

A Convenient Scapegoat: Fair Value Accounting by Commercial Banks during the Financial Crisis

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ABSTRACT: Critics argue that fair value provisions in U.S. accounting rules exacerbated the recent financial crisis by depleting banks' regulatory capital, which curtailed lending and triggered asset sales, leading to further economic turmoil. Defenders counter-argue that the fair value provisions were insufficient to lead to the pro-cyclical effects alleged by the critics. Our evidence indicates that these provisions did not affect the commercial banking industry in the ways commonly alleged by critics. First, we show that fair value accounting losses had minimal effect on regulatory capital. Then, we examine sales of securities during the crisis, finding mixed evidence that banks sold securities in response to capital-depleting charges. However, the sales that potentially resulted from the charges appear to be economically insignificant, as there was no industry- or firm-level increase in sales of securities during the crisis.

Keywords: *regulatory capital; standard setting; other-than-temporary impairments; fair value accounting; mark-to-market; pro-cyclical; contagion; credit crisis; asset sales.*

JEL Classifications: *M41; M42; M44.*

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I. INTRODUCTION

U.S. accounting rules, which are the basis of bank regulatory capital requirements, have been blamed for exacerbating the recent financial crisis. Critics allege that the rules required financial institutions to write down their assets to abnormally low market prices even when the institutions did not intend to sell at those prices; they argue that these write-downs decreased banks' regulatory capital, forcing them to take actions that led to further rounds of price declines and capital depletions. Defenders of U.S. accounting and bank regulatory systems counter-argue that the fair value accounting provisions are limited and are unlikely to have led to the pro-cyclical effects alleged by critics. Defenders point out that most bank assets are not fair valued, and the assets that are fair valued likely have little effect on regulatory capital, especially when banks do not intend to sell these assets at low prices.¹

Evidence in our study indicates that fair value accounting did not affect the commercial banking industry in the ways commonly alleged by critics. There are two primary aspects of our analyses. First, we quantify the effects of fair value losses on regulatory capital. Typically, the largest asset on bank balance sheets subject to fair value accounting is the portfolio of debt securities classified as available-for-sale (AFS) or held-to-maturity (HTM). Fair value losses on these securities do not affect regulatory capital unless management deems them "other than temporary," meaning that the bank cannot demonstrate intent and ability to hold the securities until the price recovers. During the crisis, the banking industry claimed that demonstrating such intent and ability was too onerous, causing "performing assets that have no credit losses [to be] written down as impaired," thus needlessly reducing regulatory capital and restricting the ability to lend ([American Bankers Association 2008](#), 3). Based on these claims, Congress pressured the Financial Accounting Standards Board (FASB) to make swift changes that softened the rules governing other-than-temporary impairments (OTTIs). In light of the link between OTTI charges and regulatory capital, the banking industry's complaints about OTTIs, and the subsequent rule changes, we examine the size, timing, and pro-cyclical effects of the OTTI charges taken by a sample of bank holding companies since 2004. We also compare the magnitude of OTTI charges to the magnitude of bad debt expense to examine the impact OTTIs had on regulatory capital relative to this other capital-depleting charge. Analytical models ([Cifuentes et al. 2005](#); [Allen and Carletti 2008](#); [Plantin et al. 2008](#)) typically assume a *pure* fair value accounting regime in which all asset price declines reduce accounting earnings and regulatory capital. This first set of analyses shows that this assumption is not descriptive of U.S. accounting.

Our second set of analyses focuses on the common allegation that banks boost their regulatory capital ratios by selling assets, which shrinks the ratio's denominator (risk-weighted assets). Selling assets in response to fair value losses such as OTTI charges would further decrease market prices, resulting in more rounds of write-downs, capital depletion, and asset selling. In this way, fair value accounting would make initial exogenous shocks to asset prices worse than is justified by fundamentals. The theoretical models cited above rely on asset sales to generate the pro-cyclical effects of fair value accounting; our second set of analyses examines the descriptive validity of this aspect of these models.

Academic commentaries ([Hellwig 2009](#); [Bignon et al. 2009](#)), popular press accounts, and trade groups allege that U.S. accounting rules and, by extension, regulatory capital rules, were sufficiently reliant on fair value to prompt pro-cyclical selling behavior, which worsened the recent crisis. These arguments were cited in Securities and Exchange Commission (SEC) deliberations

¹ Examples of arguments made by critics of fair value accounting include the [American Bankers Association \(2008\)](#), [Wallison \(2008a, 2008b\)](#), [Whalen \(2008\)](#), and [Forbes \(2009\)](#). Examples of arguments defending fair value accounting and its role during the crisis include [Ball \(2008\)](#), [Turner \(2008\)](#), and [Veron \(2008\)](#).

and in Congressional hearings that pressured the FASB to change U.S. accounting rules. However, as [Laux and Leuz \(2010, hereafter, LL\)](#) point out, there is no systematic evidence concerning whether banks do, in fact, sell assets in response to write-downs or low capital ratios. We examine banks' selling behavior during the crisis, consistent with calls by [LL \(2009, 833\)](#) for research to be "specific about the links through which write-downs under fair value can create problems" and "more explicit about the mechanism of contagion."

Our sample consists of 150 bank holding companies with large portfolios of non-Treasury AFS and HTM securities. We conduct industry- and firm-level analyses. At the industry level, we find no support for claims that the fair value provisions of U.S. accounting rules significantly depleted regulatory capital or caused pro-cyclical selling of securities. OTTI charges reached levels during the crisis that were likely unprecedented, but these charges had only a small impact on regulatory capital, especially compared to the impact of bad debt expense (which is largely determined by management estimates, not by marking to market). Furthermore, most of the OTTI charges were not recognized until late in the crisis, well after the financial markets deteriorated and capital ratios began to fall. We do not observe an increase in industry-level sales of AFS and HTM securities, as alleged by some critics of fair value accounting; sales of AFS and HTM securities during the crisis were in line with the levels seen before the crisis. Also, we find no evidence that banks more commonly sold securities at a loss during the crisis, providing no support for claims that fair value losses caused "fire-sales" of assets.

We find mixed evidence of pro-cyclical activity at the firm level. We seek evidence as to whether bank stress factors, such as low capital ratios or capital-depleting accounting charges, cause banks to sell securities. Our results suggest that, consistent with the notion of pro-cyclicality, sales of securities are correlated with the magnitude of OTTIs and bad debt expenses and with decreases in capital ratios. On the other hand, inconsistent with the notion of pro-cyclicality, sales of securities are not significantly related to other components of earnings in the predicted direction. Furthermore, we find some evidence that banks with low capital ratios actually engage in less selling than do banks with high capital ratios, undermining a central tenet of cyclicity models.

We also seek evidence regarding whether bank stress factors led banks to sell assets at fire-sale prices. Again, there is inconsistent evidence of pro-cyclical behavior; net losses realized on sales of securities are statistically significantly correlated with the capital ratio in some specifications, but the correlations between net losses realized on sales and all other stress factors are not statistically significant in the predicted directions.

Finally, we find little evidence that interrelated selling activity among banks increased during the crisis. In fact, across the full sample of banks, the coefficient of variation in securities sales significantly increased during the crisis. This higher variation in selling across banks is counter to the notion that U.S. accounting rules are pro-cyclical, inasmuch as they force banks to uniformly respond to a common set of market conditions.

In summary, our analyses indicate that the fair value provisions in U.S. accounting rules generally did not affect the commercial banking industry in the ways commonly alleged by critics. It is important to understand the role that accounting rules played in the recent crisis, because many critics pointed to the economic turmoil as evidence that the FASB needs more government oversight ([Lamoreaux 2009; Isaac 2010](#)). This study's findings suggest that Congress was rash in demanding rule changes from the FASB, which should give pause to advocates of more government involvement in accounting standard setting.

In the next section, we explain the concerns about fair value accounting and pro-cyclical asset sales, and recent rule changes. Section III describes the sample. Section IV describes our research design and findings. Section V concludes.

II. BACKGROUND

Arguments Regarding Fair Value Accounting and Cyclicalities

There are two arguments supporting the notion that fair value provisions in U.S. accounting rules worsened the recent financial crisis. One argument is based on the premise that during the crisis, market prices were poor indicators of the long-run value of certain assets (principally, mortgage-backed securities). Even though the securities were fundamentally sound and banks had no intention of selling them at low prices, they were forced to write them down, leading to decreases in regulatory capital that did not reflect fundamentals. If this is true, it would reduce the lending capacity of fundamentally healthy banks, extending what began as a weakness in subprime mortgage-backed securities to the broader economy. In lobbying to reform the OTTI rules (which eventually proved successful), the American Bankers Association (ABA) describes the problem as follows:

One key factor that is recognized as having exacerbated these problems is fair value accounting, which influences the recognition of OTTI. In today's illiquid market the results can be severe: (1) capital is artificially eroded despite solid fundamental credit performance, (2) the lending capability of a bank is reduced as much as \$13 for every \$1 of needless OTTI, and (3) the accounting formula is driving economic outcomes—including reduced availability of consumer and small business credit, with a negative impact on the health of individual institutions—and does not reflect economic reality. ([American Bankers Association 2008](#), 2)

Supporting the ABA's claims about capital erosion and lending, [Barajas et al. \(2010\)](#) find that banks reduced their lending during the crisis because of lower regulatory capital (as opposed to lower liquidity or lower demand for loans). However, [Barajas et al. \(2010\)](#) do not examine what types of charges were responsible for the decreases in capital. We quantify the effects of fair value and non-fair value charges on bank capital to assess their role in the lending shortage.

A key assumption of this first argument regarding the effects of fair value accounting is that the fundamental values of the assets were sound, and that banks would shield themselves from market price declines by holding the securities and collecting the underlying cash flows in the long run. If this assumption does not hold (i.e., if the securities were not fundamentally sound and banks would not be able to recover the losses), fair value accounting cannot be blamed for causing an unjustified decline in lending. To the contrary, fair value accounting improves economic efficiency by speeding recognition that capital reserves are inadequate to support further lending.

The second argument regarding the pro-cyclical effects of fair value accounting holds even if the initial fair value losses reflect fundamentals. This argument is that after the fair value losses are taken to reflect exogenous fundamental shocks to asset prices, banks sell assets in an attempt to boost the capital ratio. This selling pressure reduces market prices below fundamentals. The fair value accounting rules then force banks to write assets down to below-fundamental values, resulting in unwarranted capital depletion and further rounds of selling and price decreases.

The essence of this second argument is consistent with various theoretical models in the academic literature. These models usually assume a pure fair value accounting regime and less than perfectly liquid markets. In [Cifuentes et al. \(2005\)](#), banks, in response to fair value losses that reduce regulatory capital, sell assets to reduce the denominator of their capital ratios (risk-weighted assets); this reduces prices even further because of less-than-perfect liquidity. In [Allen and Carletti \(2008\)](#), fair value losses cause banks to be declared insolvent by regulators, resulting in forced liquidations that reduce market prices even further because of less-than-perfect liquidity. Both of these models suggest that in response to fair value losses, selling of all types of risky assets increases. In contrast, [Plantin et al. \(2008\)](#) predict that banks increase selling of the very assets that

have declined in value. Their model does not rely on capital shortages to produce pro-cyclical asset sales. Instead, the model assumes that managers are concerned with the effects of fair value losses on reported earnings. In response to an exogenous negative shock to an asset price, managers race to be among the first to sell the asset early in the asset's price decline, flooding the market with supply and causing prices to fall below fundamental values.

Even though U.S. accounting and bank regulatory rules are not as fair value-oriented as the regimes assumed in these models, critics have made similar claims about how U.S. rules promoted pro-cyclical sales of assets during the recent crisis. Academic commentaries making this claim include [Hellwig \(2009, 176\)](#) and [Bignon et al. \(2009\)](#). [Bignon et al. \(2009, 4\)](#) go so far as to claim that “a consensus exists on the role of fair-value measurements in spreading the crisis throughout the whole of the financial system: some entities urgently sold their assets to obtain the liquidities required to respond to their accounting write downs, creating the mechanism by which the crisis was amplified.” Numerous popular press accounts also make this claim, including [Hall \(2008\)](#), [Kewelramani \(2008\)](#), [The Economist \(2008\)](#), and [Wesbury and Stein \(2009\)](#). *The Economist* describes the problem as follows:

Regulators and bankers fear that this “mark-to-market” approach is helping to turn a liquidity crisis into a solvency one. As holders of mortgage-backed securities and the like revalue their assets at fire-sale prices, they are running short of capital—which can lead to further sales and more write-downs. Are the bean counters ensuring a crash? (*The Economist* 2008, 13)

The claim that U.S. rules promoted pro-cyclical sales of assets during the crisis was also part of the lobbying and policy deliberations surrounding fair value accounting reforms. A significant portion of the Mortgage Bankers Association's comment letter to the SEC describes how fair value losses related to Statement of Financial Accounting Standards (SFAS) No. 157 can result in pro-cyclical asset sales ([Mortgage Bankers Association 2008](#)). The SEC received other comments of a similar nature, as evidenced by the SEC's synopsis of its October 29, 2008, public roundtable meeting on fair value accounting:

[Some panelists] assert that when asset prices decline and liquidity is reduced, banks are forced to sell their investments or raise capital (due to the interaction of regulatory capital requirements that are based on the fair value of their assets). If bank portfolios are marked-to-market, their capital position deteriorates, which, in turn, causes more asset sales and further depresses asset prices. ([SEC 2008](#), 149)

In response to the criticism, in October 2008, the FASB issued supplemental guidance for valuing securities that trade in inactive markets (FASB Staff Position FAS No. 157-3). However, the banking industry complained that the guidance provided little relief because it continued to require that fair values be discounted for illiquidity risk ([Katz 2008](#)). The criticism culminated in March 2009 Congressional hearings conducted by the House of Representatives. Representative Scott Garrett of New Jersey stated in his prepared opening statement:

When the price of assets in a bank's balance sheet are written down, the bank has to raise additional capital by selling additional assets or stock. These sales put more downward pressure on prices and so it is this negative feedback loop that is exacerbated by the combination of accounting practices and capital requirements. ([Garrett 2009](#))

During these hearings, several members of Congress pressed the FASB for swift changes to SFAS No. 157, as well as to the rules governing OTTI.² It is rare for government policymakers to

² The *Wall Street Journal* recounts an exchange between Rep. Paul Kanjorski and FASB Chairman Robert Herz: “‘We want you to act,’ Rep. Kanjorski told Robert Herz, FASB's chief. Mr. Herz waffled about how quickly the standards board could act. Rep. Kanjorski leaned over the dais. ‘You do understand the message that we're sending?’ he said. ‘Yes,’ Mr. Herz replied, ‘I absolutely do, sir’” ([Pulliam and McGinty 2009](#)).

overtly pressure the FASB, which is a private entity that strives to keep its standard setting processes independent of political interference.³ The standing policy of the SEC is that FASB accounting standards have “authoritative” status, although the SEC does have the ultimate (but rarely used) authority to revoke this status (SEC 2003). In the Emergency Economic Stabilization Act of 2008, Congress emphasized the SEC’s power to revoke FASB rules, especially rules pertaining to fair value. Subsequently, Congress debated various forms of legislation that would create a systemic risk regulator that has the power to change accounting rules when they are deemed to threaten financial stability (Lamoreaux 2009). Responding to the Congressional pressure, the FASB made more significant changes to fair value accounting standards in April 2009.

Changes to Accounting Standards

The FASB issued two new staff positions that made major changes to fair value accounting rules. Staff Position No. 157-4 gives preparers more freedom to depart from observable market prices and assign more optimistic fair values. The original standard (SFAS 157) had created a three-level hierarchy that specifies the information preparers should use to estimate fair values. The hierarchy gives highest priority to quoted prices in active markets for identical assets (level 1). The controversial part of the standard is how to value an asset when an active market does not exist. The original standard required heavy reliance on prices from inactive markets, directing preparers to use “quoted prices for identical or similar assets or liabilities in markets that are not active, that is, markets in which there are few transactions for the asset or liability, the prices are not current, [etc.]” (SFAS 157, ¶28). These level-2 inputs have priority over level-3 “unobservable inputs,” such as the preparer’s internal cash flow projections. Auditors reportedly enforced the standard strictly. The Center for Audit Quality, an industry group formed by the Big 4 accounting firms, issued a white paper emphasizing that prices from inactive markets took precedence over internal projections (Center for Audit Quality 2007). This appears to have emboldened auditors to force preparers to anchor their fair value estimates on low prices from inactive markets, rather than on more optimistic internal projections (Reilly 2007).

The new staff position issued after the Congressional hearings emphasizes that prices from inactive markets can, in fact, be significantly adjusted:

If the reporting entity concludes there has been a significant decrease in the volume and level of activity for the asset or liability in relation to normal market activity for the asset or liability (or similar assets or liabilities), transactions or quoted prices may not be determinative of fair value (for example, there may be increased instances of transactions that are not orderly). Further analysis of the transactions or quoted prices is needed, and a significant adjustment to the transactions or quoted prices may be necessary to estimate fair value in accordance with Statement 157, ¶13.

This position was widely seen as backtracking from the original standard in response to outside pressure (Pulliam and McGinty 2009).

The FASB issued another staff position (FSP FAS 115-2 and 124-2) that makes it easier to avoid OTTI charges and reduces the impact on regulatory capital when OTTI charges still need to be taken. The rules in place during the crisis required an OTTI charge unless the firm could

³ Responding to Congressional interference regarding accounting for stock option compensation in 2004, the FASB governing board stated: “While we respect the right of Congress to set accounting rules if it chooses, we believe that doing so would dangerously compromise the independence of the FASB and, by politicizing standard setting, would compromise the credibility of the resulting accounting standards” (Financial Accounting Foundation [FAF] 2005, 3). More recently, the FASB opposed Congressional efforts to create a federal systemic risk council that has power to change accounting rules (FAF 2010, 14).

demonstrate ability and intent to hold the asset until the fair value recovered (FSP FAS 115-1 and 124-1, ¶A2–¶A4). In other words, the old standard presumed impairment unless the firm could prove otherwise. For debt securities, the new standard switches the presumption to no impairment. It states that an OTTI charge is not necessary unless the firm anticipates that it will have to sell the debt securities before the price recovers (FSP FAS 115-2 and 124-2, ¶7), thus enabling firms to avoid OTTI charges more often.

The FASB staff position's second OTTI rule change reduces the impact on regulatory capital even when OTTI charges on debt securities are necessary. Under the old rule, the size of the OTTI loss was the difference between the security's fair value and amortized cost, and the entire loss was recognized in net income and flowed to retained earnings where it affected regulatory capital. Under the new rule, only the "credit" portion of the loss (i.e., the portion related to expected non-recoverable cash flows) is recognized in net income and retained earnings (FSP FAS 115-2 and 124-2, ¶8–¶9). The non-credit portion of the loss, which reflects illiquidity discounts that the bank will avoid if it holds on to the asset, is recognized in "accumulated other comprehensive income." Many items in this account, including the non-credit portion of OTTI charges, are excluded from regulatory capital ([Board of Governors of the Federal Reserve System 2010](#), HC-R-2). In summary, changes to the accounting standards allow firms to make more optimistic fair value estimates, and avoid or reduce charges to earnings and regulatory capital even when the optimistic estimates indicate losses.

Prior Empirical Studies on the Role of Fair Value Accounting in the Crisis

Despite the controversy surrounding fair value accounting, there are relatively few studies that empirically examine its role in the crisis. [Khan \(2010\)](#) analyzes how the extreme negative stock returns of individual banks covary with those of money-center banks. He finds that the negative returns covary more strongly during times when more items are measured at fair value, suggesting that fair value accounting contributes to contagion. [Bowen et al. \(2010\)](#) find that the stock market reacted positively (negatively) to key events that signaled policymakers would (would not) relax fair value accounting rules.

The inferences that may be drawn from stock returns regarding the effects of fair value accounting are limited. Because the amount of assets subject to fair value accounting has steadily increased over time, the increased covariance of bank returns that [Khan \(2010\)](#) documents could be due to other temporal trends, such as the proliferation of ratings-based structured products ([LL 2010](#)). The stock market reactions to rulemaking events that [Bowen et al. \(2010\)](#) document may reflect investors' erroneous perceptions of fair value accounting; the banking industry's lobbying against fair value accounting could have led investors to believe that fair value accounting was problematic even if there was little underlying evidence. Alternatively, bank investors could have responded favorably to relaxed fair value accounting, not because they believed that fair value accounting was distorting banks' financial condition, but because relaxation made regulatory takeovers less likely; extending the life of a bank, even when unjustified by economic fundamentals, benefits the shareholders because it increases the value of the call option embedded in the equity claim. Finally, even if the rule changes represented improvements, this does not necessarily mean that the old rules caused severe or unwarranted turmoil in the banking industry. Investors may have welcomed more information about the credit and non-credit components of OTTIs even if OTTIs were not unduly affecting banks. The new rules may have also benefitted investors by requiring: (1) quarterly (rather than annual) disclosures about valuation techniques and model inputs, and (2) more detailed breakdowns of fair value disclosures by security type (FSP FAS 157-4, ¶20).

Rather than trying to make inferences from stock returns, other studies examine the direct impact of fair value accounting on banks' financial condition. As part of the Emergency Economic Stabilization Act of 2008, Congress required the SEC to examine the role of fair value accounting in the crisis. The SEC examined a sample of 50 financial institutions that failed during the crisis, concluding that fair value accounting did not play a meaningful role in the failures (SEC 2008). The primary basis for this conclusion is that the failed banks had a minority of assets whose fair value losses affected regulatory capital, and even for the banks that did report sizeable fair value losses, the failures appeared to stem from credit losses related to poor lending decisions, rather than from marking assets to market.

Short of causing bank failures, fair value accounting could have contributed to the crisis by causing pro-cyclical activity, such as sales of assets. LL (2010) discuss this possibility, but conclude otherwise. Similar to the SEC study, LL (2010) claim that loans and leases held for investment, which constitute roughly half of the assets in the banking sector, are not fair valued; rather, the loans and leases are valued at their amortized cost less an allowance for future uncollectible amounts projected by management.

The next-largest bank asset (after loans and leases) is the portfolio of HTM and AFS securities, which constitutes between 15 and 20 percent of total assets. HTM securities are not fair valued, except for OTTI adjustments. Even though AFS securities are fair valued, LL (2010) argue that they could not have played a role because the fair values typically do not affect regulatory capital. Most AFS securities are debt securities, and regulatory capital rules exclude fair value gains and losses on debt securities unless they are deemed other than temporary.⁴ These OTTI charges merit further study because of allegations that the charges were excessive and pro-cyclical, leading the FASB to change the OTTI rules. Shaffer (2010) also examines OTTI charges and pro-cyclical actions taken by a small sample (14) of large bank holding companies in 2008 only. He finds that the impact of the OTTI charges on regulatory capital was negligible for most of the banks, and finds little evidence of distressed sales and other pro-cyclical behavior.

Our study examines more banks over a longer time period, allowing us to compare activity during the crisis to that under more normal circumstances. It also allows us to determine whether pro-cyclical behavior was occurring in 2007 as the crisis built momentum (Ryan 2008). To measure sales of securities, Shaffer (2010) uses "AFS and HTM net portfolio inflows/outflows," which closely mirrors the change in the AFS and HTM portfolio's amortized cost. This measure, however, hides pro-cyclical selling activity in cases where banks sell risky securities and use the proceeds to purchase riskless securities like Treasuries. Instead, we collect a more direct measure of securities sales from the statement of cash flows found in the SEC forms 10-Q and 10-K; this measure is not affected by purchases. Also, while Shaffer (2010) presents descriptive information on sales of securities, our study examines the relation between securities sales and OTTI charges and other stress factors. Finally, we test whether cross-bank relations in selling behavior are consistent with theoretical models of cyclicity.

III. SAMPLE SELECTION

Our sample consists of 150 bank holding companies that were among the largest holders of non-Treasury AFS and HTM securities as of June 30, 2006. Later as the crisis unfolded, some non-commercial banks such as Goldman Sachs Group, Inc. became bank holding companies. Only

⁴ Fair value gains and losses on AFS equity securities do affect regulatory capital, but mean (median) holdings of AFS equity securities in our sample is only 0.4 (0.1) percent of assets. Thus, fair value losses on AFS equity securities are unlikely to have meaningfully affected regulatory capital. LL (2010) argue that securities classified as "trading," which constitute about 12 percent of the assets of large banks, are the only fair valued assets that could have significantly affected regulatory capital. However, LL (2010) point out that even the ABA believes that trading securities should be fair valued because they are intended to be sold at market prices within short horizons; even if the accounting rules had shielded banks from unrealized fair value losses, realized losses would have soon followed when the trading securities were sold.

institutions that were bank holding companies as of June 30, 2006 are included in our sample. We form the sample just before the first public signs of distress in the banking industry, which [Ryan \(2008\)](#) traces to February 2007, when two subprime mortgage originators announced major increases in loss reserves. We identify the banks using Federal Reserve Y-9C reports filed by bank holding companies with total consolidated assets of at least \$500 million. To form the sample, we first rank all report filers by the amortized cost of their portfolio of non-Treasury AFS and HTM securities. We use the portfolio's amortized cost instead of fair value because amortized cost reflects the notional amount of risky securities that are subject to OTTI charges and are available to sell. We require banks to regularly file forms 10-Q and 10-K with the SEC because we use the filings to hand-collect OTTI charges and sales of securities. We further require that the bank file both the Y-9C and 10-Q for at least the first quarter of 2007 to ensure valid comparisons across the pre-crisis (2004 to 2006) and crisis (2007 to 2008) periods.

To obtain 150 usable banks, we expand the data search to the top 208 banks, because 46 banks are private or foreign and, thus, do not file with the SEC, and an additional 12 banks did not file the Y-9C and 10-Q for the first quarter of 2007. The combined non-Treasury AFS and HTM amortized holdings of the 150 banks in our sample exceeds \$1.5 trillion, which represents over 82 percent of the holdings reported by all of the 998 banks filing a Y-9C report.

IV. RESEARCH DESIGN AND RESULTS

Effects of Fair Value Losses on Regulatory Capital

Our first set of analyses investigates the effects of fair value losses on regulatory capital by examining the size and timing of OTTI, as well as bad debt expense, another capital-depleting charge, taken by banks before and during the financial crisis. Because the Y-9C report combines OTTI charges with realized gains and losses on securities sales, we hand-collect quarterly OTTI charges on AFS and HTM securities from 10-Qs and 10-Ks from 2004 to 2008. Panel A of Figure 1 plots the industry-level OTTI charges taken on AFS and HTM securities each quarter.⁵ The sample size varies by quarter because we choose the sample banks at a single point in time. We standardize the sample size each quarter by including only the top 100 banks ranked by beginning holdings of non-Treasury HTM and AFS securities. Panel A of Figure 1 shows that the OTTI charges taken in 2008 far surpass those taken in the four prior years. The 2008 OTTI charges total approximately \$18 billion, with the last two quarters accounting for \$14 billion. In contrast, OTTI charges from 2004 to 2006 are well below \$1 billion annually. In 2007, OTTI charges are small for the first three quarters, but reach nearly \$1 billion in the fourth quarter.

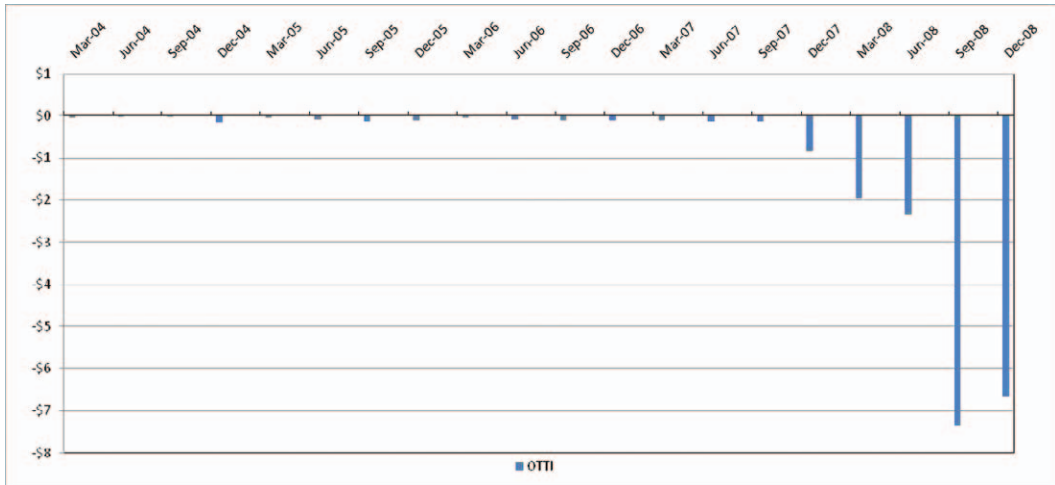
Although OTTI charges reach unprecedented levels during 2008, Panel B of Figure 1 shows that they represent only a small portion of banks' normal earnings. Furthermore, the bulk of OTTI charges occurs well after bank earnings begin to decline (September 2007), and after indices tracking BBB- and AAA-rated subprime mortgage-backed securities begin to decline (July and October 2007, respectively) ([Ryan 2008](#)). Thus, fair value accounting charges were not an early factor in the subprime market collapse or the credit crisis. The figure shows that bank earnings fell in late 2007 and 2008 primarily because of increasing bad debt expense, which is largely determined by managers' own projections of future uncollectible loans.⁶ Quarterly bad debt

⁵ The change to OTTI rules allowing firms to split the charge into credit and non-credit portions (FSP FAS 115-2 and 124-2) was not effective until 2009. Therefore, all OTTI charges during the sample period decrease earnings and regulatory capital.

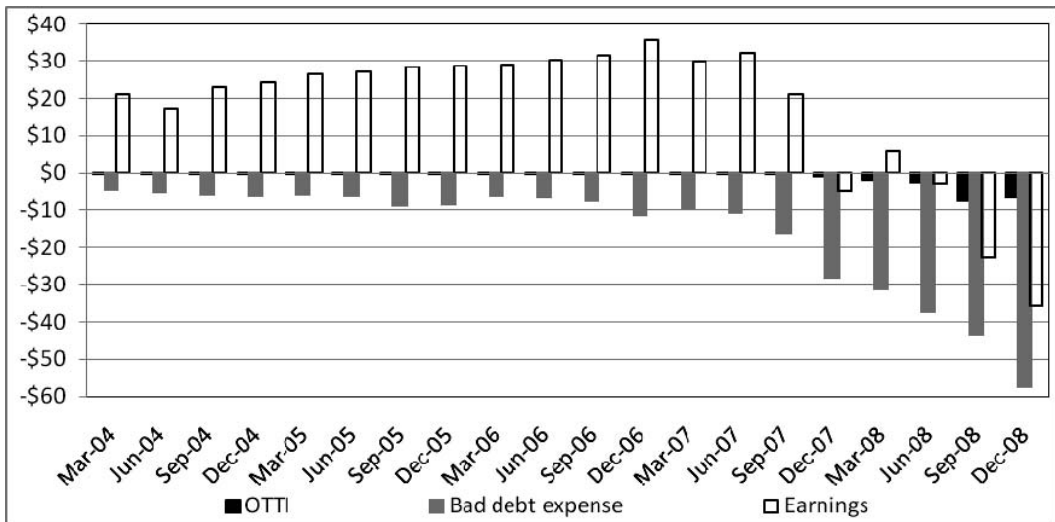
⁶ If a loan is secured by collateral, bad debt expense is affected not only by the estimated probability of default, but also by the fair value of the collateral and, thus, has an element of fair value accounting. We are unable to decompose bad debt expense into the two components. However, we are not aware of significant complaints against fair value accounting related to its effect on bad debt expense. The critics focused on fair value accounting for investment securities, not for the real property that served as loan collateral.

FIGURE 1
Other-Than-Temporary Impairments, Bad Debt Expense, and Earnings by Quarter

Panel A: OTTI



Panel B: OTTI, Bad Debt Expense, and Earnings



OTTI is the amount of other-than-temporary impairments of available-for-sale (AFS) and held-to-maturity (HTM) securities. Bad debt expense is a charge related to management's expectations about future uncollectible loan amounts (bhck4230). Earnings is the amount of net income (loss) (bhck4340). The sample is based on the top 100 banks ranked by beginning-of-quarter holdings of non-Treasury HTM and AFS securities. All amounts are in billions.

expense averaged \$6.7 billion from 2004 to 2006. From September 2007 to December 2008, quarterly bad debt expense averaged \$35.7 billion, for a total of \$214.1 billion, as compared to a total of only \$19.3 billion of OTTI charges over the same time period.

Next, we assess the effect of bad debt expense and OTTI charges on regulatory capital ratios. Panel A of Figure 2 plots the interquartile range, mean, and median of Tier 1 capital ratios by quarter. The Federal Deposit Insurance Corporation (FDIC) considers a bank “well capitalized” at a Tier 1 capital ratio of 6 percent or above.⁷ Panel A shows that even the bank at the 25th percentile was well above the “well capitalized” level throughout the sample period, including the crisis years. Capital ratios fell during the sample period, but rose sharply in December 2008, when the U.S. government infused capital through the Troubled Asset Relief Program (TARP).

We examine the effect of bad debt expense and OTTI charges on Tier 1 capital ratios for the quarter ended September 2008. We choose September 2008 because banks had recognized significant bad debt expense and OTTI charges by this point, but had not yet received capital through TARP. Panel B of Figure 2 compares the distribution of September 2008 Tier 1 capital ratios to three “as if” distributions of Tier 1 capital ratios. The first “as if” distribution removes the effect of abnormal bad debt expense, and the second removes the effect of OTTI charges. To compute each bank’s normal bad debt expense, we average the bank’s quarterly bad debt expense as a percentage of gross loans and leases from 2004 to 2006, and apply this percentage to the gross loans and leases reported each quarter from September 2007 to September 2008. We then compute abnormal bad debt expense by subtracting normal bad debt expense from reported bad debt expense. The underlying assumption is that the composition of the bank’s loan and lease portfolio remains constant across the normal and crisis periods. To adjust the September 2008 Tier 1 capital ratio for abnormal bad debt expense, we sum the quarterly abnormal bad debt expense from September 2007 to September 2008 and add this sum to the numerator. We compute a similar “as if” Tier 1 capital ratio adjusted for OTTI charges by summing the quarterly OTTI charges from September 2007 to September 2008 and adding this sum to the numerator.

Adjusting the Tier 1 capital ratio for OTTI increases the median capital ratio slightly, from 9.9 to 10.0 percent. The increase in the mean is larger, from 10.5 to 10.8, suggesting that the effect of OTTI is concentrated in a small number of banks. On the other hand, the effect of abnormal bad debt expense on capital ratios is considerably larger. Adjusting for abnormal bad debt expense moves the median capital ratio from 9.9 to 10.7 and the mean from 10.5 to 11.4. The similar magnitude of the shifts in the median and mean capital ratios indicate that the capital depletion caused by abnormal bad debt expense is relatively uniform across banks.⁸

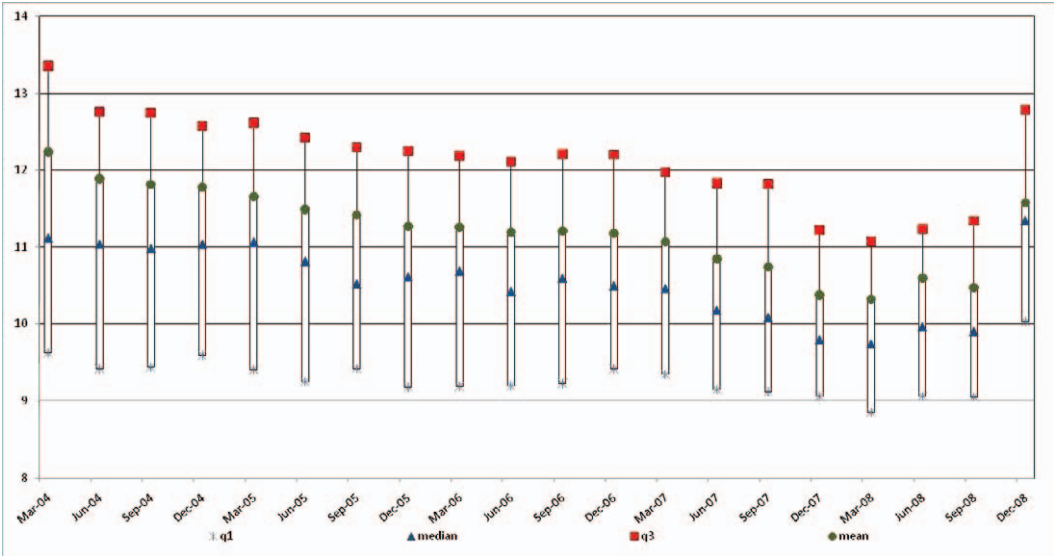
Recall that under U.S. rules, fair value losses on AFS and HTM securities affect regulatory capital only when they are considered other than temporary. If these securities were subject to pure

⁷ A bank is considered “adequately capitalized” if the Tier 1 capital ratio is above 4 percent. See capital adequacy guidelines at: http://www.fdic.gov/deposit/insurance/risk/rtps_ovr.html

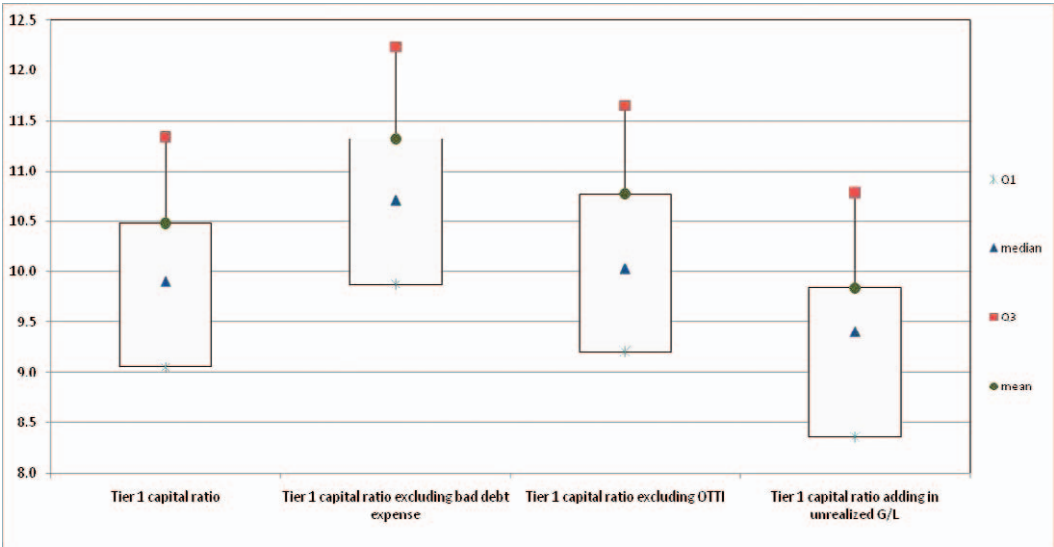
⁸ These “as if” computations ignore tax effects and only adjust the numerator of the capital ratio. OTTI and bad debt expense can also affect the denominator (risk-weighted assets), but we find that including denominator adjustments has almost no effect on the “as if” capital ratios. OTTI affects denominators because it reduces the amortized cost of the AFS and HTM securities in the denominator. Adjusting the denominator for OTTI is not as simple as adding back the OTTI amount, because the OTTI may have applied to securities that were risk-weighted at more or less than 100 percent. When we add back OTTI to both the numerator and the denominator, assuming that the applicable securities had a 100 percent weighting, the mean (median) “as if” capital ratio stays at 10.8 (10.0), as reported above. Large bad debt expenses can affect the denominator because banks are allowed to reduce the denominator by the amount of the allowance for loan loss that exceeds 1.25 percent of gross risk-weighted assets. To adjust for this denominator effect, we add back the lesser of abnormal bad debt expense and excess allowance for loan loss (item bhcka222 of the Y-9C report). After adjusting both the denominator and numerator for abnormal bad debt expense, the mean (median) “as if” capital ratio is 11.3 (10.7), compared to 11.4 (10.7) when only the numerator is adjusted.

FIGURE 2
Tier 1 Capital Ratios

Panel A: Box-Plot of the Tier 1 Capital Ratio by Quarter

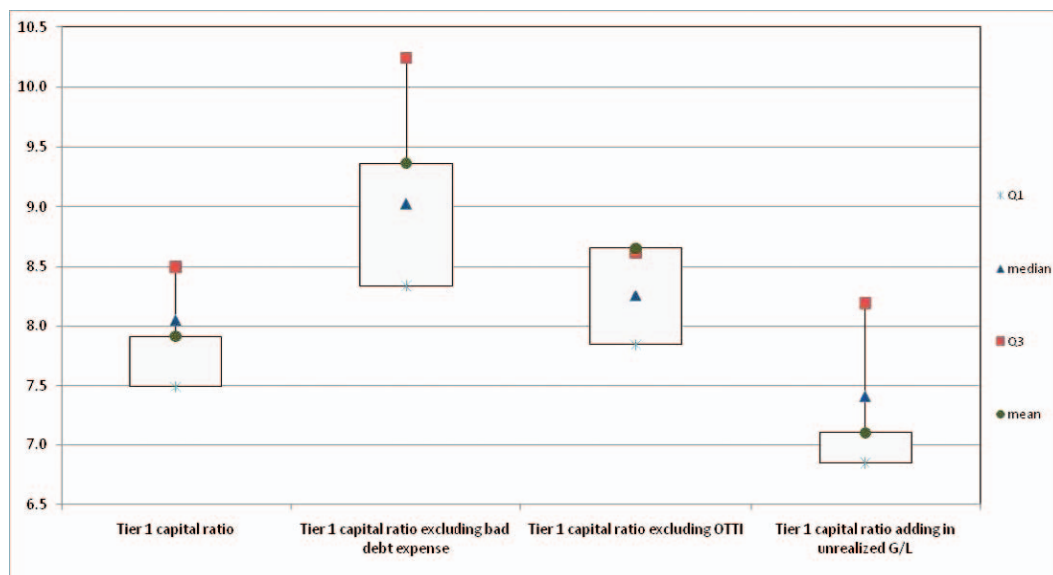


Panel B: Tier 1 Capital Ratio for Quarter Ended September 2008 for the Full Sample



(continued on next page)

FIGURE 2 (continued)

Panel C: Tier 1 Capital Ratio for Quarter Ended September 2008 for Weaker Banks

Banks are considered “weaker” when they are in the bottom quintile of Tier 1 capital ratio. Tier 1 capital ratio is item bhck7206 from the Federal Reserve FR Y-9C report. The box plots are based on 131 banks as of September 2008. The “Tier 1 capital ratio excluding bad debt expense” adds the quarterly abnormal bad debt expenses from September 2007 to September 2008 back to the numerator of the September 2008 Tier 1 capital ratio. Abnormal bad debt expense equals reported bad debt expense (bhck4230) minus normal bad debt expense. Each quarter’s normal bad debt expense equals average bad debt expense as a percentage of gross loans and leases from 2004 to 2006 times gross loans and leases for that quarter. The “Tier 1 capital ratio excluding OTTI” adds the quarterly other-than-temporary impairments of available-for-sale (AFS) and held-to-maturity (HTM) securities from September 2007 to September 2008 back to the numerator of the September 2008 Tier 1 capital ratio. The “Tier 1 capital ratio adding in unrealized G/L” subtracts (adds) the unrealized holding loss (gain) on the portfolio of AFS and HTM securities as of September 2008 from (to) the numerator of the September 2008 Tier 1 capital ratio. The unrealized holding gain or loss equals the difference between the fair value of HTM (bhck1771) and AFS securities (bhck1773) and the amortized cost of HTM (bhck1754) and AFS securities (bhck1772).

fair value accounting, all unrealized holding gains and losses would affect regulatory capital. To gauge the effect on capital ratios in this hypothetical regime, we compute “as if” capital ratios by reducing (increasing) the numerator by unrealized holding losses (gains) on HTM and AFS securities. This adjustment decreases the median capital ratio from 9.9 to 9.4 percent, and decreases the mean from 10.5 to 9.8 percent. This adjustment does not change the capital ratios by as much as the adjustment to the ratios for abnormal bad debt expense. Thus, even if these accounting rules that are closer to pure fair value accounting had been in place for HTM and AFS securities, the losses still would not have been the main source of declines in the capital ratio. Moreover, there is only one bank that would have fallen below the 4 percent regulatory minimum because of the unrealized losses.

We also examine the subsample of banks in the lowest capital ratio quintile, because these are the banks whose capital ratios were most likely affected by the OTTI charges. Panel C of Figure 2 shows that adding back OTTI moves the mean (median) capital ratio among these banks from 7.9 to 8.6 percent (8.0 to 8.3 percent). Consistent with the tests based on the full sample, abnormal bad debt expense has a considerably larger effect, moving the mean (median) capital ratio from 7.9 to 9.4 percent (8.0 to 9.0 percent). Also consistent with the tests based on the full sample, even if all unrealized gains and losses on AFS and HTM securities affected regulatory capital, the effect on capital ratios would have been smaller than the effect of abnormal bad debt expense.

Selling of AFS and HTM Securities

Patterns of Selling Before and During the Crisis

Our second set of analyses examines whether banks engage in pro-cyclical selling of assets. We focus on the portfolio of AFS and HTM securities because this portfolio is typically the second largest asset on banks' balance sheets and consists of relatively liquid securities (LL 2010). We do not examine held-for-investment loans, the largest asset class on bank balance sheets, because they are not liquid.⁹ Banks' most liquid risky assets are trading securities, but we do not examine these because they are intended to be sold in the short run; U.S. accounting rules would cause pro-cyclical sales of assets only if they cause banks to sell assets that would not otherwise have been sold.¹⁰

Figure 3 includes a plot of the quarterly cash proceeds from sales of AFS and HTM securities from 2004 to 2008; these data were obtained from the investing activities section of the statement of cash flows.¹¹ We adjust the cash proceeds from sales by adding back realized losses and subtracting realized gains on sales of AFS and HTM securities.¹² Without this adjustment, the measure of selling activity would be biased downward (upward) in times of falling (rising) prices. The figure contains four plots. The first plot is total selling of securities by the top 100 banks, ranked by beginning-of-quarter holdings of non-Treasury AFS and HTM securities (labeled "constant sample size"). The second plot is total selling for a sample that consists of the same firms each quarter (labeled "constant sample firms"). In order to increase the number of firms that can be used, we start this graph in 2005.

The third plot is total selling across all observations each quarter. Because the sample size for this plot varies by quarter, we scale by average liabilities (labeled "scaled"). We scale by liabilities instead of assets because fewer liabilities are measured at fair value, meaning that they are a more-stable scalar in times of changing market prices. The scaling is done on a value-weighted basis across firms $i = 1$ to n in each quarter q :

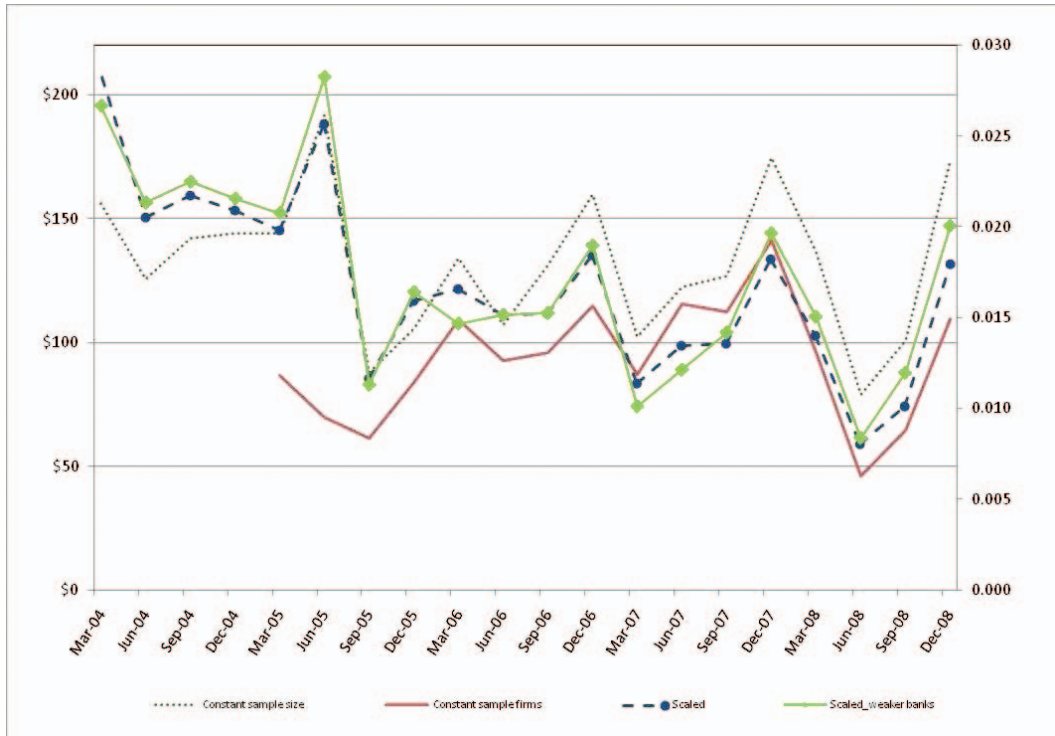
⁹ Consistent with banks being unable to sell held-for-investment loans, during the sample period, we observe few transfers of loans and leases from the held-for-investment to held-for-sale categories. During 2007 and 2008, only 13 of the 150 banks make such transfers. The total amount transferred during these years is \$14.5 billion, representing only 0.3 percent of sample banks' total loans and leases held for investment at the beginning of 2007.

¹⁰ We do not examine held-for-sale loans because, like trading securities, they are also intended to be sold in the short run. Furthermore, because the mean (median) held-for-sale loans as a percentage of total assets is only 0.9 (0.1) percent, it is unlikely that these assets had pro-cyclical effects.

¹¹ Compustat contains a version of this variable, but it is often aggregated with cash from maturities of investments, even though the two are presented separately on the bank's published statement of cash flows. We aggregate maturities with sales of securities only when they are aggregated on the published cash flow statement (12 banks).

¹² The realized gains/losses come from the Y-9C report and include OTTI charges, even though these losses are unrealized. Using our hand-collected OTTI information, we add back the OTTI charges to the realized gains/losses to compute the gain/loss realized on actual sales.

FIGURE 3
Sales of AFS and HTM Securities by Quarter



Sales of available-for-sale (AFS) and held-to-maturity (HTM) securities are obtained from the statement of cash flows. The “constant sample size” plot is based on the top 100 banks ranked by beginning-of-quarter holdings of non-Treasury HTM and AFS securities. The “constant sample firms” plot is based on the same 69 firms each quarter. To increase the number of firms that can be used, this plot does not start until 2005. The “scaled” plot is based on 2,685 firm-quarters and is the total amount of HTM and AFS securities sales, scaled by average liabilities. The “scaled_weaker banks” plot includes only the banks in the bottom quintile of Tier 1 capital ratio each quarter. The left axis, in billions, applies to the “constant sample size” and “constant sample firms” plots, while the right axis applies to “scaled” and “scaled_weaker banks” plots.

$$SALESJ_q = \frac{\sum_{i=1}^N Sales_{i,q}}{\sum_{i=1}^N Ave.Liabilities_{i,q}}. \quad (1)$$

The final plot is total selling by the banks in the lowest quintile of beginning Tier 1 capital ratio each quarter, scaled on a value-weighted basis by average liabilities (labeled “scaled_weaker banks”). We include this plot to check whether only the weaker banks felt pressure to sell securities during the crisis. Although the mean Tier 1 capital ratio of 7.9 percent in this subsample is still well above the regulatory minimum of 4 percent, [Chami and Cosimano \(2010\)](#) demonstrate that banks find it optimal to maintain the ratio above the regulatory minimum as insurance against potential depletions of capital. Thus, the banks in this subsample ought to be the most sensitive to capital-reducing charges.

All four plots in Figure 3 show a similar pattern. The level of quarterly selling during the crisis period of 2007 and 2008 averages \$126.9 billion for the constant sample of 100 and 1.3 percent of average liabilities for the full sample, in line with the levels of selling seen from 2004 to 2006. Over the entire sample period, the quarter with the least amount of selling ends in June 2008 (\$78.9 billion for the constant sample of 100 firms and 0.8 percent of average liabilities for the full sample). In other words, the crisis period was not characterized by abnormally high levels of sales of securities. Untabulated tests confirm that the industry level of selling was not statistically significantly higher during the crisis years.¹³

One limitation of the analyses in Figure 3 is that the measure of sales combines risky and riskless securities (banks seldom disclose what types of securities are sold). Thus, it is possible that during the crisis, banks started selling more risky securities and fewer riskless securities than in the past, masking an intertemporal increase in sales of risky securities. To investigate this possibility, we examine holdings of Treasury securities, non-agency mortgage-backed securities (MBS), and all other AFS and HTM securities over time. Holdings are measured using amortized cost so that they are unaffected by all fair value adjustments, except those for OTTI. Figure 4 plots industry-level holdings scaled by industry-level average liabilities for each of the three security types from 2004 to 2008. The figure has six plots because each of the three types of security holdings is plotted for two samples, the full sample and the weaker banks sample. Unscaled plots using the constant firm and constant size samples are not included because the patterns are very similar. For both the full and weaker banks samples, holdings of Treasury securities steadily decline from 2004 to 2007. In 2008, Treasury holdings rise in the full sample and stay level in the weaker banks sample. A decline in holdings does not necessarily indicate sales, because holdings are also affected by purchases and maturities. However, if declines in Treasury holdings reflect selling over 2004 to 2007, the lack of Treasury selling in 2008 could hide an increase in sales of risky securities that year. Later, we use OLS regression to assess the level of securities selling during the crisis period, while controlling for changes in the holdings of Treasury securities.

Full-sample holdings of non-agency MBS increase sharply in 2007 and level off in 2008, while in the weaker banks sample, the holdings tend to increase throughout 2007 and 2008.¹⁴ In both samples, holdings of all other securities steadily decline from 2004 to 2007 and increase during 2008. In other words, there is no sign of a decline in holdings of risky securities that is unique to the crisis period, suggesting that banks did not engage in widespread selling of these securities during the crisis, consistent with the evidence regarding sales of HTM and AFS securities shown in Figure 3.

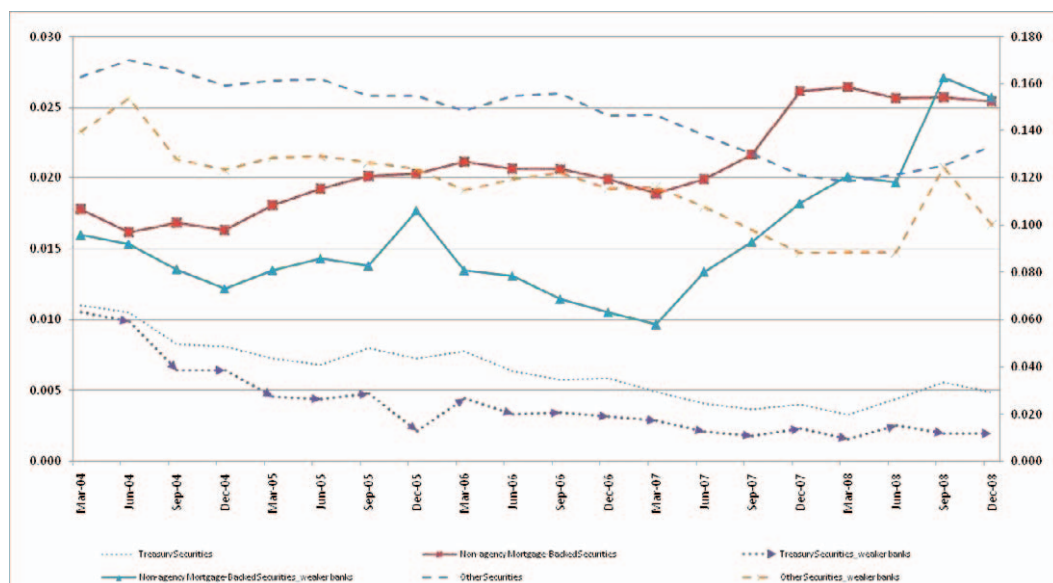
Firm-Level Analysis of Sales Before and During the Crisis

The industry-level analyses conducted thus far give more weight to large sellers or holders of HTM and AFS securities, which seems appropriate because the activity of the largest players would affect market prices most. However, to do a comprehensive search for evidence of pro-cyclical behavior, we also examine firm-level sales of securities, because the non-cyclical selling behavior of the largest banks may be masking pro-cyclical behavior among the smaller banks. To determine

¹³ Extreme illiquidity in markets for mortgage-backed securities (MBS) may have prevented banks from selling MBS securities during the crisis. However, the sale of any risky asset would reduce the capital ratio denominator (and, thus, boost the ratio). Thus, if banks were actively attempting to boost capital ratios through asset sales, they would have sold other risky securities in response to the illiquid MBS markets. In fact, MBS probably would not have been banks' first choice of securities to sell; given the unrealized losses sustained on the MBS securities from the initial wave of delinquencies, sales of MBS would have generated *realized* losses that would have reduced the capital ratio numerator, offsetting the benefit of the lower denominator.

¹⁴ To compute the amortized cost of non-agency MBS holdings, we sum items bhck1709, bhck1711, bhck1733, and bhck1735 from Schedule HC-B of the Y-9C report.

FIGURE 4
Holdings of Treasury Securities, Non-Agency Mortgage-Backed Securities, and All Other AFS and HTM Securities by Quarter



All securities included in this figure are either available-for-sale or held-to-maturity securities. All amounts are industry-level holdings scaled by industry-level average liabilities. “_weaker banks” includes only the banks in the bottom quintile of Tier 1 capital ratio each quarter. The sample is based on 2,846 firm-quarters. The left axis applies to “Treasury Securities,” “Treasury Securities_weaker banks,” “Non-Agency Mortgage-Backed Securities,” and “Non-Agency Mortgage-Backed Securities_weaker banks,” while the right axis applies to “Other Securities” and “Other Securities_weaker banks.”

whether firm-level securities sales are higher during the crisis period, we regress each bank’s quarterly securities sales (*SALES*) on crisis year indicator variables (2007 and 2008) and two control variables: the bank’s quarterly change in Treasury security holdings (*CH_TREASURY*) and the bank’s ending quarter $q-1$ holdings of non-Treasury HTM and AFS securities (*PORTFOLIO_SIZE*):

$$SALES_{i,q} = a + b_1 2007_INDICATOR + b_2 2008_INDICATOR + b_3 CH_TREASURY_{i,q} + b_4 PORTFOLIO_SIZE_{i,q-1} + e_{i,q}. \quad (2)$$

All variables except for the indicators are scaled by firm i ’s average liabilities in quarter q . Table 1, Panels A and B, present descriptive statistics for these and other firm-quarter variables used later, partitioned into pre-crisis and crisis years. Panel C presents correlations between the variables. We control for *CH_TREASURY* in an attempt to purge the dependent variable of the variation attributable to sales of Treasury securities.¹⁵ We expect a negative relation between *CH_TREASURY* and *SALES* because when banks sell Treasury securities, Treasury holdings decline and cash from sales increases. We expect a positive relation between *PORTFOLIO_SIZE* and *SALES* because large portfolios imply that there are more securities that can potentially be sold.

¹⁵ Banks could reduce the denominator of the capital ratio only by selling risky assets.

TABLE 1
Descriptive Statistics and Correlations for Firm Quarters

Panel A: Descriptive Statistics for the Full Sample

Full Sample (n = 2,683)	Mean	Std. Err.	Min	Q1	Median	Q3	Max
SALES	0.0141	0.0341	0.0000	0.0000	0.0021	0.0133	0.2518
CAPITAL_RATIO	11.2388	3.3858	0.1200	9.2100	10.4300	12.2700	30.0000
ΔCAPITAL_RATIO	-0.0639	0.7011	-3.0800	-0.2800	-0.0300	0.1900	2.7900
EARNINGS	0.0092	0.0099	-0.0382	0.0044	0.0087	0.0143	0.0381
OTTI	0.0001	0.0007	0.0000	0.0000	0.0000	0.0000	0.0173
BDE	0.0010	0.0018	-0.0004	0.0002	0.0004	0.0009	0.0104
CH_TREASURY	-0.0003	0.0034	-0.0203	0.0000	0.0000	0.0000	0.0155
PORTFOLIO_SIZE	0.2595	0.1265	0.0605	0.1715	0.2346	0.3253	0.7097
FIRM_SIZE	9.1239	1.5692	6.9895	7.9248	8.7029	9.6850	14.1172
SALES_I	0.0169	0.0049	0.0080	0.0136	0.0159	0.0205	0.0283
REALIZED_GL	0.0043	0.0351	-0.1621	0.0000	0.0003	0.0072	0.1972
APPRECIATION	-0.0014	0.0048	-0.0167	-0.0039	-0.0014	0.0007	0.0158
LIQUIDITY	0.1674	0.1197	0.0200	0.0888	0.1317	0.2037	0.6281
LIABILITIES (\$ millions)	60.916	220.395	815	2,765	6,021	16,075	2,156,448

Panel B: Descriptive Statistics for the Pre-Crisis Sample and Crisis Sample

Pre-Crisis (n = 1,672)	Mean	Std. Err.	Min	Q1	Median	Q3	Max
SALES	0.0157***	0.0353	0.0000	0.0000	0.0030***	0.0159	0.2518
CAPITAL_RATIO	11.5915***	3.6303	6.0000	9.3600	10.8200***	12.5300	30.0000
ΔCAPITAL_RATIO	-0.0526	0.7308	-3.0800	-0.2800	-0.0200	0.2100	2.7900
EARNINGS	0.0118***	0.0077	-0.0382	0.0059	0.0106***	0.0163	0.0381
OTTI	0.0000***	0.0001	0.0000	0.0000	0.0000***	0.0000	0.0020
BDE	0.0005***	0.0008	-0.0004	0.0001	0.0003***	0.0006	0.0091
CH_TREASURY	-0.0004	0.0038	-0.0203	0.0000	0.0000	0.0000	0.0155

(continued on next page)

TABLE 1 (continued)

	Mean	Std. Err.	Min	Q1	Median	Q3	Max
PORTFOLIO_SIZE	0.2799***	0.1298	0.0605	0.1926	0.2579***	0.3462	0.7097
FIRM_SIZE	9.0650**	1.5499	6.9895	7.8939	8.6537***	9.6974	14.1172
SALES_I	0.0191***	0.0045	0.0117	0.0152	0.0185***	0.0209	0.0283
REALIZED_GL	0.0033	0.0338	-0.1621	0.0000	0.0002	0.0076	0.1972
APPRECIATION	-0.0012***	0.0051	-0.0167	-0.0040	-0.0012***	0.0013	0.0158
LIQUIDITY	0.1798***	0.1236	0.0244	0.0965	0.1421***	0.2206	0.6281
LIABILITIES (\$ millions)	51.855***	180.390	815	2,681	5,731***	16,275	1,694,445
Crisis (n = 1,011)							
SALES	0.0114	0.0317	0.0000	0.0000	0.0011	0.0094	0.2518
CAPITAL_RATIO	10.6555	2.8443	0.1200	9.0700	10.0000	11.7100	30.0000
ΔCAPITAL_RATIO	-0.0826	0.6491	-3.0800	-0.2800	-0.0400	0.1700	2.7900
EARNINGS	0.0049	0.0115	-0.0382	0.0022	0.0057	0.0108	0.0381
OTTI	0.0003	0.0012	0.0000	0.0000	0.0000	0.0000	0.0173
BDE	0.0019	0.0024	-0.0004	0.0003	0.0009	0.0024	0.0104
CH_TREASURY	-0.0001	0.0027	-0.0203	0.0000	0.0000	0.0000	0.0155
PORTFOLIO_SIZE	0.2259	0.1132	0.0605	0.1519	0.1980	0.2799	0.7097
FIRM_SIZE	9.2213	1.5966	6.9895	8.0171	8.8409	9.6658	14.1172
SALES_I	0.0133	0.0032	0.0080	0.0114	0.0134	0.0140	0.0182
REALIZED_GL	0.0060	0.0371	-0.1621	0.0000	0.0004	0.0066	0.1972
APPRECIATION	-0.0019	0.0043	-0.0167	-0.0037	-0.0017	0.0000	0.0158
LIQUIDITY	0.1470	0.1101	0.0200	0.0770	0.1148	0.1706	0.6281
LIABILITIES (\$ millions)	75,901	273,473	853	3,032	6,911	15,769	2,156,448

Panel C: Pearson (above the diagonal) and Spearman (below the diagonal) Correlations

Full Sample (n = 2,683)	1	2	3	4	5	6	7	8	9	10	11	12	13
SALES (1)		0.30***	-0.02	0.11***	0.06***	-0.06***	-0.11***	0.20***	-0.03	0.12***	0.07***	0.02	0.34***
CAPITAL_RATIO (2)	-0.04		0.06***	0.19***	0.01	-0.16***	-0.11***	0.62***	-0.39***	0.12***	0.14***	0.03	0.54***
ΔCAPITAL_RATIO (3)	0.02	0.05**		0.07***	-0.03	-0.01	0.04	0.00	0.03**	0.00	-0.01	0.07**	0.01
EARNINGS (4)	0.08***	0.09***	0.05**		-0.16***	-0.57***	-0.03	0.14***	0.03	0.13***	0.04**	0.08***	0.12***
OTTI (5)	0.05**	-0.16***	0.02	-0.14***	0.17***	0.02	0.00	0.00	-0.01	-0.09**	0.02	-0.15***	-0.01

(continued on next page)

TABLE 1 (continued)

Full Sample (n = 2,683)	1	2	3	4	5	6	7	8	9	10	11	12	13
<i>BDE</i> (6)	-0.01	-0.31***	-0.02	-0.32***	0.21***	0.04	0.04	-0.27***	0.16**	-0.19***	0.04**	-0.03	-0.17***
<i>CH_TREASURY</i> (7)	-0.06***	-0.03	0.01	-0.02	0.05**	0.03		-0.02	0.04	-0.07***	-0.03	0.00	-0.11***
<i>PORTFOLIO_SIZE</i> (8)	0.08***	0.60***	-0.02	0.07***	-0.09***	-0.37***	0.01		-0.36***	0.17***	0.09**	-0.05**	0.48***
<i>FIRM_SIZE</i> (9)	0.13***	-0.51***	0.03**	0.08***	0.19***	0.13***	-0.04**	-0.43***		-0.05**	0.00	0.06***	-0.08***
<i>SALES_I</i> (10)	0.19***	0.12***	0.01	0.19***	-0.15***	-0.21***	-0.08	0.19***	-0.07***		0.06**	0.17***	0.11***
<i>REALIZED_GL</i> (11)	0.22***	-0.03	0.01	-0.03	0.07**	0.06***	0.01	0.04**	0.04	0.10***		0.16***	0.12***
<i>APPRECIATION</i> (12)	0.08***	-0.05***	0.06**	-0.02	-0.07**	0.04**	-0.01	-0.11***	0.02	0.17***	0.16***		0.13***
<i>LIQUIDITY</i> (13)	0.09***	0.45***	0.01	0.05***	-0.09***	-0.28***	-0.04**	0.41***	-0.21***	0.12***	0.04**	0.10***	

, * In Panel B, denotes that the value in the pre-crisis partition significantly differs from the corresponding value in the crisis partition at the 5 percent and 1 percent levels, respectively (two-tailed).

, * In Panel C, denotes significantly different from zero at the 5 percent and 1 percent levels, respectively (two-tailed).

All continuous variables are winsorized at 1 and 99 percent except for *CAPITAL_RATIO*, *OTTI*, and *LIABILITIES*. *CAPITAL_RATIO* is, instead, winsorized at 99 percent only. All items beginning with "bhck" come from Federal Reserve Y-9C reports.

Variable Definitions:

SALES = total amount of held-to-maturity (HTM) and available-for-sale (AFS) securities sales (from cash flow statement) plus (minus) realized losses (gains) on sale, scaled by average liabilities (bhck2948);

CAPITAL_RATIO = ending $q-1$ Tier 1 Capital Ratio (bhck7206);

Δ *CAPITAL_RATIO* = change in the Tier 1 Capital Ratio (bhck7206) during quarter $q-1$;

EARNINGS = pretax earnings (bhck4301) plus extraordinary items (bhck4320) (grossed up by an assumed 35 percent income tax rate if pretax earnings are positive), excluding other-than-temporary impairments (OTTI) and bad debt expense (bhck4230), scaled by average liabilities (bhck2948);

OTTI = other-than-temporary impairments of AFS and HTM securities, scaled by average liabilities (bhck2948);

BDE = charge related to management's expectations about future uncollectible loan and lease amounts (bhck4230), scaled by average liabilities (bhck2948);

CH_TREASURY = quarterly change in the amortized cost of HTM (bhck0211) and AFS Treasury securities (bhck1286), scaled by average liabilities (bhck2948);

PORTFOLIO_SIZE = ending $q-1$ amortized cost of non-Treasury HTM and AFS securities (bhck1754 + bhck1772 - bhck0211 - bhck1286), scaled by average liabilities (bhck2948);

FIRM_SIZE = natural log of average of total liabilities during the quarter (bhck2948);

SALES_I = industry-wide sales of HTM and AFS securities, scaled by industry-wide average liabilities (bhck2948);

REALIZED_GL = net realized gains and losses from the sale of HTM and AFS securities (bhck3521 + bhck3196), scaled by average liabilities (bhck2948). We add back OTTI charges to exclude them from these items;

APPRECIATION = ending $q-1$ difference between the fair value of HTM (bhck1771) and AFS securities (bhck1773), and the amortized cost of HTM (bhck1754) and AFS securities (bhck1772), scaled by average liabilities (bhck2948);

LIQUIDITY = ending $q-1$ noninterest-bearing and interest-bearing cash balances (bhck0010) plus AFS and HTM securities other than those that are mortgage- or asset-backed (bhck0213 + bhck1290 + bhck1295 + bhck8497 + bhck1738 + bhck1287 + bhck1293 + bhck1298 + bhck8499 + bhck1741 + bhck1746 + bhck511) plus Fed funds sold and securities purchased under agreements to resell (bhck225), scaled by average liabilities (bhck2948); and

LIABILITIES = average total liabilities during the quarter (bhck2948).

TABLE 2
Level of Selling during the Crisis Period

	<u>Predicted</u>	<u>Full Sample</u>	<u>Weaker Bank Subsample</u>
Intercept	?	0.0003 (0.0080)	0.0022 (0.0059)
2007_INDICATOR	+	-0.0015 (0.0022)	-0.0028 (0.0022)
2008_INDICATOR	+	-0.0007 (0.0030)	0.0004 (0.0041)
CH_TREASURY	-	-1.0448*** (0.3640)	-0.5725 (1.3756)
PORTFOLIO_SIZE	+	0.0536** (0.0309)	0.0596** (0.0318)
Adjusted R ²		5.3%	4.3%
n		2,683	528

*, **, *** Denote significantly different from zero at the 10 percent, 5 percent, and 1 percent levels, respectively (one-tailed if sign is in the predicted direction, two-tailed otherwise). The model is estimated using ordinary least squares where *SALES* is the dependent variable. Robust standard errors clustered by firm are presented in parentheses below coefficient estimates. The “Weaker Bank Subsample” regression includes only the banks in the bottom quintile of Tier 1 capital ratio each quarter. See Table 1 for other variable definitions.

Variable Definitions:

2007_INDICATOR = 1 if the quarter is in 2007, and 0 otherwise; and

2008_INDICATOR = 1 if the quarter is in 2008, and 0 otherwise.

Table 2 presents results from estimating Regression (2) using the full sample and the subsample of weaker banks. In both regressions, the estimated coefficients on the year indicator variables suggest that the level of selling is not significantly different during the crisis years of 2007 and 2008 compared to the prior years. In the regression based on the full sample, the estimated coefficients on the *CH_TREASURY* and *PORTFOLIO_SIZE* controls are statistically significantly different from zero in the expected directions. In the regression involving the weaker banks, only the *PORTFOLIO_SIZE* coefficient is statistically significant in the expected direction.

Cross-Sectional Determinants of Selling of HTM and AFS Securities

We next examine the cross-sectional determinants of securities selling. In particular, we are interested in whether bank stress factors such as low capital ratios lead banks to sell securities. The capital ratio plays a crucial role in theoretical models of pro-cyclicality; faced with negative shocks to the numerator of the ratio (the balance of regulatory capital), banks sell assets to shrink the denominator (risk-weighted assets). Therefore, we predict an inverse relation between quarterly securities sales and the ending $q-1$ Tier 1 capital ratio (*CAPITAL_RATIO*). Similarly, we predict an inverse relation between securities sales and the prior quarter's change in capital ratio (Δ *CAPITAL_RATIO*), because recent capital ratio declines could prompt banks to sell securities. We use the prior quarter's *CAPITAL_RATIO* and Δ *CAPITAL_RATIO* because securities sales endogenously boost capital ratios during the current quarter. We include the bank's quarterly pretax net income scaled by average liabilities (*EARNINGS*) in order to capture exogenous shocks to the capital ratio within the quarter, which would prompt sales of assets. *EARNINGS* is the summary measure of performance that would lead to changes in the capital ratio during the quarter, absent

sales of assets. Given the potentially important role of OTTI charges and bad debt expense in pro-cyclical selling, we exclude these components from *EARNINGS* and, instead, include separate variables (denoted *OTTI* and *BDE*).¹⁶

The final bank stress factor we examine is liquidity. We expect that banks with relatively illiquid balance sheets are more likely to be forced to sell AFS and HTM securities to meet funding needs. Thus, we predict a negative relation between securities sales and liquid assets scaled by average liabilities (*LIQUIDITY*). Following Cornett et al. (2011), we define liquid assets as cash, non-asset-backed HTM and AFS securities, federal funds sold, and securities purchased under agreements to resell. Because fair value accounting does not directly affect liquidity, the *LIQUIDITY* coefficient does not inform us about the role of fair value accounting in cyclicity; rather, we include *LIQUIDITY* simply to control for other potential causes of securities selling.

We also control for two characteristics of the non-Treasury HTM and AFS securities portfolio that could affect securities selling. As in previous tests, we control for the portfolio's size (*PORTFOLIO_SIZE*) because larger portfolios imply more securities to potentially sell. The second characteristic is the portfolio's total unrealized gain or loss, scaled by average liabilities (*APPRECIATION*). We predict that more portfolio appreciation induces banks to sell securities because the realized gains would boost earnings and regulatory capital. We also include as controls *CH_TREASURY* and the natural log of average liabilities during the quarter (*FIRM_SIZE*). The regression model is as follows:

$$\begin{aligned} SALES_{i,q} = & a + b_1CAPITAL_RATIO_{i,q-1} + b_2\Delta CAPITAL_RATIO_{i,q-1} + b_3EARNINGS_{i,q} \\ & + b_4OTTI_{i,q} + b_5BDE_{i,q} + b_6LIQUIDITY_{i,q-1} + b_7PORTFOLIO_SIZE_{i,q-1} \\ & + b_8APPRECIATION_{i,q-1} + b_9CH_TREASURY_{i,q} + b_{10}FIRM_SIZE_{i,q} + e_{i,q}. \end{aligned} \quad (3)$$

We focus on the effects of bank stress factors during the crisis by separately estimating Regression (3) in the pre-crisis period (2004 to 2006) and in the crisis period. We estimate two crisis-period regressions; one including only 2008, the other pooling 2007 and 2008. We estimate a 2008-only model because Figure 1 shows that in 2007, bank earnings were still high and OTTI charges were small.¹⁷

Determinants of Selling: Regression Results

Table 3 presents coefficient estimates for Regression (3). The results provide mixed evidence concerning whether banks pro-cyclically sell securities in response to stress factors. Consistent with pro-cyclical sales of securities, the estimated coefficient on *OTTI* is positive and statistically significant in both the 2008-only and in the 2007–2008 pooled regression. The estimated coefficient on *OTTI* is insignificant in the pre-crisis regression, but the statistical power is low because few banks recognize OTTI charges in the pre-crisis period.

OTTI is just one of many accounting charges that deplete regulatory capital. The remaining capital-depleting charges are captured by *BDE* and *EARNINGS*. The estimated coefficient on *BDE* is positive and significant in both the 2008-only and in the 2007–2008 pooled regression, consistent

¹⁶ To compute *EARNINGS*, we take pretax earnings before extraordinary items, remove *OTTI* and *BDE*, and then add extraordinary items. Because extraordinary items are after-tax amounts, before adding them to pretax earnings, we gross them up by assuming a 35 percent tax rate if pretax earnings are positive and a 0 percent tax rate if pretax earnings are negative.

¹⁷ All variables are winsorized at the 1st and 99th percentile except for *CAPITAL_RATIO* and *OTTI*. Because *CAPITAL_RATIO* has no extreme outliers in the left tail, we winsorize at the 99th percentile only. We do not winsorize *OTTI* because it is 0 for nearly 90 percent of observations. Instead, in robustness tests, we replace continuous *OTTI* with a ranked version and with an indicator variable that captures whether an OTTI charge is taken at all.

TABLE 3
Cross-Sectional Determinants of Selling

	Predicted	Pre-Crisis	2008 Only	2007 and 2008	2007 and 2008_Weaker Banks
Intercept	?	-0.027 (0.017)	-0.067** (0.031)	-0.045*** (0.017)	-0.036 (0.025)
<i>CAPITAL_RATIO</i>	-	0.002 (0.001)	0.004* (0.002)	0.003** (0.001)	0.002 (0.002)
Δ <i>CAPITAL_RATIO</i>	-	0.001 (0.001)	-0.009***^^^ (0.003)	-0.006**^ (0.004)	-0.006* (0.004)
<i>EARNINGS</i>	-	0.151 (0.207)	0.480** (0.241)	0.377 (0.248)	-0.006 (0.321)
<i>OTTI</i>	+	-0.946 (5.055)	2.295** (1.025)	2.271* (1.572)	-0.164 (1.441)
<i>BDE</i>	+	-2.227* (1.268)	2.249***^^^ (0.885)	1.629**^^ (0.734)	0.991 (1.060)
<i>LIQUIDITY</i>	-	0.068 (0.046)	0.027 (0.025)	0.070 (0.047)	0.077 (0.052)
<i>PORTFOLIO_SIZE</i>	+	-0.005 (0.023)	0.028 (0.027)	-0.007 (0.024)	0.097* (0.062)
<i>APPRECIATION</i>	+	-0.064 (0.329)	-0.077 (0.505)	-0.315 (0.590)	-0.295 (0.444)
<i>CH_TREASURY</i>	-	-0.661** (0.345)	-0.941* (0.630)	-0.543 (0.422)	-1.726* (1.208)
<i>FIRM_SIZE</i>	?	0.001 (0.001)	0.002* (0.001)	0.001 (0.001)	0.000 (0.001)
Adjusted R ²		12.4%	28.7%	20.5%	21.7%
n		1,672	474	1,011	199

*, **, *** Denote significantly different from zero at the 10 percent, 5 percent, and 1 percent levels, respectively (one-tailed if sign is in the predicted direction, two-tailed otherwise).

^, ^^, ^^^ Denote the coefficient in the “2008 Only” or “2007 and 2008” column is significantly different from the corresponding “Pre-Crisis” coefficient at the 10 percent, 5 percent, and 1 percent levels, respectively (two-tailed).

The model is estimated using ordinary least squares where the dependent variable is *SALES*. Robust standard errors clustered by firm are presented in parentheses below coefficient estimates. The “_Weaker Banks” regression includes only the banks in the bottom quintile of Tier 1 capital ratio each quarter. See Table 1 for variable definitions.

with banks selling securities in response to large bad debt expenses. However, the *BDE* coefficient is weakly significant ($p=0.08$) in the unexpected direction in the pre-crisis regression. Unlike *OTTI* and *BDE*, *EARNINGS* is not significantly related to securities selling in the expected direction. In fact, *EARNINGS* is significantly positively related to securities selling in the 2008-only regression, suggesting that banks actually sell fewer securities when earnings are low. Thus, there is mixed evidence that capital-depleting charges cause banks to sell securities.

A central tenet of theoretical models of cyclicalities is that charges such as *OTTI* and *BDE* and low *EARNINGS* prompt banks to sell securities due to concerns about their capital ratio. This reasoning implies that banks with low beginning capital ratios will sell more securities. However, we observe the opposite; in both crisis-period regressions the estimated coefficient on *CAPITAL_RATIO* is statistically significantly positive (in the pre-crisis regression, the estimated coefficient is not significantly different from zero). On the other hand, the estimated coefficient on the prior quarter’s change in capital ratio (Δ *CAPITAL_RATIO*) is consistent with pro-cyclical

selling; the significantly negative coefficient during the crisis period suggests that banks tend to sell more securities after a decline in the capital ratio.¹⁸

A possible reason for the mixed evidence of pro-cyclical behavior at the individual bank level is that many of the sample banks have high capital ratios and do not feel pressure to take actions to boost the capital ratio. Thus, we rerun the regression on the subsample of banks in the lowest quintile of Tier 1 capital ratio (fourth column of Table 3). The only bank stress factor that continues to have a statistically significant coefficient in the expected direction is $\Delta\text{CAPITAL_RATIO}$ ($p = 0.07$). The estimated coefficient on PORTFOLIO_SIZE is statistically significantly positive in this sample partition and not the others, suggesting that the weaker banks with larger portfolios sell more than the weaker banks with smaller portfolios, likely because larger portfolios have more securities that can potentially be sold. To assess whether low statistical power is contributing to insignificant coefficients on the other stress factors, we rerun the regression using the banks with the lowest 50 percent of capital ratios, rather than the lowest 20 percent. All bank stress factors are statistically insignificant in this regression (untabulated).

Determinants of Selling: Robustness Tests

We consider several alternative specifications in order to check the robustness of our results.¹⁹ In order to determine whether the positive relation between *SALES* and *OTTI* is driven by the mere incidence of an OTTI charge, rather than by the magnitude of the OTTI charge, we replace *OTTI* with an indicator variable capturing whether the bank takes an OTTI charge. The estimated coefficient on the OTTI indicator variable is not significantly different from zero in the pre-crisis or crisis-period regressions. Thus, the relation between continuous *OTTI* and *SALES* is driven primarily by the magnitude of the OTTI charges.

To determine whether tail observations drive the unexpectedly positive relation between *SALES* and *CAPITAL_RATIO*, we re-estimate Regression (3) using ranks of all variables. Ranked *FIRM_SIZE* is highly collinear with the other ranked explanatory variables, so we remove it from the regression. The estimated coefficient on ranked *CAPITAL_RATIO* is not statistically different from zero in the pre-crisis or crisis-period regressions. The coefficient on ranked *OTTI* continues to be insignificant in the pre-crisis period, and positive and significant ($p = 0.001$) in the crisis period.

The final set of sensitivity tests modifies the dependent variable. Inferences remain similar when we re-estimate Regression (3) after restricting the sample to observations that have a non-zero level of *SALES*, and when restricting the sample to the top 20 percent of observations that have a non-zero level of sales. Inferences also remain similar when using two alternative dependent variables: the quarterly change in the amortized cost of (1) all non-Treasury AFS and HTM securities, and (2) non-agency mortgage-backed securities.

Realized Gains and Losses on Sales of Securities

In this subsection, we examine the realized gains and losses on sales of AFS and HTM securities during the financial crisis. We do this for two reasons. First, even though we find that securities sales did not increase during the crisis, the fair value provisions of U.S. accounting rules

¹⁸ In Table 3, we also test differences in coefficients across the pre-crisis and crisis periods to determine if pro-cyclical behavior was more pronounced during the crisis. The coefficient differences are not the main focus of our study because, in theory, individual banks should behave pro-cyclically regardless of the state of the economy; i.e., an individual bank with significant capital depletion would be expected to sell securities even in a good economy. The only variables with significantly different coefficients across the two periods are $\Delta\text{CAPITAL_RATIO}$ and *BDE*.

¹⁹ None of these results are tabulated.

could have spread the crisis across the financial sector as follows: a relatively modest level of selling at low prices could have established the marks that other banks used when marking their securities to market (LL 2010). These markdowns then would have decreased regulatory capital if considered other than temporary. If this alternative scenario occurred, realized net profit from sales of securities likely would decline during the crisis.

The second reason for examining realized gains and losses during the crisis is that analytical models of pro-cyclicality differ in their predictions about what assets banks sell in response to market price shocks. Plantin et al. (2008) predict that banks sell the very assets that are marked down, while other models predict that banks sell any liquid risky asset, not necessarily the assets that are marked down (Cifuentes et al. 2005; Allen and Carletti 2008).²⁰ If the Plantin et al. (2008) model is descriptive of the recent crisis, we would expect to see a decline in realized net profit from sales of securities during the crisis.

Figure 5 plots realized gains and losses on sales of AFS and HTM securities netted across banks for each quarter from 2004 to 2008.²¹ The net gains in 2007 and 2008 are in line with those realized in 2004 and early 2005, and are actually higher than those realized in late 2005 and 2006. Consistent with these observations, untabulated analysis indicates that the 2007 and 2008 net gains/losses are statistically significantly higher than those in the pre-crisis quarters. Thus, industry-level realized gains/losses provide no evidence of increased loss selling during the crisis.

We also investigate the cross-sectional determinants of realized gains and losses (*REALIZED_GL*) to determine if stress factors such as low capital ratios prompt banks to engage in loss selling. The explanatory variables are the same as in the *SALES* Regression Model (3), except that we exclude *CH_TREASURY* because there is no strong *ex ante* reason to expect a relation with *REALIZED_GL*. The estimated coefficients for the bank stress factors are, however, expected to have the opposite signs. We do not predict coefficient signs for the *PORTFOLIO_SIZE* and *FIRM_SIZE* controls. We expect a positive coefficient on the *APPRECIATION* control because it captures the unrealized gains available to offset the losses incurred when a bank sells securities that have declined in value. Because *REALIZED_GL* is a component of *EARNINGS*, we remove it from *EARNINGS* to create an explanatory variable, *EARNINGS_GL*.

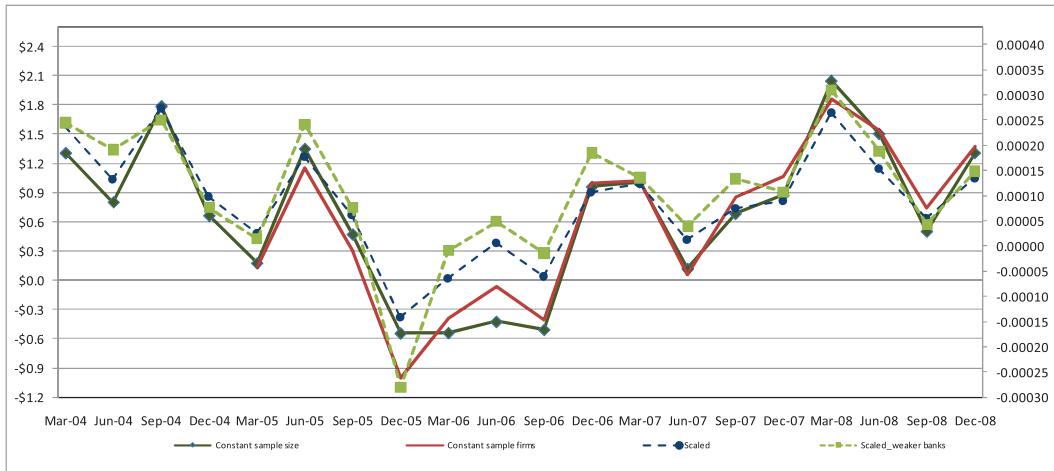
Table 4 presents coefficient estimates from the regression. In the crisis-period regressions, no bank stress factors are statistically significantly related to *REALIZED_GL* in the predicted direction except for *CAPITAL_RATIO* (full sample, 2007–2008 pooled regression only). None of the stress factors have statistically significant coefficients when estimating the regression on banks with below-median Tier 1 capital ratios or when using an OTTI indicator variable (untabulated). The inconsistency and lack of significance in the relations between *REALIZED_GL* and the bank stress factors suggest that loss selling is not a common response to distress, contrary to the Plantin et al. (2008) model prediction.²²

²⁰ The previous analyses in Table 3 tested whether banks sell securities in general and, thus, tested the predictions of the Cifuentes et al. (2005) and Allen and Carletti (2008) models.

²¹ The realized gains and losses are taken from items bhck3521 and bhck3196 on the Y-9C report. We add back OTTI charges because they are included in the items, but are not actually realized.

²² We speculate that accounting rules may have discouraged fire sales because the realized losses on sale would have reduced the capital ratio numerator and, thus, in many cases, would have reduced the overall capital ratio. Auditing practices may have also discouraged fire selling. Based on our conversations with auditors, sales of securities at a loss would be cause for questioning the bank's intent and ability to hold securities until prices recover, increasing the probability that the auditor would require OTTI charges on securities remaining in the portfolio. The basis for this auditing practice appears to be Auditing Standard AU 332, ¶57, which states that auditors should consider whether management's activities, such as securities selling, corroborate or conflict with stated intent. These incentives not to sell securities in times of falling prices would mean that accounting rules promote counter-cyclical behavior.

FIGURE 5
Net Realized Gains and Losses on Sales of AFS and HTM Securities by Quarter



Net realized gains and losses from the sale of held-to-maturity (HTM) and available-for-sale (AFS) securities are obtained from Federal Reserve Y-9C items bhck3521 and bhck3196. We add back OTTI charges to these items to compute the gains/losses realized from actual sales. The “constant sample size” plot is based on the top 100 banks ranked by beginning-of-quarter holdings of non-Treasury HTM and AFS securities. The “constant sample firms” plot is based on the same 121 firms each quarter. To increase the number of firms that can be used, this plot does not start until 2005. The “scaled” plot is based on 2,838 firm-quarters and is scaled by average liabilities. The “scaled_weaker banks” plot includes only the banks in the bottom quintile of Tier 1 capital ratio each quarter. The left axis, in billions, applies to the “constant sample size” and “constant sample firms” plots, while the right axis applies to “scaled” and “scaled_weaker banks” plots.

Interrelation of Securities Sales across Banks

The last aspect of cyclicity we examine is cross-bank relations in selling behavior. [Plantin et al. \(2008\)](#) predict that fair value accounting causes banks to respond to price shocks in uniform ways, creating volatile economic conditions. If banks’ selling behavior in non-crisis periods is based on idiosyncratic liquidity needs or noise trading, we would expect to observe less cross-sectional variation in selling during crisis periods, as banks begin selling securities in response to write-downs stemming from a *common* set of market prices. Similarly, in crisis periods, the industry level of selling should become a primary determinant of each individual bank’s selling activity.

Figure 6 plots the coefficient of variation (i.e., standard error/mean) for *SALES* in each quarter. In the full sample, contrary to expectations, variation in selling in 2007 and 2008 appears in line with 2006, and actually higher than in 2004 and 2005. Untabulated analysis confirms that the coefficient of variation is statistically significantly higher in 2007 and 2008 than in the pre-crisis quarters. For the banks in the lowest quintile of the Tier 1 capital ratio, the variation in selling appears higher than average in 2007 and slightly lower than average in 2008. However, in untabulated analysis, we find that the variation in selling in either year is not statistically different from the level observed from 2004 to 2006.

The second way we examine cross-bank relations in selling behavior is by adding industry-level quarterly sales (*SALES_I*) to the model of firm-level *SALES* (Regression Model (3)). The presence of cross-bank relations would create a positive association between *SALES_I* and *SALES*, and we would expect the relation to become significantly more positive during the crisis period.

TABLE 4
Cross-Sectional Determinants of Realized Gains and Losses

	Predicted	Pre-Crisis	2008 Only	2007 and 2008	2007 and 2008_Weaker Banks
Intercept	?	-0.0137 (0.0127)	-0.0490** (0.0230)	-0.0403** (0.0192)	-0.0209 (0.0473)
<i>CAPITAL_RATIO</i>	+	0.0010*** (0.0005)	0.0009 (0.0013)	0.0016* (0.0011)	0.0028 (0.0036)
Δ <i>CAPITAL_RATIO</i>	+	-0.0006 (0.0014)	-0.0038 (0.0034)	-0.0030** (0.0018)	0.0016 (0.0057)
<i>EARNINGS_GL</i>	+	-0.1589 (0.1939)	0.1415 (0.3357)	0.2016 (0.2289)	-0.0419 (0.3827)
<i>OTTI</i>	-	1.1024 (6.5950)	0.7899 (3.0047)	1.7224 (2.6265)	3.1393 (3.5260)
<i>BDE</i>	-	1.0327 (1.3553)	0.8837 (1.4892)	1.8179* (1.0893)	1.0346 (1.8721)
<i>LIQUIDITY</i>	+	0.0102 (0.0093)	-0.0206 (0.0374)	-0.0068 (0.0197)	-0.0539* (0.0379)
<i>PORTFOLIO_SIZE</i>	?	0.0043 (0.0109)	0.0709* [^] (0.0408)	0.0449* (0.0258)	0.0186 (0.0568)
<i>APPRECIATION</i>	+	0.7840*** (0.2272)	1.7442** (0.8619)	2.1960*** ^{^^} (0.5799)	3.7191*** (0.8989)
<i>FIRM_SIZE</i>	?	0.0004 (0.0010)	0.0039*** [^] (0.0019)	0.0021* (0.0012)	0.0012 (0.0017)
Adjusted R ²		2.9%	5.1%	10.5%	14.3%
n		1,672	474	1,011	199

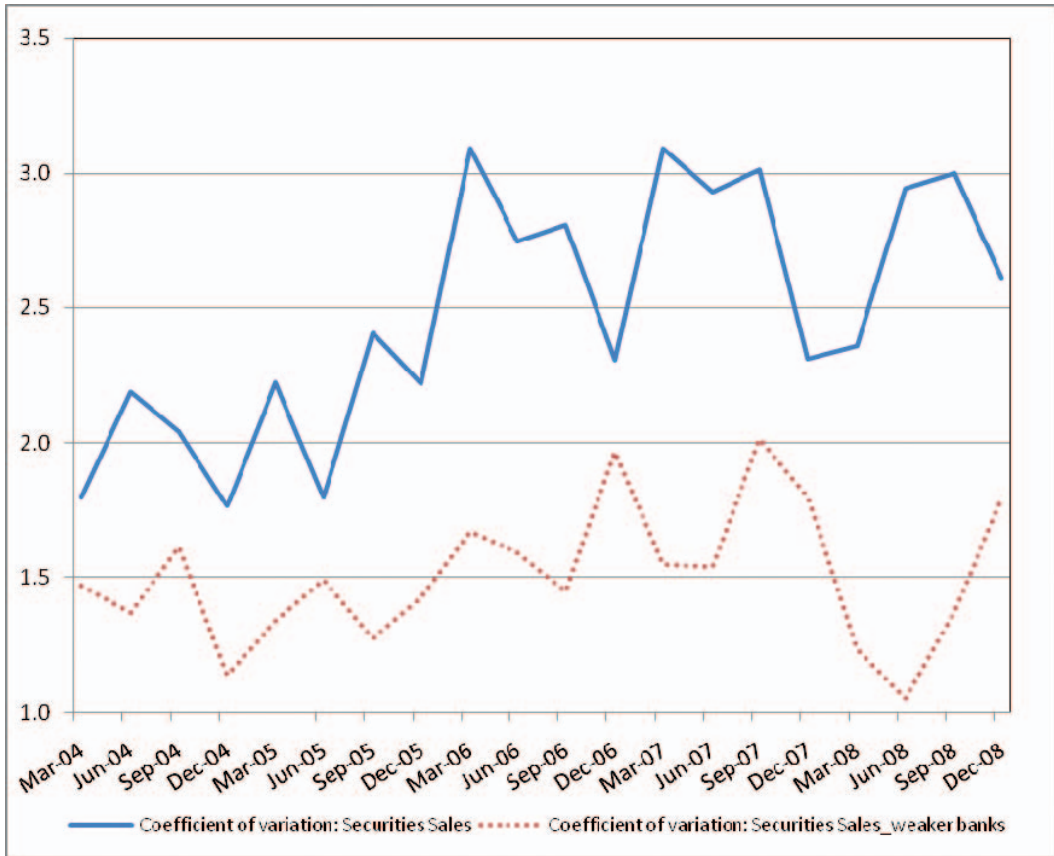
*, **, *** Denote significantly different from zero at the 10 percent, 5 percent, and 1 percent levels, respectively (one-tailed if sign is in the predicted direction, two-tailed otherwise).

[^], ^{^^}, ^{^^^} Denote the coefficient in the “2008 Only” or “2007 and 2008” column is significantly different from the corresponding “Pre-Crisis” coefficient at the 10 percent, 5 percent, and 1 percent levels, respectively (two-tailed). The model is estimated using ordinary least squares where the dependent variable is *REALIZED_GL*. Robust standard errors clustered by firm are presented in parentheses below coefficient estimates. The “_Weaker Banks” regression includes only the banks in the bottom quintile of Tier 1 capital ratio each quarter. *EARNINGS_GL* equals *EARNINGS* minus *REALIZED_GL*. See Table 1 for other variable definitions.

Table 5 shows that for the full bank sample, the estimated coefficient on *SALES_I* is significantly positive in the pre-crisis period. However, the estimated coefficient becomes insignificant in the crisis period, and is actually smaller in magnitude than the pre-crisis coefficient.

In the quintile of banks with the lowest capital ratios, results are more consistent with cyclicity. The *SALES_I* coefficient is statistically significant in the crisis period regression and not in the pre-crisis regression. The coefficient magnitude in the crisis-period regression is larger than that in the pre-crisis regression, although the coefficient magnitudes do not differ statistically across the regressions. When expanding the sample to banks with below-median capital ratios, the *SALES_I* coefficient has similar magnitude across the pre-crisis and crisis regression, and is not significantly different across the regressions (untabulated). In summary, there is some evidence that selling among the weakest banks becomes more related to the industry level of selling during the crisis, but the coefficient of variation in selling for these banks is not discernibly higher during the crisis, and there is no evidence of interrelated selling in the samples including stronger banks.

FIGURE 6
Coefficient of Variation in Sales of AFS and HTM Securities by Quarter



The coefficient of variation is the standard error of *SALES* divided by the mean of *SALES* each quarter. *SALES* equals the total amount of held-to-maturity and available-for-sale securities sales, scaled by average liabilities. “_weaker banks” includes only the banks in the bottom quintile of Tier 1 capital ratio each quarter. The sample is based on 2,685 firm-quarter observations.

V. CONCLUSION

Fair value provisions of U.S. accounting rules have been blamed for exacerbating the recent financial crisis, leading critics to call for substantial rule changes. Banking industry lobbyists and members of Congress pressed the FASB and SEC to change or suspend fair value accounting, and the FASB swiftly responded with changes. Defenders of U.S. rules argued that the role of fair value accounting in U.S. bank regulation is not sufficient to lead to the pro-cyclical effects alleged by the critics, and are concerned about government interference in U.S. standard setting.

We contribute to the debate over the role of fair value accounting in the recent crisis by examining the size and timing of OTTI charges taken by banks. We focus on OTTI charges because they are the only fair value write-downs of AFS and HTM debt securities that affect regulatory capital. We find that although OTTI charges reached unprecedented levels during the financial

TABLE 5
Interrelation of Selling across Banks

	Predicted	Pre-Crisis	2008 Only	2007 and 2008	Pre-Crisis_ Weaker Banks	2007 and 2008_Weaker Banks
Intercept	?	−0.0460** (0.0181)	−0.0706** (0.0308)	−0.0467*** (0.0161)	−0.0703** (0.0261)	−0.0416 (0.0250)
<i>SALES_I</i>	+	0.9874*** (0.2364)	0.3726 (0.3318)	0.1538^^ (0.2663)	0.3661 (0.2595)	0.7983** (0.4689)
<i>CAPITAL_RATIO</i>	−	0.0015 (0.0012)	0.0037* (0.0021)	0.0028** (0.0013)	0.0041* (0.0023)	0.0015 (0.0018)
Δ <i>CAPITAL_RATIO</i>	−	0.0007 (0.0015)	−0.0084***^^^ (0.0030)	−0.0062**^ (0.0037)	−0.0035* (0.0022)	−0.0050* (0.0039)
<i>EARNINGS</i>	−	0.2864 (0.2167)	0.4703* (0.2399)	0.3589 (0.2650)	−0.3112** (0.1364)	−0.0548 (0.3321)
<i>OTTI</i>	+	−0.0048 (5.2025)	2.3687** (1.0213)	2.2826* (1.5658)	8.1515*** (2.4596)	−0.1822^^^ (1.5016)
<i>BDE</i>	+	−2.0419 (1.2843)	2.1127***^^^ (0.8901)	1.5468**^^ (0.8085)	−1.9043* (1.0790)	0.7155^ (1.1236)
<i>LIQUIDITY</i>	−	0.0695 (0.0462)	0.0273 (0.0253)	0.0698 (0.0465)	0.0188 (0.0219)	0.0775 (0.0515)
<i>PORTFOLIO_SIZE</i>	+	−0.0080 (0.0225)	0.0287 (0.0275)	−0.0065 (0.0237)	0.0524** (0.0255)	0.1014* (0.0627)
<i>APPRECIATION</i>	+	−0.3049 (0.3412)	0.0032 (0.5055)	−0.2929 (0.5797)	−0.5485 (0.3680)	−0.2694 (0.4262)
<i>CH_TREASURY</i>	−	−0.5848** (0.3416)	−0.9328* (0.6321)	−0.5357 (0.4178)	2.0545 (1.4031)	−1.7213*^^ (1.1843)
<i>FIRM_SIZE</i>	?	0.0014 (0.0011)	0.0023* (0.0013)	0.0012 (0.0008)	0.0033*** (0.0007)	0.0003^^ (0.0011)
Adjusted R ²		13.7%	28.8%	20.4%	14.1%	22.6%
n		1,672	474	1,011	329	199

*, **, *** Denote significantly different from zero at the 10 percent, 5 percent, and 1 percent levels, respectively (one-tailed if sign is in the predicted direction, two-tailed otherwise).

^, ^^, ^^^ Denote the coefficient is significantly different from the corresponding “Pre-Crisis” coefficient at the 10 percent, 5 percent, and 1 percent levels, respectively (two-tailed).

The model is estimated using ordinary least squares where the dependent variable is *SALES*. Robust standard errors clustered by firm are presented in parentheses below coefficient estimates. “_Weaker Banks” includes only the banks in the bottom quintile of Tier 1 capital ratio each quarter. See Table 1 for variable definitions.

crisis, the impact on regulatory capital was minimal. Moreover, the majority of the OTTI charges were not recognized until the later part of 2008, well after the financial crisis was underway.

We find evidence that is largely inconsistent with the notion that banks sell securities in response to capital-depleting charges. We do find that OTTI charges, bad debt expenses, and prior-quarter declines in the capital ratio are associated with more sales of securities. However, we find that banks with low capital ratios actually tend to do less selling, contradicting a central assumption of cyclicity models. Furthermore, industry- and firm-level sales of AFS and HTM securities during the crisis were similar to levels before the crisis; the implication is that the accounting charges did not prompt enough sales of securities to discernibly increase the overall level of selling. We also find no evidence that banks increasingly sold securities at losses during the crisis, providing no support for claims that fair value accounting caused “fire-sales” of assets.

Finally, the bulk of our tests of interrelated selling show little evidence of an increase during the crisis. Based on our findings, it is unlikely that fair value accounting affected the banking industry in the ways commonly alleged by critics. Rather, our evidence suggests that if accounting-based depletions of regulatory capital played a role in the crisis, the main culprit was bad debt expense, which primarily reflects managers' own estimates of troubled loans.

It is important to understand the role that accounting rules played in the recent crisis because many critics, including a former FDIC chairman, pointed to the economic turmoil as evidence that the FASB needs more government oversight and checks on its standard-setting power (Lamoreaux 2009; Isaac 2010). This study's findings counter many of the claims about accounting's role in the crisis, which, in turn, suggests that Congress was rash in demanding rule changes from the FASB. This should give pause to advocates of even more government involvement in accounting standard setting. An alternative way for the government to limit the FASB's influence over the financial sector is to delink regulatory capital rules from accounting rules. Even before the crisis, bank regulators shielded regulatory capital from several items affecting accounting book equity (e.g., unrealized gains/losses on AFS debt securities). More exclusions could be made if systemic risk is a concern.

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