Systemic Risk and the U.S. Insurance Sector

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Introduction

Beginning with the bursting of the housing bubble in 2007, the term systemic risk has been gathering increasing importance for all financial market players (investors, regulators, financial institution management, etc.). In particular, defining systemic risk, mitigating the effects of systemic events, and developing strategies to forestall future systemic crises have been the focus in regulatory discussions at every level of functional regulator and across all financial markets. In fact, new regulation has been proposed for financial institutions at the federal level, including for some insurers. Therefore, a specific question arises as to whether a financial institution such as an insurer is systemically risky or not. Insurers, with the possible exception of monoline financial guarantee, strongly maintain that insurance is not systemically risky, while some regulators disagree. Very little direct research concerning insurance and systemic risk exists however.[1]

The purpose of this paper is to investigate whether the U.S. insurance sector is systemically risky. In answering this question, the basic operations of insurers are examined (i.e., underwriting), and insurer financial statistics are compared to another, systemically important financial sector, commercial banking. Of course, the term systemic risk must be defined to achieve this research's objective. Therefore, the finance literature is reviewed for a common, reasonable definition of systemic risk. Primary factors that are associated with systemic risk in the literature are identified (e.g., interconnectedness, substitutability, concentration, and infrastructure), and these factors are reviewed for their role in systemic events. Finally, the factors associated with systemic risk are assessed with respect to the insurance sector.

By way of preview, the analysis suggests that insurers are not instigators or the cause of systemic risk. Therefore, they do not require systemic risk regulation -- any direct systemic risk regulation of insurers is unlikely to stem future systemic risk crises. Instead, most systemic risks arise from common shocks in the market. Thus systemic risk regulation should concentrate on reducing the impact of these market shocks (rather than focusing on "too big to fail" (TBTF) institutions). However, as financial intermediaries, insurers are prone to the effects of systemic shocks on financial markets

[1] Notable exceptions are Harrington (2009), Swiss Re (2003) and Bell and Keller (2009).

(regardless of their cause), especially life insurers. Therefore, insurance regulators have a stake in developing any new regulations regarding systemic risk, because of insurers' exposure to it. Thus insurance regulators should be included in discussions relating to systemic risk and should play a role in any new systemic risk regulation.

The remainder of this paper is organized as follows. In the next section, insurers' exposure to financial risk is discussed. Following this, systemic risk for purposes of this research is defined. Primary and secondary factors associated with systemic risk are discussed. The third section directly addresses the issue of whether U.S. insurers are systemically risky. The last section concludes, with suggestions regarding regulation of systemic risk and insurance.

Insurance Financial Risks

All financial institutions face financial risk. The principal types of financial risk are market, credit, liquidity, and underwriting (or technical risk)[2]; and the extent of exposure to these risks vary by type of financial institution (insurers, banks, and securities firms). In this section, the exposure of insurers to financial risks is discussed.

Underwriting as Core Activity

Traditionally, the fundamental purpose of insurance is the pooling or diversification of risk for purposes of achieving risk reduction (i.e., underwriting).[3] In the vernacular, pooling involves using the law of large numbers (or the law of averages) to make losses more predictable, thus alleviating risks that individuals and companies would otherwise have to bear. The types of risks pooled are typically "real events" such as theft, fire, sickness, death, and natural hazards (Bell and Keller, 2009). These are exogenous events and mostly independent in nature, as opposed to other types of financial risk which tend to be systematic (such as market risk).[4]

In the simplest case, diversification takes place by insuring a variety of risks. Typically, similar risks are pooled together through a risk classification process. Further

[2] Of course, financial institutions are exposed to many other types of risk, such as operational risk.
[3] An exception is that some types of life insurance products are primarily asset accumulation vehicles.
[4] Some types of risks may be correlated, with classic cases being losses from a catastrophe (such as hurricane or earthquake) or a pandemic.

diversification takes place by underwriting different types of risk (e.g., fire and auto), by underwriting in different geographic areas (across different states and different countries), and by diversifying across different types of risks (such as underwriting and investment risk).

To the extent that risk is not eliminated by diversification, mitigation techniques may be used by insurers. The primary mitigation devices for underwriting risk are reinsurance and securitization. In a reinsurance transaction, an insurer (the primary company) cedes some of the business it has issued to another insurer (the reinsurer).[5] Reinsurance may be desirable because the reinsurer may be able to achieve better pooling or diversification of risk than the primary company since it operates on a global basis and can further diversify risks geographically and by (risky) lines of business.[6] Reliance on reinsurance exposes insurers to another financial risk, credit risk (i.e., the risk that the reinsurer will not be able to pay contractual losses under the reinsurance policy).[7] Finally, securitization, such as through insurance-linked securities like catastrophe or mortality bonds, is increasingly being relied upon for insurance of losses for which even reinsurers may not be able to obtain an adequate spread of risk or in circumstances where it is relatively cheaper to use securitization than reinsurance.[8] Insurance-linked securities are attractive to investors because of their low correlation with capital market returns.

Insurance policies are typically pre-funded, as premiums are paid prior to providing coverage. Because insurance is pre-funded, insurers must estimate the losses associated with policies prior to policy issuance; actuarial analysis and tools assist in this process. Thus insurers face pricing or underwriting risk (sometimes called technical risk), and this is a significant risk that insurers bear, especially property-liability insurers.[9] Once policies have been issued and loss experience begins to develop, insurers form ex post estimates of losses for their policies. The estimate of unpaid losses for insurance policies issued is frequently referred to as reserves, or loss reserves.

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[5] Ceding reinsurance is similar to transferring or selling the business, except that the primary insurer remains ultimately responsible for paying claims under the policy.

[6] Some lines of business are considered riskier than others and may require a larger spread of risk for diversification than the primary insurer can underwrite, given the capital of the primary company.

[7] This risk is sometimes mitigated by collateral requirements.

[8] For a good discussion of risk mitigation devices including catastrophe bonds, see Cummins and Weiss (2009).

[9] Market risk is the major risk borne for some types of life insurer policies such as some types of annuities.

Estimating adequate reserves for losses and benefits is complicated by the payment patterns for losses and benefits. For example, in occurrence-based property-liability insurance, even though coverage under a policy may cover occurrences over a one year time frame, losses associated with the occurrence may be paid after coverage under the policy has expired. Thus, latent diseases associated with the workplace may not manifest themselves until years after a workers' compensation policy has expired; but if the occurrence (disease) can be traced back to the year of coverage, the insurer is responsible for workers' compensation losses. For some lines of business, such as workers' compensation, there can be a long time lag between payment of premiums and payment of losses, hence these lines of business are sometimes referred to as long-tail. Examples of long-tail lines typically include liability lines of business such as general (commercial) liability, medical malpractice, homeowners multiple peril and auto liability.[10] In contrast, in lines such as property insurance (e.g., auto collision or theft), loss payments are made relatively quickly; hence these lines of business are considered short-tail. In life insurance, mortality and morbidity statistical tables makes estimation of future losses more straightforward; however, complications can still arise (e.g., estimation of lapse rates).[11]

Insurers as Financial Intermediaries

Insurers invest the (pre-funded) premiums until loss (property-liability insurance) or benefit payments (life insurance) are made. Investment of premiums exposes insurers to market, credit and mispricing risk, as the major types of insurer invested assets are bonds (both government and corporate) and equities. In particular, anticipated loss and benefit payments under the policy are discounted when determining the premium, hence

[10] The statutory statements of property-liability insurers, called the Annual Statement, details loss payments for these lines of business in Schedule P. Schedule P indicates historical loss payouts over a 10-year period attributed to specific years of occurrence (accident or report years) for long-tail lines of business. Using the year 1998 as an example, the payment history of losses attributable to 1998 over a 10-year period is provided in the Annual Statement. Of the total losses paid after 10 years, 45% were paid in 1998 and 91% had cumulatively been paid out by the end of 2002. The latter statistics apply to the entire industry. For specific lines of coverage, the payment pattern may be more extended. For workers' compensation insurance, for example, of the total losses paid after 10 years for coverage associated with 1998, 25% were paid in 1998 and 85% were paid out by the end of 2002. These payment percentage estimates are extremely conservative because they assume that total losses associated with the year 1998 are all paid out after 10 years. In reality, the payment stream can continue over 20 years or more.

[11] Lapse rates may be related to market risk and underlying economic conditions.

insurers face the risk that investments will yield a lower return than assumed in premium pricing.

Predictability of loss payment timing varies by line of business, hence insurers face the possibility that they may be required to liquidate assets at an inopportune time (liquidity risk). Life insurers, especially, are exposed to liquidity risk in their life and annuity contracts, since policyholders may have the option to cash in a policy (e.g., an annuity). The liquidity risk may be related to market risk since policyholders may choose to withdraw funds during adverse market conditions. The latter could be a significant problem if withdrawals occur at the same time that markets freeze up.

Capital Requirements

Although pooling makes loss and benefit payments more predictable, they are by no means known in advance with certainty. Therefore, regulation places significant emphasis on the appropriate calculation of reserves. Further, insurers hold additional capital (or surplus) to absorb the effects of larger than expected losses (underwriting risk) and unexpected investment losses. Minimum amounts of capital are prescribed by regulation and, in the U.S., are based on the risks of the specific insurer (i.e., capital requirements are risk-based). Thus firms writing relatively riskier lines of business or investing in relatively riskier investments are required to hold relatively larger capital, so that the minimum amount of capital held is commensurate with each insurer's risk. In reality, most insurers hold capital amounts well above the minimum regulatory required level.

Financial Distress and Guaranty Funds

Ultimate responsibility for U.S. insurer solvency rests with each state insurance department and the state insurance Commissioner (sometimes also known as the Administrator, Director or Superintendent of Insurance). State insurance departments are assisted by the National Association of Insurance Commissioners (NAIC), whose overriding objective is to assist state insurance regulators by offering financial, actuarial,

legal, computer, research, and economic expertise.[12] Every state insurance department in the U.S. is financially accredited. The purpose of the financial accreditation program is for state insurance departments to meet minimum, baseline standards of solvency regulation, especially with respect to regulation of multi-state insurers.[13] It is partly because of the accreditation program that it can be said that the U.S. has a national system of state insurance regulation (NAIC, *United States Insurance Financial Solvency Framework*, 2009).

In a competitive market such as in the U.S., insolvencies are not unexpected. In theory regulation is designed to balance the benefit of reducing insolvencies from increased regulation with the cost of increased regulation on the market. Table 1 contains information on the number of insolvencies and insolvency rate (expressed as a percentage of companies) for the years 1988 to 2008. The maximum number of insolvencies for life-health (property-liability) insurers occurred in 1991 with 81 (60) insolvencies. The average number of insolvencies (rate) was 21.3 (1.2%) for life-health insurers and 32.2 (1%) for property-liability insurers over the period. The low number of insolvencies and impairment rates attest to the effectiveness of state insurance regulation and market discipline in insurance.

Insurers that are seriously financially impaired are handled in one of two ways. The insurer may be placed into receivership while the liabilities are "run-off."[14] That is, as indicated above, loss payments under policies do not actually become due until some point in the future (often years), so the receiver operates the insurer so as to pay off (or run off) losses as they actually come due. Alternatively, for life-health insurance, the business of the insolvent insurer may be sold to another insurer (with the help of additional funds as explained below), and the policies are continued under the new insurer. Thus, liquidation of assets at distressed prices usually does not occur in an insurer insolvency nor are immediate payments/settlements to all policyholders made at

[12] The NAIC is a voluntary organization of the chief insurance regulatory officials of the state insurance departments.
[13] To be financially accredited, a state must demonstrate that it has met and continues to meet a wide range of legal, financial, functional and organizational standards.
[14] An insolvent insurer is defined to be an insurer which is in receivership or liquidation.

that time.[15] (An exception exists for life insurers. There is a danger that many policyholders would surrender their (cash value) policies as an insurer becomes financially distressed causing a liquidity problem.) The latter exception notwithstanding, insolvent insurers typically have substantial assets on hand to cover liabilities when they fail because losses are prepaid through premiums.[16]

In most countries, a safety net exists to provide protection for policyholders of insolvent insurers in the form of guaranty funds. For example, each state in the U.S. operates a guaranty fund under which solvent insurers are assessed each year to cover shortfalls in loss payments for insolvent insurers, subject to the guaranty fund restrictions. The restrictions consist of a limit on the maximum loss payable; and guaranty fund coverage does not apply to all lines of business.[17] Most guaranty funds are assessed on an ex-post basis rather than being pre-funded by assessments.[18]

The payment from the guaranty fund each year is designed to cover the shortfall in losses that are scheduled to be paid in that year only; that is, guaranty funds do not make settlements with policyholders for all losses covered at the time of insolvency. Instead guaranty funds are assessed as losses actually need to be paid.[19] For life insurers the insolvent insurer's business may be sold to another insurer; in that case, the guaranty fund is assessed an amount to make the sale attractive to the acquiring insurer.[20] Guaranty fund payments sometimes are used to offset state premium tax payments the assessed insurers would otherwise have to make to the state (usually 2-3% of premiums), reducing this liability for insurers.[21]

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[15] Policyholder claim/benefit payments are typically frozen for a period of time, except for death and financial need.

[16] For example, in a life insurer insolvency, the shortfall in assets relative to liabilities is typically in the 5 to 10% range, and very rarely can be as high as 25% (Galanis, 2009).

[17] Small policyholders are typically protected by guaranty funds. Commercial insurance is covered also, however more than half of the states have a net worth restriction, such that if a company has net worth above some threshold (usually $25-50 million) they are excluded from coverage. In addition, workers compensation insurance is always covered, while a few lines such as title insurance and mortgage guaranty insurance are not covered.

[18] New York is an exception. The rationale for ex post assessments is that, unlike the obligations of the FDIC, insurance payments under policies are spread over many years in the future as claims arise.

[19] There is a cap on the amount of premiums an insurer can be assessed in an individual year, which varies by state. In life insurance, the cap is typically in the range of 2% of covered premiums (Galanis, 2009).

[20] In other words, guaranty funds replace policyholders' coverage not policyholders' cash.

[21] A premium tax offset is more commonly allowed in some states for life insurance only, and offset availability varies by state.

This assessment system is designed to place minimal stress on solvent insurers while protecting the policyholders of the insolvent insurer. But if necessary, guaranty funds in the U.S. have the ability to borrow against future assessments in the event that losses covered by the guaranty fund in any one year would place a financial stress on solvent insurers. To date, in the U.S., guaranty funds (with their borrowing ability) have successfully paid claims of insolvent insurers, including large insurers such as Reliance, Executive Life, Confederation Life and Mutual Benefit Life. This is notable not only because these insolvencies were large but because insolvencies tend to peak or cluster together during certain periods so that guaranty fund payments to cover several insolvencies at the same time have been required.

Table 1 provides statistics regarding guaranty fund assessments over the 20-year period from 1988 to 2008. The total amount (annual average amount) paid from life-health guaranty funds was approximately $6.5 billion ($312 million), and it was $11.7 billion ($555 million) for property-liability insurers. More importantly, the assessment rate on premiums never exceeded 0.35% of total premiums assessed, a very low amount. The guaranty fund system has stood up very well to impairments within the insurance industry.[22]

Comparative Financial Statements

The insurance industry is segmented into life-health insurance and property-liability insurance because the nature of the risks involved in each is different.[23] Life-health insurers may issue life insurance, annuities, deposit-type contracts and, of course, health insurance. Except for health insurance, life-health insurance risks tend to be long-term in nature, meaning that the policy exceeds a one year term (e.g., 10 year renewable life insurance).[24] Property-liability risks include property damage, theft, and liability and are almost always one year or less in term.

[22] In 2009 alone, the maximum assessment capacity of life-health insurers was estimated to be $8.8 billion. Of course, insolvencies that are much larger than this could have been financed because many claims of insolvent insurers actually need to be paid in the future, and assessments would continue until all claims are paid (Galanis, 2009).

[23] The industry also consists of title, fraternal, and health-only insurance companies, although emphasis is placed here on life-health and property-liability insurers because of the large volume of business they transact.

[24] The exception is one year term life insurance policies.

In this section, relative financial risks for these types of insurers are distinguished by comparing the respective, aggregate balance sheets of these insurers. As an illustration of how insurance differs from other financial institutions, the balance sheet for commercial banks is reviewed also below.

Insurer Financial Statistics. U.S. industry aggregate balance sheet statistics for life-health and property-liability insurers for 2007 are presented in Table 2. With respect to total assets, Table 2 indicates that the life insurance industry is more than two times as large as the property-liability insurance industry, with $3,150.5 billion in assets (without separate accounts) for life-health compared to $1,551.3 billion for property-liability insurance.[25] This result is not surprising since most life insurance and annuity products involve the accumulation of assets. As a percentage of GDP, insurance carriers and related activities accounted for 2.4% of GDP in 2007.[26,27]

As expected for a financial intermediary, the bulk of assets are invested assets (86% and 94% of total assets for property-liability and life-health insurers, respectively). The total amounts invested in stocks and bonds are approximately equal for both types of insurers (approximately 73%), although property liability insurers have proportionately more invested assets in stocks than life insurers.[28] Life insurers are more active in the direct mortgage loan business (10 percent) than property-liability insurers, whose investments are negligible. The longer term, asset accumulation aspect of life insurer

[25] When separate accounts are included, the life insurance industry is more than three times larger than the property-liability insurance industry. Separate accounts include variable life contracts, variable annuities, modified guaranteed annuities, and modified guaranteed life insurance. They may also include some types of group contracts for pension and other employee benefit plans. Separate accounts can be used to accumulate funds which are intended to be used in the future to provide life insurance or to accumulate funds for settlement or dividend options. Separate accounts do not receive guaranty fund coverage; however, if a guaranteed minimum return is associated with a separate account product, then the general account of the insurer may be used to fulfill the guarantee. As the name suggests, separate account assets are held separately from all other life insurer assets.

[26] It is sometimes tempting to compare total premium revenue to GDP to determine the importance of insurance in the economy. Such a comparison is incorrect. The bulk of premiums consist of expected loss/benefit payments, and losses/benefits are not "produced" by the insurer; rather they are exogenous events. Most of insurers' premiums, typically, will be returned to policyholders in the form of loss/benefit payments. Instead, insurers produce services, and it is the estimated value of these services (the premium loading) which is included in GDP.

[27] Before proceeding further it is important to realize that the percentages for asset and liability items for an individual insurer can vary considerably from that of the industry average.

[28] CMBS and RMBS are included in the Bonds category of assets according to statutory accounting.

products explains why life-health insurers would be relatively more interested in a long-term investment such as mortgages.

Table 3 contains statistics concerning the importance of life-health and property-liability insurers in the economy as financial intermediaries.[29] In terms of insurers' importance in the capital markets, life-health insurers held 6.9% of all U.S. equities in 2007 while property-liability insurers held 1.1%, according to Table 3. Life-health (property-liability) insurers held 17.6 (2.7)% of corporate and foreign bonds in the U.S. economy in 2007. Property-liability insurers accounted for 14% of U.S. municipal securities and loan holdings, while for life-health insurers the corresponding amount is 1.3% in 2007.

Thus, life insurers are relatively more important in the market for corporate and foreign bonds, while property-liability insurers have more significant holdings in the U.S. municipal securities and loan market. However, in assessing life insurer holdings it is important to realize that these tend to be long-term because of the nature of life-health insurer liabilities. Thus only a small fraction of the investment in corporate bonds would become due (or turn over) in any given year and be available to meet the new credit needs of corporations.[30] That is, in a credit crunch affecting other financial institutions, life insurers would have only the turnover in their corporate debt to reinvest each year as well as the proceeds of new insurance policies issued.

It is interesting to note the interconnections via investments between banks and securities firms. Historically, insurers have been attracted to bank bonds because the issuers tend to have high credit quality, and their issues tend to be relatively long term. Both attributes are desirable for life insurer portfolios. Banks also often issue commercial paper, which is attractive to property-liability insurers. Banks have been active in the issue of "hybrid" capital securities, which have in the past been attractive to

[29] The statistics quoted include separate accounts for life insurers.

[30] For example, if the average term of corporate bonds for life-health insurers is 25 years, then each year life-health insurers would have 1/25 of their portfolio turnover, and this amount would be available to invest in new corporate bonds or pay benefits. The latter is notable because even though life insurers have sizable investments in corporate debt, the amount invested in new corporate debt each year is much less than their total bond debt indicates. In contrast, banks have a shorter duration for their investments. If commercial banks have investments with average terms of 5 to 10 years, then 1/5 to 1/10 of their investments would pay off in any given year and be available to use for extending new credit or paying depositors.

insurers because they offered a relatively higher yield.[31] Of the total U.S. corporate and foreign bonds owned by U.S. insurers in 2008, 5.6% was invested in various types of bank bonds, while less than 1% of corporate equities held by U.S. insurers were invested in bank stocks. U.S. insurers invested a small proportion of their invested assets in the bonds of securities firms (1.6%), and a negligible proportion in stocks of securities firms (1%).[32]

Reinsurance recoverables represent amounts insurers have paid (or will pay) for claims covered by reinsurance and for which the insurer will be indemnified by the reinsurer. For both insurance sectors, reinsurance recoverables on losses are small, ranging from approximately 2.3% in property-liability insurance to 0.1% in life insurance when measured as a percent of assets. However, if difficulties exist in recovering insurance, the capital of the insurer would be tapped to absorb the loss to the extent reinsurer collateral was not available. Therefore, it is meaningful to compare reinsurance recoverables against capital. As a percent of capital, reinsurance recoverables for property-liability (life-health) insurers, represents 6.6% (1.4%) of capital. Hence, in total for the industry, the credit risk posed by recovering these loss payments from reinsurers appears to be manageable, everything else held equal.[33]

The largest liability item for both types of insurers is aggregate (or loss) reserves which constitute 58% ($583.6/$1,014.1) of total liabilities for property-liability and 86% ($2,430/$2,821.8) for life-health insurers. Again, the larger percentage for life-health insurers is accounted for by the fact that many life products involve accumulation of assets, and the funds received by insurers not needed for current benefit payments and expenses are added to policy reserves. Although not broken out separately in Table 2, unearned premiums are a significant liability for property-liability insurers, accounting

[31] Recently, insurers have been less active in this market because of uncertainty about their accounting treatment.

[32] That is, approximately $119.5 billion of insurer investments were invested in bank bonds in 2008, and U.S. insurers held a total of $2,116.1 billion in U.S. corporate and foreign bonds. Approximately $0.122 billion of total U.S. insurers' investments in equities ($1,161.0 billion) were held in bank stocks. The amount of U.S. insurers' investment in U.S. securities firms' bonds is $33,856.2 million, while the amount invested in securities firms' stock is $746.9 million. The data regarding banks and securities firms were obtained directly from the NAIC. The remaining data were obtained from Insurance Information Institute, *The Financial Services Fact Book*, 2010.

[33] The impact to capital from reinsurance recoverables may be somewhat understated. That is, if a large shock occurs in the reinsurance market, the same shock would probably have an impact on the primary insurance market and eat away at some insurer capital.

for approximately half of the amount included in All Other Liabilities for these insurers.[34] Borrowed money is a negligible liability for both types of insurers. Hence, insurers do not have to worry about sources for continued borrowing to satisfy policyholder obligations.

As indicated earlier, insurers mitigate risk through reinsurance transactions. In a typical transaction with an authorized reinsurer,[35] the ceding insurer transfers a reinsurance premium to the reinsurer along with the accounting liability for the business being ceded. In many cases, the reinsurer is an affiliate of the insurer, and reinsurance among affiliates helps to diversify business among members of a group. Reinsurance transactions with unauthorized reinsurers occur as well, but the liability associated with this reinsurance is still carried as a liability on the books of the ceding company to the extent that acceptable collateral is not held by, or in trust for, the ceding company as security for the transferred liabilities. It is very difficult to obtain a precise measure of the liabilities transferred to reinsurers through reinsurance transactions that are not covered by collateral. However, a conservative (overstated) ball park figure for property-liability insurance for 2008 is $660 billion.[36] For life insurance, a conservative, overstated ball park figure of outstanding reinsured liabilities (not covered by collateral) is $210 billion for 2008.[37]

The relative amount of capital funding differs substantially between life-health and property-liability insurers, with property-liability insurers relying more on capital funding than life insurers. Equity capital accounts for approximately 35% of assets for

[34] Unearned premiums refers to the portion of (prepaid) premiums for which coverage has not yet been provided. For example, if the premium for a one year policy is paid on July 1 of the year, then by December 31 of that year half of the premium would still be unearned and carried as a liability on the insurer's balance sheet.

[35] In the U.S., an "authorized" reinsurer is one that is either licensed in the ceding insurer's state of domicile to write the same type of business, an accredited reinsurer in the ceding insurer's state of domicile, or is given regulatory equivalence by being licensed in a state with substantially similar credit for reinsurance laws and regulations through various specified means.

[36] The ball park estimate of total outstanding reinsurance liabilities is $776 billion, and this is offset by $116 billion in collateral to yield $660 billion for property-liability insurance. The data for property-liability and life-health insurers are from the aggregated Annual Statements of insurance legal entities filing to the NAIC Financial Data Repository on Reinsurance Ceded Schedule F, Parts 4 and 5 (property-liability insurance) and Schedule S, Parts 2 and 4 (life-health insurance). These figures can be materially overestimated due to double counting as a result of intercompany pooling arrangements within groups.

[37] This amount consists of total outstanding reinsurance liabilities of $414 billion (ball park figure) less $204 billion in collateral, yielding $210 billion of net reinsurance liabilities outstanding.

property-liability insurers and 10.4% for life-health insurers. At least part of the difference in leverage between life-health and property-liability insurance can be explained by the fact that property-liability types of losses are more unpredictable than the mortality and morbidity risks insured by life-health insurers.

Commercial Banking Financial Statistics. To better understand the relative importance of insurance in the financial system and how it differs from other financial institutions, the aggregate balance sheet for commercial banks is presented in Table 2 also. With respect to size, measured by assets, the commercial banking sector is more than 7 times (3.5 times) larger than the property-liability (life-health) insurance sector. If separate accounts are included, the commercial banking sector is 2 times larger than the life-health insurance sector. When considering the combined assets of life-health and property-liability insurers, the commercial banking industry is approximately 1.7 times larger (2.4 times larger without separate accounts).[38] For further comparison, the securities industry had financial assets of $3,092 billion in 2007, which is on a par with life insurers if separate accounts are excluded.[39] In terms of GDP, the entire Finance and Insurance Sector (including insurance, banks and securities firms) accounted for 7.9 percent of GDP in 2007 (Department of Commerce, *Statistical Abstract of the U.S.*).

The traditional business of banks is to make loans with demand deposit funds. Hence the largest single asset of the commercial banking sector is loans, which account for approximately 60 percent of assets. Investment in stocks, measured as a percentage of assets, is on par with that of the property-liability insurance industry, while total invested assets (measured as a percentage of assets) are on a par with life-health insurers.[40]

Not surprisingly, (demand) deposits are the single largest liability item for commercial banks, accounting for about 65 percent of assets. Commercial banks have more borrowed money than insurers (approximately 10% of assets) and are more active

[38] These figures do not include unregulated, non-banking affiliates and Special Investment Vehicles (SIVs) of commercial banks.
[39] Securities firms such as Lehman Brothers and Bear Stearns were important security firms caught up in the current financial crisis because of their investments in RMBS and other structured securities, coupled with significant short-term funding.
[40] Data were not available to determine banks' investments in U.S. insurance companies.

in the federal funds purchasing and repo market (approximately 6.9% of assets). Thus commercial banks are more dependent on borrowing than insurers and would have more concerns about sources of credit financing during a crisis than insurers. Leverage, measured as equity/total assets, is approximately the same for commercial banks and life-health insurers (when separate accounts are excluded). Property-liability insurers have substantially lower leverage.

Regarding relationships between insurers' and other financial institutions, U.S. insurers held approximately 9.4 percent of banks' "other borrowed money" in 2008. This may seem to be a surprisingly high figure; but, as noted above, borrowed money is not the primary source of financing to banks (10% of liabilities). U.S. insurers held 14.1% of securities firms' outstanding corporate bond debt; however corporate bonds represent only 11.2 percent of securities firms' financings (liabilities). U.S. insurers held a negligible portion of securities firms' and banks' stock outstanding.

Systemic Risk and Insurance

In this section, systemic risk for purposes of this research is defined. Primary indicators or characteristics of systemic risk are reviewed, and secondary indicators that appear in some definitions of systemic risk or were precipitating factors in past systemic crises are discussed. Finally, the insurance sector is assessed with respect to these indicators to determine the potential of insurance to instigate a systemic crisis.

Note that instigating or causing a systemic crisis for purposes of this research is not the same as being susceptible to the crisis. To instigate a systemic crisis the shock or event must first emanate from the insurance sector due to the specific activity of insurers. And it is not just a matter of semantics whether insurers are instigators or victims, because regulation designed to pre-empt a systemic crisis would depend on whether insurers are the instigators or not. That is, if insurers are instigators of systemic risk, then more direct regulation of insurers would be called for. On the other hand, if insurers are susceptible to loss because of their exposure to shocks that affect markets and thus their investments, then more direct regulation of the market overall would be desirable.

Definition of Systemic Risk and Systemic Risk Indicators

The financial literature is replete with definitions of systemic risk. Some construe the term very broadly to include any disruption within one financial sector (life-health insurance, property-liability insurance, securities or banking) that has *any* spillover effect on the general economy. A narrower construct of the term encompasses a disruption across all financial sectors (i.e., the financial system) and into the general economy. The latter perspective is used in this study.

For purposes of this paper, systemic risk is defined as the risk of adverse consequences that reverberate across a large segment of the financial sector as a whole, posing a potentially grave effect on the economy. Systemic risk may arise from interconnectedness among financial institutions that cascade throughout the financial sector (akin to a domino effect) and/or from a significant common shock to which many financial firms have a large exposure (Helwege 2009).[41] Traditionally, systemic risk has been considered important because it results in increases in the cost of capital or reductions in its availability, while being frequently accompanied by asset price volatility. The latter have spillover effects on the economy by affecting demand and/or supply of goods for an extended period (Financial Stability Board, 2009).

Four general characteristics or indicators appear repeatedly in definitions of systemic risk across the literature. These indicators are contagion (or correlation/interconnectedness) in results across financial institutions; substitutability of products; concentration of risk; and infrastructure.[42] A number of other factors have been shown to exacerbate the effect of a systemic event, once the event occurs, including size ("too big to fail"), leverage, and liquidity. These risk factors are also associated with systemic risk, as discussed below.

[41] The shock may emanate from mispricing of assets (such as in an asset bubble) or from unexpected exogenous events (such as changes in oil prices). Note that not all asset bubbles are associated with systemic risk (e.g., the dot com bubble).

[42] The Financial Stability Board (FSB) considers size (of exposures, volumes of transactions or assets managed), substitutability, and interconnectedness as the key criteria in identifying systemically important institutions (Financial Stability Board, 2009). The International Monetary Fund (IMF) considers size, interconnectedness, leverage, and (risky) funding structure in assessing the systemic importance of institutions (International Monetary Fund, 2009).

Primary Indicators of Systemic Risk

Contagion/Correlation/Interconnectedness. The classic example of contagion/correlation/interconnectedness occurs in the banking sector as a "run on the bank" that cascades through the system. In principle, bank runs can occur in a widespread fashion if depositors lose confidence in the overall banking system, as occurred in the Great Depression. Bank runs can also occur because of the interconnectedness of banks. That is, bank runs can unfold when bank customers (e.g., depositors) recognize that a bank may be weak and rush to withdraw their funds. Since banks hold mostly long-term, illiquid assets (loans), only a fraction of depositor funds are on hand at any particular time to meet withdrawal demand. Thus the bank cannot readily meet all of the depositor demands and ultimately closes. In the meantime, many of the dealings of most banks are intertwined (or interconnected), with banks lending and borrowing extensively from each other. Thus the closure of one bank (say a large bank) may have negative repercussions on other banks which have loaned a substantial amount of money to the failed bank, causing them financial distress. These other banks then may be subject to bank runs, and so the saga continues with bank failures cascading through the system. Since banks are connected internationally with each other, the cascade can extend world-wide in principle. Note that otherwise sound banks can get caught up in both sorts of bank runs, so that their solvency is in peril.

In order for the second bank run scenario to develop, the first bank to fail must be very large, and the other banks which have loaned money to the first bank must have a large investment in the first bank or somehow depend greatly on that bank. For the banking crisis to continue to spread, many banks must have significant portions of their assets tied up at other banks. But the latter defies the principles of diversification in investments that underlies good financial practice. Nevertheless, this scenario provides justification for a governmental policy in which banks that are "too big to fail (TBTF)" receive governmental intervention. That is, the presumption is that the cascade or domino effect can be forestalled if the first bank's problems can be solved (by pumping money into that bank).

But, the presence of federal deposit insurance from the FDIC should prevent runs on the bank by depositors in the first place (as long as they maintain insured balances).

Thus, some question exists as to whether the scenario described above is actually reasonable. According to Kaufman and Scott (2003, pp. 376 and 379),

> There is little if any empirical evidence that the insolvency of an individual bank directly causes the insolvency of economically solvent banks or that bank depositors run on economically solvent banks very often or that, when they do, they drive these banks into insolvency…Banks fail because of exposure to a common shock such as a depression in agriculture, real estate or oil prices, not because of direct spillover from other banks without themselves being exposed to the shock…Sudden unexpected bad news about a particular bank or group of banks appears to ignite a round of reexamination of other banks by market participants to determine their risk exposures. Although deposit flows and stock values of a large group of banks may be affected adversely immediately, the sorting out process appears to occur relatively quickly.

In the events surrounding AIG Financial Products, the precipitating event was the bursting of the housing price bubble. This exposed the guarantees written by AIG Financial Products to loss where no loss had been expected previously.[43] But the precipitating event did not apply just to AIG Financial Products. Many banks and life insurers were affected by this shock as well, requiring the government to intervene. So the main point is that a shock occurs and this shock *may* lead to the appearance of contagion among financial institutions, if they hold significant amounts of the assets being shocked.[44] Finally, in the current crisis, instead of a traditional depositor-led "bank run," the inter-bank loan market dried up. This was the result of widespread banking investments in the housing market coupled with a lack of transparency, so counterparties could not assess the solvency of those they were doing business with.

[43] Goldman Sachs claims that is was well-hedged against a collapse of AIG, supporting the argument that at least some firms doing business with AIG protected themselves from counterparty risk.

[44] Some contagion effect or "bank run" effects can be attributable to the rescinding of securities lending programs among financial institutions in the current crisis. That is, as ratings of lending financial institutions fell, security borrowers began to demand their cash collateral back. The securities borrowers would not have been insured by the FDIC, exposing them to loss from securities lending. Note that only financial institutions heavily involved in securities lending would be affected by the bank run rather than all financial institutions.

Also, in the U.S. at least, companies can access the capital markets directly, rather than relying on funding through banks or other financial intermediaries, reducing the effect of bank failures on these investors. This makes well-functioning capital markets more important and contagion within capital markets more problematic. Bear Stearns is a case in point, as it experienced a "bank run" after a market shock threatened its financial viability. In addition, the collapse of Lehman Brothers, a major writer of commercial paper, sent shock waves through that market and contributed to the freezing of credit markets around the time of its bankruptcy.[45]

Substitutability. Problems can occur when the supply of a vital product is removed from the market.[46] If other market participants cannot step in quickly with a substitute product, then market disruption may occur that spills over into the general economy. Two characteristics of the market that are likely to have a bearing on whether substitutability is a problem are ease of entry into the part of the market that is affected and the size and concentration of the product market. Ease of entry can help to minimize the amount of market disruption, while the failure of one firm that dominates a product market can lock up or have severe repercussions on the market, everything else held equal.

Concentration. Concentration may be related to substitutability, if concentration in the product market means that an important product becomes scarce as a result of insolvency of the concentrated firm. However, concentration encompasses more than products. Concentration in investments – either by type of investment or geographic location of the investment -- may have spillover effects if the investment or geographic area becomes problematic. For example in the current crisis, concentration of investments in subprime mortgages (either directly or through securitizations) led to

[45] Lehman was a big investor in subprime and prime mortgages. Although it had been reporting losses on these investments, the market feared that Lehman Brothers had not come clean about its problems in the time leading up to its bankruptcy, and uncertainty concerning its transactions with banks and hedge funds only deepened the "crisis in confidence" Lehman's was going through.

[46] This might occur, for example, due to widespread insolvencies of providers or the insolvency of a few large suppliers that dominate the market.

extreme losses among many financial institutions, significantly decreasing the amount of credit available to the economy overall.

Infrastructure. Infrastructure refers to critical resources required for an activity. Financial distress at institutions that are part of the financial or payment infrastructure can have spillover effects on the general economy.[47] For example, banks are part of the payment system so that large-scale bank failures can have a significant effect on the payment system and the economy.

Risk Factors for Systemic Risk

Leverage. Leverage is typically defined in terms of the relative amount of a firm's debt versus equity. Leverage can also be created through options, through buying securities on margin or through some financial instruments. Leverage is related to systemic risk because when a shock or run on the bank hits a financial firm, the ability to absorb its effect is determined by the amount of equity it has relative to debt. Firms with higher leverage have relatively less equity to absorb shocks and, thus, are more likely to experience financial distress. This financial distress, in turn, can affect counterparties (who may also be highly leveraged). More highly leveraged firms are also less likely to withstand the market volatility associated with systemic events.

Size. The size of the firm helps to determine whether it is "too big to fail." In fact, the term "too big to fail" came into existence from the bailout of Continental Illinois Bank and Trust Company of Chicago in 1984. Continental Illinois faced bank runs from its wholesale depositors, prompting the FDIC to guarantee all liabilities of Continental Illinois through a direct infusion of capital.[48] In general, size may be important in a failure if it is associated with large spillover effects. At the time of its failure,

[47] Being part of the infrastructure also has a bearing on the degree of substitutability of the institution's services.

[48] William Isaac, Head of the FDIC in the 1980s, was quoted in Robert Trigaux, "Isaac Reassesses Continental Bailout," *American Banker*, p. 6, July 31, 1989, as saying, "I wonder if we might not be better off today if we had decided to let Continental fall, because many of the large banks that I was concerned might fail have failed anyway. And they probably are costing the FDIC more money by being allowed to continue several more years than they would have had they failed in 1984."

Continental Illinois was the seventh largest bank in the U.S. That is, it is reasonably possible that a large financial institution may be engaged in significant, large transactions with other financial institutions through interbank activities and securities lending, so that potential spillover effects into the general economy could occur with its failure.

Of course, a lesson learned from the current financial crisis is that size measured by assets may not capture the impact an institution can have on the market or economy. The now defunct Financial Products division of AIG wrote hundreds of billions of dollars of coverage with relatively little capitalization, forcing a bailout of AIG's holding company by the U.S. government costing billions of dollars. For this reason, size is not included with the primary factors. Note, too that the term "too big to fail" is being replaced with "Systemically Important Financial Institution" (SIFI), in recognition that size is not an adequate proxy for spillover effects.

Liquidity. In the event of a run on the bank or an unexpected demand for cash to settle contracts (e.g., caused by falling asset prices or a rating downgrade), the asset liquidity of the institution is important. Liquidation of relatively illiquid assets (such as long-term assets) at an inopportune time can create losses for a financial institution and even failure. Securities lending is a case in point in the most recent financial crisis. As the market dropped, counterparties that had provided collateral in exchange for the ability to hold loaned securities from other institutions began to return the loaned securities and demand the return of their cash collateral. In the meantime the cash collateral from these securities lending transactions had been invested in other assets by the lender; and these alternative assets had fallen in value, in many cases quite significantly. Typically the lender would sell these investments to meet the cash collateral demands, but the prospect of significant losses prevented this activity. This created a liquidity problem for the security lender.

If many firms experience liquidity problems at the same time, then asset prices in the capital markets can be (further) affected adversely if massive sales of assets are required to meet claims. This in turn can affect the investment values of otherwise solvent firms, potentially placing them in financial distress.

Regulation and Government Policy. As indicated previously, government policy in the form of the FDIC has a large bearing on whether depositor-led bank runs occur. But the elimination of bank runs comes at a cost. That is, the presence of federal deposit insurance removes market discipline; demand depositors do not have the incentive to monitor bank activity for riskiness. And bank deposit insurance is frequently underpriced for banks, creating a moral hazard problem. That is, if banks engage in risky activity, they are not penalized through higher deposit insurance premiums. They therefore have an incentive to engage in risky activity, even potentially systemically risky activity.

Regulation played a role in the attractiveness of AIG Financial Products to the banks that purchased CDSs from it. That is, these (mostly European) banks were engaging in regulatory arbitrage; purchase of CDSs from AIG Financial Products reduced capital requirements.[49] The possibility exists that future forms of regulatory arbitrage may play a comparable role in future systemic crises.

With respect to regulation and the current U.S. crisis, Harrington (2009, p. 800) notes,

> Banking regulation permitted and probably encouraged high leverage, aggressive investment strategies, inadequate capital requirements for risky loans and securitizations, and complex off-balance sheet vehicles, often financed by commercial paper, all taking place within the framework of government deposit insurance and TBTF policy."

Further, regulation that may benefit the solvency of the regulated financial institution can exacerbate a crisis. For example, an increase in capital requirements can occur in times of financial distress (i.e., capital requirements can be pro-cyclical). Thus, at a time when credit is most needed in an economy, financial institutions would be forced to hold more capital, reducing the amount of funds available to invest or loan.

[49] This occurred because Basel I was in effect. Under Basel II, this form of regulatory arbitrage would no longer be attractive.

Other Factors. A number of other factors have historically been shown to be related to systemic risk. For example, if incentive compensation does not take risk of the activity into account (as was the case with securitized mortgage loans), then an incentive is provided to engage in risky activities with no repercussions. Accounting rules, too, can influence firm behavior if the firm believes that the market responds to accounting information reported. For example, if accounting rules do not require recognition of the risk of some activities, then there is an incentive to engage in these activities to improve apparent accounting performance such as reported income.

Systemic Risk in U.S. Insurance

In this section systemic risk in U.S. insurance is evaluated. The purpose is to determine whether or to what extent insurers can instigate a systemic event. The discussion proceeds by assessing the impact of the factors discussed above with respect to insurance.

Insurance Contagion/Correlation/Interconnectedness. As indicated previously, a run on the bank by (insured) depositors is unlikely to lead to a systemic crisis. Similarly, if a run on an insurer occurred, there would likely be no significant spillover effects to other financial institutions either within or outside of the insurance sector.[50] For example, as indicated earlier, U.S. life insurers in total held 9.4 and 14.1 percent of banks' and securities firms' other borrowed money and corporate bonds, respectively, in 2008. But other borrowed money and corporate bonds for banks and securities firms, respectively, are not a significant source of financing for these firms (10% and 11.2%, respectively).[51] And any one insurer would hold only a fraction of

[50] Under stress testing conducted by the National Organization of Life and Health Insurance Guaranty Associations (NOLHGA), assessment capacity of life-health guaranty funds in 2009 alone was large enough to cover several nationally significant life insurer insolvencies in that year by selling the insolvent insurer's policies to other insurers. That is, the assessment capacity would have been sufficient to make the sale of the insolvent insurers' policies attractive to other insurers. No future assessments for these 2009 insolvencies would have been needed.

[51] Thus the amount that banks depended on insurer holdings of other borrowed money in total in 2008 was 0.094*0.10= .0094 or less than 1 percent. Similarly, the total amount that securities firms relied on insurer financing in 2008 was 0.141*0.112=.016 or 1.6 percent.

these financial institutions' bonds. So if life insurers were required to cash in bank and securities firms' related investments, it should not significantly affect their market value (and cost of capital).[52] It is true that bank affiliates are counterparties on derivatives transactions. However, U.S. regulated insurers usually are not sellers of protection, and insurers' exposure to derivatives tends to be rather limited.[53] There may be some disruption in the banking sector if the bank affiliates covered their side of the derivatives trades; but it is unlikely to be a cascading effect due to the limited exposure.[54]

A source of potential contagion/interconnectedness/correlation in the insurance industry that is frequently mentioned is reinsurance. In particular, the fear is that the insolvency of several reinsurers would set off a cascade of losses among primary (ceding) insurers. However, as indicated earlier, reinsurance recoverables for U.S. property-liability (life-health) insurers is only 6.6% (1.4%) of total capital. The liabilities transferred to reinsurers (via reinsurance ceded) are much larger. A very rough gauge of the effect on the property-liability insurance industry from widespread reinsurer failures can be made by comparing estimated reinsured liabilities outstanding and the capital of the industry. For example, if it is assumed that 20% of all (non-collateralized) reinsured liabilities outstanding became uncollectible due to reinsurer failures, this would deplete approximately 28 percent of equity (high-end, ball park figure) in the property-liability insurance industry.[55] For life-health insurers, if 20% of all (non-collateralized) reinsured liabilities became uncollectible, this would deplete approximately 16% of capital,

[52] Further, even if life insurer investment sales of financial institution's debt or stock did affect price (and thereby cost of capital), banks do not go into the market to sell new instruments regularly; rather their financing needs are staggered. And banks tend to wait until markets are favorable before issuing new securities.

[53] The Financial Products division of AIG was a net seller of protection, but this division was not an insurance company nor was it regulated by U.S. insurance regulators.

[54] Note that insurers are more exposed to bank insolvencies than banks to insurer insolvencies. Major bank insolvencies would affect the value of insurers' investments (at least to some extent), and banks may not be able to cover their side of derivatives transactions. Further, insurers rely on banks for many services – e.g., handling cash, custodial arrangements for securities, clearinghouse arrangements and securities lending arrangements. The high volume transactional nature of insurers' relationships with banks means that insurers could experience service disruptions from major bank failures.

[55] The 28% figure is found first by finding 20% of (non-collateralized) outstanding reinsured liabilities (0.2*$660 billion=$132 billion) and dividing the result by equity of property-liability insurers in 2008 ($132/$475.2 = 0.28). Source of equity data: A.M. Best Co., *Best's Aggregates & Averages – Property-Liability*, 2009. Note that it is unlikely that *all* reinsurers would become insolvent at the same time.

keeping in mind that this is an overstated, ball park figure.[56] These estimates of capital depletion represent a substantial depletion of capital in the insurance industry, but the depletion should be sustainable by the industry as a whole, especially since most insurers hold more than the prescribed minimum capital amounts.

To mitigate reinsurance credit risk, primary insurers engage in due diligence to determine the credit-worthiness of the reinsurer. Furthermore, insurers diversify the reinsurance they cede among several reinsurers to insulate themselves from the failure of any one reinsurer.[57] Primary insurers may protect themselves from slow paying or insolvent reinsurers by ceding and assuming reinsurance from the same reinsurer as well. Then if trouble arises, the ceding company can net (or offset) together the payments owed to the reinsurer with reinsurance payments due from the reinsurer. Finally, reinsurance failures have not been a major factor in insurer insolvencies. Reinsurance failures were the triggering event in 2% of life-health insurance insolvencies and 3.7% in property-liability insurance failures over the period 1969-2008 (A. M. Best Co, 2009a, A. M. Best Co., 2009b).[58]

A study by the G30 examined the effect of failures of reinsurers equal to 20% of the global reinsurance market and concluded that there would be no systemic effect from these bankruptcies (see Group of Thirty, 2006). The latter study considered the impact on the primary insurance industry from unpaid reinsurer liabilities; the size of the holdings of the reinsurance industry in the capital markets; and the relationship between banks and reinsurers.[59,60] The main negative effects posited from the reinsurer failures

[56]The 16% figure is found first by finding 20% of (non-collateralized) outstanding reinsured liabilities (0.2*$210 billion=$42 billion) and dividing the result by equity of life-health insurers in 2008 ($42/$258 = 0.163). Source of equity data: A.M. Best Co., *Best's Aggregates & Averages – Life-Health*, 2009.

[57] Over the years, this has become a little more difficult due to consolidation in the industry.

[58] For life-health insurers, the most common triggering events for insolvency were inadequate pricing (27.7%), affiliate problems (19.3%) and rapid growth (14.7%) (A.M. Best Co, 2009b). For property-liability insurers, the most common triggering events were deficient loss reserves/inadequate pricing (38.1%) and rapid growth (14.3%) (A. M. Best Co., 2009a). It is not surprising to see that factors related to underwriting risk, the main business of insurers, are associated with the most failures.

[59] A cautionary note should be made about the use of rating triggers in the reinsurance market. A reinsurance policy with a rating trigger allows the primary company to cancel the policy if the reinsurer experiences a rating downgrade below a threshold indicated in the policy. Triggering of this rating clause would likely place the reinsurer in runoff when it was already experiencing financial difficulty. Because of this potential, large, well capitalized reinsurers increasingly are refraining from writing policies with a ratings trigger clause. However, the reinsurance policies of small, less well capitalized reinsurers may still contain a rating trigger in their policies.

studied were (1) that primary insurance might become more expensive (if some primary insurers failed) because it takes time to form an insurer and due to heavy regulation it is difficult to form an insurer and (2) the price of reinsurance might rise. Both effects are likely to be temporary, however. New reinsurers can be formed relatively quickly in offshore locations such as Bermuda, restoring any capacity lost due to other reinsurer failures. In another study of the reinsurance sector by Swiss Re, reinsurance is shown not to be systemically risky (see Swiss Re, 2003).

In some parts of the world, insurance is linked directly to banking through cross-holdings of bank and insurance stock and/or insurer purchase of bank subordinated debt. Thus, theoretically a spiral might develop if insurers invest a significant fraction of assets in bank debt, the cross holdings between banks and insurers is widespread through the market and the cross holdings are significant in dollar amount. Then, a shock hitting insurers could cause the stock price of the insurers to fall, leading to a decline in the assets of the cross holding banks. The decline in the banks' stock price would lead to a further decline in the value of the insurers' investment portfolios, since insurers hold the banks' stock (and possibly debt) as a significant asset. In the meantime, the declines in the market value of the banks' equity and subordinated debt would raise the cost of capital to banks. These events could continue to reinforce each other or spiral through the banking and insurance markets creating systemic risk. The risk of this occurring in the U.S. is minimal, as insurers do not hold a large enough amount of bank stock or bank debt to be able to influence their prices.[61] However the scenario described above is suggested as a possibility under Solvency II in Europe (see European Central Bank, 2007 pp. 14-15).

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[60] A retrocession market exists in reinsurance in which reinsurers sell off some of the business they have assumed (bought) to other reinsurers. Some have likened the retrocession market to interbank lending and borrowing in the banking industry. As such it is sometimes thought to be a transmission mechanism for contagion and systemic risk within the reinsurance industry. But unlike mortgage backed securities leading up to the recent crisis, retroceders still retain part of the risk (to reduce adverse selection). Regardless of the amount of retrocession activity that occurs, reinsurance recoverable to the primary insurer remains the relevant metric for determining the impact of this aspect of reinsurance on the primary industry (and this is small). And even if a spiral developed in the retrocession market, it would be unlikely to cause most of the reinsurance industry to become insolvent. As indicated above, even if 20% of U.S. reinsured liabilities became uncollectible, this could be tolerated within the U.S. insurance industry.

[61] And, as indicated previously, assets of insolvent insurers are not all liquidated at the time of insolvency.

Another theoretical possibility for contagion in insurance is with respect to losses. Most insurer loss exposures are idiosyncratic, uncorrelated events, so contagion is not an issue. However, some losses may be correlated; for example, adverse rulings in court cases can increase an insurer's liability retrospectively (e.g., environmental impairment liability).[62] During the 1980s, a liability crisis occurred due to adverse rulings in various liability-related cases. Catastrophes, such as hurricanes, are another type of loss that is correlated. These risks can be mitigated through reinsurance and, increasingly for catastrophes, by insurance-linked securitization (e.g., catastrophe bonds). Finally, it is notable that even with correlation in losses, credit markets were not frozen nor were there major spillover effects into the general economy from this correlation.

In conclusion, the risk of contagion spreading from the traditional insurance market to other financial sectors and ultimately the overall economy is negligible. However, insurers, because they are financial intermediaries, are subject to the same asset shocks as other financial institutions, and the spreading of the shock across the industry may have the appearance of contagion. But this is not the same as instigating a systemic crisis; instead some other shock or event is required in this situation, and insurers are victims of this shock as are other financial institutions.

Substitutability. Some types of liability insurance are required by law (such as auto insurance or workers' compensation in some states), and there is no substitute possible for the insurance policy in most cases. (The exception concerns asset accumulation products such as Guaranteed Investment Contracts (GICs) and other investment type products that are offered by banks and life-health insurers.) Hence the complete lack of some types of coverage has the ability to severely impact the amount of economic activity that occurs.

A major, lengthy disruption is unlikely to occur, however, due to the ease in formation of reinsurers in offshore locations (such as Bermuda) to provide capacity in the

[62] In other words, insurers may find themselves liable for losses that they never intended to cover or, due to social inflation, losses on a major block of business may turn out to be higher than anticipated.

market[63] and the existence of surplus lines insurance. That is, new reinsurance capital/capacity can quickly be raised to provide coverage where supply is lacking. A case in point is the formation of significant, new property catastrophe reinsurers after Hurricanes Andrew and Iniki reduced capacity for property catastrophe insurance in the U.S. in 1992. In addition, if some particular type of insurance is unavailable in a state then a surplus lines insurer can come into the market to fill the void. Surplus lines insurers are insurers that are not licensed to operate in the state but are allowed to offer coverage in the state because of a shortage of capacity for some type of insurance.

The flexible supply of capacity in insurance contrasts with the situation in banking. Banks don't have the equivalent of reinsurance or surplus lines; rather capital enters the industry through existing banks or the formation of new banks. Lack of transparency in banking investment can hinder capital entry through existing banks in crisis periods,[64] and the process of obtaining a new bank charter and associated FDIC approval can be a lengthy one.

It is true that some types of insurance may become unavailable at least during some periods of time. For example, after 9/11 there was a shortage of most types of commercial property and liability coverages, requiring the federal government to intervene with the Terrorism Risk Insurance Act (TRIA). The reason for the shortage in insurance capacity is that insurers assessed terrorism risk as uninsurable.[65] Thus 9/11 was a shock for parts of the insurance market. Insurers did not *instigate* the shock (the terrorist attacks), but the insurance market was severely affected by it.

Nevertheless, some associate the withdrawal of capacity after 9/11 and in other similar situations as an indication that insurance is systemically risky. It is difficult to understand how failing to underwrite a type of risk that could destabilize the insurance industry (because it does not meet the conditions for insurance) would mean that

[63] The reinsurer can assume (buy) insurance from a primary insurer who might otherwise not offer the coverage. In this case, the primary (ceding) company would still retain some fraction of the loss to avoid agency conflicts.

[64] For example, investors would not be willing to place their money in banks in which the value of their investments (e.g., in RMBS and CMBS) is uncertain.

[65] Insurers did not feel they could adequately evaluate and cover the risk that they were expected to underwrite. In other words, the existence of insurance is premised on the notion that losses are predictable and that the insurer has adequate capital to absorb any adverse losses that may develop. Terrorism risk shortly after 9/11 did not meet these requirements. Thus terrorism losses for commercial businesses became uninsurable.

insurance is systemically risky. In fact, by not underwriting such risks, solvency in the industry is enhanced, reducing any systemic risk that might otherwise be present in the industry.

In conclusion, because capital can flow freely into the insurance market, substitutability risk is not considered to be significant for insurers.

Concentration. In insurance, concentration can primarily occur in types of investment, types of lines written, and geographic location of the risks insured. Insurers' investments tend to be conservative in nature; and to the extent needed insurers match the maturity of assets with liabilities (asset-liability management). Asset-liability management (ALM) is considered by regulators (e.g., the actuarial opinion addresses ALM). To manage credit and market risk, insurers invest in a diversified portfolio of credit instruments and equities; in fact regulations require diversification, and regulation places limits on the type and size of investments that insurers can make. Insurers invest in relatively liquid assets, however this can vary substantially by the lines of business the insurer writes. Nevertheless, insurers, especially life insurers, were caught up in the financial crisis in their role as financial intermediaries. That is, as noted previously, insurers are prone to market risk.[66]

As an industry, whether property-liability or life-health, insurance is concentrated in a relatively small number of *groups*.[67] For example, in 2007, in property-liability insurance the top 4 (10) groups accounted for approximately 29 (50)% of industry premiums written, while the top 4 (10) life-health insurer groups accounted for approximately 24 (45)% of industry premiums written. The top group in life-health (property-liability) insurance accounted for approximately 7.1% (11)% of total premiums in 2007.[68] As a result, nationally significant insurers are reviewed every quarter by the National Association of Insurance Commissioners (NAIC), and those that appear to be

[66] The insurance industry has received very little funds from the Troubled Asset Relief Program as compared to banks. To date, with the obvious exception of AIG, only two insurer groups have received government funds. Hartford Financial Services received $3.4 billion, and Lincoln National Corporation received $950 million in funds.

[67] An insurance group is a collection of firms, mostly insurers, under common ownership.

[68] The source of these data is the NAIC. In contrast, the top 4 (10) reinsurers of U.S. property-liability business wrote 46 (82)% of premiums in 2007 (A.M. Best Co., *Best's Aggregates & Averages – Property Liability Edition*, 2008).

performing poorly are prioritized for detailed analysis by a group of experienced, seasoned financial regulators (i.e., the Financial Analysis Working Group (FAWG)).

But in fact it is misleading to assess concentration purely on group statistics. Insurance entities (companies) are regulated at the state level. And if one or more companies in a group exhibit signs of financial distress, state regulators act to "ring-fence" the assets of the remaining insurers in the group. This protects the other insurers in the group from the spread of financial distress. Thus, while the holding company for AIG and AIG Financial Products are important in understanding the government bailout of AIG, no insurer in the AIG group has become insolvent due to this ring-fencing behavior.

On a company, or legal entity, basis, the top 4 (10) insurance companies accounted for approximately 16-18% (28-31%) of net premiums written, and the top company in life-health (property-liability) accounted for approximately 5.2 (7.1)% of net premiums written in 2007. Further, there is diversity in the top insurance companies writing different lines of business within the life-health and property-liability insurance industry.[69] Thus the industry is considerably less concentrated than it might seem at first.

In conclusion, the insurance industry may be somewhat concentrated as far as susceptibility to concentration risk is concerned.[70] As noted earlier, disruptions in the U.S. product market for some type of insurance would likely be mitigated through reinsurance and/or surplus lines.

Leverage. Property-liability insurers are much less highly leveraged than either life-health insurers or banks and as a result would be better able to withstand a systemic shock, everything else held constant. Leverage for life-health insurers is on a par with commercial banks (when separate accounts are excluded), as noted earlier, and the effect of a systemic shock on these institutions should be comparable, based on leverage alone.

[69] This diversity exists even at the group level. The top writers in any given line are not the same across lines of insurance.

[70] Australia learned this lesson for home builder's warranty (with the HIH failure) and for medical indemnity insurance with the near failure of United Medical Protection.

On balance, then, life-health insurers would be much more susceptible to a systemic event than property-liability insurers. Because life-health insurers are so highly leveraged, their ability to sustain a large market shock may be limited.

Size. In 2007, the largest life-health (property-liability) insurance group had $457 ($143) billion in assets.[71] But as indicated previously, it may be more relevant to look at the size of companies, since it is companies rather than groups that become insolvent. The largest life-health (property-liability) insurance company, in 2007, had $297 ($104.8) billion, representing 5.9 (6.8) % of industry assets.[72]

Compared to total credit debt outstanding, the largest life-health (property-liability) insurance group had assets equal to 0.9 (0.3)% of total credit market debt outstanding in 2007.[73] On a company basis, the largest life-health (property-liability) insurance company had assets equal to 0.6 (0.2)% of total credit market debt outstanding in 2007. Even if one looks only at corporate credit market debt, the largest life-health (property-liability) insurance *group* had assets equal to 3.3 (1.0)% of total corporate credit market debt outstanding; of course the percentages for the largest insurance companies are even smaller. (Keep in mind, also, that an insurer's assets are not 100% invested in corporate credit market debt.)

Thus, the insolvency of one of the largest insurers would not have a significant impact on credit markets in terms of credit market debt outstanding. Further, as explained previously, when an insurer becomes insolvent, all assets of the insurer are not liquidated at that time. Rather it takes many years before all loss/benefit payments are made to policyholders. Therefore the insolvent insurer can continue to hold considerable corporate credit market debt until loss payments are due, so that the value of the bonds should not decline significantly in value due to forced sales of these assets nor should the cost of capital increase significantly to the bond issuer at the time of insolvency.

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[71] The largest life-health insurer group was Metropolitan Life, and the largest property-liability insurer group was Berkshire Hathaway in 2007.

[72] The largest life-health (property-liability) insurance company in 2007 was Metropolitan Life Insurance Company (State Farm Mutual Auto Insurance Company). These data were obtained directly from the NAIC.

[73] These data are from the *Statistical Abstract of the U.S.*, Flow of Funds Accounts – Credit Market Debt Outstanding.

Therefore, size is not considered likely to be an issue with respect to any insurer systemic risk in the U.S.

Liquidity. Potential liquidity problems caused by a run on an insurer vary by industry segment. Liquidity problems caused by a run on a property-liability insurer by policyholders are unlikely. First, property-liability insurers provide coverage for exogenous events such as property damage and liability, thus policyholders cannot withdraw funds for these on demand; the (random) event must occur first. Policyholders are entitled to a return of premiums for coverage not yet provided if they cancel their policies. In this case the insurer merely returns these (prepaid) amounts to policyholders, and, as noted previously, these funds account for approximately 14 percent of all assets for property-liability insurers.[74] But U.S. property-liability insurers typically hold very liquid assets (such as short-term US Treasury bonds) and customers often don't want to be uninsured, so payment for cancelled policies should not present a serious problem.

For life insurers, the same analysis applies to policies which do not have a cash value (such as health insurance). However, some life insurance products involve asset accumulations and provide for premature distribution of policy cash values at the policyholder's discretion. Moreover, since some life insurer products resemble banking products, the search for favorable credit spreads can lead insurers to invest in some complicated, illiquid assets, just as banks do. Thus, theoretically, a run on a life insurer is more of a problem than for a property-liability insurer. In particular, the performance of variable annuities and other Separate Account policies is related to the market, and a run on these policies could occur during a market panic. Hence liquidity can be an issue for life insurers during times of extreme market swings, and in some circumstances life insurers can add to market disruptions once a systemic event occurs through their investments.

However, premature surrender of a life insurance policy often entails severe penalties to the policyholder so that the policyholder takes a substantial haircut on the funds received; and there is a delay in receiving the payment (while the request is

[74] In this case, it is relevant to compare unearned premiums with total assets, since the funds for unearned premiums were received and invested by the insurer. In contrast, reinsurance recoverables are amounts owed to the insurer.

processed). These features make premature withdrawal of funds undesirable for policyholders. The existence of guaranty fund protection, subject to its limitations and restrictions, also makes cancellation of policies less likely (Galanis, 2009).[75] For example, small policyholders with policies in personal lines would still receive coverage for losses if the insurer failed. Hence a cancellation threat for life insurers exists, but it is considered to be small to moderate.

Infrastructure. The U.S. insurance industry is not part of the financial or payment infrastructure and does not impose any risk in this regard.

Regulation and Government Policy. As in banking, some moral hazard in the operation of insurance guaranty funds exist; more specifically, guaranty fund premiums are not risk-based. Recall that this feature of guaranty funds can lead to excessive risk-taking in insurers. However, this is mitigated by the fact that insurance company guaranty funds have claim payment limits.[76] Thus an incentive to monitor insurers exists by policyholders. Hence, relatively more market discipline for insurers exists than for other financial institutions such as banks (Harrington, 2009).

Other Factors. This paper would be remiss if it did not consider the potential impact of noninsurer, perhaps nonregulated, entities within the group as a source of potential problems (e.g., AIG Group and its Financial Products division). As indicated previously, regulators act to ring-fence assets of insurance companies within groups experiencing financial trouble. However, legal, exercisable guarantees among insurers within a group to noninsurance affiliates can link the results of members of a group together. Thus the role of financial guarantees to noninsurance affiliates within a group must be watched carefully, especially if the noninsurance affiliate is a banking or securities entity. A similar argument can be made regarding intra-group transactions. Nevertheless, as argued previously, the insolvency of a major U.S. insurance group would most likely not set off a systemic crisis in credit markets at least as far as the

[75] Recall, separate account products such as variable annuities are not subject to guaranty fund protection.
[76] Recall, also, that some states have net worth restrictions that apply to commercial insurance.

insurance business is concerned. Primary markets would be expected to be disrupted temporarily while new capacity (reinsurance capacity, surplus lines, and new capital for solvent insurers) became available to fill the void.

Conclusion

The core activity of insurers is underwriting or pooling of losses, and loss events for most types of insurance are unique and idiosyncratic in nature, unlike other financial risks such as market and credit risk. To the extent that losses are not diversifiable, insurers can partly mitigate their effects through reinsurance and, increasingly, securitization.

To determine whether insurers are systemically risky, the term systemic risk must be defined. For purposes of this research, systemic risk is defined as the risk of adverse consequences that reverberate across a large segment of the financial sector as a whole, posing a potentially grave effect on the economy. A distinction is made in this research between instigating a systemic event and merely being susceptible to the effect of systemic risk. The distinction is important, because the source of the systemic risk suggests the types of entities and activities that should be regulated to avoid the occurrence of future systemic events.

On the whole, this research concludes that insurers are not forseeably instigators or the cause of systemic risk. That is, the analysis of primary indicators associated with systemic risk and risk factors associated with systemic risk suggests that insurance does not create systemic risk. Some correlation in losses within lines of insurance is possible in the industry if unexpected losses arise due to the same event (e.g., adverse court rulings), but the latter is unlikely to affect all lines of business (property, liability, and life) at exactly the same time. In addition, insurance is pre-funded by the payment of premiums, so that insurers typically have a large amount of assets on hand for payment of losses when insolvency occurs. An orderly process for resolution of an insolvent insurer exists in which assets of the insurer are not liquidated at insolvency. Rather the policies of the insolvent insurers are transferred to another company or the insolvent insurer is run-off with assets liquidated as loss/benefit payments come due, usually years in the future.

Insurers are important financial intermediaries because of the gain from investments resulting from premium pre-funding and the time lag between an accident and the resulting claim payment. As intermediaries they are exposed to all of the financial risk intermediaries face: credit risk, market risk, investment mispricing risk, and liquidity risk. Typically insurers invest in high grade securities and/or use asset-liability matching to mitigate market and credit risks. However, to the extent these risks are not mitigated, insurers will be affected by systematic and systemic market events. In this case, insurers are not the cause or instigators of the crisis, but rather are susceptible to its consequences on markets. The capital markets likely to feel the most effect from widespread insurer insolvencies are the market for corporate debt (life-health insurers) and for municipal securities (property-liability insurers).

Because insurers cannot reasonably be viewed as instigators of systemic risk, they do not require direct systemic risk regulation for their insurance operations. Further, insurer operations are already regulated, successfully, for solvency. For example, regulations exist already with respect to insurer investments concerning diversification requirements and limits on investing. The capital an insurer is required to hold reflects the relative riskiness of the insurer, including its investment and underwriting risk.

Thus, for insurers' sake, systemic risk regulation should focus on forestalling systemic shocks on markets and then mitigating their effect on markets overall when they occur (rather than concentrating on a handful of firms that are TBTF). Further, the impact systemic events have on insurers gives them an inherent interest in the imposition of systemic risk regulation. Insurance regulators deserve a seat at the table in regulation of systemic risk because the insurance industry can always be expected to be susceptible to systemic risk.

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Table 1
Solvency Record and Guaranty Fund Assessments
1988 to 2007

	Life-Health				Property-Liability			
Year	No. of Insolvencies	Insolvency Impairment Rate	Assessments (in millions)	Guaranty Fund Premium Assessment Rate	No. of Insolvencies	Insolvency Impairment Rate	Assessments (in millions)	Guaranty Fund Premium Assessment Rate
1988	27	1.15%	$80	0.0351%	50	1.52%	$465	0.2298%
1989	54	2.38%	$135	0.0552%	48	1.45%	$714	0.3418%
1990	46	2.10%	$248	0.0939%	55	1.66%	$434	0.1988%
1991	81	3.92%	$885	0.3355%	60	1.77%	$435	0.1948%
1992	38	1.95%	$760	0.2696%	58	1.69%	$384	0.1685%
1993	24	1.30%	$725	0.2270%	41	1.18%	$520	0.2152%
1994	12	0.56%	$854	0.2525%	29	0.83%	$498	0.1985%
1995	11	0.53%	$876	0.2495%	16	0.46%	$67	0.0256%
1996	19	1.13%	$611	0.1615%	12	0.35%	$95	0.0355%
1997	18	1.11%	$419	0.1035%	31	0.89%	$236	0.0854%
1998	12	0.77%	$201	0.0453%	18	0.56%	$239	0.0843%
1999	26	1.77%	$126	0.0257%	19	0.60%	$179	0.0620%
2000	11	0.87%	$101	0.0187%	49	1.56%	$306	0.1012%
2001	8	0.60%	$113	0.0236%	50	1.62%	$713	0.2168%
2002	8	0.62%	$69	0.0135%	47	1.54%	$1,184	0.3125%
2003	4	0.33%	$18	0.0034%	35	1.14%	$874	0.2106%
2004	5	0.42%	$96	0.0179%	18	0.59%	$953	0.2182%
2005	10	0.89%	$71	0.0133%	14	0.46%	$836	0.1910%
2006	3	0.28%	$19	0.0032%	15	0.50%	$1,312	0.2895%
2007	9	0.89%	$81	0.0133%	5	0.17%	$916	0.2026%
2008	NA	NA	$60	0.2222%	7	0.23%	$298	NA
Total	426		$6,551		677		$11,659	
Average	21.3	1.18%	312	0.1040%	32.2	0.99%	555	0.1791%

Sources: A. M. Best Co., Insurance Information Institute, *The Financial Services Fact Book,* 2009, and *Statistical Abstract of the U.S*., various years.
Note: Average is simple average. The insolvency impairment rate is measured as the number of insolvencies divided by the total number of insurers. The guarantee fund assessment rate is found by dividing guaranty fund payments each year by total premiums assessed.

Table 2
2007 Industry Aggregate Statistics

	Property-Liability Insurance		Life-Health Insurance		Commercial Banks	
	$ (billions)	% Assets	$ (billions)	% Assets	$ (billions)	% Assets
Assets:						
Bonds	$884.8	57.0%	$2,163.0	68.7%		
Stocks	$247.2	15.9%	$143.2	4.5%	$1,590.8	14.2%
Loans					$6,626.4	59.3%
Mortgage Loans on Real Estate	$4.8	0.3%	$314.0	10.0%		
Real Estate	$10.6	0.7%	$19.5	0.6%	$114.8	1.0%
Assets in Trading Accounts					$867.6	7.8%
Cash and equivalents	$99.8	6.4%	$78.8	2.5%	$482.2	4.3%
Other Invested Assets	$83.2	5.4%	$235.2	7.5%	$646.1	5.8%
Total Invested Assets	$1,330.4	85.8%	$2,953.7	93.8%	$10,327.9	92.4%
Reinsurance Recoverables	$35.7	2.3%	$4.6	0.1%		
Other Assets	$185.2	11.9%	$192.2	6.1%	$848.2	7.6%
Total Assets without Separate Accounts			**$3,150.5**			
Separate Accounts			$1,899.5			
Total Assets with Separate Accounts	**$1,551.3**		**$5,050.0**		**$11,176.1**	
Liabilities and Equity:						
Loss Reserves &LAE	$583.6	37.6%	$2,430.0	77.1%		
Deposits					$7,309.8	65.4%
Federal Funds Purchased and Repos					$765.6	6.9%
Other Borrowed Money	$10.3	0.7%	$24.6	0.8%	$1,115.0	10.0%
All Other Liabilities	$420.1	27.1%	$367.2	11.7%	$842.7	7.5%
Total Liabilities	**$1,014.1**	65.4%	**$2,821.8**	89.6%	**$10,033.1**	89.8%
Total Equity	**$537.2**	34.6%	**$328.7**	10.4%	**$1,143.0**	10.2%
Total Liabilities and Equity without Separate Accounts			**$3,150.5**			
Separate Accounts			$1,899.5			
Total Liabilities and Equity with Separate Acounts	**$1,551.3**		**$5,050.0**		**$11,176.1**	

Source: Life-Health and Property-Liability Insurance data are from the 2008 ed. of A. M. Best Co., *Best's Aggregates & Averages, Life-Health* and *Best's Aggregates & Averages, Property-Liability* . Commercial Bank data are obtained from Insurance Information Institute, T*he Financial Services Fact Book* , 2009.
Note: Stock amounts include preferred stock. Loss Reserves includes loss adjustment expense reserves and reinsurance payable. Real Estate includes premises of insurers and banks.

Table 3
Importance of Insurers in Capital Markets, 2007

Type of Investment	Life-Health	Property-Liability
Equities	6.9%	1.1%
Corporate and Foreign Bonds	17.6%	2.7%
U.S. Municipal Securities and Loan Holdings	1.3%	14.0%
Treasury Securities	2.2%	1.6%
Agency & GSE Bonds	4.9%	2.3%

Source: Federal Reserve Flow of Funds Accounts; Insurance Information Institute, *The Financial Services Fact Book*, 2009.