Towards a Financial Statement Based Approach to Modeling Systemic Risk in Insurance and Banking

Garud Iyengar, Yu Luo, Shiva Rajgopal[1], Venkat Venkatasubramanian and Albert Zhang

Comments welcome
May 14, 2017

ABSTRACT:

One of the important limitations of the SRISK measure of systemic risk, proposed by Brownlees and Engle (2017) and Acharya, Engle and Richardson (2012), is its reliance on stock market data without much validation against the institutions' fundamentals based on its financial statements. We propose a financial statement based approach to estimating the vulnerability of an institution to a systemic event (labeled CRISK). We illustrate our approach for three business models: a life insurer (Prudential), a property and casualty insurer (Chubb) and an investment bank (JP Morgan Chase). We also validate CRISK using AIG's capital shortfall during the 2008 financial crisis. Our approach reveals that SRISK is likely to (i) overstate (misstate) capital requirements for life insurers (P&C insurers); and (ii) to overstate capital requirements for banks heavily reliant on FDIC insured deposits. We recommend using the market based SRISK measure as a first cut filter to identify systemically important institutions. The analyst can refine the list and validate the expected capital shortfall number using CRISK or a detailed financial statement analysis of the kind we advocate in this paper.

[1] Corresponding author. Authors are listed alphabetically. Iyengar is the Department Chair of the Industrial Engineering and Operations Research at Columbia University. Rajgopal is the Kester and Byrnes Professor of Accounting and Auditing at Columbia Business School. Venkatsubramanian is Samuel Ruben-Peter G. Viele Professor of Engineering at Columbia University. Luo and Zhang are doctoral students in Engineering at Columbia University. We thank (i) Alakar Srinivasan and Shenglin Wu for excellent research assistance; (ii) our respective schools as well as the Center for the Management of Systemic Risk (CMSR) for financial support; and (iii) insurance professionals at Prudential Insurance for their technical assistance with the project. We also acknowledge helpful comments from Urooj Khan and the 2016 Columbia Workshop on Systemic Risk in Insurance.

Towards a Financial Statement Based Approach to Modeling Systemic Risk in Insurance and Banking

1.0 Introduction

The purpose of this paper is twofold. First, we provide a critique of SRISK, proposed by Brownless and Engle (2017) and Acharya et al. (2012), as a measure of systemic risk that a financial institution imposes on markets. Second, to address some of the shortcomings of SRISK, we propose an alternative measure of a financial institutions' vulnerability at the time of a crisis, based on its audited financial statements.

Brownless and Engle (2017) define SRISK as "an estimate of the amount of capital that a financial institution would need to raise in order to function normally if we have another financial crisis." SRISK attempts to measure the "expected capital shortfall" of an institution during a financial crisis. Such a shortfall is computed as the "projected market capitalization" if equity markets declined by 40% based on historical stock market correlations (i.e. equity beta) minus the "prudent market capitalization" of greater than or equal to 8% of total assets. The NYU V-Lab computes SRISK on a real-time basis from stock prices of various financial institutions and makes them publicly available at https://vlab.stern.nyu.edu/en/welcome/risk/.

SRISK has gained wide prominence as an important measure of systemic risk. Recently, MetLife filed a lawsuit contesting the Federal Reserve Bank's decision to designate it as a SIFI (systemically important financial institution) under the Dodd-Frank Act. Professor Engle, along with other professors, wrote an *amicus curiae* brief in the lawsuit, which reaffirms the Fed's assessment of MetLife as systemically risky. That assessment relies on the SRISK measure as well as on other qualitative analyses.

We argue that SRISK, as a measure of systemic risk, suffers from several shortcomings. First, capital shortfalls computed under SRISK represent a black box. Hence, it is hard for the analyst to know whether or not SRISK incorporates the fundamental attributes of a business. As we demonstrate later, the financial vulnerability to a 40% decline in the broad market index is radically different for a life insurer as opposed to that of a commercial bank or an investment bank. Second, volatility in the stock prices of the

bank and in the market index, embedded in the SRISK measure, yield highly variable estimates of capital shortfalls and are hence of limited value to policy makers. Third, SRISK assumes that the underlying business is marked to market daily and hence works best for models where liabilities are instantly callable (e.g., investment banks). As such, SRISK does not work well for insurance companies and commercial banks that are funded by relatively illiquid sources such as future policy obligations or FDIC insured deposits. Fourth, SRISK assumes that the key systemic event is a large decline in the stock market index for all business models of financial institutions although for a life insurer, a pandemic is more likely the key systemic event. Fifth, SRISK assumes that prudent capital is 8% of the firm's assets without considering the riskiness of these assets, as in risk weighted assets (RWA) for banks or risk based capital (RBC) for insurers. This limitation results in misstated amounts of prudent capital that need to set aside. Finally, SRISK does not adequately capture the intuition that systemic risk ought to involve (i) a forced unwinding of transactions big enough to materially impact the underlying market in that financial instrument; and (ii) the contagion effect that such unwinding can cause.

To overcome the "black box" nature of SRISK, we advocate a financial statement approach to estimate systemic risk. We draw from data in firms' financial statements and modify SRISK, labeled CRISK, to accommodate variations in the three business models of financial institutions (life insurer, Prudential Insurance, a P&C insurer, Chubb and a commercial bank combined with an investment bank, J.P Morgan). Our method involves two broad steps: (i) during the crisis; and (ii) post crisis. During the crisis, we begin by reviewing whether each liability (on or off-balance sheet) will be callable when a potential systemic event happens (say a 40% decline in the stock market). To settle callable liabilities, we consider the existence of earmarked assets (e.g., separate account assets for a life insurer). If an earmarked asset does not exist, we assume the higher quality assets will be sold first. If these assets are not cash, we assume that the assets will be sold at a discount that is appropriate for sales of the relevant securities during such a crisis. As an aside, the expected sale of specific baskets of securities will also provide an indication of whether the sale is big enough to seize up the market in that security. Finally, we charge these "discounts" or losses

from sales of securities against the firm's book value of equity. We assume that goodwill and several other intangible assets such as value of business acquired (VOBA) or deferred policy acquisition costs (DAC) for an insurer would be worthless should a systemic event occur.

After the crisis, the assets left on the balance sheet will, by definition, represent less-liquid or even lower quality claims. We compute 8% of the left-over assets (based on Basel standards) and designate that number as the institution's loss absorption capacity. Finally, we validate the loss absorption capacity of the institution. That is, we apply "haircuts" to the left-over assets based on their credit ratings to approximate loss/default rates in the post-crisis scenario after the storm has passed. The excess, if any, of these haircuts over the institution's loss absorption capacity (based on the 8% Basel standards) represents the financial statement based measure of SRISK (labeled here as CRISK). For completeness, we also consider both available book equity as per GAAP and equity under statutory capital guidelines applicable to that institution. This comparison should predict whether the institution will need to raise new capital, should a systemic event occur.

SRISK and CRISK for the three businesses we considered are as follows: (i) Prudential, SRISK of $47.5 billion and CRISK of $10.7 billion; (ii) Chubb, SRISK not reported and CRISK indicating surplus capital of 7.6 billion and (iii) JP Morgan Chase, SRISK is $81.5 billion and CRISK is $64.4 billion. What might explain these differences? It is worth noting that CRISK writes off all intangible assets when a crisis occurs. Hence, CRISK is conservative. Despite such generous impairment related assumptions, SRISK overstates the capital shortfall needed for life insurance companies relative to CRISK. This is because a large chunk of the life insurer's liabilities is usually (i) separate account liabilities, for which there are usually earmarked offsetting separate account assets; (ii) policyholder benefits, where the risk of market underperformance is mostly passed on to the policyholders; and (iii) future policy benefits which represents reserves set aside to pay future policyholder claims. Eliminating just the separate accounts line from the assets and liabilities line substantially reduces SRISK for Prudential.

Second, SRISK misreports capital shortfalls required for P&C insurers. This is because P&C companies only book their unpaid losses on the policy after the catastrophe has occurred. These losses could potentially exceed the actuarial estimates of losses reserved for in the books. Moreover, the unpaid loss reserves, which are deliberately set aside to settle claims from floods or losses, are erroneously considered by SRISK as obligations against which capital needs to be provided. More important, correlated floods or hurricanes, which would represent real systemic risk for P&C firms, are unlikely to coincide with SRISK's operationalization of systemic risk -- a 40% decline in the market index.

Third, SRISK overstates capital shortfalls for banks that rely heavily on FDIC insured deposits. Such deposits usually do not get called in a crisis although SRISK assumes these deposits are as callable as say overnight deposits held by institutions. J.P. Morgan relies heavily on FDIC insured deposits. Moreover, financial statements yield other data on sources of systemic risk that may not be otherwise obvious. For instance, J.P. Morgan Chase's forced of $340B of bank deposits at short notice, should a systemic event occur, might be a cause for concern.

Finally, we attempt to validate the computation of CRISK by examining how the measure fared for AIG in 2007, during the four quarters of 2008 and in the present day, for year ended 2015. CRISK changes from $80.7 billion shortfall in 2007 to $67.1 billion surplus in 2015. The point when CRISK shortfall drops significantly coincides with the government bailout of AIG in September (2008 Q3). These trends give us some assurance that CRISK is a plausible measure of capital shortfalls should a systemic event such as a 40% decline in the overall stock market occur.

In sum, the ease of computation and almost real time measurement of an institution's SRISK from stock market based data from the NYU database is attractive. Computing CRISK from financial statements, on the other hand, is difficult, time-consuming, mired in detailed assumptions and requires extensive knowledge of accounting conventions. However, financial statements can help the analyst (i) incorporate important first-order attributes of the industries' business model or of the institution that a broad-brush market based measure will almost necessarily miss; and (ii) explicitly articulate the underlying assumptions

implicit in the SRISK computation (e.g., what haircut should we assume on the institutions' holdings of corporate bonds and so on) to enable further critical evaluation of the institution's capital requirement. Perhaps, a compromise strategy might involve using market data based SRISK to generate a short list of potential systemically important financial institutions (SIFIs) that can be calibrated with detailed financial statement analysis of the kind we advocate.

The remainder of the paper proceeds as follows. Section 2 explains market data based SRISK, its limitations and our financial statement based modified approach. Sections 3-6 discuss the derivation of financial statement based CRISK for Prudential Insurance, Chubb, JP Morgan and AIG. Section 7 summarizes and concludes.

2. Market based SRISK and a modified financial statement based approach

2.1 What is SRISK?

Brownlees and Engle (2017) define SRISK as the expected capital shortfall (CS) of a firm in the event of a market decline. The systemic event is modeled as an event when the arithmetic market return (R_m) is below a threshold *C* over horizon *h* as shown in equation (1):

$$SRISK_{it} = E_t(CS_{it+h} \mid R_{mt+1:\,t+h} < C) \quad (1)$$

Assuming that the institutions' debts cannot be renegotiated, the institution's capital shortfall (CS) can be written as:

$$CS_{it} = k\,A_{it} - W_{it} = k\,(D_{it} + W_{it}) - W_{it} \quad (2)$$

where W_{it} is the market value of equity and D_{it} is the book value of debt, A_{it} is value of "quasi assets" (equivalent to sum of W_{it} and D_{it}) and *k* is prudent capital fraction, usually set to 8%. An institution's prudent capital level is calculated as 8% of the sum of the book value of on-balance sheet debt and the reduced market capital of equity after the systemic event. SRISK is basically the capital shortfall measured as the difference between the prudent capital level relative to the left-over market capital after the systemic event. The maximum of SRISK and zero is assumed to be the capital injection needed by the government

to help the firm. Aggregate SRISK for all financial institutions is the summation of SRISK for each institution.

A few features of the SRISK measure are worth highlighting. First, SRISK is based on Merton type default risk models that is the core feature of several credit risk models. Second, SRISK merges a firm's balance sheet information (book value of on-balance sheet debt, as stated) and market value of equity capital to estimate the conditional shortfall in capital after a systemic event. Although one can compute capital shortfalls based on accounting values alone (as we do in our CRISK measure), SRISK's creators argue that the stock market is forward looking and hence SRISK is a conceptually superior measure. Of course, reliance on stock market measures makes SRISK excessively volatile and renders it a black box in terms of its relation to fundamentals of the firm, as explained later.

Third, SRISK does not explicitly employ off-balance sheet information and on top of that might not capture the correct on-balance sheet asset and liability structure of a firm. The value of *k*, the prudent capital requirement, is based on the capital ratio maintained by large financial institutions and is taken to be 8%, although the correct value of *k* to be used is currently under debate. The value of the *C* parameter should reflect extreme events (in practice set to 40% decline in the stock market) and the horizon '*h*' ought to sufficiently long. If the horizon were short and the threshold were small, SRISK would identify the current capital shortfall rather than the shortfall around the stressed systemic event.

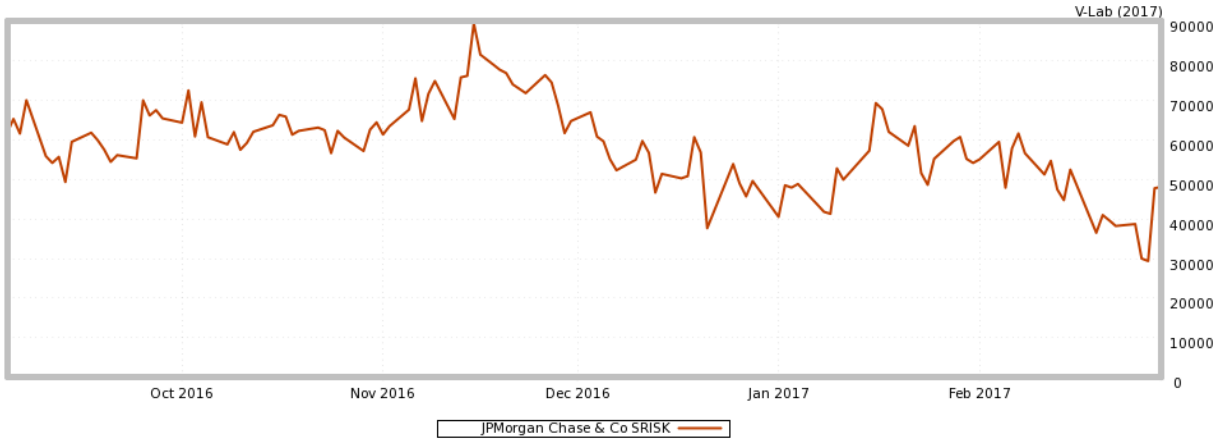
2.2 Limitations of SRISK

We identify several limitations of the SRISK measure as follows:

2.2.1 SRISK is volatile

SRISK relies solely on daily or weekly equity market prices of financial institutions to compute expected capital shortfalls at these institutions. If stocks markets are volatile for whatever reason, SRISK may not reflect economic capital of the institution. The figure reproduced below shows how JP Morgan's SRISK has fluctuated dramatically between $37 billion and $90 billion in the six months ending March 3,

2017. These deviations are driven by volatility in stock markets and are unlikely to reflect shortfalls in JP Morgan's economic capital.



2.2.2 SRISK is a black box

One cannot tie changes in SRISK based on stock market fluctuations to changes in the firms' fundamentals. SRISK is somewhat silent about the source of exposure faced by heterogeneous business models underlying several institutions such as commercial banks, investment banks, life insurers and P&C insurers. To cite one example, SRISK lumps liabilities of these business models together without recognizing nuances associated with liabilities on each of these institutions' balance sheets. For instance, if a bank's liability is due in the next six months, the institution is more likely to face a short run capital shortfall as compared to a liability (say a deposit) that is due in 10 years and is potentially backed by the FDIC in the event of a bank's default. Or, for a life insurer, the profit margins on selling life insurance policies are embedded in an account called "future policy benefits" that appears on the liabilities side of the insurer's balance sheet. These margins simply represent unearned profit that would be recognized as earned profits over the life of the policy. Although they appear on the liabilities side of the insurer's balance sheet, unearned profits do not strictly represent outside obligations that will come due when a systemic event occurs. As discussed in section 3, we address this limitation of SRISK by relying on fundamental

information in the firm's balance sheet and the income statement to assess the potential vulnerability of a financial institution to a systemic event.[2]

2.2.3 SRISK assumes liquidation and works best for "callable' businesses

By implicitly marking the firm's balance sheet to market, SRISK assumes a liquidation event and is hence predicated on the idea that changes in the stock market capitalization of an institution equal the long term expected capital shortfall of that institution. This assumption is questionable for several reasons. First, a typical bank's liabilities are not repriced due to changes in market prices (e.g., long term deposits) but the banks' assets are typically marked to market. Retail deposits usually do not experience runs on account of FDIC guarantees. Even on the assets side, loans are not marked to market partly because they are not due in the short-run. In the event of a crisis, the loans usually do not get sold. Instead, the FDIC gives banks time to work through a credit crisis.

Second, an insurers' liabilities, as in the case of separate accounts for life insurers, change with market movements and can be offset one for one with separate accounts on the assets side of the balance sheet. Moreover, a life insurer's liabilities represent conservative estimates of long dated future benefits on these policies that contain margins. These margins are not typically withdrawable in the near term. Policy holders, for both life insurers and property and casualty (P&C) insurers, are unlikely or contractually unable to file claims if the broad market index were to decline by 40%.

SRISK is perhaps best suited to evaluate the financial vulnerability of a pure investment bank because most of the investment bank's balance sheet is "marked to market" on a daily basis. The embedded horizon in the assets and liabilities of an investment bank is usually small (a matter of days sometimes). Moreover,

[2] Brownlees and Engle (2017) attempt to use SRISK to explain the Bloomberg Loan Crisis dataset, which details firms that received Federal Reserve capital injections during the 2008-9 financial crisis. A regression model containing basic industry variables explains 18.2% of the variation in this dataset. However, adding SRISK increases the adjusted r-squared slightly to 21.5%. Acharya, Engle, and Pierret (2014) show that SRISK produces rankings of capital shortfalls similar to those generated by U.S. stress tests. Our analysis is more focused on the absolute number of the capital shortfall than relative cross-sectional ranks of such shortfall. Arguably, the size of the financial institution itself is the best cross-sectional predictor of capital shortfalls.

an investment bank's balance sheet can be labeled as "callable" or potentially the most susceptible to a bank run where liabilities come due quickly and assets have to be liquidated to pay off these liabilities. Hence, the investment bank's equity capital is potentially well approximated by the market capitalization of the firm's equity, as reflected in SRISK.

2.2.4 SRISK assumes that the stock market decline is the key systemic event

SRISK assumes that the key systemic event to consider is a 40% or a similarly large decline in the broad market index. Even a broad market decline need not be a systemic event for banks. For instance, the stock market declined significantly during the 2000 crash in technology stocks. However, that market decline did not create a systemic event for banks. Systemic events are likely to differ for individual business models. For a life insurer, a more relevant systemic event might be a pandemic which causes several thousand of its policy holders to die at once. In this scenario, the life insurer would be obligated to pay out claims to those policy holders at the same time. For a P&C company, such a systemic event might be a devastating hurricane that may or may not coincide with a 40% decline in the broad market index.

2.2.5 Market value of equity is not loss absorption capacity

We define loss absorption capacity as assets that are held above and beyond that needed to pay off third party liabilities such as depositors, policyholders and the tax authorities. Ideally, we would like to measure the loss absorption capacity of the institution when a systemic event occurs (say a 40% decline in the broad stock market index, as assumed by Brownless and Engle 2017). SRISK assumes that such loss absorption capacity is captured by the market value of a firm's equity. It is not obvious that an institution can use the market value of its equity to pay off its obligations.

2.2.6 SRISK ignores statutory capital requirements

In general, we can think of three different constructs of equity capital: (i) regulatory capital such as risk based capital (RBC) in insurance or risk weighted assets (RWA) in banking; (ii) GAAP based capital; and (iii) economic capital. Each of these three measures can differ for the same financial institution. The capital

metric used for banks is based on the Basel minimum capital requirements and the accounting basis of measuring capital is, of course, usually based on GAAP. In contrast, for insurance companies, the capital metric is RBC and the accounting based measure of capital is based on statutory accounting principles (SAP), which tends to be more conservative than GAAP accounting. SAP is set by the National Association of Insurance Commissioners (NAIC). SAP, unlike GAAP, reflects the insurance company in a quasi-state of liquidation rather than as an ongoing business. The primary goal of SAP is to enhance solvency. SAP computes policyholder surplus, defined as assets minus liabilities and serves as the insurer's capital cushion against catastrophic losses.

SRISK is based on GAAP based equity capital regardless of the nature of the institution involved. Prudent capital, under SRISK, is defined as 8% of quasi-assets of the financial institution, where quasi assets are measured as the sum of the book value of debt and the market value of equity. However, as mentioned, this measure of quasi assets ignores the notion of risk-weighted assets in the banking context or RBC for insurance firms. There can be large differences between 8% of quasi assets under SRISK and risk weighted assets or RBC for an institution. In most cases, the prudent capital to be held, under the quasi-assets calculation, would exceed prudent capital defined as risk-weighted assets or RBC. For instance, under the quasi-assets concept, a financial institution that holds a substantial portion of its assets in U.S. treasuries would be treated no differently from an institution that holds risky loans. However, under the risk-weighted assets calculation, the weight attached to U.S. treasuries would be zero. Our procedure, explained in the next section, relies in spirit on a similar risk weighted calculation in that we assume highly liquid assets (usually with a risk weight is zero) are liquidated first to settle callable liabilities and hence leave the balance sheet after the crisis.

2.2.7 SRISK does not adequately capture the systemic aspect of systemic risk

Systemic risk, to us, involves both (i) vulnerability of a firm in a crisis; and (ii) the impact of that vulnerability to the financial system as a whole. That is, systemic risk involves: (i) a forced unwinding of transactions big enough to materially impact the underlying market in that financial instrument; and (ii) the

contagion effect that such unwinding can cause. One can potentially think of distressed firms that would not cause significant contagion or damage to the financial system. One could argue that for SRISK to capture systemic risk, all financial institutions have to sell securities in the same or similar asset classes to raise capital at the same time. If everyone is trading the same or similar asset class, and the firm is forced to trade, such trades could cause a systemic event or market failure.

To illustrate, if an institution designated as systemically large were forced to liquidate a hundred billion dollars of equities, over a three-month period, one could plausibly argue that such an unwind would simply register a blip in the equity market. On the other hand, if the institution were forced to unwind a hundred billion dollars of single B rated bonds in three months, such an unwind might cause systemic worries. That transaction could potentially change the fundamental availability and pricing of credit for single B bonds. SRISK is better at measuring the risk that a particular institution will fail. However, that does not necessarily imply that the failure will take every other institution down. Nor, is SRISK nuanced enough to isolate a market seizure in a particular set of securities.

2.3 Alternative to SRISK

The shortcomings of SRISK, discussed in section 2, inevitably raise at least two follow up questions: (i) what should an ideal measure of systemic risk capture? (ii) what, if anything, is a plausible alternative to SRISK? We address these questions next.

2.3.1 Computing CRISK

We believe that an ideal measure of systemic risk ought to capture three characteristics: (i) callable liabilities (and "callable" assets); (ii) financial vulnerability in the event of a crisis; and (iii) inter connectedness to the market. We propose a financial statement based measure labeled CRISK to remedy at least the first two of these three shortcomings of SRISK. In particular, we propose the following steps:

<u>During the crisis</u>

1. Review each liability (on or off-balance sheet) and evaluate whether that liability will be callable when a potential systemic event happens (say a 40% decline in the stock market).
2. If a liability is callable, consider whether the firm has earmarked specific assets to pay off that liability (e.g., separate account assets offset against separate account liabilities for a life insurer).
3. If the firm does not have specific assets set aside, assume the higher quality assets will be sold first to pay off the liability. If these assets are not cash or cash equivalents, assume that the liquidated assets will be sold at a discount that is appropriate for that basket of securities during such a crisis.
4. The extent of the expected sale of securities will provide an indication of the potential impact of such a sale on the market for that security. For instance, if the institution were forced to liquidate $100 billion of BB bonds, it might be worth asking whether such a sale might seize up the market for such bonds.
5. Charge these losses from sales of securities against the firm's book value of equity.
6. Account for potential asset write downs caused by the systemic event. For instance, if the institution owns equity securities, a 40% decline in the stock market index will entail a corresponding write down in the value of those securities against the firm's book value of equity.
7. Assume goodwill will be worthless, should a systemic event occur, and hence reduces the book value of equity. Also, review the need to potentially write off intangible assets such as the value of business acquired or of deferred policy acquisition costs on the balance sheet.

<u>Post crisis</u>

8. The assets left over will, by definition, represent less-liquid or even lower quality claims. Now compute 8% of the left-over assets (based on Basel standards) and designate that number as the institution's required loss absorption capacity after the crisis has passed. Ensure that such loss absorption capacity exceeds available equity at the institution. For completeness, consider both available book equity as per GAAP and equity under statutory capital guidelines applicable to that

institution. This comparison should predict whether the institution will have to raise new capital should a systemic event occur.

9. Validate the required loss absorption capacity of the institution. That is, apply "haircuts" to these assets based on approximate loss default rates that apply to these assets based on their credit ratings. For instance, if the left-over asset portfolio, after paying off callable liabilities, is made up of half of AAA bonds and half of BBB rated bonds of 10-year duration, one could assume haircuts, representing expected future defaults, consisting of 0.86% (4.64) % of AAA (B) bonds. These "haircuts" represent "business as usual" losses/defaults after the crisis has abated. The excess, if any, of these haircuts over the institution's loss absorption capacity (based on the 8% Basel standards) represents the financial statement based measure of SRISK or CRISK.

We illustrate this approach for three business models, as mentioned before. Let's start with Prudential Insurance.

3.0 Prudential Insurance

3.1 Introduction to Prudential's liabilities

Prudential is primarily a life insurance business. Prudential's balance sheet as of December 31, 2015, from its 2015 10-K is reproduced in the appendix A1. A glance at the assets side of the balance sheet reveals that the three largest asset types are (i) fixed maturities - available for sale of $290 Billion; (ii) separate accounts of $286 Billion; and (iii) commercial mortgages of $51 Billion. These three assets collectively account for 83% (627/757) of Prudential's total assets.

Turning to the liabilities side, we find that the top three liabilities include: (i) separate accounts of $286 Billion; (ii) future policy benefits of $224 Billion; and (iii) $137 Billion in policyholders' account balances. These three liabilities cover 90% (647/715) of Prudential's liabilities. Prudential's equity, as per U.S. GAAP based balance sheet and including non-controlling interests, is $41.9 Billion.

As one can see, separate accounts of $286 billion appear both on the assets and liabilities side. On page 184 of its 10-K, Prudential discloses the following information about separate accounts:

"Separate account assets are reported at fair value and represent segregated funds that are invested for certain policyholders, pension funds and other customers. The assets consist primarily of equity securities, fixed maturities, real estate-related investments, real estate mortgage loans, short-term investments and derivative instruments. The assets of each account are legally segregated and are not subject to claims that arise out of any other business of the Company. Investment risks associated with market value changes are borne by the customers, except to the extent of minimum guarantees made by the Company with respect to certain accounts. Separate account liabilities primarily represent the contract holder's account balance in separate account assets and to a lesser extent borrowings of the separate account, and will be equal and offsetting to total separate account assets. The investment income and realized investment gains or losses from separate account assets generally accrue to the policyholders and are not included in the Company's results of operations."

Given that (i) the separate accounts are legally segregated from the rest of the business and; (ii) the investment risk on these assets is borne by customers, whose claims are represented by separate account liabilities, we net out separate account assets and liabilities for the purposes of our analysis. Even if the broad market index were to decline by 40% and the value of separate account assets were to fall by say 40%, that loss would be absorbed by a fall in separate account liabilities. It is interesting to note that elimination of these separate accounts, by itself, shrinks the assets side of Prudential's balance sheet by 38% (286/757) and its liabilities side by 40% (286/715) with no impact on its GAAP equity.

Let's turn to future policy benefits of $224 billion. These represent obligations that the company owes its policy holders in the event the policy holder dies. We would not expect policyholder mortality to coincide with a systemic event such as a 40% decline in the stock market. Although this is a long-term obligation borne entirely by Prudential, against which long term capital has to be set aside, we do not believe this liability is callable.

Finally, consider the notes to the financial statements on policy holders' account balances of $136 billion. Policy holder dividends of $5.7 billion are similar in spirit to policy holders' balances for our purposes.

"Policyholders' Account Balances

The Company's liability for policyholders' account balances represents the contract value that has accrued to the benefit of the policyholder as of the balance sheet date. This liability is primarily associated with the accumulated account deposits, plus interest credited, less policyholder withdrawals and other charges assessed against the account balance, as applicable. These policyholders' account balances also include provision for benefits under non-life contingent payout annuities and certain unearned revenues. See Note 10 for additional information regarding policyholders' account balances."

In simple terms, policyholder account balances represent pre-investment type contracts that do not impose risk on the insurer (Ryan 2007). Hence, they are accounted for like bank deposits under SFAS 97 in which the policyholder can be thought of as the depositor and the insurer as the bank and the premiums as deposits. Premiums add to the financial liability held by the insurer, referred to as policyholder account balances. Policyholder account balances are increased by the interest expense over time and are reduced by the cash payments to the policyholder that are in effect cash withdrawals from the investment balance. Given this discussion, it is not obvious that a 40% broad market decline will change the risk borne by the insurer. More important, it is unlikely that policyholders would want to cash out their policies when the stock market falls by 40%.

The income tax liability of $8.7 billion is mostly a deferred tax liability. In particular, note 19 of the financial statements reveals a tax receivable of $0.16 billion that is offset by a deferred tax liability of $8.9 billion. These represent future obligations due to the IRS on account of differences in the definition of income or expense between GAAP and IRS accounting. Hence, these obligations are not likely callable if the stock market falls by 40%.

3.2 A more systematic approach

A detailed analysis of Prudential's CRISK is reported in Table 1 of this paper. The process behind the derivation of that number is as follows. In step 1, we ascertain the total callable liabilities in a crisis to be $60 billion, derived from Prudential's contractual obligations disclosure for 2015 under the column "2016" reproduced below for reference.

Contractual Obligations

The table below summarizes the future estimated cash payments related to certain contractual obligations as of December 31, 2015. The estimated payments reflected in this table are based on management's estimates and assumptions about these obligations. Because these estimates and assumptions are necessarily subjective, the actual cash outflows in future periods will vary, possibly materially, from those reflected in the table. In addition, we do not believe that our cash flow requirements can be adequately assessed based solely upon an analysis of these obligations, as the table below does not contemplate all aspects of our cash inflows, such as the level of cash flow generated by certain of our investments, nor all aspects of our cash outflows.

	Estimated Payments Due by Period				
	Total	2016	2017-2018	2019-2020	2021 and thereafter
			(in millions)		
Short-term and long-term debt obligations(1)	$ 41,678	$ 2,219	$ 4,921	$ 4,549	$ 29,989
Operating and capital lease obligations(2)	665	131	209	127	198
Purchase obligations:					
Commitments to purchase or fund investments(3)	3,879	3,010	443	289	137
Commercial mortgage loan commitments(4)	2,272	1,619	600	30	23
Other liabilities:					
Insurance liabilities(5)	1,121,869	41,598	69,030	71,005	940,236
Other(6)	11,602	11,405	63	53	81
Total	$ 1,181,965	$ 59,982	$ 75,266	$ 76,053	$ 970,664

(1) The estimated payments due by period for long-term debt reflects the contractual maturities of principal, as disclosed in Note 14 to the Consolidated Financial Statements, as well as estimated future interest payments. The payment of principal and estimated future interest for short-term debt are reflected in estimated payments due in 2016. The estimate for future interest payments includes the effect of derivatives that qualify for hedge accounting treatment. See Note 14 to the Consolidated Financial Statements for additional information concerning our short-term and long-term debt.

(2) The estimated payments due by period for operating and capital leases reflect the future minimum lease payments under non-cancelable operating and capital leases, as disclosed in Note 23 to the Consolidated Financial Statements.

(3) As discussed in Note 23 to the Consolidated Financial Statements, we have commitments to purchase or fund investments, some of which are contingent upon events or circumstances not under our control, including those at the discretion of our counterparties. The timing of the fulfillment of certain of these commitments cannot be estimated, therefore the settlement of these obligations are reflected in estimated payments due in less than one year. Commitments to purchase or fund investments include $92 million that we anticipate will ultimately be funded from our separate accounts.

(4) As discussed in Note 23 to the Consolidated Financial Statements, loan commitments of our commercial mortgage operations, which are legally binding commitments to extend credit to a counterparty, have been reflected in the contractual obligations table above principally based on the expiration date of the commitment; however, it is possible these loan commitments could be funded prior to their expiration date. In certain circumstances the counterparty may also extend the date of the expiration in exchange for a fee.

(5) The estimated cash flows due by period for insurance liabilities reflect future estimated cash payments to be made to policyholders and others for future policy benefits, policyholders' account balances, policyholder's dividends, reinsurance payables and separate account liabilities, net of premium receipts and reinsurance recoverables. These future estimated cash flows for current policies in force generally reflect our best estimate economic and actuarial assumptions. These cash flows are undiscounted with respect to interest. The sum of the cash flows shown for all years in the table of $1,122 billion exceeds the corresponding liability amounts of approximately $654 billion included in the Consolidated Financial Statements as of December 31, 2015. Separate account liabilities are legally insulated from general account obligations, and it is generally expected these liabilities will be fully funded by separate account assets and their related cash flows. We have made significant assumptions to determine the future estimated cash flows related to the underlying policies and contracts. Due to the significance of the assumptions used, actual cash flows will differ, possibly materially, from these estimates.

(6) The estimated payments due by period for other liabilities includes securities sold under agreements to repurchase, cash collateral for loaned securities, liabilities for unrecognized tax benefits, bank customer liabilities, and other miscellaneous liabilities. Amounts presented in the table also exclude $8,597 billion of notes issued by consolidated VIE's which recourse for these obligations is limited to the assets of the respective VIE and do not have recourse to the general credit of the company.

We also enter into agreements to purchase goods and services in the normal course of business; however, these purchase obligations are not material to our consolidated results of operations or financial position as of December 31, 2015.

The contractual obligations disclosure reveals that $59.9 or $60 billion is due one year out. The largest obligation is the $41.6 billion obligation due in 2016 related to insurance liabilities. As the note indicates, that number includes liabilities due under future policy benefits, policyholder account balances, policyholder dividends, reinsurance payables and separate account liabilities. Prudential does not reveal how much of this obligation relates to separate accounts versus the rest.

In 2016, $11.4 billion appears as "other liabilities." This number includes securities sold under agreements to repurchase, cash collateral for loaned securities, and other miscellaneous liabilities and

$2.2 billion is due in long term debt and short term debt. We cannot ascertain whether the obligation of $11.4 billion of other liabilities is likely to come due in a week or a month. Hence, finer data, with a periodicity of less than a year, related to when these obligations are actually due next year would assist in refining this analysis. Second, the disclosure ignores the asset side of the discussion. For instance, it is quite possible that Prudential has matched these liabilities with its assets and can use bonds that are set to mature, whose proceeds are earmarked to pay off these liabilities. However, data unavailability precludes us from addressing such assets earmarked against these liabilities.

We have assumed that investment commitments of $3 billion will be due when a systemic event happens. We also include operating and capital lease obligations of $0.13 billion and commercial mortgage loan commitments $ 1.6 billion in callable liabilities. Notes due by variable interest entities (VIEs) consolidated into Prudential's books amount to $8.6 billion. Note 5, shown below, clarifies that that these obligations are due by the VIEs over five years, are offset by an equivalent amount of dedicated assets and Prudential is not legally responsible for any deficit, if any, in the VIE's capital. Hence, we consider these unlikely to be callable for our purposes here.

5. VARIABLE INTEREST ENTITIES

In the normal course of its activities, the Company enters into relationships with various special-purpose entities and other entities that are deemed to be variable interest entities ("VIEs"). A VIE is an entity that either (1) has equity investors that lack certain essential characteristics of a controlling financial interest (including the ability to control activities of the entity, the obligation to absorb the entity's expected losses and the right to receive the entity's expected residual returns) or (2) lacks sufficient equity to finance its own activities without financial support provided by other entities, which in turn would be expected to absorb at least some of the expected losses of the VIE.

If the Company determines that it is the VIE's "primary beneficiary" it consolidates the VIE. There are currently two models for determining whether or not the Company is the "primary beneficiary" of a VIE. The first (the "Investment Company Model") relates to those VIEs that have the characteristics of an investment company and for which certain other conditions are true. These conditions are that (1) the Company does not have the implicit or explicit obligation to fund losses of the VIE and (2) the VIE is not a securitization entity, asset-backed financing entity or an entity that was formerly considered a qualified special-purpose entity. In this model the Company is the primary beneficiary if it stands to absorb a majority of the VIE's expected losses or to receive a majority of the VIE's expected residual returns.

For all other VIEs, the Company is the primary beneficiary if the Company has (1) the power to direct the activities of the VIE that most significantly impact the economic performance of the entity and (2) the obligation to absorb losses of the entity that could be potentially significant to the VIE or the right to receive benefits from the entity that could be potentially significant.

3.3 Evaluating the asset position

The question turns next to how Prudential would fund the immediately callable liability of $60 billion. Step 2 of Table 1 lists the "high quality" liquid assets that Prudential could sell to pay off the liability. As shown in step 2, Prudential has access to $126.1 billion of such highly liquid assets. Hence, Prudential should be able to comfortably to settle its immediate obligations of $60 billion.

Turning to the details, we find that Prudential carries cash and cash equivalents of $17.6 billion, including $1 billion belongs to the closed block. We assume none of the closed block assets can be used to pay the callable liability but the remaining $16.6 billion is available. After using up the cash, it seems logical to assume that Prudential would start selling its U.S. treasuries before trying to liquidate its other securities should a systemic event occur.

Note 4 in the 2015 10-K, reproduced below, provides the details of the $290 billion of securities held by Prudential.

4. INVESTMENTS

Fixed Maturities and Equity Securities

The following tables provide information relating to fixed maturities and equity securities (excluding investments classified as trading) as of the dates indicated:

	December 31, 2015				
	Amortized Cost	Gross Unrealized Gains	Gross Unrealized Losses	Fair Value	OTTI in AOCI(4)
	(in millions)				
Fixed maturities, available-for-sale					
U.S. Treasury securities and obligations of U.S. government authorities and agencies	$ 14,992	$ 3,544	$ 19	$ 18,517	$ 0
Obligations of U.S. states and their political subdivisions	8,089	747	41	8,795	0
Foreign government bonds	71,849	12,011	147	83,713	1
U.S. corporate public securities	70,979	6,344	1,955	75,368	(3)
U.S. corporate private securities(1)	28,525	2,278	359	30,444	0
Foreign corporate public securities	26,354	2,821	621	28,554	0
Foreign corporate private securities	19,393	739	994	19,138	0
Asset-backed securities(2)	10,121	226	121	10,226	(452)
Commercial mortgage-backed securities	10,337	195	70	10,462	(1)
Residential mortgage-backed securities(3)	4,777	335	6	5,106	(4)
Total fixed maturities, available-for-sale(1)	$ 265,416	$ 29,240	$ 4,333	$ 290,323	$ (459)
Equity securities, available-for-sale	$ 6,847	$ 2,570	$ 143	$ 9,274	

Assume that Prudential can sell $18.5 billion of U.S. treasuries and $8.8 billion of U.S. state and municipal bonds to cover the callable liability. Companies may need to sell assets at a discounted price, should a systemic crisis occur. To account for that possibility, we apply haircuts on these securities as per data gathered by the Bank for International Settlements (2010) (see table reproduced below) to estimate haircuts on securities sold in June 2009 (closest date to the crisis that we could get data for).

Table 1

Typical haircut on term securities financing transactions

In per cent

	June 2009		
	Prime[1]	**Non-prime[2]**	**Unrated[3]**
G7 government bonds			
Short-term	0.5	1	2
Medium-term	1	2	3
US agencies			
Short-term	1	2	3
Medium-term	2	5	7
Pfandbrief	1	2	8
Prime MBS			
AAA-rated	10	20	30–100
AA- and A-rated	100	100	100
Asset-backed securities	25	50	100
Structured products (AAA)	100	100	100
Investment grade bonds			
AAA- and AA-rated	8	12	15
A- and BBB-rated	10	15	20
High-yield bonds	15	20	40
Equity			
G7 countries	15	20	25
Emerging economies	20	25	40

We do not have precise information on whether Prudential holds short term or medium term bonds. Hence, we have averaged the haircuts for short term and medium term bonds under the "Prime" category to compute haircuts applicable to the following three sets of assets: (i) G7 government bonds; (ii) U.S. agencies (covering treasuries and U.S. state and municipal bonds). The amount, thus raised, after haircuts on a hypothetical sale is (8.8 – 0.1) + (18.5 – 0.1) = $ 27.1 billion. That sale leaves about $16.3 billion of contractual obligations uncovered ($60-16.6-27.1 billion).

Next, we assume that Prudential can sell $16.6 billion of foreign government bonds including $ 0.3 billion haircuts even in a systemic crisis. We believe that the absolute magnitude of the sale ($43.4

billion in total) is small enough for the market to absorb such a sale without disrupting the functioning of the market in such securities.

3.4 Crisis haircuts

The systemic event itself will lead to haircuts of $5.9 billion in the value of assets held by Prudential. Consider the data reported in step 3 of Table 1. We estimate those haircuts as follows: (i) a haircut of $3.1 billion in equity securities (see section 3.3.1); (ii) ii) $2.6 billion haircut in trading assets (see section 3.3.2); and (iii) $0.1 billion in commercial mortgage commitments (see section 3.3.3)

3.4.1 Equity securities

A closer look at the balance sheet reveals that Prudential holds equity securities worth $9.3 billion, in which $ 2.7 billion is not taken into consideration as it belongs to the closed block. A 40% decline in the stock market would cause an equivalent 40% haircut of $2.6 billion.

3.4.2 Trading account assets

As revealed by the trading assets disclosures reproduced below, 91% of $20.5 billion is considered high or highest quality. For the 91% of the trading asset portfolio, we assign a haircut of 9% (average haircut of 8% and 10% applicable to the investment grade bonds and discussed in section 3.2). For the rest of the 9% of the portfolio, we assign the haircut of 15% applicable to high yield bonds as per the table in section 3.2. Combined, this haircut accumulates to $2.6 billion.

Trading Account Assets Supporting Insurance Liabilities

The following table sets forth the composition of the TAASIL portfolio attributable to PFI excluding the Closed Block division as of the dates indicated.

	December 31, 2015		December 31, 2014	
	Amortized Cost	Fair Value	Amortized Cost	Fair Value
	(in millions)			
Short-term investments and cash equivalents	$ 765	$ 765	$ 196	$ 196
Fixed maturities:				
Corporate securities	12,797	12,851	11,922	12,439
Commercial mortgage-backed securities	1,860	1,862	2,505	2,546
Residential mortgage-backed securities	1,411	1,428	1,640	1,676
Asset-backed securities	1,295	1,299	1,180	1,198
Foreign government bonds	680	694	621	650
U.S. government authorities and agencies and obligations of U.S. states	326	369	303	372
Total fixed maturities	18,369	18,503	18,171	18,881
Equity securities	1,030	1,254	896	1,186
Total trading account assets supporting insurance liabilities	$ 20,164	$ 20,522	$ 19,263	$ 20,263

As a percentage of amortized cost, 77% and 75% of the portfolio was publicly-traded as of December 31, 2015 and 2014, respectively. As of December 31, 2015 and 2014, 91% and 92%, respectively, of the fixed maturity portfolio was considered high or highest quality based on NAIC or equivalent rating. As of December 31, 2015, $1.377 billion of the residential mortgage-backed securities were publicly-traded agency pass-through securities, which are supported by implicit or explicit government guarantees, of which more than 99% have credit ratings of A or higher. Collateralized mortgage obligations, including approximately $26 million secured by "ALT-A" mortgages, represented the remaining $34 million of residential mortgage-backed securities, of which 51% have credit ratings of A or better and 49% are BBB and below. For a discussion of this portfolio and changes in the fair value, see "—Experience-Rated Contractholder Liabilities, Trading Account Assets Supporting Insurance Liabilities and Other Related Investments," above.

3.4.3 Commercial mortgages

Prudential carries $50.5 billion of commercial mortgages. Page 208 of its annual report discloses credit quality indicators of such loans. We assume that loans with debt-service coverage ratio of less than 1 and loan-to-value ratio of more than 80% will default in a systemic event. That would suggest a haircut of $0.132 billion.

PRUDENTIAL FINANCIAL, INC.
Notes to Consolidated Financial Statements

Commercial mortgage loans

	Debt Service Coverage Ratio—December 31, 2015			
	Greater than 1.2X	1.0X to <1.2X	Less than 1.0X	Total
	(in millions)			
Loan-to-Value Ratio				
0%-59.99%	$ 25,978	$ 515	$ 207	$ 26,700
60%-69.99%	12,191	395	234	12,820
70%-79.99%	5,668	500	97	6,265
Greater than 80%	119	151	132	402
Total commercial mortgage loans	$ 43,956	$ 1,561	$ 670	$ 46,187

Agricultural property loans

	Debt Service Coverage Ratio—December 31, 2015			
	Greater than 1.2X	1.0X to <1.2X	Less than 1.0X	Total
	(in millions)			
Loan-to-Value Ratio				
0%-59.99%	$ 2,587	$ 84	$ 3	$ 2,674
60%-69.99%	185	0	0	185
70%-79.99%	0	0	0	0
Greater than 80%	0	0	0	0
Total agricultural property loans	$ 2,772	$ 84	$ 3	$ 2,859

Total commercial mortgage and agricultural property loans

An aging schedule reveals the following data (on page 209). Non-accruing and past due loans are negligibly small at $23 million.

Table of Contents

PRUDENTIAL FINANCIAL, INC.
Notes to Consolidated Financial Statements

	December 31, 2015							
	Current	30-59 Days Past Due	60-89 Days Past Due	Greater Than 90 Days - Accruing	Greater Than 90 Days - Not Accruing	Total Past Due	Total Commercial Mortgage and Other Loans	Non-Accrual Status
	(in millions)							
Commercial mortgage loans	$ 46,187	$ 0	$ 0	$ 0	$ 0	$ 0	$ 46,187	$ 53
Agricultural property loans	2,856	2	0	0	1	3	2,859	1
Residential property loans	288	7	0	0	6	13	301	6
Other collateralized loans	312	0	0	0	0	0	312	0
Uncollateralized loans	1,012	0	0	0	0	0	1,012	0
Total	$ 50,655	$ 9	$ 0	$ 0	$ 7	$ 16	$ 50,671	$ 60

3.5 Post-crisis haircuts

We assume the remaining assets will continue to default/become unrecoverable after the crisis at the rates that would prevail during the course of normal business. In particular, we apply the S&P Corporate Average Cumulative Default rates 1981-2015, reproduced below, to estimate the post-crisis haircuts associated with the assets that are left after the systemic event.

Table 26

Global Corporate Average Cumulative Default Rates By Rating Modifier (1981-2015) (%) (cont.)

	--Time horizon (years)--														
Rating	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
B-	8.74	16.36	21.49	25.01	27.82	29.82	31.46	32.51	33.18	33.76	34.56	35.17	35.44	35.75	36.10
CCC/C	27.22	36.41	41.59	44.64	46.99	47.84	48.79	49.59	50.48	51.12	51.61	52.24	53.08	53.74	53.74
Investment grade	0.12	0.32	0.54	0.80	1.06	1.32	1.56	1.79	2.02	2.25	2.47	2.66	2.84	3.02	3.21
Speculative grade	4.29	8.28	11.61	14.19	16.25	17.93	19.36	20.54	21.60	22.55	23.34	24.00	24.60	25.13	25.65
All rated	1.59	3.12	4.44	5.51	6.40	7.16	7.80	8.35	8.85	9.32	9.72	10.05	10.36	10.64	10.92

Sources: Standard & Poor's Global Fixed Income Research and Standard & Poor's CreditPro®.

The post crisis haircuts, as shown in step 3 of Table 1, cumulate to $3.1 billion. Of this, $2.3 billion relates the fixed maturities portfolio, discussed next.

3.5.1 Fixed maturities portfolio

Consider Prudential's disclosure of the NAIC assigned ratings of its fixed maturities securities portfolio.

Fixed Maturity Securities Credit Quality

The Securities Valuation Office ("SVO") of the National Association of Insurance Commissioners ("NAIC"), evaluates the investments of insurers for statutory reporting purposes and assigns fixed maturity securities to one of six categories called "NAIC Designations." In general, NAIC Designations of "1" highest quality, or "2" high quality, include fixed maturities considered investment grade, which include securities rated Baa3 or higher by Moody's or BBB- or higher by Standard & Poor's. NAIC Designations of "3" through "6" generally include fixed maturities referred to as below investment grade, which include securities rated Ba1 or lower by Moody's and BB+ or lower by Standard & Poor's. The NAIC Designations for commercial mortgage-backed securities and non-agency residential mortgage-backed securities, including our asset-backed securities collateralized by sub-prime mortgages, are based on security level expected losses as modeled by an independent third-party (engaged by the NAIC) and the statutory carrying value of the security, including any purchase discounts or impairment charges previously recognized.

As a result of time lags between the funding of investments, the finalization of legal documents, and the completion of the SVO filing process, the fixed maturity portfolio generally includes securities that have not yet been designated by the SVO as of each balance sheet date. Pending receipt of SVO designations, the categorization of these securities by NAIC Designation is based on the expected ratings indicated by internal analysis.

Investments of our international insurance companies are not subject to NAIC guidelines. Investments of our Japanese insurance operations are regulated locally by the Financial Services Agency, an agency of the Japanese government. The Financial Services Agency has its own investment quality criteria and risk control standards. Our Japanese insurance companies comply with the Financial Services Agency's credit quality review and risk monitoring guidelines. The credit quality ratings of the investments of our Japanese insurance companies are based on ratings assigned by nationally recognized credit rating agencies, including Moody's, Standard & Poor's, or rating equivalents based on ratings assigned by Japanese credit ratings agencies.

The following table sets forth our fixed maturity portfolio by NAIC Designation or equivalent ratings attributable to PFI excluding the Closed Block division as of the dates indicated.

Table of Contents

NAIC Designation(1)(2)	December 31, 2015 Amortized Cost	Gross Unrealized Gains(3)	Gross Unrealized Losses(3)(4)	Fair Value	December 31, 2014 Amortized Cost	Gross Unrealized Gains(3)	Gross Unrealized Losses(3)(4)	Fair Value
	(in millions)							
1	$ 177,350	$ 22,783	$ 1,445	$ 198,688	$ 176,122	$ 25,715	$ 564	$ 201,273
2	43,731	3,698	1,545	45,884	42,111	4,934	402	46,643
Subtotal High or Highest Quality Securities(5)	221,081	26,481	2,990	244,572	218,233	30,649	966	247,916
3	7,085	408	292	7,201	6,619	537	58	7,098
4	2,332	150	100	2,382	2,228	204	50	2,382
5	415	78	12	481	441	83	24	500
6	367	20	4	383	264	22	3	283
Subtotal Other Securities(6)(7)	10,199	656	408	10,447	9,552	846	135	10,263
Total Fixed Maturities	$ 231,280	$ 27,137	$ 3,398	$ 255,019	$ 227,785	$ 31,495	$ 1,101	$ 258,179

(1) Reflects equivalent ratings for investments of the international insurance operations.
(2) Includes, as of December 31, 2015 and December 31, 2014, 938 securities with amortized cost of $4,253 million (fair value, $4,325 million) and 1,330 securities with amortized cost of $6,864 million (fair value, $7,342 million), respectively, that have been categorized based on expected NAIC Designations pending receipt of SVO ratings.
(3) Includes $316 million of gross unrealized gains and $0 million of gross unrealized losses as of December 31, 2015, compared to $328 million of gross unrealized gains and $1 million of gross unrealized losses as of December 31, 2014, on securities classified as held-to-maturity.
(4) As of December 31, 2015, includes gross unrealized losses of $212 million on public fixed maturities and $196 million on private fixed maturities considered to be other than high or highest quality and, as of December 31, 2014, includes gross unrealized losses of $71 million on public fixed maturities and $64 million on private fixed maturities considered to be other than high or highest quality.
(5) On an amortized cost basis, as of December 31, 2015, includes $190,638 million of public fixed maturities and $30,443 million of private fixed maturities and, as of December 31, 2014, includes $189,713 million of public fixed maturities and $28,520 million of private fixed maturities.
(6) On an amortized cost basis, as of December 31, 2015, includes $5,836 million of public fixed maturities and $4,363 million of private fixed maturities and, as of December 31, 2014, includes $5,712 million of public fixed maturities and $3,840 million of private fixed maturities.
(7) On an amortized cost basis, as of December 31, 2015, securities considered below investment grade based on lowest of external rating agency ratings, total $11,491 million, or 5% of the total fixed maturities, and include securities considered high or highest quality by the NAIC based on the rules described above.

Of the $290 billion of fixed maturity securities shown in the balance sheet, Prudential shows the ratings composition for about $255 billion. The rest pertain to the "closed block" division of Prudential, which is a legally separate entity for whose obligations Prudential is not responsible.

As can be seen, the $255 billion of securities breaks out into the following six buckets: (i) NAICS rating 1 and 2 (equivalent to BBB- or higher) covers $244.6 billion; and (ii) NAICS ratings of 3-6 (equivalent to BB+ or lower) cover the remaining $10.4 billion. We apply 3-year investment grade default rate 0.54% for NAICS 1-2 and 3-yeaer speculative grade default rate 11.61% for NAICS 3-6.

Recall that $$43.8B (60.5B assets sold – 16.7B cash) billion of securities would have been sold from this portfolio to settle liabilities. Assuming default rates in the middle of this range, Prudential is likely to take a haircut of $2.3 billion in its fixed maturities portfolio [(0.54%* $(244.6 billion -43.8 billion) + 11.61% of $10.4 billion)].

3.5.2 Non - fixed maturities portfolio

For rest of the non-fixed maturities assets, we apply S&P default rates, reproduced below, based on the following assumptions. (1) 1-year short-term A rating default rate (0.07%) for short-term investments and other trading account assets; (2) 10-year long-term A rating default rate (1.63%) for other long-term investments; (3) 5-year A rating default rate (0.57%) for other assets: commercial mortgage, policy loans, accrued investment income and other assets. This gives rise to a default of $ 0.7 billion (exclusive of closed block assets) (short-term $ 0.015 billion + long-term $ 0.1 billion + other assets $ 0.5 billion + remaining trading accounts $ 0.1 billion)

Global Corporate Average Cumulative Default Rates By Rating Modifier (1981-2015) (%)

	--Time horizon (years)--														
Rating	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
AAA	0.00	0.03	0.14	0.25	0.35	0.47	0.52	0.61	0.67	0.73	0.76	0.79	0.82	0.89	0.96
AA+	0.00	0.06	0.06	0.11	0.17	0.23	0.29	0.35	0.41	0.47	0.54	0.61	0.68	0.75	0.82
AA	0.02	0.04	0.09	0.23	0.38	0.50	0.64	0.75	0.85	0.96	1.05	1.11	1.23	1.30	1.38
AA-	0.03	0.10	0.21	0.30	0.38	0.49	0.57	0.62	0.69	0.75	0.82	0.89	0.92	0.97	1.03
A+	0.06	0.12	0.25	0.40	0.52	0.62	0.75	0.89	1.04	1.21	1.36	1.53	1.73	1.96	2.14
A	0.07	0.18	0.28	0.42	0.57	0.77	0.97	1.16	1.38	1.63	1.84	2.00	2.14	2.22	2.41
A-	0.09	0.22	0.36	0.49	0.68	0.87	1.14	1.34	1.50	1.64	1.78	1.93	2.07	2.21	2.33
BBB+	0.15	0.41	0.70	0.98	1.26	1.59	1.84	2.11	2.41	2.71	3.00	3.20	3.46	3.80	4.19
BBB	0.23	0.56	0.85	1.26	1.67	2.08	2.46	2.83	3.23	3.63	4.07	4.47	4.79	4.92	5.16
BBB-	0.36	1.06	1.83	2.67	3.44	4.13	4.76	5.35	5.84	6.32	6.87	7.32	7.75	8.37	8.84
BB+	0.49	1.38	2.48	3.53	4.51	5.49	6.31	6.91	7.65	8.35	8.83	9.41	9.96	10.41	11.03
BB	0.76	2.25	4.25	6.01	7.68	9.01	10.22	11.20	12.12	12.91	13.69	14.37	14.70	14.93	15.27

A caveat related to these haircuts deserves mention. Insurance companies, such as Prudential, discount their policy obligations by a rate a return that implicitly includes the profit margin on these policies. One can consider the margins as unearned revenue. As the unearned revenue gets earned, such margins would offset some of the haircuts in assets discussed above. However, we could not find that disclosures on such margins in Prudential's 10-K. Hence, we could not address this issue in our analysis.

3.6 CRISK

Let's consider the modified balance sheet of Prudential after the systemic event. Liabilities of $ 60 billion ($ 2.2 + 3 + 41.6 + 13.2 billion) and equivalent set of assets have left the books. Hence, the revised assets number at Prudential would be $ $757-60 or $697 billion. On top of that, let's eliminate

separate accounts of $286 billion to leave us with an asset balance of $411 billion. Recall that $224 billion on the liabilities side relates to future policy benefits, which are reserves set aside to pay future policy holders. It seems odd to provide for capital on such reserves, which are themselves funds set aside to meet future policy obligations. Hence, we exclude future policy benefits from the SRISK computation. Following Basel conventions, SRISK assumes that 8% of these liabilities would represent a safe capital target. By that calculation, Prudential would have to hold $15 billion of capital [8% of (757-60-224)]

In the CRISK model detailed in step 4 of Table 1, we eliminate the Accumulated Other Comprehensive Income (AOCI) balance from the book value of equity, which leads to a remaining number of $ 29.6 billion (41.9 – 12.3). We do so because AOCI reflects unrealized gains and losses on just assets but not the liabilities in general for Prudential.

The haircuts during the crisis, adding up to $5.9 billion, would further reduce book value of equity to $23.7 billion (29.6-5.9). On top of that, to be conservative, we write off intangible assets valued at $19.5 billion [(value of business acquired (VOBA) of $2.8 billion and $16.7 billion of Deferred Policy Acquisition Costs (DAC)] noting in the process that not all of the DAC is likely to be unrecoverable. Thus, the resultant book value of equity left is $4.3 billion. SRISK defines expected capital shortfall as prudent capital minus the capital left after the crisis. To compare apples with apples, CRISK would be $29.7 billion ($15 billion - $4.3 billion). Hence, Prudential's CRISK is $10.7 billion.

The NYU website expects Prudential's SRISK or expected capital shortfall (without simulation), given a crisis to be $47.5 billion as of March 31, 2016. What might explain the mismatch between the NYU SRISK measure and ours? To understand that, we try to reconstruct the SRISK measure. The loss absorption capacity would be 8% of ($715 billion in liabilities and $32.4 billion, the market value of Prudential's equity as of 3/31/2016) or $59.7 billion.[3] If SRISK is $47.5 billion, NYU implicitly assumes only $12.2 billion equivalent of market value of equity is left after the crisis. That is, a 40% decline in the

[3] The closing stock price was $72.22 as of 3/31/2016 and the number of outstanding shares as per Prudential's balance sheet in appendix A is 449.1 million shares.

market index is expected to wipe off $20.1 billion of market value of equity, implying a beta of 1.55. Turning to the question of why CRISK and SRISK differ, note that as discussed before, not all of the $715 Billion of Prudential's liabilities are callable. Separate accounts themselves account for $285 Billion of those liabilities and are hence excluded. Even if we were to just eliminate separate accounts from the NYU SRISK calculation, SRISK would fall by $23 Billion (0.08*285). The risk of market fluctuations in $137 Billion of policyholder account balances, as discussed earlier, is borne mostly by the policy holders. If one were to eliminate that balance from the NYU SRISK calculation, SRISK would fall further by $11 Billion (0.08*137).

Second, SRISK assumes that the estimated market value of equity lost from the systemic event, $20.1 billion, would cover (i) losses on assets held by Prudential due to the crisis; and (ii) the present value of future earnings lost by Prudential due to the crisis. As demonstrated earlier, Prudential has high quality assets such as treasuries to offset its immediately callable liabilities. Hence, it is not obvious that Prudential will incur substantial losses from asset sales during a crisis. Prudential could simply sit tight and wait for the storm to pass.

Turning to the present value of future earnings lost, our procedure captures this intuition using write offs of goodwill balances and other acquired intangible assets. Arguably, all of the DAC is unlikely to be worthless as policy holders acquired by spending those resources will not all prematurely cancel their policies with Prudential if the stock market were to crash by 40%. Even if all policyholders sought to prematurely cash out their policies, they would incur fairly substantial surrender charges. Moreover, it is not clear that an institution should raise capital to offset all future lost earnings, as long as it is solvent enough to meet its current obligations. As a counter point, CRISK ignores the addition to capital stemming from earnings from the normal business of writing insurance policies during the six months or the year when the crisis might pay out. Further, the state regulatory authorities would force life insurers to raise capital only when the risk based capital (RBC) ratio falls below a certain threshold (e.g., below 100%).

There is potentially another perspective one can take to computing CRISK. One could argue that at a bare minimum, Prudential would need to hold capital that is enough to cover expected future defaults. The expected post-crisis default number for Prudential is $3.1 billion. Considering that Prudential's book value after the crisis is $4.2 billion, it has excess capital of $1.1 billion.

3.7 Comparison with book capital and RBC

Let's compare the $33 billion of capital required with what Prudential already has. The book value of Prudential's capital, without the AOCI (accumulated other comprehensive income) component, is about $31 billion.[4] On page 141 of its 2015 annual report, Prudential reports that its RBC capital ratio, as of December 31, 2015, was greater than 498%. It is not obvious how the sale of securities and the settlement of callable liabilities during the crisis would affect Prudential's RBC ratio. However, 498% appears high enough to tentatively conjecture that Prudential's RBC will not fall below 100% after the crisis.

4. Chubb

We turn next to the discussion of a large P&C insurer - Chubb. Chubb's balance sheet is reproduced in appendix A3. Chubb's asset base is $102 Billion as of December 31, 2015. The three major categories of assets are (i) investments of $66 billion, comprising primarily of fixed maturities available for sale of $43 billion; and (ii) reinsurance recoverable amounts of $11 billion; and (iii) $5.3 billion of insurance and reinsurance balances receivable; and $5.6 billion in goodwill from prior acquisitions. These assets collectively account for 86% (87.9/102) of Chubb's assets.

Turning to the liabilities side, the top five liabilities are (i) unpaid losses and loss expenses of $37.3 billion; (ii) $9.4 billion of long term debt; and (iii) $8.4 billion of unearned premiums; (iv) $6.2 billion of accounts payable; and (v) $4.8 billion of future policy benefits. These five liabilities, collectively,

[4] This assumption assumes that assets and liabilities are well matched in terms of duration. Otherwise the unrealized gains/losses in assets will not approximately offset the unrealized losses/gains in liabilities.

account for $66.1 billion or 90% of total liabilities (66.1/73 billion). The GAAP equity held by Chubb is $29.1 billion. P&C companies are required to estimate the potential claims and payouts, which in Chubb's case, amount to $37 billion. Theoretically, P&C companies are required to hold capital to ensure that they can meet their actuarially estimated losses for at least their biggest concentration of risk exposures. P&C Company's portfolios usually hold fairly short duration investments to be able to sell these to meet unpaid claims.

4.1 Callable liabilities

To assess Chubb's callable liabilities, we turn, as usual to its contractual obligations disclosure, reproduced in step 1 of Table 2. As can be seen, Chubb owes $12.6 B of liabilities in the short term. The largest liability of $9.3B represents gross loss payments under insurance and reinsurance contracts, although the note accompanying the disclosure claims that the actual dollar amount is uncertain. The other big liability is $1.4B for repurchase contracts.

4.2 High quality liquid assets to settle obligations

To raise $12.6B to settle its callable liabilities, we assume Chubb will pay off cash of $1.8B, followed by a liquidation of its treasuries at stated fair value of $2.5B. Chubb states on page F-12 that the short-term investments of $10.4B represent cash and cash equivalents. Hence, we assume that Chubb will realize the remaining balance of $8.3B from the sale of short term investments. That leaves a balance of $2.1B in short term investments. As shown in step 2 of Table 2, we have assumed that the sale of bonds leads to a small haircut of $0.1 billion based on the rating structure of these bonds.

4.3 Crisis related haircuts

As shown in step 3 of Table 2, based on a detailed analysis of the credit rating structure of Chubb's fixed income securities portfolio, disclosed on page 74 of Chubb's 2015 annual report, we calculate a haircut of $6.5 billion on a portfolio of $62 billion. A closer look at Chubb's balance sheet reveals that it holds

$497 million of equities as assets. Assuming a beta of one, a 40% decline in the market index would cause an unrealized loss of approximately $200 million.

The biggest asset, other than investments, is $11.4B of reinsurance receivables. The concern here, of course, is whether these receivables will be subject to a haircut. On page F-38 reproduced below, Chubb's financial statements provide details of their allowance for uncollectible reinsurance. Applying the crisis related haircuts in section 3.2 as a function of credit ratings, we calculate the hair cut to be $1.8 billion, as shown in detail in step 3 of Table 3. As detailed in step 3, the haircuts during the crisis amount to a total of $8.4 billion.

The following tables present a listing, at December 31, 2015, of the categories of Chubb's reinsurers.

December 31, 2015 (in millions of U.S. dollars, except for percentages)	Gross Reinsurance Recoverable on Loss and Loss Expenses	Provision for Uncollectible Reinsurance	% of Gross Reinsurance Recoverable
Categories			
Largest reinsurers	$ 5,335	$ 69	1.3%
Other reinsurers rated A- or better	3,078	44	1.4%
Other reinsurers with ratings lower than A- or not rated	378	68	18.0%
Pools	347	14	4.0%
Structured settlements	546	10	1.8%
Captives	1,786	23	1.3%
Other	244	100	41.0%
Total	$ 11,714	$ 328	2.8%

5.4 Post crisis haircuts

After reviewing the remaining assets and by intersecting their credit rating/recoverability with the default rate schedule provided by S&P, as discussed before in section 3.3, we estimate the crisis related haircuts to be $0.1 billion.

4.4 CRISK

Let's consider the modified balance sheet of Chubb after the systemic event. On balance sheet liabilities of $12.5 billion would leave the books. Assets equivalent to $12.5 billion would also leave the books. Hence, the revised assets number at Chubb would be $102.3-12.5B or $90 billion. SRISK assumes that 8% of these liabilities would represent a safe capital target. Note, however, that $37.3

billion is specifically earmarked by Chubb to pay off future losses. Not only does 8% of $37.3 billion (roughly $3 billion) represent redundant SRISK, arguably all of $37.3 billion represents loss absorption capacity for the P&C that SRISK would miss. Excluding that number from assets, Chubb would need to hold $4.2 billion of capital 8% of (90-37.3).

As detailed in step 4 of Table 3, the book value of Chubb's capital is about $29 billion. The crisis related haircuts amount to $8.1 billion. Eliminating AOCI removes $0.1 billion of equity. We write off three intangible assets that appear on Chubb's balance sheet: (i) goodwill of $5.7 billion; (ii) value of business acquired of $0.4 billion; and (iii) deferred policy acquisition costs of $2.9 billion. The write offs and haircuts would impair $17.2 billion of equity capital and leave us with $11.8 billion of GAAP capital. Expressed as a ratio of left over GAAP assets of $90 billion, the left-over capital ratio is 13.1% (11.8/90). Thus, Chubb has negative CRISK or surplus capital of 7.6 billion (4.2-11.8).

Why is Chubb's capital ratio so high? The P&C business is riskier than life insurance. Hence, P&C businesses hold more capital than life insurance businesses. Of course, as discussed earlier, the unpaid losses reserve of $37.3 billion, considered as a liability by SRISK, represents capital available to pay off obligations. Perhaps more important, clusters of floods or hurricanes, which represents systemic risk for a P&C firm, are rarely likely to coincide with a 40% decline in the stock market.

5.0 J.P. Morgan

Finally, we turn to the balance sheet of an investment bank, J.P. Morgan (JPM). The total assets of JPM are $2.352 trillion. The top five categories of assets include: (i) loans of $824 billion; (ii) trading assets of $344 billion; (iii) deposits with banks of $340 billion; (iv) $291 billion of securities; and (v) $213 billion of federal funds sold and securities purchased. These five categories account for $2 trillion of the total assets on the books (85%).

JPM's liabilities amount to $2.104 trillion. The top five categories of liabilities are: (i) $1.280 trillion in deposits; (ii) $289 billion of long term debt; (iii) $178 billion of accounts payable; (iv) $153 billion of

federal funds purchased and securities sold; and (v) $126 billion in trading liabilities. These collectively account for 96% of JPM's liabilities.

5.1 Callable liabilities

To assess JPM's callable liabilities, we consider the contractual obligations disclosure, reproduced below. As can be seen, JPM owes $1.56 trillion in the near term due to on and off balance sheet obligations. The largest number in these, by far, is $1.26 trillion of deposits.

JPM's contractual obligation disclosure

Contractual cash obligations

By remaining maturity at December 31, (in millions)	2015					2014
	2016	2017-2018	2019-2020	After 2020	**Total**	Total
On-balance sheet obligations						
Deposits[a]	**$ 1,262,865**	**$ 5,166**	**$ 3,553**	**$ 4,555**	**$ 1,276,139**	$ 1,361,597
Federal funds purchased and securities loaned or sold under repurchase agreements	**151,433**	**811**	**3**	**491**	**152,738**	192,128
Commercial paper	**15,562**	**–**	**–**	**–**	**15,562**	66,344
Other borrowed funds[a]	**11,331**	**–**	**–**	**–**	**11,331**	15,734
Beneficial interests issued by consolidated VIEs	**16,389**	**18,480**	**3,093**	**3,130**	**41,092**	50,200
Long-term debt[a]	**45,972**	**82,293**	**59,669**	**92,272**	**280,206**	262,888
Other[b]	**3,659**	**1,201**	**1,024**	**2,488**	**8,372**	8,355
Total on-balance sheet obligations	**1,507,211**	**107,951**	**67,342**	**102,936**	**1,785,440**	1,957,246
Off-balance sheet obligations						
Unsettled reverse repurchase and securities borrowing agreements[c]	**42,482**	**–**	**–**	**–**	**42,482**	40,993
Contractual interest payments[d]	**8,787**	**9,461**	**6,693**	**21,208**	**46,149**	48,038
Operating leases[e]	**1,668**	**3,094**	**2,388**	**4,679**	**11,829**	12,441
Equity investment commitments[f]	**387**	**–**	**75**	**459**	**921**	1,108
Contractual purchases and capital expenditures	**1,266**	**886**	**276**	**170**	**2,598**	2,832
Obligations under affinity and co-brand programs	**98**	**275**	**80**	**43**	**496**	2,303
Total off-balance sheet obligations	**54,688**	**13,716**	**9,512**	**26,559**	**104,475**	107,715
Total contractual cash obligations	**$ 1,561,899**	**$ 121,667**	**$ 76,854**	**$ 129,495**	**$ 1,889,915**	$ 2,064,961

(a) Excludes structured notes on which the Firm is not obligated to return a stated amount of principal at the maturity of the notes, but is obligated to return an amount based on the performance of the structured notes.
(b) Primarily includes dividends declared on preferred and common stock, deferred annuity contracts, pension and postretirement obligations and insurance liabilities.
(c) For further information, refer to unsettled reverse repurchase and securities borrowing agreements in Note 29.
(d) Includes accrued interest and future contractual interest obligations. Excludes interest related to structured notes for which the Firm's payment obligation is based on the performance of certain benchmarks.
(e) Includes noncancelable operating leases for premises and equipment used primarily for banking purposes and for energy-related tolling service agreements. Excludes the benefit of noncancelable sublease rentals of $1.9 billion and $2.2 billion at December 31, 2015 and 2014, respectively.
(f) At December 31, 2015 and 2014, included unfunded commitments of $50 million and $147 million, respectively, to third-party private equity funds, and $871 million and $961 million of unfunded commitments, respectively, to other equity investments.

One can perhaps assume that a large proportion of retail deposits less than $250,000 (the FDIC insurance limits) is not callable, should a systemic event occur. Note 19, reproduced below, provides details on those deposits. $112.6 billion of deposits are valued in excess of $250,000. We assume these are fully

callable. We have also assumed that 10% of the deposits under $250,000, amounting to $114 billion are also callable (10%*($1.26 T-$112.6B). Other than deposits, we assume that the rest of liabilities, amounting to $299 billion, are all callable ($1.561T - $1.263T). Hence, as shown in step 1 of Table 4, the total amount of callable deposits, should a systemic event occur, is $526 billion (112.6B + 114B+ 299B).

JPM's deposits disclosure

Note 19 – Deposits

At December 31, 2015 and 2014, noninterest-bearing and interest-bearing deposits were as follows.

December 31, (in millions)	2015	2014
U.S. offices		
Noninterest-bearing	**$ 392,721**	$ 437,558
Interest-bearing		
Demand[a]	**84,088**	90,319
Savings[b]	**486,043**	466,730
Time (included **$10,916** and $7,501 at fair value)[c]	**92,873**	86,301
Total interest-bearing deposits	**663,004**	643,350
Total deposits in U.S. offices	**1,055,725**	1,080,908
Non-U.S. offices		
Noninterest-bearing	**18,921**	19,078
Interest-bearing		
Demand	**154,773**	217,011
Savings	**2,157**	2,673
Time (included **$1,600** and $1,306 at fair value)[c]	**48,139**	43,757
Total interest-bearing deposits	**205,069**	263,441
Total deposits in non-U.S. offices	**223,990**	282,519
Total deposits	**$1,279,715**	$1,363,427

(a) Includes Negotiable Order of Withdrawal ("NOW") accounts, and certain trust accounts.
(b) Includes Money Market Deposit Accounts ("MMDAs").
(c) Includes structured notes classified as deposits for which the fair value option has been elected. For further discussion, see Note 4.

At December 31, 2015 and 2014, time deposits in denominations of $250,000 or more were as follows.

December 31, (in millions)	2015	2014
U.S. offices	$ 64,519	$ 56,983
Non-U.S. offices	48,091	43,719
Total	$112,610	$ 100,702

An important issue related to the repo liability in the contractual obligations disclosure is worth mentioning. The $151 billion of repo liability that JPM is responsible for is almost equivalent to the entire balance of $152.6 billion repo liability as per JPM's balance sheet. That repo liability is backed by collateral of securities owned by JPM. Hence, we do not attempt to find funding for these repo liabilities as they are collateralized. However, if the underlying collateral securities were to lose value given a systemic event, that loss in value will have to be charged to JPM's equity capital. On page 163 of its 2015 annual report, JPM states that these obligations are "secured by high quality collateral including government-issued debt and agency MBS."

Note 13, following accounting guidance effective 2015, discloses the nature of collateral underlying these obligations (reproduced below). The disclosure relates to $290 billion of collateral although only $153 billion appears on the balance sheet because the difference is netted to offset opposite claims with counterparties. The disclosure reveals that, of $290 billion, $15 billion is secured by treasuries and government agencies, $80 billion with non-U.S. government debt and $1.3 billion of municipal debt. We apply the repo haircuts discussed in section 3.2 for the month of June 2009. As shown in step 1 of Table 4, the repo related haircuts work out to $23.4 billion (290B-266.6B). These numbers may be overstated as our calculations ignore the role of netting. However, we could not find disclosures on which asset classes were netted off with counter parties.

Note 13 on collateral quality underlying repo liabilities of JPM

The following table presents as of December 31, 2015 and 2014, the gross and net securities sold under repurchase agreements and securities loaned. Securities sold under repurchase agreements have been presented on the Consolidated balance sheets net of securities purchased under resale agreements where the Firm has obtained an appropriate legal opinion with respect to the master netting agreement, and where the other relevant criteria have been met. Where such a legal opinion has not been either sought or obtained, the securities sold under repurchase agreements are not eligible for netting and are shown separately in the table below. Securities loaned are presented on a gross basis on the Consolidated balance sheets.

	2015			2014		
December 31, (in millions)	Gross liability balance	Amounts netted on the Consolidated balance sheets	Net liability balance	Gross liability balance	Amounts netted on the Consolidated balance sheets	Net liability balance
Securities sold under repurchase agreements						
Securities sold under repurchase agreements with an appropriate legal opinion	**$ 277,415**	**$ (156,258)**	**$ 121,157**	$ 290,529	$ (142,719)	$ 147,810
Securities sold under repurchase agreements where an appropriate legal opinion has not been either sought or obtained[a]	**12,629**		**12,629**	21,996		21,996
Total securities sold under repurchase agreements	**$ 290,044**	**$ (156,258)**	**$ 133,786** [c]	$ 312,525	$ (142,719)	$ 169,806 [c]
Securities loaned[b]	**$ 22,556**	**NA**	**$ 22,556** [d][e]	$ 25,927	NA	$ 25,927 [d]

(a) Includes repurchase agreements that are not subject to a master netting agreement but do provide rights to collateral.
(b) Included securities-for-securities lending transactions of $4.4 billion and $4.1 billion at December 31, 2015 and 2014, respectively, accounted for at fair value, where the Firm is acting as lender. These amounts are presented within other liabilities in the Consolidated balance sheets.
(c) At December 31, 2015 and 2014, included securities sold under repurchase agreements of $3.5 billion and $3.0 billion, respectively, accounted for at fair value.
(d) There were no securities loaned accounted for at fair value at December 31, 2015 and 2014, respectively.
(e) Included $45 million and $271 million at December 31, 2015 and 2014, respectively, of securities loaned where an appropriate legal opinion has not been either sought or obtained with respect to the master netting agreement.

	Gross liability balance	
December 31, 2015 (in millions)	Securities sold under repurchase agreements	Securities loaned
Mortgage-backed securities	**$ 12,790**	**$ –**
U.S. Treasury and government agencies	**154,377**	**5**
Obligations of U.S. states and municipalities	**1,316**	**–**
Non-U.S. government debt	**80,162**	**4,426**
Corporate debt securities	**21,286**	**78**
Asset-backed securities	**4,394**	**–**
Equity securities	**15,719**	**18,047**
Total	**$ 290,044**	**$ 22,556**

	Remaining contractual maturity of the agreements				
December 31, 2015 (in millions)	Overnight and continuous	Up to 30 days	30 - 90 days	Greater than 90 days	Total
Total securities sold under repurchase agreements	**$ 114,595**	**$ 100,082**	**$ 29,955**	**$ 45,412**	**$ 290,044**
Total securities loaned	**8,320**	**708**	**793**	**12,735**	**22,556**

5.2 Assets

To settle these liabilities of $375 billion, let's assume that JPM draws on its cash balance of $20 billion. This is followed by a liquidation of bank deposits of $340 billion. The remaining $15 billion will have to be met from a sale of U.S treasuries of $19 billion, which should involve a minimal haircut. Before

proceeding, it is worth asking whether a withdrawal of $340 billion at short notice is possible given the pressure on counterparties to fulfil these promises.

The other question worth pondering is the expected loss in the underlying securities owned by other counter parties against which these $212 billion of repos are held as assets by JPM. If a systemic event were to reduce the value of the collateral placed with JPM, the face value of the repo assets is unlikely to be realized. This, in turn, would result in a potential charge that JPM's equity will have to absorb. We could not find disclosures on the nature of the collateral backing these repo assets. We have assumed that the collateral structure underlying repo assets is similar to that underlying repo liabilities. As shown in step 1 of Table 4, assuming the same haircuts on underlying assets of repos, the expected haircut on repo assets is $ 17.2 billion ($212.6B -195.4B).

5.21 Other crisis related haircuts

5.21.1 Trading assets

Trading assets constitute $344 billion on JPM's balance sheet. Page 189 of JPM's 10-K, reproduced below, reports the exact composition of these trading assets. We apply the crisis related haircuts, discussed in section 3.2, and arrive, as shown in step 3 of Table 4, to a haircut of $77.8 billion. The three major contributors to such haircuts include a (i) $38 billion fall in the value of equity securities (40% of the holding of $94.9 billion); and (ii) a $17.9 billion write down in the value of MBS securities relative to the balance sheet number of $ 32.5 billion; and (iii) a $10.7 billion decline for derivative receivables held by JPM. The credit profile of derivative receivables is reproduced below for the reader's reference.

Assets and liabilities measured at fair value on a recurring basis

December 31, 2015 (in millions)	Fair value hierarchy Level 1	Level 2	Level 3	Derivative netting adjustments	Total fair value
Federal funds sold and securities purchased under resale agreements	$ –	$ 23,141	$ –	$ –	$ 23,141
Securities borrowed	–	395	–	–	395
Trading assets:					
Debt instruments:					
Mortgage-backed securities:					
U.S. government agencies[a]	6	31,815	715	–	32,536
Residential – nonagency	–	1,299	194	–	1,493
Commercial – nonagency	–	1,080	115	–	1,195
Total mortgage-backed securities	6	34,194	1,024	–	35,224
U.S. Treasury and government agencies[a]	12,036	6,985	–	–	19,021
Obligations of U.S. states and municipalities	–	6,986	651	–	7,637
Certificates of deposit, bankers' acceptances and commercial paper	–	1,042	–	–	1,042
Non-U.S. government debt securities	27,974	25,064	74	–	53,112
Corporate debt securities	–	22,807	736	–	23,543
Loans[b]	–	22,211	6,604	–	28,815
Asset-backed securities	–	2,392	1,832	–	4,224
Total debt instruments	40,016	121,681	10,921	–	172,618
Equity securities	94,059	606	265	–	94,930
Physical commodities[c]	3,593	1,064	–	–	4,657
Other	–	11,152	744	–	11,896
Total debt and equity instruments[d]	137,668	134,503	11,930	–	284,101
Derivative receivables:					
Interest rate	354	666,491	2,766	(643,248)	26,363
Credit	–	48,850	2,618	(50,045)	1,423
Foreign exchange	734	177,525	1,616	(162,698)	17,177
Equity	–	35,150	709	(30,330)	5,529
Commodity	108	24,720	237	(15,880)	9,185
Total derivative receivables[e]	1,196	952,736	7,946	(902,201)	59,677
Total trading assets	138,864	1,087,239	19,876	(902,201)	343,778

The following table summarizes the ratings profile by derivative counterparty of the Firm's derivative receivables, including credit derivatives, net of other liquid securities collateral, at the dates indicated. The ratings scale is based on the Firm's internal ratings, which generally correspond to the ratings as defined by S&P and Moody's.

Ratings profile of derivative receivables

Rating equivalent December 31, (in millions, except ratios)	2015 Exposure net of all collateral	2015 % of exposure net of all collateral	2014[a] Exposure net of all collateral	2014[a] % of exposure net of all collateral
AAA/Aaa to AA-/Aa3	**$ 10,371**	**24%**	$ 18,713	32%
A+/A1 to A-/A3	**10,595**	**25**	13,508	23
BBB+/Baa1 to BBB-/Baa3	**13,807**	**32**	18,594	31
BB+/Ba1 to B-/B3	**7,500**	**17**	7,735	13
CCC+/Caa1 and below	**824**	**2**	821	1
Total	**$ 43,097**	**100%**	$ 59,371	100%

(a) Prior period amounts have been revised to conform with current period presentation.

5.21.2 Loans

Let's begin with the largest asset on JPM's balance sheet, Loans. Gross loans account for $837 billion (net of allowance for loan losses is $824B) of JPM's assets. The Federal Reserve's (2016, 104) stress tests assume a loan loss rate of 6.1% for a severely adverse scenario. Applying that default rate leads to losses of $47.8 billion. After subtracting the allowance of $13 billion already provided for, the incremental charge to capital would be $34.8 billion.

5.21.3 Securities

The next category of assets constitute securities borrowed of $98.7B and securities held at $291 billion. Page 106 of JPM's 10-K notes that $287.8 billion of the securities portfolio is rated AA+. Applying the haircuts applicable to investment grade and non-investment grade bonds during the crisis, as discussed in section 3.2, leads to capital charge of $33.6 billion. We could not find clear disclosures on the quality of the $98.7B of securities borrowed. JPM claims that they do not expect any credit risk from these securities. Regardless, to be conservative, we applied the haircuts applicable to investment grade bonds under the prime category during the crisis, as discussed in section 3.2, leading to haircuts of $7.9 billion.

5.21.4 Other assets

There is not much information on the exact composition of accrued interest and accounts receivable, accounting for $46.6B of JPM's assets, and in other assets that account for $105.6B. We have assumed an ad-hoc 10% haircut, equivalent to $15.22B. Goodwill accounts for $47.3B, which we assume will be worthless should a systemic event happen and hence that is charged to equity capital right away. That leaves MSRs of $6.6B. Note 17, reproduced below, suggests that the adverse change changes in the input parameters (such as interest rate changes) of the MSR's fair value result in projected losses of around $0.5B. We have assumed $0.5B to be haircut attributable to MSRs.

The table below outlines the key economic assumptions used to determine the fair value of the Firm's MSRs at December 31, 2015 and 2014, and outlines the sensitivities of those fair values to immediate adverse changes in those assumptions, as defined below.

December 31, (in millions, except rates)	2015	2014
Weighted-average prepayment speed assumption ("CPR")	**9.81%**	9.80%
Impact on fair value of 10% adverse change	**$ (275)**	$ (337)
Impact on fair value of 20% adverse change	**(529)**	(652)
Weighted-average option adjusted spread	**9.02%**	9.43%
Impact on fair value of 100 basis points adverse change	**$ (258)**	$ (300)
Impact on fair value of 200 basis points adverse change	**(498)**	(578)

CPR: Constant prepayment rate.

In sum, putting these various pieces together, as shown in step 3 of Table 4, we estimate that JPM will take a write down of $244 billion should a systemic event occur.

5.3 Post crisis haircuts

As detailed in step 3 of Table 3, the post crisis defaults work out to $38.9 billion. The largest contributor to that number is $30.2 billion stemming from the application of the 5-year default rate of 16.25% related to speculative investments.

5.4 CRISK

After the systemic event, JPM's on balance sheet liabilities and assets of $375 billion would leave the books. Hence, the revised assets number at JPM would be $2.352T-0.375T or $1.977 trillion. $1.14T is the approximate magnitude of deposits less than $250,000, which are FDIC insured. SRISK assumes that 8% of these liabilities would represent a safe capital target. If we were to subtract the FDIC insured deposits from those liabilities, JPM would need to hold $67B of capital (8%*(1.977-1.14T). The book value of JPM's capital is about $247.6 billion. Haircuts of $244 billion during the crisis would leave us with $2.6 billion of GAAP capital. Expressed as a ratio of left over GAAP assets of $1.977 trillion, the capital ratio is 1.31% (2.6B/1.977T). Hence, the CRISK, based on financial statements, or the expected capital shortfall for JPM is $64.4 billion. In contrast, the SRISK NYU website expects JPM's SRISK or expected capital shortfall (without simulation), given a crisis to be $81.5 billion as of March 31, 2016. What might explain the mismatch?

To understand that, we try to reconstruct the SRISK measure for JPM. The loss absorption capacity would be 8% of ($1.977 T in liabilities and $217 billion, the market value of Prudential's equity as of 3/31/2016) or $176 billion.[5] If SRISK is $47.5 billion, NYU implicitly assumes market value of equity equivalent to $128.5 billion was left after the crisis. That is, a 40% decline in the market index is expected to wipe off $88.5 billion of market value of equity, implying a beta of roughly one. SRISK appears to overstate JPM's expected capital shortfall partly because it assumes that the FDIC insured deposits of $1.14T are immediately callable. That assumption alone would increase the expected capital shortfall of JPM by $91 billion (8%*$1.14T).

6.0 AIG

One way to validate CRISK is to apply the framework to AIG's books during and after the financial crisis. To account for AIG's eventual bailout in the build-up to the financial crisis, (i.e., end of 2007 and

[5] The closing stock price was $59.22 as of 3/31/2016 and the number of outstanding shares as per JPM's balance sheet in appendix C is 3.663 trillion shares.

four quarters of 2008), we need to review AIG's quarterly reports (i.e., 10-Qs) in addition to its annual financial statements.

We begin with an analysis of AIG's CRISK in 2015. To do so, we consider AIG's balance sheet as of December 31, 2015, reproduced in Appendix 4A. AIG's asset base is $470 billion. The major categories of assets include (i) bonds available for sale of $248 billion; (ii) $80 billion of separate account assets; (iii) $30 billion of mortgage and other loans receivable; and (iv) $30 billion of other invested assets. These four items collectively account for 82.5% (388/470) of AIG's total assets.

Turning to the liabilities side, as of December 31, 2015, AIG's total liabilities amount to $407 billion. The major categories include (i) $128 billion of policyholder contract deposits; (ii) $80 billion of separate account liabilities; (iii) $75 billion of liability for unpaid losses and loss adjustment expenses; (iv) $44 billion of future policy benefits for life and accident and health insurance contracts; and (v) $29 billion of long-term debt. These collectively account for 87% (356/407) of total liabilities. GAAP based equity held by AIG is $90 billion.

In contrast, AIG's asset base as of December 31, 2007 was bigger at $1.06 trillion (see Appendix 4B). The top four major categories of assets only accounted for 58% (611/1060) of AIG's assets. The top five liabilities as of December 31, 2007 collectively, account for $731 billion or 76% of total liabilities of $ 964 billion. GAAP equity held by AIG is $95.8 billion. We illustrate the CRISK calculation for AIG in 2015 but only report the summary CRISK values for other periods (2007 and the four quarters of 2008), details of which are available on request.

6.1 Callable liabilities

To evaluate AIG's callable liabilities as of December 31, 2015, we turn, as usual, to its contractual obligations disclosure, reproduced in step 1 of Table 4. As can be seen, AIG owes $37.8 billion in the next year. The largest liability of $19 billion pertains to loss reserves, which we assume are expected losses that

need to be paid for. $16 billion relates to insurance and investment contracts. Together with off-balance sheet obligations, the total callable liabilities amount to $41.3 billion.

Contractual Obligations

The following table summarizes contractual obligations in total, and by remaining maturity:

December 31, 2015		Payments due by Period			
(in millions)	Total Payments	2016	2017 - 2018	2019 - 2020	Thereafter
Insurance operations					
Loss reserves	$ 78,090	$ 19,035	$ 22,202	$ 12,243	$ 24,610
Insurance and investment contract liabilities	229,806	15,691	28,322	24,999	160,794
Borrowings	813	-	-	106	707
Interest payments on borrowings	1,141	54	109	109	869
Operating leases	986	253	350	197	186
Other long-term obligations	25	4	11	6	4
Total	$ 310,861	$ 35,037	$ 50,994	$ 37,660	$ 187,170
Other					
Borrowings	$ 23,548	$ 1,619	$ 3,208	$ 2,475	$ 16,246
Interest payments on borrowings	17,142	1,067	1,998	1,759	12,318
Operating leases	149	51	52	23	24
Other long-term obligations	107	-	-	-	107
Total	$ 40,946	$ 2,737	$ 5,258	$ 4,257	$ 28,695
Consolidated					
Loss reserves	$ 78,090	$ 19,035	$ 22,202	$ 12,243	$ 24,610
Insurance and investment contract liabilities	229,806	15,691	28,322	24,999	160,794
Borrowings	24,361	1,619	3,208	2,581	16,953
Interest payments on borrowings	18,283	1,121	2,107	1,868	13,187
Operating leases	1,135	304	402	219	210
Other long-term obligations[(a)]	132	4	11	6	111
Total[(b)]	$ 351,807	$ 37,774	$ 56,252	$ 41,916	$ 215,865

(a) Primarily includes contracts to purchase future services and other capital expenditures.

(b) Does not reflect unrecognized tax benefits of $4.3 billion, the timing of which is uncertain.

6.2 High quality liquid assets to settle obligations

To raise $41.3 billion to settle its callable liabilities, illustrated in step 1, we assume that AIG will pay off cash of $1.6 billion, followed by a liquidation of its treasuries at the stated fair value of $1.8 billion. That leaves a balance of $37.9 billion in callable liabilities which has to be covered by a sale of US state, municipal and foreign government bonds. As shown in step 2 of Table 4, we have assumed that the sale of US state and municipal bonds leads to a small haircut of $0.4 billion based on the rating structure of these bonds.

As shown in step 3 of Table 2, based on a detailed analysis of the credit rating structure of AIG's fixed income securities portfolio, disclosed in AIG's annual report, we are left with a total portfolio of $248.2 billion with no assumed haircuts. A closer look at AIG's balance sheet reveals that it holds $3.8 billon of

equities as assets. Assuming a beta of one, a 40% decline in the market index would cause an unrealized loss of approximately $1.5 billion.

6.3 Post crisis haircuts

After reviewing the remaining assets and intersecting their credit rating/recoverability with the default rate schedule provided by S&P, as discussed before in section 3.3 for Prudential, we estimate the crisis related haircuts to be $1.5 billion.

6.4 CRISK

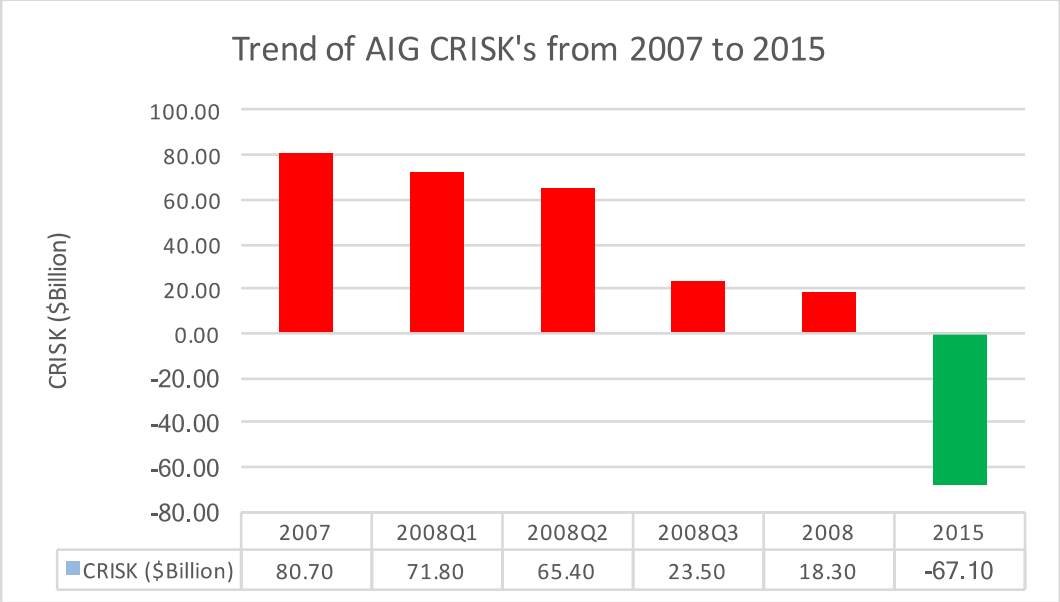
Let's consider the modified balance sheet of AIG after the systemic event. Liabilities of $41.3 billion would leave the books. Assets equivalent to $41.3 billion would also leave the books. Hence, the revised assets number at AIG would be $469.9-41.3B or $455.6 billion. SRISK assumes that 8% of these liabilities (=total revised assets) would represent a safe capital target. By that calculation, AIG would need to hold $36.5 billion of capital.

As detailed in step 4 of Table 4, the book value of AIG's capital is about $90.2 billion. The crisis related haircuts amount to $0.4 billion. Eliminating AOCI removes $2.5 billion of equity. We write off three intangible assets that appear on AIG's balance sheet: (i) goodwill of $1.6 billion; (ii) value of business acquired of $0.5 billion; and (iii) deferred policy acquisition costs of $11.1 billion. The write offs, haircuts, and expected post-crisis defaults would impair $20.5 billion of equity capital and leave us with $67.1 billion of GAAP capital. Expressed as a ratio of left over GAAP assets of $455.6 billion, the leftover capital ratio is 14.7% (67.1/455.6).

Now, we consider AIG's CRISK over the course of the 2008 financial crisis (see table and chart below). A few interesting observations emerge. First, AIG's CRISK monotonically improves since the beginning of the crisis. CRISK changes from $80.7 billion shortfall in 2007 to $67.1 billion surplus in 2015. Second, the point when CRISK shortfall drops significantly coincides with the government bailout of AIG in September (2008 Q3). The change is likely a result of the rapid unloading of distressed and

available for sale assets and a capital injection from the $182 billion bailout. These trends give us some assurance that CRISK is a plausible measure of capital shortfalls should a systemic event such as a 40% decline in the overall stock market occur.

Year	2007	2008				2015
Quarter	FY	Q1	Q2	Q3	FY	FY
CRISK (Billion)	80.70	71.80	65.40	23.50	18.30	-67.10



7.0 Conclusions

In this paper, we propose a financial statement based modification to the popular SRISK measure of systemic risk of a financial institution proposed by Brownlees and Engle (2017) and Acharya et al. (2012). SRISK considers a systemic event, operationalized as a 40% decline in the stock market index. It goes on to evaluate the loss in the institution's market value of equity on account of that decline via the institution's beta. The measure then computes 8% of the sum of the book value of the institutions' liabilities and the reduced market value of equity ("quasi assets") as the prudent level of capital an institution should held. The difference between such prudent level of capital and the market value of fallen equity capital is SRISK.

We operationalize the same intuition using financial statements. In particular, we evaluate every on-balance sheet and off-balance liability on the institution's balance sheet that is potentially callable should the stock market decline by 40%. We then assess whether the institution has high-quality liquid assets that can be sold in a crisis to pay off its callable liabilities. Any projected loss on the sale of such assets and any goodwill balance and that of other intangible assets on the institution's balance sheet are charged against the book value of the institutions' equity capital. We assign haircuts on the left-over assets to account for losses and future defaults once the crisis passes and compare such haircuts with the institution's left over book value of equity capital to compute the financial statement version of SRISK (CRISK).

What does this approach buy us? Apart from forcing us to explicitly consider off-balance sheet liabilities, a detailed look at balance sheets compels the analyst to acknowledge that not all on-balance sheet liabilities are callable should a crisis occur (e.g., FDIC insured deposits). Moreover, certain on-balance sheet liabilities that appear very large (e.g., separate accounts liability for a life insurer) are actually offset by the holding of separate account assets on the assets side. In sum, a detailed analysis of financial statements pushes the analyst to incorporate idiosyncrasies of the firm's business model than a broad-based market based measure such as SRISK will perhaps necessarily miss.

We recommend marrying the strengths of both approaches. SRISK, with its real-time availability and ease of access, is a great way to generate a short list of potentially systemic financial institutions. Once such a short list has been generated, detailed financial statement analysis of the kind we advocate here would enable a nuanced and a finer measure of capital shortfalls that may arise in a crisis.

REFERENCES:

Acharya, V., R. Engle R., and M. Richardson. 2012. Capital shortfall: a new approach to ranking and regulating systemic risks. *American Economic Review*: 102:59–64.

Acharya, V., R. Engle R., and D. Pierre. 2014. Testing macroprudential stress tests: The risk of regulatory risk weights. *Journal of Monetary Economics*: 65:36–53.

Brownlees, C. and R. Engle. 2017. SRISK: A Conditional Capital Shortfall Measure of Systemic Risk. *Review of Financial Studies*: 30(1): 48-79.

Board of Governors of the Federal Reserve. 2016. Dodd-Frank Act Stress Test 2016: Supervisory Stress Test Methodology and Results.

Ryan, S. 2007. Financial Instruments and Institutions: Accounting and Disclosure Rules. John Wiley and Sons.

APPENDIX 1: PRUDENTIAL'S 2015 BALANCE SHEET

PRUDENTIAL FINANCIAL, INC.

Consolidated Statements of Financial Position
December 31, 2015 and 2014 (in millions, except share amounts)

	2015	2014
ASSETS		
Fixed maturities, available-for-sale, at fair value (amortized cost: 2015 – $265,416; 2014 – $265,116)(1)	$ 290,323	$ 299,090
Fixed maturities, held-to-maturity, at amortized cost (fair value: 2015 – $2,624; 2014 – $2,902)(1)	2,308	2,575
Trading account assets supporting insurance liabilities, at fair value(1)	20,522	20,263
Other trading account assets, at fair value(1)	14,458	10,874
Equity securities, available-for-sale, at fair value (cost: 2015 – $6,847; 2014 – $6,921)	9,274	9,861
Commercial mortgage and other loans (includes $274 and $380 measured at fair value under the fair value option at December 31, 2015 and December 31, 2014, respectively)(1)	50,559	46,432
Policy loans	11,657	11,712
Other long-term investments (includes $1,322 and $1,082 measured at fair value under the fair value option at December 31, 2015 and December 31, 2014, respectively)(1)	9,986	10,921
Short-term investments	8,105	8,258
Total investments	417,192	419,986
Cash and cash equivalents(1)	17,612	14,918
Accrued investment income(1)	3,110	3,130
Deferred policy acquisition costs	16,718	15,971
Value of business acquired	2,828	2,836
Other assets(1)	14,358	13,379
Separate account assets	285,570	296,435
TOTAL ASSETS	$ 757,388	$ 766,655
LIABILITIES AND EQUITY		
LIABILITIES		
Future policy benefits	$ 224,384	$ 217,766
Policyholders' account balances(1)	136,784	136,150
Policyholders' dividends	5,578	7,661
Securities sold under agreements to repurchase	7,882	9,407
Cash collateral for loaned securities	3,496	4,241
Income taxes	8,714	9,881
Short-term debt	1,216	3,839
Long-term debt	19,727	19,831
Other liabilities(1)	13,517	13,037
Notes issued by consolidated variable interest entities (includes $8,597 and $6,033 measured at fair value under the fair value option at December 31, 2015 and December 31, 2014, respectively)(1)	8,597	6,058
Separate account liabilities	285,570	296,435
Total liabilities	715,465	724,306
COMMITMENTS AND CONTINGENT LIABILITIES (See Note 23)		
EQUITY		
Preferred Stock ($.01 par value; 10,000,000 shares authorized; none issued)	0	0
Common Stock ($.01 par value; 1,500,000,000 shares authorized; 660,111,339 shares issued at both December 31, 2015 and December 31, 2014)	6	6
Class B Stock ($.01 par value; 0 shares authorized and issued at December 31, 2015; 10,000,000 shares authorized and 2,000,000 shares issued at December 31, 2014)	0	0
Additional paid-in capital	24,482	24,565
Common Stock held in treasury, at cost (213,009,970 and 205,277,862 shares at December 31, 2015 and December 31, 2014, respectively)	(13,814)	(13,088)
Class B Stock held in treasury, at cost (0 and 2,000,000 shares at December 31, 2015 and December 31, 2014, respectively)	0	(651)
Accumulated other comprehensive income (loss)	12,285	16,050
Retained earnings	18,931	14,888
Total Prudential Financial, Inc. equity	41,890	41,770
Noncontrolling interests	33	579
Total equity	41,923	42,349
TOTAL LIABILITIES AND EQUITY	$ 757,388	$ 766,655

APPENDIX 2: CHUBB's 2015 BALANCE SHEET

CONSOLIDATED BALANCE SHEETS

Chubb Limited and Subsidiaries

(in millions of U.S. dollars, except share and per share data)	December 31 2015	December 31 2014
Assets		
Investments		
Fixed maturities available for sale, at fair value (amortized cost – $43,149 and $47,826) (includes hybrid financial instruments of $31 and $274)	**$ 43,587**	$ 49,395
Fixed maturities held to maturity, at amortized cost (fair value – $8,552 and $7,589)	**8,430**	7,331
Equity securities, at fair value (cost – $441 and $440)	**497**	510
Short-term investments, at fair value and amortized cost	**10,446**	2,322
Other investments (cost – $2,993 and $2,999)	**3,291**	3,346
Total investments	**66,251**	62,904
Cash	**1,775**	655
Securities lending collateral	**1,046**	1,330
Accrued investment income	**513**	552
Insurance and reinsurance balances receivable	**5,323**	5,426
Reinsurance recoverable on losses and loss expenses	**11,386**	11,992
Reinsurance recoverable on policy benefits	**187**	217
Deferred policy acquisition costs	**2,873**	2,601
Value of business acquired	**395**	466
Goodwill and other intangible assets	**5,683**	5,724
Prepaid reinsurance premiums	**2,082**	2,026
Deferred tax assets	**318**	295
Investments in partially-owned insurance companies	**653**	504
Other assets	**3,881**	3,556
Total assets	**$ 102,366**	$ 98,248
Liabilities		
Unpaid losses and loss expenses	**$ 37,303**	$ 38,315
Unearned premiums	**8,439**	8,222
Future policy benefits	**4,807**	4,754
Insurance and reinsurance balances payable	**4,270**	4,095
Securities lending payable	**1,047**	1,331
Accounts payable, accrued expenses, and other liabilities	**6,205**	5,726
Repurchase agreements	**1,404**	1,402
Short-term debt	**—**	1,150
Long-term debt	**9,447**	3,357
Trust preferred securities	**309**	309
Total liabilities	**73,231**	68,661
Commitments and contingencies		
Shareholders' equity		
Common Shares (CHF 24.15 and CHF 24.77 par value; 342,832,412 shares issued; 324,563,441 and 328,659,686 shares outstanding)	**7,833**	8,055
Common Shares in treasury (18,268,971 and 14,172,726 shares)	**(1,922)**	(1,448)
Additional paid-in capital	**4,481**	5,145
Retained earnings	**19,478**	16,644
Accumulated other comprehensive income (AOCI)	**(735)**	1,191
Total shareholders' equity	**29,135**	29,587
Total liabilities and shareholders' equity	**$ 102,366**	$ 98,248

See accompanying notes to the consolidated financial statements

APPENDIX 3: JP MORGAN CHASE'S 2015 BALANCE SHEET

Consolidated balance sheets

December 31, (in millions, except share data)	2015	2014
Assets		
Cash and due from banks	$ **20,490**	$ 27,831
Deposits with banks	**340,015**	484,477
Federal funds sold and securities purchased under resale agreements (included **$23,141** and $28,585 at fair value)	**212,575**	215,803
Securities borrowed (included **$395** and $992 at fair value)	**98,721**	110,435
Trading assets (included assets pledged of **$115,284** and $125,034)	**343,839**	398,988
Securities (included **$241,754** and $298,752 at fair value and assets pledged of **$14,883** and $24,912)	**290,827**	348,004
Loans (included **$2,861** and $2,611 at fair value)	**837,299**	757,336
Allowance for loan losses	**(13,555)**	(14,185)
Loans, net of allowance for loan losses	**823,744**	743,151
Accrued interest and accounts receivable	**46,605**	70,079
Premises and equipment	**14,362**	15,133
Goodwill	**47,325**	47,647
Mortgage servicing rights	**6,608**	7,436
Other intangible assets	**1,015**	1,192
Other assets (included **$7,604** and $11,909 at fair value and assets pledged of **$1,286** and $1,399)	**105,572**	102,098
Total assets[(a)]	$ **2,351,698**	$ 2,572,274
Liabilities		
Deposits (included **$12,516** and $8,807 at fair value)	$ **1,279,715**	$ 1,363,427
Federal funds purchased and securities loaned or sold under repurchase agreements (included **$3,526** and $2,979 at fair value)	**152,678**	192,101
Commercial paper	**15,562**	66,344
Other borrowed funds (included **$9,911** and $14,739 at fair value)	**21,105**	30,222
Trading liabilities	**126,897**	152,815
Accounts payable and other liabilities (included **$4,401** and $4,155 at fair value)	**177,638**	206,939
Beneficial interests issued by consolidated variable interest entities (included **$787** and $2,162 at fair value)	**41,879**	52,320
Long-term debt (included **$33,065** and $30,226 at fair value)	**288,651**	276,379
Total liabilities[(a)]	**2,104,125**	2,340,547
Commitments and contingencies (see Notes 29, 30 and 31)		
Stockholders' equity		
Preferred stock ($1 par value; authorized 200,000,000 shares: issued **2,606,750** and 2,006,250 shares)	**26,068**	20,063
Common stock ($1 par value; authorized 9,000,000,000 shares; issued **4,104,933,895** shares)	**4,105**	4,105
Additional paid-in capital	**92,500**	93,270
Retained earnings	**146,420**	129,977
Accumulated other comprehensive income	**192**	2,189
Shares held in restricted stock units ("RSU") trust, at cost (**472,953** shares)	**(21)**	(21)
Treasury stock, at cost (**441,459,392** and 390,144,630 shares)	**(21,691)**	(17,856)
Total stockholders' equity	**247,573**	231,727
Total liabilities and stockholders' equity	$ **2,351,698**	$ 2,572,274

(a) The following table presents information on assets and liabilities related to VIEs that are consolidated by the Firm at December 31, 2015 and 2014. The difference between total VIE assets and liabilities represents the Firm's interests in those entities, which were eliminated in consolidation.

December 31, (in millions)	2015	2014
Assets		
Trading assets	$ 3,736	$ 9,090
Loans	75,104	68,880
All other assets	2,765	1,815
Total assets	$ 81,605	$ 79,785
Liabilities		
Beneficial interests issued by consolidated variable interest entities	$ 41,879	$ 52,320
All other liabilities	809	949
Total liabilities	$ 42,688	$ 53,269

The assets of the consolidated VIEs are used to settle the liabilities of those entities. The holders of the beneficial interests do not have recourse to the general credit of JPMorgan Chase. At both December 31, 2015 and 2014, the Firm provided limited program-wide credit enhancement of $2.0 billion, related to its Firm-administered multi-seller conduits, which are eliminated in consolidation. For further discussion, see Note 16.

APPENDIX 4A. AIG'S 2015 BALANCE SHEET

AMERICAN INTERNATIONAL GROUP, INC.
CONSOLIDATED BALANCE SHEETS

(in millions, except for share data)	December 31, 2015	December 31, 2014
Assets:		
Investments:		
Fixed maturity securities:		
Bonds available for sale, at fair value (amortized cost: 2015 - $240,968; 2014 - $243,307)	$ 248,245	$ 259,859
Other bond securities, at fair value (See Note 5)	16,782	19,712
Equity Securities:		
Common and preferred stock available for sale, at fair value (cost: 2015 - $1,379; 2014 - $1,930)	2,915	4,395
Other common and preferred stock, at fair value (See Note 5)	921	1,049
Mortgage and other loans receivable, net of allowance (portion measured at fair value: 2015 - $11; 2014 - $6)	29,565	24,990
Other invested assets (portion measured at fair value: 2015 - $8,912; 2014 - $9,394)	29,794	34,518
Short-term investments (portion measured at fair value: 2015 - $2,591; 2014 - $1,684)	10,132	11,243
Total investments	338,354	355,766
Cash	1,629	1,758
Accrued investment income	2,623	2,712
Premiums and other receivables, net of allowance	11,451	12,031
Reinsurance assets, net of allowance	20,413	21,959
Deferred income taxes	20,394	19,339
Deferred policy acquisition costs	11,115	9,827
Other assets, including restricted cash of $170 in 2015 and $2,025 in 2014	11,390	12,153
Separate account assets, at fair value	79,574	80,036
Total assets	$ 496,943	$ 515,581
Liabilities:		
Liability for unpaid losses and loss adjustment expenses	$ 74,942	$ 77,260
Unearned premiums	21,318	21,324
Future policy benefits for life and accident and health insurance contracts	43,585	42,749
Policyholder contract deposits (portion measured at fair value: 2015 - $2,325; 2014 - $1,561)	127,588	124,613
Other policyholder funds (portion measured at fair value: 2015 - $6; 2014 - $8)	4,212	4,669
Other liabilities (portion measured at fair value: 2015 - $62; 2014 - $350)	26,164	26,441
Long-term debt (portion measured at fair value: 2015 - $3,670; 2014 - $5,466)	29,350	31,217
Separate account liabilities	79,574	80,036
Total liabilities	406,733	408,309
Contingencies, commitments and guarantees (see Note 15)		
AIG shareholders' equity:		
Common stock, $2.50 par value; 5,000,000,000 shares authorized; shares issued: 2015 - 1,906,671,492 and 2014 - 1,906,671,492	4,766	4,766
Treasury stock, at cost; 2015 - 712,754,875; 2014 - 530,744,521 shares of common stock	(30,098)	(19,218)
Additional paid-in capital	81,510	80,958
Retained earnings	30,943	29,775
Accumulated other comprehensive income	2,537	10,617
Total AIG shareholders' equity	89,658	106,898
Non-redeemable noncontrolling interests	552	374
Total equity	90,210	107,272
Total liabilities and equity	$ 496,943	$ 515,581

APPENDIX 4B. AIG'S 2007 BALANCE SHEET

American International Group, Inc. and Subsidiaries

Consolidated Balance Sheet

December 31, *(in millions)*	2007	2006
Assets:		
Investments and financial services assets:		
Fixed maturities:		
Bonds available for sale, at fair value (amortized cost: 2007 — $393,170; 2006 — $377,163)	$ 397,372	$386,869
Bonds held to maturity, at amortized cost (fair value: 2007 — $22,157; 2006 — $22,154)	21,581	21,437
Bond trading securities, at fair value (includes hybrid financial instruments: 2007 — $555; 2006 — $522)	9,982	10,836
Equity securities:		
Common stocks available for sale, at fair value (cost: 2007 — $12,588; 2006 — $10,662)	17,900	13,256
Common and preferred stocks trading, at fair value	21,376	14,855
Preferred stocks available for sale, at fair value (cost: 2007 — $2,600; 2006 — $2,485)	2,370	2,539
Mortgage and other loans receivable, net of allowance (2007 — $77; 2006 — $64) (includes loans held for sale: 2007 — $399)	33,727	28,418
Financial services assets:		
Flight equipment primarily under operating leases, net of accumulated depreciation (2007 — $10,499; 2006 — $8,835)	41,984	39,875
Securities available for sale, at fair value (cost: 2007 — $40,157; 2006 — $45,912)	40,305	47,205
Trading securities, at fair value	4,197	5,031
Spot commodities	238	220
Unrealized gain on swaps, options and forward transactions	16,442	19,252
Trade receivables	6,467	4,317
Securities purchased under agreements to resell, at contract value	20,950	30,291
Finance receivables, net of allowance (2007 — $878; 2006 — $737) (includes finance receivables held for sale: 2007 — $233; 2006 — $1,124)	31,234	29,573
Securities lending invested collateral, at fair value (cost: 2007 — $80,641; 2006 — $69,306)	75,662	69,306
Other invested assets	58,823	42,111
Short-term investments, at cost (approximates fair value)	51,351	27,483
Total investments and financial services assets	851,961	792,874
Cash	2,284	1,590
Investment income due and accrued	6,587	6,091
Premiums and insurance balances receivable, net of allowance (2007 — $662; 2006 — $756)	18,395	17,789
Reinsurance assets, net of allowance (2007 — $520; 2006 — $536)	23,103	23,355
Deferred policy acquisition costs	43,150	37,235
Investments in partially owned companies	654	1,101
Real estate and other fixed assets, net of accumulated depreciation (2007 — $5,446; 2006 — $4,940)	5,518	4,381
Separate and variable accounts	78,684	70,277
Goodwill	9,414	8,628
Other assets	20,755	16,089
Total assets	$1,060,505	$979,410

Liabilities:		
Reserve for losses and loss expenses	$ 85,500	$ 79,999
Unearned premiums	28,022	26,271
Future policy benefits for life and accident and health insurance contracts	136,068	121,004
Policyholders' contract deposits	258,459	248,264
Other policyholders' funds	12,599	10,986
Commissions, expenses and taxes payable	6,310	5,305
Insurance balances payable	4,878	3,789
Funds held by companies under reinsurance treaties	2,501	2,602
Income taxes payable	3,823	9,546
Financial services liabilities:		
Securities sold under agreements to repurchase, at contract value	8,331	19,677
Trade payables	10,568	6,174
Securities and spot commodities sold but not yet purchased, at fair value	4,709	4,076
Unrealized loss on swaps, options and forward transactions	20,613	11,401
Trust deposits and deposits due to banks and other depositors	4,903	5,249
Commercial paper and extendible commercial notes	13,114	13,363
Long-term borrowings	162,935	135,316
Separate and variable accounts	78,684	70,277
Securities lending payable	81,965	70,198
Minority interest	10,422	7,778
Other liabilities (includes hybrid financial instruments at fair value: 2007 — $47; 2006 — $111)	30,200	26,267
Total liabilities	964,604	877,542
Preferred shareholders' equity in subsidiary companies	100	191
Commitments, Contingencies and Guarantees (See Note 12)		
Shareholders' equity:		
Common stock, $2.50 par value; 5,000,000,000 shares authorized; shares issued 2007 and 2006 — 2,751,327,476	6,878	6,878
Additional paid-in capital	2,848	2,590
Payments advanced to purchase shares	(912)	—
Retained earnings	89,029	84,996
Accumulated other comprehensive income (loss)	4,643	9,110
Treasury stock, at cost; 2007 — 221,743,421; 2006 — 150,131,273 shares of common stock (including 119,293,487 and 119,278,644 shares, respectively, held by subsidiaries)	(6,685)	(1,897)
Total shareholders' equity	95,801	101,677
Total liabilities, preferred shareholders' equity in subsidiary companies and shareholders' equity	$1,060,505	$ 979,410

TABLE 1: COMPUTING CRISK FOR PRUDENTIAL FOR YEAR ENDED 2015

Panel A: Compiling contractual obligations

STEP 1	
Adjustments	**Value**
Callable Liabilities	
Other liabilities	11.4
Short term and Long term	2.2
Investment Commitments	3.0
Operating leases	0.1
Commercial mortgage	1.6
Insurance liabilities	41.6
Total Callable liabilities	**59.9**

Panel B: Finding high quality liquid assets to settle contractual obligations

STEP 2			
Assets	**Value**	**After haircuts**	**Check for covering calls**
Cash and Cash equivalents	16.6	16.6	FALSE
US Treasury	18.5	18.4	FALSE
US State and Municipal bonds	8.8	8.7	FALSE
Foreign Government bonds	83.7	82.4	TRUE
		126.1	
Haircuts during crisis		0.5	

TABLE 1: COMPUTING CRISK FOR PRUDENTIAL FOR YEAR ENDED 2015 (cont'd)

Panel C: Computing haircuts post crisis on remaining assets

STEP 3				
Adjustments	**Value**	**Closed block value**	**During crisis haircuts/defaults**	**Post-crisis default**
Assets				
Total Assets	757.4	61.5		
Cash and cash equivalents	17.6	1.0		-
Separate account assets	285.6			-
Fixed maturities, available-for-sale	290.3			
NAIC - 1	198.7			1.1
NAIC - 2	45.9			0.2
NAIC - 3	7.2			0.8
NAIC - 4	2.4			0.3
NAIC - 5	0.5			0.1
NAIC - 6	0.4			0.0
Other (belongs to closed block)	35.3	35.3		
Total	290.3			2.3
Fixed maturities, held-to-maturity	2.3			0.1
Trading account assets supporting insurance liabilities	20.5			
Short term investments	0.8			
Corporate securities	12.9			
CMBS	1.9			

STEP 3				
Adjustments	**Value**	**Closed block value**	**During crisis haircuts/defaults**	**Post-crisis default**
RMBS	1.4			
ABS	1.3			
Foreign Government bonds	0.7			
US government obligations	0.4			
Equity securities	1.3		0.5	-
Total	19.3		2.6	0.1
Other trading account assets, at fair value	14.5	0.3		0.0
Equity securities	9.2	2.7	2.6	-
Commercial Mortgage	50.6	9.8	0.1	0.2
Policy loans	11.7	4.8		0.0
Other long-term investments	10.0	2.9		0.1
Short-term investments	8.1	1.5		0.0
Accrued investment income	3.1	0.5		0.0
Deferred policy acquisition costs	16.7			0.1
Value of business acquired	2.8			0.0
Other assets	14.4	0.5		0.1
Remaining Assets and Haircuts corresponding	756.1	59.3	5.9	3.1

TABLE 1: COMPUTING CRISK FOR PRUDENTIAL FOR YEAR ENDED 2015 (cont'd)

Panel D: CRISK computation

STEP 4		
Equity		
BV of Equity	41.9	
(-AOCI)	(12.3)	
	29.6	
(-Goodwill/VOBA/DAC write off)	(19.5)	
(-Haircuts during crisis)	(0.5)	
(-Default on Commercial Mortgage)	(0.1)	
(-Defaults and haircuts on Trading assets)	(2.6)	
(-Equity drop)	(2.6)	(5.8)
	4.2	
SRISK AS OF March 31, 2016 as per NYU	**47.5**	
CRISK using 8% of post crisis assets (see text)	**10.7**	
CRISK using future expected default	**(1.2)**	

TABLE 2: COMPUTING CRISK FOR CHUBB FOR YEAR ENDED 2015

STEP 1	
Adjustments	**Value**
Callable Liabilities	
short term contractual liabilities	12.6
Total Callable liabilities	**12.6**

STEP 2			
Assets	**Value**	**After haircuts**	**Check for covering calls**
Cash	1.8	1.8	FALSE
US Treasury	2.4	2.4	FALSE
US Agency bonds	0.9	0.8	FALSE
US municipal bonds	5.0	4.9	FALSE
Non-US government bonds	14.2	14.0	TRUE
		23.9	
Haircuts during crisis		0.1	

TABLE 2: COMPUTING CRISK FOR CHUBB FOR YEAR ENDED 2015 (cont'd)

STEP 3			
Adjustments	**Value**	**During crisis haircuts/defaults**	**Post crisis Defaults**
Assets			
Total Assets	102.4		
Cash	1.8		-
Separate account assets	1.6		-
Fixed maturities, available for sale	43.6		
Fixed maturities, held-to-maturity	8.4		
Short-term investments, at fair value and amortized cost	10.4		-
AAA	14.4		
AA	22.1	2.0	0.0
A	10.2	1.5	0.0
BBB	8.9	1.3	0.1
BB	3.8	0.9	0.1
B	3.0	0.8	0.4
Other	0.2	0.0	0.0
Total (Fixed maturities + ST investment)	62.6	6.6	0.6
Equity securities, at fair value	0.5	0.2	
Other investments	3.3		0.0
Securities lending collateral	1.0		
cash	0.4	-	
US treasury and agency	0.1	0.0	0.0
Foreign	0.3	0.0	0.0
Corporate securities	0.0	0.0	0.0

TABLE 2: COMPUTING CRISK FOR CHUBB FOR YEAR ENDED 2015 (cont'd)

STEP 3			
Adjustments	**Value**	**During crisis haircuts/defaults**	**Post crisis Defaults**
Equity securities	0.3	0.1	
Total	1.0	0.1	0.0
Accrued investment income	0.5		0.0
Insurance and reinsurance balances receivable	5.3		0.0
Reinsurance recoverable on losses and loss expenses	11.4		
Largest reinsurers	5.3	0.6	0.0
Other reinsurers rated A- or better	3.0	0.4	0.0
Other reinsurers with ratings lower than A- or not rated	0.3	0.1	0.0
Pools	0.3	0.1	0.0
Structured settlements	0.5	0.1	0.1
Captives	1.8	0.4	0.2
Other	0.1	0.0	0.0
Total	11.4	1.8	0.4
Reinsurance recoverable on policy benefits	0.2		0.0
Deferred policy acquisition costs	2.9		0.0
Value of business acquired	0.4		0.0
Goodwill and other intangible assets	5.7		-
Prepaid reinsurance premiums	2.1		0.0
Deferred tax assets	0.3		0.0
Investments in partially-owned insurance companies	0.7		0.0
Other assets	2.3		0.0
Remaining Assets and Haircuts corresponding		8.5	1.1

TABLE 2: COMPUTING CRISK FOR CHUBB FOR YEAR ENDED 2015 (cont'd)

STEP 4	
Equity	
BV of Equity	29.1
(-AOCI)	0.7
	29.9
(-Goodwill/VOBA and DAC)	(9.0)
(-Haircuts during crisis)	(0.1)
(-Haircuts on fixed maturities)	(6.6)
(-Haircuts on securities lending collateral)	(0.1)
(-Haircuts on reinsurance receivables)	(1.8)
(-Equity drop)	(0.2)
	12.1
SRISK AS OF March 31, 2016 as per NYU	**Not reported**
CRISK using 8% of post crisis assets	**-7.6**
CRISK using future expected default	**(11)**

TABLE 3: COMPUTING CRISK FOR J.P.MORGAN FOR YEAR ENDED 2015

STEP 1	
Adjustments	**Value**
Callable Liabilities	
On balance-sheet obligations - deposits	227.6
Other contractual liabilities	147.6
Total Callable liabilities	375.2

STEP 2			
Assets	**Value**	**After haircuts**	**Check for covering calls**
Cash due from banks	20.5	20.5	FALSE
Deposits with banks	340.0	340.0	FALSE
Trading assets	343.8		
US government agency MBS	32.5	14.6	TRUE
US treasuries	19.0	18.9	TRUE
Obligations of US states and municipalities	7.6	7.6	TRUE
Non US government securities	53.1	52.3	TRUE
Nonagency residensial mortgage	1.5	1.4	TRUE
Nonagency commercial mortgage	1.2	1.1	TRUE
Asset backed securities	4.2	3.7	TRUE
Corporate debt	23.5	20.0	TRUE
Loans	28.8	26.5	TRUE
Equity holdings	94.9		
Derivatives	59.7		
Others	17.7		
Total	343.8	702.0	
Total	744.7	702.0	
Haircuts during crisis	1.0		

TABLE 3: COMPUTING CRISK FOR J.P.MORGAN FOR YEAR ENDED 2015 (cont'd)

STEP 3			
Adjustments	**Values**	**During crisis - Haircuts/Defaults**	**Post-crisis default**
Assets			
Total Assets	2,351.7		
Cash and due from banks	20.5		-
Deposit with banks	340.0		-
Securities borrowed	98.7	7.9	0.1
Trading assets	343.8		
US government agency MBS	32.5	17.9	0.0
US treasuries	19.0	0.1	0.0
Obligations of US states and municipalities	7.6	0.1	0.0
Non US government securities	53.1	0.8	0.1
Nonagency residensial mortgage	1.5	0.1	0.0
Nonagency commercial mortgage	1.2	0.1	0.0
Asset backed securities	4.2	0.5	0.0
Corporate debt	23.5	3.5	0.0
Loans	28.8	2.3	0.0
Equity holdings	94.9	38.0	-
Derivatives	59.7		
AAA to AA-	10.4	1.2	0.0
A+ to A-	10.6	1.2	0.0
BBB+ to BBB-	13.8	2.1	0.0
BB+ to B-	7.5	1.9	0.2
CCC+ and below	0.8	0.2	0.2
Others	16.6	4.1	0.5

TABLE 3: COMPUTING CRISK FOR J.P.MORGAN FOR YEAR ENDED 2015 (cont'd)

STEP 3

Adjustments	Values	During crisis - Haircuts/Defaults	Post-crisis default
Others	17.7	3.5	0.0
Total	343.8	77.8	1.1
Securities	290.8		
AA+	287.8	33.6	0.2
Others	3.1	0.6	0.1
Total	290.8	34.2	0.3
Loans	837.3		
Loans with credit exposure	783.1		
Investment grade	585.1	35.7	5.8
Non-investment grade	198.0	12.1	30.2
Others	54.2		0.6
Allowance for loan losses	(13.6)		
Total loans (net)	823.7	34.2	36.6
Accrued interest and accounts receivable	46.6	0.4	0.3
Premises and equipment	14.4		-
Goodwill	47.3	47.3	-
Mortgage servicing rights	6.6	0.5	0.0
All other intangible assets	1.0	1.0	-
Other assets	105.6	10.6	0.5
Remaining Assets and Haircuts corresponding	2,139.1	213.8	38.9

TABLE 3: COMPUTING CRISK FOR J.P.MORGAN FOR YEAR ENDED 2015 (cont'd)

STEP 4	
Equity	
BV of Equity	247.6
(-AOCI)	(0.2)
	247.4
(-Goodwill and intangible assets)	(48.3)
(-Haircuts during crisis)	(1.0)
(-Haircuts to repo assets)	(17.1)
(-Haircuts to loans)	(34.2)
(-Haircuts to securities borrowed)	(7.9)
(-Haircuts to securities)	(34.2)
(-Haircuts to trading assets)	(77.8)
(-Haircuts to repos liabilities)	(23.4)
(-Haircuts to accrued interest and accounts receivable)	(0.4)
(-Haircuts to MSR)	(0.5)
	2.6
SRISK AS OF March 31, 2016 as per NYU	**81.5**
CRISK using 8% of post crisis assets	**64.4**
CRISK using future expected default	**36.3**

TABLE 4: COMPUTING CRISK FOR AIG FOR YEAR ENDED 2015

STEP 1	
Adjustments	**Value**
Callable Liabilities	
Loss Reserves	19.0
Insurance and investment contract liabilities	15.7
Borrowings and interest on them	2.7
Operating leases and other long term liabilities	0.3
Guarantees	0.6
Commitments	2.9
Total Callable liabilities	**41.3**

STEP 2			
Adjustments	**Value**	**After haircuts**	**Check for covering calls**
Assets			
Cash and Cash equivalents	1.6	1.6	FALSE
US Treasury	1.8	1.8	FALSE
US State and Municipal bonds	27.3	27.1	FALSE
Foreign Government bonds	18.2	17.9	TRUE
		48.5	
Haircuts during crisis		0.4	

TABLE 4: COMPUTING CRISK FOR AIG FOR YEAR ENDED 2015 (cont'd)

STEP 3			
Adjustments	**Value**	**During crisis haircuts/defaults**	**Post-crisis default**
Assets			
Total Assets	496.9		
Cash and cash equivalents	1.6		-
Separate account assets	79.6		-
Fixed maturities, available-for-sale	248.3		
AAA	38.7		0.1
AA	40.3		0.0
A	58.2		0.2
BBB	76.2		0.6
Below Investment grade	33.9		3.9
Not rated	0.9		0.1
Total	248.2		4.7
Other bond securities	16.8		
AAA	5.0		0.0
AA	0.9		0.0
A	2.2		0.0
BBB	0.7		0.0
Below Investment grade	7.9		0.9
Not rated	0.1		0.0
Equity securities	3.8	1.5	
Mortgage and other loans	29.5		0.2
Other investments	29.8		0.2
Short-term investments	10.1		0.0
Premiums and other recoverables	11.5		0.1
Deferred Income Taxes	20.4		0.1
Accrued investment income	2.6		0.0
Deferred policy acquisition costs	11.1		
Value of business acquired	0.5		
Goodwill	1.6		
Reinsurance recoverables	20.4		0.1
Other assets	11.4		0.1
Remaining Assets and Haircuts corresponding	497.2	1.5	5.5

TABLE 4: COMPUTING CRISK FOR AIG FOR YEAR ENDED 2015 (cont'd)

STEP 4		
Adjustments	**Value**	**After haircuts**
Equity		
BV of Equity	90.2	
(-AOCI)	(2.5)	
	87.7	
(-Goodwill, DAC, VOBA)	(13.2)	
(-Haircuts during crisis)	(0.4)	
(-Default on Commercial Mortgage)	-	
(-Defaults and haircuts on Trading assets)		
(-Equity drop)	(1.5)	(1.9)
	72.6	
CRISK	**(67.1)**	