

Kupiec, Paul H.

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## Policy uncertainty, financial stability, and stress testing

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# Policy Uncertainty, Financial Stability, and Stress Testing

Paul H. Kupiec  
*American Enterprise Institute*

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## **Policy Uncertainty, Financial Stability, and Stress Testing**

by

Paul H. Kupiec<sup>1</sup>

April 1, 2019

### **Abstract**

Since the 2009 Supervisory Capital Assessment Program (SCAP), US regulators have employed a representative bank model as the benchmark of comparison in mandatory stress test exercises. For risk management functions, a bank's own stress model must be calibrated to reflect the bank's historical performance. I analyze stress test forecasts produced by individual bank and a representative bank stress test models. Each model is calibrated using different data, but an identical statistical approach similar to the Fed's 2009 SCAP CLASS model. I compare stress test forecasts to actual institution performance over the first 3 years of the financial crisis. Forecasts from the representative bank model differ dramatically from those produced by bank-specific models and actual outcomes. The results highlight the policy uncertainty inherent in using stress tests, both to set minimum bank capital requirements and to assess the capital adequacy needed to maintain banking system stability.

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<sup>1</sup> Resident Scholar, The American Enterprise Institute. I am grateful to Yisehak Abraham for research assistance. Any errors and omissions are my own. Email: paul.kupiec@aei.org

# Policy Uncertainty, Financial Stability, and Stress Testing

by

Paul H. Kupiec<sup>2</sup>

April 1, 2019

*...[A] s we know, there are known knowns; there are things we know we know. We also know there are known unknowns; that is to say we know there are some things we do not know. But there are also unknown unknowns—the ones we don't know we don't know. And if one looks throughout the history of our country and other free countries, it is the latter category that tend to be the difficult ones. Donald H. Rumsfeld<sup>3</sup>*

## I. Introduction

Beginning in 2009 with the Federal Reserve's Supervisory Capital Assessment Program (SCAP), the Federal Reserve began using dynamic stress tests to assess the capital adequacy of the largest US financial institutions and gauge the overall stability of the US banking system. Dynamic stress tests use econometric models to forecast a financial institution's income and regulatory capital over one or more hypothetical multi-year economic stress scenarios. Institutions project their performance under economic conditions specified by regulators and evaluate whether their capital is adequate to absorb losses created by the hypothetical adverse economic conditions. Regulators evaluate banks' own stress test estimates by comparing each institution's forecast to projections from a confidential supervisory stress test model. The supervisory stress test model is a representative bank model, a model that is calibrated to mimic the behavior of an average bank. Regulatory stress tests are not only used to set institution-

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<sup>3</sup> Donald Rumsfeld remarks made at February 12, 2002, Department of Defense news briefing <http://archive.defense.gov/Transcripts/Transcript.aspx?TranscriptID=2636>

specific minimum capital requirements, but to assess the overall capital adequacy and resilience of the banking system.<sup>4</sup>

The use of a representative bank stress test model as the benchmark of comparison raises some important issues. An explicit goal of mandatory stress testing requirements is to foster the development of individual institutions' risk management capabilities. Given this goal, it is appropriate for institutions to build their own internal stress test models using their own historical. If participating banks are unique in some dimension(s), it is unclear how closely a representative bank model may track individual bank stress test forecasts. The stress test forecasts and minimum regulatory capital projections from a representative bank model may differ markedly from the projections made by a bank's own internal stress test model. If the divergence is large and widespread across institutions, it may not only create legitimate disagreements regarding the adequate level of minimum capital needed at individual institutions, it may also give authorities misleading signals about the overall resilience of the banking system.

In this paper, I investigate the coherence of a regulatory process that evaluates capital adequacy and financial stability using a representative bank stress test model to assess the stress test forecasts and capital adequacy projections made by individual banks. The experimental design uses the first 12 quarters of the 2008 financial crisis to seed the macroeconomic and financial market data that characterize the stress scenario. I compare alternative stress test model projections to the actual performance of 14 large US banks over 12 stress scenario quarters.

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<sup>4</sup> In a recent speech ( <https://www.bis.org/review/r190207a.htm> ), Federal Reserve Vice Chairman Quarles said that stress tests offer the Federal Reserve “a forward-looking measurement of bank capital, a view of common and systemic risks across the banking sector, and a broader understanding of the health of the financial system.” Moreover, for nearly 20 years, the International Monetary Fund has included bank stress tests as a key component in its member financial stability assessments. See, for example Ong (2014).

I assume the regulatory authority estimates a representative bank stress test model using an approach that closely mimics the process used to estimate the Federal Reserve Bank of New York’s CLASS model (Hirtle, et. al., 2015). The CLASS model was used to estimate bank performance in the Federal Reserve 2009 Supervisory Capital Assessment Program (Bhanot, Hirtle, Kovner, and Vickery, 2014). I assume banks use their own historical data and estimate bank-specific stress test models following an identical CLASS-style algorithm.

I develop a method to remove the impact of any dividends, share repurchases, asset sales or capital injections on bank capital ratios, including any capital injections associated with the Troubled Asset Relief Program (TARP) that may have occurred over the stress test scenario. The analysis also must account for a significant number of bank mergers that take place during the stress test period. I develop new procedures to merger-adjust stress test forecasts so that *ex ante* forecasts can be made more comparable to individual banks’ reported outcomes.

I estimate a baseline time path for individual bank equity-asset ratios under passive management operating assumptions.<sup>5</sup> The implied time path for individual bank equity-asset ratios are compared to forecasts from each bank’s individual CLASS-style stress test model as well as to forecasts from the representative bank stress test model. The results highlight the magnitude of the policy uncertainty associated with the use of stress tests, both to set institution-specific minimum capital requirements and to assess the capital adequacy and resilience of the entire banking system.

In order to “pass” the stress test, I assume that institutions are required to sustain, without any capital injections or asset sales, equity-asset ratios of at least 6 percent in every stress test

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<sup>5</sup> No dividend payments, no share buybacks, no new external capital, no asset sales, and no changes in loan exposure or other operating characteristics.

quarter.<sup>6</sup> Historically, after removing the impact of capital injections, asset sales, dividends and share repurchases, 2 of the 14 institutions I examine fail to pass the stress test. For these institutions, a minor amount of additional equity capital (\$151 million) is required to mitigate the capital shortfall at both institutions.

When the stress test is run using the representative bank model, 6 of 14 institutions are projected to fail dramatically. The forecast from the representative bank stress test model indicates that these 6 banks need, in aggregate, \$925 billion in additional equity capital to pass the stress test. In contrast, when individual institution-specific CLASS-style models are used to forecast each banks' performance, two banks fail. In the latter case, the aggregate estimated equity capital shortfall is \$29 billion.

The stress test models I analyze use identical macroeconomic and financial market data and identical estimation algorithms. The only thing that differs between models are the bank-specific explanatory variables used to estimate the stress test models. All model coefficient estimates are selected to provide the highest adjusted  $R^2$  for the estimation data set utilized. Because the estimation data sets used by the individual banks and the regulator differ (and appropriately so), there is no statistical way to determine *ex ante* which of the stress test estimates is likely to be more accurate. The magnitude of the difference between the alternative stress test model estimates is a gauge for the magnitude of policy uncertainty associated with stress test based bank regulation.

The findings suggest that when stress tests are used to judge the capital adequacy of the largest US banks, in reality, the outcome of the exercise mostly depends on the expert judgement

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<sup>6</sup> I provide each bank's projected stress test equity-asset ratios, so the reader can immediately see the implications of choose a different required minimum equity-asset ratio.

of regulatory authorities. Forecasts from the alternative stress test models indicate that these 14 large banks require, in aggregate, somewhere between \$29 billion and \$925 billion in new equity capital to ensure their solvency throughout the stress scenario. Whether \$925 billion, \$29 billion, or some intermediate amount of additional equity is the “right” amount of capital to ensure financial stability is anyone’s guess—but in the end, despite all the modeling and calculations, it remains a guess.

It is possible, perhaps even likely, that alternative modelling approaches can reduce the difference between the capital shortfall estimates produced by the competing modelling approaches. However, it is unclear how much convergence can be achieved by altering stress test modeling techniques alone. If banks differ in some important dimension(s), it seems unlikely that the stress test forecast from a representative bank model will closely align with forecasts from individual bank-specific stress test models.

The paper is organized as follows. Section II discusses the mandatory stress test requirement imposed by the Dodd-Frank Wall Street Reform and Consumer Protection Act and the Federal Reserve Board stress testing regime adopted to comply with the requirement. Section III reviews the New York Federal Reserve CLASS approach for stress test modeling. Section IV discusses the experimental design and the data used in the analysis. Section V reviews the estimation results for the representative bank model and individual bank stress test models. Section VI focuses on the alternative stress test forecasts of the ratio of bank income before tax and extraordinary items to assets. Section VII discusses the stress test forecasts of bank equity to asset ratios, the measure of capital adequacy I use in the analysis. Section VIII provides a perspective on the policy implications of the analysis and Section IX concludes the paper.



## II. Mandatory regulatory stress tests

From 2011, Section 165 of the Dodd-Frank Wall Street Reform and Consumer Protection Act requires the Federal Reserve to conduct annual stress tests of bank holding companies with total consolidated assets of \$50 billion or more and nonbank financial companies designated by the Financial Stability Oversight Council for supervision by the Federal Reserve Board (so-called “covered companies”). The Dodd-Frank stress test is required to have a “baseline”, an “adverse” and a “severely adverse” economic scenario.<sup>7</sup> Covered companies must also conduct company-run stress tests semi-annually and report the results to the Federal Reserve Board. In addition, all financial companies with more than \$10 billion in total consolidated assets and supervised by a primary federal financial regulatory agency are required to conduct an annual company-run stress test using the Dodd-Frank stress test scenarios and report the results to the institution’s primary federal regulator.

According to the Federal Reserve Board,<sup>8</sup> Dodd-Frank mandated stress tests,

“are intended to provide company management and boards of directors, the public, and supervisors with forward-looking information to help gauge the potential effect of stressful conditions on the ability of these large banking organizations to absorb losses, while meeting obligations to creditors and other counterparties, and continuing to serve as credit intermediaries.”

In order to fulfill this role, individual institutions need to estimate their stress test models using data on their own historical performance. If an institution has adequate historical data on its own performance, data on the performance of other institutions, including data on a “representative

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<sup>7</sup> The Federal Reserve Board has recently reduced the scenarios to two: a baseline and a severely adverse scenario (John Heltman, *American Banker*, January 8, 2019).

<sup>8</sup> Federal Reserve Board, “Dodd-Frank Act Stress Test 2016: Supervisory Stress Test Methodology and Results,” <https://www.federalreserve.gov/bankinforeg/stress-tests/2016-Background-on-Dodd-Frank-Act-Stress-Testing.htm>

bank”, or data on the average performance of the banking system writ large is of secondary importance when calibrating a bank’s own internal models to be used to project the bank’s performance in Dodd-Frank stress scenarios.

The Federal Reserve Board (FRB) does not make extensive public disclosures regarding the details of its own Dodd-Frank stress test model methodology. However, the FRB does disclose that its stress test model uses an “industry average” approach using pooled institution data, and are not bank specific,

“The estimated model parameters are the same for all BHCs and reflect industrywide, portfolio- specific, and instrument-specific response to variation in the macroeconomic and financial market variables. This industrywide approach reflects both the challenge in estimating separate, statistically robust models for each of the 33 BHCs and the desire of the Federal Reserve not to assume that historical BHC-specific results will prevail in the future.” (Board of Governors of the Federal Reserve, 2016, p. 3.)

The difference in focus between the models used by individual institutions and the models used by bank regulatory agencies—firm-specific versus industry average models— raises questions regarding the comparability of forecasts produced by these alternative stress test modeling approaches. Can an industry average representative bank model be used to accurately evaluate the forecasts from bank-specific stress test models? How do the stress scenario forecasts from industry average stress test models compare to forecasts generated by individual bank stress test models when these forecasts are prepared for identical stressful economic scenarios? These issues are fundamentally important and yet they have received relatively little attention in the existing literature.

### III. The Federal Reserve CLASS stress test model

A Federal Reserve Bank of New York Staff Report (Hirtle, et. al., 2015) includes a detailed discussion of the data and estimation methodology underlying the New York Federal Reserve Bank CLASS stress test model. The CLASS model is a representative bank model estimated using publicly available historical data collected in regulatory reports. Bhanot, Hirtle, Kovner, and Vickery (2014) suggest that CLASS model estimates were used in the earliest Federal Reserve SCAP stress test exercise.

The Federal Reserve Board's Dodd-Frank stress test model methodology and data differ from CLASS-style stress test models. FRB Dodd-Frank stress test models are estimated using detailed transaction level data collected from covered institutions under authority of the FRB's Dodd-Frank enhanced supervisory powers. The modeling methodology uses pooled loan level data from covered institutions instead of aggregated quarterly regulatory report data. The data and the details that underlie the FRB's newer stress test modeling methodology are confidential so it is impossible to replicate the FRB's Dodd-Frank stress test forecasting methodology from publically available information.<sup>9</sup> But the information the FRB has made public clearly indicates that the FRB's Dodd-Frank stress test model is also a representative bank model.

To circumvent unit root issues, the CLASS models estimate bank income components in ratio, normalizing quarterly bank income and expense items by bank assets or other balance sheet values (e.g. total loans) that share a common time trend. When estimated in ratio form,

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<sup>9</sup> The Federal Reserve Board has announced plans to provide some additional details and disclosures regarding its Dodd-Frank stress test model, but its new disclosures will be limited so as not to allow banks to replicate the Fed's modeling approach. According to a recent *American Banker* story, in his public comments, Vice Chairman Quarles has remarked that, "With respect to the models, he said, the US has developed a system whereby the Fed's own proprietary model is the binding constraint, meaning that there is a risk in over-divulging its secrets." (John Heltman, *American Banker*, Feb 7, 2019).

bank income components can be successfully modeled as stationary time series. To convert ratio forecasts back into income component projections, the CLASS model applies historical average balance sheet growth rates to forecast asset levels in out-of-sample stress scenario simulations.

The CLASS model forecasts a bank's net non-provision income-to-asset ratio. It disaggregates this ratio into six components that are modeled independently: net interest income, trading income, non-interest non-trading income, compensation expense, expenses related to premises and fixed assets, and other non-interest expense. Each individual component model includes endogenous variables that measure time-varying bank characteristics as well as macroeconomic and financial market variables.

The six CLASS models are estimated using stepwise regression. The CLASS model specification process systematically eliminates variables with weak statistical significance with the goal of producing a parsimonious model, with a high adjusted- $R^2$  and a minimal regression residual standard error estimate. The New York Federal Reserve staff study also suggests that economic priors are used to guide variable selection (Hirtle, et. al., p. 20)<sup>10</sup> but the study does not provide any specific examples in which economic priors overrode typical stepwise regression procedures to determine the final CLASS model specifications.

The within-sample fits of the individual models that comprise the Federal Reserve CLASS model are all exceptional. Many individual CLASS regression models have adjusted  $R^2$  statistics close to 90 percent.

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<sup>10</sup> The CLASS model specification searches do not make use of any information criteria like the AIC, BIC or Mallows Cp statistics.

When it comes to loan and lease loss provision expenses, the CLASS model deviates from using stepwise regression to model the history of the representative bank provision expense series. The CLASS model combines forecasts of loan and lease write-off amounts generated from 15 separate models of loans and lease categories with a judgmental algorithm to generate stress scenario provision expenses.<sup>11</sup> CLASS model loan and lease loss provision estimates are not calibrated to reproduce actual reported historical loan and lease loss provisions.

The presence of variables that measure bank-specific balance sheet and operational characteristics builds flexibility into the CLASS representative model. For example, when an individual bank is evaluated using the supervisory model, the bank's stress scenario projections are based on the bank's own risk characteristics and not the characteristics of the representative bank that are used to estimate the regulatory model. This feature imparts flexibility that is intended to account for bank characteristics that differ from those of the representative bank. However, there is no empirical evidence evaluating how well forecasts from a CLASS-style representative bank model reproduce the forecasts from bespoke bank stress test models.

#### IV. Experimental Design and Data

I use the macroeconomic and financial market conditions that prevailed over the first three years of the 2008 financial crisis as the stress scenario and compare the accuracy of forecasts from alternative stress test models. I estimate stress test models using calibration methods that mimic the methodology used to estimate the New York Federal Reserve's CLASS

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<sup>11</sup> Models that estimate loan and lease writes include First lien and junior lien residential mortgages, home equity lines of credit (HELOC), construction loans, multifamily and non-farm non-residential commercial mortgages, credit cards, other consumer loans, commercial and industrial (C&I) loans, leases, loans to foreign governments, loans to depository institutions, agriculture loans, other real estate loans, and all other loans. <sup>11</sup> Quarterly loan and lease write-off amounts are scaled by loan and lease initial balances.

stress test model. I focus on CLASS-style stress test models because the CLASS methodology has been publically disclosed and these models can be estimated using publically available regulatory data.

The analysis uses quarterly bank regulatory Call report data<sup>12</sup>, quarterly data on financial market and economic conditions derived from the Federal Reserve Bank of Saint Louis FRED database, and data on real home prices from the American Enterprise Institute Center for Housing Markets and Finance to estimate CLASS-style models. The macroeconomic and financial market explanatory variables included in stress test model regressions are reported in Table 1 along with summary statistics for these data.<sup>13</sup>

I estimate a CLASS-style model using historical data for a representative bank. The representative banks data is constructed as the asset-weighted average of all insured depository institutions. The explanatory variables that measure bank-specific balance sheet and operational characteristics that are included in the first step of CLASS-style model are reported in Table 2 along with summary statistics for the data of the representative bank.

I estimate individual stress test models and compute stress scenario forecasts for all traditional banks with total assets in excess of \$100 billion as of June 2008, provided the banks remained independent through June 2011. Table 3 lists the 19 insured US depository institutions with reported assets in excess of \$100 billion as of June 2008. Four of these institutions—Countrywide, Wachovia, Washington Mutual and National City Bank—were merged into an acquiring institution between September 2008 and June 2011. I exclude FIA Card Services from

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<sup>12</sup> The quarterly regulatory report, “Reports of Condition and Income” are typically referred to as “Call” reports.

<sup>13</sup> All Tables appear at the end of the paper.

the analysis because it is not a traditional bank. It is a specialized credit card bank and would require a different modelling algorithm.<sup>14</sup>

I compare forecasts from the representative bank model to stress test forecasts from individual bank CLASS-style stress test models and to each bank's actual performance over the first 12 quarters of the financial crisis (September 2008 through June 2011).

The representative bank model and each bank-specific stress test model are estimated following an identical CLASS-style algorithm. The only thing that differs is the historical bank data that is used to estimate the models.

For each bank, I use data from March 1993 to June 2008 to construct a stress test model. I use this model to project the bank's ratio of earnings before tax and extraordinary items to assets (INBFTXEX) over the period September 2008 through June 2011 using the macro and financial market data from this period as the stress scenario inputs. This stress test scenario encompasses financial market and macroeconomic conditions generated by the worst US recession since the Great Depression. Under simplifying assumptions (discussed below), I can convert each bank's actual and forecasted profit and loss into projections of its capital adequacy over each quarter of the stress test period.

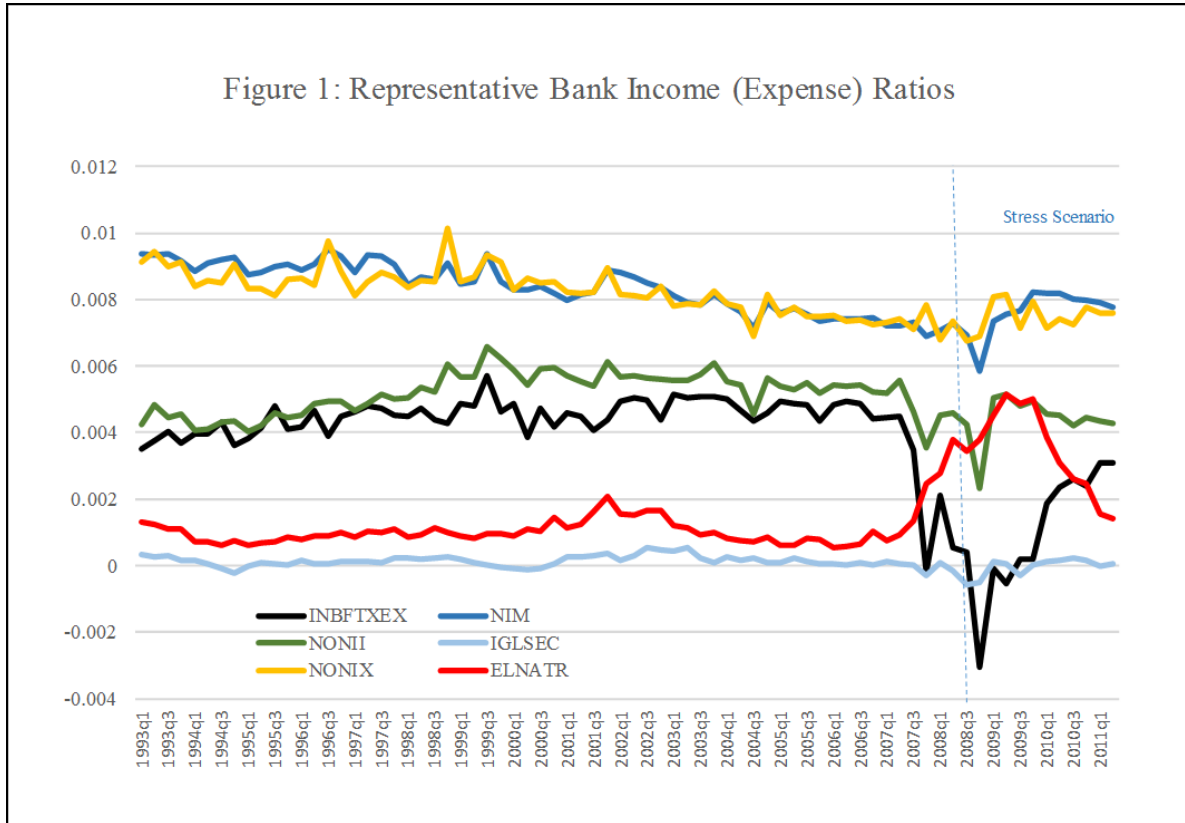
Figure 1 plots representative bank data for the ratio of income before tax and extraordinary items to assets (INBFTXEX), and its five component ratios: net interest income to assets (NIM), noninterest income to assets (NONII), noninterest expense to assets (NONIX),

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<sup>14</sup> FIA Card Services has characteristics that differ markedly from the other banks in the analysis. Because it is a credit card bank it does not make any loans in some of the loan categories included in the first stage of the CLASS model. As a consequence, the first step CLASS model design matrix is singular. FIA must be modeled with a different algorithm than is used to fit the other banks' CLASS models. I omitted FIA Card Services to maintain the consistency of the estimation process across all estimated stress test models.

loan and lease loss provision expense to assets (ELNATR) and securities gains (losses) to assets (IGLSEC). The relationship between INBFTXEX and its the five earnings/expense component ratios is,

$$INBFTXEX_t = NIM_t + NONII_t - NONIX_t - ELNATR_t + IGLSEC_t \quad (1)$$



When a bank constructs its own stress test models, it is natural that it would model its own historical performance data. The bank's own profit and loss history are most closely tied to the loan underwriting, capitalization, funding, and other risk management policies practiced by bank management and only indirectly related to the average performance characteristics of the entire industry.

When building individual bank stress test models it is important to recognize that most of the largest U.S. banks attained their size in part by acquiring other bank assets through mergers.



For example, between March 1993 and June 2008, JP Morgan Chase Bank<sup>15</sup> acquired or otherwise absorbed the assets of 225 depository institutions. Over the same period, Bank of America<sup>16</sup> acquired or otherwise absorbed 305 depository institutions. While mergers do not impact the construction of the representative bank data, they must be taken into account when constructing the data used to estimate individual bank stress test models.

When a bank acquires or merges with another institution, it can cause jumps and discontinuities in the bank's reported income statement and balance sheet values. To control for these events, I merger adjust each individual bank's data by combining the bank's reported data with the data reported by merged and acquired banks for all quarters prior to the merger. The merger-adjusted bank data simulates data that would have been reported by the bank if it had absorbed each acquired institution beginning in March 1993 (or the date the acquired institution was first chartered) and merged using the pooling method for merger accounting.<sup>17</sup>

Figure 2 illustrates the construction of merger-adjusted data for bank A, the surviving bank. In this example, at date t1, bank A acquires bank B, and bank B ceases to exist as a separate depository. Bank B no longer issues Call reports. At date t2, Bank C acquires bank D, and D stops issuing call reports. At date t3, bank A acquires bank C, and bank C no longer issue a regulatory report. The merger-adjusted data for bank A is constructed as the sum of balance sheet and income statement variables for banks A, B, C and D from date t0 to date t1. At date t1, the merger-adjusted data for bank A is constructed as the sum of the balance sheet and income

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<sup>15</sup> Bank Cert 628.

<sup>16</sup> Bank Cert 3510.

<sup>17</sup> Under pooling-of-interests accounting treatment, the target bank's assets, liabilities, and owner's equities are combined with those of the acquiring bank at book value. Under purchase accounting treatment, the assets of the target bank are marked to market before they are combined with the acquiring bank's assets. Any difference between the purchase price and the implied mark-to-market value of target bank's equity is recorded as goodwill in the acquiring bank's balance sheet. My method for merger adjusting the data implicitly assumes that all mergers used pooling-of-interests accounting.

statement items reported by banks A, C and D. At date t2, bank D stops reporting, so the merger-adjusted data for bank A is the sum of the Call report components for banks A and C. At date t3, bank C is acquired by bank A. From date t3 onwards, the Call report data from bank A includes all the assets (and income) from the previously merged banks.

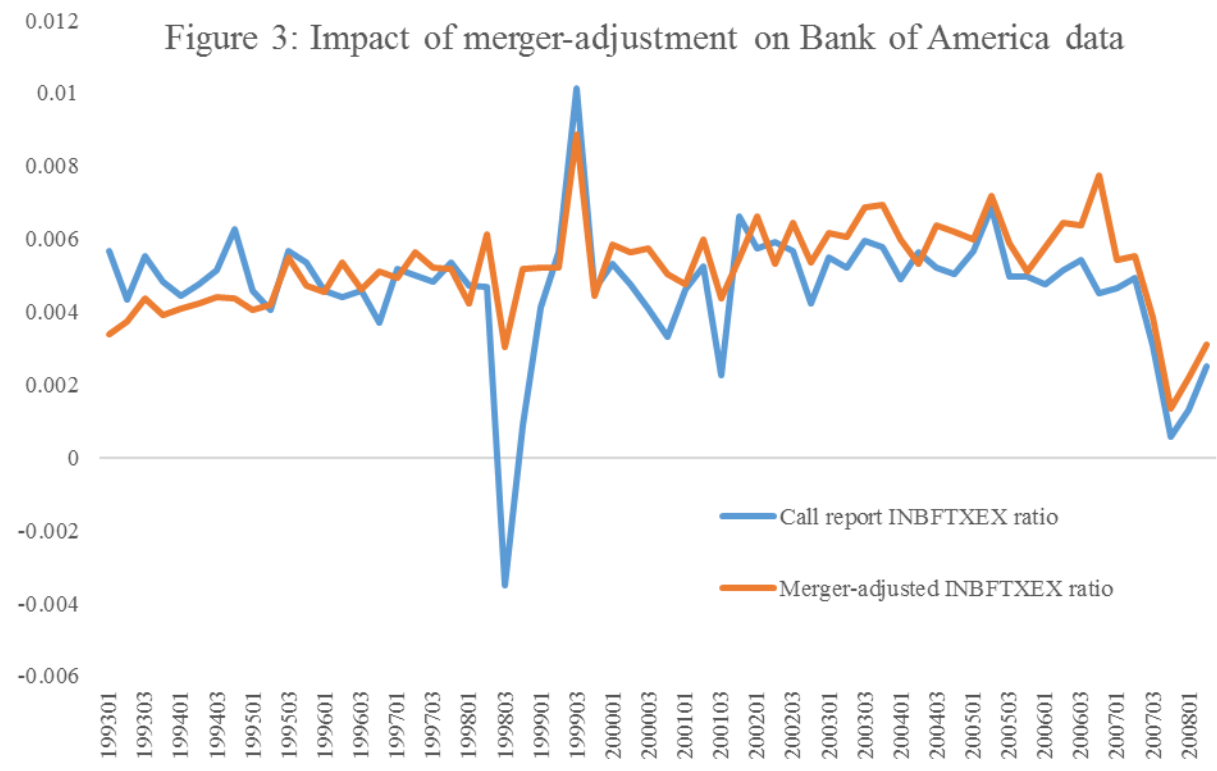
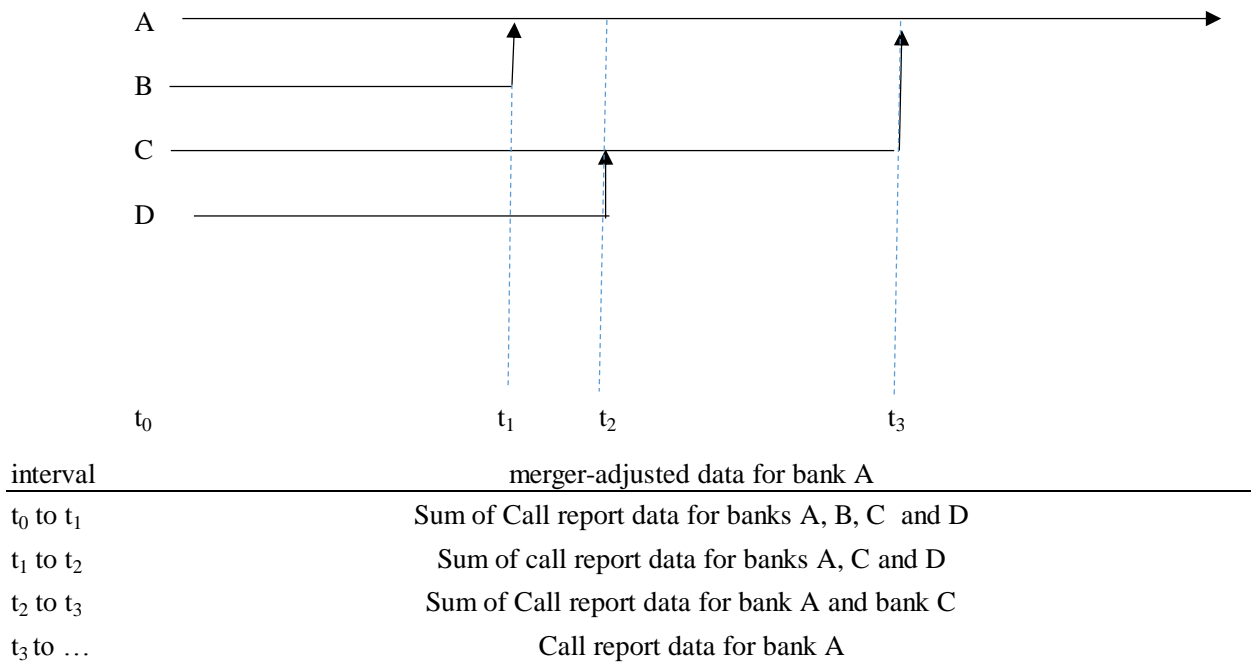
The merger-adjustment process can have a noticeable impact on an individual bank's historical data. Figure 3 plots the unadjusted and merger-adjusted ratio of income before tax and extraordinary items to assets (INBFTXEX) for Bank of America for the period March 1993 through June 2008. The merger-adjustment includes all banks acquired between March 1993 and June 2008. For Bank of America, the merger-adjustment smooths the INBFTXEX series and raises the series average from the mid-1990s through June 2008.

All CLASS-style models are estimated using backward stepwise regression. The algorithm starts with all potential explanatory variables in the model and, at each step identifies the variable whose estimated coefficient has the highest probability of being consistent with the null hypothesis that the coefficient has a 0 value (the coefficient estimate with the largest t-test p-value). The variable is eliminated, the model is re-estimated, and the variable with highest p-value is again identified and eliminated. The constant term is retained in the regression regardless of its statistical significance. The algorithm continues until the process maximizes the regression's adjusted R-square statistic.<sup>18</sup>

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<sup>18</sup> The algorithm is equivalent to backward stepwise regression in STATA, including a constant, and eliminating explanatory variables with a p-value in excess of 0.32.

**Figure 2: Merger-adjustment methodology**



## V. Model Estimates

Tables 4-8 report the CLASS-style model estimates for the 5 component ratios that comprise INBFTXEX—NIM, NONII, NONIX, ELNATR and IGLSEC. Each table includes, in the first column, CLASS-style model estimates for the representative bank followed by the CLASS-style model estimates for each individual bank. Individual bank CLASS models are estimated using the same stepwise regression algorithm used to construct the representative bank model after substituting the bank's own merger-adjusted data from March 1993 to June 2008. Each of the five component models includes macroeconomic and financial market factors in addition to bank-specific characteristics.

All of the representative bank models have excellent within-sample fits. The model with the least explanatory power, noninterest expense to assets (NONIX), has an adjusted R-squared in excess of 75 percent. The model estimates for loan and lease loss provision expense, a critical component determining losses in a stress scenario (the red series in Figure 1), has an adjusted R-squared of nearly 94 percent.

The bank-specific CLASS-style models, with few exception, exhibit lower adjusted R<sup>2</sup> statistics compared to their representative bank counterparts. This is not surprising given that individual bank data can be expected to contain a greater share of idiosyncratic noise compared to representative bank data where the averaging process reduces idiosyncratic variation.

The coefficients in the individual bank-specific stress test models typically emphasize a different set bank characteristics relative to the representative bank model. For example, among the bespoke NIM models, JPMorgan Chase, Bank of America, BB&T and State Street each include only one of the non-zero bank-specific factors that are included in the representative

bank model, and for two of these banks, Bank of America and State Street, the single common bank-specific factor has a different coefficient sign than appears in the representative bank model. Such differences are to be expected if the individual banks are heterogeneous in their exposures and business operations.

## VI. Stress Test Forecasts of Bank Profit and Loss

Forecasts from the alternative stress test models are compiled for the first 12-quarters of the 2008 financial crisis (September 2008-June 2011). Forecasts are compiled separately for each of the 5-component stress test models, NIM, NONIL, NONIX, ELNATR and IGLSEC. The resulting forecasts are combined using equation (1) to generate a forecast for INBFTXEX.

The stress test forecasts are true out-of-sample forecasts. They use coefficient estimates derived from a sample that ends in June 2008. The forecasts use the actual quarterly values for the financial market and macroeconomic factors over the 12-quarter stress period. In the initial forecast quarter, lagged dependent variables are set to June 2008 values. In subsequent quarters, lagged dependent variables are set equal to lagged forecast values. For example, should a NIM model include a lagged dependent variable, the NIM forecasts for September 2008 uses the actual NIM value from June 2008. For the December 2008 NIM forecast, the lagged dependent variable is set equal to the September 2008 NIM forecasted value.

While the bank-specific explanatory variables are endogenous, regulatory stress tests typically do not model or forecast these variables. The approach taken by the Federal Reserve is to hold these variables fixed at their June 2008 values throughout the stress scenario forecast. My forecasts are calculated using this Fed convention.

Many of the large banks I examine acquired banks during the first 12 quarters of the financial crisis. These mergers complicate the process of evaluating the accuracy of 12-quarter forecasts made using bank data from June 2008. When the acquired bank is merged, the acquiring institutions Call report data are augmented to reflect the deposits, loans, securities, deposits and other characteristics of the newly-merged institution. A 12-quarter forecast made using initial conditions set equal to the bank's June 2008 call report data cannot be expected to accurately forecast the bank's INBFTXEX at a subsequent quarter should the bank acquire assets and liabilities from a merging institution.

When forecasting using a representative bank stress test model, the stress test model coefficient estimates are not impacted by mergers. The assets of a merged bank remain in the banking system and are merely transferred to the acquiring institution. The acquiring institution's Call report data and asset weight are augmented by the exact increments needed to keep the representative bank's data from being impacted by the merger.

While representative bank stress test model coefficients estimates are not altered by mergers, representative bank model stress test forecasts must be adjusted when the institution of interest acquires another bank in the stress test period. Because the 12-quarter stress test forecasts are dynamic— meaning that, after the first quarter forecast, lagged dependent variables are set equal to lagged forecast values—to account for mergers in the stress period, stress test forecasts must be constructed from forecasts from multiple merger-augmented banks' over the stress period.

Figure 3 illustrates how the representative bank model stress test forecast for bank A is adjusted to account for acquisitions the bank makes within the stress test forecast period. In the example in Figure 3, Bank A acquires Bank E in 2008 Q3, Bank F in 2008 Q4, Bank G in 2009

Q1 and Bank H in 2009 Q2. To adjust the representative bank model stress test for these mergers, it is necessary to construct 2008 Q2 data for four hypothetical banks.

The first stress test quarter forecast, 2008 Q3, uses data from June 2008 for the representative bank model initial conditions. When there are mergers in the stress test interval, it is necessary to construct 2008 Q2 initial conditions for each of the merger-augmented banks.<sup>19</sup> The 2008 Q2 initial conditions for these combined banks along with the coefficient estimates of the representative bank model are used to construct 12-quarter stress test forecasts for each merger-augmented bank.

The merger-adjusted stress test forecast is constructed from selected quarters taken from each of the merger-augmented banks' stress test forecasts. In the example in Figure 3, the merger-adjusted stress test forecast uses the 2008 Q3 forecast for union of bank A and E; the 2008 Q4 forecast for the union of banks A, E and F; the 2009 Q1 forecast for the union of banks A, E, F and G; and the 2009 Q2 forecast for the union of banks A, E, F, G and H. If there are no additional mergers in the forecast period, the remaining forecasts are the subsequent quarterly forecasts for the union of banks A, E, F, G and H. Depending on a bank's merger history during the stress period, the merger adjustment process could require the construction of as many as 12 separate merger-augmented bank forecasts to be used as inputs into the construction of the merger-adjusted forecast.

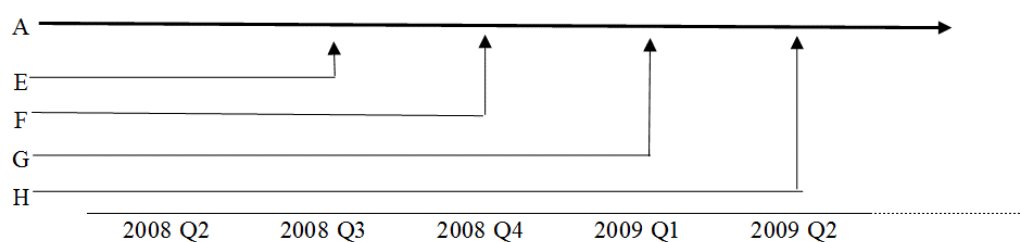
If bank stress test performance is projected using a bank-specific model, the merger-adjustment process for the stress test forecast is more complex. Using Figure 3 as the example, the additional steps involve constructing merger-adjusted data for each of the four merger-

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<sup>19</sup>In the case of Figure 3, this requires calculating initial conditions for four merger-augmented banks: banks A and E; banks A, E and F; banks A, E, F and G; banks A, E, F, G, and H.

augmented banks for the period 1993 Q2 through 2008 Q2. These merger-adjusted data are used to estimate bank-specific stress test models for each of the stress period merger-augmented banks. The stress test model coefficient estimates for the merger-augmented banks along with appropriate initial conditions (calculated as in Figure 3) are used to generate 12-quarter stress test forecasts for each merger-augmented bank. The merger-adjusted stress test forecast is assembled from the stress period forecasts of these merger-augmented banks following the same process outlined in Figure 3. Again, depending on the merger history in the stress test period, merger adjusting a bank's stress test forecast could require estimating up to twelve merger-augmented stress test models, 12 sets of merger-augmented initial conditions, and extracting appropriate quarterly forecasts from up to a dozen 12-quarter stress scenario forecasts.

**Figure 4: Merger-Adjusting Stress Test Initial Conditions**



quarter	Initial Conditions mnemonic	Summation of banks' 2008 Q2 Call report data needed to construct merger-adjusted initial forecast conditions
2008 Q3	8Q3	Bank A + Bank E
2008 Q4	8Q4	Bank A + Bank E + Bank F
2009 Q1	9Q1	Bank A + Bank E + Bank F + Bank G
2009 Q2	9Q2	Bank A + Bank E + Bank F + Bank G + Bank H

Construction of a Merger-Adjusted Stress Test Forecast				
Forecast Initial Conditions	Forecast Quarter			
	2008 Q3	2008 Q4	2009 Q1	2009 Q2
2008 Q3	F(2008Q3,8Q3)	F(2008Q4,8Q3)	F(2009Q1,8Q3)	F(2009Q2,8Q3)
2008 Q4	F(2008Q3,8Q4)	F(2008Q4,8Q4)	F(2009Q1,8Q4)	F(2009Q2,8Q4)
2009 Q1	F(2008Q3,9Q1)	F(2008Q4,9Q1)	F(2009Q1,9Q1)	F(2009Q2,9Q1)
2009 Q2	F(2008Q3,9Q2)	F(2008Q4,9Q2)	F(2009Q1,9Q2)	F(2009Q2,9Q2)
Merger-Adjusted Stress Test Forecast	F(2008Q3,8Q3)	F(2008Q4,8Q4)	F(2009Q1,9Q1)	F(2009Q2,9Q2)

Notes: The notation F(t,IC) represents a dynamic stress test forecast for quarter t based on the initial forecast



## VII. Stress test forecasts of bank capital adequacy

Under a few simple assumptions, the stress scenario quarterly forecasts of INBFTXEX can be used to estimate the impact of bank profits and losses on a bank's capital position. Assuming that, over the stress scenario, the bank forgoes making any capital distributions (dividends or share buybacks), does not raise any new external capital or undertake any assets sales, and reinvests any profits and absorbs any losses by scaling up or down its existing equity, investments and operations, it can be shown<sup>20</sup> that the bank's equity-to-asset ratio will evolve according to the following equation,

$$\frac{equity_t}{assets_t} = \left( \frac{equity_{t-1}}{assets_{t-1}} + INBFTXEX_t \right) / (1 + INBFTXEX_t) \quad (2)$$

Using a bank's reported June 2008 equity-to-asset ratio and the actual and forecasted quarterly values of INBFTXEX over the stress scenario, equation (2) can be used to project the evolution of the bank's ratio of equity-to-assets over the course of the stress test scenario. Since this approach begins with a bank's capital position as of June 2008 and then adjusts the capital ratio dynamically using only additions and subtractions generated by the bank's quarterly INBFTXEX, these estimates are free from any distortion introduced by capital injections from government assistance programs like TARP.<sup>21</sup>

Table 9 reports the actual quarterly realizations of the INBFTXEX ratio for each of the 14 institutions over the 12 stress test quarters. Five of these banks, JPMorgan Chase, US Bank, BB&T, PNC, and State Street posted profits in all 12 quarters. The four largest single quarterly

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<sup>20</sup> See Appendix 1.

<sup>21</sup> TARP capital injections were made at the holding company level, not at the bank level. However, the bank holding company could, if needed or deemed desirable, pass some (or all) of the new TARP capital down to the bank.

losses are Region's Bank (-4.76%), Bank of New York (-2.39%), Citibank (-1.13%), and Capital One (-1.03%). Bank of America and Wells Fargo each experienced only a single quarterly loss of minor magnitude over the entire 12-quarter period. It is, of course, the cumulative impact of gains and losses that will determine whether a bank has sufficient capital to survive the stress test scenario.

The top panel of Table 10 lists the actual equity-asset ratios for each bank calculated using Call report data for each of the 12 stress test quarters. The bottom panel of Table 10 reports the quarterly values of each institution's equity-to-asset ratio calculated using each bank's reported INBFTXEX ratio, the passive operating assumption, equation (2) and each institution's actual reported equity-to-asset ratio in June 2008 as an initial condition.

A comparison of the top and bottom panels of Table 10 suggests a number of interesting features of each bank's capitalization history. In the case of Bank of America, Citibank, Sun Trust, Region's Bank, BB&T, PNC, HSBC and RBS, it is likely that at least some TARP capital injected at the bank holding company level was passed down to bolster the bank's capital adequacy position. Each of these banks' reported quarterly INBFTXEX values that were insufficient to generate the equity-to-asset ratios reported on their Call reports.

A comparison of the top and bottom panels of Table 10 justifies the use of a passive operating assumption and equation (2) to estimate the equity-to-asset ratios these banks would have reported in the absence of capital infusions or payouts over the first 12 quarters of the financial crisis. The estimates in lower panel of Table 10 are reasonable baseline estimates of the capital ratios each bank would have posted had each retained all its earnings, absorbed losses, and avoided share repurchases, asset sales, and external capital injections over the first 12 quarters of the financial crisis.

I arbitrarily set 6 percent as the minimum equity capital ratio that a bank must maintain to “pass” the stress test. Since I provide data on all institutions capital positions, an interested reader can easily see the implications of selecting a different minimum capital threshold. Using the 6-percent minimum equity-asset ratio as the pass/fail criteria, the estimates in the bottom panel of Table 10 suggest that two banks (Bank of New York and HSBC) would have failed the stress test during the first 12 quarters of the financial crisis had they followed the passive operating strategy and avoided raising any new capital.

I estimate the additional capital a bank needs to pass the stress test by calculating the increase in each bank’s June 2008 equity that is needed to enable the bank to maintain a minimum equity-asset ratio of 6-percent in every stress test quarter. My estimates suggest that the Bank of New York would have met the 6-percent stress test capital threshold with an additional \$91 million of equity capital in June 2008. HSBC would have passed with an additional \$60 million of equity capital. Overall, the estimates in the bottom panel of Table 10 do not suggest that these two banks were deeply undercapitalized. An additional \$151 million of equity capital in June 2008 would have been sufficient to maintain a 6 percent equity-asset ratio at all 14 banks without any emergency risk management measures—meaning the banks passed while passively managing their June 2008 positions and operations over the first three years of the financial crisis.

The top panel of Table 11 reports quarterly INBFTXEX stress scenario forecasts generated by the representative bank stress test model for each of the 14 banks. These forecasts are adjusted for all bank acquisitions that were completed between September 2008 and June

2011.<sup>22</sup> In contrast to the actual results reported by these banks, the representative bank stress test model forecasts very large and persistent losses at JPMorgan Chase, Bank of America, Citibank, HSBC, and Bank of New York. The model projects smaller reoccurring losses for State Street.

The bottom panel of Table 11 reports the stress scenario forecasts of each bank's equity-asset ratio using equation (2) and the passive operating assumptions. The large negative quarterly INBFTXEX forecasts quickly exhaust the capital of JPMorgan Chase, Bank of America, Citibank, HSBC and Bank of New York. Using the representative bank model to forecast their stress scenario performance, each of these banks dramatically fails the stress test, ending the 12-quarters with extremely large projected capital shortfalls. JPMorgan Chase, Bank of America and Citibank are estimated to each require hundreds of billions of dollars in additional equity capital to survive the stress test. Bank of New York and HSBC are estimated to need tens of billions of dollars in additional equity capital. State Street also fails to maintain the required 6-percent minimum equity-asset ratio, but its estimated equity-capital shortfall, \$125 million, is more manageable. In total, the representative bank model estimates that these 14 large banks face a equity capital deficit of \$924 billion if they are to remain well-capitalized throughout the stress scenario.<sup>23</sup>

Table 12 reports the results of the stress test when bank-specific CLASS-style models are estimated and used to forecast INBFTXEX. The forecasts in the top panel of Table 12 are fully merger-adjusted. Bank-specific CLASS models coefficients are re-estimated to reflect stress

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<sup>22</sup> The representative bank model coefficients are unaffected by stress period mergers. However, stress period forecasts are impacted by merger-induced changes in initial forecast conditions as previously discussed.

<sup>23</sup> The Troubled Asset Relief Program (TARP) was created under the authority of the Emergency Economic Stabilization Act of 2008. TARP originally allocated \$700 billion that could be used to purchase of assets of or inject capital into targeted financial institutions.

period acquisitions using merger-adjusted quarterly data from June 1993 through June 2008. June 2008 initial forecast conditions are also adjusted to account for stress period mergers.

The bank-specific CLASS style model forecasts repeated large quarterly losses at Bank of New York. These losses exhaust the bank's capital and, by the end of the stress scenario, it has a large negative equity position. Bank-specific stress test models also forecast modest but repeated losses at JPMorgan Chase, PNC and Capital One, but only in the case of JPMorgan Chase do the cumulative losses push the bank below the 6-percent minimum equity-to-asset threshold.

When the banks are allowed to use their own data to estimate CLASS-style stress test models and forecast their stress scenario performance, only two banks are projected to fail the stress test: JPMorgan Chase and Bank of New York. Model estimates suggest that the Bank of New York would require almost \$13 billion of additional capital in June 2008 to pass the stress test. JPMorgan Chase is estimated to require an additional \$16 billion in capital to meet the 6-percent equity-capital minimum throughout the period.

## VIII. Discussion

The analysis highlights the policy uncertainty inherent when stress tests are used to set institution-specific required minimum capital levels or to assess the overall capital adequacy of the banking system. Actual bank outcomes suggest that only two banks (Bank of New York and HSBC) would fail to maintain a 6 percent minimum equity-to-asset threshold throughout the stress period but would together require only \$151 million in additional equity capital to remain capitalized above the 6 percent threshold. In contrast, the representative bank CLASS-style stress test model forecasts the failure of 6 banks, and all by large margins. In aggregate, forecasts

from the representative bank model suggest that these 6 failing banks would require an additional \$924 billion in equity capital to pass the stress test. Finally, CLASS-style stress test models estimated using each bank's own historical data predict two stress test failures (Bank of New York and JPMorgan Chase) with an aggregate equity capital shortfall of nearly \$29 billion.

Had these stress tests been run in July 2008 using a stress scenario that anticipated the exact financial market and macroeconomic data that materialized over the next three years, regulatory authorities would have faced a policy conundrum: they would have to decide whether they were facing a US banking system that was moderately undercapitalized (a \$29 billion capital shortfall), or massively undercapitalized (a \$925 billion capital shortfall). At the time of the stress test, no one could have known the actual outcome for these 14 institutions (a shortfall of \$151 million).

The uncertainty facing regulatory authorities is compounded by the fact that, in July 2008 when this hypothetical stress test takes place, there is no tool or data analysis authorities can use to determine which stress test estimates are likely to be more realistic. Authorities could compare stress test models using the respective models' fit within the estimation sample, but each model is estimated using a different data set. By design, the modelling approach generates the best-fit for its estimation sample (according to the adjusted- $R^2$  statistic). Unless the stress test model coefficient estimates for the representative bank model and a bank-specific CLASS-style model exactly agree, the bank-specific model will always provide a better adjusted  $R^2$  fit for a bank's own historical data. The reverse is also always true. A further limiting factor is the small sample size (61 quarterly auto correlated observations) that authorities have to work with. In this setting, there are no statistical tests I am aware of that can accurately determine which stress test forecast is likely to be more reliable.

## IX. Conclusion

The findings in this study suggest that when stress tests are used to judge the capital adequacy of the largest US banks, to a large extent, the outcome of the stress test exercise depends on the expert judgement of regulatory authorities. Consider for example a hypothetical stress test exercise conducted in July 2008 with an economic scenario that exactly mimics the first 12 quarters of the great recession financial crisis. Forecasts from a representative bank stress test model suggest that, faced with this scenario, 6 of the 14 largest US banks would become deeply insolvent. In contrast, forecasts from bank-specific stress test models suggest that only 2 of 14 institutions would fail to maintain the required 6 percent equity-asset ratio. The actual data show that only 2 of the 14 institutions actually failed to maintain a 6-percent equity-asset ratio, and for these institutions, only \$151 million of additional equity would have permitted them to pass the stress test.

Regarding financial stability assessments, forecasts from the alternative stress test models indicate that these 14 large banks would have required, in aggregate, somewhere between \$29 billion and \$925 billion in new equity capital to ensure each institution's solvency throughout the stress scenario. Unfortunately, there are no existing statistical methods (of which I am aware) then or now that can be used to select which capital estimate—\$925 billion, \$29 billion, or some intermediate amount—as the “correct” amount of additional equity capital needed to ensure financial stability. Whatever the estimate of the capital shortfall, because of the extreme range of model estimates, the stress test exercise provides little practical guidance. The shortfall must be based largely on regulatory judgement.

It is possible, even likely, that alternative stress test modelling approaches can generate a smaller difference between the capital shortfall estimates produce by competing stress test model

approaches. However, it is unclear how much convergence can be achieved by modifying stress test modeling techniques alone. If banks differ in some important dimension(s), it seems unlikely that the stress test forecast from a representative bank model will closely align with forecasts from individual bank-specific stress test models.

## Appendix

Using the following two dynamic identities,

$$equity_t = equity_{t-1} + assets_{t-1} \times INBFTXEX_t$$

$$assets_t = assets_{t-1} + assets_{t-1} \times INBFTXEX_t$$

the bank's ratio of equity to assets has the following dynamics,

$$\frac{equity_t}{assets_t} = \frac{equity_{t-1} + assets_{t-1} \times INBFTXEX_t}{assets_{t-1} + assets_{t-1} \times INBFTXEX_t}$$

Multiplying by  $\left(\frac{1}{assets_{t-1}} / \frac{1}{assets_{t-1}}\right)$  yields the desired relationship.



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**Table 1: Stress Test Macroeconomic and Financial Market Explanatory Variables**

Macroeconomic and Financial Conditions Variables	Minimum	Maximum	Average	Median	Standard deviation
Nominal Quarterly GDP growth rate, SAAR	-7.70	10.20	4.67	4.90	2.89
civilian unemployment rate, unadjusted +	3.80	10.00	5.82	5.50	1.64
10-year Treasury yield*	2.71	7.84	5.00	4.88	1.22
3-month Treasury yield*	0.04	6.23	3.29	3.60	2.01
Moody's AAA yield*	4.57	8.55	6.39	6.39	1.01
Moody's Baa yield*	5.04	9.19	7.19	7.27	1.01
Federal funds rate*	0.09	6.52	3.45	4.06	2.09
Wilshire quarterly market index return	-22.92	21.51	2.44	3.29	8.69
Wilshire daily return standard deviation	-0.87	4.22	1.02	0.86	0.63
Kansas City Fed Financial Stability Index (FSI) quarterly average	-0.94	5.56	0.11	-0.29	1.13
VIX daily average	11.03	58.60	20.57	19.92	8.02
VIX quarterly percent change	-82.41	127.50	3.58	-0.49	30.70
Change in Real House Price Index	-6.25	4.68	0.32	0.85	2.08

Notes: Quarterly data for the period March 1993 through June 2011. All data except the change in the real house price index are from the Federal Reserve Bank of St. Louis economic research department public database <https://fred.stlouisfed.org/>. The change in the real house price index is the American Enterprise Institute International Center on Housing Risk calculated quarterly as FHFA's all-transaction house price index divided by BEA's price index for personal consumption expenditures. + Indicates unemployment rate on the first day following quarter-end. \* Indicates interest yield on the first day of each quarter.

**Table 2: Stress Test Bank Balance Sheet and Income Statement Explanatory Variables**

Variables	Variable definitions (FDIC SDI variable names)	Representative Bank Sample Statistics				
		Minimum	Maximum	Average	Median	Standard deviation
Income before tax and extraordinary items to total assets	$(nim_t + nonii_t + iglsec_t - elnatr_t - nonix_t) / asset_t$	-0.297	0.520	0.372	0.431	0.161
Net Interest Income to total assets	$nim_t / asset_t$	0.566	0.925	0.804	0.811	0.072
Noninterest income to total assets	$nonii_t / asset_t$	0.231	0.600	0.496	0.504	0.067
Noninterest expense to total assets	$nonix_t / asset_t$	0.631	0.937	0.794	0.806	0.063
Provisions for loan and lease losses to total assets	$elnatr_t / assets_t$	0.053	0.502	0.143	0.097	0.110
Securities gains and losses to total assets	$glsec_t / asset_t$	-0.053	0.054	0.010	0.010	0.019
Total securities to total assets	$sc_t / asset_t$	14.625	23.616	18.975	18.964	2.129
Trading account assets to total assets	$trade_t / asset_t$	2.095	7.554	4.732	4.705	0.999
Other real estate owned to total assets	$ore_t / asset_t$	0.047	0.944	0.179	0.097	0.181
Income earned, not collected on loans to total assets	$oaienc_t / asset_t$	0.361	0.662	0.457	0.445	0.064
Total unused commitments to total assets	$uc_t / asset_t$	30.611	69.053	55.253	60.417	11.488
Notional value of derivative positions to total assets	$obsdir_t / asset_t$	213.936	1829.845	792.183	632.296	460.756
Total loans and leases to total assets	$lnlsgr_t / asset_t$	54.045	63.289	60.003	60.593	1.943
Construction and development loans to total assets	$lnrecons_t / asset_t$	1.660	4.891	2.873	2.877	1.037
Commercial real estate loans to total assets	$lnrenres_t / asset_t$	6.344	8.331	7.190	7.305	0.534
1 to 4 family residential loans to total assets	$lnrrers_t / asset_t$	18.299	23.857	20.821	20.567	1.318
Commercial and industrial loans to total assets	$lnci_t / asset_t$	8.745	14.856	11.748	11.636	1.799
Consumer loans to total assets	$lncon_t / asset_t$	7.705	10.874	9.159	9.054	0.894

Notes: The data are calculated from Statistics on Depository Institutions (SDI) quarterly data as reported on the Federal Deposit Insurance Corporation's public website for the period March 1993 through June 2011. The exact variable definitions are reported in the SDI's "Read me" file. Variables with a "t" subscript represent the aggregate value for all reporting institutions in quarter "t" for the SDI variable of the same name. Income and expense variables are quarterly values calculated from the year-to-date data reported in SDI.

**Table 3: Depository Institutions with more than \$100 billion as of June 2008**

cert	Name of insured depository	Holding company	depository assets
1 628	JPMorgan Chase Bank, National Association	JPMORGAN CHASE & CO.	1,378,468,000
2 3510	Bank of America, National Association	BANK OF AMERICA CORPORATION	1,327,429,079
3 7213	Citibank, National Association	CITIGROUP INC.	1,228,445,000
4 33869	Wachovia Bank, National Association	WACHOVIA CORPORATION	670,639,000
5 3511	Wells Fargo Bank, National Association	WELLS FARGO & COMPANY	503,327,000
6 32633	Washington Mutual Bank	WASHINGTON MUTUAL, INC	307,021,614
7 6548	U.S. Bank National Association	U.S. BANCORP	242,307,928
8 57890	HSBC Bank USA, National Association	HSBC HOLDINGS PLC	177,466,246
9 867	SunTrust Bank	SUNTRUST BANKS, INC.	171,500,853
10 33318	FIA Card Services, National Association	BANK OF AMERICA CORPORATION	165,349,652
11 6557	National City Bank	NATIONAL CITY CORPORATION	151,164,598
12 12368	Regions Bank	REGIONS FINANCIAL CORPORATION	139,353,930
13 14	State Street Bank and Trust Company	STATE STREET CORPORATION	138,858,742
14 9846	Branch Banking and Trust Company	BB&T CORPORATION	132,884,104
15 57957	RBS Citizens, National Association	THE ROYAL BANK OF SCOTLAND GROUP PLC	132,050,955
16 639	The Bank of New York	THE BANK OF NEW YORK MELLON CORPORATION	130,062,000
17 6384	PNC Bank, National Association	THE PNC FINANCIAL SERVICES GROUP, INC.	128,348,405
18 33143	Countrywide Bank, FSB	COUNTRYWIDE FINANCIAL CORPORATION	116,384,145
19 4297	Capital One, National Association	CAPITAL ONE FINANCIAL CORPORATION	108,520,315

**Table 4: CLASS-Style Model Estimates for Net Interest Income to Assets (NIM)**

Explanatory Variable	Representative Bank	JPMorgan Chase	Bank of America	Citibank	Wells Fargo	US Bank	Sun Trust	Regions Bank	BB&T Bank	PNC Bank	Capital One Bank	Bank of New York	State Street Bank	HSBC bank	RBS
Lagged dependent variable		-0.304 (-2.41)		0.249 (2.35)	-0.195 (-1.57)			-0.181 (-1.60)	-0.159 (-1.28)	-0.206 (-1.79)			0.695 (7.31)	-0.480 (-3.67)	-0.350 (-2.57)
Trading account assets to total assets		0.023 (3.24)		-0.017 (-2.58)									0.003 (1.07)		-0.560 (-1.19)
Total securities to total assets		-0.008 (-1.34)		-0.026 (-3.92)					-0.024 (-1.66)		-0.067 (-2.56)			0.025 (3.50)	
Other real estate owned to total assets	0.109 (2.87)				0.198 (1.44)		0.563 (2.51)	0.539 (2.39)		0.586 (4.33)		0.148 (1.34)			0.140 (1.10)
Uncollected earned income on loans to total assets	0.118 (1.43)	0.461 (2.53)	-0.306 (-1.54)			3.621 (2.77)		0.638 (3.28)		0.896 (3.09)	1.361 (1.28)	0.772 (2.45)			1.851 (2.08)
Total unused commitments to total assets			-0.004 (-1.70)	0.001 (1.45)			-0.008 (-1.31)		0.022 (1.68)	0.004 (1.17)		-0.008 (-2.03)	-0.004 (-3.65)	-0.008 (-1.62)	
Notional value of derivatives to total assets		0.000 (-2.67)		-4.8E-05 (-1.00)	4.3E-04 (1.70)			-0.009 (-3.53)			0.044 (2.39)			1.5E-04 (2.49)	
Total loans and leases to total assets		0.011 (1.95)	0.017 (3.17)	-0.025 (-3.70)	-0.020 (-4.67)	0.122 (3.19)				0.007 (1.63)	-0.157 (-3.33)			-0.065 (-3.13)	-0.028 (-2.83)
Construction and development loans to total assets		0.285 (3.52)		-0.076 (-2.68)	-0.109 (-3.98)	-0.291 (-2.31)			-0.085 (-3.48)	-0.100 (-4.22)	-0.802 (-3.65)	-0.352 (-1.05)	-1.283 (-2.08)	-0.135 (-1.97)	
Commercial real estate loans to total assets			-0.061 (-1.90)		0.050 (2.89)	-0.212 (-2.04)	-0.182 (-2.57)		-0.149 (-4.66)			0.085 (1.72)		0.236 (4.87)	0.103 (1.24)
1 to 4 family residential loans to total assets			-0.032 (-4.57)						-0.068 (-3.51)		0.067 (1.46)	-0.057 (-2.60)	-0.757 (-1.87)	0.024 (1.16)	
Commercial and industrial loans to total assets	0.024 (3.85)			0.021 (2.19)		-0.105 (-1.84)	0.018 (2.20)	-0.064 (-1.81)		-0.033 (-2.38)	0.245 (2.34)	0.012 (1.51)	-0.011 (-2.27)	0.051 (2.09)	
Consumer loans to total assets	0.029 (3.93)			0.017 (2.30)	0.014 (1.18)	-0.203 (-3.00)	0.062 (3.48)		0.086 (2.15)		0.144 (2.96)	0.180 (2.90)		0.116 (4.80)	

Table 4 Continued: CLASS-Style Model Estimates for Net Interest Income to Assets (NIM)

Explanatory Variable	Representative Bank	JPMorgan Chase	Bank of America	Citibank	Wells Fargo	US Bank	Sun Trust	Regions Bank	BB&T Bank	PNC Bank	Capital One Bank	Bank of New York	State Street Bank	HSBC bank	RBS	
Nominal Quarterly GDP growth rate, SAAR	3.2E-05 (1.63)		8.8E-05 (1.37)	3.8E-05 (1.11)								7.5E-05 (1.26)				
civilian unemployment rate	1.9E-04 (1.29)	0.001 (2.92)		0.001 (3.70)	-0.001 (-2.25)	-0.001 (-1.14)	0.001 (1.77)					-0.001 (-3.17)				
10-year Treasury yield	5.0E-04 (-2.63)		-0.002 (-2.75)	2.6E-04 (1.74)	0.001 (3.13)		4.2E-04 (1.41)	0.003 (3.91)		0.002 (2.83)	0.003 (3.50)	0.002 (2.81)		-0.003 (-3.40)	0.006 (3.57)	
3-month Treasury yield	3.8E-04 (1.92)			1.7E-04 (1.28)	-2.0E-04 (-1.62)				2.9E-04 (2.20)	0.002 (2.98)	-0.005 (-2.06)				-0.003 (-1.76)	
Moody's AAA yield	-4.0E-04 (-1.88)	0.001 (3.37)	0.002 (2.76)		-0.002 (-4.13)	0.001 (2.02)		-0.003 (-3.63)	-0.001 (-1.88)	-0.002 (-2.20)		-0.003 (-3.07)		0.004 (3.19)	-0.005 (-3.26)	
Moody's Baa yield		0.001 (3.40)			-0.001 (-2.76)	-0.002 (-2.85)		-0.001 (-2.35)	-0.001 (-2.39)				1.5E-04 (1.78)	-0.001 (-3.08)		
Federal funds rate	-4.4E-04 (-2.59)					-0.001 (-2.87)	2.4E-04 (1.25)				-0.002 (-3.23)	0.004 (1.65)		7.2E-05 (2.56)	-4.5E-04 (-2.84)	0.002 (1.67)
Wilshire quarterly market index return	7.4E-06 (1.65)	0.000 (3.16)			2.1E-05 (2.05)			7.5E-05 (3.97)								0.000 (1.84)
Wilshire daily return standard deviation					3.3E-04 (1.38)				0.001 (1.85)		0.002 (1.86)		-3.8E-04 (-2.94)	0.001 (1.32)		
Kansas City Fed Financial Stability Index			-0.001 (-2.97)	-0.001 (-2.14)				0.002 (3.10)		0.001 (1.33)			-3.3E-04 (-2.00)	0.001 (1.33)	0.004 (4.20)	
VIX daily average	2.5E-05 (2.25)			3.7E-05 (1.77)				0.000 (2.15)	-1.2E-04 (-2.76)	6.0E-05 (1.53)		8.0E-05 (1.88)	4.6E-05 (2.94)	-1.4E-04 (-2.65)		
VIX quarterly percent change		0.000 (2.25)	-4.9E-06 (-1.31)	-8.9E-06 (-4.78)				0.000 (2.66)					-2.3E-06 (-1.99)		1.4E-05 (1.56)	
Change in Real House Price Index				-1.8E-04 (-2.71)						-1.5E-04 (-1.67)	0.001 (1.72)		-1.4E-04 (-4.95)	0.001 (4.55)	0.001 (2.08)	
Constant	0.001 (0.87)	-0.016 (-3.49)	0.006 (2.48)	0.013 (2.48)	0.037 (6.89)	-0.004 (-0.18)	0.008 (1.10)	0.023 (3.76)	0.056 (4.87)	0.008 (2.13)	0.060 (2.84)	0.014 (3.64)	0.001 (0.76)	0.016 (3.04)	0.019 (1.86)	
Adjusted R <sup>2</sup>	0.890	0.782	0.710	0.877	0.624	0.392	0.600	0.665	0.596	0.778	0.302	0.792	0.892	0.704	0.314	

All models are estimated using quarterly data from June 1993 through June 2008 (61 observations), using backward stepwise regression where variables are eliminated to generate the maximum adjusted R<sup>2</sup> value. T-statistics appear in parenthesis below coefficient estimates. The representative bank is the asset-weighted average of all insured depository institutions in a quarter. Individual bank estimates use merger-adjusted quarterly data including mergers completed through June 2008. All bank-specific variables are lagged one quarter.

**Table 5: CLASS-Style Model Estimates for Non Interest Income to Assets (NONII)**

Explanatory Variable	Representative Bank	JPMorgan Chase	Bank of America	Citibank	Wells Fargo	US Bank	Sun Trust	Regions Bank	BB&T Bank	PNC Bank	Capital One Bank	Bank of New York	State Street Bank	HSBC bank	RBS
Lagged dependent variable		-0.173 (-1.57)		-0.190 (-1.53)	-0.138 (-1.11)		-0.199 (-1.53)	-0.191 (-1.56)		-0.175 (-1.43)		-0.392 (-3.62)		0.270 (1.99)	-0.344 (-2.61)
Trading account assets to total assets		0.025 (2.69)			0.080 (2.07)		-0.009 (-1.54)	0.079 (1.22)		-0.068 (-2.84)		-0.024 (-2.91)	0.016 (1.41)	-0.007 (-1.33)	
Total securities to total assets		-0.013 (-1.40)			-0.010 (-1.70)		-0.010 (-2.50)	-0.012 (-1.58)	-0.014 (-3.01)		-0.022 (-1.71)	-0.036 (-3.06)	0.007 (3.69)	0.008 (1.73)	
Other real estate owned to total assets										-0.239 (-1.23)		0.319 (1.40)	5.087 (3.63)		0.062 (1.41)
Uncollected earned income on loans to total assets	-0.196 (-1.91)	0.504 (2.24)			-1.005 (-3.83)	1.365 (2.09)		-0.164 (-1.03)			0.848 (1.44)	-1.813 (-2.60)			1.066 (3.08)
Total unused commitments to total assets	0.004 (3.74)	0.009 (1.93)	-0.003 (-1.26)	0.006 (4.27)	-0.007 (-1.41)				0.016 (4.80)		0.014 (2.17)	0.029 (4.57)		-0.006 (-1.57)	
Notional value of derivatives to total assets	-2.8E-04 (-3.88)			-3.8E-04 (-6.23)				-7.7E-03 (-2.57)	1.4E-03 (1.20)		1.6E-02 (1.69)	1.6E-03 (4.17)		1.4E-04 (3.00)	
Total loans and leases to total assets			0.025 (4.81)		-0.011 (-1.79)	0.041 (2.08)			0.018 (2.75)		-0.090 (-2.86)				
Construction and development loans to total assets	0.071 (3.76)	0.573 (3.45)			0.050 (2.08)				-0.051 (-4.61)		-0.372 (-3.58)	-3.038 (-4.16)	-4.541 (-1.57)		
Commercial real estate loans to total assets		-0.101 (-1.28)	-0.050 (-2.36)		0.076 (3.06)	-0.144 (-3.62)		0.049 (2.64)	-0.050 (-3.78)	-0.132 (-2.94)		0.603 (5.96)			
1 to 4 family residential loans to total assets			-0.027 (-4.54)	0.032 (3.68)			-0.007 (-1.98)	-0.030 (-2.91)	-0.029 (-3.64)		0.048 (1.49)			-0.006 (-1.14)	-0.013 (-2.61)
Commercial and industrial loans to total assets	0.022 (3.95)					-0.041 (-1.53)		-0.072 (-2.43)		0.041 (2.69)	0.160 (2.38)	-0.105 (-6.69)	0.023 (2.07)	0.028 (2.74)	
Consumer loans to total assets		0.027 (1.55)	-0.037 (-3.70)	-0.023 (-2.35)		-0.077 (-2.62)			-0.050 (-3.36)		0.089 (2.56)			0.012 (1.64)	

Table 5 Continued: CLASS-Style Model Estimates for Non Interest Income to Assets (NONII)

Explanatory Variable	Representative Bank	JPMorgan Chase	Bank of America	Citibank	Wells Fargo	US Bank	Sun Trust	Regions Bank	BB&T Bank	PNC Bank	Capital One Bank	Bank of New York	State Street Bank	HSBC bank	RBS
Nominal Quarterly GDP growth rate, SAAR			8.3E-05 (1.91)	1.4E-04 (2.31)	-1.5E-04 (-2.52)	-1.0E-04 (-1.32)			-4.5E-05 (-2.37)		-1.2E-04 (-1.19)		-1.4E-04 (-2.14)		
civilian unemployment rate	-3.2E-04 (-1.91)			1.2E-03 (2.52)	-2.0E-03 (-4.17)	-6.5E-04 (-1.63)		-3.1E-04 (-1.36)		-6.9E-04 (-1.62)		-1.2E-03 (-1.75)	-2.0E-03 (-2.01)	-1.9E-03 (-4.27)	
10-year Treasury yield	-1.5E-04 (-1.56)		-5.5E-04 (-2.52)	-8.1E-04 (-2.44)			3.6E-04 (2.38)	8.7E-04 (1.60)			1.4E-03 (3.67)		5.0E-04 (1.63)	-1.5E-03 (-2.59)	2.9E-03 (3.95)
3-month Treasury yield	5.8E-04 (2.11)	2.2E-03 (2.94)	1.3E-03 (2.36)	3.6E-03 (4.38)		-7.4E-04 (-3.30)	-9.2E-04 (-2.68)		4.2E-04 (2.02)		-7.8E-04 (-2.65)	-3.5E-03 (-2.39)	-7.6E-04 (-3.15)	2.7E-03 (4.97)	-1.6E-03 (-2.27)
Moody's AAA yield					-0.001 (-3.08)	0.001 (1.40)		-0.001 (-1.22)		-0.001 (-2.22)				0.001 (1.64)	-0.003 (-3.93)
Moody's Baa yield		7.6E-04 (2.59)	-7.4E-04 (-3.25)	-4.3E-04 (-1.38)		-9.4E-04 (-3.21)				-6.9E-04 (-2.37)	5.4E-04 (1.45)	7.0E-04 (1.11)		-3.1E-04 (-1.49)	
Federal funds rate	-6.9E-04 (-2.75)	-2.2E-03 (-2.99)	-1.3E-03 (-2.39)	-2.7E-03 (-3.48)			7.1E-04 (2.32)		-3.2E-04 (-1.56)	-5.8E-04 (-3.49)		2.9E-03 (2.01)		-2.5E-03 (-5.12)	1.5E-03 (2.29)
Wilshire quarterly market index return	1.1E-05 (2.20)	2.7E-05 (1.96)			2.9E-05 (1.85)			4.5E-05 (3.48)					1.0E-04 (4.79)		1.8E-05 (1.11)
Wilshire daily return standard deviation	-2.5E-04 (-2.26)		-5.7E-04 (-2.29)					-4.3E-04 (-1.53)	-3.6E-04 (-3.29)	1.1E-03 (2.97)	6.3E-04 (1.34)	-1.1E-03 (-1.35)		6.6E-04 (2.58)	
Kansas City Fed Financial Stability Index		-0.001 (-1.79)						0.001 (1.79)				-0.002 (-2.12)		-0.001 (-1.89)	0.001 (3.43)
VIX daily average					-1.1E-04 (-3.86)			4.2E-05 (1.51)		-1.3E-04 (-3.33)		1.9E-04 (1.65)	5.1E-05 (1.31)		
VIX quarterly percent change			-3.1E-06 (-1.07)	-5.3E-06 (-1.26)	5.5E-06 (1.34)	6.7E-06 (1.54)		9.8E-06 (3.24)	2.0E-06 (1.59)				7.3E-06 (1.37)		6.0E-06 (1.42)
Change in Real House Price Index				2.8E-04 (2.29)	-3.9E-04 (-4.00)			1.7E-04 (2.10)			3.3E-04 (1.60)	-5.8E-04 (-2.76)	-1.8E-04 (-2.22)	1.8E-04 (1.84)	2.4E-04 (2.55)
Constant	0.004 (2.38)	-0.011 (-2.57)	0.011 (3.95)	0.006 (0.99)	0.033 (5.14)	0.010 (1.38)	0.007 (4.34)	0.020 (3.00)	0.013 (3.56)	0.027 (5.11)	0.026 (2.32)	0.015 (1.69)	0.017 (5.06)	0.001 (0.21)	0.005 (1.76)
Adjusted R <sup>2</sup>	0.827	0.593	0.615	0.778	0.788	0.550	0.211	0.609	0.933	0.688	0.675	0.717	0.621	0.632	0.417

All models are estimated using quarterly data from June 1993 through June 2008 (61 observations), using backward stepwise regression where variables are eliminated to generate the maximum adjusted R<sup>2</sup> value. T-Statistics appear in parenthesis under coefficient estimates. The representative bank is the asset-weighted average of all insured depository institutions in a quarter. Individual bank estimates use merger-adjusted quarterly data including mergers completed through June 2008. All bank-specific variables are lagged one quarter.

Table 6: CLASS-Style Model Estimates for Non Interest Expense to Assets (NONIX)

Explanatory Variable	Representative Bank	JPMorgan Chase	Bank of America	Citibank	Wells Fargo	US Bank	Sun Trust	Regions Bank	BB&T Bank	PNC Bank	Capital One Bank	Bank of New York	State Street Bank	HSBC bank	RBS
Lagged dependent variable	-0.364 (-2.72)	-0.426 (-3.70)		-0.179 (-1.45)	-0.321 (-2.90)			-0.343 (-2.92)	0.231 (1.95)	-0.246 (-1.88)	-0.181 (-1.34)		-0.172 (-1.08)	-0.505 (-4.47)	-0.251 (-1.85)
Trading account assets to total assets		0.031 (2.46)		-0.013 (-2.43)		-0.265 (-1.04)	-0.028 (-1.44)							-0.011 (-1.74)	
Total securities to total assets	0.027 (2.58)			-0.021 (-3.06)	-0.008 (-1.15)		-0.035 (-2.26)		-0.024 (-2.61)	0.017 (1.87)		-0.011 (-2.41)		0.013 (2.43)	
Other real estate owned to total assets	0.322 (3.56)		-0.203 (-1.74)	-0.309 (-1.71)	0.342 (1.75)		0.280 (2.06)		0.322 (1.86)			0.189 (2.31)			0.280 (2.52)
Uncollected earned income on loans to total assets	0.328 (1.89)	1.313 (3.96)	-0.359 (-1.73)	-0.233 (-2.19)		3.263 (3.17)				0.947 (3.03)					
Total unused commitments to total assets	0.003 (1.54)		-0.004 (-2.02)	0.002 (2.38)	-0.014 (-2.90)		-0.010 (-1.57)		0.022 (2.35)		0.018 (3.50)		-0.004 (-1.46)	-0.012 (-3.31)	
Notional value of derivatives to total assets	2.0E-04 (1.36)	-1.1E-04 (-3.19)	-9.2E-05 (-1.45)	-9.8E-05 (-1.92)				-1.1E-02 (-2.17)	4.0E-03 (1.66)		2.1E-02 (1.70)	1.2E-04 (1.05)		1.3E-04 (2.44)	1.3E-02 (1.91)
Total loans and leases to total assets	0.037 (3.49)	0.023 (2.26)	0.061 (3.08)		-0.012 (-2.25)	0.127 (3.50)	-0.027 (-1.63)				-0.041 (-3.88)		-0.013 (-1.48)	-0.023 (-3.84)	
Construction and development loans to total assets	-0.066 (-1.32)	0.914 (4.77)		0.374 (1.95)	-0.080 (-2.95)	-0.257 (-2.76)	0.038 (1.24)	0.025 (1.20)	-0.076 (-3.46)		-0.357 (-3.05)			0.171 (3.07)	
Commercial real estate loans to total assets	-0.071 (-1.07)	-0.355 (-3.31)		0.158 (3.39)	0.145 (4.19)	-0.266 (-2.93)			-0.059 (-2.42)	-0.124 (-2.95)		0.090 (3.14)		0.177 (5.03)	
1 to 4 family residential loans to total assets	-0.017 (-1.14)		-0.057 (-2.89)					-0.057 (-3.04)	-0.050 (-3.41)	0.012 (1.36)		-0.022 (-2.12)	-2.845 (-1.35)		-0.028 (-2.21)
Commercial and industrial loans to total assets		-0.051 (-2.49)	-0.057 (-2.03)		-0.028 (-1.95)	-0.120 (-2.38)	0.020 (1.76)	-0.181 (-4.12)			0.186 (4.22)	-0.019 (-5.10)		0.047 (4.07)	-0.023 (-1.07)
Consumer loans to total assets			-0.057 (-2.16)			-0.223 (-3.46)	0.053 (2.49)	0.052 (1.62)		0.027 (4.11)	0.022 (1.25)			0.048 (4.24)	-0.056 (-2.66)



**Table 6 Continued: CLASS-Style Model Estimates for Non Interest Expense to Assets (NONIX)**

Explanatory Variable	Representative	JPMorgan	Bank of	Citibank	Wells Fargo	US Bank	Sun Trust	Regions	BB&T Bank	PNC Bank	Capital One	Bank of	State Street	HSBC bank	RBS
	Bank	Chase	America					Bank			Bank	New York	Bank		
Nominal Quarterly GDP growth rate, SAAR					-1.5E-04 (-2.60)			-9.7E-05 (-1.25)			-3.0E-04 (-2.44)			-5.8E-05 (-1.16)	
civilian unemployment rate				-0.002 (-4.02)	-0.002 (-4.69)				0.001 (2.71)	-0.001 (-2.74)		-3.1E-04 (-1.47)	0.001 (1.54)		-0.002 (-1.52)
10-year Treasury yield	0.001 (1.67)		-0.001 (-2.09)	0.001 (2.62)	0.003 (4.47)			0.003 (3.00)			0.002 (3.01)		0.003 (4.28)	-0.002 (-2.91)	0.003 (1.78)
3-month Treasury yield	0.001 (1.63)	0.003 (3.70)			-3.0E-04 (-1.73)	-0.001 (-3.72)		-0.002 (-1.68)		0.001 (1.97)	-0.002 (-1.51)		-0.001 (-1.58)	-0.001 (-1.58)	-0.001 (-1.35)
Moody's AAA yield	-0.001 (-1.71)		0.001 (1.37)	-0.002 (-3.56)	-0.004 (-5.08)	0.001 (2.25)		-0.003 (-3.13)				-0.001 (-3.54)	-0.003 (-5.31)	0.002 (2.20)	-0.003 (-1.43)
Moody's Baa yield		0.001 (3.72)			-3.9E-04 (-1.44)	-0.002 (-2.64)		-0.001 (-2.06)		0.000 (-1.13)		0.000 (-2.16)	0.001 (3.46)	-4.8E-04 (-2.11)	0.001 (1.33)
Federal funds rate	-0.001 (-1.94)	-0.003 (-3.35)		-4.1E-04 (-2.35)				0.001 (1.60)	0.001 (4.34)	-0.002 (-2.57)	0.002 (1.30)		0.001 (2.14)		
Wilshire quarterly market index return	1.7E-05 (2.65)	3.8E-05 (2.14)			5.6E-05 (3.56)			8.8E-05 (4.08)						-3.2E-05 (-2.02)	7.0E-05 (2.06)
Wilshire daily return standard deviation			-0.001 (-2.09)				-5.0E-04 (-1.37)		-0.001 (-4.95)	4.9E-04 (1.54)	0.001 (1.09)		-0.001 (-1.74)		0.001 (1.24)
Kansas City Fed Financial Stability Index	4.1E-04 (1.56)				0.001 (2.02)			0.002 (4.11)				-4.3E-04 (-2.10)			0.002 (1.82)
VIX daily average	2.3E-05 (1.16)			5.7E-05 (2.15)					8.1E-05 (2.96)				1.5E-04 (2.75)		
VIX quarterly percent change				-7.4E-06 (-2.73)	7.6E-06 (1.81)			2.1E-05 (3.75)					-7.7E-06 (-2.07)	-5.9E-06 (-1.51)	1.1E-05 (1.38)
Change in Real House Price Index					-2.6E-04 (-2.27)			2.6E-04 (2.11)		1.5E-04 (1.34)			-2.2E-04 (-2.45)	4.4E-04 (4.37)	5.5E-04 (2.25)
Constant	-0.009 (-1.35)	-0.012 (-1.86)	0.002 (0.50)	0.028 (7.26)	0.050 (7.30)	-0.008 (-0.62)	0.026 (2.02)	0.051 (5.10)	0.025 (2.99)	0.016 (3.16)	0.010 (1.77)	0.020 (7.76)	0.009 (1.88)	0.006 (1.21)	0.029 (2.27)
Adjusted R <sup>2</sup>	0.765	0.434	0.768	0.787	0.615	0.369	0.457	0.641	0.580	0.381	0.309	0.804	0.582	0.674	0.351

All models are estimated using quarterly data from June 1993 through June 2008 (61 observations), using backward stepwise regression where variables are eliminated to generate the maximum adjusted R<sup>2</sup> value. T-statistics are in parenthesis below coefficient estimates. The representative bank is the asset-weighted average of all insured depository institutions in a quarter. Individual bank estimates use merger-adjusted quarterly data including mergers completed through June 2008. All bank-specific variables are lagged one quarter.

**Table 7: CLASS-Style Model Estimates for Loan and Lease Loss Provision Expense to Assets (ELNATR)**

Explanatory Variable	Representative Bank	JPMorgan Chase	Bank of America	Citibank	Wells Fargo	US Bank	Sun Trust	Regions Bank	BB&T Bank	PNC Bank	Capital One Bank	Bank of New York	State Street Bank	HSBC bank	RBS
Lagged dependent variable	0.255 (2.13)	-0.127 (-1.23)	-0.413 (-3.17)	0.354 (3.15)	-0.399 (-2.94)	-0.203 (-1.46)		-0.355 (-2.95)		-0.190 (-1.61)				-0.298 (-2.33)	-0.169 (-1.40)
Trading account assets to total assets				0.006 (1.71)	0.066 (3.21)		-0.009 (-1.95)						0.000 (1.09)		
Total securities to total assets	-0.017 (-4.95)	-0.014 (-4.26)			-0.007 (-2.21)		-0.006 (-1.37)	-0.014 (-3.63)	-0.007 (-2.62)		-0.018 (-3.22)			-0.004 (-1.73)	
Other real estate owned to total assets				0.038 (1.24)	0.380 (4.62)	-0.314 (-1.07)			0.084 (1.44)			0.147 (2.12)	0.243 (4.50)	-0.192 (-2.64)	0.091 (4.91)
Uncollected earned income on loans to total assets		0.458 (4.70)	0.298 (3.96)	-0.103 (-1.20)	-0.384 (-2.98)	1.699 (2.33)				0.375 (2.99)	-0.772 (-2.79)		0.002 (1.07)		
Total unused commitments to total assets	-0.004 (-3.84)		-0.002 (-2.39)		-0.004 (-1.50)	0.016 (2.71)		0.005 (1.59)		0.007 (3.20)			0.000 (-1.68)		
Notional value of derivatives to total assets	2.0E-04 (4.55)	-2.1E-05 (-2.36)		-6.4E-05 (-1.70)	2.7E-04 (1.77)			3.8E-03 (2.63)	2.3E-03 (3.19)	-6.5E-04 (-1.65)				-3.1E-05 (-1.07)	4.3E-03 (4.50)
Total loans and leases to total assets	0.015 (3.03)	0.012 (3.91)	0.008 (3.50)		0.005 (1.10)		0.038 (2.67)					0.014 (3.15)	0.001 (3.47)		-0.009 (-2.43)
Construction and development loans to total assets	-0.049 (-3.65)	0.167 (3.75)					-0.034 (-2.55)							0.094 (1.63)	
Commercial real estate loans to total assets		-0.086 (-3.29)	-0.043 (-2.67)	-0.087 (-3.13)	-0.047 (-3.26)	-0.098 (-2.35)	-0.045 (-1.95)		-0.006 (-1.74)		-0.031 (-2.44)				
1 to 4 family residential loans to total assets	-0.016 (-2.20)		-0.017 (-5.54)		-0.011 (-2.52)	0.036 (1.62)	-0.042 (-2.54)	-0.028 (-3.64)	-0.009 (-2.13)		-0.007 (-2.37)		-0.094 (-1.63)		0.009 (2.15)
Commercial and industrial loans to total assets		-0.017 (-2.66)		0.019 (2.04)	0.031 (3.09)		-0.040 (-2.67)	-0.056 (-3.54)			-0.030 (-1.44)	-0.023 (-3.96)			0.010 (1.63)
Consumer loans to total assets	-0.031 (-3.49)	-0.024 (-3.28)			0.010 (1.22)	-0.056 (-1.44)	-0.029 (-2.41)	0.045 (5.44)	0.044 (4.47)	-0.025 (-3.23)				0.011 (2.34)	

**Table 7 Continued: CLASS-Style Model Estimates for Loan and Lease Loss Provision Expense to Assets (ELNATR)**

Explanatory Variable	Representative	JPMorgan	Bank of	Citibank	Wells Fargo	US Bank	Sun Trust	Regions	BB&T Bank	PNC Bank	Capital One	Bank of	State Street	HSBC bank	RBS
	Bank	Chase	America					Bank			Bank	New York	Bank		
Nominal Quarterly GDP growth rate, SAAR		5.4E-05 (2.23)	5.6E-05 (2.37)	-8.2E-05 (-1.98)	-7.6E-05 (-3.02)				-3.2E-05 (-2.34)	4.8E-05 (1.49)	-1.1E-04 (-2.24)			-3.7E-05 (-1.29)	-6.4E-05 (-3.47)
civilian unemployment rate	5.2E-04 (6.47)	8.3E-04 (4.55)	7.2E-04 (3.14)	1.2E-03 (5.58)	-3.0E-04 (-1.35)		5.5E-04 (2.94)			1.0E-03 (5.31)	7.5E-04 (2.61)	7.8E-04 (2.81)		4.3E-04 (2.37)	-3.6E-04 (-1.99)
10-year Treasury yield	2.4E-04 (1.78)			1.3E-03 (3.32)	9.3E-04 (2.92)	-3.7E-03 (-2.78)	2.1E-04 (1.94)			5.0E-04 (3.25)		-1.2E-03 (-2.69)		1.2E-03 (3.22)	
3-month Treasury yield		2.4E-04 (3.21)	-8.8E-05 (-1.04)		-2.9E-04 (-3.63)		-8.5E-04 (-3.44)	-6.1E-04 (-2.36)			-2.2E-03 (-4.27)	1.6E-03 (2.91)		-6.3E-04 (-1.73)	-9.1E-04 (-4.21)
Moody's AAA yield	-2.4E-04 (-1.51)	1.9E-04 (1.93)		-1.6E-03 (-3.88)	-9.3E-04 (-2.41)	5.2E-03 (3.39)			-1.9E-04 (-2.46)		5.2E-04 (2.80)	1.1E-03 (2.71)		-1.0E-03 (-2.32)	3.2E-04 (3.40)
Moody's Baa yield	-1.5E-04 (-1.89)		-4.7E-04 (-4.39)	3.7E-04 (1.91)	2.6E-04 (1.93)					3.1E-04 (2.64)				3.1E-04 (2.23)	
Federal funds rate						-6.5E-04 (-2.35)	7.7E-04 (3.60)	5.9E-04 (2.38)	-7.4E-05 (-2.28)		1.9E-03 (3.65)	-1.1E-03 (-2.34)	5.8E-06 (1.75)	5.2E-04 (1.57)	5.2E-04 (2.39)
Wilshire quarterly market index return		1.2E-05 (2.36)				-3.5E-05 (-1.58)	-1.2E-05 (-2.71)	1.3E-05 (1.97)		2.1E-05 (2.90)		3.0E-05 (2.46)	-8.4E-07 (-1.26)		
Wilshire daily return standard deviation	8.5E-05 (1.18)			7.2E-04 (3.47)	4.1E-04 (2.77)		-1.8E-04 (-1.65)				5.1E-04 (2.23)				
Kansas City Fed Financial Stability Index	4.6E-04 (3.64)	1.1E-03 (7.23)	9.3E-04 (6.65)		5.2E-04 (2.10)	-1.6E-03 (-2.73)		6.2E-04 (3.54)	2.4E-04 (2.92)	5.6E-04 (3.34)				-2.9E-05 (-2.45)	9.2E-04 (3.97)
VIX daily average					-2.2E-05 (-1.10)	-8.2E-05 (-1.30)		-3.7E-05 (-2.03)	-2.0E-05 (-2.09)			1.5E-04 (4.83)	3.5E-06 (2.44)		
VIX quarterly percent change	7.4E-07 (1.14)							2.5E-06 (1.41)	1.2E-06 (1.52)				-3.1E-07 (-1.88)		
Change in Real House Price Index					-9.6E-05 (-1.74)		-1.6E-04 (-5.34)	1.3E-04 (2.82)		1.1E-04 (1.76)					4.6E-05 (1.14)
Constant	0.002 (0.77)	-6.3E-03 (-4.02)	2.4E-03 (1.45)	-4.6E-03 (-2.12)	4.8E-03 (1.61)	-1.5E-02 (-2.34)	-3.3E-03 (-1.00)	1.2E-02 (3.36)	3.0E-03 (2.54)	-1.1E-02 (-4.58)	9.3E-03 (2.99)	-1.2E-02 (-4.62)	-1.2E-04 (-2.27)	-2.9E-03 (-1.48)	4.0E-03 (1.70)
Adjusted R <sup>2</sup>	0.939	0.804	0.797	0.722	0.882	0.445	0.832	0.676	0.640	0.537	0.752	0.545	0.780	0.807	0.838

All models are estimated using quarterly data from June 1993 through June 2008 (61 observations), using backward stepwise regression where variables are eliminated to generate the maximum adjusted R<sup>2</sup> value. T-statistics appear in parenthesis after coefficient estimates. The representative bank is the asset-weighted average of all insured depository institutions in a quarter. Individual bank estimates use merger-adjusted quarterly data including mergers completed through June 2008. All bank-specific variables are lagged one quarter.

Table 8: CLASS-Style Model Estimates for Securities Gains (Losses) to Assets (IGLSEC)

Explanatory Variable	Representative	JPMorgan	Bank of					Regions				Capital One	Bank of	State Street		
	Bank	Chase	America	Citibank	Wells Fargo	US Bank	Sun Trust	Bank	BB&T Bank	PNC Bank	Bank	New York	Bank	HSBC bank	RBS	
Lagged dependent variable	-0.260 (-2.64)				-0.320 (-3.00)	-0.367 (-2.40)	-0.368 (-3.27)				-0.188 (-1.71)	-0.483 (-3.87)	-0.223 (-1.70)			
Trading account assets to total assets	-0.004 (-4.17)	-0.007 (-1.70)		-0.031 (-3.10)			0.028 (1.69)							0.008 (3.24)	-0.159 (-2.28)	-0.159 (-2.28)
Total securities to total assets					-0.009 (-2.87)			0.009 (2.22)			-0.004 (-2.82)			0.006 (3.18)		
Other real estate owned to total assets		0.048 (1.20)	0.082 (2.22)		0.077 (1.38)	0.216 (2.81)		-0.101 (-1.19)	0.110 (2.30)	0.077 (4.12)	0.109 (3.61)	-0.566 (-1.91)			-0.033 (-2.07)	-0.033 (-2.07)
Uncollected earned income on loans to total assets		0.122 (2.00)		0.366 (4.92)	-0.445 (-2.55)		0.090 (2.84)					0.012 (1.25)	-0.045 (-1.36)	0.563 (3.08)	0.563 (3.08)	
Total unused commitments to total assets			-0.001 (-4.12)	-0.002 (-1.78)						0.002 (2.18)	0.002 (2.18)			-0.007 (-2.53)	-0.007 (-2.53)	
Notional value of derivatives to total assets		-4.5E-05 (-2.46)	1.1E-05 (1.04)			3.6E-03 (6.48)				-1.2E-03 (-1.18)	6.4E-05 (1.64)			2.3E-03 (2.07)	2.3E-03 (2.07)	
Total loans and leases to total assets				-0.003 (-1.82)		-0.036 (-3.50)		-0.019 (-2.81)		-0.013 (-4.22)	-0.001 (-1.39)			0.019 (5.53)		
Construction and development loans to total assets		-0.067 (-3.53)	-0.044 (-1.09)	-0.011 (-1.62)		-0.020 (-1.49)		0.017 (1.93)		-0.023 (-2.21)		0.764 (1.79)	0.040 (2.31)			
Commercial real estate loans to total assets			-0.032 (-4.46)	-0.013 (-2.41)	0.012 (1.22)		-0.011 (-3.16)	0.017 (1.34)		0.013 (1.68)	0.015 (1.41)	0.097 (2.19)				
1 to 4 family residential loans to total assets	-0.011 (-4.76)	0.003 (2.18)			-0.019 (-3.75)	0.039 (2.88)		0.019 (2.01)		0.013 (4.02)	-0.012 (-2.52)			-0.010 (-4.35)	-0.005 (-3.57)	-0.005 (-3.57)
Commercial and industrial loans to total assets		-0.004 (-2.14)	0.006 (2.23)			0.056 (4.59)		0.036 (2.60)	0.007 (1.51)			-0.005 (-2.16)				
Consumer loans to total assets	-0.007 (-1.99)	-0.009 (-2.70)	0.005 (3.00)			0.043 (3.07)				0.014 (3.79)			-0.013 (-3.68)	-0.008 (-2.52)	-0.008 (-2.52)	

Table 8 Continued: CLASS-Style Model Estimates for Securities Gains (Losses) to Assets (IGLSEC)

Explanatory Variable	Representative Bank	JPMorgan Chase	Bank of America	Citibank	Wells Fargo	US Bank	Sun Trust	Regions Bank	BB&T Bank	PNC Bank	Capital One Bank	Bank of New York	State Street Bank	HSBC bank	RBS
Nominal Quarterly GDP growth rate, SAAR	2.3E-05 (1.84)	-2.0E-05 (-1.64)				-4.0E-05 (-1.82)	1.8E-05 (1.67)	3.3E-05 (1.57)			2.6E-05 (1.75)			3.8E-05 (1.96)	3.8E-05 (1.96)
civilian unemployment rate	5.5E-04 (6.21)				7.0E-04 (6.37)	6.4E-04 (4.33)	9.5E-05 (1.48)	2.4E-04 (2.55)			1.5E-04 (1.36)	1.6E-04 (2.24)	3.6E-04 (3.33)		
10-year Treasury yield	-2.4E-04 (-5.18)	-1.3E-04 (-2.54)	-1.1E-04 (-2.44)	-1.5E-04 (-2.06)	-5.9E-04 (-7.45)				-9.3E-05 (-1.30)	-2.6E-04 (-5.62)	-4.7E-04 (-2.82)	-3.6E-04 (-2.83)	1.6E-04 (2.25)		
3-month Treasury yield		-1.3E-04 (-4.02)	1.0E-04 (4.54)	-2.4E-04 (-1.36)		2.8E-04 (3.10)	-4.1E-04 (-3.29)			-1.9E-04 (-1.33)	5.3E-04 (2.51)	1.1E-04 (3.15)		-9.6E-05 (-2.62)	-9.6E-05 (-2.62)
Moody's AAA yield						0.000 (-1.80)	0.000 (-2.53)	0.000 (-1.94)			0.000 (2.44)	0.000 (1.98)		0.000 (-3.00)	-2.6E-04 (-3.00)
Moody's Baa yield		-1.6E-04 (-2.68)			2.1E-04 (2.18)	-3.3E-04 (-3.58)				-8.1E-05 (-1.86)					
Federal funds rate	2.0E-04 (5.32)			1.9E-04 (1.18)	4.3E-04 (5.35)		3.0E-04 (2.63)		-7.5E-05 (-1.70)	2.6E-04 (1.97)	-4.0E-04 (-2.23)		1.8E-04 (2.62)		
Wilshire quarterly market index return	8.7E-06 (3.10)		-3.6E-06 (-1.15)			-5.1E-06 (-1.09)						-9.7E-06 (-3.21)	-9.1E-06 (-1.58)	-1.2E-05 (-1.87)	-1.2E-05 (-1.87)
Wilshire daily return standard deviation		1.4E-04 (2.16)	-9.2E-05 (-1.30)	-2.0E-04 (-2.03)	2.9E-04 (2.16)		3.0E-04 (4.43)	4.9E-04 (3.55)		-1.8E-04 (-2.78)				2.7E-04 (2.38)	2.7E-04 (2.38)
Kansas City Fed Financial Stability Index	-2.0E-04 (-2.23)		-2.6E-04 (-3.72)		-7.5E-04 (-4.63)		-1.7E-04 (-2.57)	-4.7E-04 (-3.17)	-1.2E-04 (-0.94)		-5.5E-04 (-4.81)	-2.1E-04 (-3.35)		1.2E-04 (1.25)	1.2E-04 (1.25)
VIX daily average	4.5E-05 (5.76)		1.8E-05 (2.38)	2.5E-05 (2.25)	4.1E-05 (2.72)			4.8E-05 (3.03)	1.6E-05 (1.26)	1.8E-05 (2.30)	2.3E-05 (2.16)	1.8E-05 (2.77)			
VIX quarterly percent change			-1.8E-06 (-2.29)		-3.4E-06 (-3.03)		-1.5E-06 (-2.14)	-3.1E-06 (-2.41)	2.1E-06 (1.51)		-1.3E-06 (-1.44)	-2.1E-06 (-2.70)	-6.3E-06 (-4.16)	-2.3E-06 (-1.64)	-2.3E-06 (-1.64)
Change in Real House Price Index	-3.1E-05 (-1.63)			6.2E-05 (2.52)	-7.1E-05 (-1.78)	-1.1E-04 (-2.76)				-4.0E-05 (-1.96)					
Constant	-4.1E-04 (-0.58)	4.7E-03 (4.35)	-4.4E-04 (-0.60)	3.1E-03 (2.50)	8.2E-04 (0.57)	1.2E-03 (0.41)	1.0E-03 (1.27)	-1.9E-03 (-0.47)	-6.7E-04 (-1.42)	4.7E-03 (4.02)	-2.5E-03 (-2.29)	-1.0E-03 (-2.40)	-1.2E-02 (-5.35)	3.7E-03 (2.91)	0.004 (2.91)
Adjusted R <sup>2</sup>	0.742	0.577	0.479	0.565	0.679	0.714	0.602	0.502	0.216	0.765	0.586	0.425	0.539	0.695	0.695

All models are estimated using quarterly data from June 1993 through June 2008 (61 observations), using backward stepwise regression where variables are eliminated to generate the maximum adjusted R<sup>2</sup> value. T-statistics appear in parenthesis below coefficient estimates. The representative bank is the asset-weighted average of all insured depository institutions in a quarter. Individual bank estimates use merger-adjusted quarterly data including mergers completed through June 2008. All bank-specific variables are lagged one quarter.

**Table 9: Actual Bank INBFTXEX Stress Scario Outcomes**

actual quarterly INBFTXEX ratio	JPMorgan	Bank of					Regions				Capital One	Bank of	State Street		
	Chase	America	Citibank	Wells Fargo	US Bank	Sun Trust	Bank	BB&T Bank	PNC Bank	Bank	New York	Bank	HSBC bank	RBS	
2008 Q2	0.19%	0.25%	-0.14%	0.43%	0.57%	0.45%	0.22%	0.40%	0.48%	0.14%	0.09%	0.58%	-0.14%	0.24%	
2008 Q3	0.09%	0.29%	-0.03%	0.44%	0.41%	0.26%	0.08%	0.40%	0.25%	0.07%	0.49%	0.27%	-0.06%	0.06%	
2008 Q4	0.20%	-0.06%	-1.13%	-0.31%	0.24%	-0.32%	-4.76%	0.21%	0.01%	-1.03%	0.03%	0.29%	-0.91%	-0.94%	
2009 Q1	0.23%	0.18%	0.13%	0.35%	0.32%	-0.52%	0.33%	0.33%	0.03%	0.13%	0.38%	0.43%	-0.05%	-0.11%	
2009 Q2	0.12%	0.19%	-0.47%	0.65%	0.24%	-0.19%	-0.12%	0.09%	0.12%	0.08%	0.18%	0.48%	-0.08%	-0.21%	
2009 Q3	0.22%	0.05%	-0.16%	0.56%	0.31%	-0.43%	-0.47%	0.10%	0.23%	0.11%	-2.39%	0.30%	0.16%	-0.22%	
2009 Q4	0.15%	0.08%	-0.17%	0.63%	0.28%	-0.29%	-0.58%	0.09%	0.63%	-0.14%	0.32%	0.70%	-0.04%	-0.19%	
2010 Q1	0.21%	0.10%	0.25%	0.30%	0.29%	-0.24%	-0.24%	0.14%	0.32%	0.36%	0.38%	0.47%	0.45%	-0.08%	
2010 Q2	0.36%	0.12%	0.32%	0.36%	0.35%	-0.06%	-0.09%	0.13%	0.39%	0.44%	0.38%	0.44%	0.25%	-0.01%	
2010 Q3	0.20%	0.33%	0.19%	0.43%	0.40%	0.07%	-0.20%	0.13%	0.34%	0.25%	0.28%	0.46%	0.37%	0.00%	
2010 Q4	0.19%	0.28%	0.12%	0.44%	0.42%	0.09%	0.14%	0.13%	0.29%	0.16%	0.33%	0.20%	0.23%	-0.01%	
2011 Q1	0.22%	0.24%	0.16%	0.42%	0.45%	0.05%	0.08%	0.17%	0.38%	0.37%	0.24%	0.36%	0.32%	0.09%	
2011 Q2	0.24%	0.15%	0.01%	0.43%	0.53%	0.14%	0.09%	0.21%	0.43%	0.41%	0.24%	0.36%	0.17%	0.16%	

**Table 10: Actual Reported and Projected Bank Equity-to-Asset Ratios under Passive Operating Assumptions**

Reported Bank Equity-to-Asset Ratios														
Quarter	JPMorgan Chase	Bank of America	Citibank	Wells Fargo	US Bank	Sun Trust	Regions Bank	BB&T Bank	PNC Bank	Capital One Bank	Bank of New York	State Street Bank	HSBC bank	RBS
2008 Q2	7.90%	8.19%	7.77%	8.73%	8.89%	11.26%	14.84%	10.31%	9.41%	19.15%	6.54%	9.09%	7.00%	13.65%
2008 Q3	7.12%	8.37%	7.49%	8.60%	8.91%	11.56%	14.75%	10.29%	8.92%	19.05%	5.68%	4.17%	6.76%	13.47%
2008 Q4	7.37%	9.03%	6.61%	7.73%	8.09%	10.54%	9.99%	9.20%	7.28%	17.40%	5.83%	7.79%	6.97%	12.18%
2009 Q1	7.81%	9.47%	9.65%	8.20%	9.06%	10.85%	10.67%	11.89%	9.95%	17.73%	7.58%	9.95%	8.05%	12.10%
2009 Q2	7.95%	10.38%	9.49%	9.22%	9.35%	10.90%	10.61%	11.95%	10.85%	18.12%	7.84%	8.05%	9.54%	13.57%
2009 Q3	7.72%	11.18%	9.75%	9.33%	9.81%	11.11%	12.31%	12.02%	11.37%	18.64%	8.02%	8.41%	9.40%	13.98%
2009 Q4	7.85%	11.38%	10.17%	9.30%	9.49%	11.01%	11.72%	12.25%	12.23%	18.42%	8.36%	9.54%	9.48%	14.20%
2010 Q1	7.62%	11.24%	10.34%	11.89%	9.71%	11.31%	12.07%	12.61%	12.94%	19.24%	8.96%	10.39%	8.89%	14.56%
2010 Q2	8.34%	11.18%	10.60%	11.66%	10.05%	12.19%	12.35%	13.47%	13.63%	19.53%	8.55%	10.39%	9.32%	14.85%
2010 Q3	8.05%	11.44%	10.50%	11.58%	10.15%	12.07%	12.36%	13.31%	14.08%	19.39%	8.28%	10.59%	9.46%	14.69%
2010 Q4	7.55%	12.13%	11.13%	11.21%	10.20%	12.06%	12.15%	13.38%	13.15%	19.09%	8.73%	10.74%	9.72%	15.69%
2011 Q1	7.21%	12.00%	11.38%	11.45%	10.44%	12.02%	12.19%	13.53%	13.80%	19.05%	8.24%	10.53%	9.52%	15.01%
2011 Q2	7.04%	12.10%	10.57%	11.33%	10.81%	12.19%	12.51%	13.58%	13.80%	19.60%	7.23%	9.92%	9.49%	16.41%
Projected Bank Equity-to-Asset Ratios under Passive Operating Assumptions														
2008 Q2	7.90%	8.19%	7.77%	8.73%	8.89%	11.26%	14.84%	10.31%	9.41%	19.15%	6.54%	9.09%	7.00%	13.65%
2008 Q3	7.98%	8.46%	7.74%	9.13%	9.26%	11.49%	14.91%	10.67%	9.64%	19.21%	7.00%	9.34%	6.94%	13.70%
2008 Q4	8.17%	8.41%	6.69%	8.85%	9.48%	11.20%	10.65%	10.86%	9.65%	18.37%	7.03%	9.60%	6.09%	12.88%
2009 Q1	8.37%	8.57%	6.81%	9.16%	9.77%	10.74%	10.94%	11.15%	9.67%	18.47%	7.38%	9.98%	6.04%	12.78%
2009 Q2	8.48%	8.74%	6.37%	9.75%	9.99%	10.57%	10.84%	11.23%	9.78%	18.54%	7.55%	10.42%	5.96%	12.60%
2009 Q3	8.68%	8.79%	6.22%	10.25%	10.27%	10.18%	10.42%	11.32%	9.98%	18.63%	5.29%	10.68%	6.11%	12.41%
2009 Q4	8.81%	8.86%	6.06%	10.81%	10.52%	9.92%	9.90%	11.39%	10.54%	18.51%	5.59%	11.31%	6.08%	12.24%
2010 Q1	9.01%	8.96%	6.29%	11.08%	10.78%	9.71%	9.68%	11.52%	10.83%	18.80%	5.95%	11.72%	6.50%	12.17%
2010 Q2	9.34%	9.06%	6.59%	11.40%	11.09%	9.65%	9.60%	11.63%	11.17%	19.16%	6.30%	12.10%	6.73%	12.16%
2010 Q3	9.52%	9.36%	6.77%	11.78%	11.44%	9.71%	9.42%	11.75%	11.48%	19.36%	6.57%	12.50%	7.07%	12.16%
2010 Q4	9.70%	9.61%	6.88%	12.17%	11.81%	9.80%	9.55%	11.86%	11.73%	19.48%	6.87%	12.68%	7.29%	12.15%
2011 Q1	9.89%	9.83%	7.02%	12.54%	12.21%	9.85%	9.62%	12.01%	12.06%	19.78%	7.10%	12.99%	7.58%	12.23%
2011 Q2	10.11%	9.97%	7.03%	12.91%	12.67%	9.97%	9.70%	12.20%	12.44%	20.10%	7.33%	13.31%	7.74%	12.37%
projected stress test outcome under passive operating assumptions	pass	pass	pass	pass	pass	pass	pass	pass	pass	pass	fail	pass	fail	pass
Additional equity required to pass stress test (in \$thous)											91,000		60,000	
Estimated 2008 Q2 equity-to-asset ratio required to pass stress test											7.24%		7.03%	

**Table 11: Representative Bank Stress Test Model Forecast of Bank Stress Scenario Performance and Capitalization Under Passive Operating Assumptions**

actual quarterly INBFTXEX ratio	JPMorgan Chase	Bank of America	Citibank	Wells Fargo	US Bank	Sun Trust	Regions Bank	BB&T Bank	PNC Bank	Capital One Bank	Bank of New York	State Street Bank	HSBC bank	RBS
2008 Q2	0.19%	0.25%	-0.14%	0.43%	0.57%	0.45%	0.22%	0.40%	0.48%	0.14%	0.09%	0.58%	-0.14%	0.24%
2008 Q3	-3.91%	-2.14%	-1.93%	0.31%	0.67%	1.04%	1.49%	0.56%	0.45%	0.67%	-0.74%	-0.21%	-1.34%	0.03%
2008 Q4	-4.15%	-2.04%	-1.85%	0.14%	0.43%	0.71%	0.98%	0.35%	0.16%	0.45%	-1.27%	-0.57%	-1.45%	-0.08%
2009 Q1	-4.39%	-2.20%	-2.10%	0.07%	0.33%	0.67%	1.02%	0.24%	0.09%	0.40%	-1.33%	-0.63%	-1.60%	-0.16%
2009 Q2	-4.21%	-1.95%	-1.88%	0.25%	0.52%	0.82%	1.15%	0.26%	0.25%	0.56%	-1.18%	-0.45%	-1.42%	0.01%
2009 Q3	-4.10%	-1.74%	-1.78%	0.37%	0.64%	0.95%	1.28%	0.27%	0.39%	0.59%	-1.06%	-0.33%	-1.31%	0.13%
2009 Q4	-4.04%	-1.65%	-1.72%	0.21%	0.87%	1.00%	1.33%	0.31%	0.63%	0.65%	-1.00%	-0.27%	-1.25%	0.19%
2010 Q1	-4.02%	-1.63%	-1.69%	0.09%	0.90%	1.03%	1.36%	0.38%	0.66%	0.68%	-0.97%	-0.24%	-1.22%	0.22%
2010 Q2	-4.02%	-1.62%	-1.69%	0.10%	0.90%	1.03%	1.37%	0.47%	0.66%	0.68%	-0.97%	-0.24%	-1.22%	0.22%
2010 Q3	-3.95%	-1.56%	-1.63%	0.17%	0.96%	1.10%	1.43%	0.50%	0.73%	0.75%	-0.91%	-0.17%	-1.15%	0.28%
2010 Q4	-3.92%	-1.52%	-1.59%	0.20%	1.00%	1.13%	1.46%	0.45%	0.76%	0.78%	-0.87%	-0.14%	-1.12%	0.32%
2011 Q1	-3.90%	-1.50%	-1.57%	0.22%	1.07%	1.15%	1.49%	0.50%	0.78%	0.80%	-0.85%	-0.12%	-1.10%	0.34%
2011 Q2	-3.87%	-1.48%	-1.55%	0.25%	1.09%	1.17%	1.51%	0.52%	0.80%	0.82%	-0.83%	-0.10%	-1.08%	0.36%
projected quarterly equity/asset ratio														
2008 Q2	7.90%	8.19%	7.77%	8.73%	8.89%	11.26%	14.84%	10.31%	9.41%	19.15%	6.54%	9.09%	7.00%	13.65%
2008 Q3	4.15%	6.18%	5.95%	9.02%	9.49%	12.17%	16.09%	10.81%	9.81%	19.69%	5.85%	8.90%	5.74%	13.67%
2008 Q4	0.00%	4.22%	4.18%	9.14%	9.88%	12.79%	16.91%	11.12%	9.96%	20.06%	4.63%	8.38%	4.35%	13.60%
2009 Q1	-4.59%	2.07%	2.13%	9.21%	10.18%	13.36%	17.75%	11.33%	10.04%	20.37%	3.35%	7.80%	2.80%	13.46%
2009 Q2	-9.18%	0.12%	0.25%	9.43%	10.64%	14.07%	18.68%	11.56%	10.27%	20.82%	2.19%	7.39%	1.40%	13.47%
2009 Q3	-13.86%	-1.66%	-1.56%	9.77%	11.21%	14.87%	19.71%	11.80%	10.62%	21.28%	1.14%	7.08%	0.10%	13.59%
2009 Q4	-18.66%	-3.36%	-3.34%	9.96%	11.98%	15.72%	20.76%	12.08%	11.18%	21.79%	0.14%	6.83%	-1.16%	13.75%
2010 Q1	-23.62%	-5.07%	-5.12%	10.04%	12.76%	16.58%	21.83%	12.41%	11.76%	22.32%	-0.84%	6.61%	-2.41%	13.94%
2010 Q2	-28.79%	-6.80%	-6.93%	10.13%	13.54%	17.43%	22.88%	12.82%	12.34%	22.85%	-1.83%	6.39%	-3.67%	14.13%
2010 Q3	-34.09%	-8.50%	-8.70%	10.28%	14.36%	18.32%	23.97%	13.25%	12.97%	23.42%	-2.77%	6.23%	-4.88%	14.38%
2010 Q4	-39.56%	-10.18%	-10.45%	10.46%	15.21%	19.24%	25.07%	13.64%	13.63%	24.01%	-3.67%	6.10%	-6.07%	14.65%
2011 Q1	-45.22%	-11.86%	-12.22%	10.66%	16.11%	20.16%	26.16%	14.07%	14.30%	24.62%	-4.56%	5.99%	-7.25%	14.94%
2011 Q2	-51.07%	-13.54%	-13.98%	10.88%	17.01%	21.08%	27.26%	14.51%	14.98%	25.23%	-5.44%	5.90%	-8.41%	15.25%
stress test outcome	<b>fail</b>	<b>fail</b>	<b>fail</b>	pass	pass	pass	pass	pass	pass	pass	<b>fail</b>	<b>fail</b>	<b>fail</b>	pass
Additional equity required to pass stress test (in \$thous)	480,150,000	209,700,000	198,900,000								13,190,000	125,000	21,940,000	
Estimated 2008 Q2 equity-to-asset ratio required to pass stress test	42.69%	23.99%	23.94%								16.68%	9.18%	19.36%	



**Table 12: Bank Specific Stress Test Model Forecasts of Bank Stress Scenario Performance and Capitalization Under Passive Operating Assumptions**

actual quarterly INBFTXEX ratio	JPMorgan	Bank of					Regions			Capital One	Bank of	State Street		
	Chase	America	Citibank	Wells Fargo	US Bank	Sun Trust	Bank	BB&T Bank	PNC Bank	Bank	New York	Bank	HSBC bank	RBS
2008 Q2	0.19%	0.25%	-0.14%	0.43%	0.57%	0.45%	0.22%	0.40%	0.48%	0.14%	0.09%	0.58%	-0.14%	0.24%
2008 Q3	-0.43%	0.05%	-0.17%	0.48%	0.85%	0.49%	-0.06%	0.56%	0.42%	0.53%	-0.63%	0.61%	0.25%	0.70%
2008 Q4	-0.57%	-0.53%	-0.13%	-0.07%	1.19%	0.44%	0.51%	0.35%	0.09%	0.79%	-1.75%	-0.25%	0.13%	1.28%
2009 Q1	-0.56%	-0.10%	0.28%	0.19%	0.37%	0.39%	0.29%	0.24%	-0.02%	-0.28%	-1.26%	-0.45%	0.23%	1.05%
2009 Q2	-0.46%	0.15%	0.57%	0.54%	0.39%	0.34%	0.30%	0.26%	0.07%	-0.34%	-1.21%	-0.33%	0.29%	0.90%
2009 Q3	-0.29%	0.09%	0.90%	0.77%	0.44%	0.36%	0.25%	0.27%	0.29%	-0.19%	-1.12%	-0.43%	0.48%	0.83%
2009 Q4	-0.25%	0.39%	0.76%	0.57%	0.32%	0.35%	0.20%	0.31%	-0.67%	-0.14%	-0.89%	-0.43%	0.44%	0.62%
2010 Q1	-0.20%	0.42%	0.89%	-0.19%	0.26%	0.36%	0.18%	0.38%	-0.71%	-0.03%	-0.92%	-0.46%	0.53%	0.73%
2010 Q2	-0.19%	0.34%	0.61%	-0.04%	0.44%	0.38%	0.17%	0.47%	-0.56%	0.19%	-0.86%	-0.35%	0.55%	0.67%
2010 Q3	-0.07%	0.54%	0.82%	0.14%	0.43%	0.35%	0.26%	0.50%	-0.55%	-0.24%	-0.84%	-0.23%	0.71%	0.41%
2010 Q4	-0.13%	0.50%	0.72%	0.17%	0.45%	0.36%	0.14%	0.45%	-0.51%	-0.50%	-0.68%	0.04%	0.62%	0.33%
2011 Q1	-0.05%	0.57%	0.88%	0.13%	0.47%	0.37%	0.22%	0.50%	-0.48%	-0.23%	-0.62%	-0.06%	0.65%	0.46%
2011 Q2	-0.11%	0.57%	0.90%	0.11%	0.44%	0.39%	0.04%	0.52%	-0.51%	-0.09%	-0.84%	-0.01%	0.81%	0.32%
projected quarterly equity/asset ratio														
2008 Q2	7.90%	8.19%	7.77%	8.73%	8.89%	11.26%	14.84%	10.31%	9.41%	19.15%	6.54%	9.09%	7.00%	13.65%
2008 Q3	7.50%	8.24%	7.62%	9.16%	9.66%	11.69%	14.79%	10.81%	9.79%	19.58%	5.95%	9.64%	7.23%	14.24%
2008 Q4	6.97%	7.76%	7.50%	9.10%	10.72%	12.07%	15.22%	11.12%	9.87%	20.21%	4.28%	9.41%	7.36%	15.32%
2009 Q1	6.44%	7.66%	7.75%	9.27%	11.06%	12.41%	15.47%	11.33%	9.86%	19.98%	3.05%	8.99%	7.57%	16.20%
2009 Q2	6.01%	7.80%	8.27%	9.76%	11.40%	12.71%	15.72%	11.56%	9.92%	19.71%	1.87%	8.69%	7.84%	16.95%
2009 Q3	5.74%	7.88%	9.09%	10.45%	11.79%	13.03%	15.93%	11.80%	10.17%	19.56%	0.75%	8.29%	8.28%	17.63%
2009 Q4	5.51%	8.23%	9.78%	10.95%	12.08%	13.33%	16.10%	12.08%	9.56%	19.45%	-0.14%	7.89%	8.68%	18.15%
2010 Q1	5.32%	8.62%	10.58%	10.78%	12.31%	13.64%	16.24%	12.41%	8.91%	19.43%	-1.07%	7.46%	9.17%	18.73%
2010 Q2	5.14%	8.93%	11.12%	10.75%	12.69%	13.96%	16.39%	12.82%	8.40%	19.58%	-1.95%	7.14%	9.66%	19.28%
2010 Q3	5.08%	9.42%	11.84%	10.87%	13.07%	14.26%	16.60%	13.25%	7.89%	19.39%	-2.81%	6.92%	10.30%	19.60%
2010 Q4	4.96%	9.86%	12.48%	11.02%	13.46%	14.57%	16.71%	13.64%	7.42%	18.98%	-3.52%	6.96%	10.85%	19.87%
2011 Q1	4.91%	10.38%	13.24%	11.14%	13.86%	14.88%	16.90%	14.07%	6.97%	18.80%	-4.17%	6.91%	11.43%	20.24%
2011 Q2	4.81%	10.89%	14.01%	11.24%	14.24%	15.21%	16.93%	14.51%	6.49%	18.72%	-5.05%	6.90%	12.14%	20.49%
stress test outcome	<b>fail</b>	pass	pass	pass	pass	pass	pass	pass	pass	pass	<b>fail</b>	pass	pass	pass
Additional equity required to pass stress test (in \$thous)	16,000,000										12,780,000			
Estimated 2008 Q2 equity-to-asset ratio required to pass stress test	9.06%										16.37%			