Accounting discretion of banks during a financial crisis

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Abstract: This paper shows that banks use accounting discretion to overstate the value of distressed assets. Banks' balance sheets overvalue real estate-related assets compared to the market value of these assets during the US mortgage crisis. Banks with large exposure to mortgage-backed securities also provision less for bad loans. Furthermore, distressed banks use discretion in the classification of mortgage-backed securities to inflate their books. Our results indicate that banks' balance sheets offer a distorted view of the financial health of the banks.

Key words: financial regulation, accounting standards, corporate disclosure, asymmetric information
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1. Introduction

At times of financial crisis when asset markets become distressed, large differences between book and market values of bank assets may arise, especially when assets are carried at values based on historical cost. Such differences give rise to incentives for banks to use accounting discretion to preserve the book value of the bank, for example, by using advantageous valuation techniques and making favorable assessments of asset impairment. As a consequence, discretion in accounting rules causes banks to understate underlying balance sheet stresses and to overstate regulatory capital.

During the recent financial crisis, large differences have arisen between the market values and book values of the assets of U.S. banks. Specifically, by end-2008, 60% of U.S. bank holding companies had a market-to-book value ratio of assets below one, compared to only 8% of banks at the end of 2001. During this period, the market values of some bank assets, such as mortgage-backed securities (MBS), declined sharply, as information asymmetries about the quality of these assets led to a collapse of the MBS market (see Gorton, 2008, Brunnermeier, 2009, Diamond and Rajan, 2009, and Krishnamurthy, 2009). The average ratio of Tier 1 capital to bank assets, however, has declined only slightly from 12% to 11% over this period. The market value of bank equity thus has dropped precipitously against a backdrop of virtually constant book capital. This suggests that values of bank assets on bank balance sheets are generally overstated by year-end 2008, and it raises doubts about the relevance and reliability of bank's accounting information – the two main criteria by which accounting systems are generally evaluated – at a time of financial crisis.

This paper shows that banks have systematically understated the impairment of real estate related assets in their public accounts since the onset of the current financial crisis. We provide

the first evaluation of such behavior, and offer three pieces of compelling evidence to support our thesis that banks use accounting discretion to overstate the book value of capital.

First, we estimate large market discounts implicit in stock prices on real estate related assets as such mortgage loans and MBS. To estimate implicit market discounts on bank assets, we empirically relate Tobin's *q*, computed as the market-to-book value of assets, to banks' asset exposures using quarterly accounting data on U.S. bank holding companies for the period 2001 to 2008. Our primary focus is on real estate related assets, as these assets constitute a large fraction of the total assets of the average bank, and as recent declines in U.S. real estate prices have raised doubts about the underlying value of these assets.

We find significant discounts on banks' real estate loans starting in 2008, averaging about 17%. As the average bank holding company in 2008 holds about 53% of its assets in the form of real estate loans, the implicit discount in loan values goes a long way towards explaining the current depressed state of bank share prices. We further find that investors started discounting banks' holdings of MBS in 2008. For that year, we find an average discount on these assets of 14%, while the average MBS exposure amounted to 10% of assets. The market discount on MBS that are available-for-sale (and carried at fair value) is estimated to be 12%, against a larger discount of 22% for MBS that are held-to-maturity (and carried at values based on historical cost). These various discounts suggest that banks have used their discretion in determining the book values of real estate and MBS to limit book-value impairment of these assets.

Second, this paper considers bank behavior regarding their loan loss provisioning and loan charge-offs in the current financial crisis. A bank that holds back on its loan loss provisioning maintains high book values of its loans and preserves regulatory capital, potentially explaining large implicit discounts on its loan portfolio. In practice, banks have considerable

leeway in setting the loan loss provisioning for bad loans and in realizing loan losses in the form of charge-offs, potentially providing room for manipulation. We focus on the use of discretion regarding the accounting for loan impairment, as loans are by far the largest asset category, amounting to 71% of assets on average in 2008.

We find that banks with large exposure to MBS reported significantly lower loan loss provisions in 2008. This indeed suggests that weakened banks manipulate their loan loss provisioning to manage their regulatory capital during the present crisis. Specifically, we find that a one standard deviation increase in MBS exposure (relative to assets) leads the average bank to reduce loan loss provisioning in 2008 by an amount that is equivalent to 0.1% of assets. This implies a substantial saving in regulatory capital, compared to a standard deviation of the ratio of Tier 1 capital to assets of 1.8% in 2008.

Third, we examine banks' choices regarding the classification of MBS as either held-to-maturity or available-for-sale. In 2008, the fair value of especially non-guaranteed MBS tended to be less than their amortized cost. This implies that banks could augment the book value of assets by classifying MBS as held-to-maturity. Indeed, we show that the share of MBS that are held-to-maturity increased substantially in 2008. The incentive to classify MBS as held-to-maturity rather than available-for-sale should increase in the difference between the amortized cost and fair value of a bank's MBS portfolio. Consistent with this, we find that the share of MBS in total assets kept as held-to-maturity is significantly related to the gap between the amortized cost and fair value of MBS exposure. The relationship between the reporting of MBS as held-to-maturity and the corresponding valuation gain is found to be especially strong during the crisis year 2008, and for distressed banks with low valuations.

Taken together, the evidence of this paper shows that banks have considerable discretion in setting the book value of assets higher than values implicit in stock prices and to limit asset impairment. Overall, accounting discretion enables banks to soften the impact of the crisis on the book valuation of assets during the present financial crisis. Some accounting discretion is unavoidable, as accounting systems in part are mechanisms for firms to reveal asymmetric information to investors and other outside parties (Shackelford et al., 2008). Accounting systems with considerable discretion, however, may deliver highly inaccurate accounting information at a time of great turmoil, such as the present financial crisis, with potential real consequences for the allocation of capital in the economy (Kedia and Philippon, 2006, and Leuz and Wysocki, 2008). Inaccurate accounting information can be especially harmful in the case of banks, as it may lead to regulatory forbearance with concomitant risks for tax payers. There is indeed ample evidence of such regulatory forbearance in previous crisis episodes in the U.S., Japan, and elsewhere (see, for instance, Kane, 1989, Kroszner and Strahan, 1996, Barth et al., 2006, Caballero et al., 2008, Skinner, 2008, and Brown and Dinc, 2009).[1] In the present crisis, the financial statements of banks appear to overstate the book value of assets to the point of becoming misleading guides to investors and regulators alike.[2] Thus, the present crisis can be seen as a 'stress test' of the accounting framework that reveals that book valuation need not always reflect the best estimate of asset value, especially at a time of sharp declines in market values.

Our paper relates to a large literature on the costs and benefits of earnings management of firms (see, e.g., Leuz et al., 2003, and Hutton et al., 2008), and the management of loan loss

[1] For example, Skinner (2008) shows that Japanese bank regulators allowed banks to use deferred tax accounting to bolster their banks' regulatory capital levels when their economic circumstances deteriorated during the Japanese banking crisis. Major U.S. banks similarly are allowed to maintain substantial deferred tax assets during the present financial crisis. Citigroup, for example, reported deferred tax assets of $ 38 billion at the end of the third quarter of 2009.

[2] The outcomes of stress tests of major U.S. banks conducted by the U.S. Treasury in 2009, which calculated capital shortfalls at several major banks, are testimony to the fact that publicly available accounting information at the time provided an inadequate picture of the health of the concerned banks.

provisioning in particular (see, e.g., Moyers, 1990, Beatty et al., 1995, Collins et al., 1995, and Ahmed et al., 1999). A theoretical literature outlines that managers of firms may have incentives to smooth reported accounting incomes either to smooth their own compensation, to increase their job security, or to increase firm valuation by investors (see, e.g., Trueman and Titman, 1988, Fudenberg and Tirole, 1995, Sankar and Subramanyam, 2000). There is also work on the costs and benefits of enhanced corporate disclosure and accounting transparency (see Leuz and Wysocki, 2008, for a review). For example, Karpoff et al. (2008) use firm-level information on legal enforcement actions to show that financial misrepresentation has reputational consequences for firms and depresses firm valuation.

A related literature reviewed by Barth et al. (2001) and Holthausen and Watts (2001) asks whether accounting information is value relevant in the sense that it conforms to the information that bank shareholders use to price bank shares. Barth et al. (1996) and Eccher et al. (1996) find that fair value estimates of loan portfolios and securities help to explain bank share prices beyond amortized cost. There is also recent work on the market pricing of bank assets reported under different fair valuation techniques (e.g., Goh et al., 2009, Kolev, 2009, and Song et al., 2009). This work shows that level 3 assets, which banks value with relatively much discretion, tend to be discounted the most. This finding is consistent with our evidence that the market attaches discounts to real estate related assets that are valued with considerable discretion. Recent work also investigates concerns about the potential procyclical nature of fair value accounting, which could magnify fluctuations in bank lending and economic activity (see Heaton

et al., 2009, and IMF, 2009). Laux and Leuz (2009) find little evidence that such effects are the result of fair value accounting.[3]

Our paper is part of an emerging literature on the causes and effects of the U.S. financial crisis that started in 2007. This work shows that house price appreciation (e.g., Demyanyk and Van Hemert, 2008) and asset securitization (e.g., Keys et al., 2008; Mian and Sufi, 2008; Loutskina and Strahan, 2009), combined with a more general deterioration of lending standards by banks (e.g., Dell'Ariccia et al., 2008), helped fuel a crisis in U.S. mortgage markets, with bank capital being eroded as the asset price bubble in real estate markets burst starting in 2007.

The paper continues as follows. Section 2 presents empirical evidence on market discounts of real estate related assets, relative to book values, during the present financial crisis. Section 3 examines the use of bank discretion regarding loan loss provisioning and loan charge-offs, and the classification of MBS into different accounting categories. Section 4 concludes.

2. Tobin's *q* and market discounts

2.1 Divergence between market value and book value of bank assets

In this study, we consider U.S. bank holding companies that are stock exchange listed. These companies report a range of accounting data to the Federal Reserve System by way of the Report on condition and income (Call report). We use quarterly data from these Call reports from the final quarter of 2001 till the end of 2008. This covers a full business cycle as defined by the National Bureau of Economic Research (NBER) from the previous recession which ended in November 2001 until the current ongoing recession which started in December 2007.

[3] A common view is that bank regulation should target any undesirable credit procyclicality directly, for instance by prescribing cyclical capital requirements (for a more detailed discussion of this debate, see Laeven and Majnoni, 2003, Kashyap and Stein, 2004, and Repullo and Suarez, 2008).

Taking stock market data from Datastream, we use the market value of common equity plus the book value of preferred equity and liabilities as a proxy for the market value of a bank's assets. Tobin's q is then constructed as the ratio of this proxy for the market value of bank assets and the book value of assets. Figure 1 reports the average Tobin's q per quarter over our sample period. The mean value of q has declined from 1.06 in the final quarter of 2001 to 1.00 in the final quarter of 2008. This suggests that over this period, the market value of bank assets has declined more than its book value.

We define a zombie bank as a bank with a q of less than one.[4] The decline of the average q has been accompanied by an increase of the share of banks that are zombie banks. As presented in Figure 1, the share of zombie banks has increased from 8.0% at the end of 2001 to 59.6% at the end of 2008. During this period, the share of zombie banks has tended to be smaller than in 2001 and 2008 reflecting an upswing of the business cycle. In fact, the share of zombie banks reached a low of 0.3% during the second quarter of 2004.

Against a background of declines in many banks' equity prices, banks' regulatory capital, as measured by the ratio of Tier 1 capital to total risk-weighted assets, has remained surprisingly stable throughout the sample period. Figure 2 shows the development of the Tier 1 capital ratio and the share of Tier 1 capital in total bank capital. While leverage increased for some banks, consistent with findings by Adrian and Shin (2008), the average Tier 1 capital ratio decreased only modestly from 12.0% in 2001 to 11.2% in 2008.[5] The composition of capital also changed only modestly over the sample period, with the share of Tier 1 capital in total capital shrinking from 88.1% in 2001 to 86.4% in 2008. This suggests that, although some banks may have looked

[4] The term zombie bank has frequently been used in the context of Japan during the 1990's banking crisis when Japanese banks continued to lend to unprofitable borrowers (e.g., Caballero et al., 2008).
[5] Tier 1 capital represents the core component of capital for banks and is regarded as the key measure of a bank's financial strength from a regulator's point of view. Tier 1 capital consists primarily of common stock, retained earnings, and disclosed reserves.

for less traditional, non-core sources of capital, such as subordinated debt or perpetual stock, to boost capital and increase assets, most banks continued to do so while increasing Tier 1 capital and maintaining excess regulatory capital.

2.2 Relationship between Tobin's *q* and market discounts

Lower values of Tobin's *q* for banks suggest that the valuation of bank assets implicit in the stock market has declined more that the book values of these assets. In fact, by relating Tobin's *q* to banks' exposure to various asset classes, we can infer market discounts on these assets relative to their book values.[6] To implement this, let *MV* be the market value of the bank. Further, let A_i be the accounting value of asset *i* and let L_i be the accounting value of liability *i*. If we assume there are operating markets for a bank's assets and liabilities, then we can state a bank's market value as follows:

$$MV = \sum_i v_i^a A_i - \sum_i v_i^l L_i \qquad (1)$$

where v_i^a is the market value of asset *i* and v_i^l is the market value of liability *i*.[7]

We can now define *q* as the market value of the equity of the bank plus the book value of all liabilities divided by the book value of all assets as follows:

$$q = \frac{MV + \sum_i L_i}{\sum_i A_i}$$

Substituting for *MV* from (1) into the expression for *q*, we get:

[6] In similar fashion, Sachs and Huizinga (1987) estimate discounts on third world debt on the books of U.S. banks at the time of the international debt crisis of the 1980s. A related literature, starting with Lang and Stulz (1994) and including Laeven and Levine (2007), has studied discounts in Tobin's *q* arising from corporate diversification. In that literature, discounts are computed for each business unit of a conglomerate with respect to the value of comparable stand-alone firms, while here we compute discounts for different assets and liabilities of the same bank.

[7] In eq. (1), we ignore that market value may depend on the co-existence of certain assets and liabilities as discussed in, for instance, DeYoung and Yom (2008).

$$q = 1 - \sum_i d_i^a a_i + \sum_i d_i^l l_i \qquad (2)$$

where $d_i^a = 1 - v_i^a$, $d_i^l = 1 - v_i^l$, $a_i = \frac{A_i}{\sum_i A_i}$ and $l_i = \frac{L_i}{\sum_i A_i}$. The coefficients d_i^a and d_i^l, that are to be estimated, are the discounts implicit in the bank's stock price of a bank's assets and liabilities relative to book values. The variables a_i and l_i are the current book values of particular assets and liabilities relative to the book value of all assets.[8] In eq. (2), Tobin's *q* will differ from 1 if at the valuation of at least one balance sheet items implicit in the stock market differs from its book value.

2.3 Data on bank balance sheet items

This section discusses the bank asset and liability categories that enter the subsequent empirical work on market discounts. Of main interest in this analysis will be banks' exposure to the real estate market, which comes in the form or real estate loans and MBS. To reflect banks' direct exposure to real estate loans, we construct the ratio of real estate loans to overall assets. From 2001 to 2008 the asset share of real estate loans has increased substantially from 45.5% to 52.9% for the average bank holding company as reflected in Figure 3. Thus, about half of the average bank's assets consist of real estate loans by 2008. Banks' exposure to MBS in turn is measured by the share of MBS in all assets. This MBS share increased only slightly from 9.9% in 2001 to 10.3% at the end of 2008.

[8] Current book values of, say, real estate loans could already reflect some loan loss provisioning. Estimated discounts on bank assets then reflect the difference between market perception of asset impairment and the recognition of this impairment through reported loan loss provisioning (rather than the difference between market value and origination value). Put differently, the estimated discount reflects the difference between market perception of any asset impairment and the accounting treatment of this impairment.

While there has been a move towards fair value accounting of bank assets, most assets of the average bank, including mortgage loans held for investment, are still reported based on historical cost.[9] The book value of MBS reflects different accounting conventions depending on whether these securities are held-to-maturity or available-for-sale. MBS classified as held-to-maturity are carried at amortized cost. This amortized cost may be adjusted periodically for amortization and capitalized interest, and it may also reflect previous loan loss provisioning. However, these adjustments to amortized cost are likely to be relatively small so that amortized cost is relatively close to origination values. MBS classified as available-for-sale, in contrast, are to be carried on the books at fair value. According to existing account rules (FAS 159), securities are to be classified as held-to-maturity and carried at amortized cost, if management has the intention to hold them until maturity, while otherwise they are available-for-sale and carried at fair value.[10]

Fair value is meant to reflect observed market values (of either the underlying asset – level 1 assets – or a comparable asset – level 2 assets) or otherwise reflect the outcome of a bank's own valuation models (level 3 assets).[11] Again, banks' assessments of fair value may differ across banking institutions as the determination of fair value in practice leaves banks with

[9] The majority of (real estate) loans are carried at historical cost, as loans held for sale, that are reported at the lower of historical cost and fair value, constitute only a small fraction of less than 1% of total assets for the average bank.
[10] This classification is to be made on the date of purchase of the security and it is in principle irreversible. On the purchase date, amortized cost and fair value should be essentially the same and hence no valuation advantage can be obtained by classifying securities either way.
[11] A breakdown of fair value assets by valuation technique (level 1 to 3) is in principle available from Schedule HC-Q of the Call report. We do not use this information in our analysis, because these assets are reported for only one of the three fair valuation techniques, making it difficult to draw any inference based on a direct comparison of the amount of assets reported in each category. Furthermore, the level 1 to 3 assets are not broken down separately for real-estate related assets, which are the primary focus of our study, and the majority of these assets are valued as level 2 assets (about 90 percent of fair value assets in 2008) so that there is not much variation in fair valuation technique.

significant discretion.[12] At any rate, at a time of declining asset values, one expects fair values to be less than amortized cost.

Interestingly, banks report in their Call report filings both the amortized cost and fair value of MBS regardless of whether these are held-to-maturity or available-for-sale. Thus, for MBS that are carried at amortized cost we also know the assessed fair value, while for MBS carried at fair value we also know the reported amortized cost. This enables us to compute a bank's share of MBS that are held-to-maturity (rather than available-for-sale) on a single accounting basis. Specifically, we can compute the share of MBS that is held-to-maturity using amortized costs for all MBS.

MBS can be broken down into those that do and do not benefit from some explicit or implicit official guarantee. Guaranteed MBS are those that are guaranteed or issued by U.S. government agencies such as the Federal National Mortgage Association (FNMA), the Federal Home Loan Mortgage Corporation (FHLMC), and the Government National Mortgage Association (GNMA), more generally known as Fannie Mae, Freddie Mac, and Ginnie Mae, respectively.[13] Figure 4 shows that for most of the sample period the share of non-guaranteed MBS classified as held-to-maturity exceeded the analogous share of guaranteed securities. Moreover, during 2008 the share of non-guaranteed MBS labeled held-to-maturity rose strongly from 8.3% to 11.4%. During that year, the share of guaranteed MBS that is held-to-maturity, instead, fell from 6.2% to 5.7%.

Figure 5 reports the mean ratio of fair value to amortized cost as reported by different banks over the sample period separately for guaranteed and non-guaranteed MBS (regardless of

[12] Indeed, work by Goh et al. (2009), Kolev (2009), and Song et al. (2009) shows that market discounts tend to be greatest for level 3 assets, where banks have most discretion.
[13] Note that these guarantees tend to cover underlying repayment of interest and principle, but not valuation risk stemming from interest rate changes or mortgage prepayment.

whether these securities are actually classified as held-to-maturity or available-for-sale). This ratio is fairly close to one for guaranteed MBS throughout the sample period. For non-guaranteed MBS, however, fair values relative to amortized cost declined from about one in 2001 to 86.6% on average at end-2008. These accounting valuations would have given banks an incentive to reclassify non-guaranteed MBS as held-to-maturity to the extent possible so as to boost the book value of assets. We indeed find that the fraction of non-guaranteed MBS that is reported as held-to-maturity increased during 2008 (as seen in Figure 4). Though straightforward reclassifications are not allowed under existing accounting rules, in the exceptional case of Citigroup, regulators have publicly approved a straight reclassification of part of the bank's MBS portfolio. Regulators may have tacitly approved reclassifications at other banks, and potentially some banks reclassified their MBS in violation of FAS 159 without regulatory approval, though we have no direct evidence of such MBS reclassification by banks apart from the exceptional case approved publicly by regulators.

It is especially interesting to assess whether the valuation of balance sheet items implicit in stock prices differs from book values at a time of financial crisis. Therefore, the emphasis of the subsequent empirical work will be on the year 2008, one year into the recession and what is generally considered the start of the U.S. mortgage default crisis (see for example Dell'Ariccia et al., 2008, and Mian and Sufi, 2008), when delinquencies on mortgage loans increased sharply.

Summary statistics for the main variables in 2008 are provided in Table 1. We exclude banks with Tobin's q exceeding its 99th percentile (amounting to a Tobin's q greater than 1.5) as these are not ordinary banks that carry primarily financial assets. The mean ratio of real estate loans to assets is 53.3%, while the mean ratio of non-real estate loans to assets is 18.0%. The average ratio of MBS (using amortized cost to value held-to-maturity securities and fair values

for securities available-for-sale) to assets is 9.6% and the ratio of non-MBS securities to assets is 7.3%. MBS can be split into MBS held-to-maturity at 0.8% of assets, and MBS available-for-sale at 8.9% of assets. MBS that are held-to-maturity can again be split into guaranteed and non-guaranteed securities equivalent to 0.7% and 0.1% of assets, respectively. Guaranteed and non-guaranteed MBS that are available-for-sale in turn amount to 8.1% and 0.8% of assets.

Low valuation is a dummy variable that equals one in a given quarter if a bank's q is less than one, and zero otherwise. By the end of 2008, 60% of U.S. banks had a value of q of less than one.

Several additional asset categories are considered as well. Trading is defined as trading assets relative to total assets (obtained from Schedule HC-B of the Call report). Trading assets, which include some MBS, are carried at fair value and held in the bank's trading book.[14] A detailed split-up of trading assets is only available for the domestic offices of bank holding companies and is not reported. On average, trading assets only amount to a share of 0.5% of assets, because only large banks tend to have such assets.

We also consider the liability structure of the bank. Deposits is defined as total deposits divided by total assets, and it amounts to 72.2% of assets on average. Data on deposits are obtained from Schedule HC-E of the Call report files. Bank capital, being the sum of Tier 1 and Tier 2 capital, is composed mostly of Tier 1 capital, amounting to 86.3% of capital on average.

Also in Table 1, loan loss provisioning is calculated as loan loss provisions divided by the book value of all loans. The mean loan loss provisioning rate is 0.8%. Net charge-offs, in turn, is the ratio of the difference between loan charge-offs and loan recoveries to the book value of loans. The mean net loan charge-off rate is 0.5%. Thus, loan loss provisioning exceeded net loan

[14] Trading assets are to be reported only by bank holding companies with average trading assets of $2 million or more in any of the four preceding quarters.

charge-offs, as expectations of loan losses surpassed actual loan write-offs. Finally, the share of real estate loans is the ratio of real estate loans to total loans with a mean value of 74.2%. The loan loss provisioning rate increased sharply as the crisis unfolded from less than 0.1% on average during the first quarter of 2007 to 1.5% on average during the fourth quarter of 2008.

2.4 Estimation of market discounts

This section provides the results of regressions of Tobin's *q* to obtain implicit market valuations of main balance sheet items. The focus is on the real estate components of loans and securities. This emphasis is justified by the fact that the real estate components of loans and securities together comprise on average 63% of bank assets in 2008, and by the fact that real estate assets have suffered from house price declines during the recent financial crisis. Nevertheless, we include several other balance sheet items in the analysis as well.

To start, Table 2 reports regressions of *q* that include the real estate loans and MBS variables with data for 2008.[15] The regressions also control for exposure to non-real estate loans, trading assets, and the composition of bank capital. All regressions include U.S. state fixed effects and time fixed effects to control for systematic differences across U.S. states and quarterly periods, such as housing and labor market conditions, or the monetary policy stance. Standard errors are corrected for clustering at the firm level. The real estate loans variable enters with a coefficient of -0.173 that is significant at the 1% level implying that the implicit market discount of real estate loans relative to book value is 17.3%. The MBS variable similarly enters with a coefficient of -0.136 that is significant at the 5% level so that MBS appear to be

[15] The estimation model implicitly sets the discount on excluded asset categories to zero. Asset categories excluded from the regression are cash-like assets (including cash, federal funds sold, and government securities), amounting to 15% of total assets, and non-cash like assets (including other securities, and fixed assets), amounting to the remainder of 3% of total assets. Thus, with cash-like assets carrying a discount of close to zero and constituting the majority of excluded assets, the implicit assumption of a discount of zero on excluded asset categories appears to be reasonable.

discounted 13.6%.[16] The economic effects are substantial. The results imply that a one standard deviation increase in real estate loans would reduce Tobin's *q* by another 2.4 percentage points, and that a one standard deviation increase in MBS would reduce Tobin's *q* by another 1.0 percentage points. These are substantial effects given the standard deviation of Tobin's *q* of 5.5%.

In unreported regressions, we split the MBS variable into its guaranteed and non-guaranteed parts yielding that non-guaranteed MBS are discounted the most.

Trading, denoting the ratio of trading assets to total assets, enters the regression with a coefficient of -0.285 that is significant at the 1% level. The economic effect of this result is small given that trading assets on average comprise only 0.5% of total assets in 2008.

The composition of equity capital can also influence bank value, especially during 2008 as markets reassessed the superior value of Tier 1 capital relative to Tier 2 capital, partly in response to stricter capital requirements proposed by regulators. We indeed find that Tier 1, denoting the share of Tier 1 capital in total capital, enters with a positive coefficient of 0.103 that is significant at the 1% level. This suggests that a one standard deviation increase of 8% in the share of Tier 1 capital in total capital increases bank value by 0.8 percentage points, which is not irrelevant given a standard deviation of *q* of 5.5%.

In unreported regressions, we find that the results are robust to including additional liability variables, including the ratio of total deposits to total assets and the ratio of bank capital to assets.

In regression 2, we replace the MBS variable with two separate variables, MBS, held and MBS, for sale that represent the parts of MBS that are held-to-maturity (and carried at amortized

[16] We only consider the market valuation of MBS as implicit in share prices. Empirical models of the direct pricing of MBS are offered by Dunn and Singleton (1983), Boudoukh et al. (1997), and Schwartz and Torous (1989).

cost) and available-for-sale (and carried at fair value). To the extent that fair values reflect market prices, we expect the discount to be smaller for available-for-sale MBS. The MBS, held variable obtains a coefficient of -0.219 that is significant at 1%, while the MBS, for sale variable enters with a coefficient of -0.119 that is significant at 10%. Thus, MBS classified as held-to-maturity appear to be discounted significantly at 21.9%, while the MBS available-for-sale tend to have a smaller discount of 11.9% on average. Thus, the gap between implicit market prices and accounting values appears to be largest for MBS classified as held-to-maturity.

Finally, in the last four regressions in Table 2 we re-estimate regression 2 separately for each of the four quarters in 2008. As we lose the time series dimension, these regressions do not include time fixed effects. We find that the discounts on the real estate related variables are fairly stable over these four quarters. Interestingly, the discounts on real estate loans and MBS that are held-to-maturity both reach a peak of 22.3% and 22.8%, respectively, during the third quarter of 2008, though the difference is not statistically significant. We obtain a similar pattern when we further split the MBS, held and MBS, for sale variables into their guaranteed and non-guaranteed parts (not reported).

The evidence indicates sizeable market discounts on real-estate related assets relative to book values for U.S. bank holding companies in 2008. As we have data starting in 2001, we next analyze whether such discounts existed before 2008. For this purpose, we re-estimate regression 2 of Table 2 with data for each of the years 2001 to 2007. The results are reported in Table 3.

Throughout the period 2001 to 2007, none of the real estate asset categories (real estate loans and MBS variables) is estimated with a significant discount. Thus, real estate loans and MBS asset categories are not estimated with significant discounts until 2008, suggesting that the

deterioration of the implicit market value of real estate assets relative to book value was sudden rather than gradual.

The final regression in Table 3 uses data for the period 2001 to 2008 and includes interactions between the explanatory variables and an indicator variable that takes a value of one for year 2008 observations to see whether the 2008 discounts reported thus far are significantly different from those in earlier years. We indeed find that Tobin's *q* is significantly lower on account of exposure to real estate loans are held-to-maturity MBS in 2008 as compared to earlier years. Real estate loans in fact obtain a discount of 14.7% compared to earlier years, and held-to-maturity MBS obtain a discount of 9.0% compared to earlier years. Both results are significant at the 1% level. The discount of real estate loans is also larger than the discount on non-real estate loans, consistent with the expectation that U.S. house price declines affect loan impairment of mortgage loans the most. Available-for-sale MBS do not obtain a discount relative to earlier years, suggesting that reductions in book value of these assets have kept pace with market perceptions of impairment.

One concern is that our results are driven by an overshooting in asset prices, meaning a temporary deviation in value from fundamental value. However, our measure of firm value is based on equity prices, which reflect the consensus view of many financial market participants. While fire sales and illiquidity may have led to overshooting in some asset markets, notably the market for derivatives on mortgage-backed securities, stock markets continued to be liquid throughout 2008. Also, we do not obtain a significant discount on available-for-sale MBS that are reported at fair value in 2008 compared to earlier years, suggesting that write-downs of these assets have kept pace with market perceptions of impairment. Moreover, we continue to find implicit discounts on real estate related assets in the final quarter of 2008, following the massive

government interventions in October 2008. Laux and Leuz (2009) explain that these interventions should have reduced the likelihood of distressed sales of banks' assets into illiquid markets. Finally, empirical evidence on the pricing of investment-grade credit risk during the financial crisis provided by Coval et al. (2009) casts doubt on the premise that prices in credit markets were systematically distorted. We therefore assert that stock market prices offer the best available information on the value of banks, and conclude that the accounting values of real estate related assets on the books of banks were inflated in 2008.

3. Accounting discretion regarding asset impairment and asset classification

Our evidence on discounts on real estate related assets implicit in bank stock prices suggests that the accounting for the impairment of these assets has not kept up with market perceptions of this impairment. In this section, we show that this does not merely reflect a passive and irresponsive accounting system, but it also results from the active use by banks of accounting discretion to prevent declines in the book value of assets. We consider accounting discretion in the areas of accounting for loan impairment and MBS classification in turn.

3.1 Accounting discretion regarding bad loans

Loan loss provisioning in principle should mirror expected future loan losses, but in practice banks have considerable discretion in setting loan loss provisioning rates. In this section, we examine whether distressed banks have systematically held back on their loan loss provisioning during the present financial crisis in order to preserve bank capital.[17] We focus on accounting for the impairment of loans as the size of the average bank's loan portfolio, at 71% of

[17] No breakdown of loss provisioning for real estate loans and other loan categories is available from the Call report.

assets, renders bank capital very sensitive to loan performance.[18] In addition, we consider whether distressed banks have different loan loss realizations in the form of loan charge-offs. Loan charge-offs reduce loan loss allowances, with no immediate implications for regulatory capital, but present charge-offs may trigger a need for future loan loss provisioning which will reduce regulatory capital.

To capture loan loss provisioning, we construct the ratio of loan loss provisions to total loans, expressed in percentages. We obtain data on loan charge-offs and provisions from Schedule HI-B of the Call report files. To proxy for potential bank distress, we use information on banks' MBS exposure and Tobin's *q*.

We first report regressions that test whether loan loss provisioning behavior of banks changed significantly during the crisis year 2008 when asset prices were depressed. The regressions are based on the entire sample period and include time fixed effects and firm fixed effects to control for time-invariant bank characteristics. To mitigate concerns about reverse causality, all explanatory variables are lagged one quarterly period.

In regression 1 of Table 4, the loan loss provisioning variable is related to the share of real estate loans in total loans and the share of MBS in total assets. We also include interaction terms between these two real estate exposure variables and a dummy variable that denotes whether the observation is for the year 2008 or not.

We expect loan loss provisioning to be more positively related to the share of real estate loans in 2008, as these loans have been particularly affected by recent house price declines. We indeed find that loan loss provisioning rate of banks with a large share of real estate loans was significantly higher during the year 2008. However, there was a significant negative relationship

[18] Laux and Leuz (2009) report that loans accounted for roughly three quarters of the balance sheets for the 31 bank holding companies that failed and were seized by U.S. bank regulators between January 2007 and July 2009.

between the share of real estate loans and loan loss provisioning in earlier years, possibly because banks were anticipating continued appreciation of real estate prices.

Banks that need to absorb large losses arising from exposure to MBS may lower their provisioning standards in an effort to preserve regulatory capital. In line with this, we find that the loan loss provisioning rate of banks with large MBS exposure was significantly *lower* during the year 2008, suggesting that banks with potential large losses on MBS were holding back on their loan loss provisioning in that year. The MBS exposure variable obtains a negative coefficient that is -1.738 lower in 2008 than in earlier years, and it is statistically significant at the 1% level.

The economic effect of this result is substantial. A one standard deviation increase in MBS implies a reduction in the loan loss provisioning rate in 2008 compared to earlier years of 0.13 percentage points. This is a substantial effect compared to the standard deviation of the loan loss provisioning rate of 1.0%. For a bank with the mean loan to assets ratio of 0.71, the implied reduction in loan loss provisioning is equivalent to 0.1 percent of assets. The average bank had a standard deviation of the Tier 1 capital to assets ratio of 1.8% in 2008, and hence a capital saving of 0.1 percent of assets is substantial.

In regression 2, we find that the loan loss provisioning rate is more negatively related to MBS that are held-to-maturity than to MBS that are available-for-sale in 2008 as compared to earlier years. Perhaps this reflects that amortized cost of MBS exceeds fair value in 2008, which implies relatively large future write-downs of MBS that are held-to-maturity.

Next, we analyze whether loan loss provisioning behavior has been significantly different for low valuation banks. The incentive to hold back on loan loss provisioning should be particularly pronounced for banks with distressed market values. To test this, regressions 3 and 4

in Table 4 include interaction terms between the real estate exposure variables and a dummy variable that takes a value of one for banks with a Tobin's *q* value of less than one. Regression 3 reports a coefficient for the MBS variable that is more negative at -0.986 and statistically significant at 1% for low-valuation banks, while regression 4 shows that the result is particularly pronounced for held-to-maturity MBS. Thus, we find that the negative relationship between loan loss provisioning and a bank's MBS exposure is significantly stronger for banks with a low valuation, as measured by a value of Tobin's *q* of less than one. This suggests that distressed banks with large exposure to MBS were particularly holding back on their loan provisioning.

Distressed banks also may be slow in recognizing losses on their real estate loan portfolio in the form of write-downs or charge-offs.[19] To analyze this, regressions 5 to 8 take as dependent variable the ratio of net charge-offs to loans (where net charge-offs are the difference between charge-offs and recoveries) expressed in percentages. Otherwise, these regressions are similar to regressions 1 to 4. Consistent with the earlier results, we find in regression 5 that the ratio of net charge-offs to loans is negatively and significantly related to the MBS variable in 2008 compared to earlier years. The results of regressions 6 to 8 similarly are analogous to those in regressions 2 to 4.

In sum, we find evidence that low-valuation banks with large MBS exposures hold back on their loan loss provisioning and charge-offs at a time of financial crisis.

3.2 Classification of mortgage-backed securities

According to FAS 159, banks have the option to classify securities as held-to-maturity or available-for-sale. Securities are to be classified as held-to-maturity and carried at amortized cost, if management has the intention to hold them until maturity. Otherwise, securities are

[19] Loan write-downs include write-downs arising from transfers of loans to a held-for-sale account.

available-for-sale and carried at fair value. This classification is to be made on the date of purchase of the security, and it is in principle irreversible. On the purchase date, amortized cost and fair value should be essentially the same and hence no valuation advantage can be obtained by classifying securities either way.

Reclassification of previously acquired securities generally affects the overall book value of securities. Specifically, overall book value rises if available-for-sale securities are reclassified as held-to-maturity at a time when amortized cost exceeds fair value. In 2008, the mean ratio of fair value to amortized cost for non-guaranteed MBS was 0.925, against a mean ratio of fair value to amortized cost for guaranteed MBS of 1.005 (see Figure 5). These accounting valuations gave banks an incentive to reclassify non-guaranteed MBS as held-to-maturity to the extent possible so as to boost the book value of assets. Indeed, the fraction of non-guaranteed MBS that is held-to-maturity increased from 7.6% at end-2007 to 11.4% at end-2008, consistent with the notion that banks had incentives during the year 2008 to classify a larger fraction of their MBS as held-to-maturity (see Figure 4).

Banks can achieve some reclassification of previously acquired securities in compliance with FAS 159 by selling and buying equivalent securities that are categorized differently within the same reporting period. In the exceptional case of Citigroup, regulators have publicly approved a straight reclassification of part of the bank's MBS portfolio despite FAS 159. Regulators may have tacitly approved reclassifications at other banks as well, and potentially some banks reclassified their MBS in violation of FAS 159 without regulatory approval. We have no direct evidence of MBS reclassification by banks, however, apart from the exceptional case approved publicly by regulators. All the same, we can examine whether changes in MBS classifications over time are consistent with a reclassification incentive. In this section, we

present evidence that the share of MBS in total assets kept as held-to-maturity is significantly related to the gap between the amortized cost and fair value of MBS exposure, especially in 2008. This evidence is consistent with a reclassification incentive.

Table 5 reports regressions of the share of held-to-maturity MBS in total assets. This share is related to real estate and non-real estate loans variables and to the MBS, amortized variable, defined as the share of all MBS valued at amortized cost in total assets. Hence, in the calculation of the MBS, amortized variable, the MBS that are actually available for sale are also valued at amortized cost. These variables first capture a bank's asset portfolio considerations. For instance, a bank with a large real estate loan portfolio may decide to hold fewer MBS, both held-to-maturity and available-to-sale. In addition, these loan and MBS exposure variables represent pressures to classify MBS as held-to-maturity, at least during 2008 when banks with large real estate related exposures faced mounting losses as house prices collapsed and amortized cost of MBS exceeded fair value. The next explanatory variable, MBS, difference, is computed as the difference between MBS at amortized cost and MBS at fair value scaled by total assets. This variable measures the valuation gain to be achieved if a bank's entire MBS portfolio is classified as held-to-maturity rather than available-for-sale. The MBS, difference variable is thus a direct proxy for a reclassification incentive. Note that the correlation between the MBS, amortized and MBS, difference variables is only 0.037 so that there are no collinearity concerns. Regressions are based on the complete sample of banks and include time and firm fixed effects. To mitigate concerns about reverse causality, all explanatory variables are lagged one quarterly period. The results are presented in regression 1 of Table 5.

We find negative and significant relationships between the share of MBS that is held-to-maturity and the loan variables. Apparently, banks that tend to specialize in loans invest less in

MBS, resulting in a negative correlation between the held-to-maturity MBS and the loan variables. Next, banks with a larger overall share of MBS in total assets, represented by the MBS, amortized variable, tend to hold more MBS as held-to-maturity relative to total assets. The estimated coefficient of 0.071 on the MBS, amortized variable can be interpreted as the marginal propensity to hold MBS as held-to-maturity. The MBS, difference variable, in turn, is estimated with a positive coefficient that is significant at the 1 percent level, consistent with a valuation incentive affecting MBS classification.

To assess whether MBS classification behavior changed during 2008, we include interactions between each explanatory variable and a dummy variable that takes a value of one for the year 2008 and zero otherwise. The results are presented in regression 2 of Table 5. The interacted real estate loan variable obtains a coefficient that is positive and statistically significant at the 1 percent level, suggesting that banks with large exposures to real estate loans had an incentive to compensate for imminent losses arising from rapidly falling house prices by reclassifying MBS. The interacted MBS, amortized variable, instead, obtains a negative coefficient that is significant at the 1 percent level. Thus, banks' marginal propensity to hold MBS as held-maturity in 2008 was lower than before, perhaps because additions to MBS portfolios were primarily classified as available-for-sale in 2008. Indeed, the average share of held-to-maturity MBS in total assets increased from 7.4% in 2007 to 8.9% in 2008, while the average share of available-for-sale MBS in total assets decreased from 0.82% in 2007 to 0.80% in 2008. The interacted MBS, difference variable obtains a positive coefficient that is significant at the 1 percent level, suggesting that banks acted more strongly on a reclassification incentive to boost asset values in 2008 than before.

The implied effects are economically significant. Specifically, regression 2 indicates that a one standard deviation increase in the MBS, difference variable implies an increase in the share of MBS that is held-to-maturity of 0.3 percentage points in 2008 as compared to earlier years. Similarly, a one standard deviation increase in the real estate loans variable implies an increase in the share of held-to-maturity MBS of 0.2 percentage points in 2008 relative to earlier years. These are substantial effects compared to the standard deviation of the share of held-to-maturity MBS variable of 3.2%.

The incentive to reclassify MBS as held-to-maturity should be particularly pronounced for distressed banks. To assess whether bank distress influences the classification of MBS, we include interactions between each explanatory variable and a low-valuation dummy variable that takes a value of one if the Tobin's *q* value of the bank is less than one. The results are presented in regression 3 of Table 5. We indeed find that the effects of the real estate loans and MBS, difference variables on the share of held-to-maturity MBS are significantly more pronounced for low-valuation banks than for high-valuation banks. Thus, especially low-valuation banks with large real estate loan exposures and facing large differences between amortized cost and fair of MBS reported more MBS as held-to-maturity. We find no significant differential effect of the MBS, amortized variable for low-valuation banks, suggesting that the propensity to report MBS as held-to-maturity is not different for distressed banks.

In sum, we find evidence that banks with large real estate loan exposures reported more of their MBS as held-to-maturity in 2008. In addition, we find that banks responded to the reclassification incentive provided by the difference between amortized cost and fair value of MBS throughout the sample period, but more strongly in 2008. The changed classification

behavior in 2008 relative to earlier years appears to reflect the application of accounting discretion in the face of a severe financial crisis.

4. Conclusions

In 2008, the majority of U.S. banks were zombie banks, as evidenced by market values of bank assets being lower than their book values. This is *prima facie* evidence that the book value of banks' balance sheets is inflated. Consistent with this, we find that the market discounts the value of banks' real estate loans and MBS relative to book values. The apparent discrepancy between market and book values of bank assets suggests that banks have been slow to adjust the asset book values to conform to market expectations about future declines in asset performance.

We find a larger discount for held-to-maturity MBS (that are carried at amortized cost) than for available-for-sale MBS (that are carried at fair value), suggesting that fair values recognize the impairment of MBS to a greater extent and more quickly than amortized costs do.

The slowness of book values to reflect market declines does not merely reflect the rigidity of accounting rules, but it in part reflects the active use by banks of accounting discretion to prevent book value deterioration.

Specifically, we demonstrate that banks with large exposures to MBS systematically report relatively low loan loss provisioning rates in 2008 so as to inflate asset values and book capital. At the same time, banks with large real estate exposures tend to classify more of their MBS as held-to-maturity in 2008, to be able to carry these assets at higher amortized cost. The amount of MBS classified as held-to-maturity further reflects the valuation gap between amortized cost and fair value, as evidence that banks classify MBS in order to boost asset values.

Our finding that distressed banks tend to exploit their discretion in loan loss provisioning and classification of MBS to boost their accounting value should be reason for concern, as it implies that the discretion implicit in current accounting rules leads to systematic biases in valuations on bank balance sheets. Accounting discretion enables banks with impaired asset portfolios to satisfy capital adequacy requirements, but it makes it difficult to assess the true health of the affected banks.

In setting loan loss provisions, banks no doubt make use of private information about the prospects of loan repayment. This makes bank discretion regarding loan loss provisioning generally beneficial in that private information about loan quality is revealed, and discretion regarding loan loss provisioning may well be unavoidable. Bank classification of MBS, in contrast, does not serve the purpose of revealing private information about MBS quality. Banks can use such information, to the extent that they have it, in determining amortized cost and fair value of their MBS assets. Classification behavior per se, however, reveals no additional information about MBS quality not already contained in accounting valuations, while it carries the cost of enabling banks to alter the book value of their assets and their regulatory capital. This may underlie the statutory rule against security reclassification contained in FAS 159. Our empirical evidence, however, suggests that changes in classification behavior are motivated so as to boost bank asset values. This suggests that in practice FAS 159 is frequently violated, with or without regulatory approval. Thus, at least some U.S. banks that are subject to GAAP may covertly have classification options similar to non-US banks that are subject to IFRS, which now overtly allow reclassification. Covert classification behavior with a view to boost regulatory capital does not seem to serve the information interest of outside interested parties.

The rationale for security classifications would disappear, if all securities are carried at fair value. More generally, replacing the mixed attribute model of accounting with a model based entirely on fair value accounting will mitigate incentives for accounting arbitrage and could serve to improve the information value of public accounts, even if fair value calculations themselves are also subject to discretion by banks. Similarly, stricter adherence to a forward-looking approach to provisioning for bad loans on an expected loss basis could improve the information content of bank accounting, although incentives for banks to use discretion on loan loss provisioning rates to inflate the book value of assets during economic downturns remain present.

No accounting system of disclosing the fair value of financial assets and expected losses will be perfect. Valuation models can be misused or misinterpreted. But reasonable and auditable methods exist today to incorporate information embedded in market prices. More reliable public accounts are beneficial to regulatory and market discipline and could potentially have helped to avoid some of the losses that banks currently face.

References

Adrian, Tobias and Hyun S. Shin, 2008, Liquidity and leverage, *Journal of Financial Intermediation*, forthcoming.

Ahmed, Anwer S. and Carolyn Takeda and Shawn Thomas, 1999, Bank loan loss provisions: a reexamination of capital management, earnings management and signaling effect, *Journal of Accounting and Economics* 28, 1-25.

Barth, Mary E., William H. Beaver and Wayne R. Landsman, 1996, Value-relevance of banks' fair value disclosures under SFAS No. 107, *Accounting review*, 513-537.

Barth, Mary E., William H. Beaver and Wayne R. Landsman, 2001, The relevance of the value relevance literature for financial accounting standard setting: another view, *Journal of Accounting and Economics* 31, 77-104.

Barth, James R., Gerard Caprio, and Ross Levine. 2006. *Rethinking Bank Regulation*. Cambridge: Cambridge University Press.

Beatty, Anne, Sandra L. Chamberlain, and Joseph Magliolo, 1995, Managing financial reports of commercial banks: the influence of taxes, regulatory capital, and earnings, *Journal of Accounting Research* 33, 231-261.

Boudoukh, Jacob, Matthew Richardson, Richard Stanton, and Robert F. Whitelaw, 1997, Pricing mortgage-backed securities in a multifactor interest rate environment: a multivariate density estimation approach, *Review of Financial Studies* 10, 405-446.

Brown, Craig O., and I. Serdar Dinc, 2009, Too many to fail? Evidence of regulatory forbearance when the banking sector is weak. *Review of Financial Studies*, forthcoming.

Brunnermeier, Markus, 2009, Deciphering the liquidity and credit crunch 2007-2008, *Journal of Economic Perspectives* 23, 77-100.

Caballero, Ricardo, Takeo Hoshi, and Anil K. Kashyap, 2008, Zombie lending and depressed restructuring in Japan, *American Economic Review* 98, 1943-1977.

Collins, Julie H., Douglas A. Shackelford, and James M. Wahlen, 1995, Bank differences in the coordination of regulatory capital, earnings, and taxes, *Journal of Accounting Research* 33, 263-291.

Coval, Joshua D., Jakub W. Jurek, and Erik Stafford, 2009, The pricing of investment grade credit risk during the financial crisis, mimeo, Harvard Business School.

Dell'Ariccia, Giovanni, Deniz Igan, and Luc Laeven, 2008, Credit booms and lending standards: Evidence from the subprime mortgage market, mimeo, International Monetary Fund.

Demyanyk, Yuliya, and Otto Van Hemert, 2008, Understanding the subprime mortgage crisis, *Review of Financial Studies*, forthcoming.

DeYoung, Robert and Chiwon Yom, 2008, On the independence of assets and liabilities: Evidence from U.S. commercial banks, 1990-2005, *Journal of Financial Stability* 4, 275-303.

Diamond, Douglas and Raghuram Rajan, 2009, Fear of fire sales and the credit squeeze, NBER Working Paper 14925.

Dunn, Kenneth B. and Kenneth J. Singleton, 1983, An empirical analysis of the pricing of mortgage-backed securities, *Journal of Finance* 38, 613-623.

Eccher, Elizabeth A., K. Ramesh and S. Ramu Thiagarajan, 1996, Fair value disclosures by bank holding companies, *Journal of Accounting and Economics* 22, 79-117.

Fudenberg, Drew and Jean Tirole, 1995, A theory of income and dividend smoothing based on incumbency rents, *Journal of Political Economy* 103, 75-93.

Goh, Beng Wee, Jeffrey Ng, and Kevin Ow Yong, 2009, Market pricing of banks' fair value assets reported under SFAS 157 during the 2008 economic crisis, mimeo, MIT.

Gorton, Gary, 2007, Information, liquidity, and the (ongoing) panic of 2007, *American Economic Review* 99, 567-572.

Heaton, Johan, Deborah Lucas, and Robert McDonald, 2009, Is mark-to-marking accounting destabilizing? An analysis and implications for policy, mimeo, University of Chicago.

Holthausen, Robert W. and Ross L. Watts, 2001, The relevance of the value-relevance literature for financial accounting standard setting, *Journal of Accounting and Economics* 2001, 3-75.

Hutton, Amy P. , Alan J. Marcus, and Hassan Tehranian, 2008, Opaque financial reports, R2, and the distribution of crash risks, *Journal of Financial Economics*, forthcoming.

International Monetary Fund, 2008, Global financial stability report. Chapter 3: Fair value accounting and procyclicality. October 2008.

Kane, Edward J., 1989, *The S&L Insurance Mess: How Did It Happen?* Washington, DC: Urban Institute.

Karpoff, Jonathan M., D. Scott Lee, and Gerald S. Martin, 2008, The cost to firms of cooking the books, *Journal of Financial and Quantitative Analysis* 43, 581–612.

Kashyap, Anil and Jeremy Stein, 2004, Cyclical implications of the Basel II capital standards, Federal Reserve Bank of Chicago Economics Perspectives 1st quarter, 18-31.

Keida, Simi and Thomas Philippon, 2006, The economics of fraudulent accounting, forthcoming in *Review of Financial Studies*.

Keys, Benjamin, Tanmoy Mukherjee, Amit Seru, and Vikrant Vig, 2008, Securitization and screening: evidence from subprime mortgage backed securities, *Quarterly Journal of Economics*, forthcoming.

Kolev, Kalin, 2009, Do investors perceive marking-to-model as marking-to-myth? Early evidence from FAS 157 disclosure, mimeo, NYU Stern School of Business.

Kroszner, Randall S., and Philip E. Strahan. 1996. Regulatory incentives and the thrift crisis: dividends, mutual-to-stock conversions, and financial distress. *Journal of Finance* 51, 1285–1319.

Krishnamurthy, Arvind, 2009, How debt markets have malfunctioned in the crisis, forthcoming, *Journal of Economic Perspectives*.

Laeven, Luc and Giovanni Majnoni, 2003, Loan loss provisioning and economic slowdowns: too much, too late, *Journal of Financial Intermediation* 12, 178-197.

Laeven, Luc and Ross Levine, 2007, Is there a diversification discount in financial conglomerates?, *Journal of Financial Economics* 85, 331-367.

Lang, Larry and Rene M. Stulz, 1994, Tobin's q, Corporate diversification, and firm performance, *Journal of Political Economy* 102, 1248-1280.

Laux, Christian and Christian Leuz, 2009, Did fair-value accounting contribute to the financial crisis?, *Journal of Economic Perspectives*, forthcoming.

Leuz, Christian, D.J. Nanda and Peter Wysocki, 2003, Investor protection and earnings management: an international comparison, *Journal of Financial Economics* 69, 505-527.

Leuz, Christian and Peter Wysocki, 2008, Economic consequences of financial reporting and disclosure regulation: a review and suggestions for future research, mimeo, Chicago University and MIT.

Loutskina, Elena and Philip Strahan, 2009, Securitization and the declining impact of bank finance on loan supply: evidence from mortgage originations, *Journal of Finance* 64, 861-889.

Mian, Atif, and Amir Sufi, 2008, The consequences of mortgage credit expansion: evidence from the 2007 mortgage default crisis, *Quarterly Journal of Economics*, forthcoming.

Morgan, Donald P., 2002, Rating banks: risk and uncertainty in an opaque industry, *American Economic Review* 92, 874-888.

Moyer, Susan E., 1990, Capital adequacy and ratio regulations and accounting choices in commercial banks, *Journal of Accounting and Economics* 13, 123-154.

Repullo, Rafael and Javier Suarez, 2008, The procyclical effects of Basel II, CEPR Discussion paper No. 6862, CEPR, London.

Sachs, Jeffrey and Harry Huizinga, 1987, U.S. commercial banks and the developing country debt crisis, *Brookings Papers on Economic Activity* 2, 555-606.

Sankar, Mandira R. and K. R. Subramanyam, 2000, Reporting discretion and private information communication through earnings, *Journal of Accounting Research* 39, 365-386.

Schwartz, Eduardo S. and Walter N. Torous, 1989, Prepayment and the valuation of mortgage-backed securities, *Journal of Finance* 44, 375-392.

Shackelford, Douglas A., Joel B. Slemrod and James M. Sallee, 2008, A unifying model of how the tax system and generally accepted accounting principles affect corporate behavior, mimeo, University of North Carolina at Chapel Hill.

Skinner, Douglas J., 2008, "The Rise of Deferred Tax Assets in Japan: The Case of the Major Japanese Banks", *Journal of Accounting and Economics*, Forthcoming.

Song, Chang Joon, Wayne Thomas, and Han Yi, 2009, Value relevance of FAS 157 fair value hierarchy information and the impact of corporate governance mechanisms, mimeo, University of Oklahoma.

Trueman, Brett and Sheridan D. Titman, 1988, An explanation for accounting income smoothing, *Journal of Accounting Research* 26, 127-39.

Appendix. Variable definitions and data sources

Variable	Definition	Source
Tobin's *q*	Ratio of market value of common equity plus book value of preferred equity and liabilities to book value of assets	Call report and Datastream
Non-real estate loans	Ratio of non-real estate loans to assets	Call report
Real estate loans	Ratio of real estate loans to assets	Call report
Non-MBS securities	Ratio of non-MBS securities to assets. Securities held-to-maturity are at amortized cost and securities available-for-sale are at fair value	Call report
MBS	Ratio of MBS to assets. Held-to-maturity securities are at amortized cost and available-for-sale securities are at fair value	Call report
MBS, held	Ratio of MBS that are held-to-maturity to assets	Call report
MBS, for sale	Ratio of MBS that are available-for-sale to assets	Call report
MBS, held, guaranteed	Ratio of MBS that are held-to-maturity and issued or guaranteed by FNMA, FHLMC, and GNMA to assets	Call report
MBS, held, not guaranteed	Ratio of non-guaranteed MBS that are held-to-maturity to assets	Call report
MBS, for sale, guaranteed	Ratio of MBS that are available-for-sale and issued or guaranteed by FNMA, FHLMC, and GNMA to assets	Call report
MBS, for sale, not guaranteed	Ratio of non-guaranteed MBS that are available-for-sale to assets	Call report
Low valuation	Dummy variable that equals 1 if Tobin's *q* is less than 1, and 0 otherwise	Call report
Trading	Ratio of assets in trading account to total assets	Call report
Deposits	Ratio of deposits to assets	Call report
Tier 1	Tier 1 capital ratio	Call report
Share of Tier 1	Ratio of tier 1 capital in total capital	
Loan loss provisioning	Ratio of loan loss provisioning to loans in percent	Call report
Net charge-offs	Ratio of loan charge-offs minus recoveries to loans in percent	Call report
Share of real estate loans	Share of real estate loans in total loans	Call report
MBS, amortized	Ratio of MBS to assets. Both held-to-maturity and available-for-sale MBS are at amortized cost	Call report
MBS, difference	Difference between MBS valued at amortized cost and MBS valued at fair value divided by total assets	

Table 1. Summary statistics for 2008, quarterly data

See the appendix for variable definitions and data sources.

Variable	Obs	Mean	Std. Dev.	Min	Max
Tobin's *q*	1114	1.0138	0.0552	0.8976	1.3280
Non-real estate loans	1114	0.1800	0.0941	0.0000	0.6116
Real estate loans	1114	0.5328	0.1361	0.0561	0.8638
Non-MBS securities	1114	0.0729	0.0591	0.0000	0.4367
MBS	1114	0.0965	0.0729	0.0000	0.4664
MBS, held	1114	0.0080	0.0316	0.0000	0.3594
MBS, for sale	1114	0.0885	0.0666	0.0000	0.4009
MBS, held, not guaranteed	1114	0.0012	0.0114	0.0000	0.2006
MBS, held, guaranteed	1114	0.0068	0.0284	0.0000	0.3577
MBS, for sale, not guaranteed	1114	0.0075	0.0165	0.0000	0.1592
MBS, for sale, guaranteed	1114	0.0810	0.0623	0.0000	0.4009
Trading	1114	0.0052	0.0255	0.0000	0.2996
Low valuation	1114	0.4560	0.4983	0.0000	1.0000
Deposits	1114	0.7220	0.1017	0.1227	0.9028
Tier 1	1114	0.1076	0.0254	0.0000	0.2086
Share of Tier 1	1114	0.8634	0.0810	0.5000	1.0000
Loan loss provisioning	1114	0.7541	1.0431	0.0000	14.3493
Net charge-offs	1114	0.4919	0.7583	-0.0936	9.0577
Share of real estate loans	1114	0.7421	0.1412	0.0993	1.0000
MBS, amortized	1114	0.0967	0.0729	0.0000	0.4661
MBS, difference	1083	0.0003	0.0028	-0.0091	0.0509

Table 2. Tobin's *q* and real estate related assets during 2008

The dependent variable is Tobin's *q*. Sample in Columns (1) and (2) consists of observations for all four quarters during the year 2008. Sample in Column (3) is the first quarter of 2008. Sample in Column (4) is the second quarter of 2008. Sample in Column (5) is the third quarter of 2008. Sample in Column (6) is the fourth quarter of 2008. All regressions include state fixed effects, and regressions in Columns (1) and (2) also include quarterly period fixed effects (not reported). Standard errors in Columns (1) and (2) are corrected for clustering at the bank level. Columns (3) to (6) report White's heteroskedasticity-consistent standard errors. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

	2008	2008	2008Q1	2008Q2	2008Q3	2008Q4
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Non-real estate loans	-0.0424	-0.0489	-0.0461	-0.0594	-0.0563	-0.0412
	(0.0576)	(0.0563)	(0.0644)	(0.0725)	(0.0807)	(0.0521)
Real estate loans	-0.173***	-0.176***	-0.169***	-0.180***	-0.223***	-0.142***
	(0.0517)	(0.0514)	(0.0558)	(0.0670)	(0.0740)	(0.0471)
MBS	-0.136**					
	(0.0625)					
MBS, held		-0.219***	-0.209**	-0.237**	-0.282***	-0.170**
		(0.0769)	(0.0967)	(0.0962)	(0.0971)	(0.0815)
MBS, for sale		-0.119*	-0.165**	-0.127	-0.109	-0.0992
		(0.0680)	(0.0768)	(0.0855)	(0.0915)	(0.0632)
Trading	-0.285***	-0.288***	-0.271***	-0.269**	-0.326**	-0.286***
	(0.0876)	(0.0872)	(0.101)	(0.106)	(0.147)	(0.0931)
Share of Tier 1	0.103***	0.105***	0.0834**	0.122***	0.150***	0.0930***
	(0.0300)	(0.0298)	(0.0407)	(0.0397)	(0.0491)	(0.0310)
Constant	1.011***	1.012***	1.031***	0.999***	0.987***	0.959***
	(0.0434)	(0.0433)	(0.0568)	(0.0578)	(0.0721)	(0.0394)
Time fixed effects	Y	Y	Y	Y	Y	Y
State fixed effects	Y	Y	Y	Y	Y	Y
Observations	1114	1114	286	279	277	272
R-squared	0.377	0.380	0.343	0.389	0.418	0.327

Table 3. Tobin's *q* and real estate related assets during 2001-2008

The dependent variable is Tobin's *q*. Regressions in Columns (1) to (7) include state fixed effects and quarterly period fixed effects (not reported), with standard errors corrected for clustering at the bank level. Regression in Column (8) includes firm fixed effects. Data are based on quarterly observations over the period 2001-2008. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

	2001	2002	2003	2004	2005	2006	2007	2001-2008
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Non-real estate loans	0.0679	0.0905	0.00244	0.0927*	0.104**	0.0836*	0.0421	0.0524***
	(0.0775)	(0.0589)	(0.0487)	(0.0509)	(0.0456)	(0.0497)	(0.0537)	(0.0134)
Real estate loans	-0.0108	0.0645	0.0232	0.0255	0.0226	-0.0142	-0.0633	0.0572***
	(0.0581)	(0.0451)	(0.0401)	(0.0413)	(0.0394)	(0.0453)	(0.0487)	(0.0101)
MBS, held	0.0658	0.150	0.0628	0.0241	0.00231	-0.0287	-0.0515	-0.00675
	(0.121)	(0.106)	(0.0998)	(0.0700)	(0.0621)	(0.0701)	(0.0803)	(0.0251)
MBS, for sale	0.0430	0.0658	0.0131	0.0532	0.0271	-0.000414	-0.0677	0.0453***
	(0.0747)	(0.0580)	(0.0506)	(0.0495)	(0.0482)	(0.0556)	(0.0621)	(0.0116)
Trading	0.198	0.117	0.0376	-0.00533	-0.209*	-0.193*	-0.139*	0.140***
	(0.263)	(0.202)	(0.161)	(0.127)	(0.110)	(0.105)	(0.0749)	(0.0462)
Share of Tier 1	-0.0369	-0.0377	-0.0110	0.0299	-0.0385	0.0109	0.00872	0.0645***
	(0.0683)	(0.0555)	(0.0406)	(0.0374)	(0.0368)	(0.0421)	(0.0331)	(0.00986)
Non-real estate loans * 2008								-0.0982***
								(0.0174)
Real estate loans * 2008								-0.147***
								(0.0136)
MBS, held * 2008								-0.0896***
								(0.0344)
MBS, for sale * 2008								-0.0207
								(0.0186)
Trading * 2008								-0.134***
								(0.0476)
Share of Tier1 * 2008								0.127***
								(0.0142)
Constant	1.087***	1.017***	1.046***	1.016***	1.068***	1.045***	1.057***	0.964***
	(0.0871)	(0.0695)	(0.0493)	(0.0525)	(0.0496)	(0.0554)	(0.0482)	(0.0119)
Time fixed effects	Y	Y	Y	Y	Y	Y	Y	Y
State fixed effects	Y	Y	Y	Y	Y	Y	Y	N
Firm fixed effects	N	N	N	N	N	N	N	Y
N	287	1189	1247	1264	1287	1167	1155	8710
R^2	0.206	0.183	0.190	0.245	0.310	0.318	0.362	0.463

Table 4. Loan loss provisions and net loan charge-offs during 2001-2008

The dependent variable in Columns (1) to (4) is the ratio of loan loss provisioning to loans and in Columns (5) to (8) net loan charge offs to loans (both expressed in percentages). Share of real estate loans is the fraction of real estate loans in total loans. 2008 denotes observations during year 2008. Low valuation denotes banks with Tobin's *q* of less than one. Explanatory variables are lagged one quarterly period. Regressions include firm and quarterly period fixed effects (not reported). Data are based on quarterly observations over the period 2001 to 2008. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

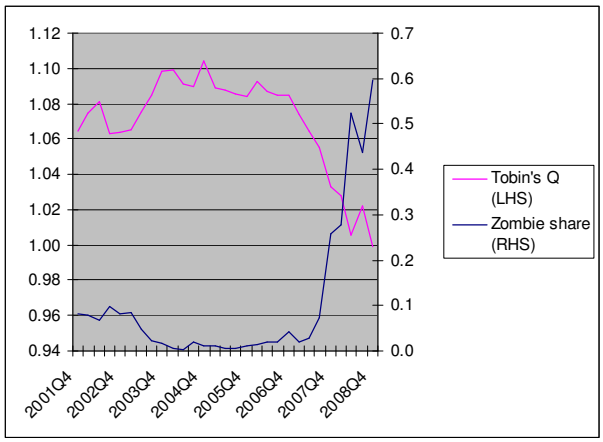
	Loan loss provisioning rate				Loan charge-off rate			
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Share of real estate loans (t-1)	-0.618***	-0.629***	-0.618***	-0.631***	-0.883***	-0.886***	-0.932***	-0.937***
	(0.104)	(0.104)	(0.103)	(0.103)	(0.0877)	(0.0878)	(0.0877)	(0.0877)
MBS (t-1)	-0.144		-0.139		-0.104		-0.0806	
	(0.124)		(0.124)		(0.105)		(0.105)	
MBS, held (t-1)		-0.0406		0.0386			-0.0974	-0.0295
		(0.306)		(0.300)		(0.258)		(0.255)
MBS, for sale (t-1)		-0.173		-0.191		-0.110		-0.0987
		(0.127)		(0.127)		(0.107)		(0.108)
Share of real estate loans (t-1) * 2008	0.265***	0.318***			0.486***	0.502***		
	(0.101)	(0.102)			(0.0851)	(0.0858)		
MBS (t-1) * 2008	-1.738***				-1.191***			
	(0.197)				(0.166)			
MBS, held (t-1) * 2008		-3.356***				-1.685***		
		(0.455)				(0.384)		
MBS, for sale (t-1) * 2008		-1.380***				-1.083***		
		(0.216)				(0.183)		
Low valuation (t-1)			0.492***	0.381***			-0.0363	-0.0789
			(0.0991)	(0.101)			(0.0842)	(0.0862)
Share of real estate loans (t-1) * Low valuation (t-1)			-0.0187	0.0972			0.491***	0.536***
			(0.123)	(0.125)			(0.104)	(0.106)
MBS (t-1) * Low valuation (t-1)			-0.986***				-0.803***	
			(0.225)				(0.191)	
MBS, held (t-1) * Low valuation (t-1)				-3.563***				-1.793***
				(0.558)				(0.475)
MBS, for sale (t-1) * Low valuation (t-1)				-0.474*				-0.606***
				(0.247)				(0.210)
Constant	1.911***	1.864***	1.121***	1.140***	1.379***	1.365***	1.120***	1.127***
	(0.110)	(0.110)	(0.0820)	(0.0820)	(0.0927)	(0.0933)	(0.0697)	(0.0698)
N	8325	8325	8325	8325	8325	8325	8325	8325
R^2	0.357	0.358	0.382	0.384	0.256	0.256	0.274	0.275

Table 5. Share of held-to-maturity mortgage-backed securities during 2001-2008

Dependent variable is the ratio of held-to-maturity MBS to total assets. MBS, amortized is total MBS at amortized cost to total assets. MBS, difference is the difference between MBS at amortized cost and MBS at fair value scaled by total assets. 2008 denotes whether observations are from the year 2008 or not. Low valuation denotes banks with Tobin's *q* of less than one. Regressions include firm and quarterly period fixed effects (not reported). Explanatory variables are lagged one quarterly period. Data are based on quarterly observations. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

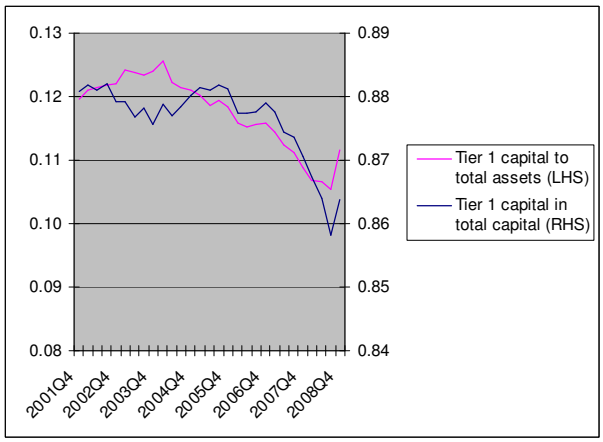
VARIABLES	(1)	(2)	(3)
Non-real estate loans (t-1)	-0.0185***	-0.0173***	-0.0164***
	(0.0061)	(0.0061)	(0.0061)
Real estate loans (t-1)	-0.0294***	-0.0300***	-0.0294***
	(0.0046)	(0.0046)	(0.0046)
MBS, amortized (t-1)	0.0706***	0.0712***	0.0714***
	(0.0051)	(0.0051)	(0.0052)
MBS, difference (t-1)	0.411***	0.298***	0.330***
	(0.0979)	(0.104)	(0.100)
Non-real estate loans (t-1) * 2008		0.0090	
		(0.0080)	
Real estate loans (t-1) * 2008		0.0153**	
		(0.0061)	
MBS, amortized (t-1) * 2008		-0.0208**	
		(0.0085)	
MBS, difference (t-1) * 2008		1.086***	
		(0.291)	
Low valuation (t-1)			0.0001
			(0.0008)
Non-real estate loans (t-1) * Low valuation (t-1)			-0.0050
			(0.0052)
Real estate loans (t-1) * Low valuation (t-1)			0.0049**
			(0.0020)
MBS, amortized (t-1) * Low valuation (t-1)			-0.0085
			(0.0075)
MBS, difference (t-1) * Low valuation (t-1)			0.935***
			(0.286)
Constant	0.0205***	0.0119**	0.0192***
	(0.0036)	(0.0058)	(0.0036)
N	8350	8350	8350
R^2	0.062	0.067	0.064

Figure 1 . Tobin's *q* and share of zombie banks



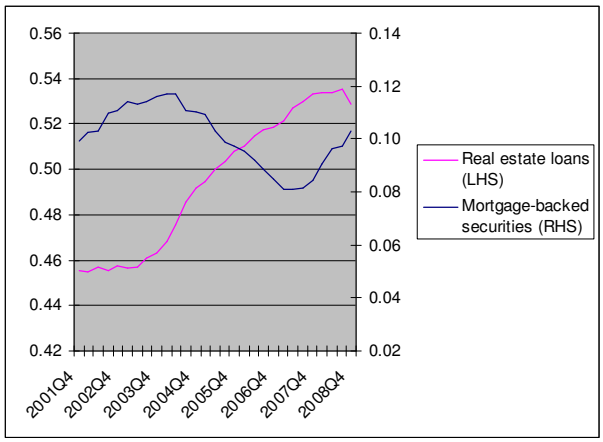
Tobin's q is the ratio of market value to book value of assets. Zombie share is the fraction of banks with Tobin's q less than 1. Quarterly data from Call reports and Datastream.

Figure 2. Capitalization and composition of bank regulatory capital



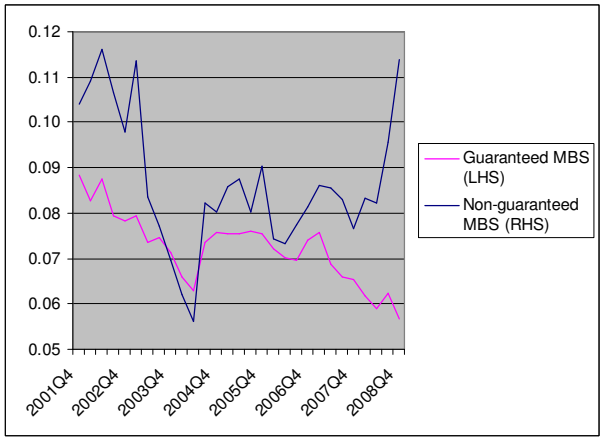
Tier 1 capital to total assets is the ratio of tier 1 capital to total risk-weighted assets. Tier 1 capital in total capital is the ratio of tier 1 capital to total regulatory capital. Quarterly data from Call reports.

Figure 3. Real estate loans and mortgage-backed securities



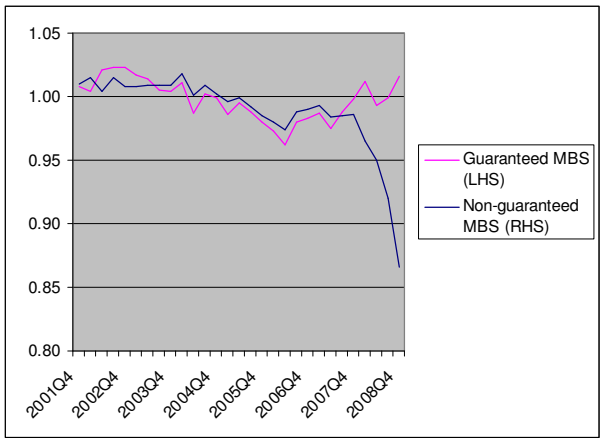
Real estate loans is the ratio of real estate loans to total assets. Mortgage-backed securities is the ratio of MBS to total assets. Securities are valued at amortized cost if held-to-maturity and at fair value if available-for-sale. Quarterly data from Call reports.

Figure 4. Share of mortgage-backed securities that is held-to-maturity



Guaranteed MBS is the fraction of guaranteed MBS that is held-to-maturity. Non-guaranteed MBS is the fraction of non-guaranteed MBS that is held-to-maturity. Quarterly data from Call reports.

Figure 5. Fair value of mortgage-backed securities relative to amortized cost



Guaranteed MBS is the fair value of guaranteed MBS to the amortized value of guaranteed MBS. Non-guaranteed MBS is the fair value of non-guaranteed MBS to the amortized value of non-guaranteed MBS. Quarterly data from Call reports.