The Role of Capital in Financial Institutions and Systemic Risk*

Giuseppe Corvasce†

Abstract

I estimate a measure of systemic risk, namely Systemic Expected Shortfall (SES), as the aggregate amount of capital that financial institutions might need when the financial system is undercapitalized. Each financial institution's SES can be measured as a combination of market capitalization, appropriate capital adequacy ratios and total amount of liabilities. Therefore, I derive (i) the appropriate leverage point that allows financial intermediaries to keep in check managerial rent-seeking and risk-shifting behaviors exacerbated during a systemic crisis; (ii) I empirically show the ability of the Marginal Expected Shortfall (MES) and insolvency risk measures to estimate the percentage variation of market capitalization and liabilities experienced by financial intermediaries during the recent financial crisis; (iii) I identify the most systemically important financial institutions (SIFIs), at the end of June 2007 and the beginning of September 2011. (iv) I derive several specifications of SES and compare them with SRISK.

JEL Classification: G01, G21, G28, G32
Keywords: Financial Crisis, Financial Regulation, Risk Management, Capital Requirements

*I would like to thank Tobias Adrian, Edward Altman, Yakov Amihud, Richard Berner, Christian Brownlees, Kose John, Eric Jondeau, Ronald Masulis, Fariborz Moshirian, Lasse Pedersen, Loriana Pelizzon, Thomas Philippon, Michael Rockinger, Anthony Saunders, Jonathan Sokobin and Norman White for useful comments. I have also benefited of feedback from participants at the International Risk Management Conference 2012, the Office of Financial Research and the ESCP Europe. I am indebted to Viral Acharya, Giovanni Barone-Adesi, Robert Engle and Matthew Richardson for their valuable advices. I also would like to thank the staff of The Volatility Institute, The Salomon Center and The Stern Center for Research Computing for their useful assistance and support. All errors are my own.

†E-mail: giuseppecorvasce@gmail.com; Tel. +1 646 240 2731

1 Introduction

During a financial crisis, highly leveraged and distressed financial institutions liquidate their own assets at prices far below their fair market value to achieve a quick sale and so satisfy their debt holders. Hence, a fire sale leads to funding problems and might degenerate into a downward spiral (Brunnermeier et al. (2009)) that can spread into the financial system and cause an aggregate shortfall of capital. Systemic risk represents the *tip of the iceberg* of this phenomenon, where debt overhang and reduced lending capacity jeopardize the stability of a financial system. Therefore, capital represents the most important key that might help the entire financial system in times of an aggregate credit crunch.

In this paper, I study the role of capital in financial institutions and the link with systemic risk. The findings are in line with the theoretical model proposed by Acharya et al. (2010) for measuring the *shortfall of capital* that a financial institution might experience during a systemic crisis. In their framework, a social planner regulates systemic risk imposing a tax that takes into account two components: each financial institutions' losses during an idiosyncratic failure and the externality that the rest of the economy suffers when the aggregate capital of all financial intermediaries is below a certain threshold, denoted *Systemic Expected Shortfall* (SES).

I empirically estimate the *Systemic Expected Shortfall (SES)* for a sample of U.S. financial institutions screened at the end of June 2007, with a quasi market value of assets (QMVA) greater than $ 5 bln. USD. Therefore, I proceed in the following way: i) I estimate the Marginal Expected Shortfall (*MES*) that represents a downside measure of market risk. ii) I calibrate the appropriate proportion of capital (*The CARK ratios*) for each financial industry and subindustry. iii) I study the *cross-sectional* percentage variation of the market capitalization and liabilities experienced by financial intermediaries during the "demo" crisis period (July 2007 to December 2008), as a function of MES and insolvency risk measures (*K, K_Stand_IND, K_Stand_SUBIND*). iv) I compute each financial institution's *SES* as a combination of *mar-*

ket capitalization, *appropriate capital adequacy ratios K* (*The CARK ratios*) and *total amount of liabilities*. v) I compare several specifications of SES with the measure of systemic risk (SRISK) proposed by Brownlees et al. (2011).

In line with Acharya et al. (2010), I find a negative relationship between variation of market capitalization and liabilities with MES and a positive relationship with insolvency risk measures (*K, K_Stand_IND, K_Stand_SUBIND*). In median, financial intermediaries that before the crisis reported a low level of MES and shown a high degree of leverage, drastically rebalanced their capital structure during the recent financial crisis (July 2007 to December 2008), resulting in an extended excursion away from their appropriate level of leverage and by a median increase of the amount of capital (SES) that financial intermediaries needed in order to avoid social costs for the entire economy. The rebalancing of the capital structure and so the variation of each financial institution's SES was characterized by both a variation of the total amount of market capitalization and liabilities. In order to gauge the reliability of the results, I perform cross-sectional regressions controlling the heterogeneity across financial institutions, for size and industry/subindustry fixed effects.

The adjusted R^2 of the *cross-sectional* regressions that explains the variation of market capitalization ranges from 6.48% (with industry fixed effects) to 14.08% (with subindustry fixed effects). The goodness of fit becomes stronger when I analyze the sample of 118 U.S. financial institutions with QMVA greater than $ 15 bln. USD. Indeed, it ranges from 7.59% (with industry fixed effects) to 43.09% (with subindustry fixed effects).

I also study the *cross-sectional* variation of the total amount of liabilities during the "demo" period of crisis. The adjusted R^2 ranges from 12.41% (with industry fixed effects) to 18.49% (with subindustry fixed effects) across different specifications and for the smaller sample of financial institutions sharply increases to 27.22%. The combined effect of the estimated amount of market capitalization and liabilities, as well as appropriate capital adequacy ratios for different industries/subindustries, make allowances for deriving several specifications of the Sys-

temic Expected Shortfall *(SES1, SES2, SES3, SES4, SES5, SES6, SES7, SES8)*. Using the first specification, *SES1*, I find that at the end of June 2007, BANKS contributed approximately 62% to the total capital shortfall experienced by all financial intermediaries; DIVERSIFIED FINANCIALS for 31%; INSURANCE institutions for 2% and REAL ESTATE institutions for 4%. At the beginning of September 2011, financial intermediaries that belong to BANKS industry contributed for 41%; DIVERSIFIED FINANCIALS for 35%; INSURANCE companies for 20% and REAL ESTATE institutions for 4%.

I further compare several specifications of SES with the systemic risk measure (SRISK) proposed by Brownlees et al. (2011). The rank correlation across all pairs of rankings is between 0.76 and 0.91 for those specifications of SES that consider the expected variation of market capitalization and liabilities. Conversely, for those specifications that do not consider a potential variation of liabilities and market capitalization, the rank correlation is between 0.90 and 0.97.

Section 2 reviews the literature related to the role of capital in financial institutions and the link with systemic risk. Section 3 presents the methodology and the key components for measuring systemic risk. Section 4 discusses the data used for the empirical analysis. In section 5, I discuss the empirical results. Section 6 concludes.

2 Capital Adequacy and Systemic Risk: A Review

The design of an optimal capital structure represents a strategic decision for many firms. There is a substantial difference between non-financial and financial institutions. Non-financial companies choose their leverage without being constrained by specific limits. On the other hand, financial companies are constrained by capital requirements that aim to lower the chances of default of a financial intermediary and thus avoid that negative externalities might impose substantial social costs to the rest of the economy. Therefore, the lack of sufficient capital

buffers represent a crucial point for explaining a systemic crisis.

An obvious question, therefore, would be: How do regulators should set capital requirements in order to reduce the default of financial intermediaries and so avoid a systemic crisis? The answer has been the main topic of research for many scholars in the finance literature (Merton (1995); Miller (1995); Allen et al. (1995); Berger et al. (1995); Santomero et al. (1977); Dimson et al. (1995, 1996); Haubrich et al. (1993); Altman et al. (2001); Altman et al. (2002); Acharya (2001); Acharya et al. (2010,2011); Brownlees et al. (2011); and Saunders et al. (2011) among many others) as well as the guide principle for central bankers of major economies.

The proposed framework is in line with the theoretical models proposed by Acharya et al. (2010, 2011). In these papers, the authors discuss how *capital* allows financial institutions to keep in check financial managers' incentives (Acharya et al. (2011)) and how a *shortfall of capital* experienced by a financial intermediary might jeopardize the stability of an entire financial system provocating distress and social costs (Acharya et al. (2010)). These negative externalities might arise for different reasons. In this respect, Brunnermeier et al. (2009) and Pedersen (2009) examine the effect to which liquidity spirals happen when everyone runs for the exit. Diamond et al. (1983) and Allen et al. (2007) point out the *bank runs* phenomenon. Acharya et al. (2011) shows how the recent crisis has been characterized by *freezes* in the market for short term debt that caused externalities in the economy.

In light of the recent crisis, many scholars have contributed to the discussion for measuring systemic risk. Gray, Merton and Bodie (2009) and Gray and Jobst (2009) use the contingent claim analysis (CCA) developed by Black (1973) and Merton (1976) for measuring and managing macrofinancial risk and financial stability. Huang et al. (2009) proposes an indicator of systemic risk based on CDS data and equity prices for respectively estimating the probability of defaults (Duffie (2009)) and asset returns correlations (Hull et. al (2001)). Adrian et. al (2009) proposes *CoVaR* for estimating the Value at Risk (VaR) of the financial system condi-

tional on institutions being in distress. Segoviano et al. (2009) uses financial institutions CDS data within a multivariate framework in order to examine the potential contribution of each firm to the potential distress.

In the quantitative finance and econometrics literature, Allen et al. (2010) proposes *CATFIN* as a measure of systemic risk. Borio et al. (2010) proposes the Shapley values for capturing the contribution of individual institutions to systemic risk that relies on Acharya et al. (2010) as well as Kurth et al. (2003) and Huang et al. (2009). Billio et al. (2010) uses the principal component analysis and Granger causality tests (Granger (1969)) for exploiting the level of interconnection among financial institutions (hedge funds, banks and insurance companies). Brownlees et al. (2011) proposes SRISK based on ARCH models (Engle (1982)) and DCC correlations (Engle (2002)). Cont (2009) investigates systemic risk relying on the network theory for studying the interconnections among intermediaries. Cont et al. (2009) uses a directed scale free weighted graph with heavy-tailed distributions degree and weight distributions for examining the network of interlinked Brazilian financial institutions.

The background of the paper relies on the economic theory of regulation as well as on the *"regulatory capture"* developed by Stigler (1971) and Peltzman (1976), in which financial institutions are always ready to find loopholes in the system and gain profits and so policy outcomes from regulatory decisions.

3 Methodology

In this section, I discuss the methodology used for estimating the Systemic Expected Shortfall (*SES*), as well as its key variables. In subsection 3.1, I derive each financial institution's *Systemic Expected Shortfall* (SES_i) as a combination between the expected amount of market capitalization, the expected amount of liabilities in the case of a systemic crisis and the appropriate capital adequacy ratios. In subsection 3.2, I derive a simple formula for computing

the appropriate capital adequacy ratios K (*The CARK ratios*) that represent the proportion of capital that allows financial intermediary to be enough capitalized and so resilient to a potential systemic crisis. In subsection 3.3, I also derive the *Marginal Expected Shortfall* as a key measure with the ability to explain the percentage variation of liabilities, as well as the percentage variation of market capitalization that a financial intermediary might experience during a crisis.

3.1 *Systemic Expected Shortfall*

The *Systemic Expected Shortfall* (*SES*) represents the expected amount of capital that financial institutions might lose, in case of a systemic crisis. For each financial institution, this quantity can be computed in the following way:

$$SES_i = E\left[app\_ratio * a_i - w_i \,|\, W < C\right] \tag{1}$$

where, a_i is the total amount of assets of each financial institution; w_i is the total amount of capital and app_ratio is the appropriate fraction of assets[1]. SES_i represents the loss in capital that a financial institution might experience in case of a systemic crisis, i.e. when the total amount of capital W in the economy is expected to be below a certain threshold C [2]. In a market based measurement, SES_i requires two main components: an estimate of the market value of equity as well as an estimate of the market value of assets, in case of a systemic crisis. As such, SES_i can be decomposed in the following way:

$$SES_i = app\_ratio * E\left[a_i \,|\, W < C\right] - E\left[w_i \,|\, W < C\right] \tag{2}$$

The market value of assets can be estimated using structural models (Black (1976); Merton

[1]The empirical analysis has been developed using the CARK_IND and CARK_SUBIND as appropriate capital adequacy ratios. The methodology for calibrating these ratios has been derived in Section C.

[2]For simplicity, in the empirical section, I have assumed that a systemic crisis happens when the variation of the MSCI US Index is below 40%.

(1973,1976)) or deduced from models based on accounting approximations (Tobin (1969); Leary et al. (2005); Lemmon et al. (2008); Acharya et al. (2010); Brownlees et. al (2011)). Using the second methodology, the market value of assets a_i can be written in the following way:

$$a_i = BVA_i - BVE_i + w_i \tag{3}$$

where BVA is the book value of assets and BVE is the book value of equity. Hence, I can rewrite SES_i in the following way:

$$SES_i = app\_ratio * E\left[BVA_i - BVE_i + w_i \,|\, W < C\right] - E\left[w_i \,|\, W < C\right] \tag{4}$$

If I rearrange the terms in the equation, I have the following quantity:

$$SES_i = app\_ratio * E\left[Liabilities_i \,|\, W < C\right] - (1 - app\_ratio) * E\left[w_i \,|\, W < C\right] \tag{5}$$

where, $Liabilities_i$ is the total amount of book value of liabilities or better the difference between the total book value of assets (BVA) and the total book value of equity (BVE). SES_i can be also written in the following way:

$$SES_i = app\_ratio * Liabilities_i * (1 + \Delta Liabilities_i) - (1 - app\_ratio) * w_i * (1 + \Delta w_i)\,. \tag{6}$$

where, $\Delta Liabilities_i$ and Δw_i respectively represent the percentage variation of liabilities and market capitalization experienced by a financial intermediary during a financial crisis. SES_i is similar in spirit to the systemic risk measure ($SRISK$) proposed by Brownlees et al. (2011), although SES_i is able to take into account the rebalancing of the capital structure (Leary et al. (2005)) that financial intermediaries experience during a systemic crisis. The deterioration of the credit conditions might force financial institutions to issue new equity or undertake cor-

porate actions (i.e. M&As and LBOs) in order to postpone the perils of insolvency. These strategic decisions change the market capitalization of a financial intermediary and might have an impact on the estimation of the amount of capital that it needs as a buffer against an insolvency risk or an aggregate credit crunch. Second, I also model the variation of the total amount of liabilities that a financial institution might experience during a fire sale period or systemic crisis. Third, I also derive appropriate capital adequacy ratios (The CARK ratios) that might allow to keep in check financial institutions' incentives to take excessive leverage and risks. SES_i represents the amount of capital that a financial institution might need for handling two moral hazard problems: *managerial rent-seeking* and *risk-shifting* or asset substitution (Jensen et al. (1976)). The proportion of equity and liabilities has been pointed out by Acharya et al. (2011) as an important decision factor that financial institutions face in order to handle Shylla (*managerial rent-seeking*) and Charybdis *(risk-shifting or asset substitution)*. From one perspective, a financial intermediary would prefer a low level of SES_i in order to better monitor the renk-seeking behaviors of managers that might be exacerbated during a systemic crisis. To the other side, with a high level of SES_i, financial intermediaries would be more inclined *to bet* on risky assets in order to increase their expected profit.

In the following subsections, I derive the Marginal Expected Shortfall (MES) and the Capital Adequacy Ratios K as important components for estimating SES_i and so the *aggregate shortfall of capital* experienced by all financial intermediaries within an economy (SES)[3].

3.2 *Marginal Expected Shortfall*

The most well known measures of risk in the banking and finance literature as well as among *risk managers* are the Value at Risk and the Expected Shortfall. The Value at Risk (VaR)

[3]Without loss of generality, since I am interested on quantifying the amount of capital that a financial institution needs in order to offset a certain proportion of liabilities in case there is a potential downside in the market, I will report in the Section 5 (Empirical Results) the maximum between 0 and SES_i. This means that if a financial institution reports a SES_i smaller than 0, I will report the value 0. To the other side, if SES_i is greater than 0, I will report the maximum between 0 and SES_i.

has been introduced with the aim of answering to the following questions: What is the expected loss incurred by a firm given a certain probability and a time horizon? What is the amount of capital that is at risk in an investment process? VaR is defined as the maximum loss incurred by a financial institution with probability $1-\alpha$, with $0 < \alpha < 1$[4]. Several studies among others (Artzner et al. (1997, 1999); Albanese (1997); Frittelli (2000); Gordy (2000); Embrechts (1997, 1999); Carr (2001); Acerbi (2002, 2004); Szego (2002, 2004); Jorion (2001); Danielsson et al. (2001, 2002); Rockafellar et al. (2001)) have shown the inadequacy of VaR as a *coherent* measure of risk and pointed out how VaR used by regulators and banking supervisors "*can destabilize an economy and induce crashes when they would not otherwise occur"* (Danielsson (2002)).

Artzner et al. (1997) have proposed the expected shortfall as a valide alternative to VaR. The expected shortfall measures how much a financial institution can lose on average in states beyond the Value at Risk, so it improves the reliability of the VaR estimation[5]. In practical applications, risk managers are interested in evaluating the risk contribution coming from a particular exposure on a certain class of assets. Let us decompose the total return that a financial institution might generate from its activity as a weighted average of returns coming from different lines of business in which the company is involved. The total financial institution return, R, can be written in the following way:

$$R = \sum_{i=1}^{N} \omega_i * r_i \tag{7}$$

where, r_i represents the returns coming from different lines of businesses; ω_i is the percentage amount of capital that the company allocates for each activity and N is the number of lines

[4]From a mathematical standpoint, VaR is the $\alpha - quantile$ of the inverse distribution function $F_X^{-1}$of a random variable X, taken with a negative sign. Hence, $VaR_\alpha = -F_X^{-1}(\alpha)$. In cases where the inverse distribution function does not exist, it can be defined as the $\alpha - quantile$ of the generalized inverse distribution function F_X.

[5]It has been shown to reflect the properties of positive homogeneity, subadditivity, monotonicity and transitional invariance typical of coherent measures of risk (Artzner (1999); Tasche (2002)). For continuous random variables the Expected Shortfall is equal to the Conditional Value at Risk (Rockfaller et al. (2002))

of business in which the company has allocated funds. In formula, I can write the Expected Shortfall as follows:

$$ES_\alpha(R) = E[R \,|\, R \leq VaR_\alpha(R)] = \sum_{i=1}^{N} \omega_i E[r_i \,|\, R \leq VaR_\alpha(R)]. \tag{8}$$

It is the average of returns on days when the total financial institution's return R exceeds the VaR. The Expected Shortfall can also be decomposed in the following way:

$$ES_\alpha(R) = \sum_{i=1}^{N} \frac{\partial ES_\alpha(R)}{\partial \omega_i} \omega_i. \tag{9}$$

This alternative specification relies on the decomposition of the expected shortfall of the financial institution risk into individual risk exposures (Tasche (1999); Yamai et al. (2005)). The sensitivity of the total risk to each individual exposure is $\frac{\partial ES_\alpha(R)}{\partial \omega_i}$, that represents the Marginal Expected Shortfall (MES).

3.3 *The Capital Adequacy Ratios K (The CARK ratios)*

The frictionless world proposed by Modigliani et al. (M&M, 1958), where no imperfections such as taxes, transaction costs, costs of financial distress, asymmetric information and regulation affect firm's leverage has been the starting point for all modern research on capital structure. Berger et al. (1995) documents how M&M's imperfections can always be justified by a tradeoff, between equity and assets, that financial intermediaries face when they choose their appropriate capital structure. In line with Berger (1991), Berger et al. (1995) and Acharya et al. (2011), in this subsection, I discuss a simple methodology for computing the *appropriate capital adequacy ratios K* (*The CARK ratios*) that regulators might impose as a way to keep in check financial institutions' incentives to increase their level of leverage. The methodology relies on the market value accounting (MVA) procedure that has been recommended by many scholars in the banking and finance literature (Benston et al. (1986), Jones et al. (1995)) as a

solution to the criticisms of the actual regulation for computing the capital requirements (Merton (1995), Altman et al. (2002), Saunders et al. (2011)) and it is in line with the wise idea behind M&M's theorems where market prices are able to compensate for any capital structure decision that a firm might undertake. As such, I compute the actual Capital Adequacy Ratio (K) for each financial institution, in the following way:

$$K = \frac{market\,value\,of\,equity}{quasi\,market\,value\,of\,assets} = \frac{w}{BVA - BVE + w} \tag{10}$$

where, BVA represents the total book value of assets; BVE is the total book value of equity and w is the total market capitalization of a financial institution[6]. From a theoretical standpoint, a financial intermediary would prefer to constantly rebalance its capital structure in response to market changes (Leary et al. (2005)) and so constantly keep in check managers' incentives; in practice, this policy can be costly and even dangerous with the deterioration of the credit conditions. Therefore, imposing *appropriate capital adequacy ratios* for financial industries/subindustries might allow financial institutions to control managers' incentives and reduce the odds of insolvency of financial intermediaries and so avoid social costs for an economy. The calibration of these ratios relies on the following steps:

1) Compute the median of the daily Capital Adequacy Ratio (K), for each year and for each financial institution;

2) Calculate a 5 years arithmetic average of the ratio computed in the first step[7];

3) Calculate the 10th percentile of the cross-sectional empirical distribution of the ratio computed in the second step, for financial institutions that belong to the same industry/subindustry.

This procedure allows to distinguish between financial intermediaries with a high level of leverage and institutions with a low leverage. Steps (1) and (2) of the procedure can be written

[6]The use of this approximation for computing the market value of assets has been reproposed by Leary et al. (2005), Acharya et al. (2010), Brownlees et al. (2011), Billio et al. (2011) and a similar one has been used by Adrian et al. (2008, 2010).

[7]The choice of 5 years arithmetic average has been used in order to smooth the K's ratios along the years of an entire business cycle.

in the following way:

$$Avg\_K_i = 0.20 * \sum_{t=1}^{5} Median(K_{i,t}) \qquad for\, i = 1, ..., N \tag{11}$$

where, Avg_K_i represents 5 years arithmetic average of the median capital adequacy ratio (K) computed using daily information on the market value of equity, book value of equity and book value of assets for all financial institutions (N). Therefore, the appropriate capital adequacy ratios K for financial industries *(CARK_IND)* have been computed in the following way:

$$CARK\_IND = percentile\,(0.10, Avg\_K_i, m) \tag{12}$$

where, the number 0.10 represents the 10th percentile of the cross-sectional empirical distribution of Avg_K_i and m is the number of financial industries[8]. Accordingly, the appropriate capital adequacy ratios K for financial subindustries *(CARK_SUBIND)* have been computed as follows:

$$CARK\_SUBIND = percentile\,(0.10, Avg\_K_i, l) \tag{13}$$

where l represents the number of financial subindustries. I also derive two other insolvency risk measures, respectively K_Stand_IND and K_Stand_SUBIND, able to take into account the divergence of the actual capital adequacy ratio (K) of each financial institution from the appropriate capital adequacy ratios of the industry/subindustry $(CARK\_IND, CARK\_SUBIND)$ in which the institution belongs. The divergence has been standardized for the cross-sectional standard deviation of this spread. K_Stand_IND and K_Stand_SUBIND are respectively computed in the following way:

$$K\_Stand\_IND_i = \frac{(K_i - CARK\_IND)}{\sigma\,(K_i - CARK\_IND)} \tag{14}$$

[8]In the empirical analysis, I focus on 4 financial industries (BANKS, DIVERSIFIED FINANCIALS, INSURANCE, REAL ESTATE)

$$K\_Stand\_SUBIND_i = \frac{(K_i - CARK\_SUBIND)}{\sigma(K_i - CARK\_SUBIND)} \tag{15}$$

The denominators of both these ratios respectively represent the cross-sectional standard deviations of the divergence between the capital adequacy ratio (K) and its industry/subindustry appropriate capital adequacy ratios (CARK_IND and CARK_SUBIND).

4 Data, Sample Selection and Summary Statistics

In this section, I discuss the data as well as the sample selection criteria used for developing the empirical analysis. In the first subsection, I explain the criteria used for calibrating the appropriate Capital Adequacy Ratios K (*The CARK ratios*) as well as provide summary descriptive statistics related to them. In the second subsection, I discuss the sample selection criteria used for the empirical analysis on the capital adequacy and systemic risk.

4.1 *Data: calibrating The CARK ratios*

For calibrating the Capital Adequacy Ratio K (*The CARK ratios*), I screen a sample of 881 US financial institutions at the end of June 2007. For these institutions, I collect data on the total amount of market capitalization, the total amount of short and long term liabilities and classify these institutions in four industries and seventeen subindustries: *BANKS* (diversified banks, regional banks, thrifts and mortgage finance), *DIVERSIFIED FINANCIALS* (asset management and specialized finance, consumer finance, custod.banks&other specialized finance, investment banking&brokerage), *INSURANCE* (financial guarantee insurance and insurance brokers, life and health insurance, multi-line insurance, property&casualty insurance and Reinsurance) and *REAL ESTATE* (diversified, industrial and office REITs, mortgage REITs, real estate development and services, residential REITs, retail REITs, specialized REITs) institutions. In order to gauge the variation of the capital structure for each financial industry/sub-industry, I also

collect data for a sample of 772 US financial institutions at the beginning of September 2011. In Table 1, I report the summary statistics of the variables as well as the appropriate Capital Adequacy Ratio K (*The CARK ratios*) for each industry/sub-industry.

[Please Insert Table 1 around here]

In particular, BANKS and INSURANCE industries have in median respectively increased their leverage for 48% and 78%, from June 2007 to September 2011. The rebalancing of the capital structure (Leary et al. (2005)) of the intermediaries in BANKS industry was mainly driven by a decrease of the market capitalization for about 34% as well as of the long term component of the liabilities, that has been decreasing 14%. On the other side, INSURANCE institutions have drastically increased the amount of short and long term liabilities.

In Figure 1 and 2, I plot the dynamics of the capital adequacy ratios from the first quarter of 2002 to the third quarter of 2011. The actual capital adequacy ratios (K) for BANKS industry as well as across its subindustries have been quite stable till the beginning of the credit crisis (July 2007). The severity of the financial crisis as well as the increase of the fear for the credit conditions have changed the capital structure of these intermediaries. As soon as the U.S. Federal Reserve started to inject liquidity through open market operations and increased the lending among banks through a reduction of the discounted window rate, financial intermediaries within BANKS industry rebalanced their capital structure in order to fulfill the minimum requirements that allowed to some of them to postpone the perils of insolvency.

[Please Insert Figures 1 and 2 around here]

The credit crunch crisis has also penalized DIVERSIFIED FINANCIALS industry. In median all asset managers as well as specialized financial intermediaries have increased their

leverage for around 35% during the crisis period. Indeed, the reduction of K has been justified by a decrease of the market capitalization for more than 50% as well as a decrease of the total amount of liabilities.

[Please Insert Figure 3 around here]

Many Asset Managers (Figure 3) preferred to reinvest funds from maturity securities into new issues of the same securities and so better control their capital structure. The rollover of the short term liabilities was also a key choice undertaken by consumer finance intermediaries as well as by investment banking and brokerage institutions. A reduction of the amount of short term liabilities has been followed by an increase of the long term liabilities.

[Please Insert Figure 4 around here]

In Figure 4, I show the dynamics of K across INSURANCE subindustries. Financial Guarantee Insurance as well as Property&Casualty Insurance and Reinsurance institutions have in median drastically increased their level of leverage. Indeed, Financial Guarantee Insurance has been the subindustry that has in median lost around 90% of market capitalization, during the crisis period. A decrease of the market capitalization has been followed by an increase for about 14% of the short term liabilities. The same trend in the leverage component has been followed by institutions that belong to Property&Casualty Insurance and Reinsurance institutions. The variation of their capital structure has been characterized by a decrease of short term component for about 5% and a decrease of the market capitalization of about 16%. After December 2008, institutions that belong to Financial Guarantee Insurance and Insurance Brokers have increased for more than 180% their level of leverage, increasing their level of short term liabilities (more than 180%) as well as their long term exposures (more than 150%).

[Please Insert Figure 5 around here]

In Figure 5, I report the dynamics of the K ratios for subindustries within REAL ESTATE industry. Before the Great Recession[9], all subindustries showed a stable proportion of capital respect to the total amount of assets. Decreasing interest rates backed by the U.S. Federal Reserve and large inflow of foreign funds increased the credit availability. In particular, banks encouraged home owners to borrow high loans thinking that the house prices could continue to increase and home owners could quickly repay their loans. The securitization procedure on the mortgage loans and the tranches of collaterilized liabilities (or debt) obligations (CDOs) greatly increased before the crisis. This spiral moved many investors in the stock market to rely on the attractive performance of institutions in REAL ESTATE industry. In median, the market capitalization of these companies drastically increased for more than 250% from the first quarter of 2002 until the second quarter of 2007. As the housing prices declined and many home owners declared foreclosure, most of the investors reduced their credibility about the stability of REAL ESTATE institutions and started to sell their shares. In particular, REAL ESTATE DEVELOPMENT & SERVICES as well as Mortgage REITs lost in median more than 70% of their market capitalization and reduced their long term liabilities to about 25%.

After the first quarter of 2009, RESIDENTIAL REITs as well as SPECIALIZED REITs increased their capital adequacy ratios for more than 100% (respectively from 0.26 to 0.52 and from 0.21 to 0.50) due to a sharp increase of the market capitalization experienced in median by these institutions. On the other side, MORTGAGE REITs continued to decrease in median their long term liabilities and so increase their leverage.

[9]This term has been coined by former Federal Reserve Chairman Paul Volcker for describing the credit crisis period (date of the article was May 5th, 2009)

4.2 *Data: Systemic Risk Analysis*

From the full sample of 881 firms, I depict those financial companies with a total amount of Quasi Market Value of Assets (QMVA) in excess of $ 5 billion US dollars, at the end of June 2007. This procedure allows consideration of 245 U.S. financial institutions classified in the following way: 97 companies of BANKS industry; 43 institutions of DIVERSIFIED FINANCIALS industry; 56 firms of INSURANCE industry and 49 REAL ESTATE companies. For each financial institution in the sample, I compute the percentage variation of the total amount of liabilities and market capitalization during the crisis period (July 2007 to December 2008), the Marginal Expected Shortfall (*MES*), the actual capital adequacy ratio (K) and the standardized measures of the actual K ratio *(K_Stand_IND* and *K_Stand_SUBIND)*. *MES* is a simple measure of tail dependence and represents the arithmetic average of stock returns in those days in which the market has performed poorly. It has been computed at the standard risk level of $\alpha = 5\%$, using daily data of equity returns from Bloomberg and the market index (MSCI US Index) from MSCI Barra.

[Please Insert Table 2 around here]

In Table 2, I report summary descriptive statistics of the key variables used for investigating the relationships between the variation of the market capitalization as well as the percentage difference of the total amount of liabilities with measures of risk.

In median, financial institutions have lost 47.18% of their market capitalization during the crisis period. In particular, DIVERSIFIED FINANCIALS and REAL ESTATE industries reported a loss of around 55% of market capitalization. On the other side, BANKS and INSURANCE industries reported a loss for less than 45%. Among the subindustries, Financial Guarantee and Insurance & Insurance Brokers, Real Estate Development & Real Estate Services as well as Thrifts & Mortgage Finance institutions lost more than 80% during the crisis. Fannie

Mae, Freddie Mac, Ambac Financial Group, Thornburg MTG, Indymac Bancorp, Washington Mutual and Lehman Brothers Holding were all financial intermediaries that lost more than 90% of market capitalization during the crisis period (July 2007 to December 2008) and most of these institutions represented a real threat to the stability of the U.S. financial system.

As the credit conditions deteriorated, financial institutions decreased the total amount of liabilities. In particular, DIVERSIFIED FINANCIALS and INSURANCE institutions respectively reduced their exposures by about 3.87% and 4.65%. Mortgage REITs institutions and Investment Banking & Brokerage respectively diminished their amount of total liabilities by 17% and 35%. On the other side, Diversified Banks subindustry and Real Estate Development & Services companies respectively increased the total amount of liabilities by 16.08% and 23.39%. The amount of short term liabilities decreased 48.13% for consumer finance institutions and 18.98% for Investment Banking & Brokerage companies. On the other side, Financial Guarantee Insurance & Insurance Brokers as well as Real Estate Development & Services respectively increased their short term liabilities by more than 16%. In terms of long term liabilities, Asset Management&Specialized Finance, Diversified Banks, Real Estate Development & Services increased by more than 26% their exposures.

5 Empirical Results

For presentation purposes, I discuss the empirical results in two subsections. In the first subsection, I report the statistics related to the cross-sectional analysis that relate the percentage variation of the market capitalization $(\triangle w)$ as well as the percentage variation of the total amount of liabilities $(\triangle Liabilities)$ with measures of risk, such as, *MES* and measures of insolvency risk (*K, K_Stand_IND, K_Stand_SUBIND)*. In the second subsection, I discuss the amount of capital that financial intermediaries were supposed to hold at the beginning of the

credit crisis (July 2007 to December 2008) as well as at the beginning of September 2011.

5.1 *Cross-sectional Analysis*

In line with the studies proposed by Acharya et al. (2010, 2011), I propose a *time* and *cross-sectional* framework for estimating the percentage variation of market capitalization ($\triangle w_i$) and liabilities ($\triangle Liabilities_i$) that financial intermediaries experienced during the "demo" period of crisis (July 2007 to December 2008).

In particular, I relate $\triangle w_i$ and $\triangle Liabilities_i$ with *MES* and insolvency measures of risk (*K, K_Stand_IND, K_Stand_SUBIND),* in the following way:

$$\triangle w_i = \alpha + \delta * MES_i + \phi * K_i \tag{16}$$

where, *MES* and measures of insolvency risk are both estimated the year before the crisis period (June 2006 to June 2007). The coefficients δ and ϕ capture the degree of sensitivity of *MES* and *K* to variations of market capitalization during the crisis period (July 2007 to December 2008). Accordingly, the variation of the total amount of liabilities has been estimated as follows:

$$\triangle Liabilities_i = \zeta + \beta * MES_i + \tau * K_i \tag{17}$$

where, the coefficients β and τ respectively capture the sensitivity of MES_i and K_i to variations of the total amount of liabilities. I control the analysis for industry and subindustry dummy variables able to take into account the potential heterogeneity across industries and subindustries that might jeopardize the goodness of the estimation[10].

[Please Insert Table 3 around here]

[10] In the previous equations, I have only reported the impact that K_i has on $\triangle w_i$ and $\triangle Liabilities_i$. The empirical analysis has been also developed using *K_Stand_IND* and *K_Stand_SUBIND* as covariates.

In Table 3, I report the results of the *cross-sectional* regressions that relate the variation of the market capitalization during the crisis period with *MES* and *K* as well as its standardized measures. In line with the theory developed by Acharya et al. (2010), I respectively find a negative and highly significant relationship between $\triangle w$ and MES as well as between $\triangle w$ and *measures of insolvency risk* $(K, K\_Stand\_IND, K\_Stand\_SUBIND)$. The combined effect of *MES* and measures of insolvency risk drastically increases the goodness of fit (adjusted R^2) of the *cross-sectional* regressions. These results become pronounced when controlling for sub-industry fixed effects. Indeed, the adjusted R^2 of the *cross-sectional* regressions increase from 6.48% (with industry fixed effects) to 12.98% (with subindustry fixed effects). Using standardized measures of K $(K\_Stand\_IND \, and \, K\_Stand\_SUBIND)$, the adjusted R^2 increases from 7.21% to 14.08%. These findings become robust, when I analyze the sample of financial institutions with Quasi Market Value of Assets (QMVA) greater than $ 15 billion USD. In particular, the goodness of fit increases from 7.59% to 40.92% under the combined effect of *MES* and *measures of insolvency.* The results become even more robust as soon as I consider the standardized measures of the actual *K* able to take into account the insolvency risk that a financial intermediary faces with respect of its subindustry (K_Stand_SUBIND). Indeed, the adjusted R^2 increases to 43.06%.

Financial intermediaries, that before the crisis period respectively reported a high level of *MES* and a low level of *K,* were those institutions that performed poorly during the "demo" period of crisis (July 2007 to December 2008). Lehman Brothers, Bear Stearns, Thornburg MTG, Merrill Lynch, Morgan Stanley, Indymac Bancorp are examples of financial intermediaries that lost more than 90% of their market capitalization and reported a high level of MES (on average more than 2.1%) and a low *K* (below 8%), before the crisis period. During the credit crunch, many financial institutions (i.e. Wachovia, Bear Stearns and Merrill Lynch) were forced into corporate actions and many others (i.e. Fannie Mae, Freddie Mac and AIG) were bailed out by the U.S. federal Reserve.

Table 4 contains the estimation of the cross-sectional regressions between the percentage variation of the total amount of liabilities during the crisis period (July 2007 to December 2008) and measures of risk (MES, K, K_Stand_IND, K_Stand_SUBIND), computed before the crisis.

[Please Insert Table 4 around here]

The coefficient β that captures the sensitivity of *MES* to variation of liabilities is negative and highly significant. On the other side, the coefficient τ related to the sensitivity of insolvency risk measures is positive and strongly significant. The combined effect of *MES* and measures of capital adequacy drastically increases the goodness of the estimation. The adjusted R^2 increases from 12.41% (with industry fixed effects) to 16.52% (with subindustry dummy variables). Standardized measures of the actual capital adequacy ratio sharply increase the adjusted coefficient of determination to 18.52%.

The results are even more robust if the analysis is developed on a smaller sample of financial intermediaries with QMVA greater than $ 15 billion USD. *MES* is negative and highly significant across all specifications; whereas, the insolvency risk measures turn out to be non significant[11].

5.2 *Systemic Expected Shortfall, at the end of June 2007*

In this subsection, I estimate the amount of capital that financial intermediaries needed at the end of June 2007, given the severity of the current financial crisis. Table 5 reports several

[11]This result is also consistent if I divide the variation of the total amount of liabilities in two parts: variation of short and long term liabilities. MES has a negative and significant impact on the variation of short and long term liabilities. On the other side, the coefficients that capture the effect of insolvency measures of risk are positive and significant for the analysis of long term liabilities.

specifications that I have used for computing the appropriate amount of capital[12]. In detail, I only show the list of the top 50 financial institutions with the greatest SES_i.

[Please Insert Table 5 around here]

The estimation has been computed using the appropriate capital adequacy ratios K of each industry $(CARK\_IND)$ and relies on an estimation procedure in which MES and the capital adequacy ratio K are the covariates of the *cross-sectional* framework. This quantity, that I call *SES1,* takes into account the potential variation of market capitalization and liabilities that a financial institution might experience during a systemic crisis. Based on this measure, the sample of 245 U.S. financial institutions needed capital for more than $ 190 bln. USD, before the financial crisis. In aggregate, BANKS contributed for 62%; DIVERSIFIED FINANCIALS for 31%; INSURANCE institutions for 2% and REAL ESTATE institutions for 4%.

Systemic risk in the system is captured by just a few subindustries: DIVERSIFIED BANKS contributed for 22%; INVESTMENT BANKING & BROKERAGE for 31%; THRIFTS & MORTGAGE FINANCE institutions for 39%. In July 2007, the top 10 financial institutions captured around 88% of the systemic risk in the financial sector. Freddie Mac, Fannie Mae, Citigroup, Morgan Stanley, AIG, Bank of America Corporation were massively bailed out by the U.S. government; other institutions (i.e. Merrill Lynch, Bear Stearns) preferred to rely on corporate actions in order to avoid the default; many other financial companies (i.e. Lehman Brothers) were not capable of avoiding the recent financial crisis.

It is also important to make a few considerations on the actual level of leverage that the 10 most systemically important financial institutions (SIFIs) reported before the crisis period. On average, these institutions reported a leverage ratio equal to 14.03, that is almost 3 times bigger than the leverage ratio across all financial intermediaries. Indeed, the amount of their liabilities was equal to 25% of the total amount of liabilities across 245 US financial intermediaries.

[12] In Table 5, the analysis has been developed using a historical perspective.

In order to gauge the stability of the results, I use other specifications of *Systemic Expected Shortfall* (SES2, SES3, SES4, SES5, SES6, SES7, SES8) that take into account different insolvency risk measures as well as industry and subindustry dummy variables for estimating the variation of market capitalization and liabilities . In particular, *SES2* and *SES6* take into account the impact that the actual capital adequacy ratio (K) has on the estimated variation of market capitalization and liabilities[13]*; SES3* and *SES7* consider the impact of K_Stand_IND[14]; *SES4* and *SES8* capture the influence of K_Stand_SUBIND[15].

The 10 most systemically risky financial institutions, across *SES3, SES4, SES7, SES8* specifications, explain about *90%* of the total capital shortfall experienced by the sample of financial institutions in the system, at the end of June 2007. In Table 6, I also report a Spearman rank correlation matrix among *Systemic Expected Shortfall* rankings[16], computed at the end of June 2007.

[Please Insert Table 6 around here]

It is interesting to note how *SES1* and *SES4* as well as *SES5* and *SES8* provide the same rankings across financial intermediaries. The rank correlation between these two pairs of rankings is respectively equal to 0.95 and 0.98. To the other side, the rank correlation between *SES3* and *SES6* as well as between *SES4* and *SES6* is respectively equal to 0.32 and 0.40. The rank correlation among the 25 most systemically important financial institutions (SIFIs) across different specifications of SES is around 0.90-0.95.

[13] *These two quantities have been estimated using respectively CARK_IND and CARK_SUBIND.*

[14] *SES3 and SES7 have been respectively estimated with CARK_IND and CARK_SUBIND.*

[15] *SES4 and SES8 have been respectively estimated with CARK_IND and CARK_SUBIND.*

[16] Spearman rank correlation is a particular case of a generalized index, *"cograduation index"*, introduced by Cifarelli and Regazzini (1990) and generalized by Conti (1993)

5.3 *Systemic Expected Shortfall, at the beginning of September 2011*

In order to gauge the predictive power of the Systemic Expected Shortfall measures, I have conducted an *out-of-sample* exercise for a sample of 245 U.S. financial institutions screened at the beginning of September 2011. In Table 7, I report the results related to these analysis. It is interesting to note how the Marginal Expected Shortfall and the crucial variables, that I use for estimating the variation of market capitalization and liabilities, have sharply increased since the end of June 2007. Using SES1 as a ranking measure, JPMorgan Chase, Goldman Sachs, Citigroup, Morgan Stanley, Wells Fargo & Co were the most systemically important financial institutions. In aggregate, these institutions were supposed to hold about $ 84 billion USD in order to be resilient to a potential systemic crisis.

[Please Insert Table 7 around here]

It is also important to note how the proportion of capital shortfall among industries/subindustries has changed from the beginning of the credit crisis. By September 1st 2011, BANKS institutions contributed for 41% to the total capital shortfall; DIVERSIFIED FINANCIALS contributed for 35%; INSURANCE companies weighted for 20% and REAL ESTATE institutions for 4%. Among subindustries, DIVERSIFIED BANKS increased their level of systemic risk to 36% (September 2011) and INVESTMENT BANKING & BROKERAGE institutions decreased their level of systemic risk to 20%.

From July 2007, the level of MES has increased more than 140%. On average, the *market risk* of these institutions, in the days in which the MSCI US Index has performed poorly, has sharply increased. In particular, MES for financial institutions in BANKS and DIVERSIFIED FINANCIALS industries has respectively increased 186% and 162%. This downside measure of market risk mainly reflect the deterioration of the market conditions exacerbated by the European sovereign debt crisis.

I also compute the Systemic Expected Shortfall, under different specifications (*SES2, SES3, SES4, SES5, SES6, SES7, SES8*), in order to evaluate the impact that different *insolvency risk measures (K, K_Stand_IND, K_Stand_SUBIND)* might have on the estimation of capital shortfall.

[Please Insert Table 8 around here]

In Table 8, I summarize the results using a Spearman rank correlation matrix. The dependence between *SES1* and *SES4* is equal to 0.85; whereas, the dependence between *SES2* and *SES6* is equal to 0.92. On the other side, the rank correlations between *SES2* and *SES3* as well as between *SES3* and *SES6* are respectively equal to 0.49 and 0.40. The rank correlation across rankings sharply increases as soon as I focus on the 25 most SIFIs. This is mainly due to the concentration of systemic risk by only a few financial institutions.

I further compare the measure of systemic risk (*SRISK*) proposed by Brownlees et al. (2011), with several specifications of SES. I use the sample of financial institutions reported on the NYU Stern VLAB website[17] at the end of August 2011 and compare the rankings across measures of systemic risk. In yellow color, I show the rank correlations among SRISK and several specifications of SES. The first set of SES measures (SES1 - SES8) capture the impact that potential variations of market capitalization and liabilities might have on the measure of systemic risk. On the other side, the second set of SES measures do not take into account these two components.

[Please Insert Table 9 around here]

[17] You can visit the following URL http://vlab.stern.nyu.edu/analysis/RISK.USFIN-MR.MES?date=2011-08-31 for monthly updates of SRISK.

In Table 9, I report the rank correlation matrix among different specifications of SES. In cyan color, I highlight the rank dependence among the first set of systemic risk measures (*SES1-SES8*) and SRISK. The rank correlation among these measures ranges from 0.66 to 0.91. On the other side, the rank correlation among the second set of SES specifications (*SES9-SES16*) and SRISK range between 0.90 and 0.97.

5.4 *Systemic Expected Shortfall: A comparative analysis at the end of June 2007 and September 2011*

In this subsection, I compare the amount of capital that financial intermediaries needed at the end of June 2007 and at the beginning of September 2011. In Figure 6, I show the aggregate amount of Systemic Expected Shortfall across industries, based on SES4. This quantity takes into account the impact that variation of market capitalization as well as variation of liabilities have on the expected amount of capital that financial intermediaries need in case of a systemic crisis. SES4 has been computed using industry appropriate capital adequacy ratios K (*CARK_IND*).

[Please Insert Figure 6 around here]

The deterioration of the credit conditions exacerbated by the European Sovereign Debt crisis have increased the uncertainty of the stock markets. These phenomena have in median sharply increased the amount of liabilities and so reduced the actual level of K across the main financial intermediaries. Hence, the aggregate Systemic Expected Shortfall for BANKS industry has increased from $ 120 bln. USD to $ 230 bln. USD. The most systemically important DIVERSIFIED FINANCIALS institutions have increased the amount of capital shortfall from $ 60 bln. USD to $ 135 bln. USD. The deterioration of the credit conditions have in particular

damaged INSURANCE institutions that reported at the beginning of September 2011 a sharp increase of the total amount of capital shortfall from $ 5 bln. USD to $ 60 bn. USD.

[Please Insert Figure 7 around here]

I also report in Figure 7, the aggregate amount of Systemic Expected Shortfall based on subindustries' minimum capital adequacy ratios K (CARK_SUBIND). DIVERSIFED FINANCIALS institutions experienced an increase of their capital shortfall for about 300% from June 2007 to September 2011. In aggregate, BANKS were supposed to increase their amount of capital for about $ 250 bln. USD, at the beginning of 2011. This represents an increase of about 30%, in respect to June 2007.

[Please Insert Figure 8 around here]

In Figure 8, I show the aggregate amount of *Systemic Expected Shortfall* based on a specification in which there is not an increase of market capitalization as well as a variation of liabilities, during the crisis period. This specification of *SES* is very close in spirit to the systemic risk measure proposed by Brownlees et al. (2011). For estimating this quantity, that I call *SES16*, I use a combination between the actual market value of equity and the total amount of liabilities, in case of a systemic crisis. Both these quantitites have been estimated without taking into account the rebalancing of the capital structure that financial intermediaries might experience during a systemic crisis. Using these SES specifications, BANKS institutions reported an increase of aggregate capital shortfall from $ 480 bln. USD to $ 950 bln. USD. It is also interesting to note how SES16 for DIVERSIFED FINANCIAL and INSURANCE companies have sharply increased to about 300%, from June 2007.

6 Conclusions

The recent financial crisis has called academics and financial supervisors to better understand the role of capital in financial institutions. The deterioration of the credit conditions might force financial intermediaries to liquidate their *assets* to prices far below their market value and thus leads to a downard spiral in which funding problems and reduced lending capacity jeopardize the stability of an entire economy. In these circumstances, capital plays the role of increasing the reliability of financial intermediaries and mitigates the drastic credit conditions.

In this paper, I link the role of capital with Systemic risk, defined as an aggregate shortfall of capital experienced by the entire financial system. Using the recent financial crisis as "demo" period, I derive each financial institution's Systemic Expected Shortfall (SES_i) as a *key* measure for estimating the capital shortfall experienced by a financial intermediary during a systemic crisis. SES_i is therefore measurable and it is related to the total amount of *market capitalization*, to the *Capital Adequacy Ratios* (*insolvency risk measure*s) and to the total amount of *liabilities*. In particular, the capital adequacy ratio (K) represents the *trade-off* that usually financial companies faces for keeping in check financial managers' incentives to take excessive leverage and risk, that might drastically increase during a financial crisis. Since the continuous rebalancing of th*e capital structure is costly,* I compute appropriate capital adequacy ratios for financial industries/subindustries (*The CARK ratios*) with a 3-steps procedure formula that allows to discriminate financial intermediaries with the lowest K and derive a reasonable amount of capital (*SES*) that financial institutions need as a buffer, in order to be resilient in the face of a looming potential systemic crisis.

I also evaluate the sensitivity that both *The CARK ratios* (CARK_IND and CARK_SUBIND) and insolvency risk measures have on the variation of market capitalization and liabilities as well as on the Systemic Expected Shortfall, in aggregate. In line with the theory proposed by Acharya et al. (2010), I find a negative and strongly significant relationship between vari-

ation of market capitalization and MES and a positive relationship with several measures of insolvency risk (*K, K_Stand_IND, K_Stand_SUBIND*).

Further, I compare several specifications of SES with the measure of systemic risk (SRISK) proposed by Brownlees and et al. (2011) and I find that at the beginning of September 2011, the rank correlation among measures of systemic risk ranges from 0.66 to 0.97.

References

Acerbi, C., Tasche, D., (2002). On the coherence of Expected Shortfall. *Journal of Banking and Finance* 26(7), 1487-1503.

Acerbi, C., Tasche, D., (2002). Expected Shortfall:a natural coherent alternative to Value at Risk. *Economic Notes* 31(2), 379-388.

Acharya V. V., (2009). A Theory of Systemic Risk and Design of Prudential Bank Regulation. *Journal of Financial Stability* 5(3), 224-255.

Acharya V. V., Cooley T. F., Richardson M. P., Walter I., (2010). Regulating Wall Street: The Dodd-Frank Act and the New Architecture of Global Finance. New York University - Stern School of Business, John Wiley & Sons

Acharya V. V., Gale, Douglas M., Yorulmazer, Tanju (2011). Rollover Risk and Market Freezes. *Journal of Finance* 66(4), 1177-1209.

Acharya V. V., Hamid M., Thakor A. V., (2011). Caught between Schylla and Charybdis? Regulating Bank Leverage When There is Rent Seeking and Risk Shifting. Working paper.

Acharya V. V., Pedersen L., Philippon T., Richardson M., (2010). Measuring Systemic Risk, *working paper*, New York University - Stern School of Business.

Acharya V. V., Richardson M., (2009). Restoring Financial Stability: How to Repair a Failed System, New York Stern - School of Business, John Wiley & Sons.

Adrian, T., Brunnermeier M., (2008). CoVaR, *staff report* No. 348, Federal Reserve Bank of New York.

Adrian, T., Hyun-Song Shin, (2008). "Leverage and Liquidity", *Journal of Financial Intermediation*, 19(3), 418-437.

Allen, F., D. Gale, (2003). Capital Adequacy Regulation: In Search for a Rationale, In R. Arnott, B.Greenwald, R.Kanbur, e B.Nalebuff eds. Economics for an Imperfect World: Essays in Honour of Joseph Stiglitz, MIT Press, Cambridge, MA.

Allen L., Bali T. G., Tang Y., (2010). Does Systemic Risk in the Financial Sector Predict Future Economic Downturns? *working paper*.

Allen F., D. Gale, (2007). Understanding Financial Crisis, *Oxford University Press*, USA

Altman, E., Sabato, G., (2005). Effects of the New Basel Capital Accord on Bank Capital

Requirements for SMEs. *Journal of Financial Services Research*, 28(1/2/3), 15-42.

Altman, E., Saunders, A., (1998). Credit Risk Measurement: Developments over the last 20 years. *Journal of Banking & Finance*

Artzner, P., Delbaen, F., Eber, J.-M., Heath, D., (1999). Thinking coherently, *Risk*, 10.

Artzner, P., Delbaen, F., Eber, J.-M., Heath, D., (1999). Coherent Measures of Risk, *Mahematical Finance,* 9(3), 203-228.

Barone-Adesi, G., (2009). Seven Pillars of Wisdom, *occasional paper*, Swiss Finance Institute - Lugano.

Berger A. N., Herring R. J., Szego G. P., (1995). The Role of Capital in Financial Institutions, *Journal of Banking & Finance*, 19(3), 393-430.

Billio M., Getmansky M., Lo A. W., Pellizzon L. (2010), Econometric Measures of Systemic Risk in the Finance and Insurance sectors. *NBER Working Paper* No. 16223.

Borio C., Tarashev N., Tsatsaronis K., (2009). The systemic Importance of Financial Institutions. *BIS Quarterly Review*.

Brownlees C., Engle R.F., (2010). Volatility, Correlation and Tails for Systemic Risk Measurement, *working paper*, New York University - Stern School of Business.

Brunnermeier M., Pedersen H. L. (2009). Market Liquidity and Funding Liquidity, *Review of Financial Studies*, 22 (6), 2201-2238.

Cifarelli D.M., Conti P., Regazzini E., (1996). On the asymptotic distribution of a general measure of monotone dependence, *Annals of Statistics*, 24 (3), 1386-1399.

Conti P., (1993). Asymptotic inference on a general measure of monotone dependence, *Statistical Methods & Applications*, 3 (2), 213-241.

Cohen, K. Harawini G., Maier S., Schwartz R., Whitcomb D., (1983). Frictions in the trading process and the estimation of systematic risk. *Journal of Financial Economics* 12, 263-278.

Cont R., (2009) Measuring systemic risk. *working paper*.

Cont R., Moussa A., Santos E. B., (2009). Network structure and systemic risk in banking systems. *working paper*.

Danielsson J., Bjorn N. J, Casper G. de Vries, (2002). Incentives for effective risk manage-

ment, *Journal of Banking & Finance*, Elsevier, vol. 26(7), pages 1407-1425.
Diamond, D., Dybvig P., (1983). Bank Runs, Deposit Insurance and Liquidity, *Journal of Political Economy,* 91(3), 401-419.

Diamond, D. W., and Raghuram G. Rajan. (2001). "Liquidity Risk, Liquidity Creation and Financial Fragility: A Theory of Banking." *Journal of Political Economy,* 109(2): 287-327.

Diamond, D. W., and Raghuram G. Rajan. (2005). "Liquidity Shortages and Banking Crises." *Journal of Finance*, 60(2), 615-647.

Dimson E., Marsh P., (1995). Capital Requirements for securities firms. *Journal of Finance*, 50(3), 821-851.

Dimson E., Marsh P., (1997). Stress tests of capital requirements. *Journal of Banking & Finance*, 21(12), 1515-1546.

Duffie, D., (1999). Modelling Term Structures of Defaultable Bonds. *Review of Financial Studies*, 12, 687-720.

Duffie, D., (2010). How Large Banks Fail and What To Do About It, *Princeton University Press*.

Embrechts P, Resnick S., Samorodnitsky, G. (1999). Extreme Value Theory as a risk management rool. *North American Actuarial Journal*, 3, 30-41.

Engle, R.F., (1982). Autoregressive Conditional Heteroskedasticity With Estimates of the Variance of UK Inflation. *Econometrica*, 50(4), 987-1008.

Engle, R.F., (2002). Dynamic Conditional Correlation. *Journal of Business and Economic Statistics*, 20(3): 339-350.

Frittelli M., Rosazza Gianin E., (2002). Putting order in risk measures. *Journal of Banking & Finance*, 26, 1473-1486.

Granger C. W. J., (1969). Investigating casual relations by econometric models and cross-spectral methods. *Econometrica*. 37(3): 424-438.

Gray, Dale F., Merton R.C., Bodie, Z., (2008). New Framework for Measuring and Managing Macrofinancial Risk and Financial Stability, *working paper* No. 09-015 (Cambridge, Massachusetts: Harvard Business School, August).

Gray, Dale F., Jobst, Andreas A., (2009). Tail Dependence Measures of Systemic Risk Using Equity Options Data - Implications for Financial Stability, *working paper*, International

Monetary Fund (IMF), Washington, DC.

Hausbrich J. G., and Wachtel P., (1993). Capital Requirements and Shifts in Commercial Bank Portfolios. Federal reserve Bank of Cleveland. Economic Review. 2-15

Hull J., White A., (2001). Valuing credit default Swaps II: Modelling Default Correlations. *Journal of Derivatives*, 8(3), 12-22.

Huang, Xin, Hao Zhou and Haibin Zhu, (2009). A Framework for Assessing the Systemic Risk of Major Financial Institution, *Journal of Banking & Finance*, 29, 2577-2603.

Jorion P., (2007). Value at Risk: The New Benchmark for Managing Financial Risk. 3rd Ed. McGraw-Hill.

Jensen M.C., Meckling W.H., (1976). Theory of the Firm: Manager Behavior, Agency Costs and Ownership Structure.*Journal of Financial Economics*, 3(4).

Kashyap, A., Raghuram R., Stein, J., (2008). Rethinking Capital Regulation, *Kansas City Simposium on Financial Stability*.

Kose J., Saunders. A., Senbet L. (2001), A Theory of Capital Regulation and Bank Management Compensation, *Review of Financial Studies*, 13(1), 95-125.

Kurth, A., Tasche, D., (2003). Contributions to credit risk. *Risk*. 16(3), 84-88.

Leary T.M., Roberts R. M., (2005). Do Firms Rebalance Their Capital Structure? *The Journal of Finance*, 60(6), 2575-2619.

Lemmon M.L., Roberts M.R., Zender J.F, (2008). "Back to the Beginning: Persistence and the Cross-Section of Corporate Capital Structure," *Journal of Finance*, vol. 63(4), pages 1575-1608, 08.

Lloyd S. Shapley (1953). "A Value for n-person Games". In Contributions to the Theory of Games, volume II, by H.W. Kuhn and A.W. Tucker, editors. *Annals of Mathematical studies*, v. 28 pp. 307-317. Princeton University Press.

Merrick John J., Saunders, A., (1985). Bank Regulation and Monetary Policy. *Journal of Money, Credit and Banking*, 17(4), 691-717.

Merton Robert ,C., (1973). "Theory of Rational Option Pricing". *Bell Journal of Economics and Management Science,* 4(1), 141-183.

Merton Miller H., (1995). Do the M & M propositions apply to banks? *Journal of Bank-*

ing & Finance, 19(3-4), 483-489.

Pedersen L. H., (2009). When Everyone Runs for the Exit, *The International Journal of Central Banking*, 5(4), 177-199.

Peltzman S., (1976). Toward a More General Theory of Regulation. *Journal of Law & Economics, 19(2),* 211-240.

Rockafellar, R., T., Uryasev, S., (2002). Conditional Value at Risk for general loss distributions. *Journal of Banking & Finance*. 26, 1443-1472.

Segoviano, M., Goodhart, C., (2009). Banking Stability Measures. International Monetary Fund (IMF), *working paper* 09/04 (Washington: International Monetary Fund).

Rockafellar, R. T., Uryasev, S., (2002). Conditional value-at-risk for general loss distributions. *Journal of Banking and Finance* 26, 1443-1472.

Saunders A., Cornett M. M., (2011). Financial Institutions Management: A Risk Management Approach. *McGraw-Hill 7th Edition*.

Spearman C., (1904). "The proof and measurement of association between two things" *Amer. J. Psychol.*, 15, 72-101.

Stigler G.J., (1971). The Theory of Economic Regulation. *Bell Journal of Economics* 2(1), 3-21.

Szego G., (2002). Measures of Risk. *Journal of Banking & Finance,* 26(7), 1253-1272.

Szego G., (2004). Risk Measures for the 21st Century. *John Wiley & Sons Ltd.*

Tasche D., (1999). Risk Contributions and Performance Measurement, *working paper,* Technische Universitat Munchen.

Tasche, D., (2002). Expected Shortfall and Beyond. *Journal of Banking & Finance* 26(7), 1519-1533.

Tobin, J., (1969). A general equilibrium approach to monetary theory. *Journal of Money, Credit & Banking*. 1(1): 15-29.

Yamai, Y., Yoshiba, T., (2005). Value-at-risk versus expected shortfall: A practical perspective. *Journal of Banking & Finance*, 29, 997-1015.

Veronesi P., Zingales L.,(2010).Paulson's Gift.*Journal of Financial Economics,*97(3),339-368.

Table 1.
Summary Statistics on the Capital Adequacy Ratio K for industry/subindustry (CARK_IND and CARK_SUBIND)

The table reports descriptive statistics for a sample of 881 US financial institutions screened at the end of June 2007 (**Panel A**) and a sample of 771 US financial institutions screened at the beginning of September 2011 (**Panel B**). These variables have been used for *calibrating the Appropriate Capital Adequacy Ratio K* for each industry/sub-industry. In particular, I report the median amount of market capitalization for each industry/sub-industry, the median amount of Short term Liabilities, the median amount of Long Term Liabilities, the Capital Adequacy Ratio K (CARK) for each industry/sub-industry, the number of financial institutions analyzed within each industry/sub-industry. (1) **Median Market Cap** is the median amount of market capitalization at the end of June 2007 or at the beginning of September 2011. (2) **Median ST Liabilities** is the median amount of Short Term Liabilities at the end of June 2007 or at the beginning of September 2011 within each industry/sub-industry. (3) **Median LT Liabilities** is the medium amount of LT Liabilities at the end of June 2007 or at the beginning of September 2011. (4) **CARK** is the Capital Adequacy Ratio K for each industry/sub-industry at the end of June 2007 and the beginning of September 2011. Capital Adequacy Ratio K for each industry/sub-industry **(CARK_IND)** and **(CARK_SUBIND)** is the 10^{th} percentile of the empirical distribution of 5 Years Average Median Ks of all institutions within an industry/sub-industry. **K** is the ratio between the Market Value of Equity/Quasi Market Value of Assets, where the Quasi Market Value of Assets is computed in the following way: Book Value of Assets - Book Value of Equity + Market Value of Equity. (5) **N° obs** represents the number of US financial institutions within each industry/sub-industry. The data are based on Bloomberg database.

Panel 1.1: Descriptive Statistics at the end of June 2007

Industry	Median Mkt. Cap. ($ bln. USD)	Median ST Liabilities ($ bln. USD)	Median LT Liabilities ($ bln. USD)	CARK IND	N° obs
Banks	0.29	1.50	0.14	0.10	453
Diversified Financials	1.05	0.36	0.13	0.08	127
Insurance	1.34	2.32	0.12	0.07	125
Real Estate	1.17	0.36	0.61	0.22	176

Sub-Industry	Median Mkt. Cap. ($ bln. USD)	Median ST Liabilities ($ bln. USD)	Median LT Liabilities ($ bln. USD)	CARK SUBIND	N° obs
Asset Management & Specialized finance	1.37	0.14	0.05	0.55	50
Consumer Finance	0.79	0.36	0.33	0.08	24
Custod. Banks & Other Specialized Finance	2.00	6.08	1.04	0.13	19
Diversified and Industrial & Office REITS	1.64	0.50	0.48	0.38	44
Diversified Banks	30.58	105.30	23.19	0.13	15
Financial Guarantee Ins. & Insurance Brokers	3.31	1.60	0.27	0.26	16
Investment Banking & Brokerage	1.35	1.37	0.04	0.06	34
Life & Health Insurance	2.07	12.74	0.56	0.04	21
Mortgage REITs	0.47	0.87	1.74	0.08	25
Multi-line Insurance	4.92	14.67	0.86	0.08	19
Property & Casualty Ins. & Reins.	0.83	0.91	0.10	0.19	69
Real Estate Development & Services	0.30	0.07	0.13	0.21	23
Regional Banks	0.27	1.46	0.11	0.14	331
Residential REITs	1.53	0.31	0.86	0.37	21
Retail REITs	1.55	0.50	0.57	0.38	29
Specialized REITs	1.43	0.33	0.58	0.42	37
Thrifts & Mortgage Finance	0.30	1.34	0.26	0.07	104

Panel 1.2: Descriptive Statistics at the beginning of September 2011

Industry	Median Mkt. Cap. ($ bln. USD)	Median ST Liabilities ($ bln. USD)	Median LT Liabilities ($ bln. USD)	CARK IND	N° obs
Banks	0.19	1.56	0.12	0.07	350
Diversified Financials	0.65	0.21	0.10	0.13	146
Insurance	1.31	5.01	0.27	0.07	97
Real Estate	1.05	0.28	0.53	0.16	178

Sub-Industry	Median Mkt. Cap. ($ bln. USD)	Median ST Liabilities ($ bln. USD)	Median LT Liabilities ($ bln. USD)	CARK SUBIND	N° obs
Asset Management & Specialized finance	0.53	0.05	0.06	0.49	67
Consumer Finance	0.56	0.13	0.22	0.16	27
Custod. Banks & Other Specialized Finance	1.01	0.69	0.71	0.10	19
Diversified and Industrial & Office REITS	1.07	0.30	0.38	0.28	50
Diversified Banks	15.59	137.37	19.30	0.08	15
Financial Guarantee Ins. & Insurance Brokers	1.50	4.59	0.68	0.14	15
Investment Banking & Brokerage	0.67	2.54	0.10	0.07	31
Life & Health Insurance	1.31	19.79	0.61	0.03	19
Mortgage REITs	0.56	0.34	0.58	0.07	29
Multi-line Insurance	3.25	18.74	0.92	0.07	19
Property & Casualty Ins. & Reins.	0.66	2.14	0.12	0.21	43
Real Estate Development & Services	0.19	0.04	0.14	0.23	24
Regional Banks	0.20	1.88	0.10	0.08	240
Residential REITs	2.68	0.29	1.25	0.28	17
Retail REITs	2.12	0.41	0.86	0.24	26
Specialized REITs	1.27	0.36	0.58	0.30	35
Thrifts & Mortgage Finance	0.14	0.97	0.13	0.06	95

Table 2.

Summary statistics and correlation matrix of the variables used for the *cross-sectional* analysis

This table contains overall descriptive statistics (**Panel A**, **Panel B** and **Panel C**) and sample correlation matrix (**Panel D**) for the following measures: (1) **Market Cap. Variation** is the variation of the market capitalization during the period July 2007 to December 2008. (2) **MES** is the marginal expected shortfall of a stock given that the US Market return (MXUS Index) is below its 5th percentile. (3) **K** is the ratio between the Market Value of Equity and the Quasi Market Value of Assets (QMVA), where the Quasi Market Value of Assets has been computed in the following way: Book Value of Assets – Book Value of Equity + Market Value of Equity. (4) **K_Stand.IND** is the standardized version of the K ratio for each financial institution, using the Capital Adequacy Ratio related to the industry (CARK_IND) in which the company belongs. It is computed in the following way: $\text{K\_Stand.IND}_i = \frac{K_i - CARK\_IND}{\sigma(K_i - CARK\_IND)}$. CARK_IND is the 10th percentile of the empirical distribution of a 5 years average median K_i of all financial institutions within an industry. (5) **K_Stand.SUBIND** is the standardized version of the ratio K_i of each financial institution, using the Capital Adequacy ratio related to the sub-industry in which the company belongs. It is computed in the following way: $\text{K\_Stand\_SUBIND}_i = \frac{K_i - CARK\_SUBIND}{\sigma(K_i - CARK\_SUBIND)}$. CARK_SUB_IND is the 10th percentile of the empirical distribution of a 5 years average median K_i of all financial institutions within a sub-industry. $\sigma(K_i - CARK\_IND)$ and $\sigma(K_i - CARK\_SUBIND)$ are the standard deviations of the empirical distribution of Ks across each industry/sub-industry. CARK industry (CARK_IND) and CARK sub-industry (CARK_SUB_IND) have been calibrated following the procedure described in Table I. (6) **Liabilities Variation** is the variation of the total amount of Liabilities experienced during the period July 2007 to December 2008. (7) **ST Liabilities Variation** is the variation of the total amount of short term Liabilities experienced during the period July 2007 to December 2008. (8) **LT Liabilities Variation** is the variation of the total amount of long term Liabilities experienced during the period July 2007 to December 2008. (9) **ME** is the total amount of market value of equity at the end of June 2007. The descriptive statistics are related to a sample of 245 US financial institutions with Quasi Market Value of Assets greater than $ 5 bln. USD. The data are from Bloomberg.

Panel 2.1

Descriptive statistics of the measures Variation Market Cap. , MES, K, K Stand.Ind, K Stand.SUBIND, Liabilities Variation, ME

	Variation Mkt. Cap.	MES	K	K Stand.IND	K Stand.SUBIND	Liabilities Variation	ME ($ bln.USD)
Average	-44.39%	1.93%	0.29	1.16	1.03	0.11	14.19
Median	-47.18%	1.88%	0.19	1.13	0.93	0.03	4.06
Max	126.59%	2.77%	0.98	4.83	3.92	7.27	253.70
Min	-99.95%	1.25%	0.04	-1.00	-1.27	-0.87	0.52
Std. Dev.	37.11%	0.26%	0.22	1.00	1.04	0.63	31.90

Panel 2.2

Sample correlation matrix of the Variation Mkt. Cap., MES, K, Stand. IND K, Stand. SUB-IND K, Liabilities Var., ME

	Variation Mkt Cap.	MES	K	K Stand.IND	K Stand.SUBIND	Liabilities Variation	ME
Variation Mkt. Cap.	1.00						
MES	-0.21	1.00					
K	0.10	-0.02	1.00				
K_ Stand. IND	0.26	-0.34	0.72	1.00			
K_ Stand. SUB-IND	0.21	-0.24	0.64	0.81	1.00		
Liabilities Variation	0.15	-0.05	0.28	0.25	0.18	1.00	
ME	-0.13	-0.19	-0.08	-0.09	-0.06	0.01	0.10

Panel 2.3

Descriptive statistics of the measures Variation Mkt. Capitalization, MES, K, K Stand.IND, Liabilities Variation, ME, Short Term Liabilities Variation, Long Term Liabilities Variation ***across industries***

	Variation Mkt. Cap.					Marginal Expected Shortfall (MES)				
	Mean	**Median**	**Max**	**Min.**	**Stand. Dev.**	**Mean**	**Median**	**Max**	**Min.**	**Stand. Dev.**
BANKS	-41.59%	-41.55%	46.23%	-99.94%	37.43%	1.86%	1.86%	2.77%	1.25%	0.25%
DIVERS. FIN.	-50.16%	-56.20%	47.75%	-99.95%	35.46%	2.19%	2.11%	2.76%	1.71%	0.28%
INSURANCE	-45.71%	-43.36%	1.47%	-95.90%	27.81%	1.85%	1.81%	2.45%	1.40%	0.20%
REAL ESTATE	-46.67%	-56.14%	126.59%	-97.33%	46.23%	1.95%	1.93%	2.59%	1.65%	0.21%
	K					**K_Stand.IND**				
	Mean	**Median**	**Max**	**Min.**	**Stand. Dev.**	**Mean**	**Median**	**Max**	**Min.**	**Stand. Dev.**
BANKS	0.16	0.16	0.36	0.05	0.05	0.16	0.16	0.36	0.05	0.05
DIVERS. FIN.	0.39	0.22	0.99	0.04	0.33	0.39	0.22	0.99	0.04	0.33
INSURANCE	0.28	0.28	0.67	0.04	0.17	0.28	0.28	0.67	0.04	0.17
REAL ESTATE	0.49	0.54	0.90	0.08	0.20	0.49	0.54	0.90	0.08	0.20
	Liabilities Variation					**ME ($ bln. USD)**				
	Mean	**Median**	**Max**	**Min.**	**Stand. Dev.**	**Mean**	**Median**	**Max**	**Min.**	**Stand. Dev.**
BANKS	11.75%	9.09%	145.77%	-87.20%	27.48%	15.26	2.06	253.70	0.52	40.37
DIVERS. FIN.	29.31%	-3.87%	727.12%	-85.90%	135.14%	17.78	10.52	94.38	0.60	23.07
INSURANCE	3.19%	-4.65%	179.77%	-22.99%	30.59%	15.97	5.09	181.67	0.69	32.90
REAL ESTATE	5.67%	5.93%	116.59%	-55.47%	29.34%	6.24	4.83	20.78	0.59	4.92
	Short Term Liabilities Variation					**Long Term Liabilities Variation**				
	Mean	**Median**	**Max**	**Min.**	**Stand. Dev.**	**Mean**	**Median**	**Max**	**Min.**	**Stand. Dev.**
BANKS	12.12%	6.61%	150.11%	-95.11%	31.52%	43.41%	7.72%	2081.34%	-99.99%	219.83%
DIVERS. FIN.	33.23%	-9.44%	643.87%	-82.57%	149.13%	58.24%	20.14%	723.54%	-93.59%	134.79%
INSURANCE	4.00%	-4.27%	227.55%	-26.93%	37.22%	23.39%	-0.27%	879.12%	-80.53%	127.60%
REAL ESTATE	21.76%	3.76%	438.76%	-74.26%	72.58%	8.38%	3.40%	311.13%	-59.52%	56.50%

Panel 2.4

Descriptive statistics of the measures Variation Market Cap., MES, K, K_Stand.SUBIND, Liabilities Variation, ME, Short Term Liabilities Variation, Long Term Liabilities Variation *across sub-industries.*

	Variation Market Capitalization					Marginal Expected Shortfall (MES)				
	Mean	**Median**	**Max**	**Min.**	**Stand. Dev.**	**Mean**	**Median**	**Max**	**Min.**	**Stand. Dev.**
Asset Management & Spec. Finance	-40.09%	-55.66%	47.75%	-91.52%	40.41%	2.17%	2.05%	2.64%	1.89%	0.27%
Consumer Finance	-70.98%	-75.15%	41.49%	-83.71%	15.83%	2.21%	2.27%	2.54%	1.75%	0.28%
Custod. Banks & Other Spec. Fin.	-49.32%	-51.56%	3.43%	-99.16%	38.66%	2.05%	2.02%	2.72%	1.71%	0.30%
Diversified Ind. & Office REITS	-54.67%	-50.91%	1.47%	-95.67%	24.03%	1.86%	1.87%	2.10%	1.68%	0.13%
Diversified Banks	-57.14%	-66.61%	-5.28%	-87.79%	25.72%	1.75%	1.74%	2.18%	1.39%	0.17%
Fin. Guarantee Ins. & Ins. Brokers	-62.68%	-88.56%	-1.50%	-95.90%	41.70%	1.89%	1.90%	2.16%	1.61%	0.18%
Investment Banking & Brokerage	-52.05%	-44.04%	-1.05%	-99.95%	32.68%	2.31%	2.14%	2.76%	2.06%	0.26%
Life & Health Insurance	-47.46%	-51.98%	1.47%	-78.16%	25.07%	1.96%	1.85%	2.45%	1.69%	0.24%
Mortgage REITs	-31.98%	-72.39%	126.59%	-96.65%	92.52%	2.19%	2.19%	2.44%	1.96%	0.19%
Multi-line Insurance	-56.47%	-53.01%	-18.08%	-91.81%	20.81%	1.79%	1.76%	2.29%	1.59%	0.17%
Prop & Casualty Insurance & Reins.	-26.58%	-20.87%	-4.71%	-60.81%	16.88%	1.78%	1.76%	2.03%	1.40%	0.15%
Real Estate Development & Services	-84.19%	-86.42%	-77.11%	-89.04%	6.27%	2.27%	2.28%	2.59%	1.94%	0.33%
Regional Banks	-31.43%	-32.05%	46.23%	-93.86%	34.21%	1.85%	1.86%	2.56%	1.53%	0.19%
Residential REITs	-44.37%	-49.06%	3.02%	-76.13%	26.35%	1.89%	1.91%	2.09%	1.70%	0.14%
Retail REITs	-58.60%	-49.28%	-15.91%	-97.33%	26.69%	1.89%	1.90%	2.09%	1.65%	0.14%
Specialized REITs	-20.10%	-10.87%	34.34%	-67.23%	40.09%	1.86%	1.82%	2.03%	1.75%	0.11%
Thrifts & Mortgage Finance	-58.64%	-83.01%	16.26%	-99.94%	42.97%	1.97%	1.92%	2.77%	1.25%	0.37%
	K					**K_Stand.SUBIND**				
	Mean	**Median**	**Max**	**Min.**	**Stand. Dev.**	**Mean**	**Median**	**Max**	**Min.**	**Stand. Dev.**
Asset Management & Spec. Finance	0.81	0.83	0.99	0.58	0.15	1.74	1.86	2.99	0.21	1.00
Consumer Finance	0.17	0.16	0.37	0.04	0.11	0.81	0.70	2.66	-0.36	1.00
Custod. Banks & Other Spec. Fin.	0.17	0.17	0.24	0.09	0.05	0.71	0.75	2.06	-0.83	1.00
Diversified, Ind. & Office REITS	0.50	0.54	0.67	0.22	0.13	0.93	1.23	2.26	-1.27	1.00
Diversified Banks	0.16	0.14	0.22	0.11	0.04	0.68	0.32	2.39	-0.62	1.00
Fin. Guarantee Ins. & Ins. Brokers	0.49	0.50	0.67	0.18	0.17	1.36	1.47	2.45	-0.47	1.00
Investment Banking & Brokerage	0.20	0.11	0.69	0.05	0.19	0.76	0.27	3.35	-0.07	1.00
Life & Health Insurance	0.14	0.10	0.35	0.04	0.10	1.06	0.60	3.16	0.03	1.00
Mortgage REITs	0.15	0.12	0.38	0.08	0.11	0.69	0.45	3.12	0.04	1.00
Multi-line Insurance	0.23	0.21	0.39	0.08	0.12	1.39	1.23	2.94	0.04	1.00
Prop & Casualty Insurance & Reins.	0.37	0.36	0.58	0.18	0.19	1.52	1.45	3.27	-0.12	1.00
Real Estate Development & Services	0.64	0.65	0.82	0.45	0.04	2.30	2.38	3.26	1.27	-
Regional Banks	0.17	0.16	0.30	0.10	0.12	0.74	0.60	3.92	-1.01	1.00
Residential REITs	0.57	0.56	0.74	0.39	0.13	1.59	1.54	2.94	0.15	1.00
Retail REITs	0.53	0.53	0.71	0.31	0.13	1.16	1.16	2.47	-0.53	1.00
Specialized REITs	0.63	0.56	0.90	0.53	0.08	1.62	1.07	3.68	0.80	1.00
Thrifts & Mortgage Finance	0.14	0.12	0.36	0.05	0.22	0.81	0.58	3.47	-0.29	1.00

	Liabilities Variation					ME (in $ bln. USD)				
	Mean	**Median**	**Max**	**Min.**	**Stand. Dev.**	**Mean**	**Median**	**Max**	**Min.**	**Stand. Dev.**
Asset Management & Spec. Finance	96.65%	-3.26%	727.12%	-32.63%	221.71%	11.85	9.41	33.07	3.35	8.30
Consumer Finance	1.33%	-5.41%	28.50%	-22.63%	19.29%	19.22	7.30	72.72	1.21	27.46
Custod. Banks & Other Spec. Fin.	4.60%	5.15%	82.93%	-85.90%	48.62%	9.53	3.49	31.43	0.92	10.87
Diversified, Ind. & Office REITS	4.95%	2.38%	36.94%	-29.98%	20.08%	5.82	3.48	16.68	1.38	5.03
Diversified Banks	33.25%	16.08%	145.77%	-14.27%	49.07%	76.19	31.59	253.70	5.36	82.35
Fin. Guarantee Ins. & Ins. Brokers	35.83%	13.07%	179.77%	-22.99%	69.65%	7.80	6.43	17.15	2.76	4.97
Investment Banking & Brokerage	-16.58%	-17.02%	17.62%	-47.61%	21.63%	29.86	11.94	94.38	0.60	33.60
Life & Health Insurance	0.34%	-1.31%	40.00%	-21.51%	13.95%	9.21	3.65	45.21	0.69	12.06
Mortgage REITs	-12.09%	-35.32%	46.21%	-55.47%	45.19%	1.98	1.32	5.68	0.59	1.81
Multi-line Insurance	-5.82%	-7.69%	16.34%	-19.68%	9.53%	25.93	7.45	181.67	0.92	45.44
Prop & Casualty Insurance & Reins.	-1.90%	-5.38%	46.75%	-11.99%	13.92%	17.41	4.82	168.32	1.47	39.91
Real Estate Development & Services	46.37%	23.39%	116.59%	-0.85%	62.00%	6.28	6.32	8.35	4.18	2.09
Regional Banks	11.26%	9.29%	62.03%	-22.98%	15.63%	3.38	1.70	23.33	0.67	4.47
Residential REITs	7.51%	3.53%	25.50%	-1.28%	10.39%	8.03	7.18	13.27	3.57	4.55
Retail REITs	12.06%	11.17%	22.14%	-2.62%	6.96%	7.37	5.40	20.78	2.37	5.74
Specialized REITs	-0.14%	-2.74%	30.56%	-39.51%	23.92%	8.49	6.66	17.20	3.25	5.10
Thrifts & Mortgage Finance	-0.07%	1.69%	60.89%	-87.20%	27.86%	9.15	2.12	63.57	0.52	16.30
	Short Term Liabilities Variation					**Long Term Liabilities Variation**				
	Mean	**Median**	**Max**	**Min.**	**Stand. Dev.**	**Mean**	**Median**	**Max**	**Min.**	**Stand. Dev.**
Asset Management & Spec. Finance	103.87%	-1.99%	643.87%	-32.63%	228.76%	80.63%	28.94%	273.08%	-61.20%	120.40%
Consumer Finance	23.80%	-48.13%	308.06%	-82.57%	152.42%	10.24%	21.27%	28.67%	-34.51%	24.89%
Custod. Banks & Other Spec. Fin.	7.42%	5.58%	81.28%	-80.89%	47.78%	76.03%	4.02%	723.54%	-93.59%	233.07%
Diversified, Ind. & Office REITS	12.92%	-0.77%	103.52%	-49.61%	38.97%	3.10%	1.19%	57.82%	-35.61%	24.27%
Diversified Banks	32.70%	16.21%	150.11%	-13.10%	48.16%	43.00%	29.60%	265.54%	-25.28%	75.10%
Fin. Guarantee Ins. & Ins. Brokers	45.93%	14.82%	227.55%	-26.93%	87.25%	4.01%	-2.99%	50.19%	-41.81%	31.49%
Investment Banking & Brokerage	-20.12%	-18.98%	17.41%	-56.10%	23.67%	39.65%	21.63%	129.96%	-3.64%	43.30%
Life & Health Insurance	-0.08%	-2.22%	41.34%	-21.73%	14.04%	8.20%	0.00%	81.96%	-51.48%	39.10%
Mortgage REITs	9.23%	21.01%	97.63%	-74.26%	61.73%	-28.52%	-48.17%	52.06%	-56.83%	40.19%
Multi-line Insurance	-7.25%	-6.79%	13.82%	-22.33%	10.53%	74.99%	0.18%	879.12%	-34.97%	234.30%
Prop & Casualty Insurance & Reins.	-2.30%	-5.12%	28.00%	-11.48%	9.94%	-0.74%	-3.58%	167.37%	-80.53%	51.64%
Real Estate Development & Services	31.43%	16.20%	88.25%	-10.17%	50.94%	115.69%	26.38%	311.13%	9.55%	169.47%
Regional Banks	11.47%	8.32%	72.55%	-21.75%	16.83%	12.97%	1.18%	317.93%	-99.99%	57.77%
Residential REITs	14.31%	0.65%	90.97%	-10.17%	37.86%	28.21%	20.58%	100.65%	-14.84%	40.61%
Retail REITs	59.45%	14.24%	438.76%	0.86%	134.51%	6.34%	11.44%	43.58%	-59.52%	27.29%
Specialized REITs	2.39%	-0.98%	34.56%	-26.95%	23.02%	-3.96%	-6.94%	50.72%	-58.41%	31.82%
Thrifts & Mortgage Finance	1.27%	1.23%	92.93%	-95.11%	42.58%	121.75%	11.74%	20.81%	-86.02%	433.19%

Table 3.

Variation of the Market capitalization during the crisis period and measures of risk (MES, K, K_Stand.IND and K_Stand.SUBIND)

The Table contains *cross-sectional regressions* between stock returns during the crisis period (July 2007 to Dec 2008) with measures of risk (**MES, K, K_Stand.IND and K_Stand.SUBIND**). The analysis has been developed on a sample of 245 US financial institutions. (1) **MES** is the marginal expected shortfall of a stock given that the MXUS Index is below its 5th percentile. (2) **Variation Mkt. cap** is the cross-sectional variation of the total amount of Market Capitalization during the crisis period (July 2007 to December 2008). (3) **K** is the ratio between the Market Value of Equity and the Quasi Market Value of Assets where the Market Value of Assets is computed in the following way: Book Value of Assets – Book Value of Equity + Market Value of Equity. This quantity has been computed at the end of June 2007 for all financial institutions in our sample. (4) **K_Stand.IND** is the standardized version of the K ratio for each financial institution, using the Capital Adequacy Ratio related to the industry (CARK_IND) in which the company belongs. It is computed in the following way: $\text{K\_Stand.IND}_i = \frac{K_i - CARK\_IND}{\sigma(K_i - CARK\_IND)}$. CARK_IND is the 10th percentile of the empirical distribution of K, related to each industry. (5) **K_Stand.SUBIND** is the standardized version of the ratio K_i of each financial institution, using the capital adequacy ratio related to the sub-industry in which the company belongs. It is computed in the following way: $\text{K\_Stand.SUBIND}_i = \frac{K_i - CARK\_SUBIND}{\sigma(K_i - CARK\_SUBIND)}$. CARK_SUB_IND is the 10th percentile of the empirical distribution of K, related to each sub-industry. $\sigma(K_i - CARK\_IND)$ and $\sigma(K_i - CARK\_SUBIND)$ are respectively the sample standard deviations of the difference between the actual K of each financial institution and $CARK\_IND / CARK\_SUBIND$. are the sample standard deviations of the empirical distribution K, for each industry/sub-industry. CARK industry (CARK_IND) and CARK sub-industry (CARK_SUBIND) have been calibrated using a sample of 881 US financial institutions. T-statistics are given in parenthesis. ***, ** and * indicate significance at 1%, 5% and 10% levels, respectively. All data are based on Bloomberg.

QMVA ($ bln. USD)	**>5**	**>5**	**>5**	**>5**	**>5**	**>5**	**>5**	**>5**	**>5**	**>5**	**>15**	**>15**	**>15**	**>15**
MES	-32.17***			-35.08***			-27.62***	-39.77***	-20.18**	-22.63**	-29.10***	-34.76***	-23.26***	-24.33***
	(-3.52)			(-7.78)			(-2.94)	(-5.78)	(-2.01)	(-2.08)	(-3.28)	(-5.24)	(-2.44)	(-5.22)
K		0.34**			0.08*		0.26*	0.41**			0.24*	0.51***		
		(2.21)			(1.65)		(1.68)	(2.21)			(1.65)	(2.68)		
Standardized Ind. K			0.10***						0.08***				0.08*	
			(3.42)						(2.65)				(1.66)	
Standardized Sub-Ind. K						0.09***				0.07***				0.08***
						(3.23)				(2.60)				(2.96)
Industry FE	**Y**	**Y**	**Y**				**Y**		**Y**		**Y**		**Y**	
Sub-Industry FE				**Y**	**Y**	**Y**		**Y**		**Y**		**Y**		**Y**
Adj. R^2	**4.90%**	**5.54%**	**6.12%**	**11.57%**	**7.67%**	**12.83%**	**6.48%**	**12.98%**	**7.21%**	**14.08%**	**7.59%**	**40.92%**	**10.00%**	**43.06%**
N. obs.	**245**	**245**	**245**	**245**	**245**	**245**	**245**	**245**	**245**	**245**	**116**	**116**	**116**	**116**

Table 4.

Variation of Liabilities during the crisis period and measures of risk (MES, K, K_Stand.IND and K_Stand.SUBIND)

The Table contains *cross-sectional* regressions between Liabilities variation during the crisis period (July 2007 to Dec 2008) with measures of risk (**MES, K, K_Stand.IND and K_Stand.SUBIND**). The analysis has been developed on a sample of 245 US financial institutions. (1) **MES** is the marginal expected shortfall of a stock given that the MXUS Index is below its 5th percentile. (2) **Liabilities Variation** is the *cross-sectional* financial institutions' Liabilities variation during the crisis period (July 2007 to Dec 2008). (3) **K** is the ratio between the Market Value of Equity and the Quasi Market Value of Assets where the Market Value of Assets is computed in the following way: Book Value of Assets – Book Value of Equity + Market Value of Equity. This quantity has been computed at the end of June 2007 for all financial institutions in our sample. (4) **K_Stand.IND** is the standardized version of the K ratio for each financial institution, using the Capital Adequacy Ratio related to the industry (CARK_IND) in which the company belongs. It is computed in the following way: $\text{K\_Stand.IND}_i = \frac{K_i - CARK\_IND}{\sigma(K_i - CARK\_IND)}$. CARK_IND is the 10th percentile of the empirical distribution of K, related to each industry. (5) **K_Stand.SUBIND** is the standardized version of the ratio K_i of each financial institution, using the capital adequacy ratio related to the sub-industry in which the company belongs. It is computed in the following way: $\text{K\_Stand.SUBIND}_i = \frac{K_i - CARK\_SUBIND}{\sigma(K_i - CARK\_SUBIND)}$. CARK_SUB_IND is the 10th percentile of the empirical distribution of K, related to each sub-industry. $\sigma(K_i - CARK\_IND)$ and $\sigma(K_i - CARK\_SUBIND)$ are respectively the sample standard deviations of the difference between the actual K of each financial institution and $CARK\_IND$ / $CARK\_SUBIND$. CARK industry (CARK_IND) and CARK sub-industry (CARK_SUB_IND) have been calibrated using a sample of 881 US financial institutions. T-statistics are given in parenthesis. ***, ** and * indicate significance at 1%, 5% and 10% levels, respectively. All data are based on Bloomberg.

QMVA ($ bln. USD)	**>5**	**>5**	**>5**	**>5**	**>5**	**>5**	**>5**	**>5**	**>5**	**>5**	**>15**	**>15**	**>15**	**>15**
MES	-27.24***			-9.26*			-20.48**	-10.47*	-18.05**	-15.47*	-37.26***	-32.54***	-20.14***	-31.88***
	(-2.98)			(-1.65)			(-2.19)	(-1.65)	(-1.97)	(-1.65)	(-3.38)	(-2.85)	(-2.42)	(-2.65)
K		0.45***			0.63***		0.33**	0.64***			-0.10	0.14		
		(2.75)			(4.07)		(1.99)	(3.95)			(-0.56)	(0.52)		
Standardized Ind. K			0.07***						0.05***				-0.01	
			(3.57)						(2.67)				(-0.28)	
Standardized Sub-Ind. K						0.09***				0.06***				0.02
						(3.55)				(3.16)				(0.92)
Industry FE	**Y**	**Y**	**Y**				**Y**		**Y**		**Y**		**Y**	
Sub-Industry FE				**Y**	**Y**	**Y**		**Y**		**Y**		**Y**		**Y**
Adj. R^2	**9.90%**	**9.72%**	**11.70%**	**11.68%**	**15.70%**	**17.52%**	**12.41%**	**16.52%**	**13.61%**	**18.49%**	**13.47%**	**25.47%**	**15.20%**	**27.22%**
N. obs.	**245**	**245**	**245**	**245**	**245**	**245**	**245**	**245**	**245**	**245**	**118**	**118**	**118**	**118**

Table 5.

Systemic Expected Shortfall, Systemic Important Financial Institutions (SIFIs) and the Capital Adequacy Ratio K (CARK) at the end of June 2007

This table contains the list of top 50 US financial institutions listed in descending order according to the Systemic Expected Shortfall based on a standardized actual k ratio (last column of the table). (1) **Company Name** is the name of the company. (2) **Industry** is the industry in which each financial institution is classified according to the GICS and BICS classifications. (3) **Sub-Industry** is the sub-industry in which each financial institution belongs. This *ad hoc* classification is based on the GICS and BICS classifications. (4) **K** is the ratio between Market Value of Equity and Quasi Market Value of Assets. (5) **CARK IND** is the 10^{th} percentile of the empirical distribution of K for all institutions that belong to an industry.(6) **CARK SUBIND** is the 10^{th} percentile of the empirical distribution of K for all institutions that belong to a sub-industry. (7) **MES** is the marginal expected shortfall of a stock given that the MXUS Index is below its 5^{th} percentile. (8) **LIABILITIES** is the total amount of Book Value of Liabilities in $ bln. USD at the end of June 2007. (9) **LVG** is the quasi market value of leverage computed as the ratio between the Quasi Market Value of Assets and the Market Value of Equity. **SES1 - SES8** are Systemic Expected Shortfall measures that takes into account a potential recapitalization as well as a variation in the total amount of Liabilities during the crisis period. **SES1-SES4** has been computed using the CARK IND ratios (for each industry); whereas **SES5-SES8** have been computed using the CARK SUBIND ratios (for each subindustry). All crisis scenarios have been computed during the period July 2007 to December 2008 where the MSCI US Equity Index lost around 40% of its capitalization. The data are based on Bloomberg database.

Company Name	Industry	Subindustry	K	CARK IND	CARK SUBIND	MES	LVG	LIABILITIES	SES1	SES2	SES3	SES4	SES5	SES6	SES7	SES8
FREDDIE MAC	Banks	Thr.&Mort.Fin.	0.05	0.10	0.07	1.71%	20.81	795.58	35.91	58.65	32.60	38.37	18.82	37.20	16.10	19.92
FANNIE MAE	Banks	Thr.&Mort.Fin.	0.07	0.10	0.07	1.86%	13.87	818.01	26.23	56.30	21.42	27.93	8.90	34.10	4.16	8.72
CITIGROUP INC	Banks	Diversified Banks	0.11	0.10	0.13	1.74%	9.25	2093.11	24.29	114.14	2.23	23.94	66.61	166.90	45.84	67.18
MERRILL LYNCH	Div.Fin	Invest.Bank.&Brok.	0.07	0.08	0.06	2.14%	15.21	1034.13	17.96	53.55	10.87	18.77	8.85	41.20	1.18	8.27
JPMORGAN CHASE	Banks	Diversified Banks	0.11	0.10	0.13	1.73%	9.40	1390.23	17.46	76.22	3.34	17.37	45.60	111.25	32.27	45.99
MORGAN STANLEY	Div.Fin	Invest.Bank.&Brok.	0.07	0.08	0.06	2.07%	14.13	1160.48	17.24	57.40	8.64	17.50	6.66	43.30	0.00	5.42
BEAR STEARNS COS	Div.Fin	Invest.Bank.&Brok.	0.05	0.08	0.06	2.13%	21.26	410.00	10.42	22.31	8.83	11.50	6.87	17.50	5.06	7.42
LEHMAN BROS HLDG	Div.Fin	Invest.Bank.&Brok.	0.06	0.08	0.06	2.06%	15.48	584.73	10.36	29.49	6.61	10.85	5.05	22.42	1.00	4.80
COUNTRYWIDE FINA	Banks	Thr.&Mort.Fin.	0.10	0.10	0.07	2.46%	10.39	202.44	4.50	15.83	2.11	4.52	0.94	10.73	0.00	0.22
ANNALY CAPITAL M	Real Estate	Mortgage REITs	0.10	0.22	0.08	2.01%	10.51	36.06	3.45	5.94	3.12	3.82	0.11	1.56	0.00	0.03
GOLDMAN SACHS GP	Div.Fin	Invest.Bank.&Brok.	0.10	0.08	0.06	2.11%	10.49	896.02	2.95	40.68	0.00	0.73	0.00	29.58	0.00	0.00
WAMU INC	Banks	Thr.&Mort.Fin.	0.12	0.10	0.07	1.92%	8.53	285.06	2.28	16.42	0.00	1.47	0.00	8.35	0.00	0.00
THORNBURG MTG	Banks	Thr.&Mort.Fin.	0.05	0.10	0.07	2.11%	18.32	54.80	2.14	4.14	1.87	2.35	1.10	2.74	0.84	1.17
NATIONWIDE FIN	Insurance	Life & Health Insurance	0.07	0.07	0.04	2.10%	13.86	115.94	1.37	5.39	0.45	1.32	0.00	2.50	0.00	0.00
METLIFE INC	Insurance	Multi-line Insurance	0.08	0.07	0.08	1.70%	11.82	517.51	1.26	17.32	0.00	0.59	2.90	19.37	0.00	2.38
RAIT FINANCIAL T	Real Estate	Mortgage REITs	0.12	0.22	0.08	2.23%	8.56	12.54	1.04	2.08	0.89	1.17	0.00	0.58	0.00	0.00
REDWOOD TRUST	Real Estate	Mortgage REITs	0.10	0.22	0.08	2.43%	9.92	11.81	1.00	2.00	0.88	1.15	0.06	0.66	0.00	0.02
INDYMAC BANCORP	Banks	Thr.&Mort.Fin.	0.07	0.10	0.07	2.77%	14.56	29.12	0.90	2.44	0.67	1.02	0.47	1.76	0.23	0.48
NELNET INC-CL A	Div.Fin	Consumer Finance	0.04	0.08	0.08	2.36%	24.32	28.26	0.76	1.61	0.66	0.84	0.83	1.71	0.74	0.93

NEWCASTLE INVT C	Real Estate	Mortgage REITs	0.13	0.22	0.08	2.30%	7.72	8.89	0.69	1.48	0.57	0.77	0.00	0.42	0.00	0.00
FLAGSTAR BANCORP	Banks	Thr.&Mort.Fin.	0.05	0.10	0.07	2.14%	22.16	15.41	0.66	1.19	0.59	0.72	0.37	0.80	0.31	0.40
MFA FINANCIAL	Real Estate	Mortgage REITs	0.08	0.22	0.08	2.01%	11.86	6.42	0.64	1.07	0.59	0.71	0.06	0.30	0.01	0.05
BANKUNITED FIN-A	Banks	Thr.&Mort.Fin.	0.05	0.10	0.07	2.39%	19.72	13.68	0.52	1.07	0.46	0.59	0.29	0.74	0.23	0.32
SANTANDER HOLDIN	Banks	Thr.&Mort.Fin.	0.12	0.10	0.07	1.96%	8.32	73.81	0.50	4.29	0.00	0.26	0.00	2.21	0.00	0.00
PHOENIX COS	Insurance	Life & Health Insurance	0.06	0.07	0.04	2.10%	16.91	27.26	0.48	1.33	0.33	0.51	0.00	0.66	0.00	0.00
AMER EQUITY INVT	Insurance	Life & Health Insurance	0.04	0.07	0.04	2.03%	23.16	15.21	0.38	0.77	0.33	0.42	0.10	0.40	0.04	0.10
ANTHRACITE CAP	Real Estate	Mortgage REITs	0.13	0.22	0.08	2.44%	7.73	4.99	0.38	0.85	0.31	0.43	0.00	0.27	0.00	0.00
NORTHSTAR REALTY	Real Estate	Mortgage REITs	0.14	0.22	0.08	2.15%	7.18	4.74	0.36	0.77	0.29	0.39	0.00	0.18	0.00	0.00
HARTFORD FINL SV	Insurance	Multi-line Insurance	0.09	0.07	0.08	1.72%	11.48	327.00	0.35	10.78	0.00	0.00	1.39	12.08	0.00	0.98
FIRST HORIZON NA	Banks	Regional Banks	0.12	0.10	0.14	2.10%	8.23	35.64	0.28	2.24	0.00	0.23	1.01	3.21	0.50	1.02
ASTORIA FINL	Banks	Thr.&Mort.Fin.	0.11	0.10	0.07	1.70%	9.39	20.45	0.25	1.10	0.05	0.22	0.00	0.51	0.00	0.00
DEERFIELD CAPITA	Banks	Thr.&Mort.Fin.	0.08	0.10	0.07	2.12%	12.14	8.43	0.23	0.60	0.16	0.24	0.06	0.38	0.00	0.05
MPG OFFICE TRUST	Real Estate	Div.Ind.&Office REITS	0.22	0.22	0.38	2.10%	4.56	5.75	0.20	0.83	0.05	0.20	0.93	1.76	0.79	0.88
CORUS BANKSHARES	Banks	Regional Banks	0.10	0.10	0.14	2.56%	10.05	8.78	0.19	0.71	0.08	0.19	0.34	0.92	0.23	0.35
CITIZENS REPUBLI	Banks	Regional Banks	0.11	0.10	0.14	2.12%	9.45	11.71	0.19	0.79	0.05	0.19	0.42	1.10	0.29	0.43
PROTECTIVE LIFE	Insurance	Life & Health Insurance	0.08	0.07	0.04	1.72%	12.33	37.94	0.18	1.33	0.00	0.12	0.00	0.32	0.00	0.00
BANKATLANTIC B-A	Banks	Thr.&Mort.Fin.	0.08	0.10	0.07	2.33%	12.56	5.98	0.17	0.46	0.12	0.18	0.06	0.30	0.01	0.05
JEFFERIES GROUP	Div.Fin	Invest.Bank.&Brok.	0.10	0.08	0.06	2.44%	9.90	30.12	0.14	1.66	0.00	0.03	0.00	1.30	0.00	0.00
ARLINGTON ASSE-A	Div.Fin	Cust.Banks&Oth.Spe.Fin.	0.09	0.08	0.13	2.72%	11.55	10.05	0.13	0.64	0.00	0.12	0.39	1.05	0.30	0.43
DOWNEY FINL CORP	Banks	Thr.&Mort.Fin.	0.12	0.10	0.07	2.13%	8.31	13.44	0.12	0.87	0.00	0.07	0.00	0.50	0.00	0.00
WINTRUST FINL	Banks	Regional Banks	0.11	0.10	0.14	1.88%	9.15	8.63	0.10	0.51	0.00	0.10	0.29	0.75	0.20	0.30
GREAT AMERN FINL	Insurance	Life & Health Insurance	0.08	0.07	0.04	2.32%	11.95	12.64	0.10	0.63	0.00	0.08	0.00	0.32	0.00	0.00
FIRSTFED FIN CO	Banks	Thr.&Mort.Fin.	0.12	0.10	0.07	2.53%	8.41	6.94	0.10	0.55	0.00	0.07	0.00	0.38	0.00	0.00
HUNTINGTON BANC	Banks	Diversified Banks	0.13	0.10	0.13	1.83%	7.95	37.27	0.07	1.91	0.00	0.00	0.82	2.85	0.30	0.79
FIRST REPUBLIC	Banks	Regional Banks	0.12	0.10	0.14	1.96%	8.15	11.96	0.06	0.69	0.00	0.05	0.32	1.02	0.16	0.32
FBL FINL GROUP-A	Insurance	Life & Health Insurance	0.09	0.07	0.04	2.22%	11.22	12.02	0.06	0.56	0.00	0.02	0.00	0.26	0.00	0.00
SOUTH FINANCIAL	Banks	Regional Banks	0.12	0.10	0.14	1.63%	8.52	12.62	0.06	0.59	0.00	0.05	0.36	0.96	0.22	0.36
FIRST CITIZENS-A	Banks	Regional Banks	0.12	0.10	0.14	1.73%	8.12	14.64	0.03	0.71	0.00	0.01	0.37	1.13	0.19	0.37
AMCORE FINANCIAL	Banks	Regional Banks	0.12	0.10	0.14	1.84%	8.35	4.92	0.03	0.27	0.00	0.02	0.14	0.40	0.08	0.14
STERLING FINL/WA	Banks	Regional Banks	0.13	0.10	0.14	1.86%	7.97	10.34	0.02	0.54	0.00	0.01	0.26	0.84	0.11	0.25
SWS GROUP INC	Div.Fin	Invest.Bank.&Brok.	0.11	0.08	0.06	2.69%	8.99	4.77	0.02	0.30	0.00	0.00	0.00	0.25	0.00	0.00

Table 6.

Spearman Rank Correlation matrix among SES rankings, at the end of June 2007

This table shows the rank correlation matrixes among Systemic Expected Shortfall (SES) rankings. **SES1 - SES8** are Systemic Expected Shortfall measures that takes into account a potential recapitalization as well as a variation in the total amount of Liabilities during the crisis period. **SES1-SES4** has been computed using the CARK IND ratios (for each industry); whereas **SES5-SES8** have been computed using the CARK SUBIND ratios (for each subindustry). All crisis scenarios have been computed during the period July 2007 to December 2008 where the MSCI US Equity Index lost around 40% of its capitalization. The data are based on Bloomberg database.

	SES 1	**SES 2**	**SES 3**	**SES4**	**SES 5**	**SES6**	**SES 7**	**SES 8**
SES 1	1.00							
SES 2	0.60	1.00						
SES 3	0.78	0.48	1.00					
SES 4	0.95	0.58	0.82	1.00				
SES 5	0.49	0.54	0.44	0.44	1.00			
SES 6	0.42	0.80	0.32	0.40	0.60	1.00		
SES 7	0.50	0.45	0.45	0.47	0.78	0.47	1.00	
SES 8	0.51	0.54	0.45	0.46	0.98	0.58	0.82	1.00

Table 7.

Systemic Expected Shortfall, Systemic Important Financial Institutions (SIFIs) and the Capital Adequacy Ratio K (CARK) at the beginning of September 2011

This table contains the list of top 50 US financial institutions listed in descending order according to the Systemic Expected Shortfall based on a standardized actual k ratio (last column of the table). (1) **Company Name** is the name of the company. (2) **Industry** is the industry in which each financial institution is classified according to the GICS and BICS classifications. (3) **Sub-Industry** is the sub-industry in which each financial institution belongs. This *ad hoc* classification is based on the GICS and BICS classifications. (4) **K** is the ratio between Market Value of Equity and Quasi Market Value of Assets. (5) **CARK IND** is the 10^{th} percentile of the empirical distribution of K for all institutions that belong to an industry.(6) **CARK SUBIND** is the 10^{th} percentile of the empirical distribution of K for all institutions that belong to a sub-industry. (7) **MES** is the marginal expected shortfall of a stock given that the MXUS Index is below its 5^{th} percentile. (8) **LIABILITIES** is the total amount of Book Value of Liabilities in $ bln. USD at the beginning of September 2011. (9) **LVG** is the quasi market value of leverage computed as the ratio between the Quasi Market Value of Assets and the Market Value of Equity. **SES1 - SES8** are Systemic Expected Shortfall measures that takes into account a potential recapitalization as well as a variation in the total amount of Liabilities during the crisis period. **SES1-SES4** has been computed using the CARK IND ratios (for each industry); whereas **SES5-SES8** have been computed using the CARK SUBIND ratios (for each subindustry). All crisis scenarios have been computed during the period July 2007 to December 2008 where the MSCI US Equity Index lost around 40% of its capitalization. The data are based on Bloomberg database.

Company Name	Industry	Subindustry	K	CARK IND	CARK SUBIND	MES	LVG	LIABILITIES	SES1	SES2	SES3	SES4	SES5	SES6	SES7	SES8
JPMORGAN CHASE	Banks	Diversified Banks	0.06	0.07	0.08	3.04%	15.58	2063.89	32.40	91.64	16.40	35.40	39.89	104.73	25.55	46.87
GOLDMAN SACHS GP	Div.Fin	Inv.Bank.&Brok.	0.06	0.13	0.06	3.49%	15.67	863.36	24.01	55.67	26.42	41.08	11.08	25.70	2.78	12.15
CITIGROUP INC	Banks	Diversified Banks	0.05	0.07	0.08	3.79%	21.31	1777.98	15.85	51.64	20.58	39.99	18.12	59.02	25.15	47.53
MORGAN STANLEY	Div.Fin	Inv.Bank.&Brok.	0.04	0.13	0.06	3.83%	24.36	762.60	11.76	40.86	23.92	36.74	5.43	18.86	7.16	14.58
WELLS FARGO & CO	Banks	Diversified Banks	0.11	0.07	0.08	3.28%	9.42	1121.82	11.30	74.73	0.00	6.41	16.97	85.40	0.00	12.35
METLIFE INC	Insurance	Life & Health Ins.	0.05	0.07	0.04	3.63%	21.96	717.65	10.60	26.65	8.81	16.38	6.05	15.23	0.99	6.68
AMERICAN INTERNA	Insurance	Multi-line Insurance	0.08	0.07	0.07	3.52%	11.87	511.59	8.82	24.48	0.14	7.34	8.82	24.48	0.14	7.34
BANK NY MELLON	Div.Fin	Cust.Ban.&Oth.Spec.Fin.	0.09	0.13	0.1	3.53%	11.62	269.98	8.09	18.91	6.38	11.53	6.22	14.55	3.24	7.65
PRUDENTL FINL	Insurance	Life & Health Ins.	0.04	0.07	0.04	3.68%	25.23	577.74	7.66	20.36	7.88	13.75	4.38	11.64	1.87	6.11
SLM CORP	Div.Fin	Consumer Finance	0.03	0.13	0.18	3.23%	29.54	195.35	5.79	11.68	8.10	11.13	8.08	16.17	12.03	16.12
BANK OF AMERICA	Banks	Diversified Banks	0.04	0.07	0.08	4.02%	26.44	2039.14	5.71	45.03	23.07	47.34	6.53	51.47	26.99	55.16
STATE ST CORP	Div.Fin	Cust.Ban.&Oth.Spec.Fin.	0.09	0.13	0.1	3.40%	10.73	170.62	5.40	12.57	3.78	7.02	4.04	9.67	1.65	4.44
BLACKROCK INC	Div.Fin	Asset.Man.&Spec.Fin.	0.15	0.13	0.5	3.53%	6.50	160.38	5.17	14.17	1.88	4.29	23.57	54.51	20.25	34.02
HARTFORD FINL SV	Insurance	Multi-line Insurance	0.03	0.07	0.07	3.60%	37.29	295.79	3.74	9.62	4.99	7.79	3.74	9.62	4.99	7.79
SCHWAB (CHARLES)	Div.Fin	Inv.Bank.&Brok.	0.14	0.13	0.06	3.65%	7.24	90.84	3.08	7.49	0.58	2.92	1.42	3.46	0.00	0.00
ANNALY CAPITAL M	Real Estate	Mortgage REITs	0.16	0.16	0.08	3.09%	6.13	86.59	3.02	9.49	0.66	2.94	0.24	4.75	0.00	0.00
AMERIPRISE FINAN	Div.Fin	Asset.Man.&Spec.Fin.	0.07	0.13	0.5	3.72%	13.51	129.83	3.00	8.33	3.05	5.76	11.54	32.02	14.39	27.00
LINCOLN NATL CRP	Insurance	Life & Health Ins.	0.03	0.07	0.04	3.47%	31.33	187.97	2.86	6.54	3.16	4.87	1.63	3.74	1.04	2.21
CAPITAL ONE FINA	Banks	Diversified Banks	0.11	0.07	0.08	3.64%	9.22	171.07	2.63	11.17	0.00	1.76	3.37	12.77	0.00	2.56

SUNTRUST BANKS	Banks	Diversified Banks	0.06	0.07	0.08	3.63%	15.69	152.51	2.45	6.07	1.25	2.96	2.80	6.93	1.75	3.65
PNC FINANCIAL SE	Banks	Diversified Banks	0.10	0.07	0.08	3.19%	9.94	228.24	2.35	14.65	0.00	1.40	3.49	16.74	0.00	2.65
PRINCIPAL FINL	Insurance	Life & Health Ins.	0.05	0.07	0.04	3.61%	18.87	138.61	2.21	5.43	1.40	2.97	1.26	3.10	0.00	1.08
NORTHERN TRUST	Div.Fin	Cust.Ban.&Oth.Spec.Fin.	0.09	0.13	0.1	3.83%	10.86	90.37	2.04	6.10	1.82	3.74	1.57	4.69	0.92	2.58
BB&T CORP	Banks	Regional Banks	0.10	0.07	0.08	3.34%	10.42	142.26	1.93	8.59	0.00	1.34	2.56	9.82	0.00	2.08
ALLSTATE CORP	Insurance	Multi-line Insurance	0.11	0.07	0.07	3.56%	9.24	110.23	1.73	5.93	0.00	1.00	1.73	5.93	0.00	1.00
FIFTH THIRD BANC	Banks	Diversified Banks	0.09	0.07	0.08	3.46%	11.50	98.20	1.62	5.34	0.00	1.29	1.99	6.10	0.27	1.77
AMERICAN CAPITAL	Real Estate	Mortgage REITs	0.11	0.16	0.08	3.16%	8.86	38.86	1.46	3.34	1.16	2.00	0.55	1.67	0.00	0.28
KEYCORP	Banks	Diversified Banks	0.07	0.07	0.08	3.34%	13.88	79.05	1.31	3.69	0.39	1.27	1.58	4.22	0.71	1.68
DISCOVER FINANCI	Div.Fin	Consumer Finance	0.20	0.13	0.18	3.33%	5.13	55.91	1.23	5.72	0.00	0.55	2.40	7.93	0.35	2.11
JEFFERIES GROUP	Div.Fin	Inv.Bank.&Brok.	0.08	0.13	0.06	3.49%	12.95	37.47	1.11	2.55	1.00	1.68	0.51	1.18	0.00	0.41
COMERICA INC	Banks	Diversified Banks	0.09	0.07	0.08	3.79%	10.79	48.10	0.95	2.65	0.00	0.73	1.10	3.03	0.07	0.94
HUNTINGTON BANC	Banks	Diversified Banks	0.08	0.07	0.08	3.70%	12.44	47.80	0.91	2.33	0.13	0.79	1.05	2.67	0.29	1.01
MF GLOBAL HOLDIN	Div.Fin	Inv.Bank.&Brok.	0.02	0.13	0.06	3.58%	52.11	44.41	0.85	2.27	1.80	2.44	0.39	1.05	0.71	1.04
INTERACTIVE BROK	Div.Fin	Inv.Bank.&Brok.	0.02	0.13	0.06	3.13%	40.06	26.05	0.80	1.53	1.24	1.58	0.35	0.71	0.45	0.62
AFLAC INC	Insurance	Life & Health Ins.	0.15	0.07	0.04	3.63%	6.50	94.25	0.80	6.12	0.00	0.00	0.00	3.50	0.00	0.00
ZIONS BANCORP	Banks	Regional Banks	0.06	0.07	0.08	3.46%	15.47	44.45	0.76	1.85	0.32	0.83	0.88	2.11	0.49	1.04
E*TRADE FINANCIA	Div.Fin	Inv.Bank.&Brok.	0.08	0.13	0.06	3.94%	13.23	42.17	0.74	2.60	0.97	1.82	0.34	1.20	0.06	0.63
NELNET INC-CL A	Div.Fin	Consumer Finance	0.04	0.13	0.18	3.22%	27.48	23.88	0.72	1.45	0.98	1.35	1.01	2.01	1.47	1.97
PROTECTIVE LIFE	Insurance	Life & Health Ins.	0.03	0.07	0.04	3.59%	31.67	47.38	0.63	1.60	0.76	1.21	0.36	0.91	0.26	0.57
HATTERAS FINANCI	Real Estate	Mortgage REITs	0.12	0.16	0.08	3.26%	8.50	15.02	0.57	1.30	0.41	0.75	0.23	0.65	0.00	0.10
CNA FINL CORP	Insurance	Multi-line Insurance	0.13	0.07	0.07	3.55%	7.80	44.03	0.54	2.59	0.00	0.18	0.54	2.59	0.00	0.18
CNO FINANCIAL GR	Insurance	Life & Health Ins.	0.05	0.07	0.04	3.26%	19.11	27.83	0.48	1.16	0.31	0.59	0.23	0.66	0.00	0.16
RAYMOND JAMES	Div.Fin	Inv.Bank.&Brok.	0.21	0.13	0.06	3.78%	4.88	13.25	0.47	1.31	0.00	0.26	0.18	0.61	0.00	0.00
UNUM GROUP	Insurance	Life & Health Ins.	0.13	0.07	0.04	3.37%	7.95	48.93	0.42	2.92	0.00	0.05	0.00	1.67	0.00	0.00
SYMETRA FINANCIA	Insurance	Life & Health Ins.	0.05	0.07	0.04	3.47%	20.86	24.30	0.41	0.94	0.29	0.54	0.23	0.54	0.01	0.20
HUDSON CITY BNCP	Banks	Thr.&Mort.Fin.	0.06	0.07	0.06	4.14%	15.79	46.89	0.41	1.68	0.34	0.99	0.35	1.44	0.22	0.82
FIRST HORIZON NA	Banks	Regional Banks	0.07	0.07	0.08	3.57%	13.53	22.37	0.40	1.03	0.10	0.38	0.47	1.18	0.18	0.49
FOREST CITY -A	Real Estate	Real Est.Dev.&Ser.	0.20	0.16	0.24	3.69%	4.93	8.54	0.36	1.00	0.00	0.28	0.58	1.50	0.27	0.61
AMER EQUITY INVT	Insurance	Life & Health Ins.	0.02	0.07	0.04	3.51%	48.54	27.53	0.36	0.87	0.53	0.77	0.21	0.50	0.24	0.39
MFA FINANCIAL	Real Estate	Mortgage REITs	0.21	0.16	0.08	3.57%	4.67	9.17	0.35	1.14	0.00	0.24	0.08	0.57	0.00	0.00

Table 8.

Spearman Rank Correlation matrix among SES rankings, at the beginning of September 2011

This table shows the rank correlation matrixes among Systemic Expected Shortfall (SES) rankings. **SES1 - SES8** are Systemic Expected Shortfall measures that takes into account a potential recapitalization as well as a variation in the total amount of Liabilities during the crisis period. **SES1-SES4** has been computed using the CARK IND ratios (for each industry); whereas **SES5-SES8** have been computed using the CARK SUBIND ratios (for each subindustry). All crisis scenarios have been computed during the period July 2007 to December 2008 where the MSCI US Equity Index lost around 40% of its capitalization. The data are based on Bloomberg database.

	SES 1	**SES 2**	**SES 3**	**SES4**	**SES 5**	**SES6**	**SES 7**	**SES 8**
SES 1	1.00							
SES 2	0.80	1.00						
SES 3	0.63	0.49	1.00					
SES 4	0.85	0.70	0.79	1.00				
SES 5	0.76	0.77	0.48	0.65	1.00			
SES 6	0.69	0.92	0.40	0.60	0.85	1.00		
SES 7	0.49	0.45	0.71	0.60	0.59	0.50	1.00	
SES 8	0.61	0.65	0.59	0.74	0.82	0.74	0.74	1.00

Table 9.

Spearman Rank Correlation matrix among Systemic Risk Measures: SESs and SRISK

This table shows the rank correlation matrix among ***Systemic Risk Measures on August 31st 2011***. (1) **SRISK** is the systemic risk measure based on Brownlees et al. (2011). **SES1 - SES8** are Systemic Expected Shortfall measures that takes into account a potential recapitalization as well as a variation in the total amount of Liabilities during the crisis period. **SES1-SES4** has been computed using the CARK IND ratios (for each industry); whereas **SES5-SES8** have been computed using the CARK SUBIND ratios (for each subindustry). **SES9 – SES16** are Systemic Expected Shortfall measures that DO NOT take into account a potential recapitalization as well as a variation in the total amount of Liabilities during the crisis period. **SES9-SES12** have been computed using the CARK IND ratios (for each industry); whereas **SES13-SES16** have been computed using the CARK SUBIND ratios (for each subindustry).All crisis scenarios for SESs measures have been computed during the period July 2007 to December 2008 where the MSCI US Equity Index lost around 40% of its capitalization. The correlation matrix has been computed on the sample of financial institutions selected by Brownlees et al. (2011). The data are based on Bloomberg database.

	SRISK	SES1	SES2	SES3	SES4	SES5	SES6	SES7	SES8	SES9	SES10	SES11	SES12	SES13	SES14	SES15	SES16
SRISK	1.00																
SES1	0.89	1.00															
SES2	0.86	0.85	1.00														
SES3	0.76	0.74	0.61	1.00													
SES4	0.91	0.93	0.81	0.86	1.00												
SES5	0.79	0.84	0.86	0.63	0.82	1.00											
SES6	0.81	0.79	0.96	0.56	0.76	0.92	1.00										
SES7	0.66	0.65	0.56	0.87	0.76	0.68	0.60	1.00									
SES8	0.84	0.80	0.77	0.75	0.88	0.91	0.84	0.83	1.00								
SES9	0.97	0.93	0.90	0.78	0.95	0.83	0.85	0.70	0.88	1.00							
SES10	0.93	0.93	0.80	0.82	0.97	0.79	0.75	0.73	0.86	0.95	1.00						
SES11	0.92	0.91	0.81	0.82	0.98	0.83	0.79	0.77	0.91	0.96	0.96	1.00					
SES12	0.96	0.88	0.89	0.72	0.90	0.85	0.87	0.67	0.89	0.98	0.91	0.93	1.00				
SES13	0.95	0.94	0.92	0.81	0.96	0.85	0.86	0.72	0.86	0.99	0.95	0.95	0.95	1.00			
SES14	0.90	0.93	0.80	0.85	0.96	0.78	0.74	0.74	0.84	0.94	0.99	0.94	0.88	0.95	1.00		
SES15	0.91	0.93	0.80	0.87	0.98	0.82	0.76	0.78	0.88	0.94	0.97	0.97	0.89	0.95	0.97	1.00	
SES16	0.94	0.90	0.94	0.77	0.92	0.87	0.91	0.69	0.87	0.97	0.90	0.91	0.96	0.98	0.90	0.91	1.00

Figure 1:
Dynamics of the K ratio across Industries

Figure 1 shows the dynamics of the average median K ratio, computed for each quarter, across financial institutions within each industry, from the first quarter of 2002 till the beginning of the third quarter 2011. **K** is the ratio between the Market Value of equity and the Quasi Market Value of Assets. In the sample, BANKS industry contains 453 financial institutions; DIV_FINANCIALS industry contains 127 financial institutions; INSURANCE industry contains 125 financial institutions; REAL ESTATE industry contains 176 financial firms. The full list of financial institutions have been screened at the end of June 2007. The data are from Bloomberg.

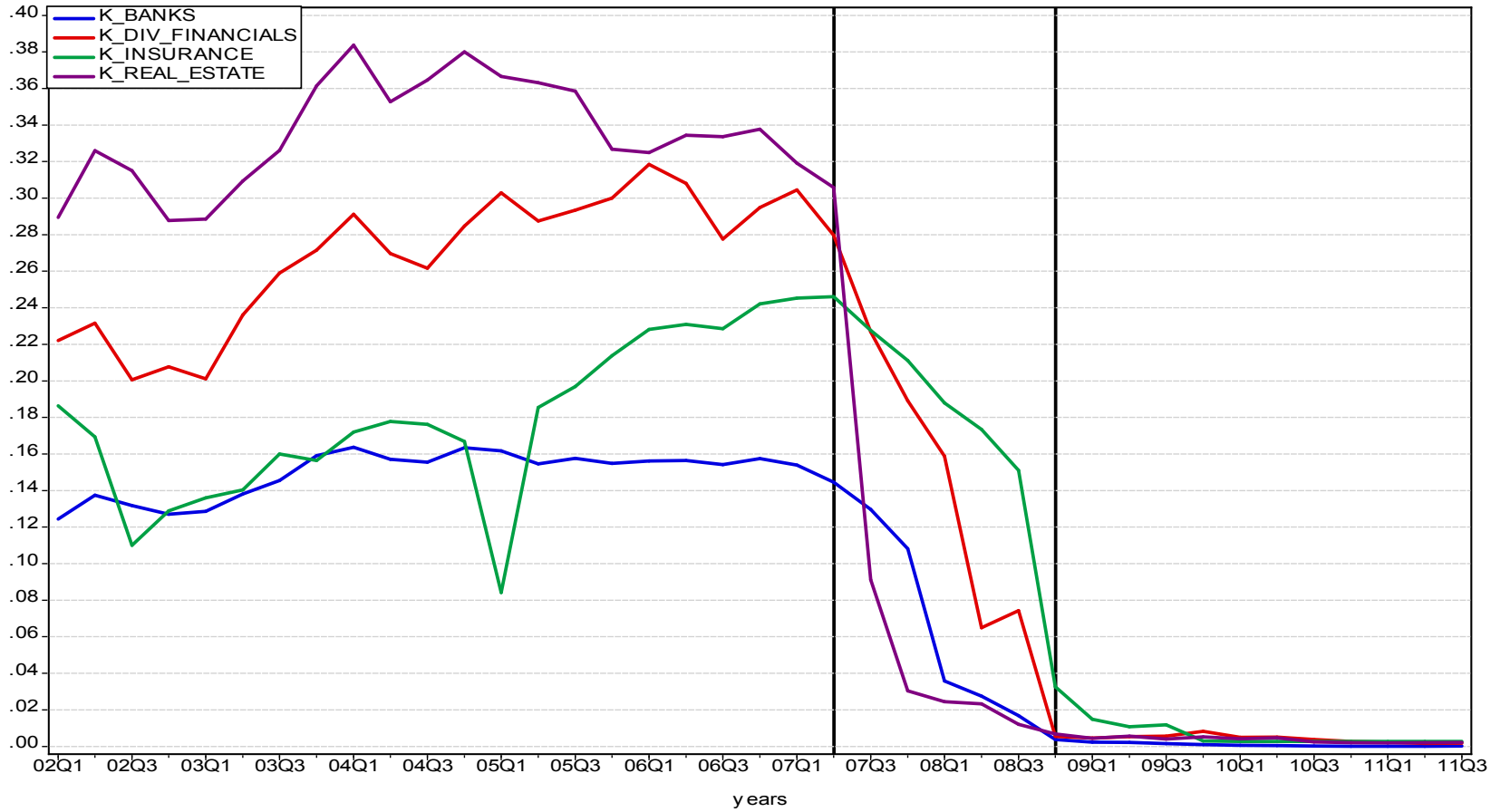

Figure 2:
Dynamics of the K ratio within BANKS industry

Figure 2 shows the dynamics of the average median K ratio, computed for each quarter, across financial institutions within BANKS industry, from the first quarter of 2002 till the beginning of the third quarter 2011. **K** is the ratio between the Market Value of equity and the Quasi Market Value of Assets. The data are from Bloomberg.

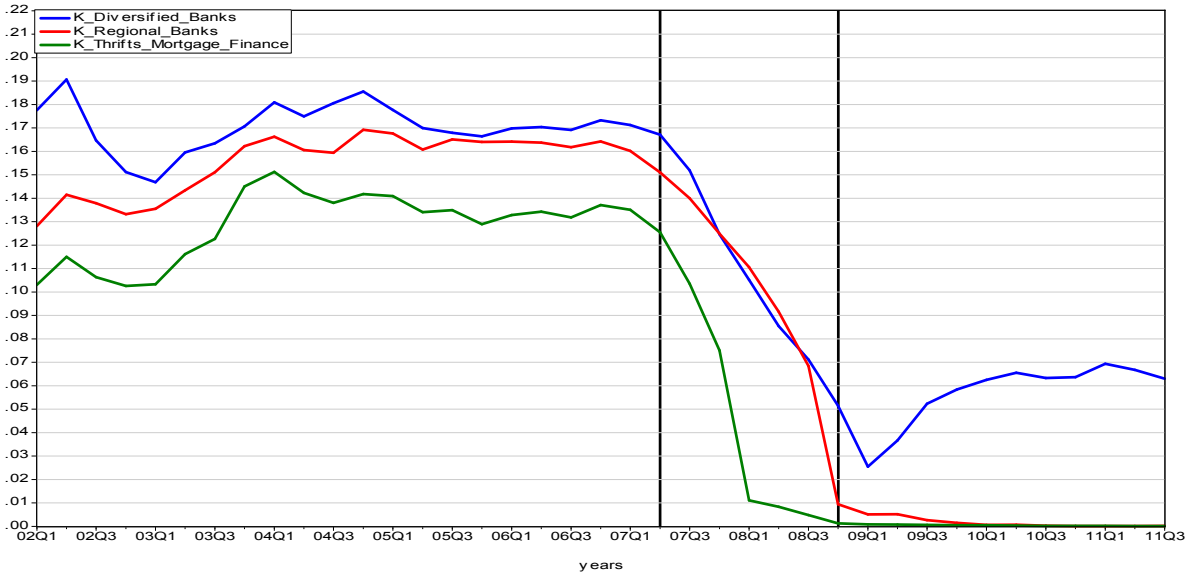

Figure 3:
Dynamics of the K ratio within DIVERSIFIED FINANCIALS industry

Figure 3 shows the dynamics of the average median K ratio, computed for each quarter, across financial institutions within DIVERSIFIED FINANCIALS industry, from the first quarter of 2002 till the beginning of the third quarter 2011. **K** is the ratio between the Market Value of equity and the Quasi Market Value of Assets. The data are from Bloomberg.

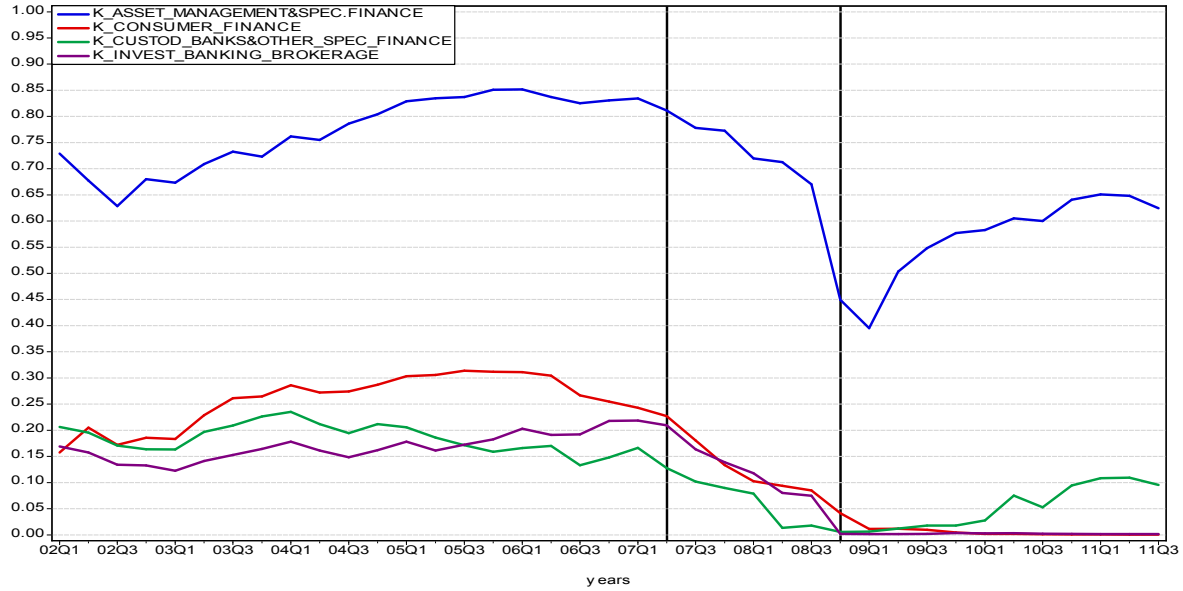

Figure 4:
Dynamics of the K ratio within INSURANCE industry

Figure 4 shows the dynamics of the average median K ratio, computed for each quarter, across financial institutions within INSURANCE industry, from the first quarter of 2002 till the beginning of the third quarter 2011. **K** is the rati4o between the Market Value of equity and the Quasi Market Value of Assets. The data are from Bloomberg.

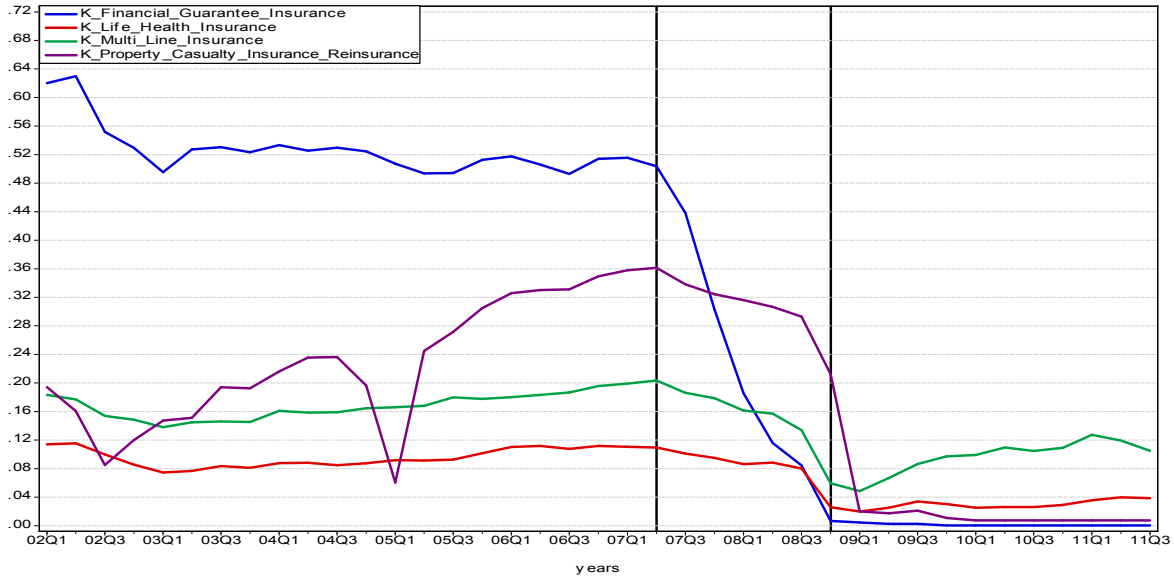

Figure 5:
Dynamics of the K ratio within REAL ESTATE industry

Figure 5 shows the dynamics of the average median K ratio, computed for each quarter, across financial institutions within REAL ESTATE industry, from the first quarter of 2002 till the beginning of the third quarter 2011. **K** is the ratio between the Market Value of equity and the Quasi Market Value of Assets. The data are from Bloomberg.

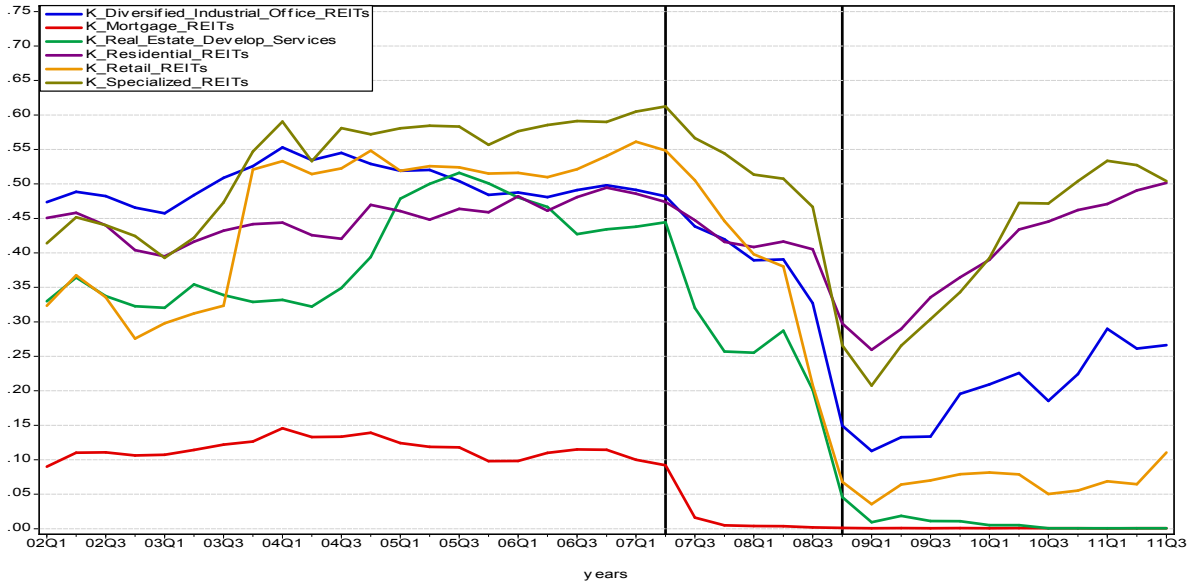

Figure 6:
Systemic Expected Shortfall based on the CARK INDUSTRY (SES4), assuming recapitalization and Liabilities variation during the crisis period

The categorical graphs show the aggregate total amount of Systemic Expected Shortfall (SES) across financial institutions in each industry using the minimum Capital Adequacy Ratio K related to each industry (CARK IND). I further assume a scenario in which there is not recapitalization and Liabilities variation during the crisis period (July 2007 to December 2008). Figure 6.1 shows the results at the end of June 2007, whereas Figure 6.2 shows the results at the beginning of September 2011. The graphs are based on a sample of 245 US financial institutions screened at the end of June 2007 (Figure 6.1) and at the beginning of September 2011 (Figure 6.2) with Quasi Market Value of Assets greater than $ 5 bln. USD. The data are from Bloomberg.

Figure 6.1: Systemic Expected Shortfall at the end of June 2007

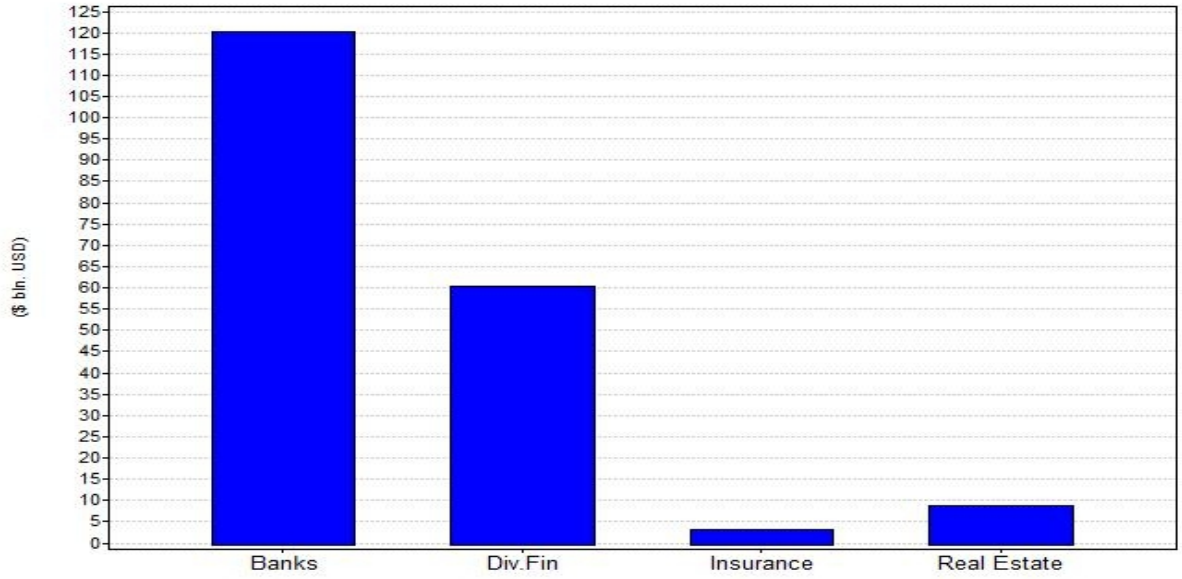

Figure 6.2: Systemic Expected Shortfall at the beginning of September 2011

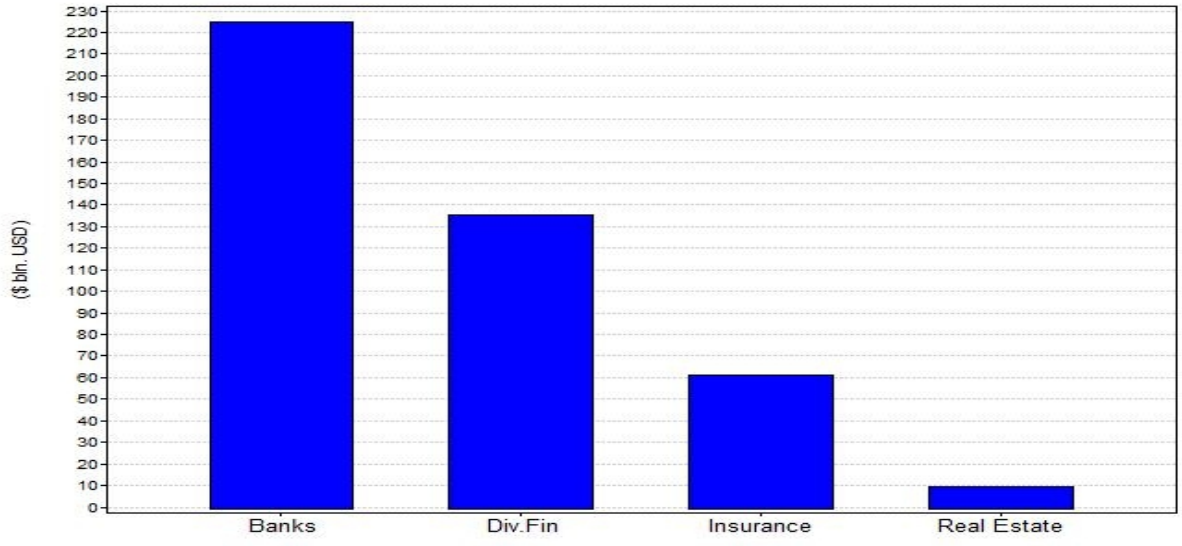

Figure 7:

Systemic Expected Shortfall based on the CARK SUBINDUSTRY (SES8), assuming recapitalization and Liabilities variation during the crisis period

The categorical graphs show the aggregate total amount of Systemic Expected Shortfall (SES) across financial institutions in each industry using the minimum Capital Adequacy Ratio K related to each subindustry (CARK SUBIND). I further assume a scenario in which there is not recapitalization and Liabilities variation during the crisis (July 2007 to December 2008). Figure 7.1 shows the results at the end of June 2007 whereas Figure 7.2 shows the results at the beginning of September 2011. The graphs are based on a sample of 245 US financial institutions screened at the end of June 2007 (Figure 7.1) and at the beginning of September 2011 (Figure 7.2) with Quasi Market Value of Assets greater than $ 5 bln. USD. The data are from Bloomberg.

Figure 7.1: Systemic Expected Shortfall at the end of June 2007

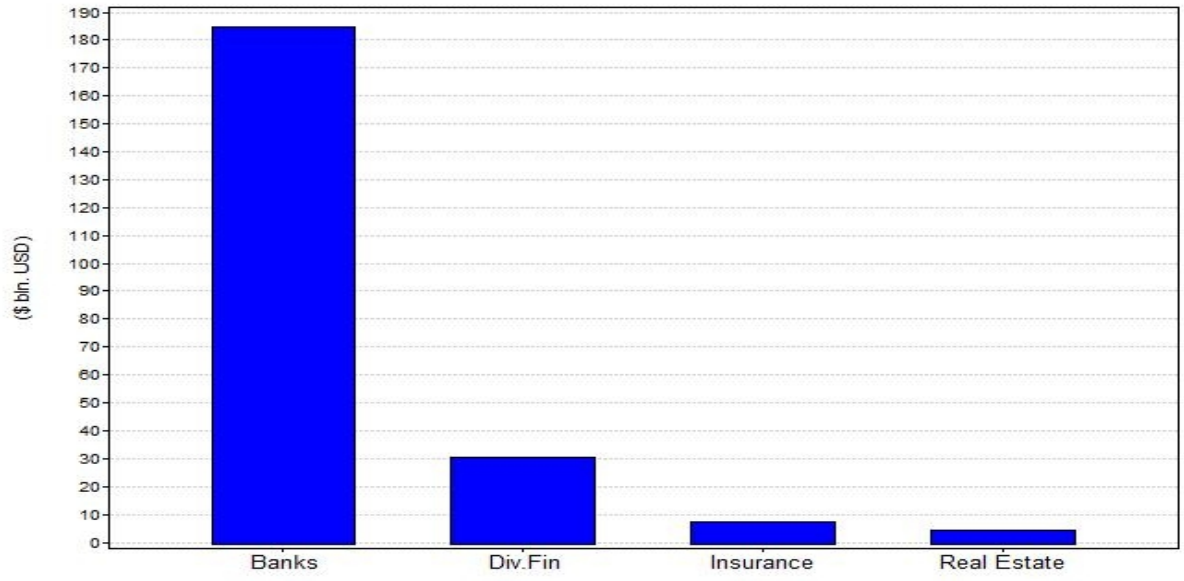

Figure 7.2: Systemic Expected Shortfall at the beginning of September 2011

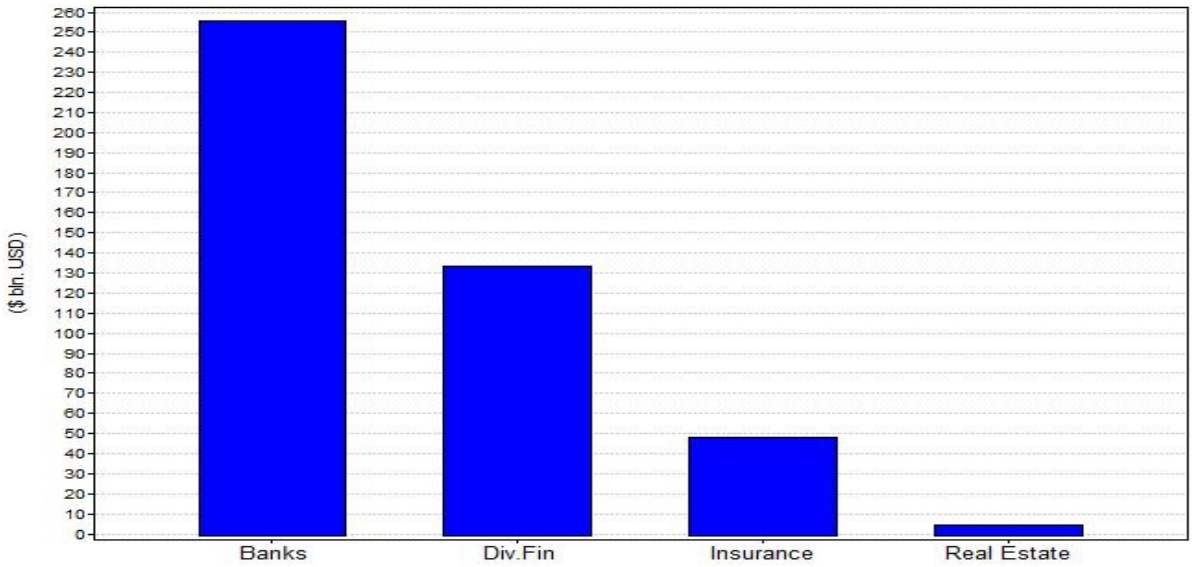

Figure 8:

Systemic Expected Shortfall based on the CARK SUBINDUSTRY (SES16), assuming no recapitalization and Liabilities variation during the crisis period

The categorical graphs show the aggregate total amount of Systemic Expected Shortfall (SES) across financial institutions in each industry using the minimum Capital Adequacy Ratio K related to each subindustry (CARK SUBIND). I further assume a scenario in which there is recapitalization and Liabilities variation during the crisis (July 2007 to December 2008). Figure 8.1 shows the results at the end of June 2007 whereas Figure 8.2 shows the results at the beginning of September 2011. The graphs are based on a sample of 245 US financial institutions screened at the end of June 2007 (Figure 8.1) and at the beginning of September 2011 (Figure 8.2) with Quasi Market Value of Assets greater than $ 5 bln. USD. The data are from Bloomberg.

Figure 8.1: Systemic Expected Shortfall at the end of June 2007

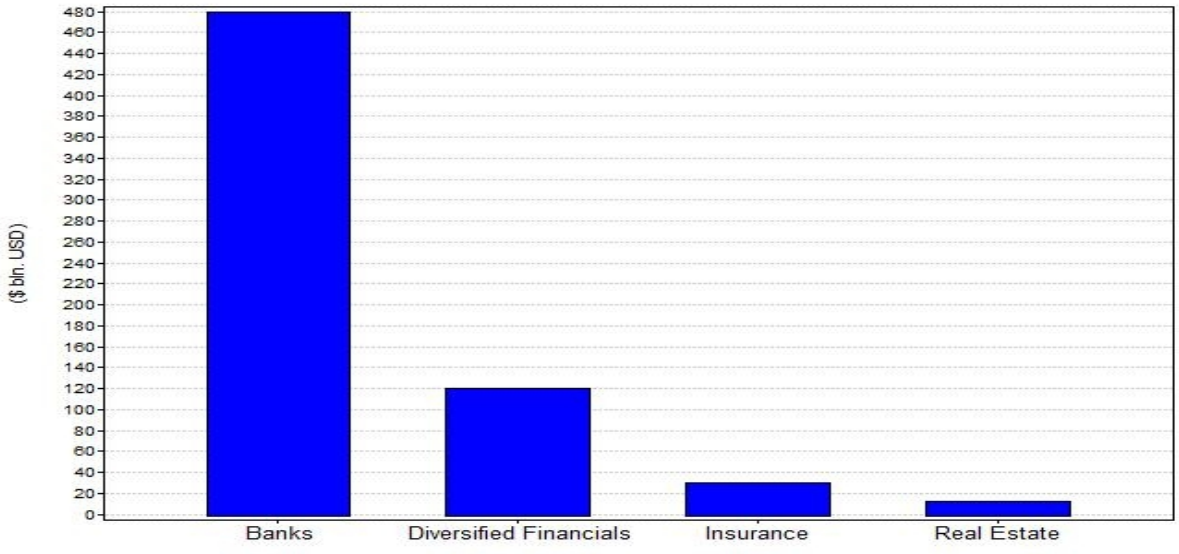

Figure 8.2: Systemic Expected Shortfall at the beginning of September 2011