From Crisis to Reform:

A Summary of the Recent Financial Crisis, the Use of Stress Tests to Promote Financial Stability, and Implications for Reporting and Corporate Governance

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by
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Table of Contents

Abstract ............................................................................................................................... 5
Executive Summary ............................................................................................................. 6
The Financial Meltdown of 2008 .................................................................................... 7
Risk-Taking and the Subprime Mortgage Market ............................................................ 7
  First Signs of Trouble .................................................................................................... 8
  Federal Government Response ..................................................................................... 8
The Meltdown ................................................................................................................... 8
  The Financial Headlines, September 2008 ................................................................. 9
  Loss of Trust .................................................................................................................. 9
Too-Big-to-Fail Policy and Moral Hazard ....................................................................... 11
Who is to Blame? ............................................................................................................. 11
Federal Government’s Response .................................................................................... 12
Troubled Asset Relief Program ....................................................................................... 12
Stress Testing and Financial Stability ............................................................................ 13
Purposes for Testing ........................................................................................................ 14
  Internal and External Monitoring ............................................................................... 14
  Capital Adequacy ......................................................................................................... 15
Levels of Testing ............................................................................................................. 17
  Internal Tests ............................................................................................................... 17
  External Tests .............................................................................................................. 17
Stress Test Methodology ............................................................................................... 17
Planning the Test ............................................................................................................. 17
  Macro-tests .................................................................................................................. 18
  Micro-tests ................................................................................................................... 19
Factors and Variables Tested ......................................................................................... 19
  Market Risk ................................................................................................................. 20
  Interest Rate Risk ...................................................................................................... 20
Abstract

When I developed the original outline for this project in September 2009, my focus was specifically set on stress testing procedures and how they were implemented through the Supervisory Capital Assessment Program (SCAP) in March 2009 for large American banks. As this project grew in scope, I added context by explaining key aspects of the financial crisis in 2008 to provide insight into the problems that created the need for review in the financial industry. I intended to focus my efforts in the spring of 2010 on significant financial reforms that had sprung from the financial crisis or the findings of the stress tests. However, given the real-time nature of this project, I found that no sweeping financial regulation had occurred by the time I was set to finish this project. Thus, the final section regarding transparency and corporate governance, while not directly related to the results of the SCAP, is my attempt to address one change thus far required by the SEC, as a result of the financial crisis in 2008.
Executive Summary

Introduction and Part I, Financial Crisis

This project has taken shape as I have written it, especially since many of the ramifications of the financial crisis of 2008 are ongoing. This paper begins with a brief summary of the events leading up to the financial crisis and some of the major structural changes to the banking industry that immediately followed.

Part II, Stress Testing

The body of this paper examines various aspects of stress testing for banks and financial institutions as a method of risk management and review, both internal and external. I discuss the process of stress testing, key variables tested at banks, and the methods by which these variables are tested. I then explore the Supervisory Capital Assessment Program (SCAP), the stress test template used for the 19 largest American bank holding companies (BHCs) in March 2009. The purpose of the SCAP was to determine the scope of losses due to the financial crisis, and to forecast a required capital buffer for each bank to survive through 2010, even if the economy continued to deteriorate. I then discuss the results and implications of the SCAP.

Part III, Transparency and Corporate Governance

The final section of this paper discusses new disclosures required by the SEC for financial institutions and public companies. These disclosures aim to provide users of financial statements with information regarding corporate risk-taking, especially as it relates to compensation incentives, and the structure of corporate risk oversight in the Board of Directors. These new disclosure requirements are in effect starting in 2010, and will provide investors and analysts with better information regarding excessive risk-taking or potential conflicts of interest as they relate to risk-based compensation.

Conclusion

The first sections of this paper discuss the financial crisis and subsequent stress testing of financial institutions as both a measure of, and a way to promote, financial stability. When I began this project in September 2009, I thought that there would be sweeping financial reform to discuss by the time I finished this paper. However, the end results (thus far) of the last two years have been limited, and include the new SEC disclosure requirements that I discuss in Part III. Thus, it seems that the major focus of reform thus far has been on risk-based compensation policies and inadequate risk oversight by corporate leadership, two factors that contributed significantly to the financial crisis. I look forward to seeing how additional reforms and structural changes unfold over the next few years as the fear of the financial crisis subsides.

A variety of summaries exist to explain the financial meltdown of 2008, while just as many critiques exist of the federal government’s response to the crisis. While this paper begins with a brief summary of the crisis in 2008, the intent is not to provide an in-depth explanation of the details and causes of the financial crisis. The topics covered are intended to provide background of the events that lead the Treasury to subject the 19 largest American banks to stress tests in early 2009, and to provide context for forward-looking financial reform in the United States. See Appendix - Exhibit 1 for a listing of the 19 banks tested.

Risk-Taking and the Subprime Mortgage Market

The roots of the recent financial crisis lie in the rapid growth of the subprime mortgage market and the zealous pursuit of risky lending and investing by financial leaders with little regard for future consequences. Subprime mortgages became increasingly available to Americans whose credit status prevented them from qualifying for traditional “conforming” mortgages. Conforming mortgages meet certain standards for purchase by the Federal National Mortgage Association (Fannie Mae) or the Federal Home Loan Mortgage Corporation (Freddie Mac). Conforming mortgages have traditionally been considered safe investments with historically low rates of default. During the expansion of the subprime mortgage market, Americans who previously could not obtain a mortgage were suddenly able to enter into mortgages on homes that they could not afford. Subprime mortgages were granted at higher interest rates than conforming mortgages, and were often given for nearly 100% of the value of the home. This rapid expansion created a financial bubble, in which houses were selling at prices significantly higher than their underlying intrinsic value, which regulatory bodies did little to control. Many parties continued to lend and invest in the housing market because they believed that housing prices would continue to rise. When housing prices began to decline, however, the value of many of these mortgages came to exceed the value of the underlying properties. Subprime borrowers were unable to pay off the mortgage in the case of foreclosure.

As risky mortgage lending expanded, financial experts traded new financial derivatives known as mortgage-backed securities (MBS), in which a portfolio of mortgages was packaged, securitized, and sold to investors. Mortgage-backed securities were typically rated by credit rating agencies as secure investments, and investors worldwide added them to their portfolios because of their excellent returns. By purchasing these securities, investors provided additional funding for new mortgages, and the market continued to expand. Eventually, however, housing prices began to decline, default rates increased, and lenders, investors, banks, and institutions began to accumulate significant losses from mortgage-backed securities. Many properties went “underwater,” with the value of the mortgage exceeding the value of the underlying
property, and the mortgagees were no longer able to pay off the mortgage at foreclosure. Thus, mortgage lenders began to experience significant losses which were subsequently passed on to investors holding mortgage-backed securities that quickly lost value. Investors began to flood the market with mortgage-backed securities, which contributed to the rapid collapse of the market.

First Signs of Trouble

In early October 2006, representatives from the Office of the Comptroller of the Currency, the Federal Reserve, the Federal Deposit Insurance Corporation, and the National Credit Union Administration convened to issue the Interagency Guidance on Non-Traditional Mortgage Products. This statement recognized the rapid growth of the subprime mortgage market and the creation of complex derivatives based on these mortgages. The intent of the Guidance was to address the possibility of increased default risk in the mortgage markets due to the growing popularity of these mortgages and related financial securities. However, the Guidance proved insufficient to suppress concerns and speculation regarding the escalating risks in the subprime mortgage market. In June 2007, the agencies published The Statement on Subprime Mortgage Lending to specifically address the risks associated with adjustable rate mortgages (ARMs) in the subprime market. Regardless of efforts to spread awareness of the riskiness of these mortgages and securities, however, the agencies failed to prevent large losses due to the rising rate of mortgage default in 2007. By the end of 2007, 28 of the largest financial institutions dealing in the subprime mortgage market had already written down $132.6 billion in losses related to U.S. mortgages.

Federal Government Response

In the spring of 2008, Treasury Secretary Henry Paulson and President George W. Bush were aware of signs of trouble in the mortgage market and the potential implications for the financial sector. They warned against over-regulation, and with the support of Federal Chairman Ben Bernanke, they cited the “moral hazard” that arises with excessive government intervention to discourage market discipline. According to the Fordham Journal of Corporate and Financial Law, the primary concern was that a federal bailout of financial lenders would encourage further speculation in the subprime mortgage market. Instead, the Board of Governors of the Federal Reserve reacted by cutting short-term borrowing costs to increase liquidity in financial markets. Congress and the Federal Reserve proposed and enacted additional changes to existing legislation to protect borrowers from unfair or predatory lending practices with the intent to prevent further losses in the mortgage market.

The Meltdown

While the losses and complications of the financial meltdown are ongoing, there is also hopeful belief that future financial regulation will create a sustainable balance
between the extreme risk taking that created the financial crisis and the degree of government interference of the last few years. In the *Harvard Business Review*, Niall Ferguson summarizes seven major events that, “in the space of just 19 days, signaled the end of an epoch.” These events will be addressed briefly, as they relate to this paper.

*The Financial Headlines, September 2008*

On September 7, 2008, the nationalization of Fannie Mae and Freddie Mac through the process of conservatorship signaled the long-foreseen collapse of the mortgage market as a result of risky mortgages and devalued real estate. On September 14, 2008, Bank of America announced its intention to purchase Merrill Lynch, a move supported and arguably forced by the federal government to swallow some of Merrill’s substantial losses. On September 15, 2008, Lehman Brothers Holdings went bankrupt, and the financial market reacted as “seven years on, 9/15/2008 supplanted 9/11/2001 as the costliest day in Wall Street’s history.” The following day, the net asset value of a money market fund, Reserve Primary, dropped below $1 per share, and the Federal Reserve agreed to give AIG $85 billion to cover losses from credit-default swaps. The Federal Reserve claimed an 80% stake in AIG’s equity, effectively nationalizing the insurance giant. On September 22, 2008, Goldman Sachs and Morgan Stanley converted from investment banks into bank holding companies which gave them access to the Federal Reserve’s discount window and the Troubled Asset Relief Program (TARP). By that point, Wall Street’s five major investment banks, Bear Stearns, Morgan Stanley, Goldman Sachs, Lehman Brothers, and Merrill Lynch had either gone bankrupt, been converted into a commercial bank, or acquired by a commercial bank. On September 25, Washington Mutual Bank was seized by the Office of Thrift Supervision and placed under the control of the Federal Deposit Insurance Corporation (FDIC) in what was the biggest bank failure in American history. Thus, the losses that started in the subprime mortgage crisis escalated into system-wide financial crisis by the end of 2008.

*Loss of Trust*

Bruce Yandle argues in *The Independent Review* that the ultimate cause of the meltdown in 2008 was a loss of trust in key players and regulators within the American financial system. He states, “beyond the power struggles, huge losses and increased regulation, there is a more fundamental threat to the industry: the destruction of trust.” Following the events listed above, investors and individuals lost trust in American financial institutions. In response to financial distrust, banks began hoarding cash and tightening credit and London interbank lending ceased to occur. Banks and financial institutions continued to write down asset impairments and credit losses. Several important assurance mechanisms designed to promote investor confidence failed to achieve their goals. These assurance mechanisms include: independent credit rating agencies (CRAs), international accounting standards, and credit-default swaps (CDSs). These assurance mechanisms serve several purposes. Credit ratings from globally recognized credit rating agencies such as Moody’s, Fitch, and Standard & Poor’s, serve
to create trust and comparability in competitive capital markets. Certified financial statements based on globally recognized accounting standards create consistency and comparability across markets and boost confidence in financial markets. Credit-default swaps serve as a form of insurance and contribute to the atmosphere of trust and security within the financial markets. Investors relied heavily on credit-default swaps as the market for mortgage-backed securities and complex derivatives grew to a dangerous size prior to the meltdown. Each of these assurance mechanisms will be addressed briefly, as they contributed to the financial meltdown.

Credit Rating Agencies

It is possible that credit rating agencies failed to fully report the true credit status of banks and financial institutions, which may have contributed to the subprime mortgage crisis. While the markets for mortgage-backed securities grew, credit agencies were unable to interpret and report the true risk behind the complex derivatives they were rating. Credit rating agencies are paid to rate the debt instruments by the very companies they are rating, which may have contributed to their inability to apply ratings objectively. Since investors worldwide depend on these ratings, any failure by these agencies to appropriately rate creditworthiness could create significant losses to investors unaware of the riskiness of their investments. Biased credit ratings can also affect the amount of capital required to be held by a financial institution. Banks or financial institutions with lower-rated debt securities are required to hold more capital than those with highly-rated debt securities. Thus, financial institutions were potentially undercapitalized due to inappropriate credit ratings on their securities.

International Accounting Standards

Amid the financial crisis and its aftermath, the convergence toward unified international accounting standards has created a number of additional issues. Specifically, SFAS 115 Accounting for Certain Investments in Debt and Equity Securities, requires most financial assets to be marked-to-market, depending on the presence of observable markets for determining fair value. Requiring financial securities to be marked-to-market was a step by the FASB toward harmonization with international accounting standards. Not only does marking-to-market affect the daily values of the securities, but it changes the daily capital requirements for banks, according to SFAS 157 Fair Value Measurements, as addressed later in this paper. Despite the complexity associated with fair value measurements, an SEC report from late December 2008 upheld the use of fair value measurements against a bank lobby to discontinue the practice. Financial institutions had argued that fair value accounting had forced them to write off losses due to dried up markets on assets that still had value. However, the SEC report did not conclude whether fair value accounting definitively contributed to the financial meltdown. While the SEC made no conclusions, Bruce Yandle’s article suggests that fair value accounting, along with credit ratings, “might have reduced a bank’s access to credit, which led to reduced ratings and a rush to sell mortgage-backed securities to
obtain cash". These institutions rushed to sell their devalued securities, which flooded the markets and caused additional losses to parties that held similar securities.

Credit-Default Swaps

The popularity of credit-default swaps grew out of doubts surrounding credit ratings, fair value accounting, and the large mortgage-backed securities market. Credit-default swaps are, in essence, an insurance contract sold by an investor to another to cover the default risk of the firm specified in the contract. Credit-default swaps were typically offered to cover the risk of mortgage-backed securities on the books of large financial institutions. As with any type of insurance, credit-default swaps worked well when the underwriter could predict the default risks that would occur. However, when mortgage defaults began to spiral out of control, credit-default swaps created another layer of complexity within the financial system, resulting in major losses at companies such as AIG, a major underwriter of credit-default swaps.

Too-Big-to-Fail Policy and Moral Hazard

Leading up to the financial meltdown, there was a common perception in the financial markets that the federal government would intervene in the case of a large scale bank failure. Many bank managers believed that the government would step in, if necessary, to bailout institutions of “systematic importance” to the American economy. This belief is known as the Too-Big-to-Fail Policy (TBTF), a policy that proved to be founded in truth based on the actions of the government toward major banks and financial institutions in 2008 and 2009. In the years before 2008, this widespread belief is thought to have encouraged banks to continue growing and spreading into increasingly risky and complex lines of business, a condition known as a moral hazard. Banks and financial institutions began to deal increasingly in complex derivatives markets, and securitized many forms of debt into such instruments as mortgage-backed securities. Huberto M. Ennis and H.S. Malek warned in the Federal Reserve Bank of Richmond Economic Quarterly in early 2005 that “in principle, the cost of the TBTF distortions could be large…it seems necessary, if not urgent, to improve our knowledge of the actual magnitude of the TBTF problem in the U.S. economy.” Thus, while many politicians and citizens are currently lobbying for the break-up of large banks that have become TBTF, awareness of their risk had been growing in the years prior to 2008.

Who is to Blame?

“Ultimately, the subprime mortgage crisis was a failure of responsibility at every level: borrowers, lenders, investment banks, appraisers, rating agencies, [auditors,] investors, and undoubtedly, the regulators.” Allowing greed to take precedence, investors, lenders, regulators, and financial institutions shirked responsibility and failed to properly evaluate risks. Credit rating agencies did not foresee the possibility of decline in housing prices, which led them to underestimate the risks of mortgage-backed
securities. Investors, dependent on the ratings published by the agencies, flocked to purchase these high-yielding mortgage-backed securities, without understanding the risky nature of the mortgages underlying the securities. Banks and financial institutions were also heavily invested in the mortgage market, with significant portions of their portfolios lying in such risky securities\textsuperscript{25}. Finally, auditors failed to comprehend the nature of the risk profile of their financial clients, or the impact that the financial crisis would have on their clients’ financials.

**Federal Government's Response**

The Federal Reserve has certain powers to regulate mortgage lending, but for many years chose not to intervene in the expanding market. It was not until default rates started to rise that the Federal Reserve began to issue regulations regarding some of the more risky practices of mortgage lending.

**Troubled Asset Relief Program**

On October 3, 2008, President George W. Bush signed the *Emergency Economic Stabilization Act* which authorized the Treasury, through the new Office of Financial Stability, to buy up to $700 billion worth of troubled assets in an effort to stabilize the financial sector\textsuperscript{26}. This program, known commonly as the Troubled Asset Relief Program (TARP) allowed the Treasury to purchase troubled assets relating to residential and commercial mortgages from financial institutions established and regulated by the laws of the United States or any individual state with significant operations within the United States\textsuperscript{27}. However, the plan to purchase troubled assets resulted mainly in the government purchasing equity in many financial institutions. Treasury Secretary Henry Paulson reported to the CEOs of the nine largest American banks that large equity stakes had been purchased in the banking sector to restore confidence in the markets and encourage banks to lend. The government hoped to reopen channels of lending by recapitalizing banks.

While the government was aware that large problems existed within the banking industry, including undercapitalization and significant writeoffs, they needed a way to measure the extent of the problems and the financial mechanisms that created them. To gain insight into these problems, the Treasury prescribed stress tests for the 19 largest American bank holding companies through the Supervisory Capital Assessment Program (SCAP). The SCAP was designed to analyze the risk of the banks and the extent to which they were vulnerable to additional adverse economic shocks to the financial system. As explained in a joint statement by Treasury Secretary Timothy Geithner, Chairman of the Federal Reserve Ben Bernanke, Chairman of the FDIC Sheila Bair, and the Comptroller of the Currency John Dugan, the SCAP was part of the government’s commitment to support the banking system during the period of financial uncertainty\textsuperscript{28}. The body of this paper will explain the purpose of stress tests, common stress test
procedures, and provide an overview of the Supervisory Capital Assessment Program (SCAP). The paper will conclude with an overview of recent updates to financial regulation and new disclosure requirements related to risk-based compensation and the role that the Board of Directors plays in risk oversight.

**Part II: Stress Testing and Financial Stability**

Stress tests consist of a series of techniques and procedures used by financial institutions and regulatory bodies to gauge the soundness of a financial system. Stress tests can be utilized as a risk management procedure within a bank, or as a tool for supervisory authorities to analyze the risk profile of large banks that influence the stability of the financial system. Procedures are designed to expose vulnerabilities within an institution or an economy by measuring the potential impact of adverse economic shocks. Amid the uncertainty of the current recession, stress tests have become an increasingly popular way to measure financial stability and determine capital adequacy.

Financial stability is a state in which there is adequate “assurance that the efficiency of intermediation between the suppliers and demanders of funds will not be significantly affected by adverse shocks.” In an economy where the role of certain regulators is to ensure a stable financial market to protect the interests of stakeholders, stress testing has proven to be a useful method for supervisory review. Financial stability is important for the efficient distribution of resources, but also for the confidence it inspires among participants. Confidence is necessary to maintain financial stability, and thus, financial stability can be viewed as an end in itself as well as a means to achieve such an end.

The financial stability of an economy depends on the operation of banks at the center of the payments system. Banks are vital to the financial system because they provide a common marketplace for investors and savers to efficiently distribute funds. Without the fluid movement of funds from lenders to users, the overall economy cannot function efficiently. It is imperative for supervisory authorities to ensure that banks and financial institutions adequately identify and mitigate risks to prevent interruptions to the financial system. Supervisory authorities must “ensure that banks observe the rules, standards, and codes of prudence that provide them with appropriate levels in the key variables underpinning and, ultimately, determining their financial condition,” as measured by profitability and solvency.

The use of stress tests in this process will allow banks and regulators to better comprehend the ramifications of adverse economic shocks. Stress tests can be viewed as a way to look at common banking risks and to measure their implications. The results of stress tests should improve the internal controls exercised by banks as part of their risk management procedures. Stress test results should suggest practical preventative procedures that can be used to shield against adverse shocks and to establish early
warning systems for significant risks. Currently, the methods and models of stress testing vary, and there is no one uniform method that is considered superior. Internationally, methodologies vary among institutions and regulators depending on what elements are designated as the biggest determinants of financial stability. Differences exist because of structural variations in financial systems across countries, and these differences complicate international stress test comparisons. Consequently, a need exists for a principle-based approach to provide guidelines for a standard method of stress testing, the results of which could be easily compared across international borders.

One such principle-based test is the Swiss Solvency Test (SST), which considers scenarios for market risk, credit risk, and underwriting risk. According to Martin Eling, Nadine Gatzert, and Hato Schmeiser in “The Swiss Solvency Test and its Market Implications,” a principle-based approach is more flexible than a strict test template. It considers the idiosyncrasies of each bank’s risk profile rather than applying a system-wide methodology. Reliance on principles rather than steadfast rules could potentially reduce systematic behavior that would in turn, reduce market risk. However, a principle-based approach may also entail additional costs and complexity in implementation at the supervisory level. Regardless, a principle-based approach for stress testing would allow for additional flexibility in considering the characteristics of individual institutions, with the end result being more comprehensive and comparable among different institutions.

**Purposes for Testing**

Stress tests for banks and financial institutions have historically been utilized to assess the risk and capital adequacy of an institution. In the aftermath of the financial meltdown of 2008, stress testing has assumed a new role in the critical evaluation of financial stability as mandated by regulatory authorities. Antonio Marcelo, Adolfo Rodriguez, and Carlos Trucharte in the *Journal of Banking Regulation* suggest, “the development and progressive implementation [of stress tests] as a prudential technique complementing traditional supervisory practices [is] making them increasingly valuable to supervisory authorities in monitoring and protecting the stability of the financial environment.” They argue that regular stress testing can provide critical insight into the potential impact of economic shocks or severe volatility in variables that significantly affect the financial economy. Thus, if used effectively, stress tests can be a standard procedure for assessing financial stability for the entire economy.

**Internal and External Monitoring**

Stress tests can be utilized internally by bank management as a method of continual evaluation and externally by regulatory bodies in their supervisory review of the financial system. Stress tests are forward-looking assessments based on specified
micro and macroeconomic scenarios that are regularly integrated into traditional risk management practices at banks and financial institutions. This type of assessment provides insight into how the institution will fare under a range of economic conditions, and where improvements can be made to compensate for notable vulnerabilities. The use of stress tests based on predetermined scenarios is a useful risk management procedure. However, the results must be viewed within the context of the scenarios tested, which may or may not occur. One must question the accuracy and relevancy of historical regressions and macroeconomic modeling when markedly volatile or stressful economic conditions arise. Apart from this consideration, stress testing can serve as a valuable risk management technique that allows executives and regulators to better comprehend risks, both firm-specific and industry-wide, that exist under certain scenarios. Stress test procedures utilize a methodical, regimented template for measuring capital buffers that may be required for certain institutions to remain solvent under suggested macroeconomic scenarios.

Capital Adequacy

Stress tests are also useful for supervisory authorities to determine appropriate levels of capital for banks. Bank capital serves as a buffer against potential future losses and write-downs. Minimum capital requirements were established in Basel I in 1988, and included a required amount of capital of at least eight percent of the bank’s risk-weighted assets. Basel II, effective March 2008, replaced the standards set forth in Basel I to improve banking regulation and reduce the probability of large-scale bank failures. The Basel II standards seek to accomplish several specific goals. These goals include: (1) ensuring that capital allocation is risk-sensitive, (2) separating operational risk from credit risk, and (3) aligning economic and regulatory capital more closely.

According to “Give Basel II a Chance” from the International Financial Law Review,

“Basel II set up rigorous risk and capital management requirements designed to ensure a bank holds capital reserves appropriate to the risk it exposes itself to through its lending and investment practices. The greater risk a bank has, the greater the amount of capital it needs to hold to safeguard its solvency and overall stability.”

Since the implementation of Basel II, many banks have been working to improve their Tier I capital ratio, which they use to measure their financial condition and capital adequacy. Tier I capital consists of equity capital and disclosed reserves. Based on the standards set by Basel II, banks that hold riskier assets should hold more capital than those with less risky portfolios. However, this standard has not necessarily simplified the process of determining capital adequacy. Some banks that hold more capital than required may appear to be well-capitalized when they are actually undercapitalized based
on their risk-weighted assets and the fair value of their portfolios. Thus, the standards set forth in Basel II may require continual revision to fix certain shortcomings.

Marsha Wallace discusses a countercyclical system of capital requirements in *Corporate Finance Review*. She states that financial regulators are continuously looking for countercyclical approaches to setting capital requirements for financial institutions, which would allow them to set aside more capital when the economy is booming. Essentially, banks would build capital stores when risk is increasing and release them when risk is decreasing. Those in favor of such a system argue that it would work in tandem with fair value accounting to prevent future pricing bubbles. The goal of capital requirements is to prevent a meltdown of the financial system and to prevent the collapse of major financial institutions within the system. Establishing proper capital standards requires understanding of default risk patterns. Major factors that drive default patterns include the beta of the bank’s assets, the bank’s leverage ratio, and the bank’s maturity gap. The bank’s asset beta is a measure of the sensitivity of the bank’s assets to movements in the financial market as a whole. The leverage ratio is a measure of the extent to which the bank uses debt as a portion of its overall capital structure. The bank’s maturity gap is a measure of the interest rate risk of its assets and liabilities. An effective system of capital requirements should consider each of these factors. It should also compare the market value of a bank’s assets to the fair value of its liabilities to ensure that additional capital is raised whenever the risk of its assets exceeds that of its liabilities.

**Fair Value Accounting and Regulatory Capital**

Regulatory capital requirements for American banks have traditionally been based on book values of assets and liabilities. With the implementation of *SFAS 157 Fair Value Measurements*, however, banks and regulators must now determine capital requirements based on the fair market value of a bank’s assets and liabilities. This has significant implications for banks, especially in an uncertain financial system when the values of their assets and liabilities may fluctuate daily. Many banks may find themselves undercapitalized at the end of the day, even though adjustments were made to their capital levels earlier in the day. Thus, banks that have traditionally been able to maintain their required level of capital may find doing so progressively more difficult.

In “Potential Effects of Fair Value Accounting on US Bank Regulatory Capital,” Benton Gup and Thomas Lutton explore the implications of *SFAS 157* on bank capital requirements. They note the significant impact that a change in interest rates could have on the value of a bank’s assets and liabilities, and in turn, the bank’s capital requirements. They suggest that point estimates of capital adequacy comparing the fair value capital requirement and the regulatory capital requirement for a bank could misleadingly make the bank appear insolvent. Thus, future capital requirements determined by stress tests conducted at the supervisory level may need to consider the fair value of an institution’s assets and liabilities. Using fair value measurements rather than book values would...
require ongoing review and calibration because of regular fluctuations in the fair value of a bank’s portfolios.

**Levels of Testing**

**Internal Tests**

In the modern financial system, risk management activities have become an integral part of everyday operations. Financial institutions continually search for more precise models to identify, measure, and mitigate risks. Many banks and financial institutions have begun to subject specific business units to stress tests in order to measure the impact of possible economic shocks on their overall financial condition. Bank managers can use stress tests to gauge the sensitivity of identified risks to adverse economic shocks, which will allow them to more precisely define their risk profile. The more accurately defined a bank’s risk profile, the more effectively bank managers can establish risk management policies to address risks and vulnerabilities. A more precise risk profile also allows bank managers to better allocate funds to improve their quality of business in anticipation of potential adverse shocks.

**External Tests**

Improved understanding of individual banks’ risks also enhances the overall stability of the financial system and allows for resources to be more efficiently distributed. Stress tests can be utilized as a supervisory procedure by financial regulators to measure the impact of proposed economic shocks on the whole economy. Used in this capacity, stress testing not only provides an indication of the soundness of the financial system, but also suggests adjustments to mitigate the impact of adverse economic shocks. A recent example of stress tests performed by financial regulators occurred in March 2009, when the 19 largest American bank holding companies (BHCs) were subjected to the Supervisory Capital Assessment Program (SCAP). The SCAP template and the results of the test will be addressed later in this paper.

**Stress Test Methodology**

**Planning the Test**

Stress testing typically involves the following steps: (1) delimitation of the scope of the test, (2) definition, design, and calibration of the economic shocks to be tested, (3) estimation of the impact of the shocks and analysis of that impact to the financial condition of the system tested, and (4) identification of the possible policy measures that may be derived from the exercise. See Appendix - Exhibit 2 for an illustration of a sample stress test process.
Prior to performing stress test procedures, the scope of the test must be determined. The scope depends on the purpose of the test, which is defined by how specific or broad the results are intended to be. Macro-tests are designed to produce results applicable to the overall financial system or its major components, while micro-tests are performed at the individual level with results that are specific to the institution or group of institutions in question. Henrik Andersen proposes a model in “Stress Testing of a Bank’s Profit and Capital Adequacy” that includes a comprehensive macro model, micro models for consumer default probabilities and defaults among non-financial institutions, and a bank model for profit and capital adequacy. The bank model can be used to analyze a number of risk factors that affect a bank’s profit and financial strength.

The bank model analyzes the profit and loss account, the balance sheet, and the capital adequacy of the bank under review. The profit and loss account of a bank reacts in a reciprocal nature to the balance sheet. The bank’s dividends and profit after tax directly affect the amount of capital reported on the balance sheet. Net interest income (NII) is also included in the profit and loss account, and is determined by the size of the assets and liabilities on the bank’s balance sheet. The balance sheet also affects the capital adequacy calculation because equity capital is a significant portion of regulatory capital. The composition of the balance sheet also indicates the risk-weighted assets that will be included in the capital adequacy calculation.

**Macro-tests**

Macro-tests are typically utilized by regulatory authorities, and can be designed through either a top-down or bottom-up approach, depending on the availability of data. A top-down approach treats the system at an aggregate level so that the results obtained can be applied subsequently to each system component. In contrast, a bottom-up approach involves testing a representative sample of financial institutions based on size and type of business and aggregating the results to be applied to the overall financial system.

The strengths and weaknesses of both approaches imply that the intended results of the test should determine the best approach. The top-down approach calls for standardized stress test procedures that can be applied similarly to all institutions so that the results reflect the aggregate whole. In order to achieve objective and accurate results with the top-down approach, it is imperative for the testing framework to be applied consistently across the system. The framework must be applied in a manner that eliminates bias due to differing characteristics among institutions. For example, a top-down test should be designed so that results will be free from bias due to differences in methods of calculations, materiality, or characteristics of the business lines of each institution. Thus, the top-down approach has the advantage of applying a uniform procedure established at the top of the system to create results for individual institutions. However, the top-down approach lacks the richness of detail gained through the bottom-up approach, which facilitates a more precise picture of the shocks tested. The bottom-
up approach relies on detailed risk characteristics of the institutions to produce results that may then be summarized for the collective whole. This rich detail may provide deeper comprehension of specific risk characteristics, but at the sacrifice of applying a uniform method across institutions to come to an objective result.

In *The Journal of Banking Regulation*, Marcelo, Rodriguez, and Trucharte suggest that the strongest stress test would combine the bottom-up and top-down approaches. This test would be most successful if similar data is available to participatory institutions and supervisory authorities. The regulator would carry out the procedures for the aggregated system while banks would carry out the same procedures in their individual institutions. A set of uniform assumptions and variables would be used both at the institutional and supervisory level. Results from the individual institutions could then be aggregated through a bottom-up approach and compared to the results obtained from the top-down approach from the supervisory authority. Ideally, the results would be comparable.

**Micro-tests**

Rather than producing results that are meant to indicate the health of the whole financial system, micro-tests allow institutions to analyze different business units and portfolios within their walls. By focusing on characteristics specific to certain business units and portfolios, micro-tests can produce a panoramic diagnostic of the bank’s risk profile. Micro-test results provide bank managers with greater depth of knowledge concerning their bank’s risks and vulnerabilities. Micro-tests involve more specific tests that can be applied to each portfolio that the management team wishes to analyze based on size and volatility. The results of micro-tests indicate the ability of various units within the institution to withstand the economic shocks tested. Micro-tests are typically performed as part of a bank’s internal risk management and monitoring.

**Factors and Variables Tested**

An important aspect of planning a stress test is determining economic shocks that would hurt the bank or economy, and quantifying the magnitude of the shock for the purposes of the test. Bank managers must identify the adverse shocks they plan to test, quantify the size of each shock, and introduce the shock scenarios to the bank. As Marcelo, Rodriguez, and Trucharte state in *The Journal of Banking Regulation*, shocks must be

“chosen on the basis of the risks to be measured, calibrated according to the type of analysis to be conducted, and implemented using the main variables (certain specific key parameters) that, due to their nature and availability, have the most significant direct or indirect effect on those risks.”
The size of a shock to be tested is typically based on the largest rapid change the variable has experienced in recent history\(^6^2\). Once the shocks have been identified and calibrated, a variety of test methods can be used to introduce the shocks to the bank’s system. These methods include sensitivity analysis and scenario analysis. Economic shocks used in testing are typically designed to measure a bank’s most significant risks, specifically, market risk, interest rate risk, credit risk, and liquidity risk\(^6^3\).

**Market Risk**

Market risk is significant to a bank’s portfolio value, and can be tested by manipulating variables such as short term and long term interest rates, exchange rates, credit spreads, stock market prices, and other financial market indices\(^6^4\). Changing these variables to test market risk allows the bank to monitor the changes in the value of their portfolios after each shock. These changes in portfolio value can then be consolidated into the bank’s financials to determine the effects on the bank’s overall condition. Market risk directly impacts the value of a bank’s portfolios because it determines dividends paid out, capital gains or losses on securities, foreign exchange rates, hedges, and other derivatives\(^6^5\). Knowledge of the impact of various shocks to these components of a bank’s portfolio allows bank managers to better understand and hedge risks in their portfolios. Understanding and hedging the market risk of their portfolios also allows bank managers to better control and estimate the impact of market risk to their profitability and financial condition.

**Interest Rate Risk**

Interest rate risk is a fundamental consideration of asset/liability management (ALM) that can be measured by shifting the yield curve for interest rates. Since asset/liability management, and therefore interest rate risk management, is a core aspect of bank operations, interest rate risk often does not require additional testing under a stress test plan. Asset/liability management methods used by banks to regularly measure and analyze interest rate risk are typically sufficient\(^6^6\). In analyzing the results, bank managers can determine the impact of changes in the yield curve on their profit and loss account and overall financial strength.

**Credit Risk**

Credit risk has significant implications for a bank’s loan portfolio, but is not as easy to measure as interest rate risk or market risk. Less accurate information is available about changes in the credit or default status of a bank’s loan customers\(^6^7\). It is also difficult for bank managers and economists to estimate the impact that macroeconomic conditions will have on the credit risk of various parties. Since a bank’s loan portfolio is its largest asset, special attention must be given to analyzing credit risk. Banks must first categorize their loan portfolios because certain shocks may have a significantly different impact on loan portfolios with different characteristics.
Loan losses are a major form of credit risk and an important variable in estimating a bank’s profit and capital adequacy. Loan losses as part of a bank’s credit risk can be estimated based on system-wide default average or the bank’s particular historical rate of loan loss. A number of factors should be incorporated into a model for estimating credit risk and loan losses, including relationships between the bank’s risky loans to the consumer, industrial, and real estate sectors. Henrik Andersen includes analysis of credit risk in his bank model in “Stress Testing of Bank’s Profit and Capital Adequacy.” The bank model estimates loan losses and the related impact on a bank’s profitability and capital adequacy.

**Liquidity Risk**

Liquidity risk is another major factor in stress testing that depends on the economic scenarios to be shocked and the availability of data for testing. Liquidity is “the ability to raise cash quickly with minimal principal loss and at a reasonable cost.” Simple liquidity tests assess liquid assets at a set date under a specified scenario. Other tests are more comprehensive, and take into consideration factors such as the maturity gaps in asset and liability positions or the timing and measurement of expected cash flows. Prior to testing liquidity risk, it is imperative to define the baseline economic scenario in which the test will be conducted as well as the shock to which the bank’s assets will be exposed. Bank management may choose to create specific requirements that the bank must meet under the scenario, such as required cash outflows for interest payments. Managers could even approach this test by asking the question “what would happen if…?” They would likely obtain indicative results of their bank’s ability to respond to various scenarios. It is also important for management to specify the condition of the economy in which the test will be run because the economic cycle can have a significant impact on a bank’s liquidity. Specifically, it is important to note the level of financial stress implicit in the scenario, such as the ease of inter-bank lending.

Tests for liquidity risk can be conducted for a single bank or the entire financial system. The results are particularly useful in uncovering vulnerabilities in the financial system when credit markets are tight. Liquidity tests can also indicate which banks and financial institutions may be illiquid when credit markets are tight. Additionally, managers can test their bank’s ability to raise liquid funds in a stressful market by setting certain parameters in the macroeconomic scenario. Parameters could include setting required cash flows over a certain period or analyzing the impact of changes in consumer confidence on demand deposits. The eventual objective will be to reach a liquidity ratio that demonstrates the bank’s ability to respond to the shocks tested.

Liquidity risk is emphasized in Henrik Andersen’s bank model because it affects a bank’s costs of financing. In the bank model, deposit and interest rates on interest-bearing liabilities can be adjusted following changes in liquidity risk. Interest rate changes on a bank’s liabilities affect the bank’s net interest income (NII), as well as its profit and capital adequacy.
**Sensitivity Analysis**

Sensitivity analysis is a method for testing variables in which a single variable is exposed to a shock while other variables remain unchanged\(^73\). The results reflect the impact of the shock on the selected variable, which shows the sensitivity of the variable to the shocks tested. Sensitivity analysis seeks to estimate how the bank’s condition is affected by adverse negative shocks based on the bank’s identified risks. The risks tested using sensitivity analysis typically include those discussed above: market risk, interest rate risk, credit risk, and liquidity risk. While sensitivity analysis is useful in testing the impact of economic shocks to specific variables, it fails to consider the dynamic aspect of the economy in which changes in one variable induce fluctuation in others. Scenario analysis seeks to overcome this problem.

**Scenario Analysis**

Scenario analysis allows for a group of variables to be tested simultaneously by testing predetermined scenarios for the effects on a bank’s financial condition. Scenarios can be developed using an econometric model that incorporates historical and theoretical relationships between the variables included\(^74\). A change to one of the model’s variables creates changes in the other variables to represent a scenario for testing. Thus, scenario analysis differs from sensitivity analysis in that it does not utilize the economic principle of *ceteris peribus* in testing variables. Instead, scenario analysis aims to project the impact of a particular scenario onto the system under analysis.

In contrast to sensitivity analysis, scenario analysis typically encompasses a time horizon of at least two years to allow the full effects of the changes to be realized. The scope of scenario analysis typically includes the balance sheet and the profit and loss account of the bank or institutions under review. Some methods divide the impacts into business risk and credit risk. Business risk is the risk attributable to a bank’s assets, and is represented by the bank’s financial condition on the balance sheet. Credit risk is represented by the way in which the financial stability of the bank’s borrowers affects the condition of the bank. Business risk can be measured by comparing the balance sheet and profit and loss account of the bank under the baseline scenario to the stressful scenario. Credit risk can be measured through two approaches. The first approach estimates credit loss provisions to reach the bottom line of the profit and loss account\(^75\). This approach, however, may be less accurate than the second approach, which models the probability of default, similar to modeling performed by banks for internal modeling of credit risk.

**Stress Test Results**

Once tests have been performed for the aforementioned risks, a quantitative assessment may be made to generalize the impact on the financial condition of the bank or economy tested. This assessment will determine the bank’s ability to withstand the
shocks tested, which will be useful in planning for future adverse economic conditions. The assessment may be made using either a piecewise approach or an integrated approach. A piecewise approach isolates specific variables that directly influence the financial condition of the bank and estimates how they are affected by the shock. It tests the differences in how the key variables react under the baseline and the adverse economic scenarios, and then analyzes the impact on the bank’s profitability and solvency. In contrast, an integrated approach considers all variables that will be affected by the shock. It measures the overall impact of the shock on the variables under both scenarios and then analyzes the impact on the bank’s profitability and solvency.

The bank must then determine what steps to take to improve efficiency, financial stability, and liquidity under stressful economic conditions. The bank should especially address significant vulnerabilities that are evident in the results of the test. If the bank is participating in a macro-test exercise for the entire financial industry, bank managers should consider how the results will be interpreted by the supervisory authority, and whether any new legislation or regulation will be put into effect.

Capital Adequacy

Once the results have been reviewed, they can be utilized to analyze the capital adequacy of a bank. This can be done on the individual level by bank managers attempting to retain sufficient capital for their daily operations. Capital adequacy can also be analyzed by supervisory authorities with the power to mandate capital requirements for institutions under their review. The standard capital adequacy calculation for a bank is based on regulatory capital and the bank’s risk-weighted assets. Regulatory capital is composed of Tier I capital and subordinated debt. The component of risk-weighted assets is included in the capital adequacy calculation to reflect the assumption that an increase in risk-weighted assets coincides with an increase in total assets. Use of risk-weighted assets as an indication of capital adequacy can be problematic, however. Studies suggest that risk increases during an economic downturn, causing banks to have insufficient capital when it is most vital for them to remain well-capitalized. To overcome this problem, Henrik Andersen suggests:

“A natural extension of the model will thus be to approximate the risk-weighted assets based on bankruptcy probabilities for enterprises and households with loans. Through this, bankruptcy probabilities for enterprises could be obtained…while projections of household margins could be used to calculate bankruptcy probabilities for households.”

This method returns to the importance of categorizing loans into their respective appropriate portfolios based on their characteristics to allow for the best estimation of their default risk.
Supervisory Capital Assessment Program

The Supervisory Capital Assessment Program (SCAP), as implemented in March 2009 for America’s 19 largest banks (see Appendix - Exhibit 1), is a template for stress testing banks developed by the Governors of the Board of the Federal Reserve. The test attempts to display the worst-case scenario for these banks, and to determine how the banks should prepare for increasingly adverse economic conditions. Specifically, the SCAP is a “forward-looking test designed to estimate losses, revenues, and reserve needs for BHCs in 2009 and 2010 under two macroeconomic scenarios.” These macroeconomic scenarios included a baseline scenario and an adverse scenario. The baseline scenario reflected the general expectations of professionals in February 2009 regarding the extent and duration of the recession. The adverse scenario represented a recession longer and more severe than what most professional forecasters expected. The SCAP framework was designed under the accounting and regulatory standards in place at the end of 2008, with consideration given to any substantial changes expected before 2011. While the framework is forward-looking, it encompasses a limited time horizon that reflects the diminishing accuracy of predictions that extend too far into the future. It is important to note that the forward-looking SCAP framework only accounted for losses that were expected to occur after the test date, but did not include losses that had already been realized by the institutions. Thus, the resulting loss projections for each institution did not represent “lifetime losses” of the assets involved.

While theoretically similar to stress tests that individual banks perform for continual risk management, the SCAP applies a universal framework across the institutions. Thus, the results of the SCAP are arguably preferable for comparing the capital adequacy and sensitivity of banks. The comprehensive data requirements and uniform methodology of the SCAP framework allow for comparison across the spectrum of banks. The SCAP constructs a wider panorama of financial health by analyzing a wider breadth of factors than many traditional bank-run stress tests. The framework incorporates all of the major asset classes and sources of revenue for each bank, rather than focusing on individual business lines or portfolios as many bank-run tests do.

Testing in 2009

In March 2009, all domestic banks with year-end assets exceeding $100 billion in 2008 were required to participate in the SCAP as part of ongoing supervision of the vulnerable banking industry. The original intent of the SCAP was to test the 19 banks that met this criteria and collectively held two-thirds of the nation’s assets as well as half of the loans in the American banking industry. These banks were asked to project their revenues and available resources, as well as their expected losses on loans, investment portfolios, and trading positions through 2010. Projections were to include off-balance sheet commitments, contingent liabilities, and other exposures. Banks were also asked to estimate their ability to absorb such losses through 2011. They were asked to provide
supporting documentation for their estimated losses and reserves, including information on projected revenues and expenses by category, portfolio characteristics, domestic and international, forecasting methods, and any relevant assumptions. Banks were provided with a common set of indicative loss rate ranges for each loan category under both the baseline and adverse scenarios, but could deviate from the range if they provided support for their reasoning. Banks with trading assets of at least $100 billion were asked to estimate potential trading and counter-party credit losses under a market stress scenario that reflected the economic shocks of late 2008. Each bank was also asked to report the resources they expected to have available to absorb losses under both macroeconomic scenarios over the two-year horizon. These resources included pre-provision net revenue (PPNR), which consists of net interest income (NII), fees and other non-interest income net of non-credit-related expenses, as well as existing reserves for probable losses, such as the allowance for loan and lease losses (ALLL). These two resources (PPNR and ALLL) combined with existing excess capital would allow the bank to absorb projected losses under each macroeconomic scenario. See Appendix - Exhibit 3 for the SCAP Templates for loss estimates and projections of resources to absorb losses.

Supervisory Review

The banks submitted their results and supporting data to supervisory teams, which were organized to review and compare specific asset classes, revenues, reserves, and capital across the banks. Specific areas of review included consumer, commercial, and industrial portfolios; commercial real estate; available-for-sale and held-to-maturity securities portfolios; trading accounts; counter-party credit risk; pre-provision net revenue (PPNR); and allowance for loan and lease losses (ALLL) coverage. The supervisory teams utilized the expertise of more than 150 individuals, including senior supervisors, on-site examiners, analysts, and economists, with senior supervisors determining the necessary capital cushion for each bank. Advisory groups composed of experts in accounting, regulatory capital, and financial and economic modeling were utilized throughout the process. The teams analyzed the initial submissions of each bank, and worked alongside the banks to request additional information to support estimates and assumptions.

The objective of each team was to evaluate the projections submitted and the approaches used to generate them. Thus, the teams strove to understand the parameters, assumptions, and variables used, so as to analyze their consistency with the two macroeconomic scenarios provided. The teams evaluated the quantitative methods that each bank used to estimate losses, reserves, and resources as well as the soundness of key assumptions. Specifically, the analysis of methodology involving losses was based on bank-specific information about the risk characteristics of each bank’s portfolios, risk management procedures, and underwriting policies. The supervisory teams formed independent benchmarks, some of which were “based on firm-specific portfolio characteristics against which they evaluated the appropriateness of the firm’s projections.
for losses and resources that would be available to absorb losses. Bank-specific characteristics included factors such as past performance, portfolio composition, borrower demographics, geographical distribution, international operations, and business mix. The benchmarks used by the supervisory teams were developed to provide a common ground for discussions with the individual banks about their submissions and resulting analysis. Other universal benchmarks were based on procedures regularly used by regulators, so as to obtain objective results across the range of banks. Overall, these benchmarks were used to generate detailed and accurate information that was both bank-specific, yet consistently applied across the participatory institutions.

Results were then analyzed based on the sensitivity of each bank’s projections to economic changes. The supervisory teams applied “across-firm, comparative analysis to support their assessments, [in which they] applied independent quantitative methods using firm-specific data to estimate losses and loss absorption resources.” These quantitative methods were applied uniformly across all of the banks to ensure consistency in comparing estimates.

Benchmarks included the set of indicative loan loss rate ranges provided to the banks prior to their preparation of assessments for their accrual loan portfolios under each macroeconomic scenario. Ranges were based on estimated loss rates generated by the contributing supervisory agencies, which they arrived at using a combination of procedures taken from their agency assessments and procedures developed specifically for the SCAP. The agencies used a number of approaches to estimate the indicative loan loss rates for different categories of loans. For example, methods for residential mortgages included “micro models of default and loss-given-default based on information about individual loans, models based on the performance of regional mortgage loan portfolios, and analysis of mortgages held by failing banks.” In contrast, methods for consumer and commercial loans estimated loss rates using regressions of historical charge-offs and defaults against macroeconomic variables such as the unemployment rate and the house price index. The ranges were used as discretionary guidelines rather than steadfast rules, reflecting the innate uncertainty in estimating bank losses under unstable financial conditions.

Analyzing the Results of the SCAP

The projected revenues, losses, and reserves for each bank were considered simultaneously to determine the amount and quality of capital that each bank would require through 2010. See Appendix - Exhibit 4 for detailed loss estimates at the 19 banks and the capital buffer required for each bank as a result of the test. As shown by these consolidated results, 10 banks were required to raise additional capital after the completion of the SCAP. These 10 banks included Bank of America, Citibank, Fifth Third Bank, GMAC, Key Corp, Morgan Stanley, PNC, Regions Bank, SunTrust, and Wells Fargo.
Bank capital, composed mostly of common equity, is important for absorbing a bank’s unexpected losses for the protection of its depositors and other creditors. Under the current regulatory environment, capital requirements are commensurate with a given institution’s level of risk\(^3\). Capital adequacy has assumed new prominence since the start of the recession, given the instability of the economy and its implications for the banking sector. The supervisory teams determined the adequate level of capital that would permit each bank to continue lending under deteriorating economic conditions. If the assessment indicated the need for a bank to raise capital or improve the quality of its capital to prepare for the severe economic scenario, regulators expected the bank to increase capital. Additional capital would serve as a cushion for future writeoffs and losses. It would ideally allow these large banks to maintain their vital role as liquid financial intermediaries in a challenging economic environment. As described in the SCAP framework,

“The capital needs determined by this supervisory exercise should be viewed as a capital buffer designed to be drawn down as losses materialize should the economy be weaker than expected, and still be substantial enough at the end of 2010 for firms to be considered sufficiently capitalized. If the economy recovers more quickly than specified in the more adverse scenario, firms could find their capital buffers at the end of 2010 more than sufficient to support their critical intermediation role and could take actions to reverse their capital build-up\(^4\).”

Thus, in reviewing the results of the SCAP, one should understand that the capital requirements prescribed by the tests are preventative measures to maintain solvency under worse-than-expected economic conditions. The results are not an indication of the current solvency or financial strength of the banks. The capital buffer required under the SCAP will not become a new industry standard, and the participating institutions will not be required to consistently maintain the capital buffer. Rather, the capital is required of the institutions for the time being to protect their capital reserves against losses in the near future that may occur if the economy deteriorates beyond current expectations\(^5\).

**Determining Capital Requirements**

The process of projecting estimated losses and revenues in the banking industry is an intrinsically ambiguous exercise, made more convoluted by stressful and volatile economic conditions. With projections of GDP, unemployment rates, consumer spending, and housing prices uncertain in the current economy, measuring the effects of these variables on the banking industry becomes much more difficult. As part of an attempt to stabilize these macroeconomic variables, policymakers developed the SCAP framework to restore consumer and commercial confidence that the banking industry is both solvent and adequately capitalized.
As part of their submissions in early March 2009, each bank reported projections of Tier I capital and common equity for 2009 and 2010 that reflected credit losses, pre-provision net revenue (PPNR) to absorb losses, and the necessary allowance for loan and lease losses (ALLL) required at the end of 2010. See Appendix - Exhibit 3 for the SCAP template related to these items. Based on the information provided, the supervisory teams projected pro forma capital for each bank in 2010 using the revised estimates of revenues and credit losses they reached at the end of their analysis.

The formula for determining capital requirements for each of the nineteen banks started with equity and regulatory capital measurements from the fourth quarter of 2008. Pro forma equity capital was then estimated over the two-year horizon using figures for tax-adjusted net income. Estimated losses were treated as though they were certain to occur so that they offset revenues earned over the same period. Projected reserve increases were also included, which reduced the resources available to the banks for absorbing other losses. The supervisory teams then analyzed the effect of preferred dividend payments and considered the provisions of regulatory capital standards for Tier I capital. These calculations resulted in pro forma levels of capital for the participatory banks over the two-year horizon.

*Reporting the Results of the SCAP*

The results of the SCAP were reported publicly by the supervisory authorities due to the unusual nature of the program and the uncertain economic conditions that precipitated it. The supervisory agencies believed that transparent reporting would promote investor confidence in the stability of the banking system and encourage the institutions to develop plans to raise the capital required as a buffer under the SCAP. The results of the SCAP were reported for the aggregate whole as well as individually for each bank. See Appendix - Exhibit 4 for the consolidated results.

In a press release dated November 9, 2009, the Federal Reserve Board reported that 9 of the 10 SCAP banks that were required to raise additional capital under the program had done so effectively. The lone exception, GMAC, was expected to meet its required capital buffer with assistance from the TARP Automotive Industry Financing Program. Together these 10 banks were required to raise an additional $74.6 billion to meet the SCAP capital buffer requirements. Most did so through the following measures: (1) issuance of common stock and similar securities, approximately $39 billion, (2) conversion of preferred stock to common stock, approximately $23 billion, and (3) sales of businesses or portfolios, approximately $9 billion. Additionally, some institutions reduced dividend payments and issued common stock through employee ownership programs. In total, an additional $77 billion of Tier I Common Equity was added. With this additional capital, these banks had enough capital to protect against the adverse economic scenario tested in the SCAP to survive through 2010.
Implications of the SCAP Template

Based on the results from the inaugural use of the SCAP template in March 2009, some experts feel that the framework can and should be utilized to develop a universal, principle-based framework for stress testing financial institutions that would allow for international comparisons. In fact, several of the SCAP banks may intend to adapt the federal template for regular internal testing and monitoring. While the template, principles, and methodologies may be practically applied to most financial institutions, some smaller and more specialized institutions may require additional attention. These institutions may not be able to duplicate or afford the regular testing that larger institutions benefit from, and thus, exceptions will be commonplace. However, as Steve Cocheo states in *The American Bankers Association Banking Journal*, “stress testing is not a black-and-white matter…even looking at the same data in the context of the same macroeconomic stress test factors, regulators and bankers did not always agree during the SCAP tests.” Therefore, the adaption of any universal framework based on standardized principles will require expert discretion and effective communication between supervisory authorities and financial institutions.

Part III: Transparency and Corporate Governance

The disclosure of the results of the SCAP in 2009 reflects the general attitude among supervisory authorities that increased transparency is necessary for public companies and financial institutions in the wake of the financial crisis. Increased transparency allows investors and consumers to make better investment decisions and enables shareholders to make more informed voting decisions. On December 16, 2009 the SEC published *SEC 33-9089 Proxy Disclosure Enhancements*, effective February 28, 2010, to increase disclosure requirements related to risk, corporate governance, and compensation policies of companies registered with the SEC. This ruling aims to enhance the information provided in proxy solicitations and other reports filed with the SEC by requiring additional disclosures concerning risk-based compensation policies, leadership qualifications of the Board of Directors, and the role of the Board of Directors in risk oversight. These disclosure requirements apply to proxy and information statements, annual reports, and registration statements filed with the SEC.

Compensation Policies

Companies are now required to disclose information regarding how compensation policies for employees may create incentives that will negatively affect the company’s level of risk and risk management procedures. According to the final ruling, companies must explain their compensation policies for all employees if the policies create risks that are reasonably likely to have a material adverse effect on the company. If the company has risk management policies in place so that the risks are no longer reasonably likely to have a material adverse effect on the company, disclosure of compensation...
policies is no longer required. The ruling includes examples of situations that may require disclosure of compensation policies. These include (but are not limited to) situations when: (1) a business unit carries a significant portion of the company’s overall risk profile, (2) a business unit has a compensation structure that differs from the rest of the company, (3) a business unit is significantly more profitable than others within the company, and (4) a business unit where the compensation expense is a significant portion of revenues. These situations reflect common occurrences in which risk-based compensation policies were exploited by employees and managers to the detriment of the company prior to the financial meltdown.

Companies should explain risk assessment and incentive considerations related to the structure of compensation policies and practices. They should also disclose how the compensation policies relate to risks taken in both the short-term and the long-term, and how those risks are mitigated through such controls as claw backs or vesting periods. Additionally, companies should report procedures for making adjustments to compensation policies subsequent to changes in the overall risk profile, and any adjustments that have been made based on a changing level of risk. Finally, they must disclose risk oversight procedures related to compensation policies and the extent to which these procedures effectively mitigate risks that arise due to risk-based compensation policies. Companies must report these items if compensation policies create risks that are reasonably likely to have a material adverse effect on the company. However, if a company determines that compensation policies are not reasonably likely to have a material adverse effect on the company, no affirmative disclosure stating so is necessary in the financial statements.

Compensation Consultant Fees

The new reporting requirements also include several disclosures regarding the utilization of compensation consultants for the development of compensation policies. Companies are now required to explain the role of the compensation consultant in “determining or recommending the amount or form of executive and director compensation.” In some situations, the disclosure of fees paid to a compensation consultant is also necessary, particularly if the consultant performs and receives fees for additional consulting services besides those related to compensation. Any additional services provided by the compensation consultant must be disclosed so that investors are aware of potential conflicts of interest. Companies must disclose whether the Board of Directors or the Compensation Committee has contracted its own compensation consultant for recommendations regarding executive compensation as well as fee-related information if the fees exceed $120,000 during the fiscal year. Disclosure is also required of whether a compensation consultant was engaged by management for non-executive compensation, and whether the recommendations of this consultant for non-executive compensation were approved by the Board. Fee disclosure is required if the fees exceed $120,000 for a consultant for executive or non-executive compensation, regardless of whether the consultant was selected by the Board or company management.
However, fee disclosure is not required for consultants that work with management to develop executive or non-executive compensation policies if the Board has its own consultant\textsuperscript{117}. Finally, disclosure is required if the company receives executive and non-executive compensation advice from its consultant, even if the Board does not engage a separate compensation consultant\textsuperscript{118}.

Analysis

Disclosure of these risk-based compensation policies will provide investors and supervisory agencies with crucial information related to awarding risky behavior in public companies and financial institutions. Investors, analysts, and other users of financial statements will be able to better identify conflicting interests related to compensation policies and the extent to which compensation policies create risks that will negatively affect the company’s condition. Had these policies been in place prior to the financial crisis, some of the risky lending and short-term financial incentives that created the crisis may have been exposed or prevented. Risky markets such as the subprime mortgage and derivatives markets may not have grown to such dangerous proportions. Thus, going forward, the SEC believes that these disclosures will help expose and mitigate risks related to compensation policies, and encourage companies to better manage these risks.

Board of Directors

Qualifications, Legal Proceedings, and Diversity Considerations

According to the Proxy Disclosure Enhancement Rulings, companies must also make additional disclosures regarding corporate governance, specifically related to the Board of Directors. Companies are now required to disclose the qualities, skills, and experiences of each member and nominee of the Board of Directors that qualify them for a position on the Board. This disclosure requirement does not specify exactly what information must be reported about each member or nominee, which allows companies to be flexible in their reporting of this information, which must be disclosed annually\textsuperscript{119}. Disclosure is also required of any directorship positions held by members or nominees of the Board over the previous 10 years\textsuperscript{120}.

Companies must disclose legal proceedings that involve members and nominees of the Board of Directors. These include proceedings as a result of mail, wire, or business fraud, or proceedings based on violations of federal or state laws regarding securities, commodities, banking, or insurance regulations. Any sanctions imposed by a stock, commodities, or derivatives exchange or similar organization must also be reported in relation to members and nominees of the Board\textsuperscript{121}. Finally, companies must report whether the nominating committee considers diversity in choosing candidates for the Board, and how diversity is defined and incorporated into the nomination process for the Board\textsuperscript{122}.

[31]
Leadership Structure and Risk Oversight

As an additional component of increased corporate governance disclosure, companies must now explain the Board leadership structure and the role of the Board of Directors in risk oversight. Companies should explain why they have chosen to combine or separate the positions of CEO and Chairman of the Board, and whether the Board has a lead independent director. The intent of these required disclosures is to provide investors with information regarding the leadership structure of the company, not to suggest that a certain structure is optimal. Companies must also report the involvement of the Board of Directors in risk oversight and whether the oversight is performed through a specific committee, such as a risk committee or the audit committee.

Analysis

These additional required disclosures related to the structure and qualifications of the Board of Directors and the role of the Board in risk oversight of the company will provide investors and consumers with better information regarding the politics of leadership within the company, and the extent to which the Board encourages or oversees risk-taking. This information will be useful for users of financial statements to discover conflicting interests within the Board of Directors or overall company leadership as well as the Board’s encouragement or failure to prevent risky behavior that could be detrimental to the company. By requiring these additional disclosures, the SEC believes that companies will work to improve their risk management procedures and corporate leadership structures to help mitigate some of the risks that created the financial crisis.

Conclusion

This paper summarizes the causes of the financial crisis of 2008 and the events that lead to the requirement by the U.S. Treasury Department for the 19 largest American bank holding companies to undergo the Supervisory Capital Assessment Program (SCAP). The body of this paper explains the purpose and methodology of financial stress tests and the specific methodology used under the SCAP to analyze the severity of the banking crisis caused by the financial meltdown. This paper concludes with a summary of one new regulatory reporting ruling by the SEC to increase transparency in financial reporting about risk-based compensation and the structure of corporate governance. While this SEC ruling is only a start to financial reform and regulation as a result of the financial crisis, it is a step toward improved transparency in financial reporting and increased responsibility for companies and financial institutions to be held accountable for the riskiness of their compensation policies and company leadership structure.
2 Ibid., 716
3 Ibid., 716
4 Ibid., 711
5 Ibid., 724
7 Ibid.
8 Ibid., 185
9 Ibid., 200
10 Ibid., 186-187
11 Ibid., 188-189
13 Ibid., 45
14 Ibid., 45
16 Ibid., 342
17 Ibid., 352
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79 Ibid., 52
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96 United States of America. Federal Reserve. Supervisory Capital Assessment Program., 4
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101 Ibid.
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104 Ibid., 21
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107 Ibid., 1
108 Ibid., 8
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112 Ibid., 16
113 Ibid., 17
114 Ibid., 51
115 Ibid., 51-52
116 Ibid., 51-52
117 Ibid., 52
118 Ibid., 53
119 Ibid., 34-35
120 Ibid., 36
121 Ibid., 37
122 Ibid., 38
123 Ibid., 42
124 Ibid., 43-44
Appendix
Nineteen American BHCs Tested Under the SCAP:

American Express
Bank of America (BofA)
Branch Banking & Trust (BB&T)
Bank of New York Mellon (BNYM)
Capital One
Citibank
Fifth Third Bank
General Motors Acceptance Corporation (GMAC)
Goldman Sachs
JPMorgan Chase
Key Corp
Metlife
Morgan Stanley
Pittsburgh National Corporation (PNC)
Regions Bank
State Street
Suntrust
US Bank
Wells Fargo

Exhibit 1.
Stress Test Flowchart

- Determine scope of stress test
- Purpose of test
  - Specific Results
    - Micro-Test
  - Broad Results
    - Macro Test
      - Top-down approach
      - Bottom-up approach
      - Combined approach
- Define, design, & calibrate shocks
  - Size of economic shocks
    - Determine variables to test
      - Market Risk
      - Interest Rate Risk
      - Credit Risk
      - Liquidity Risk

Exhibit 2.
Stress Test Flowchart, (ctd.)

1. Estimate impact of shock
2. Analysis
   - Sensitivity analysis
   - Scenario analysis
   - Impact to bank or financial system tested
   - Identify resulting policy measures
     - New initiatives or policies at institution level
     - New financial regulation at the system-wide level

Exhibit 2, (continued)
### Appendix:
The SCAP Templates

**Loan and Security Categories to be Included in the Loss Estimates**
*(Loss Amounts in Billions of Dollars)*

<table>
<thead>
<tr>
<th>LOANS</th>
<th>Outstanding Balance Q4 2008</th>
<th>Loss Estimates</th>
<th>Loss Estimates</th>
<th>Loss Estimates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2009</td>
<td>2010</td>
<td>TOTAL</td>
</tr>
<tr>
<td>First Lien Mortgages</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prime</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alt-A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subprime</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Second/Junior Lien Mortgages</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Closed-end Junior Liens</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HELOCs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C&amp;I Loans</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CRE Loans</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multifamily</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonfarm, Non-residential</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Credit Cards</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Consumer</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Loans</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>COMMITMENTS AND CONTINGENT OBLIGATIONS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>List by type the amount and assumed losses related to commitment draw-downs and other contingent obligations</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SECURITIES</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Available for Sale</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Held to Maturity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TRADING ACCOUNT</strong> (including traded loans)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For the more adverse scenario only: report total dollar loss amount, table identifying positions captured and those not captured in the stress tests, risk factors stressed, and size of risk factor changes assumed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Form to be completed once for the baseline scenario and once for the more adverse scenario. If there are positions, businesses or risk exposures not captured on this template that would materially affect losses under the baseline or more adverse scenario, please include estimates of those losses in addition to the losses associated with the positions included on this template.

Exhibit 3.
## Resources to Absorb Losses*  
(Amounts in Billions of Dollars)

<table>
<thead>
<tr>
<th></th>
<th>2009</th>
<th>2010</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PRE-PROVISION NET REVENUE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net Interest Income</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-interest Income</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-interest Expense</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ALLOWANCE FOR LOAN LOSSES</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1) ALLL at end of previous year</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) ALLL at end of year</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALLL Resources: (1) – (2)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Form to be completed once for the baseline scenario and once for the more adverse scenario.

## Post-Scenario Tier 1 Capital*  
(Amounts in Billions of Dollars, end of period)

<table>
<thead>
<tr>
<th></th>
<th>Q4 2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tier 1 Capital</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sum of Tier 1 Elements</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Common Stockholders' Equity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk-Weighted Assets</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Form to be completed once for the baseline scenario and once for the more adverse scenario.

Exhibit 3. (continued)
<table>
<thead>
<tr>
<th>Tier</th>
<th>Common Capital</th>
<th>Risk-Weighted Assets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tier 1</td>
<td>1.13</td>
<td>1.04</td>
</tr>
<tr>
<td>Tier 2</td>
<td>1.0</td>
<td>1.04</td>
</tr>
<tr>
<td>Tier 3</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Exhibit 4:**

<table>
<thead>
<tr>
<th>Tier 1 Capital</th>
<th>Tier 1 Common Capital</th>
<th>Risk-Weighted Assets</th>
</tr>
</thead>
<tbody>
<tr>
<td>AmEx</td>
<td>BofA</td>
<td>BB&amp;T</td>
</tr>
<tr>
<td>10.1</td>
<td>1.13</td>
<td>1.04</td>
</tr>
</tbody>
</table>

**Table 3:** Supervisory Capital Assessment Program Estimates for 19 Participating Bank Holding Companies Billions of Dollars

<table>
<thead>
<tr>
<th>Total Loss estimates (Before purchase accounting adjustments)</th>
<th>Total Loss Rate on Loans (2)</th>
<th>Memo: Purchase Accounting Adjustments</th>
</tr>
</thead>
<tbody>
<tr>
<td>First lien mortgages</td>
<td>14.3%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Second/Junior lien mortgages</td>
<td>13.3%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Commercial &amp; Industrial loans</td>
<td>7.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Commercial Real Estate Loans</td>
<td>9.1%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Credit Card Loans</td>
<td>20.2%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Securitizations (ABS and HTM)</td>
<td>1.3%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Trading &amp; Counterparty</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Other (1)</td>
<td>2.7%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

**SCAP Buffer Added for More Adverse Scenario**

<table>
<thead>
<tr>
<th>Indicated SCAP buffer as of December 31, 2008</th>
<th>Capital Actions and Effects of Q1 2009 Results (4) (5) (6) (7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

**Note:** Numbers may not sum due to rounding.
Bibliography


