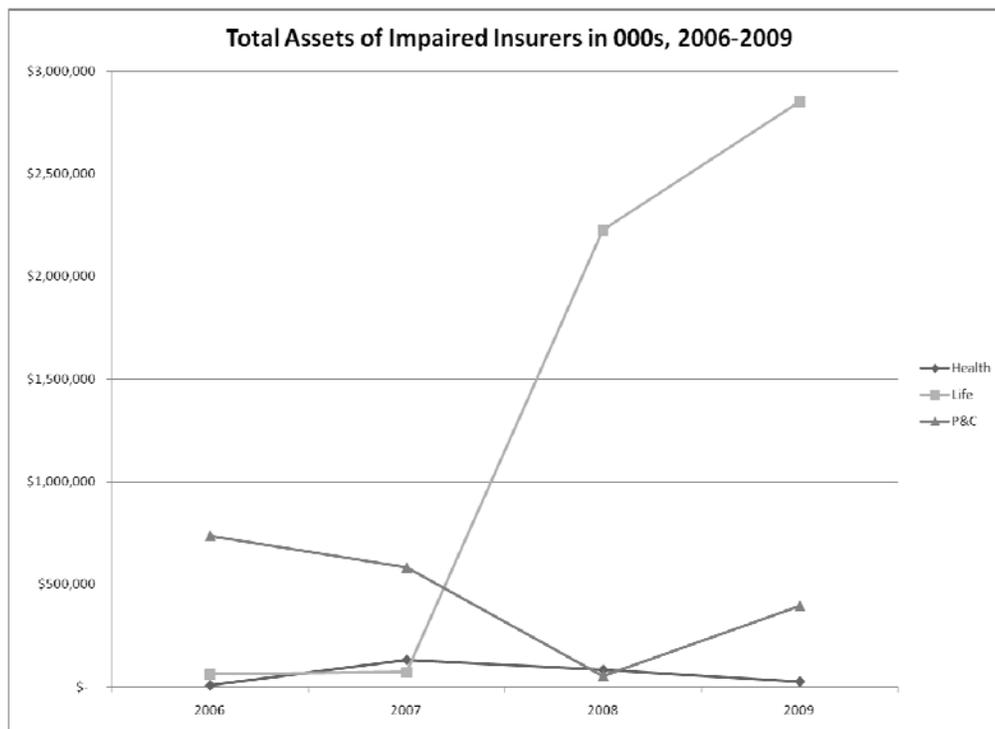**Figure 1: Insurer and Bank Impairments.**

Figure 2: Total Assets of Firms with Impairments.

One of the problems leading to the financial crisis was the mortgage originator's practice of selling

its loans for securitization. The frenzy of mortgage origination was due, in part, to low interest rates which

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[15] FDIC (2009), "Washington Mutual Bank - Receivership Balance Sheet Summary (Unaudited)" (November 23), http://www.fdic.gov/bank/individual/failed/wamubalsheet.html.

pushed up the value of real estate. As money became cheaper, more people purchased homes. There is nothing wrong with this per se, but when there is no real underwriting of the underlying credit risk this could (and did) lead to relatively large losses when real estate prices were not able to continue their upward growth. This process was exacerbated by the federal guarantees backing mortgages for those with relatively poor credit.

Insurers never saw a corresponding bubble in their product markets. Risks were underwritten consistently with how they had been in the past. Further, insurers who write risks tend to keep them on their books rather than sell significant portions of their risks to other insurance or reinsurers. Further, if the risks were sold, they were likely to be underwritten by the buyer too. Thus, poor risks did not "poison" insurers' balance sheets in the same way mortgage-backed securities poisoned the balance sheets of banks, financial institutions, and investors.

Solvency guarantees are also significantly different between banks and insurers. Deposits are insured with first dollar coverage up to the FDIC limit, which was $100,000 until the recent crisis and is now temporarily up to $250,000. This is broad coverage and anyone who has more than the limit can protect their cash by putting it in a different bank, or in some cases a different type of account. It is thus quite easy to obtain full deposit insurance. It is also obvious after the fact that deposit insurance was underpriced by the government, as some 140 banks failed in 2009, 37 banks have failed in the three months of 2010 and the FDIC's insurance fund is over $8 billion in the hole.[16] This type of deposit insurance (underpriced and full coverage) creates moral hazard by reducing the depositor's incentive to discipline the risk taking by bank managers. Consumers do not care about bank insolvency because there is little risk of real loss. Failed banks merely close overnight and have a new name the next day, with all deposits available for immediate withdrawal. Consumers shop based upon other concerns such as location, fees, and interest rates.

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[16] Dash, Eric (2009), "As Bank Failures Rise, F.D.I.C. Funds Fall Into Red," *New York Times*, November 24, http://www.nytimes.com/2009/11/25/business/economy/25fdic.html and FDIC (2010), "Failed Bank List," April 5, http://www.fdic.gov/bank/individual/failed/banklist.html.

In exchange for the deposit protection, banks are overseen by various regulators including the FDIC. The idea is that consumers may not have the ability to understand what risk bank managers undertake, but the regulators are experts and can regulate banks to reduce the probability of going insolvent. What is interesting is that the regulators and the FDIC were not able to discipline the managers either.

In contrast, every state except New York (which has a FDIC like pre-loss insurance fund)[17] uses an ex post assessment on healthy insurers to fund any insurable loss not payable by the bankrupt insurer. Each state's insurance guarantee fund has the power to assess the remaining insurers based on their premium volume. Further, there are limits to the amount of protection one can obtain though the guarantee funds. Many states limit, for example, the amount one can receive from a life insurance policy to $500,000, no matter if one purchased a $2 million policy. Similarly homeowner coverage may be limited to $200,000, no matter how much the house's value was insured for initially. These limits help reduce some amount of risk taking by insurers because consumers are concerned about the claims-paying ability of the insurer. Further, rating agencies such as A.M. Best play a large role in insurance sales though this monitoring process by providing consumers with a claims solvency rating.[18] There is no need for a similar bank rating agency which provides useful information for depositors, since depositors are fully insured. Thus, there is more market discipline on insurers than there is for banks.

Banks also have a different demand for assets than insurers typically do. Banks have deposits which are short term in nature, but they make long-term loans. This causes a maturity mismatch between inputs (deposits) and outputs (loans). Brunnermeier (2009) describes how this maturity mismatch created a demand for off-balance sheet activities which could lower the level of required regulatory capital and led to creation and use of mortgage-backed securities.

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[17] New York's fund is funded by assessments every year. If the insured losses increase, the New York guarantee fund can increase assessments. However, it does not have statutory access to the state treasury to make up shortfalls. See e.g. The Life Insurance Company Guaranty Corporation of New York Act, 77 N. Y. Comp. Codes R. & Regs.

[18] Doherty and Phillips (2002) and Grace, Klein and Kleindorfer (2004) all show that ratings make consumers more sensitive to the decision to purchase insurance. Grace et al show that in Florida (a state with a high hurricane risk), consumers with more expensive homes above the state's guarantee fund limit value purchasing coverage from higher rated insurers. In contrast, consumers with relatively low valued houses below the coverage limit from the guarantee fund are insensitive to the solvency prospects of the firm as they are fully insured against insolvency risk.

Insurers, in contrast, are structured differently, as their inputs and outputs are more closely matched in duration. Property casualty companies have short-tail lines (i.e. coverages generally are for six months or a year). Thus, they can invest their reserves in short-term and relatively lower risk bonds. Life insurers generally sell products that have long durations (10-20 years or for one's expected lifetime). Life insurers then invest in long-term bonds with similar types of duration. Thus, the pressure to engage in off balance sheet activities is less. However, the life industry is exposed to systemic risk due to their investments in mortgage-backed securities. This risk to the life industry is somewhat mitigated because, while the value of the MBS may fall, not all mortgages underlying the securities will fail to pay off. Life insurers may be able to weather the crisis because they do not have as severe a liquidity problem due to the change in valuation of some securities in their portfolio.

One can also argue that the state insurance regulators did a better job of regulating insurers in light of this crisis than the federal bank regulators and that it was the structure of state regulation which made a difference in the outcome.[19] However, insurance regulators permitted (among others) AIG to sell credit default swaps (CDS) as a derivative product rather than as bond insurance though a monoline insurer.[20] The proposition that state insurance regulation dominates a federal approach is difficult to test for the same reasons that insurers are different from banks. Regulators could look "good" merely because the pressures on banks and related financial institutions did not exist for traditional insurers. While 140 banks failed in 2009 and these failures are more than likely attributable to the financial crisis, it does not appear that any insurers other than AIG have "failed" due to the crisis.[21] State insurance regulation is just not that good. No regulatory system is. Further, according to Hartwig (2009) "[d]espite financial market turmoil, high cat

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[19] The National Association of Professional Insurance Agents, for example, an opponent of the federal chartering proposals makes this point. See http://www.pianet.com/NewsCenter/PressReleases/10-3-08.htm.

[20] See Player (2009) for a short history of New York's actions with regard to the regulation of CDS. See also State of New York Insurance Department Circular Letter No. 19 (2008), September 22, http://www.ins.state.ny.us/circltr/2008/cl08_19.pdf. Arguably, New York could have required this product to be sold within a separate monoline insurer, but chose not to do so.

[21] Two other insurers, Hartford and Lincoln National, did receive TARP funds. One can certainly argue that these companies needed the capital to prevent a future impairment. However if they had failed, a legitimate question would be whether they would have had any effect on the market or on other insurers.

losses and a soft market in 2008, 81% of ratings actions by A.M. Best were affirmations; just 3.8% were downgrades and 4.0% upgrades."[22] Thus the insurance industry, while not as severely affected, continues to be relatively stable. This is evidence that the insurance was not necessarily protected by good regulators, but a lack of a significant exposure to systemic risk which could place insurers in financial jeopardy.

AIG was a unique company compared to others chartered in the United States. On some levels it was the largest insurer in the world. No other company matched AIG's product depth or international reach. Other companies might have exposure to losses in the market as a whole, but the question one must ask is whether the failure of an insurance company can take down a significant set of companies or influence the solvency prospects in other markets. Arguably AIG was one such company, but are there others? Life insurers wrote annuity contracts and the monoline companies wrote mortgage and bond insurance. All three of these sectors were exposed to a potential contagion from changes in the credit markets, but the question which remains is whether its risk led to problems in other firms. The next section examines the relationship among various insurers and the market as a whole to see whether insurers are a source of systemic risk.

III.   Systemic Risk: Are Insurers a Source or a Victim?

A set of event studies are used to help answer the question as to whether insurers contribute to systemic risk or whether they are potential victims of systemic risk. Event studies are based upon a statistical technique which allows one to obtain evidence whether a market event leads to an abnormal return for a particular company or portfolio of companies. An abnormal return is thought to be an unexpected positive or negative stock return change relative to the market as a whole. A market event is some type of new information revealed to the market, identified prior to analysis that the researcher believes will affect the returns to a company or a sector. The lead up to the financial crisis had a number of events to examine. Further, there were events which occurred during the crisis.

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[22] To be fair, a more accurate comparison would be to see what percent of the market (say, in terms of assets) was affected by downgrades.

A.   Event Studies

We look at seven events that are suggestive of potential systemic effects. The first is the announcement that AIG was going to have to write down the value of its CDS in February of 2008. In addition, the failure and bailout of Bear Stearns, the bankruptcy of Lehman Brothers, the bailout of AIG, and three TARP events are examined. The three TARP events are the passage of the TARP bill, the announcement of the firms obtaining the initial funding, and the decision to accept or reject TARP funds by a number of companies. Box 1 provides more details regarding the events.

Box 1. Description of the Systemic Events.

Event 1. February 11, 2008. In a Securities and Exchange Commission (SEC) filing, AIG reported that unrealized losses within AIG's Financial Products Division would be approximately $5 billion, which was three time higher than previously believed. (*Insurance Journal,* February 12, 2008).

Event 2. March 16, 2008. Bear-Stearns announced that it is being taken over by JPMorgan for $2 per share (Sorkin and Thomas, 2008).

Event 3. September 15, 2008. Lehman goes bankrupt without any intervention from the U.S. Treasury or the Fed. (Fox, 2009).

Event 4. September 16, 2008. The infusion to AIG of $85 billion loan from the Federal Reserve Bank of New York. (Board of Governors, September 16, 2008).

Event 5. October 8, 2008. President Bush signs the Emergency Economic Stabilization Act of 2008, which authorizes the establishment of the TARP. (H.R. 1424).

Event 6. October 13, 2008. Nine financial institutions announce intention to take TARP money (St. Louis Fed, 2009).

Event 7. May 15, 2009. Hartford obtains TARP funds, Allstate Declines TARP funds. (Frye and Christie May 15, 2009).

We obtained stock price data for a number of companies (AIG, Genworth Financial, Allstate, Hartford Insurance Group, Metropolitan Life, Ameriprise, and Lincoln National). Each of these companies was identified in some way as being injured by the financial crisis. Specifically, these companies are those who received TARP money (AIG, Lincoln and Hartford),[23] who applied for it and did not receive it

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[23] SNL Financial provided the listing of insurance TARP recipients and is shown in the Appendix.

(Genworth),[24] or were identified in the press thinking about applying for TARP Funds (Allstate and Ameriprise).[25]

SNL Financial,[26] a provider of financial data for many types of regulated firms, is the source of the data employed in the study. SNL follows all publicly traded companies in the banking and insurance industries. In doing so it also creates a number of "stock" indices for various sectors of the various industries including those companies who are recipients of TARP funds. In this paper, the focus is on TARP recipients,[27] the property-casualty industry; the life industry; and certain individual companies named as having a potential link to TARP.

A simple event study method is employed to do two things. First, we obtain the market beta just prior to the event. This provides an indication of how the stock's returns relates to the market's returns. The period from 60 days to 30 days prior to the event is used to calculate the individual stock's beta. Then one calculates the abnormal returns during the estimation window (+/-4 trading days) around the event.

Because we have the firms which eventually took TARP funds, one can examine how these ex post systemically important companies fared (as a group) during earlier events. It is also possible to examine how certain insurers and the property-liability sector or the life insurance sector reacted to these events.

Thus, the model estimated is

(1) $$r_i = \alpha + \beta_t r_{s\&p} + e_i$$

where $r_{s\&p}$ is the daily return on the S&P 500 and r_i is the daily return for the stock or the particular stock index for each event period described in Box 1. A higher β implies a higher covariance between the stock's

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[24] Reuters reports that Genworth Financial was seeking to buy a thrift to obtain TARP money. See e.g.,(2008), "Genworth in deal to buy bank, seeks TARP money," November 17, http://www.reuters.com/article/idUSTRE4AF2IC20081117 .

[25] "The TARP Trap" (2008), *The Economist*, November 20.

[26] For an overview of the products, see www.snl.com.

[27] The list of TARP recipients was obtained from SNL Financial.

returns and the market's. A β that is less than one implies a relatively low correlation between a stock's returns and the market's, while a β equal to 1 implies that a stock's return moves directly with the market's returns.

Second, for each event, abnormal return for each stock *i* is calculated (i.e. the difference between the predicted and the actual return during the event window). Thus,

$$(2) \qquad AR_i = (r_i - (\alpha + \beta_i r_{s\&p})) .$$

Finally, we obtain the AR_i over the event window ([-4, +4]) and then we calculate the cumulative abnormal return (CAR) over the event window. As mentioned above, the event window starts four days prior to the announcement of the event and ends four days after the event. This should include most of the information generated by the announcement even if some information leaks out prior to the actual event. Thus

$$(3) \qquad CAR_i = \sum_{t=-4}^{t=+4} AR_{it} .$$

A positive CAR would imply the event helped the company (or index of firms), while a negative CAR implies the opposite.

An interesting question that arises given the results of the events studies is, what would be evidence of systemic risk? First, a high market beta would be an indication of risk, but not necessarily a systemic risk. However, a high market beta implies that the firm is sensitive to changes in the market. To the extent that the market is influenced by a shock, then firms with high betas will be stressed. This relates to Kaufman's correlation definition of systemic risk.

Second, a CAR consistent with a given event is a possible indicator of systemic risk. For example, if a firm's bankruptcy announcement leads to a negative CAR for another firm, this would be evidence of Kaufman's third example of systemic risk – a shock which leads to a negative return on similar firms as

uncertainty about these firms is created. Similarly, an announcement about a bailout which leads to positive CARs for similar firms might also be evidence of a systemic risk correlation, as the expectation is that all would benefit from the bailout. A third possibility exists in the sense that an announcement which negatively affects a company is associated with a positive CAR for another company. In this case, the company with a positive CAR experiences benefits from the negative announcement. This is more likely to be viewed as the effect of the injury to a competitor, which increases returns to the rest of the firms in the market segment. This is not systemic risk. Finally, if returns over the event period are correlated, this suggest some evidence of a systematic effect. This is also consistent with Kaufman's first definition if systemic risk which focuses on correlation. Each of these is examined in our event study: eta, CAR, and correlation of returns.

The result of each event is described in Tables 1-7 and is organized in the same manner. Table 1 shows the results of the February 2008 AIG CDS write-down event. The first column shows the market beta (β) estimated by equation (1). AIG has the third highest β just behind Ameriprise and Genworth Financial. AIG's β is higher than the TARP Recipients' Index β which suggests that AIG was riskier than a portfolio of TARP recipients during the estimation period. All of the βs (except Metropolitan's) are significantly greater than 1, which means their returns vary more than the market during this period. This implies that the life industry is more "risky" than the market as a whole during the period prior to AIG's write-down announcement. In contrast, the SNL Property/Casualty (PC) Index has a β of less than 1 and Allstate's β during this period is approximately 1. This suggests that the property liability industry is less sensitive to the market than the life industry and the TARP firms. This is to be expected since property and liability losses tend to be uncorrelated with the overall market. The third column in the table examines the hypothesis that the β is less than 1. It is merely a test whether the β is less than or equal to one. Those βs which are inconsistent with the hypothesis (or are rejected) are those with a β significantly greater than 1. These companies are therefore more risky than the market.

The fourth column shows the cumulative abnormal return (CAR) over the event window ([-4, +4]). What is interesting is that AIG suffers a statistically significant negative CAR of -0.139. The TARP firms also suffer a significantly negative CAR as does Hartford. In contrast, The PC Index shows a significantly positive CAR suggesting a competitive benefit as returns increased to the PC industry as a whole.[28] This makes sense, as an "injury" or impairment to AIG's ability to produce insurance helps the rest of the industry.

The fifth column shows the results of a test of correlation among the errors of the model estimated in equation (1). A seemingly unrelated regression model was estimated with AIG and each insurer (or

Table 1. AIG CDS Write-down (February 11, 2008)

	β	$H_o: \beta \leq 1$	Event CAR	Correlation with AIG	Returns correlated with AIG? (BP Test $\chi^2(1)$)
AIG	1.724 ***	reject	-0.139 **	-	-
SNL PC Index	0.641 ***	not reject	0.009 *	0.079	2.389
SNL Life Index	1.305 ***	reject	-0.015	0.222	8.144 ***
SNL TARP Index	1.591 ***	reject	-0.043 **	0.090	3.795 *
Met	1.182 ***	not reject	0.018	0.267	3.83 *
Lincoln	1.709 ***	reject	0.019	0.814	5.966 **
Hartford	1.332 ***	not reject	-0.083 **	0.725	7.797 ***
Ameriprise	2.021 ***	reject	-0.159	0.714	4.592 **
Allstate	1.087 ***	not reject	-0.011	0.608	3.329 *
Genworth Financial	1.775 ***	reject	-0.024	0.668	4.019 **

***denotes significance at the .01 level
** denotes significance at the .05 level
* denotes significance at the .10 level

index). The Breusch-Pagan (BP) test is a test of the correlation between the error in (1) for AIG and the error for each insurer (or index) during the period [-4, +4] days surrounding the event. If the test is significant, it implies that there is a relationship between the returns of the two stocks (or AIG and an index). For the AIG write-down event, there are correlations between AIG and the other returns including

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[28] Egginton et al (2009) find similar competitive effects.

those from the TARP index. This suggests that while there was a negative shock to AIG, other insurers'
returns were correlated with AIG's during this time period. This fits in with Kaufman's third definition of
systemic risk, but it is really limited in scope to companies identified as systemic risky (eventual TARP
recipients) and Hartford.

Table 2 shows the results from a different shock. This is the Bear Stearns - Federal Reserve Bank
of New York brokered sale to JPMorgan. A similar ranking of the betas (βs) is observed as in Table 1.
AIG is one of the higher beta firms (second only to Lincoln National). All the life insurers (except for
Metropolitan) and the TARP Index had betas significantly greater than 1. AIG had a significantly negative
CAR as did the SNL PC Index and Allstate. In contrast, the individual life insurers and the SNL TARP
Index had either statistically zero or positive returns. Further, the BP test shows that only Lincoln,
Hartford, and Genworth Financial had returns correlated with AIG during the event. Since these insurers
had positive event CARs, it is difficult to think that the life insurer results were systemically related to
AIG's returns essentially because of the positive CARs for life insurers.

Table 2 Bear Sterns Event (March 15, 2008)

	β	H_o: β ≤ 1	Event CAR	Correlation with AIG	Returns correlated with AIG? (BP Test $\chi^2(1)$)
AIG	1.610 ***	reject	-0.048 ***	-	-
SNL PC Index	0.665 ***	not reject	-0.033 **	-0.208	0.388
SNL Life Index	1.117 ***	not reject	0.024 **	0.376	1.247
SNL TARP Index	1.544 ***	reject	0.023 **	0.390	1.375
Met	1.240 ***	reject	0.025 **	0.499	2.238
Lincoln	1.611 ***	reject	0.020	0.629	3.559 *
Hartford	1.582 ***	reject	0.016 **	0.769	5.326 **
Ameriprise	1.461 ***	reject	0.030 *	-0.426	1.63
Allstate	1.090 ***	not reject	-0.028 *	-0.094	0.079
Genworth Financial	1.388 ***	reject	-0.002	0.556	2.78 *

***denotes significance at the .01 level
** denotes significance at the .05 level
* denotes significance at the .10 level

Table 3 shows the event study results for the Lehman Brothers bankruptcy. Note that this event was chosen because, like Bear Stearns, it was thought there might be a Fed-brokered bail out. This turned out to not be the case and Lehman Brothers went bankrupt. The market betas are again relatively consistent with the previous two tables. However, note the increase in AIG's beta from March to September. It increased from 1.60 to 3.027. Further, the life insurers also saw increases in their betas over the period, but not to the same degree as AIG. AIG had a negative CAR for this event, implying that the treatment of Lehman Brothers was likely to lead to a bankruptcy for AIG. Of all the other sectors or firms, only AIG and Ameriprise had a negative CAR. In fact the SNL PC index as well as the SNL Life index saw increased positive CARs, suggesting a competitive effect. Finally, there was no correlation among AIG's returns and the other indices or companies. Again while AIG is falling, we do not see negative CARs across broad industry sectors or individual firms. This is not consistent with the existence of systemic risk.

Table 3. Lehman Event (September 16, 2008)

	β		H_o: β ≤ 1	Event CAR		Correlation with AIG	Returns correlated with AIG? (BP Test $\chi^2(1)$)
AIG	3.072	***	reject	-1.064	***	-	-
SNL PC Index	0.752	***	not reject	0.154	**	0.103	0.095
SNL Life Index	1.592	***	reject	0.053	*	-0.044	0.018
SNL TARP Index	2.972	***	reject	0.018		0.410	1.509
Met	1.331	***	not reject	0.082		-0.142	0.181
Lincoln	1.898	***	reject	0.053		-0.108	0.105
Hartford	1.828	***	reject	-0.020		0.474	2.024
Ameriprise	1.760	***	reject	-0.055	**	0.065	0.038
Allstate	0.943	***	not reject	0.034	*	-0.070	0.43
Genworth Financial	1.949	***	reject	0.129		0.420	1.586

***denotes significance at the .01 level
** denotes significance at the .05 level
* denotes significance at the .10 level

Table 4 shows the results of an event study where the event was the cash infusion of $85 billion by the Federal Reserve Bank of New York. AIG still has the highest beta, just beating out the TARP index. AIG also suffers a relatively large and negative CAR. No one else suffers a negative CAR, but what is

interesting is that the PC Index shows a positive CAR, which likely reflects the effect of expected

diminished competition from AIG on the industry.

Table 4. AIG Bailout by NY Fed (September 17, 2008)

	β		H₀: β ≤ 1	Event CAR	Correlation with AIG	Returns correlated with AIG? (BP Test χ²(1))
AIG	3.005	***	reject	-0.635 *	-	-
SNL PC Index	0.7484	***	not reject	0.091 **	-0.496	2.218
SNL Life Index	1.5797	***	reject	0.030	-0.184	0.305
SNL TARP Index	2.973	***	reject	-0.020	0.276	0.687
Met	1.300	***	not reject	0.091	-0.020	0.004
Lincoln	1.900	***	reject	0.010	-0.226	0.009695
Hartford	1.829	***	reject	-0.035	0.284	-0.0351
Ameriprise	1.749	***	reject	-0.019	0.253	0.575
Allstate	0.950	***	not reject	-0.004	-0.481	2.081
Genworth Financial	1.930	***	reject	0.009	0.188	0.318

***denotes significance at the .01 level

** denotes significance at the .05 level

* denotes significance at the .10 level

Tables 5 and 6 show the results of two specific TARP related events. Table 5 shows the effect of

the passage of the law setting up TARP, while Table 6 shows the effect of the information regarding the

initial recipients and their initial funding levels. In Table 5, AIG has a positive CAR, as the expectation is

that AIG would have access to further funds to shore up its liquidity problems. The PC index shows a

negative CAR which is consistent with a competitive effect of a subsidized AIG on the PC market.

Hartford and Genworth also had positive CARs, which reflected the market's belief that they might be

recipients of TARP money. We also see evidence of correlated returns between AIG and the SNL TARP

Index, Lincoln and Ameriprise.

Table 6 shows the results of the TARP funding decision when the initial funds were allocated to the

TARP Recipients. Only Hartford and Genworth had positive CARs. This is likely due the fact that that it

may have been common knowledge that some of the other firms were going to be granted TARP funds

(such as AIG) while others would not (Allstate). Thus there was little effect on returns for this event. We

do see that there are correlated returns from the SNL Life industry index, the SNL TARP Index, Lincoln (a TARP Recipient), Hartford (a TARP Recipient), and Ameriprise.

Table 5. TARP Signed into Law (October 8th, 2008)

	β	H₀: β ≤ 1	Event CAR	Correlation with AIG	Returns correlated with AIG? (BP Test χ²(1))
AIG	4.119 ***	reject	0.350 **		-
SNL PC Index	0.810 ***	not reject	-0.035 *	0.439	1.731
SNL Life Index	1.881 ***	reject	0.052	0.496	2.216
SNL TARP Index	3.002 ***	reject	0.247 *	0.554	2.76 *
Met	1.586 ***	reject	0.094	-0.091	0.075
Lincoln	2.065 ***	reject	0.118	0.564	2.859 *
Hartford	2.245 ***	reject	0.356 *	0.440	1.471
Ameriprise	1.826 ***	reject	0.051	0.636	3.64 *
Allstate	1.051 ***	not reject	-0.096	0.326	0.957
Genworth Financial	2.365 ***	reject	0.561 **	-0.172	0.267

***denotes significance at the .01 level
** denotes significance at the .05 level
* denotes significance at the .10 level

Table 6. TARP Event II (October 13, 2008)

	β	H₀: β ≤ 1	Event CAR	Correlation with AIG	Returns correlated with AIG? (BP Test χ²(1))
AIG	3.908 ***	reject	-0.078	-	-
SNL PC Index	0.786 ***	do not reject	-0.030	0.072	0.046
SNL Life Index	1.618 ***	reject	-0.046	0.586	3.085 *
SNL TARP Index	2.528 ***	reject	0.153	0.679	4.149 **
Met	1.534 ***	reject	-0.976	0.030	0.008
Lincoln	2.065 ***	reject	-0.037	0.660	3.922 **
Hartford	2.194 ***	reject	0.263 **	0.720	4.670 **
Ameriprise	1.639 ***	reject	-0.021	0.661	3.943 **
Allstate	0.948 ***	not reject	-0.127	0.017	0.003
Genworth Financial	2.484 ***	reject	0.437 **	0.064	0.037

***denotes significance at the .01 level
** denotes significance at the .05 level
* denotes significance at the .10 level

Finally, our last event study is shown in Table 7. This is the date the Hartford and Lincoln National took TARP funds. By this time date AIG's β had fallen to 1.912 (about the same as Allstate's). Hartford

and Lincoln National's betas were the highest (at 4.4 and 3.8 respectively). While Hartford did not have a significant CAR as the event was likely to be expected, AIG had a significantly negative CAR as did the SNL TARP Index, and Allstate. A subsidized Hartford, which had a negative competitive consequence for AIG, is one possible conclusion. Another is that TARP funds might be "running out" and AIG would less likely obtain further contributions from a reluctant Congress. Table 7 also shows the correlation of returns to AIG and for Hartford Insurance Group. AIG's returns were correlated with Hartford's, as was the life and TARP indices and Lincoln National. By May of 2009, the turmoil from the credit markets had diminished and the likelihood of the collapse of the financial system was reduced. However, we still see correlations among the risky companies (TARP recipients) and the life industry, suggesting that there was a systemic link like that of Kaufman's third definition.

Table 7. TARP Event III (May 15, 2009)

	β	$H_o: β \le 1$	Event CAR	Correlation with AIG	Returns correlated with AIG? (BP Test $\chi^2(1)$)	Correlation with HIG	Returns correlated with HIG? (BP Test $\chi^2(1)$)
AIG	1.912 ***	do not reject	-0.263 **	-	-	0.725	4.735 ***
SNL PC Index	1.132 ***	do not reject	-0.007	0.079	0.056	0.227	0.464
SNL Life Index	2.977 ***	reject	0.018	0.222	0.444	0.631	3.580 *
SNL TARP Index	2.430 ***	reject	-0.082 **	0.090	0.073	0.635	3.624 *
Met	3.261 ***	reject	-0.029	0.267	0.641	0.479	2.062
Lincoln	4.413 ***	reject	0.219 ***	0.581	3.041 *	0.885	7.045 ***
Hartford	3.805 ***	reject	0.074	0.725	4.735 **	-	-
Ameriprise	2.500 ***	reject	0.019	-0.223	0.449	0.189	0.321
Allstate	1.940 ***	reject	-0.059 *	0.352	1.115	-0.144	0.186
Genworth Financial	3.672 ***	reject	0.176 *	0.764	5.259 **	0.503	2.062

***denotes significance at the .01 level
** denotes significance at the .05 level
* denotes significance at the .10 level

What do these results tell us about systemic risk? These particular tables examine Kaufman's first definition of systemic risk, i.e. "a high correlation and clustering of …failures." While the event studies are not exactly a test of failures, I examine correlation of returns and the level of significantly negative CAR's. In each event, if there was systemic risk, all returns should be correlated and all sectors or firms should experience a negative CAR. While we do see some evidence of correlation, we do not see it consistently, nor do we see significantly negative CARs during the major systemic risk events. Thus, there

is evidence which suggests little systemic risk present in the markets and between sectors over the entire period of time.

Before moving to a second test of systemic risk, it is also illustrative to look at how the individual firm betas for the SNL market indices have changed over the term of the financial crises. This is shown in Figure 3. The market betas were calculated for the period 30-60 days prior to the events described above. In addition, market betas were calculated for the first trading day of the month in April, May, June, July, August and September. At one extreme there is the SNL PC Index, which has relatively small change in its beta over the period. At the other extreme is the AIG beta, which changes quite dramatically over the period and looks much like the SNL TARP Index beta. Finally, the SNL Life Index shows modest change (relative to AIG) over the period.
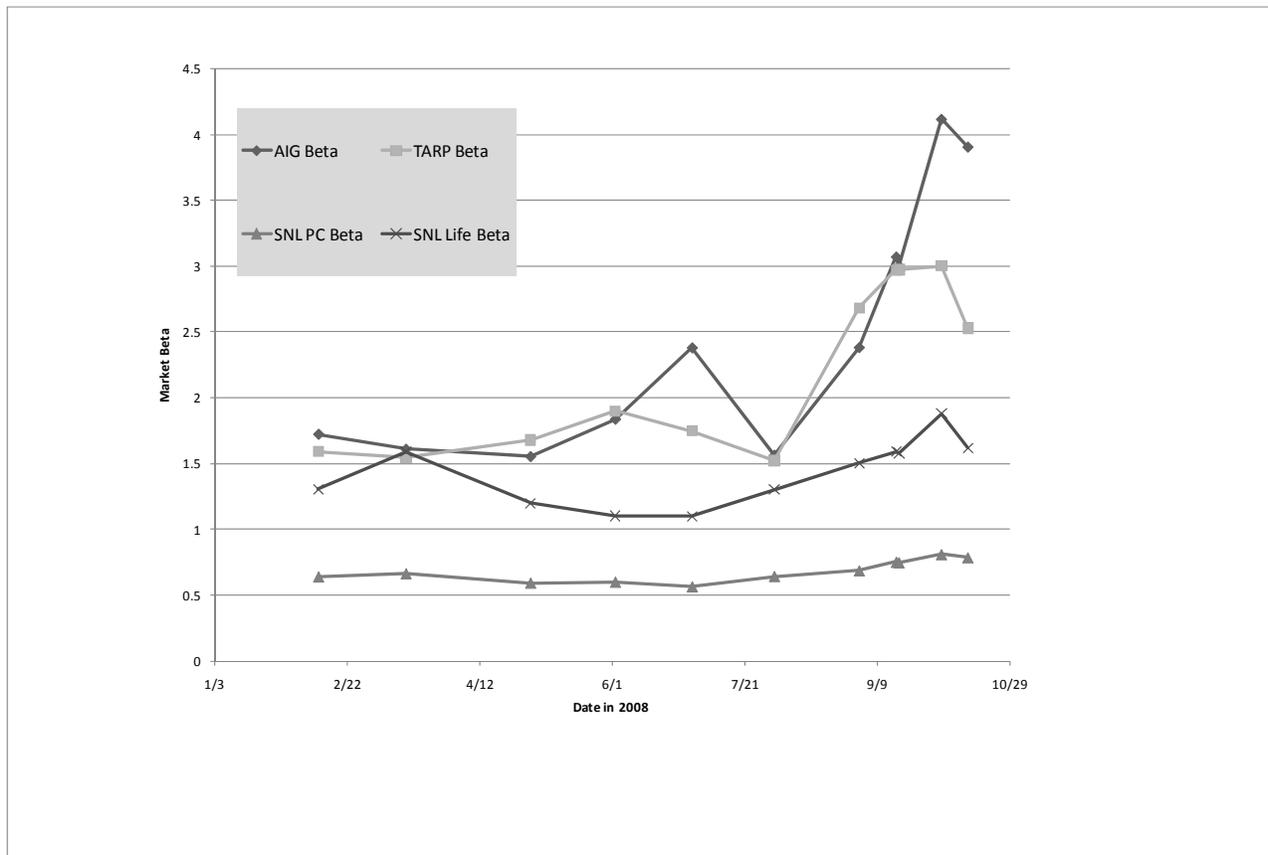

Figure 3: Capital Asset Pricing Model Betas over Time from February to October 2008.

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The results shown in Figure 3 and in the tables suggest that while AIG was becoming riskier, the PC and Life industry was experiencing little to modest change. This does not sound like what one would expect if Kaufman's first definition of systemic risk was present. Furthermore, the correlations among AIG's returns and other indices were not consistent over time, suggesting a lack of a systemic component to the relationship between AIG and other insurers. Often AIG's negative CAR was offset by industry indices with positive CARs. This also is inconsistent with a systemic risk to the insurance industries (both PC and life), leading one to believe that while AIG was risky and experienced an increase in risk, other insurers on an index basis were not much like AIG.

Finally, if we look over the various events, AIG and the SNL TARP Index seem to have similar characteristics in terms of betas and often had correlated returns. In contrast, the PC industry did not. Further, while the life industry has a higher beta than the PC industry, its returns were not always correlated with AIG and they often had CARs of the opposite sign from AIG. Thus, the evidence from the event studies does not suggest the insurance industry, other than AIG contributes to systemic risk.

B.   Causality and Simulated Responses to Shocks

Two further and related statistical tests were used to examine the effect of one firm's influence on the market or on other firms. These two tests are attempts at examining Kaufman's second and third definitions of systemic risk. The event studies described above look within the financial sectors and now we look at whether AIG influenced the broader market. The first test is called Granger Causality. This test asks whether lagged values of a particular variable are significant in terms of the prediction model on another variable. Thus our test is whether

$$(4) \qquad y_t = \alpha + \beta_1 y_{t-1} + \beta_2 y_{t-2} + \lambda_1 x_{t-1} + \lambda_2 x_{t-2} + e_t$$

is a better model than

$$(5) \qquad y_t = \alpha + \beta_1 y_{t-1} + \beta_2 y_{t-2} + e_t.$$

If equation (4) is a better predictor than equation (5), then Granger Causality exists. Thus in the parlance, X Granger Causes Y. Table 8 shows the results running three specific events: AIG's write down, AIG's bailout, and the acceptance of TARP money by Lincoln and Hartford. The first of the two AIG related events are separated by just about seven months and were chosen to examine whether AIG had an effect on other insurers or the market. The third insurance event, the acceptance of TARP funds by Lincoln and Hartford, looks at the effects of an insurance market shock after AIG has been partially resolved. Presumably, if the insurance industry was a source of systemic risk, it would show up in the responses to a major insurer's taking of TARP funds.

The results shown in Table 8 Panel A regarding AIG's February 2008 CDS portfolio write down are interesting. First, there appears to be no statistical evidence consistent with Granger causation between AIG's returns and other insurance companies or industry indices. Further, there no is evidence of a causal relation between AIG and TARP recipients either.

Table 8. Tests of Granger "Causality"

Panel A. CDS Write-down Event
Hypothesis: AIG Returns do not "Cause" Change in Returns of Stock or Index

Stock or Index	Result of Hypothesis Test	Conclusion	Significance
S&P	Do not Reject	No evidence of "Causation"	
SNL PC	Do not Reject	No evidence of "Causation"	
SNL Life	Do not Reject	No evidence of "Causation"	
SNL TARP	Do not Reject	No evidence of "Causation"	
ALLstate	Do not Reject	No evidence of "Causation"	
Metropolitan	Do not Reject	No evidence of "Causation"	
Hartford	Do not Reject	No evidence of "Causation"	
Ameriprise	Do not Reject	No evidence of "Causation"	
Lincoln	Do not Reject	No evidence of "Causation"	
Genworth	Do not Reject	No evidence of "Causation"	

Panel B. AIG Bailout
Hypothesis: AIG Returns do not "Cause" Change in Returns of Stock or Index

Stock or Index	Result of Hypothesis Test	Conclusion	Significance
S&P	Do not Reject	No evidence of "Causation"	
SNL PC	Reject	Evidence of AIG "Causing" Effect on Returns	**
SNL Life	Reject	Evidence of AIG "Causing" Effect on Returns	**
SNL TARP	Reject	Evidence of AIG "Causing" Effect on Returns	**
ALLstate	Do not reject	No evidence of "Causation"	
Metropolitan	Reject	Evidence of AIG "Causing" Effect on Returns	*
Hartford	Do not reject	No evidence of "Causation"	
Ameriprise	Do not reject	No evidence of "Causation"	
Lincoln	Do not reject	No evidence of "Causation"	
Genworth	Do not reject	No evidence of "Causation"	

** denotes significance at the .05 level
* denotes significance at the .10 level

Panel C. Hartford /Lincoln TARP Acceptance
Hypothesis: Hartford Internal Group's Returns do not "Cause" Change in Returns of Stock or Index

Stock or Index	Result of Hypothesis Test	Conclusion	Significance
S&P	Do not Reject	No evidence of "Causation"	
SNL PC	Do not Reject	No evidence of "Causation"	
SNL Life	Do not Reject	No evidence of "Causation"	
SNL TARP	Do not Reject	No evidence of "Causation"	
ALLstate	Do not Reject	No evidence of "Causation"	
Metropolitan	Do not Reject	No evidence of "Causation"	
AIG	Do not Reject	No evidence of "Causation"	
Ameriprise	Do not Reject	No evidence of "Causation"	
Lincoln	Reject	Evidence of HIG "Causing" Effect on Returns	*
Genworth	Reject	Evidence of HIG "Causing" Effect on Returns	*

** denotes significance at the .05 level
* denotes significance at the .10 level

Panel B shows the results from AIG's returns on the indices and insurer returns during the period of AIG's September bailout. In this case, there is a Granger causal relationship. First, a Granger causal relation exists between AIG and the various indices and Metropolitan Life Insurance. An interesting point here is that relationship changed over the period from February to September 2008. Thus, we do see evidence that AIG was systemically related to the various insurance industries' returns.

Table 8's Panel C shows the analysis for the Hartford/Lincoln National acceptance of TARP Funds. The question here is whether Hartford's returns cause changes of returns for other indices or companies. Only for Lincoln and Genworth do we see evidence of Hartford's returns causing any effect.

Kaufman's second definition of systemic risk included causation. Using a specific definition of causation, it is possible to say during the AIG bailout period that AIG's returns Granger-caused returns in the insurance sector. However, during the AIG write-down there was no Granger causation between AIG and other companies. Finally, there was some casual relationship between Hartford and Lincoln and Genworth during the period when Hartford accepted TARP funds. However, no other firm or sector was affected. These tests suggest that, during the systemically important events surrounding the market in September of 2008, there was evidence of causation between AIG and other firms. However, because this is the only time period where significant "casual" relationships exists, the conclusion that systemic risk exists needs to be moderated somewhat as the entire market experienced losses and it may be that AIG did not cause anything per se. AIG could have been experiencing events just prior to the market experiencing them, rather than causing the market to fall.[29] Granger casualty cannot discern the difference between AIG's possible increased sensitivity relative to the market and whether it actually was the cause of the other companies experiencing lower returns.

Kaufman's third definition of systemic risk is based upon how firms respond to a shock. It is possible to obtain an appreciation for how firms respond to a shock to liquidity or how other firms respond

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[29] An econometrician once said that Granger causation would be consistent with a rooster's early morning crowing "Granger Causing" the sun to rise. The same is true with AIG. It could be possible that AIG just naturally experienced realized losses prior to the market experiencing them.

to a shock in the returns to a company like AIG. A way to do this is to model the returns jointly and then use a simulation to see how firms or sectors might respond to a shock.

Figures 4-7 present the graphical results of an error-corrected vector auto regression model. These graphs are the result of a simulation of the relationship among the returns over time. Essentially, one estimates a regression like

$$(6) \qquad r_{it} = \alpha + \beta r_{jt} + \lambda r_{kt} + \text{Lagged Terms} + e .$$

After the estimation, we shock r_j (and/or r_k) to see how the shock influences r_i forecasted into the near future. The results, in terms an impulse response function, are then graphically described in Figures 4-7.

The event study tests focused solely on insurers and TARP recipients, but this new test introduces another variable which reflects the state of the market in terms of liquidity. This variable is the spread between the three-month T-bill rate and the three-month London Interbank Offered Rate. This spread reflects the cost of liquidity and is called the TED spread (see Brunnermeier, 2009). A higher TED spread indicates a lower level of available liquidity. Specifically, what is tested with the impulse response function is the effect of a shock to AIG's returns on the TED spread. If AIG is systemically important, then it should have an effect on the TED spread. If, however, there is little effect from the shock, then there might be no evidence of a systemic effect.

Figure 4 provides the impulse response functions for the period surrounding the AIG write-down event. The figure shows the impulse response function of the TED when the AIG return, the TARP Index return are shocked.   This simulation tracks the TED's response to a shock over the next 15 days. So, if we shock each of these returns, the question is what happens to market liquidity as measured by the cost of liquidity (TED)? A shock to the PC Index has the highest effect compared to the Life Index, AIG, and the eventual TARP recipients. Recall that this time period is prior to the discovery of serious problems at AIG or at the banks. What the results suggests is that an unexpected shock to returns from the PC industry has a relatively large effect on the TED compared to shocks from the other indices. However, at its peak the

effect of a 10 percent shock to the underlying PC Index was only about .005 percent to the TED. This is consistent with the market's participants not anticipating the effect AIG's future problems would have on liquidity.
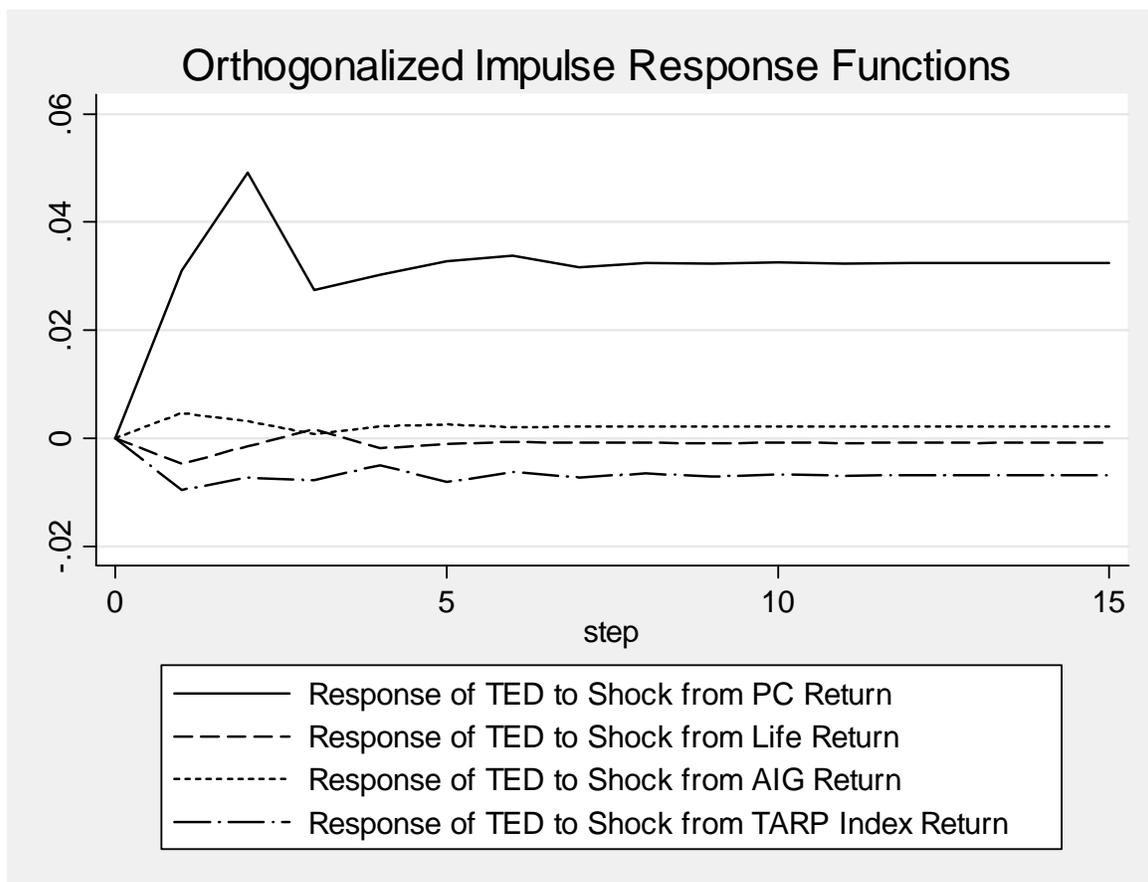

**Figure 4: Impulse Response Functions of the TED Spread from Shocks to Various
Stocks or Indices for AIG CDS Write-down Event Period (February 2008).**

Figure 5 shows the same experiment during the AIG bailout period. A shock to AIG or the returns from the TARP recipients has significantly larger effects on the TED than the PC or life industry. However, note that in Figure 4, the largest effect on the TED was about 2.5 times higher in February than in September 2008. During these two time periods, the TED spread increased from 82.156 to 302.094 a percentage change of approximately 268 percent.[30] Thus, while the shock's effects seem lower in September the overall level of the TED was significantly higher. Further, if we examine the TED's response

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[30] See "Ted Spread" *Bloomberg.com*, http://www.bloomberg.com/apps/cbuilder?ticker1=.TEDSP%3AIND.

to shocks to the Life and PC Index, they are in the opposite direction from AIG's and the TARP recipient's

shocks.

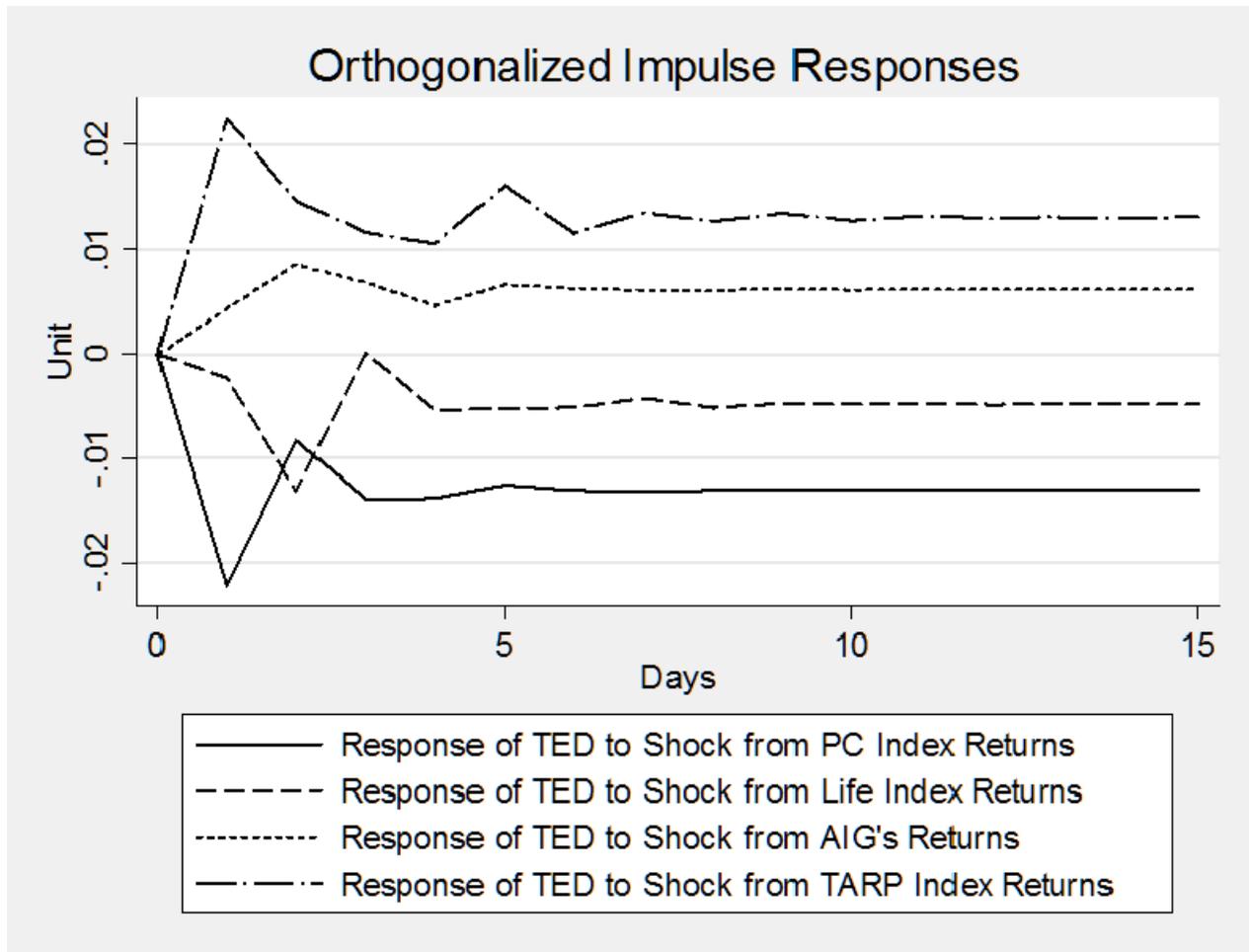## Orthogonalized Impulse Responses

**Figure 5: Impulse Response Functions of the TED Spread from Shocks to
Various Stocks or Indices for AIG Bailout Period (September 2008).**

Figure 6 shows impulse response functions for shocks to Hartford International Group (HIG) during

the period that Hartford accepted TARP Funds. This particular time period is chosen to test whether there

is a systematic link between Hartford and other insurers. Figure 5 shows the link between TED (overall

market liquidity) and the influence of the insurance industry. In contrast, Figure 6 shows the link between a

large insurer and various aspects of the insurance market. The shock to HIG has relatively similar and

small effects on the PC Index, the Life Index, AIG, or TARP Recipients. One would think that if HIG was

systemically important, then a shock to its returns would have greater effects.

Finally, Figure 7 shows an impulse response function for the TED during the same time period as the Hartford's acceptance of TARP funds. A shock to Hartford did have the biggest effect on the TED, but at its height the effect was only .005 units. This is in contrast to a shock in the PC industry which had its largest effect at 0.002 units. These four simulations look at the effect of insurers on the broader financial market as well as among themselves during periods of financial turbulence related to insurers. The relationships appear stronger at the beginning of the financial crisis (AIG's write down), but still are not large.
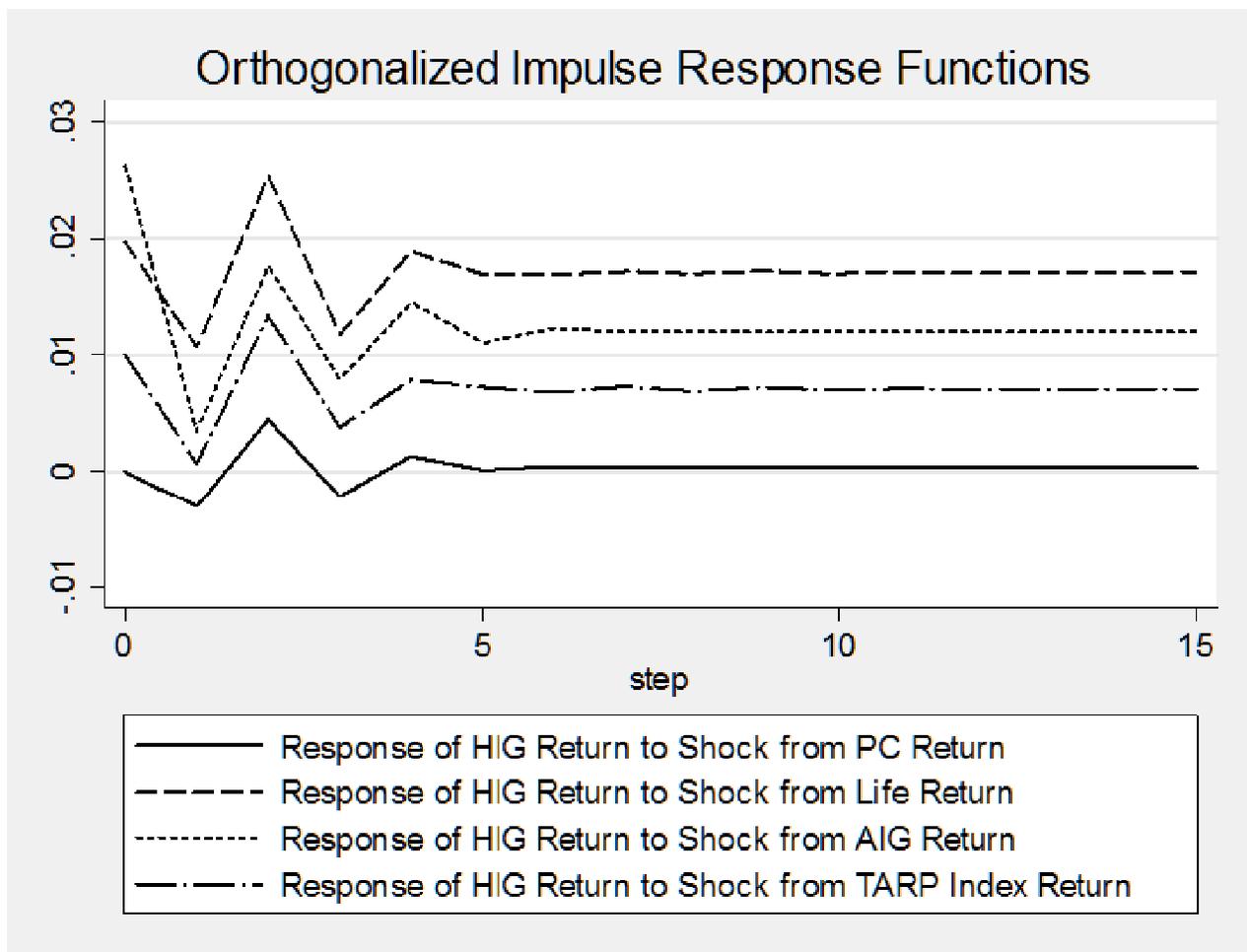

Figure 6: Impulse Response Functions of the Indices or Insurers from Shocks to Hartford International Group (HIG) for the Period Around HIG's Acceptance of TARP Funds.
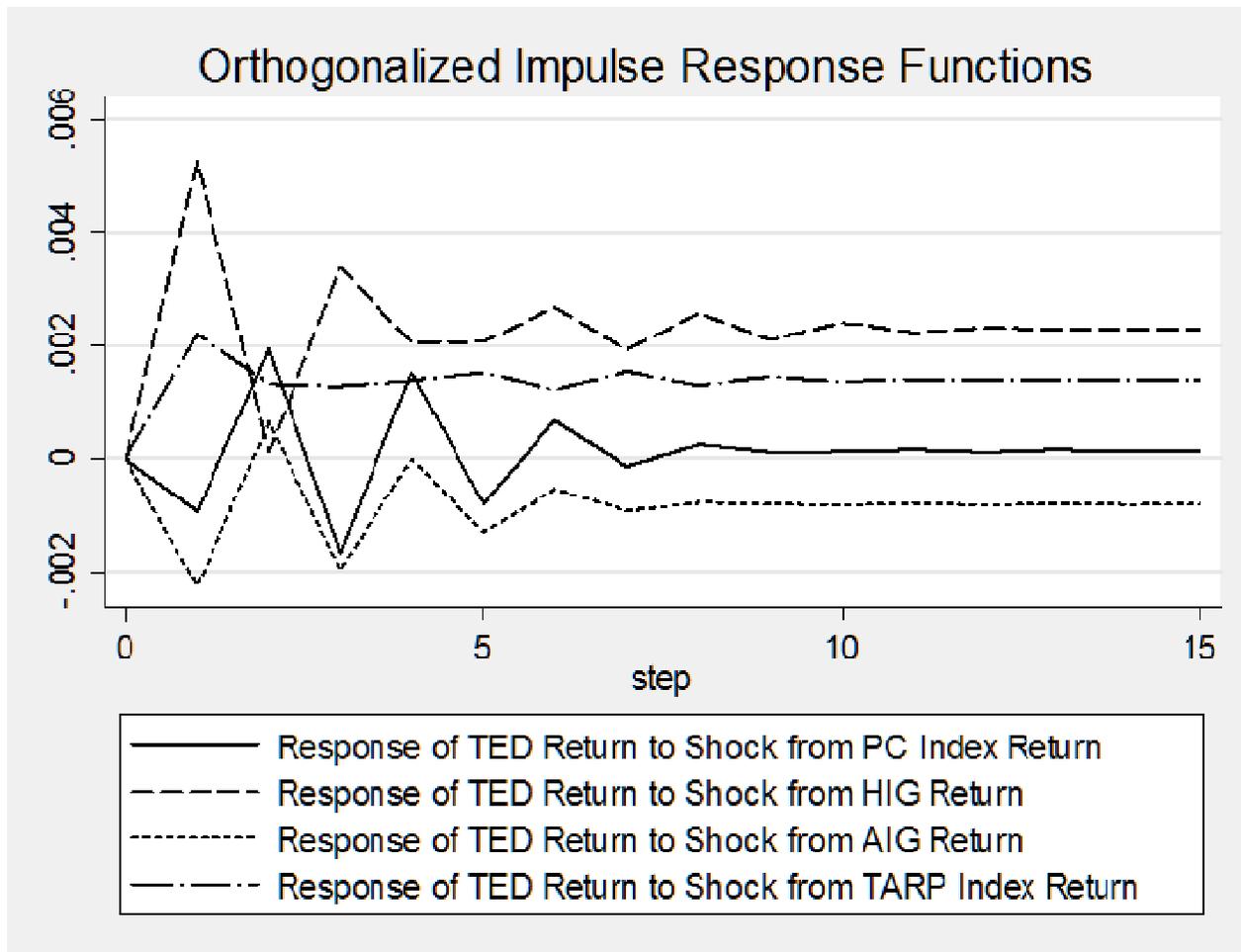
Figure 7: Impulse Response Functions of the TED Spread from Shocks to Indices or Insurers for the Period Around HIG's Acceptance of TARP Funds.

Kaufman's third definition of systematic risk concerns how firms behave after a shock. If we model the shock to liquidity as measured by a shock to the TED or by a shock to a particular company, we can see how other firms or industry sectors respond to the shock. What is interesting about this impulse response function approach is that one can observe how a shock to AIG gets transmitted to other firms or sectors as well as how a liquidity shock gets transferred to firms in the financial sector. Overall, the results of the impulse response function suggest there is some systematic effect (especially in February) resulting from a shock to AIG returns on the cost of liquidity. However, this effect was lessened by the time of AIG's bailout event. This diminishment could have been, in part, due to the fact that a great deal of activity occurred over the weekend prior to the AIG bailout and while AIG was still important it affects on others had already been taken into account. However, the overall effects are consistent with Kaufman's definition

regarding correlation after a common shock. In sum, there is evidence that AIG was systemically related to the market, but that other insurers were not. Further, by the time of AIG's bailout and when Hartford accepted TARP funds, the systemic effect was lessened.

IV.   Discussion

The results from the market analyses described above are generally inconsistent with the insurance industry being a source of systemic risk. However, there is some indication that AIG's effect on the market was systemic. AIG looked very much like the TARP recipients in many of the tests. In fact, due to the effect systemic risk plays on the valuation in the market overall, if anything, the industry (not including AIG) is a potential victim of systemic risk much like other institutional and individual investors are. Insurance insolvencies tend to be caused by fraud, mismanagement, or a natural disaster – not systemic risk.[31] What made AIG different than most of its insurance counterparts is the counterparty risk it held and the resulting connections to other financial institutions.

The life insurers who were stressed by the financial meltdown tended to have guaranteed annuity products that were improperly priced. Two types were issued: one guaranteed minimum withdrawal benefit and the other with a minimum value benefit. The financial crisis caused a change in the value of these products and created a potential for a run on the insurer. While this sounds like Kaufman's contagion definition of systemic risk, it is slightly different than a bank run, as annuitants could not remove all of their money – just a portion. However, insurers also promised a floor on the value of the annuity. This amount, however, was enough to cause concern at the firms writing such annuities as well as the state regulators and the federal government. Insurers had to add reserves at a time when the value of the market was falling. This is the rationale for their TARP membership and eventual fund draws.[32] The number of insurers writing

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[31] See e.g., the various A.M. Best insolvency studies published over the last twenty years. The most recent is A. M. Best (2008), "Best's Impairment Rate and Rating Transition Study, 1997-2007," April 21, http://www.ambest.com/ratings/methodology/impairment.pdf.

[32] The NAIC recently proposed changes to the life reserving process by making them principals based rather than formulaic. It may actually reduce the reserves necessary for GMWB annuities.

this type of business is relatively small, but the wealth effect is much bigger. Other problems in the life industry concern the overreliance on derivatives pricing models when the models are not yet robust to large market declines. Again, this is something everyone realizes now. It is also not something the firms or regulators pushed previously.

So what does this mean about regulation? As mentioned above, the insurance industry has not been injured quite the same way the banking industry has been injured. This is in part due to the different nature of insurers versus banks. It does not really say anything about regulation of insurers. The state system of regulation is arguably inefficient (Grace and Klein, 2000; Grace and Phillips, 2007; Pottier, 2007). One might argue that the inefficiency is what prevented the insurance industry from suffering the full effects of the financial crisis. This is not necessarily accurate, as the New York insurance commissioner arguably had something to say about AIG (as did the Pennsylvania Insurance Commissioner or any other state insurance commissioner that regulated an AIG company domiciled within its state). A corollary argument is that the 50 state system works well because more than one set of regulators is looking over an insurer. Again, this did not stop AIG from avoiding state regulatory scrutiny for its Financial Products division.

State regulation has nontrivial transactions costs which are ultimately paid by consumers in terms of higher prices. The industry has been proposing an Optional Federal Charter, which would allow companies to choose to be regulated by the states or by the federal government. This proposal for the most part, represented by the National Insurance Consumer Protection Act,[33] is not real regulatory innovation. It merely takes a structure found in the banking industry invented during President Lincoln's administration, in part as a way to raise taxes on the newly created federal banks, and combines it with state insurance cobweb-covered consumer protection laws to make a supposedly new regulatory structure.[34]

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[33] H.R. 1880 (2009), "National Insurance Consumer Protection Act," http://www.govtrack.us/congress/bill.xpd?bill=h111-1880.

[34] See Grace (2009) for more on this particular issue, as well as Grace and Scott (2009).

While the 2008 *Treasury Blueprint* is no longer being discussed, it did have some innovations which might have a positive influence on the regulation of insurers. In a nutshell, the *Blueprint* called for three regulators: solvency, consumer protection, and a risk regulator. The Treasury report avoided overt approval of an OFC but implied that it would be permissible within their envisioned regulatory system. These three monitors would each have a different mission. Unlike state insurance regulators, which all have the same mission, the three-headed regulator would be able to discern different information about the regulated firm. In fact, this type of multiple agency regulator has been examined by Martimort (1999), who suggests it can increase efficiency as there are benefits to having separation of powers and overlapping jurisdiction.

Butler and Ribstein (2009) have also proposed a novel solution to the structuring of regulation and that is to allow (with some restrictions) the interstate sales of insurance, with regulation being conducted solely by the company's home state. This would also increase efficiency as it reduces duplicative regulation, since only the home state's regulation would apply. The benefit of this proposed solution is that the duplicative costs of regulation would be reduced.

Neither the *Blueprint* nor the Butler-Ribstein plan is on the table currently. The Optional Federal Charter bill mentioned above is still on the table, as well as bill which would create a proposed Office of National Insurance. This second bill provides for a small group within Treasury to provide information to the federal government about the insurance industry. Congress is considering a massive regulatory change and the Obama Administration's *White Paper on Financial Regulation* (U.S. Department of Treasury, 2009) is one of the starting points employed by both houses of Congress.

Among other things, the *White Paper* proposes to regulate any institution whose "combination of size, leverage, and interconnectedness could pose a threat to financial stability if it failed." This position would likely have caused AIG to be regulated by the risk regulator. The evidence above suggests that AIG, but not insurers in general, was sufficiently interconnected and able to influence the cost of liquidity. However, if we are concerned about this issue, it is possible that it is exacerbated by oversight as a

systemically important or too big to fail (TBTF) institution. Systemic risk, arguably, was created by the implicit assumption that the Fed, the Treasury, or the Congress would protect counterparties. If the counterparties thought they might have a default risk, they would not have paid the same prices to AIG. AIG would not have been able to sell as many CDS and the market participants would have been able to discipline each other. Further, in the case of a firm failure, it would not have been of the same size in terms of private or public cost.

The risk regulator's oversight comes with an implied TBTF protection. This protection creates moral hazard. The protection would allow firms to borrow at lower cost and at the same time increase their riskiness. In addition, the TBTF protection provides a competitive advantage to those lucky institutions. Thus, over time we see a reduction in the number of firms competing against the TBTF companies. This allows the TBTF firms to become even bigger, which in turn, increases the risk to the taxpayers.

Even if the regulator charged a risk premium for the expected guarantee for a TBTF firm, it would never be priced appropriately. Not one federal insurance program sells accurately (risk) priced insurance coverage. It is all subsidized in some manner. Further, there is nothing the government can do short of a constitutional amendment that will credibly commit itself to proper risk based pricing. If instead of an insurance premium, the government required the potentially TBTF institution to reserve appropriately, it would still have difficulty in credibly calculating the appropriate level of capital. The better solution is to commit to no future bailouts, but given the incentives of politicians to seek reelection, that is not a credible commitment either. All one has to do is examine the history of the federal crop insurance program or the federal flood insurance program to see how this TBTF guarantee will eventually evolve.

It seems opposite from common sense, but the best approach would be to not permit any institution to be classified legally or by any type of implication as TBTF so as to let the market discipline the participants. It is not likely that this will ever be agreed to by any Congress or any President. So, the second best policy would be to recognize that Congress has never been able to say no to a bailout and to develop a policy that minimizes the social costs of a TBTF policy.

This is where state-based insurance regulation might provide assistance. Insurance failures are costly and they are costly to resolve at the state level (Grace, Klein and Phillips, 2009), but due to an ex post bankruptcy assessment as well as limited coverage, there is an incentive for policyholders to make an attempt at assessing the risk of an insurer before commencing a relationship. This is what is missing from non-insurance financial markets. The FDIC full first dollar insurance coverage and the implicit TBTF guarantee has a rational, but pernicious, affect on risk taking by depositors, managers, and counterparties. A social cost minimizing policy would introduce some aspect of risk sharing to depositors and counterparties. This will reduce the growth of the future public liability for any type of financial disaster.

V.   Conclusions

This paper examines the role insurance plays in either causing systemic risk or being a victim of it. The findings suggest that AIG was a systemically important company, but that generally insurance does not create risk to financial markets. The state-based system of insurance regulation did not directly prevent insurers from experiencing systemic risk events. Nothing about the lack of an insurance meltdown is due to any superior regulatory foresight by state insurance regulators. That success is more likely attributable to the fact that insurers differ from banks. A demand for financial innovation by banks which help them to fix their asset-liability maturity mismatch though securitization did not exist in insurance. In addition, there is less structural moral hazard in the insurance regulatory apparatus. Implicit or explicit guarantees regarding failed insurers are limited which, in turn, reduces moral hazard. Further, the government programs to subsidize high risk loans through federal guarantees have no real counterpart in insurance.

The governmental level at which insurance is regulated is immaterial as long as similar moral hazard risk is present in both regulatory systems. However, there is a risk that this would change if an Optional Federal Charter law is enacted. There is a higher risk that Congress would permit a creeping socialization of risk pricing for federally chartered insurers through subsidies to various higher risk insureds as the costs are spread nationwide. States desire to engage in subsidization for high risk consumers to some

extent, but they can quickly see how these subsidies destroy markets over short periods of time. In addition,

it creates a massive political problem that has political as well as fiscal costs.[35]

The federal government cannot help being a good Samaritan in time of crisis. Ideally, it must

redesign its financial guarantees to minimize future moral hazard costs. This will be hard to do, but it will

be the only way to solve the "too big to fail problem."

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[35] See the various chapters on New Jersey, Massachusetts, and South Carolina on the regulation of automobile
insurance prices in Cummins (2002). Also the Florida homeowner's insurance market has been nearly destroyed by
failing to allow risk based pricing.

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