THE VALUATION IMPLICATIONS OF UNREALIZED GAINS AND LOSSES ON NON-AGENCY SECURITIES

By

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I dedicate this to my parents, my wife, and my daughter.

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In this paper I examine the value relevance and future-earnings predictive ability of unrealized gains and losses on non-agency securities and how these valuation properties have changed in the recent crisis period. I find value relevance of these unrealized changes, but only in the crisis period, which is consistent with the fire-sale expectation story. A stronger relation between the unrealized changes and future-realized gains/losses in the crisis period provides economic rationale to the value relevance during the crisis period. I also find that fair value revaluations for non-agency securities are positively associated with interest income in future periods. In the crisis period, however, this association is weaker. Such results suggest the potential weakness of fair value's predictive ability for future interest income during times of market instability, although fair value information satisfies the value-relevance criterion.

CHAPTER 1
INTRODUCTION

Motivation and Research Question

Non-agency securities, which include non-agency mortgage-backed securities (MBS) and other asset-backed securities (ABS), are generally difficult to value due to limited market participants, infrequent transactions, or complex structures (Ashcraft and Schuermann 2008; Gorton 2008). The difficulty of valuing non-agency securities has been amplified during the financial crisis, rendering fair value estimates for those securities less reliable. Emphasizing the reduced reliability of fair value estimates for non-agency securities, the banking industry has questioned the usefulness of fair value estimates for these securities during the crisis (SEC 2008; Leone 2008).[1]

In this paper I examine the usefulness of fair value information for non-agency securities from two perspectives: (1) the value relevance and (2) the future-earnings predictive ability of unrealized changes on non-agency securities.[2] Value relevance tests provide evidence of market investors' perception of fair value estimates for these complex financial instruments. Future-earnings predictive ability tests provide direct evidence of the relation between fair value revaluations for non-agency securities and future earnings realizations from those securities. Such evidence potentially helps standard setters evaluate the usefulness of fair value information for complex financial

[1] They also expressed concern that fair value measurement yielded an adverse feedback effect which had caused further reductions in the market values of illiquid assets and possibly even systematic risk. See SEC (2008), Shaffer (2010), and Badertscher et al. (2010) for a discussion of this concern.

[2] *Unrealized changes, unrealized gains and losses*, and *fair value revaluation* are used interchangeably throughout this article.

instruments based on one of qualitative characteristics of accounting information as stated in the Statement of Financial Accounting Concepts No. 2.[3]

I next examine whether these valuation implications of unrealized changes on non-agency securities may have changed during the recent financial crisis. Although the effect of market instability on valuation implications of fair values is not documented in the literature, market instability may render fair values difficult to measure and thus unreliable, as appears to have occurred for non-agency securities during the credit crunch. Thus, the usefulness of fair value estimates for complex financial instruments to financial statement users may have decreased (Barth and Landsman 2010).

Preview of Results

Using a sample of bank holding company (BHC) data between 2001 and 2009, I find that unrealized gains and losses on non-agency securities are not value relevant. The result implies that investors do not consider these revaluations informative because of the (assumed) lack of reliability of fair value estimates for these securities. The unrealized gains/losses on non-agency securities, however, gain value relevance in the crisis period although fair values for these securities are allegedly not reliable due to market illiquidity. A possible explanation for this is that investors may increase their assessments of fair value for such illiquid securities because of banks' anticipated liquidation of those securities during this period. A stronger relation between the unrealized changes and future realized gains/losses in the crisis period provides an economic rationale for value relevance during the crisis period.

[3] Statement of Financial Accounting Concepts No. 2 states that predictive value is an important consideration in distinguishing relevant from irrelevant accounting information (FASB 1980).

I also find that fair value revaluations for non-agency securities are positively associated with one- and two-year-ahead future interest income. This suggests that unrealized gains/losses on non-agency securities reflect changes in values associated with prepayment and credit risk in spite of the less reliable fair values. The relation between the fair value revaluations and future interest income in the crisis period, however, is weaker. This suggests the potential weakness of fair value's predictive ability for future earnings during times of market instability, although fair value information satisfies the value-relevance criterion.

Contributions

My study makes three contributions to the existing literature. First, I examine the valuation implications of non-agency mortgage-backed and other asset-backed securities which have not been previously examined in the literature. This analysis is important to standard setters as they consider expanding fair value accounting to loans and other financial instruments. Particularly for bank loans that share similar characteristics with mortgaged-related securities, my results suggest that the fair value mandate may introduce measurement error that ultimately compromises the usefulness of fair values in evaluating banks' profitability during times of market instability.

Second, my predictive approach allows me to evaluate claims made by the banking industry directly, thus offering an alternative perspective for standard setters when evaluating the relevance of fair value. I provide evidence that fair value revaluations for non-agency securities are useful in predicting future interest income although investors do not generally consider them informative. However, the usefulness of these revaluations is reduced during times of market instability such as the financial crisis.

Third, I investigate the valuation implications using a longer period that includes observations from before and during the crisis period. This is in contrast to recent studies, which examine the value relevance of Level 3 assets (many of which are presumably non-agency securities) during only the first three quarters of 2008 (Song et al. 2011; Kolev 2010). More importantly, rather than rely solely on fair values I also consider amortized cost. Focusing on the valuation implications of value differences (fair value less amortized cost) allows me to explore the incremental usefulness of fair values to amortized costs, particularly in predictive tests. My analysis thus complements and extends recent studies in the growing literature on fair values.

Organization

The remainder of the paper is organized as follows. Chapter 2 provides a brief background and related research concerning fair value measurement. Chapter 3 describes non-agency securities owned by BHCs, and Chapter 4 develops hypotheses and outlines the research design for the value relevance and predictive ability tests. Sample selection, empirical results, and sensitivity of results are described in Chapter 5, 6, and 7, respectively. Finally, Chapter 8 offers concluding remarks.

CHAPTER 2
BACKGROUND AND RELATED LITERATURE

Fair Value Accounting

FAS 157 (also known as Accounting Standards Codification 820 in the updated FASB Codification) defines *fair value* as the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date (FASB 2006).[1] This definition of fair value reflects an ideal "exit value" in an orderly transaction that allows for due diligence. The rule explicitly states that an orderly transaction is neither a forced liquidation nor a distressed sale. The standard setters (FASB and IASB) consider fair value measurement as a possible measurement basis in many situations (Barth 2006). The fundamental case in favor of fair value accounting is that fair value incorporates current information about future cash flows and current risk-adjusted discount rates into the financial statements. Incorporating timely information enhances the relevance of information in financial statements as defined in the standard setters' conceptual framework, with potential advantages to investors, managers, and other parties in making decisions (FASB 2000; Ryan 2007).

When quoted prices in active markets are available, there are few conceptual objections against fair value accounting. However, when financial instruments are not actively traded, firms would have to either estimate their fair value or use the quoted

[1] FAS 157 also outlines a hierarchy of inputs to derive the fair value of an asset or liability. Level 1 inputs are quoted prices in active markets for identical assets. If Level 1 inputs are not available, models are used to determine fair value, which is sometimes called "marking to model." FAS 157 requires that these models use observable inputs (Level 2), which includes quoted prices for similar assets and other relevant market data (such as interest rate yield curves or spreads between related interest rates). Level 3 inputs are unobservable inputs, typically model assumptions, and can be used if observable inputs are not available.

price from the illiquid market. In either case fair value estimates may contain significant bias and error, thereby lacking reliability. Particularly in the context of the financial crisis, the banking industry complains that fair values of mortgage-related assets are poor indicators of their long-run value as the market price of them has tumbled (Hughes and Tett 2008). Thus, fair values are of limited usefulness to bank investors to adequately assess a firm's financial position and earnings potential.

Existing Accounting Research on Fair Value

Empirical accounting research has taken a value-relevance approach to evaluate the usefulness of fair value information to investors. Such research generally analyzes the association of fair value estimates with stock prices and returns. A significant and predicted association of fair value estimates with stock price or returns implies that the estimates are relevant and sufficiently reliable to be impounded in firm value (Barth et al. 2001). Much of the accounting research assessing the value relevance of fair value information focuses on banks, since banks are largely comprised of financial assets and liabilities. In general, prior studies provide substantial evidence that fair value estimates for financial instruments are relevant to investors and reliable enough to be reflected in share price or returns. This conclusion holds for pensions and other post-retirement liabilities (Landsman 1987; Barth 1991), bank loans and core deposits (Barth et al. 1996; Eccer et al. 1996; Nelson 1996), derivatives (Schrand 1997; Venketachalam 1996), and investment securities held by closed-end mutual funds (Carroll et al. 2003).

For banks' investment securities, Barth (1994) finds that investment securities' fair values are incrementally associated with bank share prices after controlling for investment securities' book values. In contrast, Nelson (1996) shows that fair value measures for banks' investment securities were not incrementally value relevant to book

value after controlling for future profitability. The results from a returns specification, which may implicitly control for correlated omitted variables, are also mixed. Barth (1994) finds that unrealized gains and losses on investment securities do not possess explanatory power in explaining contemporaneous stock returns. The ambiguous finding for securities gains and losses is typically attributed to 1) measurement errors in the estimated unrealized gains and losses and 2) the omission of correlated unrealized gains and losses on other assets and liabilities. Barth et al. (1995) lend support to the measurement error explanation by showing that fair-value-based measures of net income are more volatile than historical cost-based measures, but the incremental volatility is not reflected in bank share prices. Ahmed and Takeda (1995) provide support for the second explanation by showing that, after controlling for interest rate sensitivity of other assets and liabilities, unrealized gains and losses on investment securities become positively related to stock returns.

Another factor that might contribute to the mixed findings above is that prior research on the value relevance of fair value estimates for investment securities often used an indirect classification to distinguish securities with high versus low measurement error (i.e., Barth 1994; Khurana and Kim 2003). For example, Barth (1994) splits her sample by the proportion of U.S. Treasury securities to explore the measurement error explanation because U.S. Treasury securities are presumably actively traded. Such indirect identification likely leads to imperfect partitioning because banks hold a wide range of investment securities, among which U.S. Treasuries account for, on average, less than 5% of investment securities (Penman 2007).

Recently, Song et al. (2010) and Kolev (2010) document the value relevance of the FAS 157 fair value estimates for samples of firms in the banking industry during the first three quarters of 2008. While the estimated value-relevance parameters differ across studies (due to different samples and specifications), these studies find that investors price a reported $1 of Level 3 assets significantly below a reported $1 of Level 1 assets. They suggest that investors apply larger discount factors to the reported Level 3 fair values because they are subject to more model risk (or noise) and larger information asymmetry.

While much literature discusses the value relevance of fair value information (some of which is summarized above), research on the relation between fair values and future performance measures is limited. The few such studies include Aboody et al. (1999), Park et al. (1999), and Evans et al. (2011). Aboody et al. (1999) provide evidence that U.K. asset revaluations are associated with future performance as well as share prices, indicating that the asset revaluations are not unreliably measured. Park et al. (1999) document that the unrealized changes from the available-for-sale securities explain one-year-ahead bank earnings, while those from the held-to-maturity securities do not. Recently, Evans (2011) et al. show that fair values from the investment securities have predictive ability for future realized income and the value relevance of fair values varies with the ability of fair values to predict reported income.

CHAPTER 3
NON-AGENCY SECURITIES

Bank holding companies are required to classify their investment securities into trading, held-to-maturity (HTM), and available-for-sale (AFS) portfolios. Trading portfolios are carried at fair value, with realized and unrealized gains and losses reported in the income statement as part of trading revenue. Under FASB ASC 320 (formerly FAS 115), securities in the HTM portfolio are accounted for at amortized cost, with fair values disclosed but not recognized. Securities that do not qualify for the HTM portfolio (i.e., no intent and ability to hold the securities until they mature) are to be classified as AFS. For AFS securities, FASB ASC 320 requires formal balance sheet recognition at fair value, with unrealized gains and losses recognized in the owners' equity section.[1]

My study focuses on non-agency securities classified as AFS and HTM investment securities. Because of the restrictive rules on when an asset could be considered HTM, most BHCs in my sample carry non-agency MBS and ABS as AFS.[2] I exclude non-agency securities in trading portfolios for two reasons. First, BHCs do not provide amortized costs for trading portfolios, preventing me from computing unrealized gains/losses on trading securities. Second, fair value accounting for trading securities is supported even by the banking industry. The banking industry agrees that fair-value accounting is appropriate for assets that are held for trading purposes and provides useful information for financial statements users (International Banking Federation

[1] If the fair value option is applied to AFS and HTM securities for existing securities, then those securities would be classified as trading as prescribed by FASB ASC 825-10 (formerly FAS 115).

[2] AFS (HTM) category contains approximately 90% (10%) of bank holdings of non-agency securities in my sample.

2008). Thus, the usefulness of fair value application to trading securities is hardly a controversial issue.

Schedule HC-B in the regulatory call report database (FR Y-9C forms) provides fair values and amortized costs for various types of investment securities held by bank holding companies. Among various types of investment securities, I focus on non-agency securities, which include bonds typically issued by homebuilders or financial institutions through subsidiaries and are backed by pools of loans (e.g., mortgage, credit cards, auto loans). Unlike agency securities (i.e., agency MBS), there is no government guarantee for these securities. Thus, credit risk, as well as prepayment and interest rate risk, resides in the non-agency security market. Many non-agency asset-backed securities are not liquid, and their prices are not transparent. This is partly because non-agency securities are not as standardized as agency mortgage-backed securities, and investors have to evaluate the different structures, maturity profiles, credit enhancements, and other features of an asset-backed security before trading it (Sabarwal 2005).

During the financial crisis secondary markets for trading non-agency MBS and ABS have been extremely illiquid due to an increase in information asymmetry about the quality of the underlying assets (Ashcraft and Schuermann 2008). Although the information on the trading activity of these securities is not publicly available, there is some evidence of the dissolution of the non-agency security market. For 2008, non-agency residential MBS issuance, which includes jumbo mortgages that exceed government-sponsored entities' conforming loan size limits and higher credit-risk mortgages that do not meet agency underwriting guidelines (i.e., sub-prime mortgages),

fell to an all-time low of $25.3 billion, a decline of 94.4% from the $451.2 billion issued in 2007. Non-agency commercial MBS (CMBS) issuance totaled $6.4 billion in 2008, down dramatically from the $228.2 billion issued in 2007. No new CMBS were issued in the fourth quarter of 2008 and only $0.1 billion was issued in the third quarter compared to the $28.4 billion issued in the fourth quarter of 2007. Total ABS issuance for 2008 was $137.2 billion, a decline of 73% from $509.7 billion raised in all of 2007. In fact, the fourth quarter of 2008 marked the first time that four of the major sectors (home equity, credit card, student loan, and equipment leases) had no issuances.[3]

As markets became inactive and transaction prices were no longer available for non-agency securities, there was vast uncertainty over how these securities should be valued (Gorton 2008), contributing to the valuation challenge. The banking industry claimed that the unusual market condition recently experienced led fair values for mortgage- or other asset-backed securities to understate the intrinsic values and to be more indicative of distressed sales (ABA 2008;Krumwiede et al. 2008; Ryan 2008). This kind of assertion has been also made by the Bank of England (2008) and the Bank of Financial Stability Forum (2008), among others. In contrast, some argue that banks tended to overvalue the illiquid securities in their books by classifying more of them as Level 3 assets (Laux and Leuz 2010).

[3] All statistics in this paragraph are based on the 2009 March Report prepared by Securities Industry and Financial Markets Association.

CHAPTER 4
HYPOTHESES DEVELOPMENT

Value Relevance of Unrealized Gains and Losses on Non-agency Securities

I begin my analysis by examining how investors value unrealized gains/losses from non-agency securities owned by BHCs. The fair value of investment securities incorporates timely information about future cash flows and risk-adjusted discount rates (FASB 2000). Accordingly, unrealized gains/losses, which are fair values less amortized costs, contain current information about changes in value of investment securities. Current information about changes in value of assets helps investors assess the value of the firm to make informed investment choices. Despite this conceptual appeal of fair value accounting, critics of fair value accounting argue that the reduced reliability of fair value estimates in the absence of liquid markets would reduce the usefulness of fair value information. This argument is relevant particularly for non-agency securities whose fair values are less observable in active markets. Thus, fair value estimates for these securities likely require more estimation than estimates for other investment securities. As the fair value estimates rely on managerial estimation, managers can opportunistically make adjustments or choose unobservable inputs in the valuation process (Ronen 2008). Such managerial judgment and discretion could compromise the reliability of fair value estimates for non-agency securities.

Due to the possible lack of reliability in measuring fair value estimates for these securities, market investors may not perceive unrealized changes on these debt securities as sufficiently reliable to be used in valuation. Whether unrealized changes in non-agency securities are used by market investors (thus, value relevant) or are not

perceived as useful information is an empirical question. Formally, I test the following hypothesis on non-agency securities:

H1a: Unrealized gains/losses on non-agency securities are value relevant.

As discussed above, fair values for non-agency securities are more likely to be estimated using valuation models instead of observable market prices from active markets. Accordingly, fair value measurements for non-agency securities are likely to be less precise than fair value measurements for other investment securities.

Prior research suggests that the value relevance of fair value measurements varies with the reliability of information. For example, Petroni and Wahlen (1995) find that fair values for equities and U.S. Treasury securities are value relevant, but fair values of municipal and corporate bonds are not, suggesting that securities actively traded in the market are more reliably associated with the market value of equity. Barth (1994) divides her sample by the proportion of U.S. Treasury securities held by banks. She finds that unrealized gains and losses are more strongly associated with stock prices for banks that hold a high proportion of U.S. Treasury securities. Recently, Kolev (2010) and Song et al. (2010) document that fair value estimates based on Level 1 input are more strongly associated with stock price than estimates based on Level 3 input.

Based on findings in prior research, I predict that market investors give a lower valuation to unrealized changes of non-agency securities than to those of other investment securities. My prediction is formally stated as Hypothesis 1b:

H1b: The value relevance of unrealized gains/losses on non-agency securities is less than the value relevance of unrealized gains/losses on other investment securities.

To test H1, I estimate the equation (1):

$$P_{it} = \alpha_t + \alpha_1 * BVE_{it} + \alpha_2 * NI_{it} + \beta_1 * URGL_{TOTAL,it} + \beta_2 * URGL_{NA\_ABS,it} + \phi_1 * SIZE_{it} + \phi_2 * GROWTH_{it} + \varepsilon_{it}, \quad (1)$$

where P is the share price of the bank measured at the end of February of Year *t+1*.[1] BVE is the book value of equity minus unrealized gains/losses from AFS investment securities. NI is earnings before extraordinary items. $URGL_{TOTAL}$ are unrealized gains/losses on all investment securities (excluding non-agency MBS and ABS) classified as HTM and AFS. $URGL_{NA\_ABS}$ are unrealized gains/losses on non-agency MBS and ABS.[2]

Following Kolev (2010), I also include the log-transformed total assets for the bank (SIZE) and the percentage change in total assets (GROWTH). These factors have been shown in the literature to affect the relationship between the price and book value of equity (Eccher et al. 1996; Khuranna and Kim 2003; Liu and Ohlson 2000; Nelson 1996; Nissim 2007). Yearly intercepts are included to account for macroeconomic factors. All variables except for SIZE and GROWTH are on a per-share basis to reduce the scale effects in the regression model similar to extant research (Barth and Clinch 2009; Kolev 2010; Song et al. 2010). *i* represents the bank subscript while *t* represents the year subscript.

Eq. (1) is based on a valuation model developed by Ohlson (1991) and further extended in Ohlson (1995) and Feltham and Ohlson (1995), which has been extensively

[1] The 4th quarterly filing date for top-tier (lower-tier) BHCs is 45 (50) calendar days after December 31.

[2] Specifically, non-agency MBS include all mortgage pass-through securities not guaranteed by the U.S. government, collateralized mortgage obligations (CMOs), real estate mortgage investment conduits (REMICs), CMO and REMIC residuals, and stripped mortgage-backed securities issued by non-U.S Government issuers for which the collateral does not consist of GNMA (Ginnie Mae) pass-throughs, FNMA (Fannie Mae) pass-throughs, FHLMC (Freddie Mac) participation certificates. ABS include all asset-backed securities collateralized by credit card receivables, home equity loans, automobile loans, commercial and industrial loans, and other consumer loans.

employed in the literature. As a refinement, I expand this model to separately evaluate the value relevance of unrealized gains/losses on non-agency securities.[3] In Eq. (1) I first test whether the valuation coefficient of $URGL_{NA\_ABS}$ (β_2) is different from zero. A positive and significant β_2 is consistent with the conjecture that equity investors find the unrealized gains/losses on non-agency securities sufficiently reliable to be reflected in bank value. I then test whether the coefficient for $URGL_{NA\_ABS}$ is smaller than the one for $URGL_{TOTAL}$ (β_1). I predict that $\beta_1 > \beta_2$.

Predictive Ability of Unrealized Gains and Losses on Non-agency Securities for Future Earnings

Next, I test whether the unrealized gains/losses on non-agency securities predict future earnings. The test is motivated by the current debate among bank managers, investors, and capital market regulators about the usefulness of fair values, particularly when markets are illiquid. Investors generally support measurements at fair value as providing the most transparent financial reporting of an investment (Ryan 2008). In contrast, bank managers and capital market regulators question the usefulness of fair values based on illiquid or distressed prices when those prices do not reflect the company's ultimate cash flow expectations. For example, in his comment letter on SEC's Study on Mark-to-Market Accounting, Todd Bernstein of Wachovia Securities wrote:

> The price of many of these [securitized mortgage] pools is well below their value based on cash flows, meaning the market is pricing in more losses than have actually, or may ever, occur. Mark-to-market accounting rules

[3] The unrealized gains and losses used in my study are not recognized under the narrow concept of income (i.e., net income). However, they could be considered as components of a broad definition of income (i.e., comprehensive income) because they reflect the change in value of a firm's investment debt securities.

force banks to take artificial hits to capital without reference to the actual performance of loans in these pools.[4]

The market-based tests discussed above have a limited ability to address critics' concerns. Prices reflect not only investors' expectations about future cash flows, but also the valuation implications of managements' future financing and investing decisions (Aboody et al. 1999). For example, investors could anticipate that banks will be inclined to sell relatively illiquid assets to replenish their capital and thus price such an expectation, even if a decline in fair values is deemed temporary. In this case the valuation parameters in the market-based tests could reflect implications for firm value not directly related to the revaluations' association with future income. Thus, relating fair value revaluations to future realized income from investment securities provides direct evidence of the association between revaluations and future operating performance and complements findings from the price specification.

Under U.S. GAAP, unrealized gains and losses are the differences between the amortized costs and fair values. The amortized cost of the debt securities is equal to the present value of the remaining contractual payments discounted using the historical at-purchase discount rate. The debt securities' fair value, in contrast, is equal to the present value of the remaining contractual payments discounted at the current expected return on similar investments (Ryan 2007). Thus, differences between the fair and amortized costs of debt securities are due to changes in their expected returns. Changes in expected returns, in turn, result from changes in interest rates, prepayment expectations, credit risk or the pricing of credit risk depending on type of debt securities (Nissim and Penman 2007). If unrealized gains/losses on non-agency securities reflect

[4] See comment letters for Study on Mark-to-Market Accounting (2008) on the SEC's website (at http://www.sec.gov/comments/4-573/4-573.shtml).

changes in the values of investment securities associated with prepayment and credit risk, they will be positively associated with changes in future interest income from those securities. This leads to my second hypothesis in alternative form:

H2a: Fair value revaluations of non-agency securities are positively related to future interest income from those securities.

Potential lack of reliability of fair values from uncertainties inherent in the estimation can reduce the predictive ability (Aboody et al., 1999). The predictive ability of unrealized gains/losses is also reduced to the extent that revaluations reflect interest rate movement because they represent the aggregate effect of interest rate, prepayment, and/or credit risk. Whether unrealized gains/losses of non-agency securities reflect information associated with future income and whether these estimates are measured reliably enough to be useful in predicting future interest income remain empirical questions.

To examine the predictive ability of unrealized gains/losses on non-agency securities, I estimate the equation below:

$$\begin{aligned} \mathrm{I}_{it+k} = {} & \alpha_t + \beta_1 * \mathrm{BV}_{OTHER,it} + \beta_2 * \mathrm{BV}_{NA\_ABS,it} + \delta_1 * \mathrm{URGL}_{OTHER,it} \\ & + \delta_2 * \mathrm{URGL}_{NA\_ABS,it} + \gamma * \mathrm{SIZE}_{it} + \varepsilon_{it}, \end{aligned} \tag{2}$$

where I is interest income from mortgage-backed securities and other investment securities (excluding U.S. Treasury securities and U.S. government agency obligations) in Year *t+k*, where *k* = 1 or 2.[5] $\mathrm{BV}_{\mathrm{OTHER}}$ are the amortized costs of investment debt securities excluding U.S. Treasury securities, U.S. government agency obligations, and

[5] This framework is similar to Evans et al. (2011) except that the current realization of interest income is absent. In empirical analysis I find a high degree of multicollinearity between $\mathrm{BV}_{\mathrm{OTHER}}$ and the current interest income as indicated by a high variance inflation factor when the current interest income is included in Eq. (2). Accordingly, inclusion of the current interest income may affect the estimation of $\mathrm{BV}_{\mathrm{OTHER}}$ although it does not affect the estimation of $\mathrm{URGL}_{\mathrm{NA\_ABS}}$.

non-agency securities.[6] BV_{NA_ABS} are the amortized costs of non-agency securities. SIZE is the natural log of a BHC's total assets and other variables are as previously defined. I include SIZE because the composition of the investment securities portfolio varies considerably across the size of BHCs (Penman 2007). All variables except for SIZE are then deflated by the book value of equity. I control for the amortized costs (BVs) in the estimating equation. Thus, significant positive coefficients of URGLs suggest that fair value revaluation contains useful information in predicting future interest income beyond that provided by the amortized costs. I limit my tests to two future years as more than two-year-ahead future income data are not available for the crisis period.

Unrealized gains and losses also can be materialized as realized gains/losses in future periods. Specifically, unrealized losses could be recognized in the future as other-than-temporary impairment charges if these are due to credit-related events (FASB 1993). Bank managers can also realize the gains/losses through sales of securities. Prior research documents that managers selectively sell appreciated or depreciated assets to minimize tax or manage earnings or capital management (Scholes et al. 1990; Moyer 1990; Warfield and Linsmeier 1992). This leads to Hypothesis 2b in alternative form:

H2b: Fair value revaluations of non-agency securities are positively related to future realized gains/losses from those securities.

[6] Note that interest income used in the analysis does not include interest income from U.S. Treasury securities and U.S. government agency obligations. This is why the subscript OTHER (instead of TOTAL) is used in Eq. (2).

To examine the relation between unrealized changes of non-agency securities and future realized gains/losses, I estimate the following regression:

$$\begin{aligned} RGL_{it+k} = {} & \alpha_t + \beta_1 * BV_{TOTAL,it} + \beta_2 * BV_{NA\_ABS,it} + \delta_1 * URGL_{TOTAL,it} \\ & + \delta_2 * URGL_{NA\_ABS,it} + \gamma * RGL_{it} + \varepsilon_{it}, \end{aligned} \quad (3)$$

where RGL are realized gains/losses from AFS and HTM investment securities in Year *t+k*, where *k* = 1 or 2. BV_{TOTAL} are amortized costs of investment securities excluding non-agency securities and all other variables are as defined previously. All variables are then deflated by the book value of equity at Year *t*. A positive and significant coefficient of $URGL_{NA\_ABS}$ (δ_2) indicates that the unrealized changes on non-agency securities are realized in future periods through sales of the securities or impairment charges.

Valuation Implications of Unrealized Gains and Losses on Non-agency Securities during the Financial Crisis

While the above equations would allow me to assess the valuation consequences of fair value revaluations from non-agency securities, I also want to determine whether the valuations implications of the fair value revaluations may have changed during the financial crisis.

From the perspective of market investors, the usefulness of fair values particularly for illiquid securities may have been reduced due to the market disruption. The bursting of the housing market bubble in the recent financial crisis resulted in the collapse in prices of loans and other financial instruments whose values were tied to housing prices. Particularly, the extraordinary complexity of the instruments tied to mortgage payment or other loan receivables provided a significant impediment to insight into the value and the reliability of cash flow (Gorton 2008). As a result, many complex financial instruments were difficult to sell and value, which made the observable transaction

prices of these securities no longer available. Indeed, at the heart of the financial crisis, non-agency securities were rarely Level 1 assets and many banks moved them to Level 3 assets (Laux and Leuz 2010). Fair values for such instruments are therefore likely to be more difficult to estimate, which could reduce their combined relevance and reliability. Such issues as the lack of relevance and reliability have been the general tenor of criticism of fair value,[7] but have not been examined in prior literature because of the recentness of the financial crisis. This leads to Hypothesis 3a:

H3a: The value relevance of unrealized gains/losses on non-agency securities decreased in the crisis period.

On the other hand, fair value revaluations of non-agency securities might become more useful for investors during the financial crisis. The market expects that banks facing financial difficulty are forced to sell their non-agency securities which are traded in extremely illiquid markets to replenish their capital during the crisis. In this case the economic value of non-agency securities more likely will equal liquidation value. Thus, fair value revaluations for non-agency securities become highly relevant marks for investors despite the questionable reliability of these fair value estimates.[8]

Selling pressure on illiquid assets is well articulated in the recent literature, particularly in the context of the financial crisis (Bhat et al. 2011; Laux and Leuz 2010). When asset prices decline and liquidity is reduced, banks are forced to sell their

[7] For example, in its comment letter on SEC's Study on Mark-to-Market Accounting, the American Bankers Association wrote that "...today's marketplace is not providing quality fair values, which results in lower quality financial statements that we believe cannot be considered acceptable from the perspective of reliable accounting."

[8] While not directly related to fair value measurement issues, prior research finds that investors place more weight on equity book values, which are better estimates of liquidation value of a firm than net income, as the financial health of a firm decreases (Barth et al. 1998).

investments or raise capital due to the interaction of regulatory capital requirements that are based on the value of their assets (SEC 2008). In selling their investments, banks could be inclined to sell relatively illiquid assets such as non-agency securities at a price below the fundamental value to pre-empt the anticipated sales of other market participants. If investors price such an expectation, the valuation parameter on non-agency securities would capture such fire-sale discounts. This leads to Hypothesis 3b:

H3b: The value relevance of unrealized gains/losses on non-agency securities increased in the crisis period.

To test H3, I estimate the following regression model:

$$P_{it} = \alpha_t + \alpha_1 * BVE_{it} + \alpha_2 * NI_{it} + \beta_1 * URGL_{TOTAL,it} + \beta_2 * URGL_{NA\_ABS,it} \quad (4)$$
$$+ \phi_1 * SIZE_{it} + \phi_2 * GROWTH_{it} + \varphi_1 * Pre\_Crisis_{it} + \varphi_2 * Pre\_Crisis_{it} * URGL_{NA\_ABS,it} + \varepsilon_{it},$$

where Pre_Crisis is a time dummy equal to 1 for 2001 to 2006 and 2009[9], and all other variables are as defined previously. A positive (negative) φ_2 is consistent with H3a (H3b).

As in H3b, investors may increase their assessments of fair value for non-agency securities because of banks' anticipated liquidation of those securities during the liquidity crisis. The effect of banks' anticipated liquidating decisions could lead to an increase in the value relevance of fair value revaluations for non-agency securities even if the fair value revaluations do not reflect changes in fundamentals. Therefore, market-based tests do not adequately address the critics' argument against fair value during the financial crisis period. The critics' argument is that prices of fair values for distressed

[9] Alternatively, I define Pre_Crisis equal to 1 for 2001 to 2007 and 2009 and confirm that the results are very similar.

assets significantly deviated from fundamental values due to the liquidity discounts and were more indicative of distressed sales.

An example of substantial liquidity discounts relates to the 2008 price collapse of AAA-rated tranches of mortgage-backed securities. Some banks wrote down the AAA-rated super senior tranches of mortgage-linked collateralized debt obligations by as much as 30% (Tett 2008) due to a fall in market prices. The Bank of England (2008) noted that if this change in price had stemmed from deterioration in fundamentals, it would have implied a loss rate of 38% for securitized subprime mortgages. This, in turn, translates as 76% of the households defaulting and only repaying 50% of the face value of the mortgages. The Bank of England further noted that this seemed unrealistic because none of the AAA-rated tranches had yet defaulted and that there should not be any future defaults at all, even with a continued decline in U.S. house prices.

Such possible divergences of fair values of non-agency securities from their intrinsic values due to liquidity pricing lead to my fourth hypothesis:

H4a: The relation between fair value revaluations of non-agency securities and future interest income from those securities is weaker in the crisis period.

To test H4a, I estimate the equation below:

$$\begin{aligned} I_{it+k} = {} & \alpha_t + \beta_1 * BV_{OTHER,it} + \beta_2 BV_{NA\_ABS,it} + \delta_1 * URGL_{OTHER,it} + \delta_2 * URGL_{NA\_ABS,it} \\ & + \varphi_1 * Pre\_Crisis_{it} + \varphi_2 * Pre\_Crisis_{it} * URGL_{NA\_ABS,it} + \gamma * SIZE_{it} + \varepsilon_{it}, \end{aligned} \quad (5)$$

where Pre_Crisis is a time dummy equal to 1 for 2001 to 2006 and 2009, and all other variables are as defined previously. If bank managers are correct that unrealized gains/losses are mainly driven by factors other than fundamentals due to the illiquid market during the financial crisis, I should expect that $\varphi_2 > 0$ or $\delta_2 < (\delta_2 + \varphi_2)$.

While the ability of unrealized changes of non-agency securities to predict future interest income may be reduced in the crisis period, they can be more closely related to near-term realized gains/losses during this period. As in the fire-sale expectation story in H3b, a liquidity crisis may lead banks to sell the non-agency securities at a fire-sale price or to write down these securities to the fair values. Such possible increase in sales and impairment charges in the crisis period can lead to more realizations of unrealized changes on non-agency securities in the near future. This leads to Hypothesis 4b:

H4b: Unrealized changes of non-agency securities in the crisis period are more closely related to future realized gains/losses from those securities than those in the non-crisis period.

To test H4b, I estimate the equation below:

$$\begin{aligned} \mathrm{RGL}_{it+k} = {} & \alpha_t + \beta_1 * \mathrm{BV}_{TOTAL,it} + \beta_2 \mathrm{BV}_{NA\_ABS,it} + \delta_1 * \mathrm{URGL}_{TOTAL,it} + \delta_2 * \mathrm{URGL}_{NA\_ABS,it} \\ & + \varphi_1 * \mathrm{Pre\_Crisis}_{it} + \varphi_2 * \mathrm{Pre\_Crisis}_{it} * \mathrm{URGL}_{NA\_ABS,it} + \gamma * \mathrm{RGL}_{it} + \varepsilon_{it}, \end{aligned} \quad (6)$$

where Pre_Crisis is a time dummy equal to 1 for 2001 to 2006 and 2009, and all other variables are as defined previously. H4b expect that $\varphi_2 < 0$ or $\delta_2 > (\delta_2 + \varphi_2)$.

CHAPTER 5
SAMPLE AND DESCRIPTIVE STATISTICS

I identify U.S. domestic BHCs' regulatory call reports (FR Y-9C) for the fiscal years 2000 to 2010 provided by the Federal Reserve Bank of Chicago. Because lag and forward variables are required in the analysis, my actual sample period runs from 2001 to 2009. The sample period begins in 2001 primarily because some of the variables (i.e., disaggregate information of investment securities) used were added to the report in the first quarter of 2001. Observations are reduced by bank-years with missing total asset, net income, equity capital, and investment securities-related interest income. I further identify publicly-traded BHCs using the employer identification number and the Center for Research of Security Prices (CRSP)–Federal Reserve Bank (FRB) link provided by the FRB of New York. I then require banks to have valid price data in the CRSP database. This initial procedure yields 3,717 bank-years. To eliminate possible recording errors, I delete bank-year observations with absolute values of unrealized gains/losses greater than the amortized costs and with ratios of amortized costs to fair values less than 0.4 or greater than 1.4 (22 bank-years).

Finally, I exclude bank-year observations with stock prices less than $1, return on equity greater than 1.00, and asset growth greater than .90. These procedures leave me a final sample of 3,640 firm-years. Untabulated statistics reveal that my sample has an annual maximum of 472 banks (2002) and an annual minimum of 302 banks (2009). To ensure that estimating expressions are not sensitive to extreme observations, I remove any observations that the Belsley, Kuh, and Welsch (1980) diagnostics indicate

are influential observations (studentized residual greater than 2).[1] Thus, the actual sample size employed varies with empirical tests.

Table 5-1 reports descriptive statistics for the variables used in the multivariate tests. The mean (median) bank-year in my sample has a share price (Price) of $23.17 ($20.83) and a book value per share (BVE) of $14.86 ($12.96). Annual income before extraordinary items (NI) averages $2.04 per share. Average unrealized changes from investment securities excluding non-agency MBS and ABS ($URGL_{TOTAL}$) are positive due to the price appreciation of U.S. Treasuries, Agency MBS, and Municipal bonds over the sample period, which accounts for more than 80% of debt investment securities owned by bank holding companies. However, unrealized changes on non-agency securities ($URGL_{NA_ABS}$) are negative, reflecting the substantial price depreciation in the crisis period.[2] The mean (median) yield for one-year-ahead interest income from mortgage-backed securities and other debt securities (I_{t+1}), excluding U.S. Treasury securities and U.S. government agency obligations, is approximately 8.4% (6.8%) of banks' book value of equity. One-year-ahead realized gains and losses from investment securities have a mean and median value of 0.001 and 0.000, respectively. About 80% (20%) of bank-years belong to the pre-crisis (crisis) period sample.

Table 5-2 presents Pearson and Spearman correlations between selected variables used in the multivariate models. As expected, BE, NI, and $URGL_{TOTAL}$ are positively correlated with Price. $URGL_{NA\_ABS}$ are significantly Spearman-correlated in the positive direction with Price, implying that unrealized changes of non-agency securities

[1] This elimination procedure is similar to Song et al. (2010).

[2] The descriptive statistics (not reported here) for the sample partitioned by pre-crisis and crisis years reveal that $URGL_{AG\_MBS}$ are positive during the pre-crisis period.

are value relevant. However, the Pearson correlation between $URGL_{NA\_ABS}$ and Price is not significant. $URGL_{TOTAL}$ is significantly correlated with I_{t+1} in a positive direction. In contrast, $URGL_{NA\_ABS}$ is insignificantly Spearman-correlated with I_{t+1} in the negative direction, implying that unrealized changes of non-agency securities are not useful in predicting future interest income from those securities. The Pearson-correlations between $URGL_{NA\_ABS}$ and I_{t+1} are significant but negative. One-year-ahead realized gains/losses are significantly positively correlated with $URGL_{TOTAL}$ and $URGL_{NA\_ABS}$, consistent with the predicted relation. Finally, the log-transformed total asset (SIZE) and percentage change in total assets (GROWTH) are positively correlated with Price.

Table 5-3 provides the mean and median ratios of amortized costs to fair values for non-agency securities vs. other investment securities and changes in the five-year U.S. Government bond rate during 2001 to 2009. Overall, the mean and median ratios of the amortized cost to fair value are very close to 1 over the sample period. This indicates that the difference between amortized costs and fair values of debt investment securities is small.

These ratios are related to changes in the five-year U.S. Government bond rate. When annual changes in five-year U.S. Government bond rate are negative (positive), fair values in investment securities increase (decrease) due to the denominator effect (i.e., lower (higher) interest rate means higher (lower) bond price), which leads to the ratio being less (greater) than 1. For example, when there were substantial rate decreases in 2001 and 2002, the mean ratios of investment securities were less than 1 on average, while the mean ratios were above 1 when there were increases in the five-year bond rate in 2005 and 2006.

At the end of 2008 when the financial crisis was peaking, the mean ratios for non-agency mortgage- and asset-backed securities ($Investment_{NA\_ABS}$) became larger than 1 while the mean ratios for other investment securities remained close to (or below) 1. The mean (median ratio) of 1.17 (1.15) for $Investment_{NA\_ABS}$ in 2008 was quite large given the declining interest rate environment and substantial impairment charges on non-agency securities made during 2008. Such discernible differences between fair values and amortized costs of non-agency securities indicate large unrealized losses on non-agency securities. It can be also interpreted under FASB ASC 320 that BHCs considered these large unrealized losses on non-agency securities temporary and had the intent and ability to retain the securities for a sufficient period to allow for a recovery in the market.

Table 5-1. Descriptive Statistics for the Full Sample

	Mean	Std	25%	Median	75%
$\mathbf{Price_t}$	23.174	15.136	14.000	20.835	29.085
$\mathbf{URGL_{TOTAL,t}}$	0.247	0.960	-0.088	0.115	0.473
$\mathbf{URGL_{NA\_ABS,t}}$	-0.051	0.388	-0.001	0.000	0.000
$\mathbf{BVE_t}$	14.860	10.562	9.697	12.961	17.382
$\mathbf{NI_t}$	2.039	2.250	1.176	1.991	2.875
$\mathbf{I_{t+1}}$	0.084	0.074	0.035	0.068	0.110
$\mathbf{RGL_{t+1}}$	0.001	0.030	0.000	0.000	0.005
$\mathbf{SIZE_t}$	14.413	1.550	13.350	14.011	15.083
$\mathbf{GROWTH_t}$	0.115	0.144	0.030	0.086	0.160
Pre_Crisis	0.808	0.394	1.000	1.000	1.000

Price denotes the share price of bank. $URGL_{TOTAL}$ are unrealized gains and losses on investment securities excluding non-agency MBS and ABS. $URGL_{NA\_ABS}$ are unrealized gains and losses on non-agency MBS and ABS. BVE is the book value of equity minus unrealized gains/losses from AFS investment securities. NI is income before extraordinary items. I and RGL are interest income and realized gains/losses on investment securities, respectively. URGLs, BVE, and NI are on a per-share basis while I and RGL are deflated by book value of equity. SIZE is a log-transformed total asset and GROWTH is the percentage change in total assets. Pre_Crisis is a time dummy equal to 1 for 2001 to 2006 and 2009

Table 5-2. Spearman and Pearson Correlations

Pearson\Spearman	Price	$URGL_{TOTAL,t}$	$URGL_{NA\_ABS,t}$	BVE_t	NI_t	I_{t+1}	RGL_{t+1}	$SIZE_t$	$GROWTH_t$	Pre_Crisis
Price		0.1806	0.0201	0.5608	0.7500	0.0866	0.0104	0.3840	0.0721	0.2482
		(<.0001)	(0.2262)	(<.0001)	(<.0001)	(<.0001)	(0.5313)	(<.0001)	(<.0001)	(<.0001)
$URGL_{TOTAL,t}$	0.0680		0.0302	0.0435	0.1953	0.1608	0.2239	0.0822	-0.0025	0.0822
	(<.0001)		(0.0685)	(0.0087)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(0.8808)	(<.0001)
$URGL_{NA\_ABS,t}$	0.1252	0.2182		-0.1666	0.0940	-0.0575	0.1149	-0.1517	0.0578	0.1363
	(<.0001)	(<.0001)		(<.0001)	(<.0001)	(0.0005)	(<.0001)	(<.0001)	(0.0005)	(<.0001)
BVE_t	0.5016	0.1286	-0.08532		0.4526	-0.0452	-0.0036	0.3124	-0.0243	-0.0893
	(<.0001)	(<.0001)	(<.0001)		(<.0001)	(0.0064)	(0.8301)	(<.0001)	(0.1426)	(<.0001)
NI_t	0.8091	0.1455	0.14038	0.5329		0.0518	0.0068	0.2357	0.1089	0.1685
	(<.0001)	(<.0001)	(<.0001)	(<.0001)		(0.0018)	(0.6825)	(<.0001)	(<.0001)	(<.0001)
I_{t+1}	0.1280	0.1434	-0.01223	-0.0014	0.0960		0.0408	0.1151	0.0193	0.0350
	(<.0001)	(<.0001)	(0.4608)	(0.9307)	(<.0001)		(0.0139)	(<.0001)	(0.2433)	(0.0345)
RGL_{t+1}	-0.0556	0.3490	0.13106	-0.0411	-0.0326	0.1602		-0.0005	0.0363	0.1835
	(0.0008)	(<.0001)	(<.0001)	(0.0132)	(0.0491)	(<.0001)		(0.9774)	(0.0287)	(<.0001)
$SIZE_t$	0.2988	-0.0315	-0.10537	0.2871	0.2532	0.1198	0.0056		-0.0023	-0.0852
	(<.0001)	(0.0576)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(0.7373)		(0.8895)	(<.0001)
$GROWTH_t$	0.1167	-0.0451	0.06837	-0.0584	0.1014	-0.0211	0.0166	-0.0045		0.0680
	(<.0001)	(0.0065)	(<.0001)	(0.0004)	(<.0001)	(0.2034)	(0.317)	(0.7881)		(<.0001)
Pre_Crisis	0.3312	0.0448	0.2177	-0.0993	0.1865	0.0189	0.0746	-0.1310	0.0812	
	(<.0001)	(0.0069)	(<.0001)	(<.0001)	(<.0001)	(0.2543)	(<.0001)	(<.0001)	(<.0001)	

This table reports the Pearson (above the diagonal) and Spearman correlations for the full sample. P-values are in parentheses. All variables are defined in Table 5-1.

Table 5-3. The Mean and Median Ratios of Amortized Costs to Fair Values of Non-agency Securities from 2001 to 2009

Year	$Investment_{TOTAL}$		$Investment_{NA\_ABS}$		Δ in Five-Year T-Bond Rate
	Mean	Median	Mean	Median	
2001	0.99	0.99	0.99	0.99	-1.60
2002	0.98	0.98	0.99	0.99	-0.74
2003	0.99	0.99	0.99	1.00	-0.85
2004	0.99	1.00	0.99	1.00	0.46
2005	1.01	1.01	1.01	1.01	0.62
2006	1.01	1.01	1.01	1.01	0.70
2007	1.00	1.00	1.02	1.01	-0.32
2008	1.00	0.99	1.17	1.15	-1.63
2009	0.99	0.99	1.17	1.09	-0.60
total	1.00	1.00	1.03	1.00	

$Investment_{TOTAL}$ includes all investment securities, excluding non-agency MBS and ABS. $Investment_{NA\_ABS}$ includes non-agency MBS and ABS. The mean and median ratios of amortized costs to fair values for investment securities are computed based on bank-year observations whose amortized costs as well as fair values for debt investment securities are non-zero. Changes in the five-year U.S. Government bond at *t* year are the difference between the ending *t* year rate and the beginning *t* year rate.

CHAPTER 6
EMPIRICAL RESULTS

Value Relevance of Unrealized Gains and Losses on Non-agency Securities

Table 6-1 reports the regression results from estimating Eq. (1). The coefficients are estimated using OLS while standard errors are corrected by two clusters (banks and years).[1] The coefficient of unrealized gains/losses on investment securities excluding non-agency MBS and ABS ($URGL_{TOTAL}$) is positive and significant (β_1=1.15, p-value<0.01), indicating that these fair value revaluations are value relevant in the banking industry. The positive and significant coefficient of $URGL_{TOTAL}$ is consistent with previous results based on the banking industry (Barth 1994) and insurance industry (Petroni and Wahlen 1995). In addition, the estimated coefficient is not statistically different from 1, implying that investors are assigning dollar-for-dollar value to these unrealized changes.

Central to my research interest, the estimated coefficient of unrealized changes on non-agency MBS and ABS ($URGL_{NA\_ABS}$) is not significant (β_2=0.18, p-value>0.10), not providing support for Hypothesis 1a which states that unrealized gains/losses of non-agency securities are value relevant. This implies that market investors may not perceive fair value revaluations for non-agency securities as useful information in valuing bank equity. In other words, fair values for non-agency securities do not have explanatory power in explaining the share price of banks beyond amortized costs. A potential explanation is that investors consider fair value estimates for these securities

[1] Petersen (2009) shows that these standard errors, clustering by two dimensions, produce less-biased standard errors.

to be less reliable because they are less likely to be based on readily observable market prices from liquid markets (Petroni and Wahlen 1995).

In Table 6-2 I report the result of the coefficient comparison test to examine whether the valuation coefficient of $URGL_{NA\_ABS}$ is smaller than the valuation coefficient of $URGL_{TOTAL}$. The coefficient of $URGL_{TOTAL}$ is significantly larger than the coefficient of $URGL_{NA\_ABS}$ (p-value < 0.01). Thus, Hypothesis 1b is supported. Consistent with the finding in Table 6-1, this suggests that the reliability of fair value estimates affects the value relevance of unrealized changes.

Predictive Ability of Unrealized Gains and Losses on Non-agency Securities for Future Earnings

Hypothesis 2a posits that unrealized changes for non-agency securities are useful in predicting future interest income from those securities. To test this hypothesis, I examine whether unrealized gains/losses on these securities are associated with one- or two-year-ahead interest income. The OLS estimation results of regression Eq. (2) are presented in Table 6-3. The significant and positive coefficient of $URGL_{NA\_ABS}$ as well as of $URGL_{OTHER}$ indicates that fair value revaluations from these securities are significant predictors of one- and two-year-ahead interest income. The magnitude of coefficients on the unrealized changes slightly increases for a longer prediction horizon (i.e., 0.106 to 0.147 for $URGL_{NA\_ABS}$; 0.059 to 0.094 for $URGL_{OTHER}$). These results are consistent with the prediction in Hypothesis 2a, suggesting that fair value estimates of non-agency securities reflect information about the future interest income despite their lack of reliability compared to other debt securities.

Examining future realized gains/losses in Eq. (3) yields similar evidence supporting the link between unrealized changes of non-agency securities and future

realized gains/losses, consistent with Hypothesis 2b. The estimated coefficient of $URGL_{NA\_ABS}$ in Table 6-4 is positive and significant in both the one- and two-year-ahead realized gains/losses (δ_2 = 0.130, p-value < 0.01 for one-year-ahead gains/losses; δ_2 = 0.100, p-value < 0.01 for two-year-ahead gains/losses).

Valuation Implications of Unrealized Gains and Losses on Non-agency Securities during the Crisis

This section examines the value-relevance of unrealized gains/losses on non-agency securities which has been at the heart of the recent financial crisis due to the amplified valuation uncertainty. Hypothesis 3a posits that the value relevance of unrealized changes on non-agency securities decreased due to reliability concerns. In contrast, Hypothesis 3b posits that the value relevance of unrealized changes on non-agency securities increased due to the fire-sale expectation.

Table 6-5 shows that the estimated coefficient of $URGL_{NA\_ABS}$ is positive and statistically significant (β_2=0.85, p-value=0.066). As can be seen, however, the interaction of Pre_Crisis and $URGL_{NA\_ABS}$ produces an estimated coefficient that is negative and statistically significant (φ_2=-1.37, p-value=0.068). This indicates an increase in value-relevance for unrealized changes for non-agency securities during the crisis period. This is consistent with the fire-sale expectation story in Hypothesis 3b although the low liquidity in the market makes reported fair values less observable and more subject to measurement errors.

Turning to the predictive ability of unrealized gains/losses on non agency securities in the crisis period, Hypothesis 4a posits that the predictive ability of unrealized gains/losses on non-agency securities for future interest income is weaker in the financial crisis period. Table 6-6 presents results from estimating Eq. (5). The

estimated coefficient of unrealized gains and losses of $URGL_{NA\_ABS}$ is positive but not significant in predicting one-year-ahead interest income. As can be seen, however, the coefficient of the interaction of Pre_Crisis and $URGL_{NA\_ABS}$ is positive (φ_2=0.126) and statistically significant (p-value<0.01) in predicting one-year-ahead interest income. The inferences drawn from results using two-year-ahead interest income are similar to those drawn from results using one-year-ahead interest income, although the level of the adjusted R^2 is lower. However, the magnitude of coefficients of the interaction of Pre_Crisis and $URGL_{NA\_ABS}$ dramatically increases for two year-ahead interest income (φ_2=0.318 with p-value < 0.05).

These results imply that the predictive ability of unrealized changes on non-agency securities decreased in the financial crisis period, which may support critics' claims that the expected returns implied in fair value estimates are disproportionately high. Thus, the unrealized changes on non-agency securities may not be a good indicator for future interest income from those securities.

In contrast to the predictive ability of the unrealized gains/losses for future interest income, the relation between $URGL_{NA\_ABS}$ and future realized gains/losses becomes stronger during the crisis period as indicated by a significantly negative coefficient of the interaction of Pre_Crisis and $URGL_{NA\_ABS}$ in Table 6-7 (φ_2=-.203 with p-value < 0.05 for one-year-ahead realized gains/losses; φ_2=-.321 with p-value < 0.01 for two-year-ahead realized gains/losses). This is consistent with Hypothesis 4b, suggesting that a liquidity crisis may have led banks to liquidate non-agency securities at a loss or to write down these securities to the fair values in future periods.

Table 6-1. Value Relevance of Unrealized Gains/Losses on Non-agency Securities

	Dep. Variable = Price		
Variables:	**Estimate**	**Clustered Std Err**	**Significance**
Year Intercept	vary		
BVE	0.50	0.032	***
NI	3.22	0.135	***
$URGL_{TOTAL}$	1.15	0.186	***
$URGL_{NA\_ABS}$	0.18	0.366	
SIZE	1.56	0.133	***
GROWTH	1.42	0.769	*
No. Obs.	3,483		
Adj. R-Square	0.80		

***, **, and * represent 1%, 5% and 10% significance, respectively. SIZE is the log-transformed total assets for the bank. GROWTH is the percentage change in total assets. Other variables are defined in Table 5-1. The models are estimated using ordinary least squares (OLS). To mitigate the effects from extreme outliers and influential points, I eliminate observations with absolute values of studentized residuals greater than 2.

Table 6-2. Test of Value Relevance Equality

Coefficient Comparison	T-Stat.	One-side P-value
Test of $\beta_1(URGL_{TOTAL}) > \beta_2(URGL_{NA\_ABS})$	2.31	<0.01

All variables are defined in Table 5-1.

Table 6-3. Predictive Ability of Unrealized Gains and Losses on Non-agency Securities for Future Interest Income

	Dep. Var=I_{t+1}			Dep. Var=I_{t+2}		
Variables:	**Estimate**	**Clustered Std Err**	**Significance**	**Estimate**	**Clustered Std Err**	**Significance**
Year Intercept	vary			vary		
$BV_{OTHER,t}$	0.044	0.000	***	0.043	0.001	***
$BV_{NA\_ABS,t}$	0.061	0.002	***	0.066	0.003	***
$URGL_{OTHER,t}$	0.059	0.013	***	0.094	0.019	***
$URGL_{NA\_ABS,t}$	0.106	0.021	***	0.147	0.042	***
SIZE	0.001	0.000	***	0.001	0.000	**
No. Obs.	3,486			2,961		
Adj. R-Square	0.95			0.87		

***, **, and * represent 1%, 5% and 10% significance, respectively. BV_{OTHER} are the amortized costs of investment debt securities excluding U.S. Treasury securities, U.S. government agency obligations, and non-agency securities. Other variables are previously defined.

Table 6-4. Predictive Ability of Unrealized Gains and Losses on Non-agency Securities for Future Realized Gains and Losses

	Dep. Var=RGL_{t+1}			Dep. Var=RGL_{t+2}		
Variables:	**Estimate**	**Clustered Std Err**	**Significance**	**Estimate**	**Clustered Std Err**	**Significane**
Year Intercept	Included			Included		
$BV_{TOTAL,t}$	0.001	0.000	***	0.001	0.000	***
$BV_{NA\_ABS,t}$	-0.002	0.001	**	-0.001	0.001	
$URGL_{TOTALt}$	0.079	0.010	***	0.070	0.011	***
$URGL_{NA\_ABS,t}$	0.130	0.023	***	0.100	0.035	***
RGL_t	0.181	0.027	***	0.195	0.033	***
No. Obs.	3,562			3,022		
Adj. R-Square	0.26			0.24		

***, **, and * represent 1%, 5% and 10% significance, respectively. RGL_{t+1} and RGL_{t+2} are one- and two-year-ahead realized gains and losses on investment securities, respectively. RGL_t are the current realized gains and losses from investment securities. Other variables are previously defined.

Table 6-5. Value Relevance of Unrealized Gains and Losses on Non-agency Securities during the Crisis

	Dep. Variable = Price		
Variables:	**Estimate**	**Clustered Std Err**	**Significance**
Year Intercept	vary		
Pre_Crisis	3.86	0.462	***
BVE	0.50	0.033	***
NI	3.22	0.135	***
$URGL_{TOTAL}$	1.13	0.189	***
$URGL_{NA\_ABS}$	0.85	0.464	*
$URGL_{NA\_ABS}$*Pre_Crisis	-1.37	0.752	*
SIZE	1.57	0.133	***
GROWTH	1.44	0.765	*
No. Obs.	3,483		
Adj. R-Square	0.80		

***, **, and * represent 1%, 5% and 10% significance, respectively. Pre_Crisis is a time dummy equal to 1 for 2001 to 2006 and 2009, and all other variables are as defined previously.

Table 6-6. Predictive Ability of Unrealized Gains and Losses on Non-agency Securities for Future Interest Income during the Crisis

	Dep. Var=I_{t+1}			Dep. Var=I_{t+2}		
Variables:	**Estimate**	**Clustered Std Err**	**Significance**	**Estimate**	**Clustered Std Err**	**Significance**
Year Intercept	vary			vary		
Pre_Crisis	-0.014	0.001	***	0.024	0.002	***
$BV_{OTHER,t}$	0.044	0.000	***	0.042	0.001	***
$BV_{NA\_ABS,t}$	0.060	0.001	***	0.060	0.002	***
$URGL_{OTHER,t}$	0.061	0.012	***	0.093	0.019	***
$URGL_{NA\_ABS,t}$	0.010	0.023		0.096	0.038	**
$URGL_{NA\_ABS,t}$*Pre_Crisis	0.126	0.033	***	0.318	0.143	**
SIZE	0.001	0.000	***	0.001	0.000	**
No. Obs.	3,478			2,962		
Adj. R-Square	0.95			0.86		

***, **, and * represent 1%, 5% and 10% significance, respectively. Pre_Crisis is a time dummy equal to 1 for 2001 to 2006 and 2009, and all other variables are as defined previously.

Table 6-7. Predictive Ability of Unrealized Gains and Losses on Non-agency Securities for Future Realized Gaines and Losses during the Crisis

	Dep. Var=RGL_{t+1}			Dep. Var=RGL_{t+2}		
Variables:	**Estimate**	**Clustered Std Err**	**Significance**	**Estimate**	**Clustered Std Err**	**Significance**
Year Intercept	Included			Included		
Pre_Crisis	-0.002	0.001	*	-0.006	0.001	***
$BV_{TOTAL,t}$	0.001	0.000	***	0.001	0.000	***
$BV_{NA\_ABS,t}$	-0.001	0.001	*	-0.001	0.001	
$URGL_{TOTALt}$	0.084	0.012	***	0.073	0.012	***
$URGL_{NA\_ABS,t}$	0.320	0.087	***	0.271	0.065	***
$URGL_{NA\_ABS,t}$*Pre_Crisis	-0.203	0.092	**	-0.321	0.111	***
RGL_t	0.172	0.026	***	0.196	0.033	***

***, **, and * represent 1%, 5% and 10% significance, respectively. Pre_Crisis is a time dummy equal to 1 for 2001 to 2006 and 2009, and all other variables are as defined previously.

CHAPTER 7
SENSITIVITY OF RESULTS

The findings so far are based on the level models. This raises the possibility that the inferences are influenced by correlated omitted variables. Thus, as a robustness check, I use difference models to re-estimate the regressions described in the prior chapter. The returns models are somewhat sensitive to specification of the window period in which the returns are collected, particularly for the crisis period. Nonetheless, the untabulated findings indicate that my inferences are consistent when based on the change-change specifications.

I also re-estimate Eq. (1) and Eq. (3) including proxies for default risk. The proxies include charge-offs, Tier 1 capital ratio, and leverage. The estimated coefficients (not reported) of interest are quantitatively similar to ones reported in Chapter 6.

CHAPTER 8
CONCLUDING REMARKS

This paper adds to the literature by examining the valuation implications of unrealized changes on non-agency securities along three dimensions. First, it provides evidence of market investors' perception of unrealized changes on non-agency securities. Consistent with prior literature that the reliability concerns affect the value relevance, my empirical test confirms that unrealized gains and losses on non-agency securities whose fair values are less observable and more subjective to measurement errors are not value relevant.

Second, the predictive-ability tests provide additional insights into information contained in fair value measurements for complex financial instruments. I provide evidence that fair value revaluations for non-agency securities are positively associated with future earnings realizations from those securities although investors do not generally consider them informative. This supports the notion that fair values for these complex instruments contain asset-specific information as well as macro information in spite of the reliability concerns.

Finally, I examine whether the valuation properties of unrealized changes on non-agency securities changed during the crisis. Unrealized gains/losses on these securities gain value relevance in the crisis period, which is consistent with the fire-sale expectation story. A stronger relation between unrealized changes on non-agency securities and future realized gain/losses is observed in the crisis period. This provides an economic rationale for the observed value relevance during this period. However, after controlling for amortized costs unrealized gains/losses on non-agency securities, which are allegedly not reliable, become less useful in predicting future interest income

in the crisis period. Such results suggest the potential weakness of fair value's predictive ability for future earnings during times of market instability.

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BIOGRAPHICAL SKETCH

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