Essays on Other Comprehensive Income

by

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Business Administration
Duke University

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Mohan Venkatachalam

Dissertation submitted in partial fulfillment of
the requirements for the degree of
Doctor of Philosophy in Business Administration
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ABSTRACT

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## Abstract

In Chapter 1, I review the existing literature on the investor and contracting usefulness of other comprehensive income (OCI) components. In Chapter 2, I perform empirical tests focusing on one aspect of investor usefulness of accounting information: risk-relevance. I examine whether OCI component volatilities are associated with investors' returns volatility using a sample of bank holding companies from 1998 to 2012. The results indicate that the volatilities of unrealized gains and losses on available-for-sale (AFS) securities and cash-flow hedges, typically deemed beyond managers' control, are negatively associated with risk, while volatilities of OTTI losses, over which managers have relatively more control, are positively associated with risk. The results are consistent with investors perceiving the volatility of non-OTTI AFS unrealized gains and losses as relatively less important, less risky, or less risk-relevant, than the volatility of OTTI losses, and perceiving the volatility of OTTI losses as an informative signal about risk. In Chapter 3, I find that Tier 1 Capital including more components of accumulated other comprehensive income (AOCI), as stipulated by Basel III, is no more volatile than pre-Basel-III Tier 1 Capital, and that the volatilities of the AOCI components new to Tier 1 Capital are not positively associated with risk. In Chapter 4, I discuss future research.

# Dedication

For my wife, Marissa, my children, Jane, Caleb, and Kate, and my parents, Ervin and Joleen.

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# Acknowledgements

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# 1. Investor and Contracting Usefulness of Other Comprehensive Income (OCI)

The FASB describes comprehensive income as follows: "A measure of all changes in equity of an entity that result from recognized transactions and other economic events of the period other than transactions with owners in their capacity as owners."[1] Reporting comprehensive income as a separate item in the financial statements was mandated by SFAS 130 for fiscal years beginning after December 15, 1997 (FASB, 1997). Other comprehensive income (OCI) includes "revenues, expenses, gains, and losses that under generally accepted accounting principles (GAAP) are included in comprehensive income but excluded from net income."[2] OCI includes adjustments for unrealized gains and losses on available-for-sale (AFS) securities and cash-flow hedges, pension-related adjustments, and foreign currency translation adjustments. Appendix A presents the components of OCI in detail as defined by the FASB. The purpose of this chapter is to review research on the investor and contracting usefulness of comprehensive income, OCI, and OCI components.

Using EBSCO, I search five major accounting publications using the search term "comprehensive income."[3] I read articles addressing comprehensive income as defined

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[1] ASC 220-10-10-1.
[2] ASC Master Glossary (https://asc.fasb.org/link&sourceid=SL7695736-108725&objid=51831223).
[3] I searched the following journals: *The Accounting Review*, *Journal of Accounting and Economics*, *Journal of Accounting Research*, *Review of Accounting Studies*, and *Contemporary Accounting Research*. In addition, I selectively review pertinent articles from other sources.

by the FASB. I eliminate articles that do not address the investor or contracting usefulness of comprehensive income, OCI, and OCI components.[4] I discuss two attributes of investor usefulness: value-relevance and risk-relevance. I also discuss research examining debt and compensation contracting usefulness.

The remainder of the chapter is organized as follows. Section 1.1 discusses research on the value-relevance of comprehensive income, OCI, and OCI components. Section 1.2 discusses research on the risk-relevance of comprehensive income, OCI, and OCI components. Section 1.3 discusses research examining the contracting usefulness of comprehensive income, OCI, and OCI components.

## *1.1 Value-Relevance*

Value-relevance research examines correlations between comprehensive income, OCI, and OCI components and both prices and returns. Bernard (1995), in his discussion of Ohlson (1995) and Feltham and Ohlson (1995), notes that most empirical work prior to these studies took an "information perspective," analyzing the association between accounting information and prices or returns. He further indicates that the models produced by Ohlson (1995) and Feltham and Ohlson (1995) enable investors and researchers to take a "measurement perspective," whereby securities are valued using

[4] For example, I eliminate articles pertaining to "comprehensive income tax allocation" (Gupta, 1995) and "comprehensive" datasets or variable lists pertaining to accounting concepts other than comprehensive income and OCI (Haw, Hu, Hwang, and Wu, 2004; Liu, Nissim, and Thomas, 2002).

book value and abnormal earnings based on "clean surplus" accounting.[5] If one could accurately measure the book value of equity and predict abnormal earnings, one would be able to perform accurate equity valuation.

Ohlson (1999) provides a model suggesting the following three properties of transitory items, two of which must exist to indicate whether a financial statement item is truly transitory: (1) Inability to predict itself; (2) Irrelevancy for forecasting next-period abnormal net comprehensive income; and, (3) Value irrelevance. I discuss the existing literature assessing the value-relevance of comprehensive income, OCI, and OCI components in light of this model.

### 1.1.1 Predictability

Using data from 46 countries, including the United States, Barton, Hansen, and Pownall (2010) provide descriptive evidence that comprehensive income is the least predictable performance measure of the eight performance measures considered (including net income). Jones and Smith (2011) find that OCI is negatively persistent, while special items have zero persistence for a sample of Compustat firms. The evidence indicates that comprehensive income and OCI are less predictable than net income.

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[5] Clean surplus accounting is defined by the following relation from Ohlson (1995): $BookValue_{t-1} = BookValue_t + Dividends_t - Earnings_t$. Some researchers refer to OCI as "dirty surplus" (Landsman, Miller, Peasnell, and Yeh, 2011).

### 1.1.2 Forecasting Ability

Dhaliwal, Subramanyam, and Trezevant (1999) provide empirical evidence on the predictive ability of net income and comprehensive income for year-ahead cash flow from operations and net income. Using Compustat data from 1994 and 1995, Dhaliwal et al. (1999) estimate pre-SFAS-130 comprehensive income and the components of OCI. They find that net income predicts year-ahead cash flow from operations and net income significantly better than comprehensive income. Kanagaretnam, Mathieu, and Shehata (2009) find that net income is a better (worse) predictor of future net income (future cash flow from operations) than is comprehensive income for a sample of Canadian firms from 1998-2003 that are cross-listed in the U.S using as-reported data from the firms' financial statements. Unrealized gains and losses on available-for-sale (AFS) securities are significantly positive in predicting future cash flow from operations. Barton et al. (2010) find that comprehensive income has the lowest ability to predict operating cash flows of the eight performance measures considered, consistent with Dhaliwal et al. (1999). Jones and Smith (2011) find that special items have better predictive power than OCI for future net income and future cash flows using a sample of Compustat firms. Goncharov and Hodgson (2011) find that comprehensive income has lower predictive ability for cash from operating activities, and find that net income adjusted to include (separately) revaluation reserves, foreign currency translation adjustments, and unrealized gains and losses on AFS securities is not more predictive for cash from operating activities than is net income for a sample of observations from 16 European countries.

However, it is not clear that comprehensive income, or OCI, should predict operating cash flows or net income better than net income. In addition, these studies do not examine the predictive ability of comprehensive income, or any of the components of OCI, for abnormal net comprehensive income in the sense of Ohlson (1999). Ohlson (1995) and Feltham and Ohlson (1995) indicate that prices are determined by book value and abnormal net comprehensive income, where these amounts are based on “clean surplus” accounting. Thus, why should we expect net income, which is not based on “clean surplus” accounting, to be better predicted by measures of income that more closely approach the notion of “clean surplus” accounting?

Landsman et al. (2011) provide evidence on the predictive ability of what they term “dirty surplus” and “really dirty surplus.” “Dirty surplus” is estimated OCI (not actual OCI from financial statements), calculated using Compustat data (similar to Dhaliwal et al., 1999). “Really dirty surplus” results from the issuance or reacquisition of equity shares where the fair-value of the shares is not recorded in the financial statements, and is estimated using Compustat and CRSP data.[6] The authors’ results suggest that OCI and “really dirty surplus” do not predict abnormal “very

[6] Examples of these types of transactions noted by the authors are: (1) Firms issuing shares when stock options are exercised; and, (2) Converting bonds into stock.

comprehensive income" (net income plus OCI plus "really dirty surplus"). However, using Compustat data instead of actual OCI amounts from financial statements potentially introduces significant measurement error (Chambers, Linsmeier, Shakespeare, and Sougiannis, 2007).

Overall, the evidence on the predictive ability of comprehensive income and OCI for future accounting amounts indicates that they have relatively low predictive ability for operating cash flows, net income, or abnormal "very comprehensive income." However, more research is necessary to understand whether predictive ability varies over time, and in different macroeconomic conditions. Thus, the body of evidence for traits (1) and (2) from Ohlson (1999) for OCI is inconclusive.

### 1.1.3 Price-Relevance

Dhaliwal et al. (1999) show that comprehensive income has less explanatory power for stock prices than net income does for a sample of Compustat firms. Cahan, Courtenay, Gronewoller, and Upton (2000) find that financial asset revaluation adjustments, but not foreign currency translation adjustments, are significantly correlated with stock prices for a sample of New Zealand firms from 1992-1997 that were required to report OCI components in a statement of changes in equity beginning in 1995. They fail to find evidence that the coefficients on net income, financial asset revaluations, and foreign currency translation adjustments are significantly different from one another and interpret this result as evidence that components of comprehensive income need not be disclosed separately. The authors also fail to find evidence that the recognition of financial asset revaluation adjustments and foreign currency translation adjustments in a statement of changes in equity increases the ability of these OCI items to explain stock prices.

Kanagaretnam et al. (2009) find evidence that unrealized gains and losses on AFS securities and cash-flow hedges are significantly correlated with stock prices. Correlations are negative for unrealized losses on cash-flow hedges, and positive for unrealized gains on cash-flow hedges. In addition, these authors find that comprehensive income is better at explaining stock prices than net income using a Vuong (1989) test, and find that a model regressing price on book value per share and net income including unrealized gains/losses on AFS securities has a higher adjusted $R^2$ than similar models substituting unrealized gains and losses on cash-flow hedges or foreign currency translation adjustments for unrealized gains/losses on AFS securities.

Goncharov and Hodgson (2011) find that the level of OCI and comprehensive income are value-relevant for prices, but not as value-relevant as net income. Further, none of the three components of OCI examined (revaluation reserves, foreign currency translation adjustments, and unrealized gains and losses on AFS securities) are value-relevant for prices after controlling for net income and book value. Goncharov and Hodgson (2011) also find that OCI and comprehensive income are value-relevant for changes in analysts price targets, but changes in OCI and comprehensive income are not.

In addition, these authors find that revaluation reserves and foreign currency translation adjustments are value-relevant for analysts' price target revisions, while unrealized gains and losses on AFS securities are not.

Finally, Landsman et al. (2011) provide evidence suggesting that OCI is price-irrelevant, while "really dirty surplus" is price- relevant, using the market value of equity as the dependent variable in a residual "very comprehensive income" valuation model motivated by Ohlson (1995). This evidence suggests that investors consider OCI to be transitory for valuation purposes, while investors do not consider "really dirty surplus" to be transitory or do not have sufficient information to value "really dirty surplus."

In sum, the research on the relations between comprehensive income or OCI and stock prices provides mixed results on the investor usefulness of comprehensive income.

### 1.1.4 Returns-Relevance

Several studies examine associations between returns and both comprehensive income and OCI and evaluate the usefulness of comprehensive income using regressions of returns on comprehensive income or OCI. In an early study, Cheng, Cheung, and Gopalakrishnan (1993) examine a sample of firms from 1972-1989 and find that an estimated version of comprehensive income is inferior to operating income and net income in explaining abnormal returns.[7] Ahmed and Takeda (1995) find that investment security gains and losses, both realized and unrealized, are positively associated with returns for a sample of banks.[8] Using as-if estimations of SFAS 130 comprehensive income, Biddle and Choi (2006) find evidence suggesting that comprehensive income explains annual returns better than either net income or the change in retained earnings plus common stock dividends using a sample of Compustat firms from 1994-1998.

Dhaliwal et al. (1999) find that comprehensive income has a stronger association with annual returns than does net income using the Vuong (1989) test.[9] The authors find that net income adjusted for unrealized gains and losses on AFS securities has the strongest association with returns out of the net income measures adjusted for three OCI items examined, and explains returns better than net income. The authors also find that comprehensive income calculated according to the provisions of SFAS 130 does not explain returns better than net income for non-financial firms, but find that SFAS 130 comprehensive income has incremental explanatory power for returns above and

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[7] Cheng et al. (1993) measure comprehensive income as the change in retained earnings plus preferred and common dividends.

[8] In a recent related study, Evans, Hodder, and Hopkins (2014, p. 14) provide evidence for a sample of commercial banks that "accumulated fair value adjustments for investment securities are positively associated with reported income from those financial instruments in the following period…and that these adjustments also have predictive ability for investment-security-related cash flows in the subsequent period."

[9] Using adjusted-$R^2$ values from regressions of long-window returns on accounting variables to examine the value-relevance of accounting variables relies on a specific interpretation of value-relevance. That is, that the value-relevance of accounting variables can be evaluated based on their correlation with the information investors use (Interpretation 4 from Francis and Schipper, 1999). As Francis and Schipper (1999, p. 326-327) state, "Under this view, value relevance is measured by the ability of financial statement information to capture or summarize information, regardless of source, that affects share values."

beyond net income for financial firms. The effect appears to be driven by unrealized gains and losses on AFS securities, but could also be driven by the magnitude of OCI relative to net income for financial firms. These results suggest that the business model of the firm is an important determinant of whether it is appropriate to assess firm performance based on comprehensive income and OCI components.

O'Hanlon and Pope (1999) find little evidence suggesting that OCI components are significantly correlated with returns for a sample of U.K. firms from 1972-1992 using data collected from actual financial statements. Kanagaretnam et al. (2009) find evidence that unrealized gains and losses on AFS securities and cash-flow hedges are significantly correlated with returns for Canadian firms, though unrealized losses appear to be negatively associated with returns. In addition, Kanagaretnam et al. (2009) find that comprehensive income is better at explaining returns than net income using the Vuong (1989) test, and that a model regressing returns on net income including unrealized gains/losses on AFS securities has a higher adjusted $R^2$ than similar models substituting unrealized gains and losses on cash-flow hedges or foreign currency translation adjustments for unrealized gains/losses on AFS securities.

Chambers et al. (2007) study whether investors in S&P 500 firms from 1994 to 2003 value comprehensive income and OCI components by analyzing the correlation between returns and comprehensive income. A key element of this paper is that the authors are able to compare findings between tests using as-reported comprehensive income in the post-SFAS 130 period and estimates of comprehensive income in the pre-SFAS 130 period with findings from tests using estimates of comprehensive income in the pre- and post-SFAS 130 periods to ascertain the effect of measurement error on returns-relevance tests of comprehensive income.[10] Instead of regressing returns on income measures separately and focusing on differing adjusted-$R^2$ values as in Dhaliwal et al. (1999), the authors regress annual returns on both net income and OCI in the same regression and analyze the coefficients on pre- and post-SFAS 130 OCI.[11] In the specification including estimated OCI in the pre-SFAS 130 period and as-reported OCI in the post-SFAS 130 period, the authors find that the overall effect of OCI is significantly greater than zero and insignificantly different from the theoretically correct value of one, while the coefficient on pre-SFAS 130 OCI is insignificantly different from zero. In the specification including as-if estimations of OCI in the pre- and post-SFAS 130 periods, the authors find no evidence of statistical significance for OCI. Further tests indicate that as-if estimations of OCI are likely subject to significant measurement error, calling into question results from studies employing as-if OCI estimations.

One puzzling finding from Chambers et al. (2007) is that the coefficient on unrealized gains and losses on AFS securities indicating its relation to returns is

[10] Recall that Dhaliwal et al. (1999) and Landsman et al. (2011) (among others) use estimates of comprehensive income and OCI items, not actual financial statement values of these items, in their studies.
[11] Net income and comprehensive income for a given firm are measured as the difference between the firm's net income or comprehensive income and the mean net income or comprehensive income for the sample in a given year.

exceptionally large, exceeding its theoretically correct value of one, and even exceeding the coefficient on net income. This finding could be consistent with one (or more) of four explanations. First, unrealized gains and losses on AFS securities are more persistent than net income. Second, investors apply a lower discount rate to unrealized gains and losses on AFS securities than net income. Third, the returns-based model used to assess the investor usefulness of OCI components is incorrectly specified.[12] Fourth, this finding is consistent with Bloomfield, Nelson, and Smith (2006), who suggest that feedback loops could exist in the pricing of unrealized gains and losses on AFS securities, which I discuss in Section 1.2.

Barton et al. (2010) measure returns-relevance as the adjusted-$R^2$ values from country-level regressions of firm annual returns on each of eight firm performance measures, respectively. Based on this measure of returns-relevance, comprehensive income is the most value-relevant performance measure of the eight performance measures considered in only 2 of 46 countries, Luxembourg and Peru. Additional tests indicate evidence that comprehensive income is value-relevant in code-law countries, but that comprehensive income is not incrementally value-relevant to the other seven performance measures in code-law or common-law countries.[13]

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[12] Dong, Ryan, and Zhang (2013) indicate that failure to control for the reclassification of realized gains and losses on AFS securities may explain the large coefficient on unrealized gains and losses on AFS securities in Chambers et al. (2007).

[13] It is unclear from the paper whether the authors use as-reported comprehensive income from the financial statements, or as-if estimated comprehensive income in the spirit of Dhaliwal et al. (1999).

Jones and Smith (2011) find evidence that special items and OCI are value-relevant for stock returns, but find that special items are more value-relevant. Goncharov and Hodgson (2011) find that OCI and comprehensive income are value-relevant for returns, but not as value-relevant as net income. Further, Goncharov and Hodgson (2011) also find that unrealized gains and losses on AFS securities are value-relevant, while revaluation reserves and foreign currency translation adjustments are not. In a non-linear specification, the authors provide evidence that OCI and comprehensive income are value-relevant for returns.

Landsman et al. (2011) use hedge returns to examine the usefulness of OCI to investors. Hedge return tests using a Carhart (1997) four-factor model, with portfolios formed by going long in firms in the top 30% of OCI and short in firms in the bottom 30% of OCI indicate that investors do not misprice OCI. Similar hedge return tests formed using rankings of "really dirty surplus" indicate that investors misprice "really dirty surplus." The authors attribute the differential results for OCI and "really dirty surplus" to investors being able to correctly assess the persistence of OCI and not being able to correctly assess the persistence of "really dirty surplus." However, investors may not have the requisite information to correctly price firms' issuance and acquisition of equity shares that are not recorded at fair-value and comprise a portion of "really dirty surplus."

Overall, the evidence from the literature examining the relation between comprehensive income or OCI and stock returns appears to depend to some extent on research design choices. Results are more reliable when as-reported comprehensive income data is used instead of as-if estimates of comprehensive income, and often stronger when financial services firms are used as sample firms.

### 1.1.5 Presentation and Value-Relevance

Many of the studies examining comprehensive income employ experiments. This is because experimenters can directly manipulate factors hypothesized to affect investors' and managers' judgments, including presentation method. Prior to the adoption of ASU No. 2011-05 (FASB, 2011), firms were required to present comprehensive income "in a financial statement that is displayed with the same prominence as other financial statements."[14] Typically, firms presented comprehensive income in one of four ways: (1) in the Statement of Changes in Equity; (2) in a separate Statement of Comprehensive Income beginning with net income, ending with comprehensive income, and not immediately following the income statement; (3) in a separate Statement of Comprehensive Income beginning with net income, ending with comprehensive income, and immediately following the income statement; and, (4) in a

[14] ASC 220-10-45-8 superseded by ASU 2011-05.

single Statement of Comprehensive Income beginning with revenue and ending with comprehensive income. Methods (3) and (4) are currently allowed under ASU 2011-05.[15]

Hirst and Hopkins (1998) analyze buy-side analysts' abilities to assess firm performance using comprehensive income in the presence of earnings management via the sale and subsequent repurchase of AFS securities. Specifically, the authors vary the level of earnings management (earnings management or no earnings management) and the presentation method of comprehensive income (no separate statement, presented in a statement of changes in shareholders' equity, or presented in a statement of comprehensive income beginning with net income and ending with comprehensive income).

They find that buy-side analysts are able to detect earnings management and incorporate this knowledge into their stock price judgments only when comprehensive income is presented in a statement of comprehensive income (a performance statement).[16] In addition, they find that buy-side analysts are better able to detect earnings management and incorporate this knowledge into their reporting quality and growth opportunities assessments when comprehensive income is presented in a

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[15] I refer to presentation methods (2)-(4) as methods using "performance statements" to present comprehensive income.

[16] Maines and McDaniel (2000) fail to find evidence that nonprofessional investors' are able to incorporate comprehensive income volatility assessments into their stock-price judgments more when comprehensive income is reported in a performance statement beginning with net income and ending with comprehensive income than when it is reported in a statement of changes in stockholders' equity. This lack of evidence may be driven by the unfamiliarity of valuation tasks to the subjects used in the study.

statement of comprehensive income. These results suggest that investors are able to correctly assess firm performance only when comprehensive income is presented in a performance statement.[17] The results indicate that the presentation of information, in addition to the content of information, matters to investors.

The results in Hirst and Hopkins (1998) are subject to several limitations. First, the analysts used as experimental participants are not experts in analyzing AFS securities. Second, the sample firm in the study is a manufacturing firm, for which AFS securities may be perceived as unimportant or transitory by investors (Maines and McDaniel, 2000). Third, as Lipe (1998) points out, in a "real-world" situation, analysts would consult other analysts if they were unsure about how to treat AFS securities transactions in their valuations. Finally, as Lipe (1998) notes, it seems strange that the experimental cell containing earnings management and a statement of comprehensive income contains the lowest "perceived reporting quality" in the study. Thus, it is unclear whether investors are assessing the quality of income or the quality of reporting, as one would expect the statement of comprehensive income to be the highest quality presentation format.

Finally, archival evidence indicates that OCI reported in a statement of changes in shareholders' equity is weighted more heavily by investors than OCI reported in a

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[17] In addition, only 50% of the participants who received comprehensive income as reported in a statement of changes in shareholders' equity recalled seeing comprehensive income in the financial statements, while 94% of the participants who received comprehensive income as reported in a statement of comprehensive income recalled seeing comprehensive income in the financial statements.

statement of performance (Chambers et al., 2007), counterintuitive to the results in Hirst and Hopkins (1998). For the individual components of OCI, presentation matters only for the minimum pension liability line item, where pension adjustments reported in a performance statement are weighted negatively by investors, and pension adjustments reported in the statement of changes in equity are weighted positively by investors (Chambers et al., 2007). Thus, it is unclear whether clarity in presentation or experience with a given presentation method better enables investors to assess firm performance.

Hunton, Libby, and Mazza (2006) examine the effect of comprehensive income presentation on non-financial company managers' propensities to manage earnings using sales of AFS securities in an experimental setting. They find that managers are less likely to engage in income-increasing or income-decreasing earnings management when comprehensive income is presented in a statement of comprehensive income beginning with net sales and ending with comprehensive income than when it is presented in a statement of changes in shareholders' equity. The intuition is that managers anticipate that investors will be better able to detect earnings management when comprehensive income is reported in a statement of comprehensive income, which curtails this type of earnings management behavior.

Lee, Petroni, and Shen (2006) provide archival evidence on a sample of firms from the property-liability insurance industry in 1998. A relatively high proportion of firms in this industry present comprehensive income in a statement of performance rather than in a statement of changes in equity. The authors find that insurance companies that manage earnings through sales of AFS securities, and firms with low disclosure quality, are less likely to report comprehensive income in a statement of comprehensive income. These findings indicate that managers believe that investors are better able to detect earnings management when comprehensive income is reported in a performance statement, similar to Hunton et al. (2006).

The studies examining comprehensive income and earnings management described above indicate that investors are better able to assess firm performance in the presence of earnings management, and that managers are less likely to attempt to manipulate firm performance metrics, when comprehensive income and OCI are presented in a statement of comprehensive income (a performance statement). I now turn my attention to the association between risk and OCI.

## 1.2 Risk-Relevance

One of the major arguments against requiring firms to report comprehensive income in a statement of performance is that OCI (and therefore comprehensive income) is more volatile than net income and would increase investors' assessments of firm risk (Hirst and Hopkins, 1998). Compared to research examining the relation between equity market prices and OCI, research examining the relation between measures of investors' equity risk and OCI is relatively sparse.

Statement of Accounting Concepts No. 8 indicates that decision-useful information helps investors assess "the amount, timing, and uncertainty of (the prospects for) future net cash inflows to the entity" (FASB, 2010, p. 1-2). In Chapter 2, I follow the FASB conceptual framework and use time-series equity returns volatility as the benchmark for whether OCI component volatilities are associated with total risk for a firm (FASB, 2010; Ryan, 2012). In doing so, I assume that investors efficiently impound risk-relevant information into equity share prices, and that equity share prices represent investors' future cash flows.

From Easton and Zmijewski (1989), we learn that associations between earnings and returns vary with the persistence of earnings and the firm's exposure to systematic risk in the equity market. Thus, research examining the relation between firm risk and OCI volatility provides evidence on one of the drivers of value-relevance: risk-relevance. In addition, value-relevance does not necessarily imply risk-relevance. Value-relevance is most often measured by the strength of associations between financial statement items and market prices or returns. We observe value-relevance when innovations in OCI, even transitory innovations, result in price movements. Risk-relevance is most often measured by the strength of associations between time-series volatilities of financial statement items and the time-series volatility of equity returns. Thus, while price movements result from news about firm fundamentals (value-relevance), the price movements may not cause deviations from the mean return that would cause volatility.

Simply put, value-relevance primarily addresses the relation between first moments of financial statement information and investors' returns, while risk-relevance addresses the relation between second moments of financial statement information and investors' returns.

Maines and McDaniel (2000) analyze how the presentation of comprehensive income affects nonprofessional investors' assessments of the volatility of unrealized gains and losses on AFS securities, and how those assessments of volatility affect the same investors' assessments of stock risk. The authors find that nonprofessional investors are able to extract the volatility of unrealized gains and losses on AFS securities for an insurance company, regardless of how comprehensive income is presented. However, the authors find that investors' stock-risk assessments indicate greater discernment of high versus low volatility of unrealized gains and losses on AFS securities when comprehensive income is presented in a performance statement than when it is presented in a statement of changes in stockholders' equity. This finding provides evidence that comprehensive income can assist investors in assessing the risk associated with unrealized gains and losses from AFS securities, and that this information can help investors assess firm risk when it is presented in a performance statement. In addition, the study validates managers' concerns that investors assess firms with higher "perceived volatility" as having greater risk.

Although some managers may have expressed concern that including comprehensive income in a performance statement would highlight volatility in comprehensive income, Lee et al. (2006) fail to find archival evidence that the probability of reporting comprehensive income in a performance statement is decreasing in the volatility of comprehensive income relative to the volatility of net income. This lack of evidence is contrary to the notion that managers may want to "hide" the volatility in comprehensive income in a statement of changes in equity.

Bloomfield et al. (2006) consider whether feedback loops between unrealized gains and losses on AFS securities and returns can cause volatility in equity prices in an experimental markets setting. The authors suggest the following line of reasoning. First, a firm's management invests in AFS securities whose returns are correlated with the firm's own return. Second, changes in the firm's share price result in changes in the share prices of the correlated investments of the firm, creating unrealized gains and losses. Third, these unrealized gains and losses are reported in financial statements, inducing further correlated price movements between the firm and its correlated investments. A key assumption about this process is that investors fail to correct for this correlation in their pricing functions. Using MBA students as experimental participants, the authors find that price volatility is highest when firm investment in perfectly-correlated securities is high and when unrealized gains and losses are reported in a statement of comprehensive income (a performance statement).

In her discussion of Bloomfield et al. (2006), Koonce (2006) suggests that the investors in the study may not have had the ability to adjust their valuation decisions based on the correlation structure of investments. Relatedly, investors may not be able to observe the correlation structure of a firm's returns with its investment returns based on information available to investors. In addition, Koonce (2006) notes that the investors in the study were not given both comprehensive income per share and net income per share, but instead were given one or the other. As Koonce (2006) points out, this research design choice could be problematic because unsophisticated investors, such as those used in the study, may not adjust earnings per share numbers for unrealized gains and losses prior to their valuation judgments. Further, Koonce (2006) questions the frequency with which feedback loops would occur in real-world settings, citing insufficient investment in correlated securities, low correlations between a firm's returns and the returns on its investments, and immaterial amounts of unrealized gains and losses as potential threats to the external validity of the study.

In a study using bank data from 1971 to 1990, Barth, Landsman, and Wahlen (1995) find the following using a measure of fair value accounting (GAAP accounting adjusted for unrealized gains and losses on investment securities): (1) Earnings including unrealized gains and losses from investment securities are more volatile than GAAP earnings, but the incremental volatility in this measure of "fair value earnings" is not priced by investors; (2) Regulatory capital violations occur more often under fair value accounting than under GAAP; (3) Regulatory capital violations under fair value accounting can predict actual regulatory capital violations, but investors do not price the risk of potential violation; and, (4) Investors price interest rate changes, despite the fixed cash flows to investment securities. Given that investors do not appear to price the incremental volatility in fair value earnings or the increased risk of potential regulatory capital violation under the authors' measure of fair value accounting, the authors suggest that a more comprehensive measure of fair value accounting, "calculated using fair values of all balance sheet accounts…may be a better proxy for economic risk than historical cost income volatility, but we fail to find this because our proxy for fair value income volatility includes only investment securities" (Barth et al., 1995, p. 588, footnote 17).

Hodder, Hopkins, and Wahlen (2006) examine the relation between returns volatility and income volatility, and the cost of equity capital and income volatility, using three different measures of income (net income, comprehensive income, and full-fair-value income) for a sample of U.S. commercial banks from 1996 to 2004. I focus my discussion on their results pertaining to net income, comprehensive income, and OCI income, as this is primary subject of my thesis. The authors find that comprehensive income is more volatile than net income. They also find that net income volatility and comprehensive income volatility are positively associated with returns volatility and long-term interest rate beta. However, comprehensive income volatility is significantly negatively associated with equity market beta (t = -2.98) and net income volatility is insignificantly negatively associated with equity market beta (t = -0.84). Incremental comprehensive income volatility (the difference between comprehensive income volatility and net income volatility) is insignificantly positively associated with returns volatility (t = 0.15), significantly negatively associated with equity market beta (t = -2.83), and insignificantly negatively associated with long-term interest rate beta (t = -1.69). Hodder et al. (2006) also find that incremental comprehensive income volatility, a proxy for OCI volatility, does not significantly assist investors in discounting abnormal earnings and is not associated with the implied cost of equity. However, these latter two findings may be unsurprising given that OCI is not included in the measure of abnormal earnings, and measures of implied cost of equity are based on forecasts of earnings and dividends that may not reflect OCI.[18]

Since the business models of non-financial and financial firms are quite different, Khan and Bradbury (2012, 2014) examine the risk-relevance of two samples of non-financial firms. Khan and Bradbury (2012) examine a sample of New Zealand firms and find that approximately two thirds of the firms in their sample have more volatile comprehensive income than net income, while the percentage is only 57% when comprehensive income excludes property, plant, and equipment revaluation

[18] In addition, I do not use annual measures of the implied cost of equity in my empirical tests in Chapters 2 and 3 because I estimate OCI volatility using time-series volatility over multiple years.

adjustments allowed under IFRS, but not under U.S. GAAP. They fail to find evidence that either incremental comprehensive income volatility or incremental comprehensive income volatility excluding asset revaluations is associated with returns volatility or beta, and fail to find evidence that investors use the information conveyed by these proxies for OCI volatility to discount abnormal earnings. Surprisingly, investors' weight on abnormal earnings is increasing in incremental comprehensive income volatility, but not in incremental comprehensive income volatility excluding asset revaluations, which may indicate a positive price response to positive asset revaluation adjustments underlying asset revaluation volatility.

Khan and Bradbury (2014) use a sample of U.S. non-financial firms and perform similar tests to their 2012 paper. They find that incremental comprehensive income volatility is not associated with returns volatility or beta and is not used to discount abnormal earnings. They also provide descriptive evidence indicating that comprehensive income and all OCI components other than the "other" component are more volatile than net income. However, they provide no evidence on the risk-relevance of OCI components.

Amir, Guan, and Oswald (2010) provide evidence on how changes in accounting standards affecting OCI can also affect real management decisions based on managers' risk preferences. Amir et al. (2010) examine how changes in pension accounting in the U.K. (FRS 17/IAS 19) and the U.S. (SFAS 158) affected the equity/debt security mix in pension portfolios. The accounting standards noted above require firms to recognize the net pension asset/liability on the balance sheet, along with actuarial gains and losses in OCI. The intuition in the study is that the new standards would introduce more volatility in OCI, which could be reduced by increasing the proportion of pension assets invested in debt securities. The authors find evidence that managers shift away from equity to debt securities in their pension portfolios in the periods surrounding the adoption of the new pension accounting standards. However, it is not clear from the results that shifts from equity to debt securities in pension plans actually reduce the volatility of OCI. This evidence would be particularly important to obtain, given recent fluctuations in debt security markets.

Currently in the literature, we do not have a firm grasp on what drives the relation (or lack thereof) between OCI volatility and firm risk. If managers are concerned that including OCI in a summary performance measure would confuse investors, result in more volatile accounting performance, and yield more volatile returns for investors, we should be able to learn more about OCI volatility and firm risk by examining the volatilities of individual OCI components and how they relate to investors' equity returns volatility.

While there is currently "no theory or conceptual argument supporting which items should be reported in other comprehensive income" (Khan and Bradbury, 2014), the IASB recently released a discussion paper of which an entire chapter is devoted to discussing conceptual differences between items of OCI and net income (IASB, 2013). The analyses performed in Chapters 2 and 3 are designed to inform this discussion. I choose to focus my examination on OCI components instead of all components of comprehensive income (including components of net income) for three reasons: (1) OCI is presented separately from net income under both U.S. GAAP and IFRS; (2) Variation in the risk-relevance of individual OCI components could be causing tests examining only the relation between proxies for OCI volatility and risk to yield insignificant results; and, (3) There is likely to be significant resistance to moving items currently included net income to OCI. If anything, the trend for summary performance measures is in the opposite direction (FDIC, 2013).

## 1.3 Contracting Usefulness

In his discussion of Dhaliwal et al. (1999), Skinner (1999) questions using the association between comprehensive income and returns as an appropriate measure of investor usefulness. He notes that the authors do not provide strong reasons for why comprehensive income would be more associated with returns than net income is, particularly since investors might perceive items in OCI as transitory. It should be noted that transitory financial statement line items are not necessarily value irrelevant. In fact, transitory financial statement items should be valued dollar-for-dollar, or have a valuation multiple of 1. Permanent, or perfectly persistent, financial statement line items should have a valuation multiple equal to $1/r$, where $r$ is the appropriate discount rate.

Instead of using returns as the benchmark for informativeness, Skinner (1999) suggests that analyzing the contracting uses of comprehensive income could be an informative method for learning about the usefulness of comprehensive income (and OCI).

Are comprehensive income and OCI useful for contracting purposes? If so, their contracting usefulness is likely to be closely tied to their investor usefulness. Ohlson (1999) indicates that the answer to this question depends on whether comprehensive income and the components of OCI (1) inform the principal about an agent's actions and, (2) predict future components of OCI and other future components of earnings. I identify two contracting uses of comprehensive income from the literature: (1) Debt contracting; and, (2) Compensation contracting.

### 1.3.1 Debt contracting

OCI should be useful for debt contracting purposes if it provides useful information to lenders (debt investors) in assessing borrowers' credit quality, consistent with conditions (1) and (2) from Ohlson (1999) noted above. Li (2010) examines the debt contracting uses of OCI. Using bank loan agreements from 1996-2005, Li (2010) provides descriptive evidence on the characteristics of debt covenants.[19] While no sample debt covenants are explicitly written on comprehensive income as a measure of earnings, Li (2010) finds that approximately 45% of sample loan contracts have a net worth covenant,

[19] Table 1 of Li (2010) indicates that financial services firms make up a very small (if not zero) percentage of the sample firms. Thus, one should interpret the results with caution, as OCI items, particularly unrealized gains/losses on AFS securities and derivatives classified as cash-flow hedges, may be relatively more important for financial services firms than the firms in Li's (2010) sample (FASB, 1998).

and that approximately 90% of the sample loan contracts that have a net worth covenant include accumulated other comprehensive income (AOCI) as part of net worth. Thus, OCI items appear to be useful "stock" measures of net worth, but less useful "flow" measures of earnings for debt contracting purposes. Goncharov and Hodgson (2011) provide evidence suggesting that comprehensive income, since it includes OCI, reverses some of the conservatism inherent in net income, resulting in a less conservative performance measure.

Ohlson (1999, p. 159) indicates that OCI "flows," if transitory, should be excluded when valuing equity and forecasting future earnings, while the "stocks" of these items, reflected in AOCI, "might well be relevant for purposes of forecasting and valuation." Specifically, Ohlson (1999) indicates that forecasting irrelevance and value irrelevance imply that an item is transitory; if these conditions hold, OCI "flow" items may not be useful for debt contracting purposes. However, Ohlson (1999) also indicates that the same OCI items may be useful indicators of stockholders' wealth because of their effects on the book value of equity through AOCI. Li's (2010) descriptive evidence is consistent with these "stock" measures being useful for debt contracting purposes. Lenders are interested in knowing about the future payouts from lending, and the net worth of the borrower appears to be an important component in assessing the actions of a borrower over time and the ability of a borrower to repay a loan.

As the Federal Deposit Insurance Corporation (FDIC) is requiring large banks in the U.S. to recognize an ever increasing portion of AOCI in Tier 1 Capital, bank regulators also appear to value the inclusion of the "stock" measure in banks' primary net worth metric (FDIC, 2013). Chapter 3 addresses the relation between AOCI and risk.

### 1.3.2 Compensation contracting

Biddle and Choi (2006) find that net income is superior to comprehensive income in explaining executive cash compensation, implying that comprehensive income (and thereby OCI) is less useful than net income for compensation contracting. Bamber, Jiang, Petroni, and Wang (2010) examine the relation between comprehensive income reporting and compensation contracting. They find that CEOs with stronger equity incentives and lower job security are more likely to report comprehensive income in a statement of changes in shareholders' equity.[20] In addition, the authors use a small sample of firms that change their comprehensive income reporting method during 1998-2001 and find evidence that the propensity to change from reporting comprehensive income in a performance statement to reporting comprehensive income in a statement of changes in shareholders' equity is increasing in the CEO's change in equity incentives and decreasing in changes in the CEO's job security. In other words, the CEO's equity incentives and job security induce reporting choices that the FASB seems to perceive as

[20] Job security is measured as the sum of two indicator variables. The first indicates whether the CEO is also the chairman of the board of directors. The second indicates whether the percentage of outside directors sitting on the firm's board is less than the sample median.

suboptimal. The results, along with those from Lee et al. (2006) who find that earnings management and disclosure quality are related to presentation choice, indicate that managers' incentives are important determinants of the presentation of comprehensive income and OCI.

# 2. Returns Volatility and OCI

In this chapter, I examine whether the volatilities of OCI and its components are associated with information about the variability of investors' equity returns. By examining this research question, I provide evidence on whether OCI and its components provide decision-useful information about the uncertainty, or variability, of investors' future cash flows.

Statement of Accounting Concepts No. 8 indicates that decision-useful information helps investors assess "the amount, timing, and uncertainty of (the prospects for) future net cash inflows to the entity" (FASB, 2010, p. 1-2). I follow the FASB conceptual framework and use time-series equity returns volatility as the benchmark for whether OCI component volatilities are associated with total risk for a firm (FASB, 2010; Ryan, 2012). I assume that investors efficiently impound risk-relevant information into equity share prices, and that equity share prices represent investors' future cash flows. Since OCI and its components are presented separately from net income under U.S. GAAP, I examine whether OCI volatility and OCI component volatilities are associated with returns volatility, controlling for net income volatility.

Prior work hypothesizes a positive association between returns volatility and financial statement line item volatility if the financial statement line item provides or is associated with decision-useful information about risk. (Hodder et al., 2006; Khan and Bradbury, 2012; 2014). This "risk-relevance" hypothesis is supported for net income volatility and comprehensive income volatility (Hodder et al., 2006; Khan and Bradbury 2012; 2014). Prior work has documented statistically insignificant associations ($p > 0.10$) between returns volatility and incremental comprehensive income volatility, the difference between comprehensive income volatility and net income volatility (a proxy for OCI volatility) (Hodder et al., 2006; Khan and Bradbury 2011; 2012).[1] This proxy for OCI volatility, however, can be negative (and is for 24% of the observations in my full sample), resulting in some measurement error when interpreting results. I calculate OCI and OCI component volatilities directly and predict that OCI component volatilities have associations with returns volatility that vary from one another, which may explain the lack of an association between OCI volatility and returns volatility. I test this prediction by disaggregating OCI in two ways.

First, I disaggregate OCI into its four primary components: AFS securities adjustments; cash-flow hedge adjustments; pension-related adjustments; and foreign currency translation adjustments.[2] I also include an "other" category for other OCI items reported by SNL Financial and Compustat. AFS securities adjustments and cash-flow hedge adjustments derive primarily from changes in the fair values of AFS securities and cash-flow hedges. I classify these two components as "fair value" components. For the bank holding companies in my sample, these "fair value" components are the two

[1] I use the term "statistically significant" ("statistically insignificant") to indicate statistical significance (or lack thereof) of a result at the 0.10 level unless I indicate otherwise.
[2] Appendix A lists OCI components (ASC 220-10-45-10A).

largest (based on the absolute value of the components divided by OCI) and most reported OCI components (based on the number of non-zero instances of the components), on average.

Pension-related adjustments arise primarily from differences between the projected benefit obligation and plan assets, differences between the expected and actual return on plan assets, prior service costs or credits, and transition assets or obligations. Foreign currency translation adjustments arise from the consolidation process, hedges of net investments in foreign companies, and gains and losses on long-term, within-firm foreign currency transactions. Since pension-related adjustments, foreign currency translation adjustments, and other OCI adjustments arise from a mixture of management estimates, actuarial assumptions, and the mechanical application of consolidation rules, I classify these components as "accounting calculation" components.[3] For the bank holding companies in my sample, these components are the three smallest and least reported OCI components (based on the metrics noted above), on average. I predict that associations between both "fair value" and "accounting calculation" component volatilities and returns volatility will be positive if the volatilities of OCI components generally reflect information also affecting investors' equity returns volatility. I also predict OCI component volatilities' associations with

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[3] I acknowledge that Level 2 and Level 3 asset values may be more akin to calculations than simple price changes. However, since Level 2 and Level 3 asset values are fair values, I consider fair value adjustments for AFS securities and derivatives in these categories as "fair value" OCI adjustments.

returns volatility will vary between "fair value" and "accounting calculation" components.

I examine the relations between returns volatility and both "fair value" and "accounting calculation" OCI component volatilities using a sample of 1,620 annual bank holding company observations from 2002-2012 (the full sample). I find that the "fair value" component volatilities are not associated with returns volatility. For the "accounting calculation" components, I find that pension-related component volatility is negatively associated with returns volatility, though this negative association becomes much less statistically significant when I examine only observations with non-zero pension-related volatility. This result may indicate that firms without pension plans (smaller firms) have more equity market volatility (more risk) than firms with pension plans (large firms). Foreign currency translation adjustment volatility is positively associated with returns volatility, though this result is insignificant when considering only observations with non-zero foreign currency translation adjustment volatility. Because of the offsetting coefficients of the volatilities of pension-related adjustments and foreign currency translation adjustments, I fail to find evidence that the risk-relevance of "fair-value" components differs from the risk-relevance of "accounting calculation" components.

The "fair value" OCI component volatilities may not appear to be associated with returns volatility because they are driven by the volatilities of both re-measurement (unrealized) gains and losses and realized (recycled) gains and losses that are transferred from AOCI to net income.[4] Volatilities of unrealized and recycled gains and losses on AFS securities and cash-flow hedges may reflect information also influencing investors' equity returns, in which case I would expect positive relations between unrealized and recycled subcomponent volatilities and returns volatility. Alternatively, volatilities of unrealized gains and losses may represent short-term fluctuations in the fair values of AFS securities and cash-flow hedges unrelated to risk, while volatilities of recycled gains and losses may represent sales of AFS securities or settlements of, cancellations of, or cessations of hedge accounting for cash-flow hedge contracts unrelated to risk. I predict that associations between unrealized subcomponent volatilities and returns volatility are different from associations between recycled subcomponent volatilities and returns volatility, but make no directional prediction.

In my second approach, I hand-collect the unrealized and recycled OCI subcomponents related to AFS securities and cash-flow hedges from Forms 10-K and 10KSB (sec.gov) for a subsample of 614 observations and calculate their volatilities (the recycling sample).[5] I also further disaggregate recycled gains and losses on AFS

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[4] An example of a reclassification adjustment occurs when an unrealized gain on an AFS security from a prior period is reclassified to net income from AOCI upon sale of the AFS security.

[5] I collect recycling data for only AFS securities and cash-flow hedge derivatives for three reasons. First, many banks provide a separation of the unrealized and realized portions of the AFS securities and cash-flow hedge derivative components of OCI. Second, many firms provide insufficient information to separately determine the following: (1) The amounts recycled to net income from the pension-related AOCI item; and, (2) The amounts capitalized to an asset from the pension-related AOCI item. Third, for banks there are

securities into recycled gains and losses related to sales of AFS securities, and other-than-temporary impairment (OTTI) losses transferred from AOCI to net income. I find that the volatilities of unrealized gains and losses on AFS securities and cash-flow hedges are negatively associated with returns volatility, while the volatility of OTTI losses is positively associated with returns volatility.

In sensitivity tests of approaches one and two, I rely on prior research that indicates financial statement users interpret comprehensive income (and thereby OCI) differently based on its presentation (Chambers et al., 2007; Hirst and Hopkins, 1998; Maines and McDaniel, 2000; Hunton et al., 2006). I compare observations that use either of the performance statement presentation methods currently allowed under U.S. GAAP to observations that do not.[6] As prior work in this area provides mixed results regarding which presentation method investors understand better, I predict that associations between returns volatility and OCI component volatilities vary with presentation, but do not make a directional prediction.

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relatively few instances of reclassification adjustments from foreign currency translation adjustments and the "other" category to net income.

[6] Following SFAS 130 (FASB, 1997), firms presented OCI in either a performance statement or in the statement of changes in equity. For fiscal years beginning after December 15, 2011, the option to present OCI in the statement of changes in equity was eliminated (FASB, 2011). Under current U.S. GAAP, a performance statement either begins with revenue and ends with comprehensive income, or begins with net income and ends with comprehensive income. If a firm begins its performance statement with net income, the performance statement must immediately follow the income statement (ASC 220-10-45-1C).

I find some evidence that comprehensive income presentation affects the joint association between OCI component and subcomponent volatilities and returns volatility: the evidence is strongest when 2012, the year in which there is no variation in presentation method, is excluded from the data. For observations from 2002 to 2011, I find that performance statement presentation negatively impacts the coefficients on the volatilities of unrealized gains and losses on AFS securities and OTTI losses and positively impacts the coefficient on the volatility of recycled gains and losses on AFS securities.

To further investigate whether the risk-relevance of OCI components vary with financial crisis periods, I separately examine 2002 to 2007 (the pre-crisis period) and 2008 to 2012 (the crisis or post-crisis period). I find that the negative coefficient on unrealized gains and losses on AFS securities (cash-flow hedges) derives from the crisis period (pre-crisis period). I also find that the coefficient on OTTI losses is negative in the pre-crisis period, and positive in the crisis period, though relatively few OTTI losses were recognized by banks during the pre-crisis period.

Overall, I provide some evidence consistent with the prediction that associations between OCI component volatilities and returns volatility vary between “fair value” components” and “accounting calculation” components. However, when I examine “fair value” OCI subcomponent volatilities, I find that the volatility of unrealized gains and losses on AFS securities, typically deemed beyond managers’ control, is significantly negatively associated with risk, while the volatility of OTTI losses, over which managers have relatively more control, is significantly positively associated with risk, especially during the financial crisis period. The results are consistent with investors perceiving the volatility of non-OTTI AFS unrealized gains and losses as relatively less important, less risky, or risk-relevant, than OTTI losses, and perceiving the volatility of OTTI losses as an informative signal about risk.[7]

The remainder of the chapter is organized as follows: Section 2.1 motivates and presents the hypotheses. Section 2.2 presents sample information. Section 2.3 discusses research design and results. Section 2.4 discusses robustness checks. Section 2.5 concludes.

## *2.1 Hypothesis Development*

### 2.1.1 Returns Volatility, Comprehensive Income Volatility, and OCI Volatility

I follow the FASB conceptual framework and use investors' equity returns volatility as the benchmark for whether OCI component volatilities are associated with total risk for a firm. Returns volatility and OCI component volatilities may be directly associated with each other, or each may be associated with the information that drives the variability of equity returns. I assume that information about returns volatility is also information about the uncertainty of investors' future cash flows. Statement of

[7] Non-OTTI AFS unrealized gains and losses are the sum of normal holding gains and losses on AFS securities and the non-credit portion of OTTI losses on AFS and held-to-maturity securities.

Accounting Concepts No. 8 indicates that information that is decision-useful helps investors assess "the amount, timing, and uncertainty of (the prospects for) future net cash inflows to the entity" (FASB, 2010, p. 1-2). The conceptual framework also indicates that information about a firm's return to investors and "the variability and components of that return also is important, especially in assessing the uncertainty of future cash flows" (FASB, 2010, p. 4). Thus, if the volatility of an OCI component is positively associated with returns volatility, the OCI component reflects risk-relevant information.

Some opponents of the current labeling of OCI as part of an income or performance measure (comprehensive income) cite the volatility of OCI items as a reason that OCI items should not be referred to as "income," as this reference could be "confusing at best and potentially misleading" (Emerson, 2010, p. 2). One of the primary concerns about the exposure draft preceding SFAS 130 (Reporting Comprehensive Income) was that investors would draw incorrect inferences about firm risk based on the incremental volatility in OCI.[8] In the Background Information and Basis for Conclusions section of SFAS 130, the FASB noted the concerns of several commenters on the standard:

> "Some respondents indicated that comprehensive income would be volatile from period to period and that that volatility would be related to market forces

[8] Concerns about OCI volatility may arise due to incremental OCI volatility beyond that of net income, or because the current accounting standards for OCI allow firms to recognize fair value changes for "only selected economic assets, liabilities, and derivatives" (Hirst and Hopkins, 1998, p. 53).

beyond the control of management. In their view, therefore, it would be inappropriate to highlight that volatility in a statement of financial performance" (FASB, 1997, p. 21).

On the other hand, "Other respondents said that comprehensive income was more a measure of entity performance than it was of management performance and that it was therefore incorrect to argue that it should not be characterized as a performance measure because of management's inability to control the market forces that could result in that measure being volatile from period to period" (FASB, 1997, p. 21).

As noted in Graham, Harvey, and Rajgopal's (2005) report of survey results, "a few CFOs state that the market becomes more skeptical of underlying cash flows when earnings are volatile. Even if two firms have the same underlying cash flow volatility, executives believe that the firm with the more volatile earnings would be perceived as riskier" (Graham et al., 2005, p. 49). Managers also appear to believe that a firm with more volatile OCI could be assessed as "riskier" (FASB, 1997).

In prior work, the volatility of a financial statement line item has been measured as the firm-specific, time-series standard deviation of the item.[9] For a sample of bank

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[9] For example, Barth et al. (1995) estimate annual historical cost and fair value income per share volatilities by computing the standard deviations of these measures over the five-year period immediately preceding the observation of stock price at the end of the year for the years 1976-1990. Hodder et al. (2006, p. 352) estimate annual net income, comprehensive income, and full-fair-value income volatilities by dividing each item by average total assets and calculating standard deviations of these measures "over five rolling five-

holding companies from 1996 to 2004, Hodder et al. (2006) provide evidence that comprehensive income is more volatile than net income. Khan and Bradbury (2012) and Khan and Bradbury (2014) confirm this result for a sample of New Zealand non-financial firms from 2003 to 2008 and a sample of U.S. non-financial firms from 2005 to 2010. These authors hypothesize that if the volatilities of comprehensive income and OCI capture risk exposure, these volatilities should be positively associated with returns volatility. Hodder et al. (2006) and Khan and Bradbury (2012, 2014) each find a significant positive relation between comprehensive income volatility and returns volatility, suggesting that comprehensive income is risk relevant. As a proxy for OCI volatility, these authors deduct the volatility of net income from the volatility of comprehensive income and arrive at incremental comprehensive income volatility.[10] Hodder et al. (2006) and Khan and Bradbury (2012; 2014) find that incremental comprehensive income volatility is not significantly related to returns volatility.

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year periods, each ending with years 2000-2004." Lee et al. (2006, p. 681) estimate the relative volatility of comprehensive income as "the standard deviation of total comprehensive income divided by the standard deviation of net income using data from 1994-2001."

[10] The variances, and thereby the standard deviations, of net income and OCI are not necessarily additive (Hodder et al., 2006, footnote 19, p. 360). Hodder et al. (2006, footnote 11, p. 351) indicate that the variance of comprehensive income is equal to: $\sigma_{CI}^2 = \sigma_{NI}^2 + \sigma_{OCI}^2 + 2COV(NI, OCI)$. Hodder et al. (2006) calculate OCI volatility indirectly as $\sqrt{\sigma_{CI}^2} - \sqrt{\sigma_{NI}^2}$ and assume that $COV(NI, OCI)$ is equal to zero in their study. They provide some evidence consistent with this assumption for their sample of bank holding companies. For my sample, untabulated Pearson (0.01, p = 0.75) and Spearman (-0.04, p = 0.05) correlation statistics between $NI$ and $OCI$ indicate that the covariance term in the expression above may not be equal to zero.

### 2.1.2 Returns Volatility and OCI Component Volatilities

I extend Hodder et al. (2006) and Khan and Bradbury (2012; 2014) in four ways. First, I consider both OCI volatility and OCI component volatilities. OCI component volatilities inform investors as to why summary performance measures, like comprehensive income, may be more or less volatile in a given fiscal period. The analyses in Hodder et al. (2006) and Khan and Bradbury (2012; 2014) constrain the associations between returns volatility and OCI component volatilities to be the same for all OCI components. OCI component volatilities could have correlations with returns volatility that vary in strength, which could confound inferences from analyzing only the association between OCI volatility and returns volatility.[11] Second, I consider additional factors that are associated with returns and may also be associated with returns volatility: size, growth opportunities, and firm performance. Third, I directly calculate OCI volatility (and OCI component volatilities), as opposed to using a calculated proxy for OCI volatility. Fourth, I control for the volatility of net income before "fair value" OCI component recycling adjustments instead of the volatility of net

[11] Net income, a component of comprehensive income, may also have component volatilities with differing associations with risk. Lipe (1986) provides evidence that disaggregation of net income (a component of comprehensive income) provides incremental information to investors, and that this information varies with the persistence of net income components. Jones and Smith (2011) compare the value relevance, persistence, and predictive ability of special items (a net income component) and OCI. They find that special items and OCI are value relevant, that special items are not persistent and OCI is negatively persistent, and that special items have relatively better predictive ability for net income and cash flows than OCI. As my study is designed to inform the ongoing debate regarding the separation of OCI from net income, I provide evidence on whether OCI and its components are associated with risk.

income including “fair value” OCI component recycling adjustments to avoid including these recycling adjustments in the same estimation twice.

I examine bank holding companies because many, if not all, of the possible items that can be reported in OCI under U.S. GAAP are present for banks and because my empirical tests use the returns volatility model from Hodder et al. (2006). The primary components of OCI for most banks are AFS securities adjustments, cash-flow hedge adjustments, pension-related adjustments, and foreign currency translation adjustments. These components derive from a diverse set of economic events, management estimates, and mechanical accounting rule applications. I group these components into those that derive primarily from fair value changes (“fair value” OCI components) and those that derive primarily from a mixture of management estimates, actuarial assumptions, and mechanical applications of consolidation rules (“accounting calculation” OCI components). I predict that the distinct natures of these primary OCI components cause variation in their associations with returns volatility. In particular, I predict that “fair value” OCI components will differ from “accounting calculation” components in their associations with returns volatility.

Associations between “fair value” component volatilities and returns volatility will be positive if the volatilities of the fair values of AFS securities and cash-flow hedge instruments generally reflect information also affecting investors’ returns volatility. For the bank holding companies in my sample, these “fair value” components are the two largest (based on the absolute value of the components divided by OCI) and most reported OCI components (based on the number of non-zero instances of the components), on average.

Pension-related adjustments arise from differences between the projected benefit obligation and plan assets, differences between the expected and actual return on plan assets, prior service costs or credits, transition assets or obligations, and amortization adjustments. Foreign currency translation adjustments arise from the consolidation process, hedges of net investments in foreign companies, and gains and losses on long-term, within-firm foreign currency transactions. I also include a category for "other" OCI components collected by SNL Financial and Compustat. Pension-related adjustments, foreign currency translation adjustments, and other OCI adjustments arise from a heterogeneous mixture of management estimates, actuarial assumptions, and mechanical applications of consolidation rules. For the bank holding companies in my sample, these components are the three smallest and least reported OCI components (based on the metrics noted above), on average.

In Hypothesis 1, I follow prior research using the "risk-relevance" hypothesis and predict positive associations between returns volatility and OCI component volatilities. In Hypothesis 2, I compare "fair value" and "accounting calculation" OCI component volatilities' relative associations with returns volatility.

H1: OCI component volatilities are positively associated with returns volatility.

H2: "Fair value" OCI component volatilities have different associations with returns volatility than do "accounting calculation" OCI component volatilities.

### 2.1.3 Returns Volatility and OCI Unrealized and Recycled Subcomponent Volatilities

The volatilities of unrealized and recycled gains and losses on AFS securities and cash-flow hedges may be associated with information simultaneously influencing investors' equity returns volatility, in which case I would expect positive relations between both unrealized and recycled subcomponent volatilities and returns volatility. Alternatively, associations between unrealized subcomponent volatilities and returns volatility could reflect "transitory" fluctuations in the fair values of AFS securities and cash-flow hedges that are not related to the risk of the firm (Dong et al., 2013), while associations between recycled subcomponent volatilities and returns volatility could reflect fluctuations in sales of AFS securities or settlements of, cancellations of, or cessations of hedge accounting for cash-flow hedge contracts that are not related to the risk of the firm (Lee et al., 2006).

In addition, Badertscher et al. (2014) note that OTTI losses, generally recognized on debt securities, are an important component of AOCI that is recycled to net income. On the one hand, Badertscher et al. (2014) suggest that since OTTI losses have already been reported in OCI and AOCI, investors may not incrementally price the credit portion of these losses that is recognized in net income upon reclassification. Thus, no significant relation between OTTI volatility and returns volatility may exist.

Alternatively, Badertscher et al. (2014, p. 812) suggest that investors may view OTTI losses as incremental "negative signals about investment strategy or quality" that "communicate only the subjective prospects of recovery, because investment security fair values and related unrealized gains and losses are disclosed every period through processes separate from impairment." This indicates that OTTI loss volatility may be associated with incremental risk-relevant information, and thereby be positively associated with returns volatility. Further, since OTTI losses on AFS debt securities have been separated into non-credit (recognized in OCI) and credit (reclassified to net income) portions since 2009, Badertscher et al. (2014, p. 812) suggest that the non-credit credit portion "may be viewed as a less negative signal about investment strategy or quality."[12] Thus, when the relations between returns volatility and both OTTI loss volatility and the volatility of non-OTTI (or non-credit-related) AFS unrealized gains and losses are examined simultaneously, one may observe the following: 1) A positive conditional association between OTTI loss volatility and returns volatility, and 2) A negative conditional association between non-OTTI AFS unrealized gains and losses and returns volatility, indicating that investors perceive the volatility of non-OTTI AFS unrealized gains and losses as relatively less important, less risky, or less risk-relevant, than OTTI losses.

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[12] Badertscher et al. (2014, p. 812) also note the possibility that the distinction between non-credit and credit OTTI losses may have little meaning to investors due to its "highly subjective" nature.

For cash-flow hedges, prior work indicates that risk-management practices improved for firms classified as ineffective hedgers or speculators following the adoption of SFAS 133 (Zhang, 2009). Further, Kanagaretnam et al. (2009) find a negative relation between total unrealized gains and losses on cash-flow hedges and returns, driven by negative unrealized losses. Unrealized gains on cash-flow hedges have an insignificant positive relation with returns. Citing Venkatachalam (1996), Kanagaretnam et al. (2009, p. 351) interpret this finding as evidence that “even negative values of the change in the fair value of cash-flow hedges may provide risk-relevant information that could be positively associated with returns. A plausible explanation for the losing positions to be viewed as a positive signal is that hedging activities may indicate that firms are proactively managing their risk even when they result in losses.”

As the relations between returns volatility and “fair value” unrealized and recycled components could vary in both strength and sign, I predict that associations between unrealized subcomponent volatilities and returns volatility are different from associations between recycled subcomponent volatilities and returns volatility, but make no directional prediction.

H3: Unrealized “fair value” OCI component volatilities differ from the volatilities of their recycled OCI counterpart volatilities in their associations with returns volatility.

## 2.2 Sample Selection

My initial sample consists of all U.S. bank holding company observations available on SNL Financial from 1998 to 2012. I begin the sample in 1998 since SFAS 130 is applicable for fiscal periods beginning after December 15, 1997 (FASB, 1997). Early research on OCI estimated OCI and its components using pre-SFAS-130 Compustat data (Dhaliwal et al., 1999). However, subsequent research suggests that using as-if estimates of OCI introduces measurement error (Chambers et al., 2007). For this reason, I use OCI data only from the post-SFAS-130 period and calculate rolling five-year standard deviations of OCI and OCI components beginning with 1998. Thus, the first estimation year included in the empirical tests is 2002.

Table 1 presents sample selection criteria. The sample from the post-SFAS-130 period (1998-2012) includes 9,842 bank-year observations from 753 banks. I ensure that the data for the components of comprehensive income is accurate with two data screens. First, I require that observations have comprehensive income within $1,000 of 1) the sum of net income, the AFS securities adjustment, the cash-flow hedge adjustment, the pension adjustment, the foreign currency translation adjustment, and the other adjustment, and 2) the sum of net income and OCI. This results in 9,147 observations from 752 banks. Second, I require that observations have $CI$ within 0.005% of average total assets of 1) the sum of $NI$, $AFS$, $DERIV$, $PEN$, $FC$, and $OTHER$, and 2) $NI$ and $OCI$. This results in 9,088 observations from 751 banks. Eliminating observations prior to

2002, I obtain 7,173 observations from 748 banks. Requiring data for $\sigma RET$, $\sigma NI$, $\sigma CI$, $\sigma CI - \sigma NI$, $\sigma AFS$, $\sigma DERIV$, $\sigma PEN$, $\sigma FC$, $\sigma OTHER$, and $\sigma OCI$, I obtain 2,073 observations from 282 banks. Requiring data for regression control variables ($EXP$, $EXPIND$, $GAP$, $GAPIND$, $CI$, $CI\_1$, $ANNRET$, $ANNRET\_1$, and $PRICE\_1$), I obtain 2,000 observations from 280 banks. Including only observations with the same number of years included in the calculation of ($\sigma NI$, $\sigma AFS$, $\sigma DERIV$, $\sigma PEN$, $\sigma FC$, $\sigma OTHER$, and $\sigma OCI$) and ($\sigma NIRECY$, $\sigma AFSUGL$, $\sigma AFSRECY$, $\sigma OTTI$, $\sigma DERIVUGL$, and $\sigma DERIVRECY$), I obtain 1,965 observations from 279 banks. Including only observations with the same number of years included in the calculation of ($\sigma NI$, $\sigma AFS$, $\sigma DERIV$, $\sigma PEN$, $\sigma FC$, $\sigma OTHER$, and $\sigma OCI$) and $\sigma ANNRET$, the rolling five-year standard deviation of annual returns, I obtain 1,627 observations from 251 banks. Requiring five years of data for each rolling five-year period, I arrive at a sample of 1,620 observations from 249 banks (the full sample).[13]

I also use the EDGAR database at sec.gov to access forms 10-K and 10KSB for bank holding companies to collect OCI recycling and presentation variables for a subsample of 614 observations from 95 banks (the recycling sample). I search for the word "comprehensive" to find the table presenting comprehensive income. I collect net-of-tax amounts recycled from AOCI to net income, along with the net-of-tax change in AOCI unrelated to recycling (i.e., the unrealized gain or loss) for AFS securities and

[13] I also require at least 49 monthly returns over each five-year period, an attempt to ensure that each year of financial data is matched with at least one month of returns from the same year.

cash-flow hedge derivatives. I also collect OTTI losses recycled from AOCI to net income. Finally, I collect presentation data and create an indicator variable equal to one when the bank presents comprehensive income using one of the two currently allowed performance statement presentations (ASC 220-10-45-1C), zero otherwise.

**Table 1: Sample Selection Criteria**

| **Sample Requirements** | **Obs** | **Banks** |
| --- | --- | --- |
| Post-SFAS-130 (fiscal year beginning after December 15, 1997). | 9,842 | 753 |
| Observations with Comprehensive Income within $1000 of 1) the sum of net income, the available-for-sale securities adjustment, the cash-flow hedge adjustment, the pension adjustment, the foreign currency translation adjustment, and the other adjustment, and 2) the sum of net income and other comprehensive income. | 9,147 | 752 |
| Observations with *CI* within 0.005% of average total assets of 1) the sum of *NI*, *AFS*, *DERIV*, *PEN*, *FC*, and *OTHER*, and 2) the sum of *NI* and *OCI*. | 9,088 | 751 |
| Observations from 2002-2012 from SNL Financial (observations with data from year *t-4* to year *t*, post-SFAS-130). | 7,173 | 748 |
| Observations with data for *σRET*, *σNI*, *σCI*, *σCI - σNI, σAFS, σDERIV, σPEN, σFC, σOTHER,* and *σOCI.* | 2,073 | 282 |
| Observations with data for *EXP*, *EXPIND*, *GAP*, *GAPIND*, *CI*, *CI_1*, *ANNRET*, *ANNRET_1*, and *PRICE_1*. | 2,000 | 280 |
| Observations with the same number of years included in the calculation of (*σAFS*, *σDERIV*, *σPEN*, *σFC*, *σOTHER*, and *σOCI*) and (*σNIRECY*, *σAFSUGL*, *σAFSRECY*, *σOTTI*, *σDERIVUGL*, and *σDERIVRECY*). | 1,965 | 279 |
| Observations with the same number of years included in the calculation of (*σAFS*, *σDERIV*, *σPEN*, *σFC*, *σOTHER*, and *σOCI*) and (*σANNRET*). | 1,627 | 251 |
| Observations with five years included in the calculation of all rolling five-year volatility variables. **FULL SAMPLE**. | 1,620 | 249 |
| Observations with data from the Bank Regulatory - Bank Holding Companies dataset to calculate *σTIER1RATIO*, *σTIER1NOAOCIRATIO*, *σAFSRATIO*, *σAFSINCRATIO*, *σAFSEQUITYLOSSRATIO*, and *σDERIVPENRATIO*. | 1,302 | 249 |
| Observations with data for *PRES*, *σAFSUGL*, *σAFSRECY*, *σOTTI*, *σDERIVUGL*, and *σDERIVRECY*. **RECYCLING SAMPLE**. | 614 | 95 |
| Observations with data for *PRES*, *σAFSUGL*, *σAFSRECY*, *σOTTI*, *σDERIVUGL*, *σDERIVRECY*, *σTIER1RATIO*, *σTIER1NOAOCIRATIO*, *σAFSRATIO*, *σAFSINCRATIO*, *σAFSEQUITYLOSSRATIO*, and *σDERIVPENRATIO*. | 516 | 82 |

Tables 2 presents descriptive statistics for bank-year observations from 1998-2012 used to calculate the volatility measures for comprehensive income and its components. 2,724 observations are used for the full sample, and 1,046 observations are used for the recycling sample. Variables are defined in Appendix B. Compared to Table 2 of Hodder et al. (2006), the banks in my full sample are similar based on $OCI$ (0.01% vs. (1.15% -

1.13% = 0.02%)), but have smaller $NI$ (0.78% vs. 1.13%) and $CI$ (0.79% vs. 1.15%) than the banks in Hodder et al. (2006).

**Table 2: Descriptive Statistics for Bank-Year Observations (1998-2012)**

| Full Sample | N | MEAN | STD | MIN | P25 | P50 | P75 | MAX |
|---|---|---|---|---|---|---|---|---|
| *NI* | 2,724 | 0.78 | 1.06 | -15.43 | 0.56 | 0.95 | 1.25 | 5.77 |
| *CI* | 2,724 | 0.79 | 1.11 | -15.41 | 0.55 | 0.95 | 1.30 | 5.55 |
| *OCI* | 2,724 | 0.01 | 0.31 | - 3.49 | - 0.11 | 0.01 | 0.13 | 2.99 |
| *AFS* | 2,724 | 0.02 | 0.29 | - 3.37 | - 0.08 | 0.02 | 0.13 | 2.97 |
| *DERIV* | 2,724 | - 0.00 | 0.05 | - 0.66 | 0.00 | 0.00 | 0.00 | 0.69 |
| *PEN* | 2,724 | - 0.00 | 0.03 | - 0.67 | 0.00 | 0.00 | 0.00 | 0.20 |
| *FC* | 2,724 | 0.00 | 0.02 | - 0.39 | 0.00 | 0.00 | 0.00 | 0.26 |
| *OTHER* | 2,724 | - 0.01 | 0.05 | - 0.63 | 0.00 | 0.00 | 0.00 | 0.47 |
| **Recycling Sample** | **N** | **MEAN** | **STD** | **MIN** | **P25** | **P50** | **P75** | **MAX** |
| *NI* | 1,046 | 0.79 | 1.06 | - 7.71 | 0.58 | 0.97 | 1.28 | 5.77 |
| *CI* | 1,046 | 0.81 | 1.13 | -11.20 | 0.55 | 0.96 | 1.33 | 5.55 |
| *OCI* | 1,046 | 0.02 | 0.31 | - 3.49 | - 0.11 | 0.01 | 0.14 | 2.99 |
| *AFS* | 1,046 | 0.03 | 0.30 | - 3.37 | - 0.08 | 0.02 | 0.14 | 2.97 |
| *DERIV* | 1,046 | - 0.00 | 0.05 | - 0.66 | 0.00 | 0.00 | 0.00 | 0.69 |
| *PEN* | 1,046 | - 0.01 | 0.04 | - 0.67 | 0.00 | 0.00 | 0.00 | 0.14 |
| *FC* | 1,046 | 0.00 | 0.02 | - 0.39 | 0.00 | 0.00 | 0.00 | 0.26 |
| *OTHER* | 1,046 | - 0.01 | 0.06 | - 0.63 | 0.00 | 0.00 | 0.00 | 0.28 |
| *NIRECY* | 1,046 | 0.79 | 1.06 | - 8.02 | 0.59 | 0.96 | 1.27 | 5.85 |
| *AFSUGL* | 1,046 | 0.03 | 0.30 | - 3.06 | - 0.07 | 0.03 | 0.15 | 1.72 |
| *AFSRECY* | 1,046 | - 0.01 | 0.11 | - 0.57 | - 0.03 | - 0.00 | 0.00 | 1.55 |
| *OTTI* | 1,046 | 0.01 | 0.10 | - 0.00 | 0.00 | 0.00 | 0.00 | 2.22 |
| *DERIVUGL* | 1,046 | - 0.00 | 0.06 | - 0.66 | 0.00 | 0.00 | 0.00 | 0.69 |
| *DERIVRECY* | 1,046 | - 0.00 | 0.03 | - 0.46 | 0.00 | 0.00 | 0.00 | 0.30 |

Table 3 presents descriptive statistics for regression variables from 2002-2012. Compared to Table 1 of Hodder et al. (2006), the banks in my full sample are larger based on $MVE$ (3,972 million vs. 2,882 million). Compared to Table 3 of Hodder et al. (2006), the banks in my sample are more volatile based on $\sigma NI$ (0.55 vs. 0.26), and similar based on $\sigma CI - \sigma NI$ (0.11 vs. 0.13). In untabulated results, I calculate average $\sigma CI$ to be greater than average $\sigma NI$ in my sample (0.61 vs. 0.50), confirming results from prior work (Hodder et al., 2006; Khan and Bradbury, 2012; 2014). In addition, an untabulated variance ratio test indicates that $CI$ is significantly more volatile than $NI$ (F = 1.09, p <

0.05). Moreover, the importance of directly computing OCI volatility is further illustrated by the difference in the averages of $\sigma CI - \sigma NI$ (0.11) and $\sigma OCI$ (0.25). Pearson (0.72, $p < 0.05$) and Spearman (0.62, $p < 0.05$) correlations between $\sigma CI - \sigma NI$ and $\sigma OCI$ suggest that these measures are not interchangeable. A t-test indicates that $\sigma CI - \sigma NI$ is significantly less than $\sigma OCI$ on average ($t = -18.94$, $p < 0.01$). Moreover, it is possible to obtain negative values of $\sigma CI - \sigma NI$, as indicated by the minimum value of $\sigma CI - \sigma NI$ in Table 3 (-0.44). 383 of the 1,620 observations (23.64%) in the full sample have a negative value of $\sigma CI - \sigma NI$.

## Table 3: Descriptive Statistics for Regression Variables (2002-2012)

| **Full Sample** | **N** | **MEAN** | **STD** | **MIN** | **P25** | **P50** | **P75** | **MAX** |
|---|---|---|---|---|---|---|---|---|
| *σRET* | 1,620 | 9.47 | 4.59 | 3.05 | 6.34 | 8.28 | 11.27 | 39.59 |
| *σNI* | 1,620 | 0.50 | 0.63 | 0.01 | 0.14 | 0.26 | 0.60 | 7.03 |
| *σCI - σNI* | 1,620 | 0.11 | 0.18 | - 0.44 | 0.00 | 0.07 | 0.17 | 2.07 |
| *σOCI* | 1,620 | 0.25 | 0.23 | 0.00 | 0.12 | 0.19 | 0.29 | 2.35 |
| *σAFS* | 1,620 | 0.22 | 0.22 | 0.00 | 0.11 | 0.17 | 0.27 | 2.30 |
| *σDERIV* | 1,620 | 0.02 | 0.05 | 0.00 | 0.00 | 0.00 | 0.01 | 0.45 |
| *σPEN* | 1,620 | 0.01 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.30 |
| *σFC* | 1,620 | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.26 |
| *σOTHER* | 1,620 | 0.02 | 0.05 | 0.00 | 0.00 | 0.00 | 0.01 | 0.41 |
| *EXP* | 1,620 | 51.79 | 344.08 | 0.00 | 0.00 | 0.54 | 6.52 | 5285.21 |
| *EXPIND* | 1,620 | 0.93 | 0.26 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| *GAP* | 1,620 | 6.79 | 10.08 | 0.00 | 0.00 | 0.33 | 10.86 | 50.66 |
| *GAPIND* | 1,620 | 0.51 | 0.50 | 0.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| *MVE* | 1,620 | 3972.18 | 18821.01 | 0.21 | 73.09 | 239.72 | 1115.48 | 238020.70 |
| *BTM* | 1,620 | 1.01 | 0.82 | - 1.38 | 0.56 | 0.80 | 1.18 | 14.96 |
| *CI* | 1,620 | 0.70 | 1.11 | -11.20 | 0.46 | 0.89 | 1.23 | 5.55 |
| *CI_1* | 1,620 | 0.70 | 1.15 | -11.20 | 0.44 | 0.91 | 1.25 | 5.55 |
| *ANNRET* | 1,620 | 4.92 | 35.09 | -88.80 | -14.63 | 4.14 | 22.87 | 275.36 |
| *ANNRET_1* | 1,620 | 3.20 | 34.48 | -92.95 | -16.12 | 2.65 | 21.92 | 275.36 |
| *PRICE_1* | 1,620 | 27.39 | 53.44 | 0.66 | 11.15 | 18.97 | 29.06 | 1368.80 |
| **Recycling Sample** | **N** | **MEAN** | **STD** | **MIN** | **P25** | **P50** | **P75** | **MAX** |
| *σRET* | 614 | 9.36 | 4.10 | 3.05 | 6.70 | 8.36 | 11.08 | 25.37 |
| *σNI* | 614 | 0.52 | 0.67 | 0.02 | 0.15 | 0.26 | 0.62 | 4.91 |
| *σCI - σNI* | 614 | 0.13 | 0.21 | - 0.36 | 0.01 | 0.09 | 0.20 | 2.07 |
| *σOCI* | 614 | 0.26 | 0.26 | 0.01 | 0.14 | 0.21 | 0.32 | 2.35 |
| *σAFS* | 614 | 0.24 | 0.25 | 0.01 | 0.11 | 0.18 | 0.29 | 2.30 |
| *σDERIV* | 614 | 0.02 | 0.06 | 0.00 | 0.00 | 0.00 | 0.01 | 0.38 |
| *σPEN* | 614 | 0.02 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.30 |
| *σFC* | 614 | 0.01 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.26 |
| *σOTHER* | 614 | 0.02 | 0.06 | 0.00 | 0.00 | 0.00 | 0.01 | 0.35 |
| *EXP* | 614 | 54.13 | 316.13 | 0.00 | 0.00 | 1.03 | 6.81 | 2817.60 |
| *EXPIND* | 614 | 0.96 | 0.19 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| *GAP* | 614 | 7.01 | 9.33 | 0.00 | 0.00 | 1.63 | 12.09 | 41.78 |
| *GAPIND* | 614 | 0.53 | 0.50 | 0.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| *MVE* | 614 | 4254.60 | 21407.04 | 1.09 | 89.25 | 259.50 | 1032.20 | 238020.70 |
| *BTM* | 614 | 0.99 | 0.79 | - 1.38 | 0.56 | 0.78 | 1.14 | 9.12 |
| *CI* | 614 | 0.71 | 1.17 | -11.20 | 0.43 | 0.88 | 1.24 | 5.55 |
| *CI_1* | 614 | 0.74 | 1.17 | -11.20 | 0.42 | 0.90 | 1.27 | 5.55 |
| *ANNRET* | 614 | 5.39 | 34.78 | -88.80 | -13.38 | 4.81 | 23.13 | 200.00 |
| *ANNRET_1* | 614 | 2.98 | 31.89 | -86.95 | -14.91 | 2.56 | 22.16 | 159.71 |
| *PRICE_1* | 614 | 28.94 | 51.28 | 1.49 | 11.19 | 18.40 | 29.72 | 775.20 |
| *σNIRECY* | 614 | 0.51 | 0.68 | 0.02 | 0.15 | 0.25 | 0.59 | 5.09 |
| *σAFSUGL* | 614 | 0.24 | 0.23 | 0.01 | 0.11 | 0.18 | 0.30 | 1.83 |
| *σAFSRECY* | 614 | 0.06 | 0.10 | 0.00 | 0.01 | 0.03 | 0.07 | 0.72 |
| *σOTTI* | 614 | 0.02 | 0.12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.99 |
| *σDERIVUGL* | 614 | 0.02 | 0.06 | 0.00 | 0.00 | 0.00 | 0.02 | 0.35 |
| *σDERIVRECY* | 614 | 0.01 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.25 |
| *PRES* | 614 | 0.31 | 0.46 | 0.00 | 0.00 | 0.00 | 1.00 | 1.00 |

Table 4 presents descriptive statistics for volatility indicator variables. These variables are equal to one when the volatility variable each indicator variable represents is greater than zero, zero otherwise. The statistics indicate that when examining associations between OCI component volatilities and returns volatility, care should be exercised when interpreting the coefficients on variables with large numbers in the "# ZEROES" column. For the full sample, Table 4 indicates that there are no observations with zero $\sigma NI_{it}$, 391 instances of non-positive $\sigma CI_{it} - \sigma NI_{it}$ (* indicates 383 negative, eight equal to zero) and eight instances of zero $\sigma OCI_{it}$. Of the five OCI primary components, $\sigma AFS_{it}$ has the least number of zeroes, followed by $\sigma DERIV_{it}$, $\sigma OTHER_{it}$, $\sigma PEN_{it}$, and $\sigma FC_{it}$. For the recycling sample, Table 4 indicates that there are no observations with zero $\sigma NIRECY_{it}$ or $\sigma AFSUGL_{it}$, 133 instances of non-positive $\sigma CI_{it} - \sigma NI_{it}$ (+ indicates 133 negative, zero equal to zero), and 378 instances of zero $\sigma DERIVUGL_{it}$. Of the recycling volatilities, Table 4 indicates 65 instances of zero $\sigma AFSRECY_{it}$, 546 instances of zero $\sigma OTTI_{it}$, and 487 instances of zero $\sigma DERIVRECY_{it}$.

### Table 4: Descriptive Statistics for Volatility Indicator Variables

| Full Sample | N | # ZEROES | # ONES | MEAN | STD | MIN | P25 | P50 | P75 | MAX |
|---|---|---|---|---|---|---|---|---|---|---|
| *σNIIND* | 1,620 | 0 | 1620 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| *(σCI - σNI)IND** | 1,620 | 391 | 1229 | 0.76 | 0.43 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| *σOCIIND* | 1,620 | 8 | 1612 | 1.00 | 0.07 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| *σAFSIND* | 1,620 | 10 | 1610 | 0.99 | 0.08 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| *σDERIVIND* | 1,620 | 1024 | 596 | 0.37 | 0.48 | 0.00 | 0.00 | 0.00 | 1.00 | 1.00 |
| *σPENIND* | 1,620 | 1207 | 413 | 0.25 | 0.44 | 0.00 | 0.00 | 0.00 | 1.00 | 1.00 |
| *σFCIND* | 1,620 | 1478 | 142 | 0.09 | 0.28 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 |
| *σOTHERIND* | 1,620 | 1113 | 507 | 0.31 | 0.46 | 0.00 | 0.00 | 0.00 | 1.00 | 1.00 |
| **Recycling Sample** | **N** | **# ZEROES** | **# ONES** | **MEAN** | **STD** | **MIN** | **P25** | **P50** | **P75** | **MAX** |
| *σNIIND* | 614 | 0 | 614 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| *(σCI - σNI)IND*+ | 614 | 133 | 481 | 0.78 | 0.41 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| *σOCIIND* | 614 | 0 | 614 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| *σAFSIND* | 614 | 0 | 614 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| *σDERIVIND* | 614 | 382 | 232 | 0.38 | 0.49 | 0.00 | 0.00 | 0.00 | 1.00 | 1.00 |
| *σPENIND* | 614 | 425 | 189 | 0.31 | 0.46 | 0.00 | 0.00 | 0.00 | 1.00 | 1.00 |
| *σFCIND* | 614 | 569 | 45 | 0.07 | 0.26 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 |
| *σOTHERIND* | 614 | 411 | 203 | 0.33 | 0.47 | 0.00 | 0.00 | 0.00 | 1.00 | 1.00 |
| *σNIRECYIND* | 614 | 0 | 614 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| *σAFSUGLIND* | 614 | 0 | 614 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| *σAFSRECYIND* | 614 | 65 | 549 | 0.89 | 0.31 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| *σOTTIIND* | 614 | 546 | 68 | 0.11 | 0.31 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 |
| *σDERIVUGLIND* | 614 | 378 | 236 | 0.38 | 0.49 | 0.00 | 0.00 | 0.00 | 1.00 | 1.00 |
| *σDERIVRECYIND* | 614 | 487 | 127 | 0.21 | 0.41 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 |

Note: * indicates 383 negative, eight equal to zero for a total of 391. + indicates 133 negative, zero equal to zero for a total of 133.

Table 5 presents Pearson and Spearman correlation statistics for the primary regression variables. In this table only, I discuss statistical significance at the 0.05 level. I find a significant positive Pearson correlation between $\sigma OCI$ and $\sigma RET$, but an insignificant positive Spearman correlation between $\sigma OCI$ and $\sigma RET$. The Pearson and Spearman correlations between incremental comprehensive income volatility, $\sigma CI - \sigma NI$, and $\sigma RET$ are negative with the Spearman correlation significant, again illustrating the difference between incremental comprehensive income volatility and OCI volatility. I find significant positive Pearson (Spearman) correlations between four (three) out of five OCI component volatilities and $\sigma RET$, consistent with H1.

OCI volatility ($\sigma OCI$) appears to be primarily driven by volatility in AFS securities adjustments ($\sigma AFS$), as indicated by the large Pearson (0.97) and Spearman (0.90) correlations and the smaller correlations between $\sigma OCI$ and the other primary OCI component volatilities ($\sigma DERIV$, $\sigma PEN$, $\sigma FC$, and $\sigma OTHER$). $\sigma AFS$ is driven primarily by volatility in unrealized gains and losses on AFS securities ($\sigma AFSUGL$), as indicated by large Pearson (0.93) and Spearman (0.96) correlations.[14] Thus, subsequent multivariate estimations of the relation between returns volatility and OCI volatility may be driven primarily by the volatility of unrealized gains and losses on AFS securities.

$\sigma RET$ is significantly positively correlated with $\sigma AFSRECY$ (Pearson and Spearman). $\sigma RET$ is positively correlated with $\sigma OTTI$ (Pearson significant, Spearman insignificant) and $\sigma DERIVRECY$ (Pearson insignificant, Spearman significant). However, I find insignificant positive Pearson correlations between $\sigma RET$ and the volatilities of unrealized gains and losses on AFS securities ($\sigma AFSUGL$) and cash-flow hedges ($\sigma DERIVUGL$), a significant negative Spearman correlation between $\sigma RET$ and $\sigma AFSUGL$, and an insignificant positive correlation between $\sigma RET$ and $\sigma DERIVUGL$. Thus, associations between returns volatility and "fair value" OCI subcomponent volatilities vary based on whether gains and losses are unrealized or recycled, supporting H3.

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[14] I also find that $\sigma DERIV$ may be driven largely by volatility in unrealized gains and losses on cash-flow hedges ($\sigma DERIVUGL$), as indicated by large Pearson (0.98) and Spearman (0.98) correlations.

# Table 5: Correlation Statistics for Regression Variables

| VARIABLE | σRET | σNI | σCI - σNI | σOCI | σAFS | σDERIV | σPEN | σFC | σOTHER | EXP | EXPIND | GAP | GAPIND | MVE | BTM | CI | CI_1 | ANNRET | ANNRET_1 | PRICE_1 | σNIRECY | σAFSUGL | σAFSRECY | σOTTI | σDERIVUGL | σDERIVRECY | PRES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| σRET | | 0.62* | -0.04 | 0.07* | 0.05* | 0.10* | -0.12* | 0.06* | 0.08* | 0.03 | 0.16* | 0.08* | 0.00 | -0.01 | 0.34* | -0.33* | -0.49* | 0.06* | -0.18* | -0.14* | 0.47* | 0.06 | 0.12* | 0.25* | 0.01 | 0.03 | 0.16* |
| σNI | 0.63* | | 0.01 | 0.19* | 0.17* | 0.13* | 0.00 | 0.05 | 0.05* | -0.02 | 0.11* | 0.04 | -0.04 | -0.04 | 0.28* | -0.47* | -0.55* | -0.11* | -0.27* | -0.09* | 0.98* | 0.28* | 0.37* | 0.11* | 0.02 | -0.00 | 0.08 |
| σCI - σNI | -0.11* | -0.30* | | 0.72* | 0.72* | 0.04 | 0.06* | 0.11* | 0.09* | 0.03 | 0.04 | 0.04 | 0.03 | 0.06* | -0.09* | 0.06* | 0.05 | 0.07* | 0.06* | 0.01 | 0.22* | 0.74* | 0.28* | 0.02 | 0.09* | 0.02 | -0.10* |
| σOCI | 0.00 | -0.03 | 0.62* | | 0.97* | 0.11* | 0.10* | 0.21* | 0.17* | 0.04 | 0.08* | -0.00 | -0.03 | 0.06* | 0.00 | 0.02 | -0.03 | 0.05 | -0.01 | 0.01 | 0.29* | 0.89* | 0.56* | 0.26* | 0.08* | 0.03 | -0.10* |
| σAFS | -0.05* | -0.10* | 0.59* | 0.90* | | -0.00 | 0.07* | 0.14* | 0.07* | 0.01 | 0.06* | 0.03 | 0.01 | 0.02 | -0.02 | 0.04 | -0.01 | 0.06* | 0.02 | 0.01 | 0.27* | 0.93* | 0.58* | 0.27* | -0.01 | -0.06 | -0.07 |
| σDERIV | 0.08* | 0.13* | 0.06* | 0.17* | 0.04 | | 0.08* | 0.15* | -0.02 | 0.13* | 0.06* | -0.08* | -0.12* | 0.21* | 0.07* | -0.07* | -0.06* | 0.00 | -0.06* | 0.03 | 0.04 | -0.02 | -0.11* | -0.01 | 0.98* | 0.62* | -0.08* |
| σPEN | -0.22* | -0.07* | 0.08* | 0.14* | 0.09* | 0.16* | | 0.03 | -0.07* | -0.02 | 0.04 | -0.07* | -0.05* | -0.02 | 0.00 | -0.01 | -0.00 | -0.04 | -0.04 | 0.01 | 0.09* | 0.02 | -0.03 | -0.04 | 0.03 | -0.00 | -0.02 |
| σFC | 0.06* | 0.09* | 0.04 | 0.07* | -0.02 | 0.35* | 0.17* | | 0.01 | 0.21* | 0.03 | -0.08* | -0.07* | 0.24* | -0.00 | 0.03 | 0.04 | -0.02 | -0.03 | 0.12* | 0.06 | 0.02 | -0.04 | -0.03 | 0.20* | 0.34* | -0.09* |
| σOTHER | 0.10* | 0.16* | 0.05* | 0.15* | 0.02 | 0.21* | 0.03 | 0.19* | | 0.05* | 0.07* | -0.09* | -0.14* | 0.06* | 0.06* | -0.06* | -0.05* | -0.04 | -0.11* | 0.02 | -0.01 | -0.03 | -0.02 | 0.21* | -0.06 | 0.00 | -0.03 |
| EXP | 0.13* | 0.14* | -0.01 | 0.10* | 0.00 | 0.62* | 0.20* | 0.43* | 0.25* | | 0.04 | -0.10* | -0.14* | 0.81* | 0.01 | 0.00 | -0.00 | -0.01 | -0.03 | 0.07* | -0.00 | 0.03 | -0.04 | -0.03 | 0.23* | 0.03 | -0.07 |
| EXPIND | 0.20* | 0.11* | 0.03 | 0.09* | 0.07* | 0.13* | 0.03 | 0.07* | 0.06* | 0.30* | | 0.07* | 0.07* | 0.05* | -0.00 | -0.03 | -0.05 | 0.01 | -0.04 | -0.06* | 0.10* | 0.06 | 0.06 | 0.03 | 0.01 | -0.04 | -0.06 |
| GAP | 0.05* | -0.03 | 0.02 | -0.02 | 0.03 | -0.12* | -0.08* | -0.17* | -0.20* | -0.16* | 0.07* | | 0.66* | -0.12* | 0.05 | -0.03 | -0.01 | 0.02 | 0.04 | -0.03 | 0.13* | 0.11* | 0.02 | 0.06 | -0.01 | -0.08 | 0.06 |
| GAPIND | 0.02 | -0.09* | 0.02 | -0.02 | 0.04 | -0.13* | -0.08* | -0.18* | -0.20* | -0.15* | 0.07* | 0.92* | | -0.16* | -0.01 | 0.01 | 0.04 | 0.03 | 0.07* | 0.01 | 0.04 | -0.00 | -0.01 | -0.02 | -0.01 | -0.02 | 0.08* |
| MVE | -0.07* | -0.14* | 0.08* | 0.13* | 0.07* | 0.42* | 0.28* | 0.46* | 0.24* | 0.61* | 0.24* | -0.13* | -0.11* | | -0.04 | 0.06* | 0.05* | 0.01 | -0.01 | 0.10* | -0.03 | -0.00 | -0.06 | -0.03 | 0.30* | 0.08* | -0.09* |
| BTM | 0.43* | 0.48* | -0.18* | -0.11* | -0.15* | 0.02 | -0.16* | -0.10* | 0.17* | -0.05 | -0.07* | -0.02 | -0.05* | -0.45* | | -0.36* | -0.36* | -0.33* | -0.34* | -0.09* | 0.27* | -0.08 | 0.16* | 0.01 | 0.01 | 0.01 | 0.10* |
| CI | -0.31* | -0.43* | 0.18* | 0.10* | 0.15* | -0.02 | 0.10* | 0.10* | -0.09* | 0.06* | 0.03 | -0.01 | 0.01 | 0.36* | -0.56* | | 0.49* | 0.36* | 0.36* | 0.02 | -0.40* | 0.06 | -0.06 | -0.00 | 0.01 | 0.06 | -0.00 |
| CI_1 | -0.43* | -0.48* | 0.17* | 0.09* | 0.12* | -0.02 | 0.11* | 0.10* | -0.06* | 0.03 | -0.00 | 0.01 | 0.03 | 0.36* | -0.57* | 0.63* | | 0.13* | 0.37* | 0.10* | -0.45* | -0.01 | -0.19* | -0.05 | 0.03 | 0.10* | -0.05 |
| ANNRET | 0.06* | -0.14* | 0.10* | 0.05* | 0.07* | -0.02 | -0.02 | 0.01 | -0.08* | 0.01 | 0.03 | 0.02 | 0.02 | 0.14* | -0.37* | 0.33* | 0.15* | | 0.06* | -0.07* | -0.12* | 0.05 | -0.01 | -0.01 | -0.03 | -0.03 | 0.15* |
| ANNRET_1 | -0.21* | -0.33* | 0.10* | 0.03 | 0.06* | -0.06* | -0.00 | -0.00 | -0.14* | -0.07* | -0.04 | 0.04 | 0.06* | 0.13* | -0.42* | 0.41* | 0.35* | 0.08* | | 0.10* | -0.24* | 0.01 | -0.13* | -0.03 | -0.05 | -0.04 | -0.08 |
| PRICE_1 | -0.47* | -0.38* | 0.13* | 0.10* | 0.09* | 0.19* | 0.22* | 0.29* | 0.05* | 0.27* | 0.04 | -0.14* | -0.13* | 0.57* | -0.48* | 0.36* | 0.49* | -0.15* | 0.25* | | -0.04 | -0.08 | -0.08* | -0.04 | 0.08* | 0.10* | -0.06 |
| σNIRECY | 0.60* | 0.94* | -0.28* | -0.09* | -0.17* | 0.10* | 0.08* | 0.16* | 0.10* | 0.22* | 0.13* | -0.04 | -0.07 | -0.12* | 0.47* | -0.43* | -0.46* | -0.13* | -0.30* | -0.35* | | 0.21* | 0.32* | -0.05 | 0.04 | 0.03 | 0.08* |
| σAFSUGL | -0.10* | -0.12* | 0.61* | 0.84* | 0.96* | 0.04 | 0.05 | 0.02 | -0.10* | 0.03 | 0.07 | -0.02 | -0.05 | 0.03 | -0.18* | 0.23* | 0.21* | 0.07 | 0.06 | 0.12* | -0.19* | | 0.60* | 0.46* | -0.02 | -0.07 | -0.06 |
| σAFSRECY | 0.13* | 0.20* | -0.00 | 0.25* | 0.36* | -0.01 | 0.00 | -0.03 | -0.01 | 0.09* | 0.10* | -0.02 | 0.01 | -0.03 | 0.15* | -0.10* | -0.16* | -0.02 | -0.10* | -0.11* | 0.15* | 0.38* | | 0.20* | -0.11* | -0.07 | 0.03 |
| σOTTI | 0.07 | 0.13* | 0.09* | 0.10* | 0.12* | 0.07 | -0.05 | -0.02 | 0.22* | -0.03 | 0.07 | -0.09* | -0.12* | -0.06 | 0.16* | 0.03 | -0.01 | 0.00 | -0.05 | -0.01 | -0.00 | 0.21* | 0.14* | | -0.01 | -0.04 | -0.02 |
| σDERIVUGL | 0.03 | 0.07 | 0.13* | 0.17* | 0.05 | 0.98* | 0.09* | 0.35* | 0.23* | 0.54* | 0.02 | -0.04 | -0.06 | 0.35* | 0.03 | 0.03 | 0.03 | -0.02 | -0.04 | 0.22* | 0.09* | 0.05 | -0.01 | 0.06 | | 0.66* | -0.08* |
| σDERIVRECY | 0.09* | 0.11* | 0.01 | 0.11* | 0.02 | 0.64* | 0.11* | 0.34* | 0.22* | 0.39* | -0.00 | -0.07 | -0.05 | 0.33* | 0.15* | -0.05 | -0.05 | -0.05 | -0.08* | 0.14* | 0.16* | 0.01 | 0.09* | 0.08 | 0.66* | | -0.10* |
| PRES | 0.17* | 0.07 | -0.13* | -0.20* | -0.14* | -0.10* | -0.06 | -0.15* | -0.06 | -0.07 | -0.06 | 0.06 | 0.08* | -0.08* | 0.22* | -0.09* | -0.11* | 0.12* | -0.10* | -0.22* | 0.08* | -0.11* | 0.08* | -0.01 | -0.06 | -0.05 | |

Note: Pearson (above) and Spearman (below) correlation statistics. * indicates statistical significance at the 5% level based on two-tailed tests.

## *2.3 Research Design and Results*

### 2.3.1 Returns Volatility, Incremental Comprehensive Income Volatility, and OCI Volatility

In this section, I compare results using my samples to results from Hodder et al. (2006). First, I investigate whether net income volatility ($\sigma NI$) and incremental comprehensive income volatility ($\sigma CI - \sigma NI$) are associated with returns volatility. I then relax the assumption of variance additivity between net income and OCI and directly calculate OCI volatility ($\sigma OCI$). Following Hodder et al. (2006), I estimate equation (1) using panel OLS regression with firm-clustered standard errors.

$$\begin{aligned}\sigma RET_{it} = \beta_0 + \beta_1 \sigma NIProxy_{it} + \beta_2 \sigma OCIProxy_{it} + \beta_3 EXP_{it} + \beta_4 EXPIND_{it} + \beta_5 GAP_{it} \\ + \beta_6 GAPIND_{it} + \beta_7 MVE_{it} + \beta_8 BTM_{it} + \beta_9 CI_{it} + \beta_{10} CI_{it-1} + \beta_{11} ANNRET_{it} \\ + \beta_{12} ANNRET_{it-1} + \beta_{13} PRICE_{it-1} + \sum_{10} \gamma_{2002-2011} + \varepsilon_{it} \qquad (1)\end{aligned}$$

$\sigma RET_{it}$ represents returns volatility for firm *i* in year *t*. $\sigma NIProxy_{it}$ is the firm-specific rolling five-year standard deviation of either $NI_{it}$ or $NIRECY_{it}$ (net income before "fair value" OCI component recycling adjustments) calculated using years *t-4* through *t*. $EXP_{it}$ represents firm *i*'s total exposure to derivatives in year *t*. $EXPIND_{it}$ is an indicator variable equal to one when $EXP_{it}$ is missing prior to setting missing values of $EXP_{it}$ equal to zero. $GAP_{it}$ represents firm *i*'s exposure to interest rate changes in year *t*. $GAPIND_{it}$ is an indicator variable equal to one when $GAP_{it}$ is missing prior to setting missing values of $GAP_{it}$ equal to zero. I expect $EXP_{it}$ and $GAP_{it}$ to be positively associated with returns volatility (Hodder et al., 2006) and make no prediction for

$EXPIND_{it}$ and $GAPIND_{it}$. In addition to the controls from Hodder et al. (2006) ($EXP_{it}$ and $GAP_{it}$), the model includes controls for size ($MVE_{it}$), growth opportunities ($BTM_{it}$), accounting performance ($CI_{it}$ and $CI_{it-1}$), and market performance ($ANNRET_{it}$, $ANNRET_{it-1}$, and $PRICE_{it-1}$), as well as year fixed effects. Since my study concerns the risk-relevance of OCI components, rather than a comparison of the risk-relevance of net income, comprehensive income, and full-fair-value income as in Hodder et al. (2006), I do not examine incremental full-fair-value income volatility in my primary tests.[15]

Table 6, Columns (1)-(4) present the results of estimating variations of equation (1) when $\sigma NIProxy_{it}$ equals $\sigma NI_{it}$ and $\sigma OCIProxy_{it}$ equals $\sigma CI_{it} - \sigma NI_{it}$ (incremental comprehensive income volatility). The signs of the coefficients on the two control variables from Hodder et al. (2006), $EXP_{it}$ and $GAP_{it}$, are both positive, though neither variable is statistically significant. In Hodder et al. (2006), $EXP_{it}$ is significant, while $GAP_{it}$ is not. $\beta_2$ is interpreted as the incremental relevance of OCI volatility for returns volatility, controlling for net income volatility. I find that net income volatility, $\sigma NI_{it}$, is positive and significantly associated with returns volatility and that incremental comprehensive income volatility, $\sigma CI_{it} - \sigma NI_{it}$, is not significantly associated with

[15] I examine whether including the volatility of a measure of full-fair-value income minus comprehensive income in my empirical tests changes my primary inferences in Section 2.4.

returns volatility, consistent with Hodder et al.'s (2006) model which also includes incremental full-fair-value volatility.[16]

Table 6, Columns (5)-(8) present the results of estimating variations of equation (1) when $\sigma NIProxy_{it}$ equals $\sigma NIRECY_{it}$ and $\sigma OCIProxy_{it}$ equals $\sigma CI_{it} - \sigma NI_{it}$ (incremental comprehensive income volatility). $\sigma NIRECY_{it}$ represents the volatility of net income before recycling adjustments. I exclude recycling adjustments from this variable so as not to include the same amounts twice in two different regression variables, $\sigma NIProxy_{it}$ and $\sigma OCIProxy_{it}$. I find a positive and significant coefficient on $\sigma NIRECY_{it}$ and an unexpected negative and significant coefficient on $\sigma CI_{it} - \sigma NI_{it}$. Hodder et al. (2006) find a positive and insignificant relation between $\sigma CI_{it} - \sigma NI_{it}$ and returns volatility; however, when beta is used as the dependent variable, the coefficient on $\sigma CI_{it} - \sigma NI_{it}$ is significant and negative. Though the use of $\sigma CI_{it} - \sigma NI_{it}$ may be problematic due to the potential to obtain negative values of $\sigma CI_{it} - \sigma NI_{it}$ and non-zero correlations between $NI$ and $OCI$, I examine negative relations between OCI component volatilities and risk in subsequent analyses. In addition, I use $\sigma OCI_{it}$ as the measure of $\sigma OCIProxy_{it}$ due to the issues with $\sigma CI_{it} - \sigma NI_{it}$ noted above.

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[16] This finding is also consistent with Khan and Bradbury (2012; 2014).

**Table 6: Returns Volatility and Incremental Comprehensive Income Volatility**

| **Dependent Variable =** | *σRET* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **PARAMETER** | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** | **(7)** | **(8)** |
| *σNI* | 4.51*** | 3.70*** | 3.46*** | 2.95*** | | | | |
| | (7.86) | (6.59) | (6.24) | (5.48) | | | | |
| *σNIRECY* | | | | | 3.07*** | 2.36*** | 2.39*** | 1.89*** |
| | | | | | (5.96) | (4.73) | (4.92) | (3.95) |
| *σCI - σNI* | -1.27 | -1.79 | -1.15 | -1.59 | -3.16** | -2.99** | -2.89** | -2.91*** |
| | (-0.63) | (-1.08) | (-0.71) | (-1.11) | (-2.06) | (-2.37) | (-2.29) | (-2.73) |
| *EXP* | | | 0.00 | 0.00 | | | 0.00*** | 0.00*** |
| | | | (0.55) | (0.67) | | | (3.15) | (2.72) |
| *EXPIND* | | | 1.68*** | 1.05** | | | 1.35 | 0.68 |
| | | | (3.72) | (2.59) | | | (1.46) | (0.76) |
| *GAP* | | | 0.02 | 0.02 | | | 0.04 | 0.04 |
| | | | (0.74) | (0.78) | | | (0.95) | (0.97) |
| *GAPIND* | | | -0.05 | 0.15 | | | -0.43 | -0.17 |
| | | | (-0.15) | (0.43) | | | (-0.76) | (-0.30) |
| *MVE* | | | 0.00 | 0.00 | | | -0.00 | -0.00 |
| | | | (0.09) | (0.36) | | | (-1.46) | (-1.05) |
| *BTM* | | | 1.28*** | 0.75*** | | | 1.25*** | 0.57* |
| | | | (4.47) | (3.21) | | | (3.41) | (1.85) |
| *CI* | | | -0.16 | -0.23 | | | -0.06 | -0.11 |
| | | | (-1.05) | (-1.58) | | | (-0.33) | (-0.63) |
| *CI_1* | | | -0.73*** | -0.64*** | | | -0.50** | -0.46** |
| | | | (-5.42) | (-5.02) | | | (-2.42) | (-2.23) |
| *ANNRET* | | | 0.03*** | 0.02*** | | | 0.03*** | 0.01** |
| | | | (8.51) | (3.72) | | | (6.96) | (2.43) |
| *ANNRET_1* | | | 0.01*** | 0.01 | | | 0.01 | -0.00 |
| | | | (3.23) | (1.25) | | | (1.61) | (-0.34) |
| *PRICE_1* | | | -0.00* | -0.00 | | | -0.00** | -0.00 |
| | | | (-1.76) | (-1.34) | | | (-2.31) | (-0.28) |
| *YEAR FE* | NO | YES | NO | YES | NO | YES | NO | YES |
| N | 1,620 | 1,620 | 1,620 | 1,620 | 614 | 614 | 614 | 614 |
| $R^2$ | 0.39 | 0.52 | 0.50 | 0.56 | 0.25 | 0.42 | 0.39 | 0.48 |

$$\sigma RET_{it} = \beta_0 + \beta_1 \sigma NIProxy_{it} + \beta_2 \sigma OCIProxy_{it} + \beta_3 EXP_{it} + \beta_4 EXPIND_{it} + \beta_5 GAP_{it} + \beta_6 GAPIND_{it} + \beta_7 MVE_{it} + \beta_8 BTM_{it} + \beta_9 CI_{it} + \beta_{10} CI_{it-1} + \beta_{11} ANNRET_{it} + \beta_{12} ANNRET_{it-1} + \beta_{13} PRICE_{it-1} + \sum_{10} \gamma_{2002-2011} + \varepsilon_{it} \quad (1)$$

Note: The table presents the results of estimating equation (1) using the full sample in Columns (1)-(4) and the recycling sample in Columns (5)-(8). $\sigma NIProxy_{it}$ equals $\sigma NI_{it}$ in Columns (1)-(4) and equals $\sigma NIRECY_{it}$ in Columns (5)-(8). $\sigma OCIProxy_{it}$ equals $\sigma CI_{it} - \sigma NI_{it}$. Variables are defined in Appendix B. The constant term is included, but not presented for the sake of brevity. Regression coefficients are presented above t-statistics calculated based on standard errors clustered at the firm level. ***, **, and * indicate statistical significance at the 0.01, 0.05, and 0.10 levels based on two-tailed tests.

Table 7, Columns (1)-(4) present the results of estimating variations of equation (1) when $\sigma NIProxy_{it}$ equals $\sigma NI_{it}$ and $\sigma OCIProxy_{it}$ equals $\sigma OCI_{it}$. I find that $\sigma NI_{it}$ is positive and significantly associated with returns volatility, while $\sigma OCI_{it}$ is not significantly associated with returns volatility. Table 7, Columns (5)-(8) present the results of estimating variations of equation (1) when $\sigma NIProxy_{it}$ equals $\sigma NIRECY_{it}$ and $\sigma OCIProxy_{it}$ equals $\sigma OCI_{it}$. I find a positive and significant coefficient on $\sigma NIRECY_{it}$ and an insignificant coefficient on $\sigma OCI_{it}$. Overall, the results from Tables 6 and 7 indicate that net income is positively associated with total risk as represented by returns volatility, while OCI is not. However, Tables 6 and 7 do not allow the risk-relevance effects to vary by OCI component, or by the unrealized and recycled subcomponents of OCI. I perform these analyses in subsequent sections.

## Table 7: Returns Volatility and OCI Volatility

| **Dependent Variable =** | *σRET* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **PARAMETER** | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** | **(7)** | **(8)** |
| *σNI* | 4.58*** | 3.79*** | 3.53*** | 3.04*** | | | | |
| | (8.38) | (6.85) | (6.48) | (5.64) | | | | |
| *σNIRECY* | | | | | 3.07*** | 2.36*** | 2.38*** | 1.89*** |
| | | | | | (5.47) | (4.41) | (4.45) | (3.57) |
| *σOCI* | -0.99 | -1.49 | -0.92 | -1.24 | -1.92 | -2.10 | -1.86 | -1.97 |
| | (-0.69) | (-1.24) | (-0.80) | (-1.17) | (-1.03) | (-1.39) | (-1.12) | (-1.36) |
| *EXP* | | | 0.00 | 0.00 | | | 0.00*** | 0.00** |
| | | | (0.57) | (0.71) | | | (2.95) | (2.52) |
| *EXPIND* | | | 1.70*** | 1.08*** | | | 1.36 | 0.68 |
| | | | (3.72) | (2.64) | | | (1.44) | (0.75) |
| *GAP* | | | 0.02 | 0.02 | | | 0.03 | 0.03 |
| | | | (0.71) | (0.74) | | | (0.82) | (0.85) |
| *GAPIND* | | | -0.07 | 0.12 | | | -0.43 | -0.18 |
| | | | (-0.20) | (0.36) | | | (-0.77) | (-0.32) |
| *MVE* | | | 0.00 | 0.00 | | | -0.00 | -0.00 |
| | | | (0.07) | (0.33) | | | (-1.34) | (-0.93) |
| *BTM* | | | 1.29*** | 0.77*** | | | 1.34*** | 0.65** |
| | | | (4.41) | (3.23) | | | (3.59) | (2.10) |
| *CI* | | | -0.15 | -0.21 | | | -0.04 | -0.09 |
| | | | (-0.98) | (-1.45) | | | (-0.21) | (-0.51) |
| *CI_1* | | | -0.72*** | -0.63*** | | | -0.50** | -0.44** |
| | | | (-5.27) | (-4.80) | | | (-2.30) | (-2.07) |
| *ANNRET* | | | 0.03*** | 0.02*** | | | 0.03*** | 0.01** |
| | | | (8.60) | (3.71) | | | (7.18) | (2.46) |
| *ANNRET_1* | | | 0.01*** | 0.01 | | | 0.01 | -0.00 |
| | | | (3.17) | (1.20) | | | (1.42) | (-0.55) |
| *PRICE_1* | | | -0.00* | -0.00 | | | -0.00** | -0.00 |
| | | | (-1.71) | (-1.23) | | | (-2.10) | (-0.30) |
| *YEAR FE* | NO | YES | NO | YES | NO | YES | NO | YES |
| N | 1,620 | 1,620 | 1,620 | 1,620 | 614 | 614 | 614 | 614 |
| $R^2$ | 0.39 | 0.52 | 0.50 | 0.56 | 0.24 | 0.41 | 0.38 | 0.47 |

$$\sigma RET_{it} = \beta_0 + \beta_1 \sigma NIProxy_{it} + \beta_2 \sigma OCIProxy_{it} + \beta_3 EXP_{it} + \beta_4 EXPIND_{it} + \beta_5 GAP_{it} + \beta_6 GAPIND_{it} + \beta_7 MVE_{it} + \beta_8 BTM_{it} + \beta_9 CI_{it} + \beta_{10} CI_{it-1} + \beta_{11} ANNRET_{it} + \beta_{12} ANNRET_{it-1} + \beta_{13} PRICE_{it-1} + \sum_{10} \gamma_{2002-2011} + \varepsilon_{it} \quad (1)$$

Note: The table presents the results of estimating equation (1) using the full sample in Columns (1)-(4) and the recycling sample in Columns (5)-(8). $\sigma NIProxy_{it}$ equals $\sigma NI_{it}$ in Columns (1)-(4) and equals $\sigma NIRECY_{it}$ in Columns (5)-(8). $\sigma OCIProxy_{it}$ equals $\sigma OCI_{it}$. Variables are defined in Appendix B. The constant term is included, but not presented for the sake of brevity. Regression coefficients are presented above t-statistics calculated based on standard errors clustered at the firm level. ***, **, and * indicate statistical significance at the 0.01, 0.05, and 0.10 levels based on two-tailed tests.

## 2.3.2 Returns Volatility and OCI Component Volatilities

My first hypothesis predicts OCI component volatilities are positively associated with returns volatility. I test H1 by calculating firm-specific rolling five-year OCI component volatilities over years *t-4* to *t* for the "fair value" OCI components ($\sigma AFS_{it}$ – AFS securities component volatility and $\sigma DERIV_{it}$– cash-flow hedge component volatility) and the "accounting calculation" OCI components ($\sigma PEN_{it}$ – pension-related component volatility, $\sigma FC_{it}$ – foreign currency translation adjustment volatility, and $\sigma OTHER_{it}$– "other" component volatility) and estimate equation (2). I include $\sigma NIRECY_{it}$ instead of $\sigma NI_{it}$ to avoid including recycling adjustments twice in the same estimation.

$$\sigma RET_{it} = \beta_0 + \beta_1 \sigma NIRECY_{it} + \beta_2 \sigma AFS_{it} + \beta_3 \sigma DERIV_{it} + \beta_4 \sigma PEN_{it} + \beta_5 \sigma FC_{it} + \beta_6 \sigma OTHER_{it} + \sum_j \delta_j \, CONTROLS_{it} + \sum_{10} \gamma_{2002-2011} + \varepsilon_{it} \quad (2)$$

Table 8 presents the results of estimating equation (2) using the full sample. $CONTROLS_{it}$ includes $EXP_{it}$, $EXPIND_{it}$, $GAP_{it}$, $GAPIND_{it}$, $MVE_{it}$, $BTM_{it}$, $CI_{it}$, $CI_{it-1}$, $ANNRET_{it}$, $ANNRET_{it-1}$, and $PRICE_{it-1}$. I find that the "fair value" component volatilities ($\sigma AFS_{it}$ and $\sigma DERIV_{it}$) are not significantly associated with returns volatility.

Of the “accounting calculation” component volatilities, pension-related volatility ($\sigma PEN_{it}$) is significantly associated with returns volatility, but its association is unexpectedly negative. Foreign currency translation adjustment volatility ($\sigma FC_{it}$) is significantly positively associated with returns volatility.

In untabulated results, I examine whether OCI component volatilities reinforce or dampen each other’s associations with returns volatility by estimating abbreviated versions of equation (2) with each possible combination of two OCI component volatilities. For example, I estimate equation (2) including the OCI component volatilities for AFS securities ($\sigma AFS_{it}$) and cash-flow hedges ($\sigma DERIV_{it}$) instead of including all five OCI component volatilities ($\sigma AFS_{it}$, $\sigma DERIV_{it}$, $\sigma PEN_{it}$, $\sigma FC_{it}$, and $\sigma OTHER_{it}$) to see if $\sigma DERIV_{it}$ reinforces or dampens the association between $\sigma AFS_{it}$ and $\sigma RET_{it}$. I find little evidence that OCI primary component volatilities significantly reinforce or dampen each other’s associations with returns volatility using this modification of the “all OCI components” model presented in Table 8, Column (4).

A given firm may not have each component of OCI each year. Thus, I investigate whether the effects of OCI component volatilities in Table 8 are driven by observations that have non-zero values of OCI component volatilities. Table 4 indicates the number of observations with non-zero values of OCI component volatilities. To do this, I estimate the specification in Table 8, Column (4) five additional times, each time restricting the sample to non-zero observations for a given OCI component volatility. While power is reduced due to a smaller sample size (N = 189), I find that the association between pension-related volatility and returns volatility is significant at the 0.10 level and the point estimate is -10.91, closer to zero than the point estimate of -13.84 from Table 8, Column (4) when I restrict the sample to observations with non-zero (positive) values of pension-related volatility (N = 189). Thus, observations with zero values of pension-related volatility may at least partially drive the initially-documented, significant negative relation between pension-related volatility and returns volatility. This result may indicate that firms without pension plans (smaller firms) have more equity market volatility (more risk) than firms with pension plans (large firms). A t-test using the full sample confirms that observations with no pension volatility are significantly smaller than observations with pension volatility based on the market value of equity.

Furthermore, the negative relation between pension-related volatility and returns volatility may be consistent with the intention of SFAS 158 to continue the practice of deferring certain pension gains and losses to OCI, instead of recognizing them in net income. Specifically, the FASB states, "This Statement does not change the past practice of delaying recognition of gains and losses as a component of net periodic benefit cost, reflecting the long-term nature of postretirement benefit arrangements" (FASB, 2006, p. 63). It appears that one of the intentions of the FASB was to enable pension gains and losses, which could introduce additional volatility into net income if included, to bypass net income and flow through OCI, resulting in a smoothing effect for net income. In other words, net income is smoother than it might have been had pension-related OCI adjustments been included in net income, and investors may respond favorably to "avoided" pension-related volatility that bypasses net income and is recognized in OCI.[17]

When I restrict the sample to observations with non-zero (positive) values of foreign currency translation adjustment volatility, I find an insignificant positive association between foreign currency translation adjustment volatility and returns volatility, though the results should be interpreted with caution due to the small number of observations (N = 45). Inferences for the other primary OCI component volatilities are unaffected.

Thus, Table 8 provides no evidence in support of H1 for AFS securities adjustments, cash-flow hedge adjustments, pension adjustments, or "other" adjustments. Only the results for foreign currency translation adjustment volatility support H1, and these results are attenuated when considering only observations with non-zero foreign currency translation adjustment volatility.

[17] Since $\sigma PEN$ is the result of both unrealized and recycled pension-related adjustments, I leave the study of which subcomponent (unrealized or recycled) of the pension adjustment, or both, drive any possible smoothing relationship resulting from the exclusion of pension-related OCI adjustments from net income to future work.

My second hypothesis predicts "fair value" OCI component volatilities have different associations with returns volatility than do "accounting calculation" OCI component volatilities. To test H2, I inspect individual OCI component volatility coefficients and perform two hypothesis tests using the estimation results for equation (2) in each column. First, I test whether AFS component volatility (cash-flow hedge component volatility) has a different relative correlation with returns volatility than the cumulative effect of the "accounting calculation" component volatilities by performing the following F-test: $\beta_2 = \beta_4 + \beta_5 + \beta_6$ ($\beta_3 = \beta_4 + \beta_5 + \beta_6$) and fail to find evidence in support of H2 for each column of Table 8. Second, I test whether the cumulative effect of the "fair value" component volatilities is different from the cumulative effect of the "accounting calculation" component volatilities by performing the following F-test: $\beta_2 + \beta_3 = \beta_4 + \beta_5 + \beta_6$, and again fail to find evidence in support of H2. However, the effects of pension-related volatility and foreign currency translation are significant as noted above and likely offset one another in the tests performed. Untabulated F-tests indicate that individual "fair value" component volatilities have different relative correlations with returns volatility than both pension-related volatility and foreign currency translation volatility do (for example, a test of $\beta_2 = \beta_4$). Thus, I find mixed evidence in support of H2. Overall, the results from Table 8 suggest that associations between returns volatility and OCI component volatilities vary not only in strength but also in sign.[18,19]

[18] To examine whether negative relations between returns volatility and OCI component volatilities occur only for bank holding companies, I estimate equation (2) for a sample of 6,845 observations from 2,300 non-financial firms from the Compustat/CRSP intersection from 2005 to 2012 with data requirements similar to those used for the full bank holding company sample. Observations from 2002 to 2004 are not included due to failure to meet data requirements. I do not calculate $EXP_{it}$, $EXPIND_{it}$, $GAP_{it}$, and $GAPIND_{it}$ for these observations, as they are particularly applicable to bank holding companies (Hodder et al., 2006), and these variables are calculated using bank data from SNL Financial. Estimating models similar to those in Table 8, I find significant negative associations between returns volatility and $\sigma DERIV_{it}$, $\sigma PEN_{it}$, $\sigma FC_{it}$, and $\sigma OTHER_{it}$ in Columns (1) and (2), between returns volatility and $\sigma FC_{it}$, and $\sigma OTHER_{it}$ in Column (3), and between returns volatility and $\sigma OTHER_{it}$ in Column (4). Results indicate that negative associations between returns volatility and OCI component volatilities may also occur for non-financial firms.

[19] When collecting the data for unrealized and recycled gains and losses on AFS securities and cash-flow hedges, I occasionally find observations where $AFSUGL + AFSRECY$ or $DERIVUGL + DERIVRECY$ are not equal to $AFS$ and $DERIV$ reported by SNL Financial. I estimate equation (2) from Table 8, Columns (1)-(4) with volatilities based on $AFS = AFSUGL + AFSRECY + OTTI$ and $DERIV = DERIVUGL + DERIVRECY$ instead of $AFS$ and $DERIV$ from SNL Financial. Inferences are unchanged.

**Table 8: Returns Volatility and OCI Component Volatilities**

| **Dependent Variable =** | | *σRET* | | |
|---|---|---|---|---|
| **PARAMETER** | **(1)** | **(2)** | **(3)** | **(4)** |
| *σNIRECY* | 3.09*** | 2.39*** | 2.32*** | 1.83*** |
| | (5.52) | (4.59) | (4.51) | (3.77) |
| *σAFS* | -1.81 | -2.10 | -1.62 | -1.82 |
| | (-0.98) | (-1.39) | (-0.97) | (-1.26) |
| *σDERIV* | -1.69 | -4.11 | -0.98 | -3.73 |
| | (-0.53) | (-1.30) | (-0.36) | (-1.36) |
| *σPEN* | -14.31*** | -14.04** | -14.61*** | -13.84*** |
| | (-3.35) | (-2.60) | (-3.41) | (-2.90) |
| *σFC* | 17.28*** | 20.43*** | 20.51*** | 21.19*** |
| | (4.40) | (4.67) | (9.05) | (9.72) |
| *σOTHER* | 7.89 | 2.31 | 6.14 | 2.45 |
| | (1.26) | (0.35) | (0.93) | (0.36) |
| *CONTROLS* | NO | NO | YES | YES |
| *YEAR FE* | NO | YES | NO | YES |
| *(H2) F-stat* ($\beta_2 = \beta_4 + \beta_5 + \beta_6$) | 1.80 | 1.09 | 1.81 | 1.18 |
| *(H2) F-stat* ($\beta_3 = \beta_4 + \beta_5 + \beta_6$) | 1.47 | 1.29 | 1.53 | 1.53 |
| *(H2) F-stat* ($\beta_2 + \beta_3 = \beta_4 + \beta_5 + \beta_6$) | 1.88 | 1.71 | 1.90 | 1.94 |
| N | 614 | 614 | 614 | 614 |
| $R^2$ | 0.29 | 0.46 | 0.44 | 0.52 |

$$\sigma RET_{it} = \beta_0 + \beta_1 \sigma NIRECY_{it} + \beta_2 \sigma AFS_{it} + \beta_3 \sigma DERIV_{it} + \beta_4 \sigma PEN_{it} + \beta_5 \sigma FC_{it} + \beta_6 \sigma OTHER_{it} + \sum_j \delta_j\, CONTROLS_{it} + \sum_{10} \gamma_{2002-2011} + \varepsilon_{it} \quad (2)$$

Note: The table presents the results of estimating equation (2). $CONTROLS_{it}$ includes derivatives exposure ($EXP_{it}$), an indicator for non-missing derivatives exposure ($EXPIND_{it}$), interest rate gap ($GAP_{it}$), an indicator for non-missing interest rate gap ($GAPIND_{it}$), firm size ($MVE_{it}$), book-to-market ratio ($BTM_{it}$), comprehensive income ($CI_{it}$), lagged comprehensive income ($CI_{it-1}$), annual stock return ($ANNRET_{it}$), lagged annual stock return ($ANNRET_{it-1}$), and lagged price ($PRICE_{it-1}$). The constant term is included, but not presented for the sake of brevity. Regression coefficients are presented above t-statistics calculated based on standard errors clustered at the firm level. ***, **, and * indicate statistical significance at the 0.01, 0.05, and 0.10 levels based on two-tailed tests.

### 2.3.3 Returns Volatility and OCI Unrealized and Recycled Subcomponent Volatilities

"Fair value" OCI components are composed of their unrealized and recycled subcomponents. The correlation matrix in Table 5 indicates $\sigma AFS$ and $\sigma DERIV$ are probably driven by volatility in their unrealized subcomponents, $\sigma AFSUGL$ and $\sigma DERIVUGL$. I estimate equation (3) including the "fair value" unrealized and recycled subcomponent volatilities and the "accounting calculation" component volatilities.

$$\begin{aligned}\sigma RET_{it} = \beta_0 &+ \beta_1 \sigma NIRECY_{it} + \beta_2 \sigma AFSUGL_{it} + \beta_3 \sigma AFSRECY_{it} + \beta_4 \sigma OTTI_{it} \\ &+ \beta_5 \sigma DERIVUGL_{it} + \beta_6 \sigma DERIVRECY_{it} + \beta_7 PEN_{it} + \beta_8 FC_{it} + \beta_9 \sigma OTHER_{it} \\ &+ \sum_j \delta_j \, CONTROLS_{it} + \sum_{10} \gamma_{2002-2011} + \varepsilon_{it} \end{aligned} \quad (3)$$

Table 9, Columns (1)-(4) present the results of estimating equation (3). I find that the volatilities of unrealized gains and losses on AFS securities ($\sigma AFSUGL_{it}$) and cash-flow hedges ($\sigma DERIVUGL_{it}$) are significantly negatively associated with returns volatility, while the volatilities of recycled gains and losses on AFS securities ($\sigma AFSRECY_{it}$) and cash-flow hedges ($\sigma DERIVRECY_{it}$) are not significantly associated with returns volatility. I also find that the volatility of OTTI adjustments ($\sigma OTTI_{it}$) is significantly positively associated with returns volatility. In untabulated results, I find when I estimate equation (2) with controls and year fixed effects for observations where $\sigma OTTI_{it} = 0$ ($\sigma OTTI_{it} > 0$), the coefficient on $\sigma AFSUGL_{it}$ is negative and significant (negative and insignificant).[20] When I estimate equation (2) with controls and year fixed effects for observations where $\sigma DERIVRECY_{it} = 0$ ($\sigma DERIVRECY_{it} > 0$), the coefficient on $\sigma DERIVUGL_{it}$ is negative and insignificant (negative and significant).

For AFS securities adjustments, these findings are consistent with investors perceiving the volatility of non-OTTI AFS unrealized gains and losses as relatively less important, less risky, or less risk-relevant, than OTTI losses. In addition, the findings are consistent with OTTI losses providing a potential incremental signal on the investment ability and strategy of the firm (Badertscher et al., 2014). For cash-flow hedges, these findings are consistent with prior work implying that changes in fair values of cash-flow hedges, particularly negative changes (losses) can be positive signals to investors that managers are actively attempting to manage risk (Kanagaretnam et al., 2009).[21]

I test whether unrealized OCI subcomponent volatilities ($\sigma AFSUGL_{it}$ and $\sigma DERIVUGL_{it}$) differ from recycled OCI subcomponent volatilities ($\sigma AFSRECY_{it}$, $\sigma OTTI_{it}$, and $\sigma DERIVRECY_{it}$) in their associations with returns volatility using F-tests for coefficient equality ($\beta_2 = \beta_3$, $\beta_2 = \beta_4$, and $\beta_5 = \beta_6$). Of the three F-tests performed in

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[20] $EXPIND_{it}$ is omitted from the model where $\sigma OTTI_{it} > 0$ due to multicollinearity.

[21] In the sample of 2,724 bank-year observations from 1998 to 2012 (Table 2), 345 have negative values of $DERIV$, 2,045 have zero values of $DERIV$, and 334 have positive values of $DERIV$. In the sample of 1,046 bank-year observations from 1998 to 2012 (Table 2), 141 have negative values of $DERIV$, 788 have zero values of $DERIV$,and 117 have positive values of $DERIV$. As negative values outnumber positive values of $DERIV$, the intuition from Kanagaretnam et al. (2009) appears likely to apply to the samples analyzed in this paper.

each column, only the test of $\beta_2 = \beta_4$ provides consistent support for H3. For example, in Column (4), the test of $\beta_2 = \beta_4$ yields an F-statistic equal to 18.35, p < 0.01. This result indicates that the coefficient on $\sigma AFSUGL_{it}$ is significantly different from the coefficient on $\sigma OTTI_{it}$. In Table 9, Column (4), I find modest evidence that the coefficient on $\sigma DERIVUGL_{it}$ is significantly different from the coefficient on $\sigma DERIVRECY_{it}$.

In untabulated results, I examine whether OCI component and subcomponent volatilities reinforce or dampen each other's associations with returns volatility by examining each possible combination of two OCI component volatilities. For example, I estimate equation (3) including $\sigma AFSUGL_{it}$ and $\sigma AFSRECY_{it}$ instead of including $\sigma AFSUGL_{it}$, $\sigma AFSRECY_{it}$, $\sigma OTTI_{it}$, $\sigma DERIVUGL_{it}$, $\sigma DERIVRECY_{it}$, $\sigma PEN_{it}$, $\sigma FC_{it}$, and $\sigma OTHER_{it}$) to see if $\sigma AFSRECY_{it}$ reinforces or dampens the association between $\sigma AFSUGL_{it}$ and $\sigma RET_{it}$. I find that only when $\sigma OTTI_{it}$ ($\sigma DERIVRECY_{it}$) is included in the estimation is the coefficient on $\sigma AFSUGL_{it}$ ($\sigma DERIVUGL_{it}$) significant and negative. This finding is consistent with the relatively large positive correlations between $\sigma OTTI_{it}$ ($\sigma DERIVRECY_{it}$) and $\sigma AFSUGL_{it}$ ($\sigma DERIVUGL_{it}$) in Table 5, though regression diagnostics indicate that multicollinearity is not a significant issue in Table 9.[22] I also find that $\sigma OTTI_{it}$ significantly reinforces the negative relation between $\sigma AFSRECY_{it}$ and $\sigma RET_{it}$.

[22] I use the "vif" procedure in STATA to investigate multicollinearity (IDRE, 2013-2014).

Overall, the evidence from Table 9 suggests that volatility in unrealized gains and losses of "fair value" OCI components is negatively associated with risk, while volatility in OTTI losses is positively associated with risk, similar to net income volatility.[23]

[23] One observation in the sample of 1,046 bank-year observations from Table 2 has a negative value for an OTTI loss reported by the bank (indicating a gain). Removing observations for this bank from the recycling sample of 614 observations leads to a sample of 610 observations. Estimating the models in Table 9, Columns (1)-(4) for this sample of 610 observations, the results are similar to those presented in Table 9.

**Table 9: Returns Volatility and OCI Unrealized and Recycled Subcomponent Volatilities**

| Dependent Variable = | *σRET* | | | |
|---|---|---|---|---|
| **PARAMETER** | **(1)** | **(2)** | **(3)** | **(4)** |
| *σNIRECY* | 3.31*** | 2.71*** | 2.72*** | 2.26*** |
| | (6.76) | (6.07) | (6.20) | (5.69) |
| *σAFSUGL* | -3.79** | -3.67** | -2.73* | -2.92** |
| | (-2.12) | (-2.46) | (-1.94) | (-2.30) |
| *σAFSRECY* | -0.30 | -2.02 | -2.96 | -3.28 |
| | (-0.07) | (-0.56) | (-0.79) | (-0.94) |
| *σOTTI* | 12.72*** | 11.89*** | 12.02*** | 11.48*** |
| | (4.73) | (4.06) | (4.95) | (4.35) |
| *σDERIVUGL* | -0.76 | -4.85* | -3.48 | -7.55*** |
| | (-0.27) | (-1.88) | (-1.18) | (-2.78) |
| *σDERIVRECY* | -3.94 | 1.53 | 6.25 | 10.06 |
| | (-0.48) | (0.23) | (0.64) | (1.21) |
| *σPEN* | -14.24*** | -13.98** | -14.87*** | -14.11*** |
| | (-3.28) | (-2.53) | (-3.46) | (-2.90) |
| *σFC* | 19.78*** | 21.39*** | 18.52*** | 18.42*** |
| | (3.94) | (3.67) | (5.26) | (6.25) |
| *σOTHER* | 2.81 | -1.81 | 1.04 | -2.18 |
| | (1.03) | (-0.58) | (0.39) | (-0.71) |
| *CONTROLS* | NO | NO | YES | YES |
| *YEAR FE* | NO | YES | NO | YES |
| *(H3) F-stat* ($\beta_2 = \beta_3$) | 0.44 | 0.12 | 0.00 | 0.01 |
| *(H3) F-stat* ($\beta_2 = \beta_4$) | 17.89*** | 17.10*** | 19.40*** | 18.35*** |
| *(H3) F-stat* ($\beta_5 = \beta_6$) | 0.10 | 0.62 | 0.66 | 2.90* |
| N | 614 | 614 | 614 | 614 |
| $R^2$ | 0.38 | 0.53 | 0.52 | 0.59 |

$$\sigma RET_{it} = \beta_0 + \beta_1 \sigma NIRECY_{it} + \beta_2 \sigma AFSUGL_{it} + \beta_3 \sigma AFSRECY_{it} + \beta_4 \sigma OTTI_{it} + \beta_5 \sigma DERIVUGL_{it} + \beta_6 \sigma DERIVRECY_{it} + \beta_7 PEN_{it} + \beta_8 FC_{it} + \beta_9 \sigma OTHER_{it} + \sum_j \delta_j \, CONTROLS_{it} + \sum_{10} \gamma_{2002-2011} + \varepsilon_{it} \quad (3)$$

Note: The table presents the results of estimating equation (3). $CONTROLS_{it}$ includes derivatives exposure ($EXP_{it}$), an indicator for non-missing derivatives exposure ($EXPIND_{it}$), interest rate gap ($GAP_{it}$), an indicator for non-missing interest rate gap ($GAPIND_{it}$), firm size ($MVE_{it}$), book-to-market ratio ($BTM_{it}$), comprehensive income ($CI_{it}$), lagged comprehensive income ($CI_{it-1}$), annual stock return ($ANNRET_{it}$), lagged annual stock return ($ANNRET_{it-1}$), and lagged price ($PRICE_{it-1}$). The constant term is included, but not presented for the sake of brevity. Regression coefficients are presented above t-statistics calculated based on standard errors clustered at the firm level. ***, **, and * indicate statistical significance at the 0.01, 0.05, and 0.10 levels based on two-tailed tests.

## *2.4 Robustness*

### 2.4.1 Returns Volatility, OCI Component Volatilities, and Presentation

Prior to 2012, firms presented comprehensive income in the statement of changes in equity, in a performance statement beginning with net income and ending with comprehensive income, or in a performance statement beginning with revenue and ending with comprehensive income. In 2012, the FASB eliminated the option to present comprehensive income in the statement of changes in equity (FASB, 2011).[24] Prior research indicates financial statement users interpret comprehensive income (and thereby OCI) differently based on its presentation. Maines and McDaniel (2000) find that investors are better able to distinguish between high versus low volatility of unrealized gains and losses on AFS securities when comprehensive income is presented in a performance statement than when it is presented in the statement of changes in equity. Chambers et al. (2007) provide evidence, using realized returns as a dependent variable,

[24] For fiscal years beginning after December 15, 2011 (FASB, 2011), comprehensive income and OCI may be presented in a performance statement in one of two forms, per ASC 220-10-45-1C: "A single continuous statement of comprehensive income or in a statement of net income and statement of other comprehensive income." If option two is elected, ASC 220-10-45-1B requires that the statement of other comprehensive income "be presented immediately after the statement of net income." In the empirical tests in this study, the presentation indicator variable equals one only when the firm uses either of the two currently allowed presentation methods. Thus, if the firm presents comprehensive income in a performance statement that does not immediately follow the income statement, the indicator variable is set equal to zero.

that investors weight OCI most heavily when it is presented in a statement of changes in equity, the predominant presentation method in their sample of S&P 500 firms from 1998-2003, though for individual components, presentation method matters only for the pension component of OCI.

To examine whether the results in Tables 8 and 9 are sensitive to OCI presentation, I estimate equation (4) using the recycling sample for which I have also collected OCI presentation data.

$$\begin{aligned}\sigma RET_{it} = \beta_0 &+ \beta_1 \sigma NIRECY_{it} + \beta_2 \sigma AFSUGL_{it} + \beta_3 \sigma AFSRECY_{it} + \beta_4 \sigma OTTI_{it} \\ &+ \beta_5 \sigma DERIVUGL_{it} + \beta_6 \sigma DERIVRECY_{it} + \beta_7 PEN_{it} + \beta_8 FC_{it} + \beta_9 \sigma OTHER_{it} \\ &+ \beta_{10} PRES_{it} + \beta_{11} \sigma NIRECY_{it} * PRES_{it} + \beta_{12} \sigma AFSUGL_{it} * PRES_{it} \\ &+ \beta_{13} \sigma AFSRECYProxy_{it} * PRES_{it} + \beta_{14} \sigma DERIVUGL_{it} * PRES_{it} \\ &+ \beta_{15} \sigma DERIVRECY_{it} * PRES_{it} + \beta_{16} \sigma PEN_{it} * PRES_{it} + \beta_{17} \sigma FC_{it} * PRES_{it} \\ &+ \beta_{18} \sigma OTHER_{it} * PRES_{it} + \sum_{j} \delta_j \, CONTROLS_{it} + \sum_{10} \gamma_{2002-2011} + \varepsilon_{it} \qquad (4)\end{aligned}$$

$PRES_{it}$ is an indicator variable equal to one if the bank reports comprehensive income in either a single statement of comprehensive income or in a separate statement of other comprehensive income immediately following the income statement. This coding approach aligns with current FASB guidance for OCI presentation (ASC 220-10-45-1C). If the interactions between OCI component volatilities and presentation in equation (4) are significantly different from zero, presentation affects associations between OCI component volatilities and returns volatility. I also test whether presentation affects the joint association between OCI component volatilities and returns volatility using an F-test for the joint significance of the interactions terms in equation

(4), both excluding ($\beta_{12} = \beta_{13} = \beta_{14} = \beta_{15} = \beta_{16} = \beta_{17} = \beta_{18} = \beta_{19} = 0$) and including $\sigma NIRECY_{it} * PRES_{it}$ ($\beta_{11} = \beta_{12} = \beta_{13} = \beta_{14} = \beta_{15} = \beta_{16} = \beta_{17} = \beta_{18} = \beta_{19} = 0$). Table 10, Columns (1)-(4) present the results of estimating equation (4) for observations from 2002 to 2012. In the full model in Column (4), I find little evidence that presentation affects the risk-relevance of OCI components, individually and jointly. However, in Column (3) when year fixed effects are excluded from the estimation, I find evidence that the negative (positive) main effects for $\sigma AFSUGL_{it}$ and $\sigma OTTI_{it}$ are strengthened when firms use performance statement presentation, and well as evidence of joint significance of presentation effects.

Since presentation does not vary in 2012, and the year fixed effect for 2012 is absorbed in the intercept in estimations including year fixed effects Columns (2) and (4)), the results might differ if observations from 2012 were excluded. I examine the presentation effect excluding observations from 2012 in Columns (5)-(8). Due to multicollinearity, $\sigma FC_{it} * PRES_{it}$ is excluded from these estimations. In these columns, I find evidence that performance statement presentation affects the individual and joint significance of associations between OCI component volatilities and returns volatility. For example, I find significant negative coefficients on $\sigma AFSUGL_{it} * PRES_{it}$ and $\sigma AFSUGL_{it} * OTTI_{it}$ and a significant positive coefficient on $\sigma AFSRECY_{it} * PRES_{it}$. Thus,

Table 10 provides mixed evidence on whether presentation affects the risk-relevance of OCI components.[25]

[25] Prior research indicates that managers are capable of, or at least believe they are capable of, influencing the perceived volatility of comprehensive income and OCI through presentation choices (Maines and McDaniel, 2000; Bamber et al., 2010) and the actual volatility of comprehensive income through real actions (Amir et al., 2010). Further, it is possible that the determinants of the choice of presentation method drive the associations between OCI component volatilities and returns volatility (Shadish, Cook, and Campbell, 2002). In untabulated results, I attempt to model presentation choice ($PRES_{it}$) using both a probit model and a linear probability model based on controls from equation (3) from Bamber et al. (2010). I use the output from this first stage model in three different approaches. First, I substitute the predicted values from either the probit or linear probability model in a second stage estimation of equation (4) above for $PRES_{it}$ in both its main effect and interactions terms. Second, I include the inverse Mills ratio from the first stage as a control variable in a second stage estimation of equation (4). Third, I include the inverse Mills ratio from the first stage as a control variable and interact it with $PRES_{it}$ in the second stage estimation of equation (4) (similar to the approach in Nichols, Wahlen, and Wieland (2009)). Unfortunately, the sample size for the first approach above is only 149 observations, and the sample size for the second and third approaches is only 128 observations. All second stage models exhibit significant multicollinearity problems, and some models yield a significant coefficient on $\sigma NIRECY_{it} * PRES_{it}$ , a result that should not obtain. Future research can pursue these approaches further with larger sample sizes. Results are available upon request.

## Table 10: Returns Volatility, OCI Unrealized and Recycled Subcomponent Volatilities, and Presentation

| **Dependent Variable =** | | | | *σRET* | | | | |
|---|---|---|---|---|---|---|---|---|
| **PARAMETER** | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** | **(7)** | **(8)** |
| *σNIRECY* | 3.21*** | 2.62*** | 2.61*** | 2.00*** | 3.21*** | 2.64*** | 2.70*** | 2.15*** |
| | (5.96) | (5.34) | (5.08) | (4.09) | (5.95) | (5.46) | (5.57) | (4.54) |
| *σAFSUGL* | -2.38 | -2.61* | -1.82 | -2.28* | -2.38 | -2.73* | -1.61 | -2.29* |
| | (-1.25) | (-1.71) | (-1.20) | (-1.73) | (-1.25) | (-1.80) | (-1.09) | (-1.79) |
| *σAFSRECY* | -1.87 | -3.50 | -4.05 | -4.46 | -1.87 | -3.32 | -4.29 | -4.45 |
| | (-0.53) | (-1.15) | (-1.24) | (-1.49) | (-0.53) | (-1.09) | (-1.29) | (-1.48) |
| *σOTTI* | 11.60*** | 11.06*** | 11.18*** | 10.84*** | 11.60*** | 11.17*** | 11.19*** | 11.01*** |
| | (4.56) | (4.12) | (4.98) | (4.63) | (4.56) | (4.16) | (4.94) | (4.52) |
| *σDERIVUGL* | -1.08 | -4.76* | -4.02 | -7.78*** | -1.08 | -4.80* | -3.65 | -7.36*** |
| | (-0.36) | (-1.83) | (-1.37) | (-2.83) | (-0.36) | (-1.88) | (-1.25) | (-2.74) |
| *σDERIVRECY* | -4.12 | 0.29 | 5.17 | 9.03 | -4.12 | 0.17 | 4.39 | 7.72 |
| | (-0.63) | (0.05) | (0.62) | (1.18) | (-0.63) | (0.03) | (0.55) | (1.04) |
| *σPEN* | -13.65*** | -12.60** | -13.51*** | -12.47** | -13.65*** | -12.46** | -13.55*** | -12.70** |
| | (-2.83) | (-2.05) | (-3.01) | (-2.44) | (-2.82) | (-2.02) | (-3.02) | (-2.43) |
| *σFC* | 20.39*** | 21.49*** | 19.07*** | 18.64*** | 20.39*** | 21.55*** | 18.90*** | 18.59*** |
| | (3.96) | (3.80) | (4.89) | (5.95) | (3.96) | (3.84) | (4.69) | (5.98) |
| *σOTHER* | 2.24 | -1.47 | 0.46 | -1.87 | 2.24 | -1.33 | 0.71 | -1.84 |
| | (0.79) | (-0.46) | (0.16) | (-0.58) | (0.79) | (-0.42) | (0.25) | (-0.57) |
| *PRES* | 1.33** | 0.49 | 0.76 | -0.02 | 0.60 | 0.40 | 0.50 | 0.11 |
| | (2.57) | (0.92) | (1.60) | (-0.05) | (1.08) | (0.69) | (1.02) | (0.21) |
| *σNIRECY * PRES* | 0.30 | 0.36 | 0.44 | 0.68 | 0.09 | -0.14 | -0.31 | -0.20 |
| | (0.40) | (0.55) | (0.59) | (1.04) | (0.08) | (-0.15) | (-0.30) | (-0.22) |
| *σAFSUGL * PRES* | -5.35** | -4.68** | -4.19* | -3.48 | -8.26** | -8.79*** | -9.03*** | -8.25*** |
| | (-2.11) | (-2.00) | (-1.80) | (-1.64) | (-2.11) | (-2.77) | (-2.97) | (-3.15) |
| *σAFSRECY * PRES* | 7.46 | 7.68 | 6.01 | 6.43 | 21.48** | 27.60*** | 26.11*** | 27.96*** |
| | (1.41) | (1.51) | (1.16) | (1.38) | (2.10) | (3.97) | (2.78) | (4.27) |
| *σOTTI * PRES* | 4.99** | 4.03 | 4.40* | 3.35 | -13.50 | -28.12*** | -19.43** | -27.52*** |
| | (2.03) | (1.54) | (1.81) | (1.34) | (-1.29) | (-3.35) | (-2.01) | (-3.70) |
| *σDERIVUGL * PRES* | -8.65 | -8.69 | -8.99 | -5.94 | -9.32 | -5.43 | -8.69 | -2.05 |
| | (-1.02) | (-1.16) | (-0.91) | (-0.78) | (-0.75) | (-0.55) | (-0.75) | (-0.19) |
| *σDERIVRECY * PRES* | 69.06* | 56.44 | 74.62 | 48.60 | 92.77 | 46.71 | 64.91 | 22.62 |
| | (1.77) | (1.46) | (1.56) | (1.22) | (1.47) | (0.82) | (1.07) | (0.38) |
| *σPEN * PRES* | -0.89 | -5.54 | -4.48 | -6.13 | 5.87 | 2.09 | 1.51 | 1.21 |
| | (-0.12) | (-0.58) | (-0.61) | (-0.72) | (0.72) | (0.20) | (0.16) | (0.12) |
| *σFC * PRES* | 10.76 | 3.52 | 6.71 | 5.17 | | | | |
| | (1.35) | (0.50) | (1.06) | (0.93) | | | | |
| *σOTHER * PRES* | 4.43 | 0.06 | 4.12 | 0.17 | 4.41 | -1.60 | 8.56* | 2.72 |
| | (1.36) | (0.02) | (1.60) | (0.06) | (0.83) | (-0.30) | (1.81) | (0.57) |
| *CONTROLS* | NO | NO | YES | YES | NO | NO | YES | YES |
| *YEAR FE* | NO | YES | NO | YES | NO | YES | NO | YES |
| *F-stat* ($\beta_{12} = \beta_{13} = \beta_{14} = \beta_{15} = \beta_{16} = \beta_{17} = \beta_{18} = \beta_{19} = 0$) | 1.55 | 0.90 | 2.88*** | 1.25 | | | | |
| *F-stat* ($\beta_{11} = \beta_{12} = \beta_{13} = \beta_{14} = \beta_{15} = \beta_{16} = \beta_{17} = \beta_{18} = \beta_{19} = 0$) | 1.38 | 0.80 | 2.60*** | 1.21 | | | | |
| *F-stat* ($\beta_{12} = \beta_{13} = \beta_{14} = \beta_{15} = \beta_{16} = \beta_{17} = \beta_{18} = 0$) | | | | | 2.14** | 2.89*** | 3.08*** | 3.35*** |
| *F-stat* ($\beta_{11} = \beta_{12} = \beta_{13} = \beta_{14} = \beta_{15} = \beta_{16} = \beta_{17} = \beta_{18} = 0$) | | | | | 1.87* | 2.57** | 2.73*** | 2.93*** |
| N | 614 | 614 | 614 | 614 | 540 | 540 | 540 | 540 |
| $R^2$ | 0.41 | 0.54 | 0.54 | 0.60 | 0.39 | 0.55 | 0.53 | 0.61 |

$$\sigma RET_{it} = \beta_0 + \beta_1 \sigma NIRECY_{it} + \beta_2 \sigma AFSUGL_{it} + \beta_3 \sigma AFSRECY_{it} + \beta_4 \sigma OTTI_{it} + \beta_5 \sigma DERIVUGL_{it} + \beta_6 \sigma DERIVRECY_{it} + \beta_7 PEN_{it} + \beta_8 FC_{it} + \beta_9 \sigma OTHER_{it} + \beta_{10} PRES_{it} + \beta_{11} \sigma NIRECY_{it} * PRES_{it} + \beta_{12} \sigma AFSUGL_{it} * PRES_{it} + \beta_{13} \sigma AFSRECYProxy_{it} * PRES_{it} + \beta_{14} \sigma DERIVUGL_{it} * PRES_{it} + \beta_{15} \sigma DERIVRECY_{it} * PRES_{it} + \beta_{16} \sigma PEN_{it} * PRES_{it} + \beta_{17} \sigma FC_{it} * PRES_{it} + \beta_{18} \sigma OTHER_{it} * PRES_{it} + \sum_{j} \delta_j \, CONTROLS_{it} + \sum_{10} \gamma_{2002-2011} + \varepsilon_{it} \quad (4)$$

Note: The table presents the results of estimating equation (4). $CONTROLS_{it}$ includes derivatives exposure ($EXP_{it}$), an indicator for non-missing derivatives exposure ($EXPIND_{it}$), interest rate gap ($GAP_{it}$), an indicator for non-missing interest rate gap ($GAPIND_{it}$), firm size ($MVE_{it}$), book-to-market ratio ($BTM_{it}$), comprehensive income ($CI_{it}$), lagged comprehensive income ($CI_{it-1}$), annual stock return ($ANNRET_{it}$), lagged annual stock return ($ANNRET_{it-1}$), and lagged price ($PRICE_{it-1}$). The constant term is included, but not presented for the sake of brevity. Regression coefficients are presented above t-statistics calculated based on standard errors clustered at the firm level. ***, **, and * indicate statistical significance at the 0.01, 0.05, and 0.10 levels based on two-tailed tests.

### 2.4.2 Returns Volatility, OCI Component Volatilities, and Macroeconomic Conditions

To investigate whether the risk-relevance of OCI components varies with financial crisis periods, I separately examine 2002 to 2007 (the pre-crisis period) and 2008 to 2012 (the crisis or post-crisis period) by estimating equations (5) and (6). The only difference between equations (5) and (6) is the year fixed effects included in the models.

$$\sigma RET_{it} = \beta_0 + \beta_1 \sigma NIRECY_{it} + \beta_2 \sigma AFSUGL_{it} + \beta_3 \sigma AFSRECY_{it} + \beta_4 \sigma OTTI_{it} + \beta_5 \sigma DERIVUGL_{it} + \beta_6 \sigma DERIVRECY_{it} + \beta_7 PEN_{it} + \beta_8 FC_{it} + \beta_9 \sigma OTHER_{it} + \sum_{j} \delta_j \, CONTROLS_{it} + \sum_{10} \gamma_{2002-2006} + \varepsilon_{it} \quad (5)$$

$$\sigma RET_{it} = \beta_0 + \beta_1 \sigma NIRECY_{it} + \beta_2 \sigma AFSUGL_{it} + \beta_3 \sigma AFSRECY_{it} + \beta_4 \sigma OTTI_{it} + \beta_5 \sigma DERIVUGL_{it} + \beta_6 \sigma DERIVRECY_{it} + \beta_7 PEN_{it} + \beta_8 FC_{it} + \beta_9 \sigma OTHER_{it} + \sum_{j} \delta_j \, CONTROLS_{it} + \sum_{10} \gamma_{2008-2011} + \varepsilon_{it} \quad (6)$$

As shown in Table 11, I find that the negative coefficient on unrealized gains and losses on AFS securities (cash-flow hedges) derives primarily from the crisis period (pre-crisis period). I also find that the coefficient on OTTI losses is negative in the pre-crisis period, and positive in the crisis period, though the coefficient on $\sigma OTTI_{it}$ should be interpreted with caution during the pre-crisis period because only five of the 264 pre-crisis observations have non-zero values of $\sigma OTTI_{it}$. The results indicate that during crisis periods, bank investors appear to interpret OTTI loss volatility as a risk-relevant signal and interpret non-OTTI AFS unrealized gain and loss volatility as relatively less important, less risky, or less risk-relevant.

In untabulated tests, I estimate the model from Table 9, Column (3) (the model with no year fixed effects) for each year from 2002 to 2012.[26] I find that the significant negative coefficient on $\sigma DERIVUGL$ is primarily driven by observations from 2005. Since $\sigma DERIVUGL$ is calculated using rolling five-year periods, 2005 may be the first year, for many banks, that all five observations in the rolling calculation periods were from the

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[26] In untabulated results, I estimate equation (3) from Table 9, Column (4) removing observations from 2008 from the estimation of Table 9, Column (4) due to concerns that 2008 is the "primary" crisis year. With a resultant sample of 553 observations, I find results similar to those presented in Table 9, Column (4). I also estimate the model from Table 9, Column (4) using only observations from 2002 to 2004 (N = 118). These sample years are those that overlap with the bank holding company sample from Hodder et al. (2006). I find negative and significant coefficients on $\sigma AFSRECY_{it}$ and $\sigma DERIVUGL_{it}$ and positive and significant coefficients on $\sigma DERIVRECY_{it}$ and $\sigma FC_{it}$. All other OCI component volatilities are insignificant. Since I use rolling five-year standard deviations of OCI components as proxies for OCI component volatilities, it is possible that abnormal OCI amounts in a given year could affect OCI component volatilities for five sample years. To address this problem, I calculate OCI component volatilities using all post-SFAS 130 observations from 1998-2012. Then, I estimate Table 9, Column (3) requiring at least 169 monthly returns and 15 years of accounting data for the OCI component volatilities. These data restrictions result in a sample of only 22 observations. Excluding $EXPIND_{it}$ from the estimation due to multicollinearity, and using robust standard errors instead of clustering the standard errors by firm as time-series correlation of error terms is not an issue in this single-period estimation, I find insignificant coefficients on all OCI component volatilities. Because the latter two tests noted here suffer from lower power, more multicollinearity issues, and lower generalizability due to their smaller sample sizes, caution should be used when interpreting their results.

post-SFAS-133 era. Prior work indicates that risk-management practices improved for firms classified as ineffective hedgers or speculators following the adoption of SFAS 133 (Zhang, 2009). Thus, the negative relation from 2005 and Table 9 might be a manifestation of investors interpreting unrealized gains and losses on cash-flow derivatives as a good signal of management's attempts to manage risk, improve hedge effectiveness, or curb derivative speculation.

## Table 11: Returns Volatility and OCI Unrealized and Recycled Subcomponent Volatilities in the Pre- and Post-Crisis Periods

| Dependent Variable = | σRET | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Time Period = | 2002 - 2007 | | | | 2008 - 2012 | | | |
| PARAMETER | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| σNIRECY | 2.34** | 2.09** | 2.08* | 1.98** | 3.05*** | 2.88*** | 2.60*** | 2.36*** |
| | (2.41) | (2.42) | (1.97) | (2.34) | (6.35) | (6.16) | (5.54) | (5.33) |
| σAFSUGL | 2.85* | -0.48 | 2.03 | -0.65 | -5.41*** | -5.07*** | -4.45** | -4.16** |
| | (1.93) | (-0.32) | (1.22) | (-0.41) | (-2.76) | (-2.76) | (-2.45) | (-2.49) |
| σAFSRECY | -7.18 | -2.97 | -7.59 | -4.24 | 0.18 | -0.74 | -1.87 | -2.14 |
| | (-1.23) | (-0.52) | (-1.47) | (-0.84) | (0.04) | (-0.17) | (-0.41) | (-0.49) |
| σOTTI | -38.93*** | -23.29*** | -30.48*** | -25.74*** | 13.52*** | 13.02*** | 12.82*** | 12.42*** |
| | (-5.89) | (-4.57) | (-4.48) | (-3.32) | (4.41) | (4.05) | (4.47) | (4.20) |
| σDERIVUGL | -5.05 | -7.88*** | -1.11 | -5.42 | -0.59 | -1.22 | -3.70 | -4.47 |
| | (-1.53) | (-3.19) | (-0.23) | (-1.14) | (-0.13) | (-0.28) | (-0.93) | (-1.28) |
| σDERIVRECY | 8.75 | 10.11 | 5.86 | 7.20 | -10.53 | -12.00 | -5.84 | -7.11 |
| | (1.26) | (1.42) | (0.79) | (0.88) | (-0.65) | (-0.80) | (-0.38) | (-0.57) |
| σPEN | -10.96** | -7.35** | -7.92** | -8.02** | -19.56*** | -17.24*** | -18.50*** | -17.04*** |
| | (-2.23) | (-2.02) | (-2.19) | (-2.49) | (-3.33) | (-2.80) | (-3.24) | (-2.99) |
| σFC | 23.85*** | 22.77*** | 28.22*** | 25.91*** | 18.12*** | 20.87** | 3.92 | 5.30 |
| | (5.61) | (3.71) | (6.18) | (5.17) | (2.65) | (2.58) | (0.80) | (1.12) |
| σOTHER | -22.94 | 10.23 | -3.50 | 12.81 | -2.42 | -2.19 | -3.29 | -3.21 |
| | (-1.19) | (0.59) | (-0.22) | (0.84) | (-0.75) | (-0.68) | (-0.97) | (-0.98) |
| CONTROLS | NO | NO | YES | YES | NO | NO | YES | YES |
| YEAR FE | NO | YES | NO | YES | NO | YES | NO | YES |
| MULTICOLLINEARITY | NO | NO | YES | YES | NO | NO | YES | YES |
| (H3) F-stat ($\beta_2 = \beta_3$) | 2.85* | 0.17 | 2.91* | 0.44 | 0.72 | 0.53 | 0.19 | 0.13 |
| (H3) F-stat ($\beta_2 = \beta_4$) | 41.01*** | 19.37*** | 21.02*** | 9.61*** | 18.75*** | 16.76*** | 17.20*** | 16.44*** |
| (H3) F-stat ($\beta_5 = \beta_6$) | 2.00 | 4.00** | 0.35 | 1.04 | 0.26 | 0.37 | 0.01 | 0.03 |
| N | 264 | 264 | 264 | 264 | 350 | 350 | 350 | 350 |
| $R^2$ | 0.27 | 0.49 | 0.40 | 0.52 | 0.37 | 0.45 | 0.52 | 0.56 |

$$\sigma RET_{it} = \beta_0 + \beta_1 \sigma NIRECY_{it} + \beta_2 \sigma AFSUGL_{it} + \beta_3 \sigma AFSRECY_{it} + \beta_4 \sigma OTTI_{it} + \beta_5 \sigma DERIVUGL_{it} + \beta_6 \sigma DERIVRECY_{it} + \beta_7 PEN_{it} + \beta_8 FC_{it} + \beta_9 \sigma OTHER_{it} + \sum_j \delta_j \, CONTROLS_{it} + \sum_{10} \gamma_{2002-2006} + \varepsilon_{it} \quad (5)$$

$$\sigma RET_{it} = \beta_0 + \beta_1 \sigma NIRECY_{it} + \beta_2 \sigma AFSUGL_{it} + \beta_3 \sigma AFSRECY_{it} + \beta_4 \sigma OTTI_{it} + \beta_5 \sigma DERIVUGL_{it} + \beta_6 \sigma DERIVRECY_{it} + \beta_7 PEN_{it} + \beta_8 FC_{it} + \beta_9 \sigma OTHER_{it} + \sum_j \delta_j \, CONTROLS_{it} + \sum_{10} \gamma_{2008-2011} + \varepsilon_{it} \quad (6)$$

Note: The table presents the results of estimating equations (5) and (6), splitting the sample into pre-crisis (2002-2007) and post-crisis (2008-2012) observations. $CONTROLS_{it}$ includes derivatives exposure ($EXP_{it}$), an indicator for non-missing derivatives exposure ($EXPIND_{it}$), interest rate gap ($GAP_{it}$), an indicator for non-missing interest rate gap ($GAPIND_{it}$), firm size ($MVE_{it}$), book-to-market ratio ($BTM_{it}$), comprehensive income ($CI_{it}$), lagged comprehensive income ($CI_{it-1}$), annual stock return ($ANNRET_{it}$), lagged annual stock return ($ANNRET_{it-1}$), and lagged price ($PRICE_{it-1}$). The constant term is included, but not presented for the sake of brevity. *MULTICOLLINEARITY* indicates the estimation results in at least one variable with a variance inflation factor greater than or equal to 10. Regression coefficients are presented above t-statistics calculated based on standard errors clustered at the firm level. ***, **, and * indicate statistical significance at the 0.01, 0.05, and 0.10 levels based on two-tailed tests.

### 2.4.3 Additional Control Variables

Variables other than those included in the $CONTROLS_{it}$ vector could be driving associations between OCI component volatilities and returns volatility. I attempt to address this concern by including additional control variables in the estimation of equation (3) from Table 9, Column (4) and report the results in Table 12.

It may be the case that the covariances between net income before recycling adjustments and the OCI components are an important correlated omitted variable, since the same underlying economic factors could be affecting both net income and OCI components, such as changes in interest rates beyond those already controlled for with $GAP_{it}$ and $GAPIND_{it}$. In addition, and as discussed previously, net income and OCI may have a non-zero correlation that could affect inferences. Though Hodder et al. (2006) provide some evidence that the covariance between net income and OCI is not significantly different from zero for most of the banks in their sample, I address the concern of non-zero covariance terms in two ways. First, in Table 12, Column (1), I add the "$COVNIRECY$" control variables, which are the rolling five-year covariance terms between $NIRECY_{it}$ and each OCI component volatility included in the model (for example, $COV(NIRECY_{it}, AFSUGL_{it})$). Second, in Table 12, Column (2), I add the "$COVALL$" control variables, which are the rolling five-year covariance terms between all volatility measures used as independent variables. Thus, Table 12, Column (2) includes all of the covariance measures from Table 12, Column (1) and also includes the covariance terms between all OCI components (for example, $COV(AFSUGL, AFSRECY)$). The results in Table 12, Column (2) should be interpreted with caution due to multicollinearity issues that arise when including the full set of covariance terms. Table 12, Columns (1) and (2) indicate that inclusion of the covariance terms affects inferences regarding the risk-relevance of OCI components. The coefficient on $\sigma AFSUGL_{it}$ is negative in Table 12, Columns (1) and (2), but is significant only in Table 12, Column (2). The coefficient on $\sigma OTTI_{it}$ is positive and significant in Table 12, Column (1), but negative and significant in Table 12, Column (2). Multicollinearity is an issue for $\sigma OTTI_{it}$ in Table 12, Column (2), as indicated by a variance inflation factor of 31.57. The coefficient on $\sigma DERIVRECY_{it}$ is positive and significant in Table 12, Column (1) and (2), while it was positive and insignificant in Table 9, Column (4). Coefficients on $\sigma PEN_{it}$ are again negative and significant, while those on $\sigma FC_{it}$ are positive and significant.

In Table 12, Column (3) ($FIRM\ FE$), I include firm fixed effects. I use caution when interpreting these results because the large number of estimated parameters reduces the degrees of freedom in the model significantly and increases multicollinearity, though multicollinearity does not affect Table 12, Column (3) as much as Table 12, Column (2). I fail to find a negative significant coefficient on $\sigma AFSUGL_{it}$; however, I continue to find a positive significant coefficient on $\sigma OTTI_{it}$ and a negative significant coefficient on $\sigma DERIVUGL_{it}$. The coefficient on $\sigma PEN_{it}$ is again negative and significant, while that on $\sigma FC_{it}$ is positive and insignificant.

Since some OCI component volatility measures contain zeroes for many observations, in Table 12, Columns (4) and (5), I examine the sensitivity of the main results from Table 9, Column (4) to indicator variables that represent whether a given OCI component volatility is zero or non-zero. In Table 12, Column (4) ($IND\ REP$), I replace all OCI component volatilities, except for $\sigma AFSUGL_{it}$ which has no zero values, with indicator variables for whether the volatility is zero (indicator = 0) or non-zero (indicator = 1). In Table 12, Column (5) ($IND$), I include the indicator variables as controls instead of substituting them for the volatility measures (again, excluding an indicator for $\sigma AFSUGL_{it}$). In Table 12, Column (4), I find that only the coefficients for $\sigma PEN_{it}$ and $\sigma FC_{it}$ are significant with signs similar to Table 9, Column (4), possibly indicating that for the "fair value" OCI subcomponents, the magnitude, not simply the presence, of volatility matters for risk. In Table 12, Column (5), the coefficients on $\sigma AFSUGL_{it}$, $\sigma OTTI_{it}$, and $\sigma PEN_{it}$ are similar to those in Table 9, Column (4). The coefficients on $\sigma DERIVUGL_{it}$ and $\sigma FC_{it}$ are not significant, but have the same sign as those in Table 9, Column (4). The significance of the other OCI component volatilities in Table 12, Column (5) are similar to Table 9, Column (4).

Since the volatility measures are calculated over rolling five-year periods, I investigate whether including the five-year average of the control variables from Table 9, Column (4) over the same time periods affects the results. I exclude the rolling five-year averages of $CI_{it-1}$ and $ANNRET_{it-1}$ since four of the five years used to calculate averages of these variables overlap with the years used to calculate average $CI_{it}$ and $ANNRET_{it}$. Table 12, Column (6) ($FIVEYR$) presents the results. Inferences are similar to Table 9, Column (4).

Investors in more levered banks may be more sensitive to OCI volatility than investors in less levered banks given the potential positive relation between risk and leverage (Khan and Bradbury, 2012; 2014). Further, banks with less liquid assets may represent a relatively higher risk for investors than banks with more liquid assets (Khan and Bradbury, 2012; 2014). In Table 12, Column (7) ($KB$), I control for bank leverage and bank liquidity (as opposed to investors' share liquidity) using the rolling five-year averages of total liabilities divided by total equity and operating cash flow divided by the current portion of long-term debt (Khan and Bradbury, 2012; 2014). Due to additional data requirements, I arrive at a sample of 560 observations. Inferences are similar to Table 9, Column (4).

Next, I control for investors' share liquidity using the rolling five-year average of the daily price impact of a trade (Amihud, 2002; Lang and Maffett, 2011) and the rolling five-year average of the bid-ask spread (Gow, Taylor, and Verrecchia, 2013). These liquidity controls are included because the negative relations between returns volatility and the volatilities of unrealized gains and losses on AFS securities and cash-flow hedges may reflect a relation between returns volatility and investors' trading liquidity. Due to data requirements, I arrive at a sample of 480 observations. Table 12, Column (8) ($SHARELIQ$) presents the results, which are similar to those in Table 9, Column (4) except that the coefficient on $\sigma AFSUGL_{it}$ is negative and insignificant instead of negative and significant.

Hodder et al. (2006) estimate a measure of incremental full-fair-value volatility and regress returns volatility on net income volatility, incremental comprehensive income volatility, and incremental full-fair-value volatility with controls. They find that net income volatility and incremental full-fair-value income volatility significantly and positively explain returns volatility, while the coefficient on incremental comprehensive income volatility is positive and insignificant. To address the concern that incremental full-fair-value volatility is a correlated omitted variable in my study, I control for incremental full-fair-value income volatility using an incremental full-fair-value income measure based on full-fair-value balance sheet changes (Blankespoor, Linsmeier, Petroni, and Shakespeare, 2013).[27] Due to data requirements, I arrive at a sample of 450 observations. Table 12, Column (9) ($FFV$) presents the results. Inferences are similar to Table 9, Column (4).

Finally, I control for returns volatility over the years *t-9* to *t-5* to control for autocorrelation in returns volatility.[28] Due to data requirements, I arrive at a sample of 322 observations. Except for the insignificant positive coefficient on $\sigma FC_{it}$, inferences are similar to Table 9, Column (4).

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[27] I thank Zeqiong Huang for providing the data and calculation for this measure. Due to concerns about data reliability from SNL Financial for off-balance-sheet financial instruments, these instruments are excluded from the calculation of this measure.

[28] I do not control for returns volatility over the years *t-5* to *t-1* because of the significant overlap such a control variable would have with the dependent variable, $\sigma RET_{it}$, which is calculated over the years *t-4* to *t*.

## Table 12: Additional Control Variables

| **Dependent Variable =** | *σRET* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Controls Added =** | ***COVNIRECY*** | ***COVALL*** | ***FIRM FE*** | ***IND REP*** | ***IND*** | ***FIVEYR*** | ***KB*** | ***SHARELIQ*** | ***FFV*** | ***σRETLAG*** |
| **PARAMETER** | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** | **(7)** | **(8)** | **(9)** | **(10)** |
| *σNIRECY* | 2.58*** | 2.50*** | 1.54*** | 1.57*** | 2.20*** | 1.89*** | 2.38*** | 2.25*** | 2.10*** | 3.20*** |
| | (5.18) | (5.45) | (3.60) | (2.84) | (5.02) | (5.15) | (5.50) | (5.32) | (5.29) | (4.33) |
| *σAFSUGL* | -1.70 | -2.28** | 0.68 | -0.61 | -2.63** | -2.14* | -2.87** | -2.13 | -3.44** | -4.19*** |
| | (-1.28) | (-1.99) | (0.51) | (-0.30) | (-2.05) | (-1.89) | (-2.11) | (-1.56) | (-2.36) | (-2.91) |
| *σAFSRECY* | -5.29 | 3.41 | -2.80 | 0.71 | -3.98 | -3.96 | -3.27 | -0.13 | -2.69 | -0.44 |
| | (-1.20) | (0.61) | (-0.91) | (1.34) | (-1.35) | (-1.10) | (-0.85) | (-0.03) | (-0.74) | (-0.08) |
| *σOTTI* | 10.92*** | -13.01* | 6.25* | 0.49 | 12.89*** | 10.94*** | 12.97*** | 9.81*** | 11.56*** | 13.46*** |
| | (5.11) | (-1.77) | (1.94) | (0.47) | (4.82) | (4.63) | (3.56) | (3.00) | (4.13) | (4.34) |
| *σDERIVUGL* | -10.21*** | -8.15** | -7.35* | -0.18 | -3.88 | -8.55*** | -8.27*** | -8.19** | -7.22** | -12.35** |
| | (-3.32) | (-2.44) | (-1.66) | (-0.35) | (-1.34) | (-2.83) | (-2.97) | (-2.46) | (-2.49) | (-2.63) |
| *σDERIVRECY* | 37.54*** | 25.87* | 11.45 | -0.28 | -0.82 | 11.61 | 6.33 | 12.50 | 0.75 | 12.46 |
| | (4.23) | (1.70) | (1.24) | (-0.45) | (-0.07) | (1.46) | (1.05) | (1.35) | (0.13) | (1.36) |
| *σPEN* | -12.27*** | -11.57*** | -15.79** | -1.29*** | -11.84* | -15.30*** | -12.43** | -20.74*** | -13.20** | -11.28** |
| | (-3.54) | (-3.10) | (-2.56) | (-2.95) | (-1.95) | (-3.30) | (-2.61) | (-4.22) | (-2.53) | (-2.53) |
| *σFC* | 18.51*** | 38.59* | 0.08 | 3.57** | 13.22 | 19.08*** | 15.66*** | 16.08*** | 16.76*** | 7.89 |
| | (4.30) | (1.79) | (0.00) | (2.48) | (1.56) | (3.83) | (5.81) | (4.40) | (5.76) | (1.28) |
| *σOTHER* | -1.87 | -3.61 | -2.14 | 0.04 | -1.71 | -1.43 | -0.83 | -4.89 | -3.28 | -5.82 |
| | (-0.58) | (-1.09) | (-0.47) | (0.06) | (-0.46) | (-0.44) | (-0.24) | (-1.38) | (-1.01) | (-1.20) |
| *CONTROLS* | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| *YEAR FE* | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| *MULTICOLLINEARITY* | NO | YES | YES | NO | NO | NO | NO | NO | NO | NO |
| *(H3) F-stat* ($\beta_2 = \beta_3$) | 0.50 | 0.85 | 1.04 | 0.34 | 0.13 | 0.17 | 0.01 | 0.14 | 0.03 | 0.39 |
| *(H3) F-stat* ($\beta_2 = \beta_4$) | 17.07*** | 1.97 | 2.10 | 0.26 | 20.91*** | 19.44*** | 13.46*** | 9.51*** | 16.34*** | 20.81*** |
| *(H3) F-stat* ($\beta_5 = \beta_6$) | 19.65*** | 4.42** | 2.41 | 0.01 | 0.05 | 3.92* | 3.07* | 2.99* | 1.01 | 3.40* |
| N | 614 | 614 | 614 | 614 | 614 | 614 | 560 | 480 | 450 | 322 |
| $R^2$ | 0.63 | 0.71 | 0.85 | 0.51 | 0.62 | 0.62 | 0.62 | 0.66 | 0.63 | 0.67 |

$$\begin{aligned}\sigma RET_{it} = {} & \beta_0 + \beta_1 \sigma NIRECY_{it} + \beta_2 \sigma AFSUGL_{it} + \beta_3 \sigma AFSRECY_{it} + \beta_4 \sigma OTTI_{it} + \beta_5 \sigma DERIVUGL_{it} \\ & + \beta_6 \sigma DERIVRECY_{it} + \beta_7 PEN_{it} + \beta_8 FC_{it} + \beta_9 \sigma OTHER_{it} \\ & + \sum_j \delta_j \, CONTROLS_{it} + \sum_{10} \gamma_{2002-2011} + \varepsilon_{it} \end{aligned} \tag{3}$$

Note: The table presents the results of estimating equation (3). $CONTROLS_{it}$ includes derivatives exposure ($EXP_{it}$), an indicator for non-missing derivatives exposure ($EXPIND_{it}$), interest rate gap ($GAP_{it}$), an indicator for non-missing interest rate gap ($GAPIND_{it}$), firm size ($MVE_{it}$), book-to-market ratio ($BTM_{it}$), comprehensive income ($CI_{it}$), lagged comprehensive income ($CI_{it-1}$), annual stock return ($ANNRET_{it}$), lagged annual stock return ($ANNRET_{it-1}$), and lagged price ($PRICE_{it-1}$). The constant term is included, but not presented for the sake of brevity. $\gamma$ includes fixed effects for years 2002 to 2011, except when data restrictions eliminate the ability to estimate a given year fixed effect. *MULTICOLLINEARITY* indicates the estimation results in at least one variable with a variance inflation factor greater than or equal to 10. Regression coefficients are presented above t-statistics calculated based on standard errors clustered at the firm level. ***, **, and * indicate statistical significance at the 0.01, 0.05, and 0.10 levels based on two-tailed tests.

## 2.4.4 Alternative Dependent Variables

In this section, I examine the sensitivity of the main results from Table 9 to the use of alternative dependent variables. I rely on estimations of equation (3) from Table 9, Column (4), as this model includes both controls and year fixed effects. In Table 13, Column (1), use the rolling five-year variance of monthly stock returns as the dependent variable, and also use the rolling five-year variances of OCI components as independent variables. Inferences are similar to Table 9, Column (4) except the coefficient on $\sigma AFSRECY_{it}$ is significant and negative.

In Table 13, Columns (2) and (3), I use the rolling five-year standard deviation ($\sigma ANNRET_{it}$) and variance ($\sigma^2 ANNRET_{it}$) of annual stock returns as dependent variables. In Column (3), I again use the rolling five-year variances of OCI components as independent variables. In Table 13, Column (2), inferences are similar to Table 9, Column (4) except the coefficient on $\sigma DERIVUGL_{it}$ is insignificant, and the coefficient on $\sigma OTHER_{it}$ is significant. In Table 13, Column (3), inferences are similar to Table 9, Column (4) except the coefficient on $\sigma FC_{it}$ is insignificant and the coefficient on $\sigma OTHER_{it}$ is significant. In Table 13, Column (4), I use the volatility of excess returns as the dependent variable, calculated as the rolling five-year standard deviation of the bank's monthly return from CRSP minus the monthly return on five-year U.S. Treasury bonds from the CRSP U.S. Treasury and Inflation Indexes dataset on WRDS.[29] Inferences are unchanged.

In Table 13, Columns (5) and (6), I use two measures of systematic risk as dependent variables: $BETA_{it}$ from a market-model regression of monthly firm returns on value-weighted market returns over rolling five-year periods from years *t-4* to *t*; and, $SYSVOL_{it}$ equal to the rolling five-year standard deviation of the predicted values from the same market-model regression. In these columns, the coefficients on the "fair value" unrealized gains and losses are insignificant ($\sigma AFSUGL_{it}$ and $\sigma DERIVUGL_{it}$), while the coefficients on $\sigma OTTI_{it}$ and $\sigma DERIVRECY_{it}$ are positive and significant, similar to other components of net income, represented by $\sigma NIRECY_{it}$. Thus, for systematic risk, unrealized gains and losses that are not recognized in income do not appear to be risk-relevant, while some recycled gains and losses appear to be risk-relevant. In Table 13, Column (7), I use a measure of idiosyncratic risk as the dependent variable, $IDIOVOL_{it}$ equal to the rolling five-year standard deviation of the residuals from the market-model used to calculate $BETA_{it}$ and $SYSVOL_{it}$.[30] Unlike the models for systematic risk, I find evidence that unrealized gains and losses on AFS securities and cash-flow hedges ($\sigma AFSUGL_{it}$ and $\sigma DERIVUGL_{it}$) are significantly negatively associated with idiosyncratic

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[29] Five-year bonds were chosen for risk-free rates of return, similar to Botosan and Plumlee (2005).

[30] I require at least 49 monthly returns to estimate $BETA_{it}$, $SYSVOL_{it}$, and $\sigma IDIOVOL_{it}$, similar to $\sigma RET_{it}$.

(diversifiable) risk, while non-OTTI recycled gains and losses ($\sigma AFSRECY_{it}$ and $\sigma DERIVRECY_{it}$) are not significantly associated with idiosyncratic (diversifiable) risk. In addition, the regression results from Table 13, Column (7) more closely mirror those from Table 9, Column (4) than do the results from Table 13, Columns (5) and (6) in terms of which coefficients are statistically significant. Thus, at least some of the associations for total risk documented in Table 9, Column (4) are driven by the diversifiable risk associations documented in Table 13, Column (7).

In Table 13, Columns (8)-(10), I use three measures of future volatility as dependent variables. In Column (8), I estimate $\sigma RETFUT_{it}$ equal to the rolling five-year standard deviation of monthly returns over years *t+1* to *t+5*. This restricts the sample to 223 observations from 2002 to 2007, since future returns from 2008 to 2012 are used to calculate $\sigma RETFUT_{it}$. I require at least 49 monthly returns to estimate $\sigma RETFUT_{it}$. I find negative significant coefficients on $\sigma AFSUGL_{it}$ and $\sigma OTTI_{it}$. Table 11, Column (4), an estimation for the period 2002 to 2007, presents a negative insignificant coefficient on $\sigma AFSUGL_{it}$ and a negative significant coefficient on $\sigma OTTI_{it}$. Thus, it appears that the results in Table 13, Column (8) may simply be a manifestation of the inertia of associations between returns volatility (current and future) and $\sigma AFSUGL_{it}$ and $\sigma OTTI_{it}$ from 2002 to 2007.

In Columns (9) and (10), I use two different estimates of implied volatility based on Rogers, Skinner, and Van Buskirk (2009) using data from the Option Metrics Standardized Options dataset available on WRDS. Data requirements limit the sample to 147 observations from 2002 to 2012. $FIVEYRIV_{it}$ equals the rolling five-year average of the average put/call implied volatility for the puts/calls with the longest duration on each date prior to or on (but not after) each year-end date of each year from year *t-4* to $t$. $LASTYRIV_{it}$ equals the average put/call implied volatility for the puts/calls with the longest duration on the date closest to or on (but not after) the year-end date of year $t$. For $LASTYRIV_{it}$, I require that the puts/calls not expire before fiscal year end. Given the construction of the three proxies for future volatility employed in Columns (8)-(10), I consider $LASTYRIV_{it}$ the cleanest proxy for the following reasons: (1) It is the most "forward-looking" measure in that it relies only on implied volatility measures from the final year of each rolling five-year period; and, (2) It allows for regression estimation using all 11 sample years (2002 to 2012).

In Column (9) using $FIVEYRIV_{it}$ as the dependent variable, I find that the coefficients on $\sigma DERIVRECY_{it}$ and $\sigma PEN_{it}$ are negative and significant. In Column (10) using $LASTYRIV_{it}$ as the dependent variable, I find that the coefficients on $\sigma AFSUGL_{it}$, $\sigma DERIVRECY_{it}$, and $\sigma PEN_{it}$ are negative and significant, while those on $\sigma AFSRECY_{it}$ and

$\sigma FC_{it}$ are positive and significant. The coefficient on $\sigma OTTI_{it}$is positive and insignificant in both Columns (9) and (10).

Overall, the estimations using proxies for future volatility in Table 13, Columns (8)-(10) provide some evidence that is consistent with the negative relation documented in Table 9 between $\sigma AFSUGL_{it}$ and $\sigma RET_{it}$. For the cleanest proxy of future volatility ($LASTYRIV_{it}$), I find results consistent with Table 9, Column (4) for $\sigma AFSUGL_{it}$, $\sigma PEN_{it}$, and $\sigma FC_{it}$, but not for $\sigma NIRECY_{it}$, $\sigma AFSRECY_{it}$, $\sigma OTTI_{it}$, $\sigma DERIVUGL_{it}$, and $\sigma DERIVRECY_{it}$. For cash-flow hedges, it appears that the negative association previously documented between the volatility of unrealized gains and losses ($\sigma DERIVUGL_{it}$) and concurrent returns volatility ($\sigma RET_{it}$) in Table 9 may manifest itself as a negative association between the volatility of recycled gains and losses ($\sigma DERIVRECY_{it}$) and future volatility ($FIVEYRIV_{it}$ and $LASTYRIV_{it}$) because past and current unrealized gains and losses from hedging activity are eventually recycled and result in relatively smoother cash flows in the future.

## Table 13: Alternative Dependent Variables

| Dependent Variable = | $\sigma^2$ *RET** | *σANNRET* | $\sigma^2$ *ANNRET** | *σEXRET* | *BETA* | *SYSVOL* | *IDIOVOL* | *σRETFUT* | *FIVEYRIV* | *LASTYRIV* |
|---|---|---|---|---|---|---|---|---|---|---|
| **PARAMETER** | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** | **(7)** | **(8)** | **(9)** | **(10)** |
| *σNIRECY* | 16.83*** | 7.68*** | 124.71*** | 2.23*** | 0.14*** | 0.83*** | 2.10*** | 0.89 | 0.08*** | 0.03 |
| | (4.44) | (5.07) | (3.49) | (5.69) | (3.25) | (3.77) | (5.51) | (1.06) | (3.23) | (1.66) |
| *σAFSUGL* | -91.63*** | -11.42** | -559.22** | -2.83** | -0.15 | -1.06 | -2.80** | -5.86* | -0.08 | -0.13** |
| | (-3.88) | (-2.46) | (-2.06) | (-2.30) | (-1.11) | (-1.64) | (-2.18) | (-1.95) | (-0.74) | (-2.37) |
| *σAFSRECY* | -178.66** | 2.29 | -666.97 | -3.36 | -0.08 | -0.40 | -3.08 | -8.27 | -0.04 | 0.51* |
| | (-2.17) | (0.14) | (-0.38) | (-0.97) | (-0.28) | (-0.29) | (-0.91) | (-0.71) | (-0.16) | (1.74) |
| *σOTTI* | 395.27*** | 18.12*** | 1,167.37** | 11.23*** | 0.97*** | 5.47*** | 10.25*** | -87.76*** | 0.16 | 0.01 |
| | (3.78) | (3.03) | (2.06) | (4.24) | (4.19) | (4.69) | (4.16) | (-3.80) | (1.30) | (0.08) |
| *σDERIVUGL* | -716.00*** | -20.69 | -6,644.39* | -7.03** | -0.45 | -2.38 | -6.70** | -24.04 | 0.17 | 0.02 |
| | (-3.04) | (-0.99) | (-1.67) | (-2.58) | (-1.27) | (-1.42) | (-2.53) | (-1.52) | (0.68) | (0.17) |
| *σDERIVRECY* | 2,131.80 | 60.65 | 34,119.83 | 10.03 | 2.50** | 10.46** | 6.38 | 23.04 | -0.89** | -0.47** |
| | (1.62) | (1.03) | (1.17) | (1.21) | (2.01) | (2.04) | (0.87) | (0.84) | (-2.24) | (-2.43) |
| *σPEN* | -1,149.79* | -46.84** | -10,728.46* | -14.27*** | -1.28** | -6.04** | -12.77*** | -0.56 | -1.26** | -0.50** |
| | (-1.81) | (-2.50) | (-1.78) | (-3.04) | (-2.39) | (-2.10) | (-2.92) | (-0.04) | (-2.71) | (-2.53) |
| *σFC* | 1,528.21*** | 48.14** | 9,533.55 | 18.53*** | 4.06*** | 18.99*** | 10.79*** | -0.21 | 0.75 | 2.00*** |
| | (4.20) | (2.09) | (1.10) | (6.34) | (9.26) | (8.81) | (3.71) | (-0.01) | (1.28) | (4.72) |
| *σOTHER* | -138.54 | -25.60** | -5,166.10* | -2.48 | 0.25 | 1.48 | -2.70 | 28.45 | -0.06 | -0.05 |
| | (-0.44) | (-2.16) | (-1.82) | (-0.82) | (0.74) | (0.85) | (-0.90) | (0.58) | (-0.15) | (-0.26) |
| *CONTROLS* | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| *YEAR FE* | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| *MULTICOLLINEARITY* | NO | NO | NO | NO | NO | NO | NO | YES | NO | NO |
| *(H3) F-stat* ($\beta_2 = \beta_3$) | 0.87 | 0.49 | 0.00 | 0.01 | 0.04 | 0.13 | 0.00 | 0.03 | 0.02 | 4.63** |
| *(H3) F-stat* ($\beta_2 = \beta_4$) | 16.65*** | 10.43*** | 5.49** | 17.96*** | 12.20*** | 16.79*** | 16.29*** | 12.16*** | 1.20 | 0.75 |
| *(H3) F-stat* ($\beta_5 = \beta_6$) | 3.56* | 1.19 | 1.60 | 2.77* | 3.98** | 4.20** | 1.95 | 1.22 | 2.78 | 2.42 |
| N | 614 | 614 | 614 | 614 | 614 | 614 | 614 | 223 | 147 | 147 |
| $R^2$ | 0.53 | 0.35 | 0.33 | 0.60 | 0.49 | 0.57 | 0.57 | 0.37 | 0.70 | 0.85 |

$$\sigma RET_{it} = \beta_0 + \beta_1 \sigma NIRECY_{it} + \beta_2 \sigma AFSUGL_{it} + \beta_3 \sigma AFSRECY_{it} + \beta_4 \sigma OTTI_{it} + \beta_5 \sigma DERIVUGL_{it} + \beta_6 \sigma DERIVRECY_{it} + \beta_7 PEN_{it} + \beta_8 FC_{it} + \beta_9 \sigma OTHER_{it} + \sum_j \delta_j\, CONTROLS_{it} + \sum_{10} \gamma_{2002-2011} + \varepsilon_{it} \quad (3)$$

Note: The table presents the results of estimating equation (3). * next to the dependent variable names in Columns (1) and (3) indicates the use of five-year variances of OCI components as independent variables. $CONTROLS_{it}$ includes derivatives exposure ($EXP_{it}$), an indicator for non-missing derivatives exposure ($EXPIND_{it}$), interest rate gap ($GAP_{it}$), an indicator for non-missing interest rate gap ($GAPIND_{it}$), firm size ($MVE_{it}$), book-to-market ratio ($BTM_{it}$), comprehensive income ($CI_{it}$), lagged comprehensive income ($CI_{it-1}$), annual stock return ($ANNRET_{it}$), lagged annual stock return ($ANNRET_{it-1}$), and lagged price ($PRICE_{it-1}$). The constant term is included, but not presented for the sake of brevity. $\gamma$ includes fixed effects for years 2002 to 2011, except when data restrictions eliminate the ability to estimate a given year fixed effect. *MULTICOLLINEARITY* indicates the estimation results in at least one variable with a variance inflation factor greater than or equal to 10. Regression coefficients are presented above t-statistics calculated based on standard errors clustered at the firm level. ***, **, and * indicate statistical significance at the 0.01, 0.05, and 0.10 levels based on two-tailed tests. $^+$ indicates the use of rolling five-year variances of OCI components as independent variables.

## 2.4.5 Outliers

Since some of the OCI component volatility measures have relatively large values in the right tails of their distributions, I examine the sensitivity of the results in Table 9, Column (4) to various techniques for addressing outliers in the data and present results in Tables 14 and 15. Note that being an "outlier" does not mean that a given observation is invalid – the designation as an "outlier" simply indicates a given observation's location in the distribution of a given variable.

### 2.4.5.1 Variable Distribution Changes

In this section, I discuss results in Table 14 that employ various distributional transformations of returns volatility and OCI component volatilities (or exclusions of observations with very large returns volatility or OCI component volatilities). Column (1) uses natural logarithmic transformations of the returns volatility and the OCI component volatilities.[31] Column (2) winsorizes these variables at the 99$^{th}$ percentile. Column (3) truncates observations using the 99$^{th}$ percentile of the distributions of these variables. Column (4) uses standardized versions of these variables. Column (5) uses rank transformations of these variables, with observations with zero values of these measures receiving a rank of one.

[31] Returns volatility and OCI component volatility are transformed using the following method: ln(volatility+1).

Results in Table 14, Columns (1)-(4) are reasonably consistent with each other and with Table 9, Column (4). However, when using the rank-transformed variables in Table 14, Column (5), I find that of the OCI component volatilities, only $\sigma PEN_{it}$ and $\sigma FC_{it}$ are statistically significant. As none of the "fair value" subcomponent volatilities are statistically significant in Table 14, Column (5), nonlinear relations may exist between these volatilities and returns volatility. I leave further investigation of the functional form of these relations to future research.

## Table 14: Outliers and Variable Distribution Changes

| Dependent Variable = | *LN(σRET)* | *σRETWIN* | *σRETTRUNC* | *σRETSTD* | *σRETRANK* |
|---|---|---|---|---|---|
| **PARAMETER** | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** |
| *σNIRECY* | 0.44*** | 2.38*** | 2.92*** | 0.33*** | 0.96*** |
| | (7.10) | (5.31) | (3.78) | (5.69) | (6.83) |
| *σAFSUGL* | -0.25* | -2.49** | -2.30 | -0.15** | -0.17 |
| | (-1.85) | (-1.99) | (-1.61) | (-2.30) | (-1.11) |
| *σAFSRECY* | -0.33 | -3.52 | 3.60 | -0.07 | -0.01 |
| | (-1.00) | (-0.99) | (0.75) | (-0.94) | (-0.04) |
| *σOTTI* | 1.04*** | 11.35*** | 12.91** | 0.30*** | 2.07 |
| | (5.87) | (4.21) | (2.21) | (4.35) | (0.68) |
| *σDERIVUGL* | -0.79*** | -7.27*** | -8.20** | -0.10*** | -0.17 |
| | (-2.89) | (-2.68) | (-2.16) | (-2.78) | (-0.37) |
| *σDERIVRECY* | 0.75 | 9.18 | 25.65 | 0.06 | -0.85 |
| | (0.99) | (1.24) | (1.62) | (1.21) | (-0.83) |
| *σPEN* | -1.39*** | -18.35*** | -15.24*** | -0.11*** | -0.72*** |
| | (-3.05) | (-3.47) | (-2.79) | (-2.90) | (-3.65) |
| *σFC* | 1.78*** | 32.99*** | 33.33** | 0.08*** | 3.55*** |
| | (6.55) | (6.48) | (2.34) | (6.25) | (4.61) |
| *σOTHER* | -0.09 | -3.02 | -8.12** | -0.03 | -0.00 |
| | (-0.36) | (-0.90) | (-2.00) | (-0.71) | (-0.02) |
| *CONTROLS* | YES | YES | YES | YES | YES |
| *YEAR FE* | YES | YES | YES | YES | YES |
| *(H3) F-stat* ($\beta_2 = \beta_3$) | 0.04 | 0.06 | 1.19 | 0.35 | 0.50 |
| *(H3) F-stat* ($\beta_2 = \beta_4$) | 25.16*** | 16.68*** | 6.32** | 15.98*** | 0.55 |
| *(H3) F-stat* ($\beta_5 = \beta_6$) | 2.62 | 3.00* | 3.63* | 4.00** | 0.26 |
| N | 614 | 614 | 542 | 614 | 614 |
| $R^2$ | 0.62 | 0.60 | 0.62 | 0.59 | 0.62 |

$$\sigma RET_{it} = \beta_0 + \beta_1\sigma NIRECY_{it} + \beta_2\sigma AFSUGL_{it} + \beta_3\sigma AFSRECY_{it} + \beta_4\sigma OTTI_{it} + \beta_5\sigma DERIVUGL_{it} + \beta_6\sigma DERIVRECY_{it} + \beta_7 PEN_{it} + \beta_8 FC_{it} + \beta_9\sigma OTHER_{it} + \sum_j \delta_j\, CONTROLS_{it} + \sum_{10} \gamma_{2002-2011} + \varepsilon_{it} \quad (3)$$

Note: The table presents the results of estimating equation (3) using various transformations of the dependent variable and OCI component volatilities. $CONTROLS_{it}$ includes derivatives exposure ($EXP_{it}$), an indicator for non-missing derivatives exposure ($EXPIND_{it}$), interest rate gap ($GAP_{it}$), an indicator for non-missing interest rate gap ($GAPIND_{it}$), firm size ($MVE_{it}$), book-to-market ratio ($BTM_{it}$), comprehensive income ($CI_{it}$), lagged comprehensive income ($CI_{it-1}$), annual stock return ($ANNRET_{it}$), lagged annual stock return

($ANNRET_{it-1}$), and lagged price ($PRICE_{it-1}$). The constant term is included, but not presented for the sake of brevity. Regression coefficients are presented above t-statistics calculated based on standard errors clustered at the firm level. ***, **, and * indicate statistical significance at the 0.01, 0.05, and 0.10 levels based on two-tailed tests.

### 2.4.5.2 Robust Regression Methods

In this section, I discuss results in Table 15 that employ various robust regression methods to address outliers in the data.[32] The methods I select are described in detail in Verardi and Croux (2009). Columns (1)-(7) employ methods explicitly described, and statistical routines written and referenced, by Verardi and Croux (2009).

In this paragraph, I summarize these methods, based on the discussion in Verardi and Croux (2009). *QREG* is median regression. *RREG* is robust regression using a type of M-estimator based on iteratively-reweighted OLS. *MREG* is robust regression using M-estimation with only Huber iterations. *SREG* is robust regression using a type of S-estimator that "minimize[s] a measure of dispersion of the residuals that is less sensitive to extreme values than the variance" (Verardi and Croux, 2009, p. 442-443). *MSREG* is robust regression that uses an S-estimator for continuous variables and an M-estimator for indicator variables. *MMREG FE* is two-step robust regression that employs an initial MS-estimator, followed by an MM-estimator computed using iteratively re-weighted OLS and is represented as a "Robust fixed-effects regression" method in its

[32] Leone, Minutti-Meza, and Wasley (2014) provide a recent example of robust regression in accounting.

STATA help file. *MMREG* is two-step robust regression that employs an initial S-estimator, followed by an MM-estimator computed using iteratively re-weighted OLS.

Columns (8)-(10) employ similar statistical routines similar to Columns (3), (4), and (7) written by Jann (2010). The test statistics presented at the bottom of the table are F-statistics for Columns (1)-(7) and $X^2$-statistics in Columns (8)-(10) due to differences in the statistical output from STATA between Columns (1)-(7) and Columns (8)-(10).

Overall, the results are remarkably stable across Table 14. The coefficient on $\sigma AFSUGL_{it}(\sigma OTTI_{it})$ is negative (positive) and significant in all 10 (six of 10) estimations. The coefficient on $\sigma DERIVUGL_{it}$ is negative and significant in six of 10 estimations. Results in Table 14 differ from Table 9, Column (4) in that six of 10 estimations result in significant negative coefficients on $\sigma AFSRECY_{it}$, whereas the coefficient on $\sigma AFSRECY_{it}$ in Table 9, Column (4) is negative and insignificant. Columns (8)-(10) differ from Columns (3), (4), and (7) with respect to $\sigma AFSRECY_{it}$, $\sigma OTTI_{it}$, and $\sigma DERIVRECY_{it}$. These results may differ due to differences in the algorithmic output of the programs written by Verardi and Croux (2009) versus Jann (2010).

## Table 15: Outliers and Robust Regression Methods

| Dependent Variable = | $\sigma RET$ | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Estimation Method = | *QREG* | *RREG* | *MREG* | *SREG* | *MSREG* | *MMREG FE* | *MMREG* | *ROBREG M* | *ROBREG S* | *ROBREG MM* |
| Author(s) | *STATA* | | *VERARDI and CROUX (2009)* | | | | | *JANN (2010)* | | |
| **PARAMETER** | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** | **(7)** | **(8)** | **(9)** | **(10)** |
| $\sigma NIRECY$ | 1.98*** | 1.79*** | 2.17*** | 1.82*** | 2.12*** | 1.99*** | 2.00*** | 2.17*** | 1.79*** | 1.88*** |
| | (9.67) | (11.40) | (11.26) | (8.27) | (14.00) | (7.56) | (7.57) | (7.92) | (8.54) | (9.50) |
| $\sigma AFSUGL$ | -3.10*** | -2.43*** | -2.77*** | -4.59*** | -3.27*** | -3.07*** | -3.13*** | -2.77*** | -4.24*** | -2.73*** |
| | (-4.38) | (-4.49) | (-4.18) | (-7.02) | (-3.55) | (-3.64) | (-3.62) | (-3.08) | (-4.67) | (-4.24) |
| $\sigma AFSRECY$ | -2.15 | -2.77** | -3.31** | -4.21*** | -2.23 | -4.03*** | -4.04*** | -3.31 | -5.12*** | -2.99 |
| | (-1.50) | (-2.53) | (-2.46) | (-2.94) | (-1.65) | (-2.65) | (-2.78) | (-1.24) | (-5.37) | (-1.46) |
| $\sigma OTTI$ | 9.48*** | 7.89*** | 10.12*** | -10.01 | -33.89*** | -12.74 | -12.68 | 10.13*** | 12.09*** | 9.15*** |
| | (8.80) | (9.57) | (9.99) | (-1.55) | (-6.53) | (-1.57) | (-1.53) | (4.79) | (15.45) | (10.82) |
| $\sigma DERIVUGL$ | -4.09 | -4.67** | -5.59** | -1.88 | -2.31 | -3.77** | -3.73** | -5.59*** | -1.91 | -3.76*** |
| | (-1.56) | (-2.32) | (-2.26) | (-1.39) | (-0.87) | (-2.27) | (-2.21) | (-3.61) | (-0.96) | (-2.63) |
| $\sigma DERIVRECY$ | -0.64 | 1.85 | 4.00 | -5.36*** | -4.75 | -1.72 | -1.88 | 3.99 | -6.79 | -2.21 |
| | (-0.12) | (0.45) | (0.80) | (-2.63) | (-1.06) | (-0.40) | (-0.43) | (1.00) | (-1.54) | (-0.67) |
| $\sigma PEN$ | -7.92*** | -9.76*** | -10.50*** | -6.05*** | -6.13*** | -7.44*** | -7.33*** | -10.50*** | -5.80*** | -8.53*** |
| | (-3.16) | (-5.08) | (-4.45) | (-3.15) | (-2.68) | (-3.73) | (-3.74) | (-5.09) | (-3.52) | (-4.47) |
| $\sigma FC$ | 23.88*** | 25.77*** | 22.65*** | 22.41*** | 24.61** | 27.07*** | 27.05*** | 22.65*** | 21.58*** | 21.05*** |
| | (5.78) | (8.14) | (5.83) | (6.57) | (2.40) | (5.04) | (4.87) | (5.59) | (3.05) | (4.36) |
| $\sigma OTHER$ | 0.81 | 0.84 | -0.01 | 1.51 | 1.17 | 1.31 | 1.32 | -0.01 | 2.91 | 1.73 |
| | (0.42) | (0.57) | (-0.01) | (0.66) | (0.60) | (0.87) | (0.87) | (-0.01) | (1.26) | (1.21) |
| *CONTROLS* | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| *YEAR FE* | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| *(H3)* $(\beta_2 = \beta_3)$ | 0.24 | 0.05 | 0.09 | 0.05 | 0.24 | 0.26 | 0.25 | 0.03 | 0.29 | 0.01 |
| *(H3)* $(\beta_2 = \beta_3 = \beta_4)$ | 44.83*** | 56.75*** | 59.16*** | 0.35 | 16.96*** | 1.23 | 1.14 | 30.70*** | 249.38*** | 95.25*** |
| *(H3)* $(\beta_5 = \beta_6)$ | 0.22 | 1.34 | 1.92 | 1.20 | 0.13 | 0.13 | 0.10 | 3.39* | 0.61 | 0.12 |
| N | 614 | 614 | 614 | 614 | 614 | 614 | 614 | 614 | 614 | 614 |

$$\sigma RET_{it} = \beta_0 + \beta_1 \sigma NIRECY_{it} + \beta_2 \sigma AFSUGL_{it} + \beta_3 \sigma AFSRECY_{it} + \beta_4 \sigma OTTI_{it} + \beta_5 \sigma DERIVUGL_{it} + \beta_6 \sigma DERIVRECY_{it} + \beta_7 PEN_{it} + \beta_8 FC_{it} + \beta_9 \sigma OTHER_{it} + \sum_j \delta_j \, CONTROLS_{it} + \sum_{10} \gamma_{2002-2011} + \varepsilon_{it} \quad (3)$$

Note: The table presents the results of estimating equation (3) using various regression methods to address outliers in the data. $CONTROLS_{it}$ includes derivatives exposure ($EXP_{it}$), an indicator for non-missing derivatives exposure ($EXPIND_{it}$), interest rate gap ($GAP_{it}$), an indicator for non-missing interest rate gap ($GAPIND_{it}$), firm size ($MVE_{it}$), book-to-market ratio ($BTM_{it}$), comprehensive income ($CI_{it}$), lagged comprehensive income ($CI_{it-1}$), annual stock return ($ANNRET_{it}$), lagged annual stock return ($ANNRET_{it-1}$), and lagged price ($PRICE_{it-1}$). The constant term is included, but not presented for the sake of brevity. Regression coefficients are presented above t-statistics (z-statistics) in Columns (1)-(7) (Columns (8)-(10)). Tests of coefficient equality display F-statistics for Columns (1)-(7) and Chi-square statistics for Columns (8)-(10). ***, **, and * indicate statistical significance at the 0.01, 0.05, and 0.10 levels based on two-tailed tests.

## 2.4.6 Alternative Explanations for Results

### 2.4.6.1 Debt and Equity Market Returns Volatilities

Negative associations between debt and equity market returns volatilities could explain negative associations between $\sigma RET_{it}$ and both $\sigma AFSUGL_{it}$ and $\sigma DERIVUGL_{it}$ because both $\sigma AFSUGL_{it}$ and $\sigma DERIVUGL_{it}$ are tied to the debt market. Most banks hold large amounts of AFS debt securities as a proportion of their total AFS portfolios.[33] In addition, cash-flow hedges are often used to protect against interest-rate risk associated with forecasted transactions. I perform two tests to examine whether debt and equity market returns volatilities are negatively associated. First, I examine Pearson and Spearman correlations between $\sigma RET_{it}$ for my full sample and rolling five-year standard deviations of monthly returns on five-year U.S. Treasury bonds from the CRSP U.S. Treasury and Inflation Indexes dataset on WRDS. I find a positive insignificant Pearson correlation of 0.03 and a positive significant Spearman correlation of 0.06 for the full sample. For the recycling sample, I find a positive insignificant Pearson correlation of 0.06 and a positive significant Spearman correlation of 0.11.

[33] I confirm this statement by obtaining AFS securities data for 1,311 of the 1,620 full-sample observations from the Bank Regulatory – Bank Holding Companies dataset on WRDS and calculating AFSMIX = (AFSDEBT / AFSTOTAL) * 100. I find that the mean (median) of the rolling five-year average of AFSMIX is 96.81% (99.12%) for these observations. For 524 of the 614 recycling-sample observations, the mean (median) is 97.44% (99.10%).

Second, I examine the Pearson and Spearman correlations between rolling five-year standard deviations of monthly value-weighted S&P 500 returns from the CRSP Index File on the S&P 500 from WRDS between 2002-2012 and rolling five-year standard deviations of five-year U.S. Treasury bond returns over the same time period. I find positive insignificant Pearson (0.28) and Spearman correlations (0.11). Thus, it appears that negative associations between debt and equity market returns volatilities are unlikely to explain negative associations between volatilities of unrealized gains and losses and returns volatility.

#### 2.4.6.2 Earnings Smoothing

Recycled gains (losses) simultaneously decrease (increase) OCI and increase (decrease) net income. Net income volatility is positively associated with returns volatility. Thus, recycled gains and losses, including OTTI losses, could result in income, and thereby returns, that are relatively smooth if managers use recycling to smooth earnings (and thereby returns). Using my recycling sample, I test for earnings smoothing in three ways.

First, prior work documents that negative associations between net income before recycled gains and losses and recycled gains and losses provide evidence of earnings smoothing (Lee et al., 2006). In my empirical tests, OCI recycled gains and loss are the opposite sign of recycled gains and losses recognized in net income. Thus, I test for the presence of earnings smoothing by examining whether positive associations exist between $NIRECY$ and each of $AFSRECY$, $OTTI$, and $DERIVRECY$. I find positive and significant Pearson and Spearman correlations between $NIRECY$ and both $AFSRECY$ and $DERIVRECY$. However, the coefficients on $\sigma AFSRECY_{it}$ and $\sigma DERIVRECY_{it}$ are insignificant in Table 9. Thus, for non-OTTI recycled gains and losses, I find that net income is smoothed by recycled items, but this smoothing effect does not appear to manifest itself in returns volatility. I find a negative insignificant (significant) Pearson (Spearman) correlation between $NIRECY$ and $OTTI$. Per these correlations, smoothing does not appear to explain the positive significant association between $\sigma RET_{it}$ and $\sigma OTTI_{it}$ from Table 9.

Second, if recycled gains and losses are used to smooth earnings, the volatility of net income should be less than the volatility of net income before recycled gains and losses. I compare the standard deviation of $NI$ to the standard deviation of $NIRECY$ using variance ratio tests. I find no evidence that $NI$ has a smaller standard deviation than $NIRECY$ (F = 1.00, p = 0.49).

Third, I use a two-sample t-test and find that $\sigma NI$ is not less than $\sigma NIRECY$ (t = 0.25, p = 0.60). Overall, the evidence for earnings smoothing is either weak or non-existent for my sample.

#### 2.4.6.3 Persistence

The risk-relevance of OCI components may arise from the persistence of the components. To address this concern, I estimate the first-order auto-regression coefficient for each OCI component (and for net income before recycling adjustments) using rolling five-year windows from year *t-4* to year *t*.[34] I include these AR(1) coefficients as additional controls variables in equation (3) from Table 9, Column (4). Table 16, Column (1) presents the results. Inferences are unchanged.

#### 2.4.6.4 Management Discretion

The risk-relevance of OCI components may be affected by the ability of managers to differentially manipulate OCI adjustments. It is difficult to predict whether managers are more able to manipulate "fair value" OCI components or "accounting calculation" OCI components. Managers may be able to manipulate "fair value" OCI adjustments through timing sales (settlements) of AFS securities (cash-flow hedges) or manipulating Level 2 and Level 3 fair values of AFS securities and cash-flow hedges. However, managers may able be able to manipulate pension-related adjustments through changing assumptions about the expected rate of return on pension assets or alter the foreign currency translation adjustment through engaging in (or not engaging in), or altering assumptions about, economic hedges of net investments in foreign subsidiaries.

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[34] Such an estimation uses the following generic model: $OCIComponent_{it} = \beta_0 + \beta_1 OCIComponent_{it-1} + \varepsilon_{it}$.

To investigate whether OCI component risk-relevance varies with managers' discretion, I proxy for managers' differential discretion over "fair value" versus "accounting calculation" OCI components by creating a variable that represents a bank's average exposure to "fair value" adjustments relative to total OCI adjustments. I calculate the sum of the absolute values of $AFSUGL$, $AFSRECY$, $OTTI$, $DERIVUGL$, and $DERIVRECY$ for each bank-year. Then, over each rolling five-year window from year *t-4* to year $t$, I calculate the average of these annual sums, scale this average by the average of the absolute values of OCI over the same period, and create a variable called $ABSFAIRVALUE$. I calculate the median of $ABSFAIRVALUE$ for the recycling sample. Observations with above-median values of $ABSFAIRVALUE$ are grouped together, and observations with equal or below values of $ABSFAIRVALUE$ are grouped together. Then, I estimate equation (3) from Table 9, Column (4) for each group. The intuition behind $ABSFAIRVALUE$ is that managers of firms with observations in the "above-median" group have more (less) discretion over "fair value" OCI components ("accounting calculation" OCI components) based on average adjustment size.

Table 16, Column (4) presents the differences in volatility coefficient estimates across the two samples from a fully interacted model. Investors appear to place significantly more positive risk-weight on the volatility of recycled gains and losses on cash-flow hedges ($\sigma DERIVRECY_{it}$) for firms with large "fair value" OCI adjustments (small “accounting calculation” adjustments). This result could indicate one of two things. First, the result could indicate that investors perceive that managers of firms with relatively large cash-flow hedge recycling adjustments have more discretion to manage earnings and assess volatility of recycled gains and losses on cash-flow hedges for these managers’ firms as relatively more risky than firms with relatively small cash-flow hedge adjustments. Second, the result could indicate that investors place relatively more positive weight on the volatility of cash-flow hedge recycling adjustments when managers have relatively more experience with cash-flow hedges, as indicated by having relatively larger cash-flow hedge recycling adjustments.

Investors also appear to place significantly more risk-weight on $\sigma FC_{it}$ for firms with relatively small “accounting calculation” adjustments (large “fair value” adjustments). Again, this result could be interpreted in two ways. First, the result could indicate that investors assess firms with volatile foreign currency translation adjustments, but less experience with these adjustments (as represented by relatively small “accounting calculation” adjustments), as relatively more risky. Second, the result could be interpreted as evidence that investors discount (i.e., place less positive weight on) foreign-currency-related volatility for firms that have relatively more discretion over foreign currency translation adjustments, as represented by relatively large “accounting calculation" adjustments. Overall, the results examining managerial discretion are mixed.

**Table 16: Persistence and Management Discretion**

| **Dependent Variable =** | *σRET* | | | |
|---|---|---|---|---|
| **Sample =** | ***Recy*** | ***Small FV*** | ***Large FV*** | ***Diff*** |
| **PARAMETER** | **(1)** | **(2)** | **(3)** | **(4)** |
| *σNIRECY* | 2.23*** | 2.34*** | 2.45*** | 0.11 |
| | (5.65) | (4.44) | (3.16) | (0.12) |
| *σAFSUGL* | -2.70** | -3.03*** | 0.36 | 3.39 |
| | (-2.31) | (-2.72) | (0.16) | (1.35) |
| *σAFSRECY* | -3.60 | -6.28* | -5.88 | 0.40 |
| | (-1.09) | (-1.93) | (-1.19) | (0.07) |
| *σOTTI* | 11.30*** | -60.04 | 7.95** | 68.00 |
| | (4.33) | (-1.15) | (2.58) | (1.30) |
| *σDERIVUGL* | -7.47*** | -6.01 | -8.49** | -2.48 |
| | (-2.63) | (-1.58) | (-2.60) | (-0.50) |
| *σDERIVRECY* | 10.59 | -60.28*** | 7.15 | 67.43*** |
| | (1.22) | (-3.66) | (1.05) | (3.61) |
| *σPEN* | -14.52*** | -10.49** | -22.15*** | -11.66 |
| | (-2.69) | (-2.22) | (-3.42) | (-1.55) |
| *σFC* | 18.11*** | 27.56*** | 45.83*** | 18.27* |
| | (5.06) | (7.73) | (5.42) | (1.85) |
| *σOTHER* | -3.06 | -0.68 | 2.06 | 2.74 |
| | (-0.97) | (-0.23) | (0.27) | (0.34) |
| *CONTROLS* | YES | YES | YES | YES |
| *YEAR FE* | YES | YES | YES | YES |
| *PERSISTENCE* | YES | NO | NO | NO |
| *MULTICOLLINEARITY* | NO | NO | NO | YES |
| *(H3) F-stat* ($\beta_2 = \beta_3$) | 0.05 | 0.73 | 0.93 | 0.16 |
| *(H3) F-stat* ($\beta_2 = \beta_4$) | 19.92*** | 1.18 | 2.33 | 1.51 |
| *(H3) F-stat* ($\beta_5 = \beta_6$) | 2.79* | 10.44*** | 2.77 | 12.18*** |
| N | 614 | 307 | 307 | 614 |
| $R^2$ | 0.61 | 0.68 | 0.58 | 0.63 |

$$\sigma RET_{it} = \beta_0 + \beta_1 \sigma NIRECY_{it} + \beta_2 \sigma AFSUGL_{it} + \beta_3 \sigma AFSRECY_{it} + \beta_4 \sigma OTTI_{it} + \beta_5 \sigma DERIVUGL_{it} + \beta_6 \sigma DERIVRECY_{it} + \beta_7 PEN_{it} + \beta_8 FC_{it} + \beta_9 \sigma OTHER_{it} + \sum_{j} \delta_j \, CONTROLS_{it} + \sum_{10} \gamma_{2002-2011} + \varepsilon_{it} \quad (3)$$

Note: The table presents the results of estimating equation (3). $CONTROLS_{it}$ includes derivatives exposure ($EXP_{it}$), an indicator for non-missing derivatives exposure ($EXPIND_{it}$), interest rate gap ($GAP_{it}$), an indicator for non-missing interest rate gap ($GAPIND_{it}$), firm size ($MVE_{it}$), book-to-market ratio ($BTM_{it}$), comprehensive income ($CI_{it}$), lagged comprehensive income ($CI_{it-1}$), annual stock return ($ANNRET_{it}$), lagged annual stock return ($ANNRET_{it-1}$), and lagged price ($PRICE_{it-1}$). The constant term is included, but not presented for the sake of brevity. In Column (1), $CONTROLS_{it}$ also includes the AR(1) coefficients for each OCI component whose volatility measure is included in the model as an independent variable, as well as the AR(1) coefficient for $NIRECY$. $MULTICOLLINEARITY$ indicates the estimation results in at least one variable with a variance inflation factor greater than or equal to 10. Regression coefficients are presented above t-statistics calculated based on standard errors clustered at the firm level. ***, **, and * indicate statistical significance at the 0.01, 0.05, and 0.10 levels based on two-tailed tests.

## 2.5 Conclusion

I examine whether OCI components are associated with returns volatility for banks. I predict that OCI component volatilities have differing associations with returns volatility, and that inferences regarding the usefulness of OCI can be improved by analyzing associations between OCI component volatilities and returns volatility. I use returns volatility as the measure of total risk for a bank, consistent with the FASB's conceptual framework, and disaggregate OCI into its four primary components: AFS securities adjustments, cash-flow hedge adjustments; pension-related adjustments; and foreign currency translation adjustments. I find some evidence that pension-related OCI volatility is negatively associated with returns volatility, but this evidence weakens considerably when examining only observations with non-zero pension-related volatility. I also find some evidence of a positive association between foreign currency translation adjustment volatility and returns volatility, but the significance of this evidence is significantly dampened when examining only observations with non-zero foreign currency translation adjustment volatility. I find no evidence of significant associations between the other primary OCI component volatilities and returns volatility.

Using hand-collected data, I further disaggregate AFS securities adjustments and cash-flow hedge adjustments into their unrealized and recycled subcomponents. I find evidence that the volatilities of unrealized gains and losses on AFS securities and cash-flow hedges, typically deemed beyond managers' control, are negatively associated with returns volatility, while the volatility of OTTI losses, over which managers have relatively more control, is positively associated with returns volatility, especially during the recent financial crisis. The results are consistent with investors perceiving the volatility of non-OTTI AFS unrealized gains and losses as relatively less important, less risky, or less risk-relevant, than OTTI losses, and perceiving the volatility of OTTI losses as an informative signal about risk, similar to the volatility of net income. Since the risk-relevance of non-OTTI unrealized gains and losses differs from that of net income, while the risk-relevance of OTTI losses is similar to net income, the results are relevant for accounting standard setters seeking to understand potential characteristics that distinguish OCI components from net income (IASB, 2013).

# 3. Returns Volatility, Tier 1 Capital Volatility, and AOCI Component Volatilities

## *3.1 Hypothesis Development*

Hypotheses 1-3 involve the volatility of "flow" variables (OCI component volatilities) as measures of performance statement volatility. I also examine the research question using the volatility of a "stock" measure from the balance sheet, accumulated other comprehensive income (AOCI), which represents the accumulation of all OCI for a bank. I examine AOCI component volatilities in the context of recently-proposed changes to the calculation of banks' Tier 1 Capital. Prior to 2014 and the recommendations of the Basel Committee (Basel III) and the FDIC, certain AOCI components were excluded from Tier 1 Capital (Basel, 2006; FFIEC, 2012; FDIC 2013). The Basel Committee (Basel III) recommended and, subsequently, the FDIC required that certain components of AOCI that were previously excluded from Tier 1 Capital be included in Tier 1 Capital starting in 2014 (FDIC, 2013).[1] AOCI components previously excluded from Tier 1 Capital will be included in Tier 1 Capital on a phased basis, with

[1] The requirement to eliminate AOCI exclusions from Tier 1 Capital applies to banks subject to the "advanced approaches rule," which are banks with assets larger than $250 billion, foreign balance sheet exposure of at least $10 billion, or banks that are subsidiaries of "advanced approaches" or "core" banks (http://www.occ.gov/topics/capital-policy/baselii-advanced-approaches/index-basel-ii.html; PWC, 2012; FDIC, 2013). Other banks may choose to continue to apply current Tier 1 Capital reporting requirements if they elect to do so "in [their] first Consolidated Reports of Condition and Income (Call Report) that is filed after …it becomes subject to the interim final rule" (FDIC, 2013, p. 34). FDIC-supervised banks that do not use the "AOCI opt-out election" will be subject to phased inclusion of previously-excluded AOCI components beginning in 2015 (FDIC, 2013, p. 211-212).

20% inclusion in 2014, 40% inclusion in 2015, 60% inclusion in 2016, 80% inclusion in 2017, and full inclusion in 2018 and thereafter (FDIC, 2013).[2]

"Banking organizations of all sizes, banking and other industry groups, public officials (including members of the U.S. Congress), and other individuals strongly opposed the proposal to include most AOCI components in common equity tier 1 capital" (FDIC, 2013, p. 145). Mirroring comments to the FASB regarding the inclusion of OCI with net income in a single statement of performance, the FDIC notes that "most commenters [on the proposed adoption of the Basel III requirements] argued that the inclusion of unrealized gains and losses on AFS debt securities in regulatory capital could result in volatile capital levels" (FDIC, 2013, p. 145).

Despite the protests of the parties noted above, the FDIC continues to maintain their position regarding the inclusion of most AOCI components in Tier 1 Capital:

> "The FDIC believes that the proposed AOCI treatment results in a regulatory capital measure that better reflects FDIC-supervised institutions' actual risk at a specific point in time. The FDIC also believes that AOCI is an important indicator that market observers use to evaluate the capital strength of an FDIC-supervised institution" (FDIC, 2013, p. 148-149).

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[2] Prior to the Basel III adjustments to Tier 1 Capital, only unrealized losses on AFS equity securities and foreign currency translation adjustments are/were included in Tier1 Capital (FDIC, 2013).

I examine the validity of the claims of the opposition to AOCI inclusion in Tier 1 Capital. I follow commenters to the FDIC and predict that Tier 1 Capital including more AOCI components will increase Tier 1 Capital volatility relative to Tier 1 Capital calculated under current standards. However, as the findings for OCI "flow" components in Chapter 2 indicate, it is not clear that AOCI component volatilities will be positively or negatively associated with returns volatility, if at all.

H4: Tier 1 Capital as proposed by Basel III and required by the FDIC is more volatile than Tier 1 Capital calculated under pre-Basel-III regulatory requirements.

H5: AOCI component volatilities are associated with returns volatility.

## 3.2 Sample

To test H4 and H5, I use a subsample of 1,302 annual bank holding company observations from 2002 to 2012. I merge the Bank Regulatory – Bank Holding Companies dataset on WRDS with the full sample from Chapter 2. To accomplish this quarterly-to-annual data merge, I match observations based on reporting dates from the bank regulatory dataset and year-end dates from SNL Financial. Since I am using "stock" measures from the bank regulatory data, this matching method is valid, as the fourth quarter "stock" measures from the bank regulatory reports are matched with year-end dates.

Table 17, Panel A presents descriptive statistics for the bank-year observations used to calculate the "stock" volatility measures. As mentioned previously, the Tier 1 Capital Ratio previously excluded accumulated unrealized gains and losses on AFS debt securities, accumulated unrealized gains on equity securities, and the accumulated sum of cash-flow hedge adjustments and pension-related AOCI items. $TIER1RATIO$ is the Tier 1 Capital Ratio under pre-Basel-III FDIC regulations. $TIER1NEWRATIO$ is the Tier 1 Capital ratio under current FDIC regulations, adjusted to include not only accumulated unrealized losses on equity securities and foreign currency translation adjustments, but also accumulated unrealized gains and losses on AFS debt securities, accumulated unrealized gains on equity securities, and the accumulated sum of cash-flow hedge adjustments and pension-related AOCI items.[3] $TIER1NOAOCIRATIO$ is the Tier 1 Capital Ratio under current FDIC regulations, but excluding unrealized losses on equity securities. The three Tier 1 Capital Ratios ($TIER1RATIO$, $TIER1NEWRATIO$, and $TIER1NOAOCIRATIO$) are distributed similarly.

$AFSRATIO$ equals accumulated unrealized gains and losses on AFS securities (scaled by risk-weighted assets), $AFSEQUITYLOSSRATIO$ equals accumulated unrealized

[3] It should be noted that various post-Basel-III adjustments to the newly-included AOCI amounts are allowed under circumstances set forth in form FR Y-9C for bank holding companies. Thus, the estimations in my study using pre-Basel-III AOCI amounts, and pre-Basel-III Tier 1 Capital altered to include pre-Basel-III AOCI amounts, represent AOCI inclusions in "Common Equity Tier 1 Capital" before such post-Basel-III adjustments. For an example of these adjustments, see p. 47-48 of Bank of America's 3/31/2014 FR Y-9C available at http://www.ffiec.gov/nicpubweb/NICDataCache/FRY9C/FRY9C_1073757_20140331.PDF.

losses on AFS equity securities (scaled by risk-weighted assets), $AFSINCRATIO$ equals accumulated unrealized gains and losses on AFS debt securities and accumulated unrealized gains on AFS equity securities (scaled by risk-weighted assets), and $DERIVPENRATIO$ equals the accumulated sum of cash-flow hedge adjustments and pension-related AOCI items (scaled by risk-weighted assets). All AOCI items are the net result of unrealized gains and losses and recycling adjustments. Of the AOCI component measures, $AFSINCRATIO$ has the largest mean for both samples.

Table 17, Panel B presents descriptive statistics for regression variables. $\sigma TIER1RATIO_{it}$ and $\sigma TIERNOAOCIRATIO_{it}$ are similarly distributed. The volatility of AFS security gains and losses new to the calculation of Tier 1 Capital ($\sigma AFSINCRATIO_{it}$) appears to determine the distributional characteristics of the volatility of all AFS security gains and losses ($\sigma AFSRATIO_{it}$). Table 17, Panel C indicates that of the AOCI volatility measures, $\sigma AFSRATIO_{it}$ and $\sigma AFSRATIOINC_{it}$ have the most non-zero values, followed by $\sigma DERIVPENRATIO_{it}$ and $\sigma AFSEQUITYLOSSRATIO_{it}$. Table 17, Panel D displays a positive significant Pearson correlation between returns volatility ($\sigma RET_{it}$) and $\sigma DERIVPENRATIO_{it}$ and negative significant Spearman correlations between $\sigma RET_{it}$ and both $\sigma AFSRATIO_{it}$ and $\sigma AFSINCRATIO_{it}$.

## 3.3 Research Design and Results

To test H4, I perform variance ratio tests of whether $TIER1NEWRATIO$ is more volatile that $TIER1RATIO$ and present the results in Table 17, Panel E. I fail to find evidence consistent with H4. $TIER1NEWRATIO$ is not significantly more volatile than $TIER1RATIO$ for either sample.[4]

[4] In a prior version of this study, I examined whether $TIER1NEWRATIO$ was more volatile than $TIER1RATIO$ for a sample of bank holding companies using quarterly data instead of annual data. I found evidence that $TIER1NEWRATIO$ was significantly more volatile than $TIER1RATIO$ based on quarterly data. In addition, I found that $TIER1NOAOCIRATIO$ was no more volatile than $TIER1RATIO$. Finally, I found evidence that $TIER1NEWRATIO$ was significantly more volatile than $TIER1NOAOCIRATIO$. Overall, these findings using quarterly data support H4, and indicate that future analysis of quarterly bank data may yield more powerful tests.

# Table 17: Summary Statistics for Regulatory Capital and AOCI

**Panel A: Descriptive Statistics for Bank-Year Observations**

| **Full Sample** | **N** | **MEAN** | **STD** | **MIN** | **P25** | **P50** | **P75** | **MAX** |
|---|---|---|---|---|---|---|---|---|
| *TIER1RATIO* | 2,258 | 12.35 | 3.14 | 0.54 | 10.28 | 11.92 | 13.94 | 37.06 |
| *TIER1NEWRATIO* | 2,258 | 12.37 | 3.20 | 0.64 | 10.24 | 11.92 | 13.94 | 36.26 |
| *TIER1NOAOCIRATIO* | 2,258 | 12.36 | 3.14 | 0.54 | 10.28 | 11.93 | 13.94 | 37.06 |
| *AFSRATIO* | 2,258 | 0.08 | 0.50 | -7.83 | -0.09 | 0.05 | 0.27 | 2.76 |
| *AFSEQUITYLOSSRATIO* | 2,258 | -0.01 | 0.04 | -0.85 | 0.00 | 0.00 | 0.00 | 0.00 |
| *AFSINCRATIO* | 2,258 | 0.09 | 0.50 | -7.80 | -0.08 | 0.06 | 0.27 | 2.76 |
| *DERIVPENRATIO* | 2,258 | -0.07 | 0.20 | -1.80 | -0.04 | 0.00 | 0.00 | 0.73 |
| **Recycling Sample** | **N** | **MEAN** | **STD** | **MIN** | **P25** | **P50** | **P75** | **MAX** |
| *TIER1RATIO* | 912 | 12.65 | 3.32 | 0.54 | 10.45 | 12.13 | 14.33 | 37.06 |
| *TIER1NEWRATIO* | 912 | 12.66 | 3.37 | 0.64 | 10.45 | 12.14 | 14.44 | 36.26 |
| *TIER1NOAOCIRATIO* | 912 | 12.65 | 3.32 | 0.54 | 10.45 | 12.13 | 14.34 | 37.06 |
| *AFSRATIO* | 912 | 0.09 | 0.50 | -5.79 | -0.08 | 0.06 | 0.27 | 2.76 |
| *AFSEQUITYLOSSRATIO* | 912 | -0.01 | 0.03 | -0.34 | 0.00 | 0.00 | 0.00 | 0.00 |
| *AFSINCRATIO* | 912 | 0.10 | 0.50 | -5.78 | -0.07 | 0.07 | 0.28 | 2.76 |
| *DERIVPENRATIO* | 912 | -0.09 | 0.23 | -1.80 | -0.05 | 0.00 | 0.00 | 0.68 |

**Panel B: Descriptive Statistics for Regression Variables**

| **Full Sample** | **N** | **MEAN** | **STD** | **MIN** | **P25** | **P50** | **P75** | **MAX** |
|---|---|---|---|---|---|---|---|---|
| *σTIER1RATIO* | 1,302 | 1.43 | 1.02 | 0.10 | 0.74 | 1.17 | 1.84 | 9.62 |
| *σTIER1NOAOCIRATIO* | 1,302 | 1.43 | 1.02 | 0.10 | 0.74 | 1.17 | 1.82 | 9.59 |
| *σAFSRATIO* | 1,302 | 0.28 | 0.30 | 0.00 | 0.12 | 0.21 | 0.35 | 3.34 |
| *σAFSEQUITYLOSSRATIO* | 1,302 | 0.01 | 0.04 | 0.00 | 0.00 | 0.00 | 0.01 | 0.38 |
| *σAFSINCRATIO* | 1,302 | 0.28 | 0.30 | 0.00 | 0.12 | 0.21 | 0.35 | 3.34 |
| *σDERIVPENRATIO* | 1,302 | 0.06 | 0.09 | 0.00 | 0.00 | 0.01 | 0.09 | 0.60 |
| **Recycling Sample** | **N** | **MEAN** | **STD** | **MIN** | **P25** | **P50** | **P75** | **MAX** |
| *σTIER1RATIO* | 516 | 1.51 | 1.13 | 0.12 | 0.74 | 1.18 | 1.94 | 9.62 |
| *σTIER1NOAOCIRATIO* | 516 | 1.51 | 1.13 | 0.17 | 0.74 | 1.19 | 1.94 | 9.59 |
| *σAFSRATIO* | 516 | 0.30 | 0.27 | 0.00 | 0.13 | 0.23 | 0.39 | 2.21 |
| *σAFSEQUITYLOSSRATIO* | 516 | 0.01 | 0.02 | 0.00 | 0.00 | 0.00 | 0.01 | 0.15 |
| *σAFSINCRATIO* | 516 | 0.30 | 0.27 | 0.00 | 0.13 | 0.23 | 0.38 | 2.25 |
| *σDERIVPENRATIO* | 516 | 0.07 | 0.11 | 0.00 | 0.00 | 0.02 | 0.12 | 0.45 |

**Panel C: Descriptive Statistics for Volatility Indiator Variables**

| **Full Sample** | **N** | **# ZEROES** | **# ONES** | **MEAN** | **STD** | **MIN** | **P25** | **P50** | **P75** | **MAX** |
|---|---|---|---|---|---|---|---|---|---|---|
| *σTIER1RATIOIND* | 1,302 | 0 | 1302 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| *σTIER1NOAOCIRATIOIND* | 1,302 | 0 | 1302 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| *σAFSRATIOIND* | 1,302 | 7 | 1295 | 0.99 | 0.07 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| *σAFSEQUITYLOSSRATIOIND* | 1,302 | 641 | 661 | 0.51 | 0.50 | 0.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| *σAFSINCRATIOIND* | 1,302 | 7 | 1295 | 0.99 | 0.07 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| *σDERIVPENRATIOIND* | 1,302 | 592 | 710 | 0.55 | 0.50 | 0.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| **Recycling Sample** | **N** | **# ZEROES** | **# ONES** | **MEAN** | **STD** | **MIN** | **P25** | **P50** | **P75** | **MAX** |
| *σTIER1RATIOIND* | 516 | 0 | 516 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| *σTIER1NOAOCIRATIOIND* | 516 | 0 | 516 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| *σAFSRATIOIND* | 516 | 0 | 516 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| *σAFSEQUITYLOSSRATIOIND* | 516 | 266 | 250 | 0.48 | 0.50 | 0.00 | 0.00 | 0.00 | 1.00 | 1.00 |
| *σAFSINCRATIOIND* | 516 | 0 | 516 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| *σDERIVPENRATIOIND* | 516 | 228 | 288 | 0.56 | 0.50 | 0.00 | 0.00 | 1.00 | 1.00 | 1.00 |

**Panel D: Correlation Statistics for Regression Variables**

| **VARIABLE** | *σRET* | *σTIER1RATIO* | *σTIER1NOAOCIRATIO* | *σAFSRATIO* | *σAFSINCRATIO* | *σAFSEQUITYLOSSRATIO* | *σDERIVPENRATIO* |
|---|---|---|---|---|---|---|---|
| *σRET* | | 0.34* | 0.34* | -0.02 | -0.03 | 0.00 | 0.06* |
| *σTIER1RATIO* | 0.38* | | 1.00* | 0.20* | 0.20* | 0.07* | 0.07* |
| *σTIER1NOAOCIRATIO* | 0.38* | 1.00* | | 0.20* | 0.20* | 0.07* | 0.07* |
| *σAFSRATIO* | -0.12* | 0.08* | 0.08* | | 1.00* | 0.30* | 0.04 |
| *σAFSINCRATIO* | -0.12* | 0.08* | 0.08* | 1.00* | | 0.24* | 0.03 |
| *σAFSEQUITYLOSSRATIO* | -0.01 | -0.04 | -0.03 | 0.07* | 0.06* | | 0.07* |
| *σDERIVPENRATIO* | 0.04 | 0.02 | 0.02 | 0.04 | 0.04 | 0.05 | |

**Panel E: Variance Ratio Tests**

| **Full Sample** | **P value** |
|---|---|
| *(H4) (σTIER1RATIO / σTIER1NEWRATIO) < 1* | 0.16 |
| *(σTIER1NOAOCIRATIO / σTIER1RATIO) < 1* | 0.51 |
| *(σTIER1NOAOCIRATIO) / σTIER1NEWRATIO) < 1* | 0.17 |
| **Recycling Sample** | **P value** |
| *(H4) (σTIER1RATIO / σTIER1NEWRATIO) < 1* | 0.31 |
| *(σTIER1NOAOCIRATIO / σTIER1RATIO) < 1* | 0.51 |
| *(σTIER1NOAOCIRATIO) / σTIER1NEWRATIO) < 1* | 0.31 |

To test H5, I estimate equations (7) and (8) using panel OLS regression with firm-clustered standard errors.

$$\sigma RET_{it} = \beta_0 + \beta_1 \sigma TIER1Proxy_{it} + \beta_2 \sigma AFSRATIO_{it} + \beta_3 \sigma DERIVPENRATIO_{it} + \sum_j \delta_j\, CONTROLS_{it} + \sum_{10} \gamma_{2002-2011} + \varepsilon_{it} \tag{7}$$

$$\sigma RET_{it} = \beta_0 + \beta_1 \sigma TIER1NOAOCIRATIO_{it} + \beta_2 \sigma AFSINCRATIO_{it} + \beta_3 \sigma AFSEQUITYLOSSRATIO_{it} + \beta_4 \sigma DERIVPENRATIO_{it} + \sum_j \delta_j\, CONTROLS_{it} + \sum_{10} \gamma_{2002-2011} + \varepsilon_{it} \tag{8}$$

I include the same $CONTROLS_{it}$ vector as the estimations in Chapter 2, and present results in Table 18 for the full subsample (N = 1,302) and the recycling subsample (N = 516). Table 18 indicates that the volatility of Tier 1 Capital is positively associated with returns volatility. Table 18 also indicates that the volatility of accumulated gains and losses on AFS securities ($\sigma AFSRATIO_{it}$) is negatively associated with returns volatility, driven primarily by the volatility of the new gains and losses on AFS securities included in Tier 1 Capital ($\sigma AFSINCRATIO_{it}$). F-tests indicate that the cumulative effect of AOCI component volatilities on returns volatility is marginal. For example, F-tests of $\beta_2 + \beta_3$ = 0 from equation (7) (Table 18, Columns (1) and (2)) indicate a significant cumulative association between AOCI component volatilities and returns volatility. However, for the recycling subsample, these F-tests yield insignificant results. Overall, the results indicate that Tier 1 Capital calculated in accordance with Basel III and new FDIC requirements is not more volatile than Tier 1 Capital calculated in accordance with previous requirements. In addition, the volatility of accumulated unrealized gains and losses on AFS debt securities and accumulated unrealized gains on AFS equity securities is negatively associated with returns volatility, consistent with the existence of an empirical association hypothesized by H5. The evidence in Table 18, Columns (3) and (6) for the volatility of new gains and losses on AFS securities included in Tier 1 Capital ($\sigma AFSINCRATIO_{it}$) is similar to that presented in Chapter 2 for non-OTTI AFS unrealized gains and losses, and may indicate that investors perceived fluctuations in the "stock" of non-OTTI AFS unrealized gains and losses as relatively less important, less risky, or less risk-relevant than $\sigma TIER1NOAOCIRATIO_{it}$, a proxy for pre-AOCI Tier 1 Capital, which is significantly positively associated with risk.

## Table 18: Returns Volatility, Regulatory Capital, and AOCI

| Dependent Variable = | $\sigma RET$ | | | | | |
|---|---|---|---|---|---|---|
| **PARAMETER** | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** |
| *σTIER1RATIO* | 0.70*** | | | 0.98*** | | |
| | (3.93) | | | (4.73) | | |
| *σTIER1NOAOCIRATIO* | | 0.70*** | 0.70*** | | 0.98*** | 0.98*** |
| | | (3.93) | (3.93) | | (4.74) | (4.76) |
| *σAFSRATIO* | -0.85* | -0.84 | | -2.62*** | -2.61*** | |
| | (-1.65) | (-1.64) | | (-2.69) | (-2.69) | |
| *σAFSINCRATIO* | | | -0.89* | | | -2.47** |
| | | | (-1.71) | | | (-2.04) |
| *σAFSEQUITYLOSSRATIO* | | | 0.43 | | | -4.23 |
| | | | (0.12) | | | (-0.32) |
| *σDERIVPENRATIO* | -3.31 | -3.30 | -3.33 | -2.98 | -2.98 | -3.00 |
| | (-1.55) | (-1.55) | (-1.55) | (-0.93) | (-0.93) | (-0.94) |
| *CONTROLS* | YES | YES | YES | YES | YES | YES |
| *YEAR FE* | YES | YES | YES | YES | YES | YES |
| *F-stat* ($\beta_2 = \beta_3$) | 1.26 | 1.26 | | 0.01 | 0.01 | |
| *F-stat* ($\beta_2 = \beta_3 = 0$) | 2.58* | 2.55* | | 3.71** | 3.72** | |
| *F-stat* ($\beta_2 + \beta_3 = 0$) | 3.60* | 3.58* | | 2.53 | 2.53 | |
| *F-stat* ($\beta_2 = \beta_3 = \beta_4$) | | | 0.65 | | | 0.03 |
| *F-stat* ($\beta_2 = \beta_3 = \beta_4 = 0$) | | | 1.75 | | | 4.27*** |
| *F-stat* ($\beta_2 + \beta_3 + \beta_4 = 0$) | | | 0.97 | | | 0.75 |
| N | 1,302 | 1,302 | 1,302 | 516 | 516 | 516 |
| $R^2$ | 0.55 | 0.55 | 0.55 | 0.53 | 0.53 | 0.53 |

$$\sigma RET_{it} = \beta_0 + \beta_1 \sigma TIER1Proxy_{it} + \beta_2 \sigma AFSRATIO_{it} + \beta_3 \sigma DERIVPENRATIO_{it} + \sum_j \delta_j\, CONTROLS_{it} + \sum_{10} \gamma_{2002-2011} + \varepsilon_{it} \quad (7)$$

$$\sigma RET_{it} = \beta_0 + \beta_1 \sigma TIER1NOAOCIRATIO_{it} + \beta_2 \sigma AFSINCRATIO_{it} + \beta_3 \sigma AFSEQUITYLOSSRATIO_{it} + \beta_4 \sigma DERIVPENRATIO_{it} + \sum_j \delta_j\, CONTROLS_{it} + \sum_{10} \gamma_{2002-2011} + \varepsilon_{it} \quad (8)$$

Note: The table presents the results of estimating equations (7) and (8). In Columns (1) and (4), $\sigma TIER1Proxy_{it}$ equals $\sigma TIER1RATIO_{it}$. In Columns (2) and (5), $\sigma TIER1Proxy_{it}$ equals $\sigma TIER1NOAOCIRATIO_{it}$. In Columns (1)-(3), $CONTROLS_{it}$ includes derivatives exposure ($EXP_{it}$), an indicator for non-missing derivatives exposure ($EXPIND_{it}$), interest rate gap ($GAP_{it}$), an indicator for non-missing interest rate gap ($GAPIND_{it}$), firm size ($MVE_{it}$), book-to-market ratio ($BTM_{it}$), comprehensive income ($CI_{it}$), lagged comprehensive income ($CI_{it-1}$), annual stock return ($ANNRET_{it}$), lagged annual stock return

($ANNRET_{it-1}$), and lagged price ($PRICE_{it-1}$). In Columns (4)-(6), $CONTROLS_{it}$ includes the same controls as Columns (1)-(3) excluding $EXPIND_{it}$ due to multicollinearity. The constant term is included, but not presented for the sake of brevity. Regression coefficients are presented above t-statistics calculated based on standard errors clustered at the firm level. ***, **, and * indicate statistical significance at the 0.01, 0.05, and 0.10 levels based on two-tailed tests.

## 3.4 Robustness

I examine the sensitivity of the results in Table 18 to using the rolling five-year standard deviation of annual returns from years *t-4* to *t* instead of the rolling five-year standard deviation of monthly returns from years *t-4* to *t*. In untabulated results, I again find that Tier 1 Capital volatility is positively associated with returns volatility. However, I only find significant negative relations between returns volatility and both $\sigma AFSRATIO_{it}$ and $\sigma AFSINCRATIO_{it}$ for the recycling subsample. I also find consistent evidence of a significant negative relation between returns volatility and $\sigma DERIVPENRATIO_{it}$. For both the full subsample and the recycling subsample, F-tests indicate that the cumulative association between AOCI component volatilities and returns volatility is significant, and individual coefficients indicate that this association is negative.

## 3.5 Conclusion

I find no evidence that post-Basel-III Tier 1 Capital is more volatile than pre-Basel-III Tier 1 Capital. I find that the volatilities of both pre-Basel-III Tier 1 Capital and Tier 1 Capital excluding the new required AOCI amounts and unrealized losses on equity securities are positively associated with returns volatility, but I find no evidence that AOCI component volatilities are positively associated with returns volatility, a measure of total risk.

Banks are including increasing percentages of AOCI in Tier 1 Capital and will continue to do so until 2018, at which time all of AOCI will be included in Tier 1 Capital, subject to allowable exclusions on form FR Y-9C, especially for large banks. As accounting standard setters and bank regulators grapple with conceptual reasons for the separation or inclusion of OCI and AOCI in summary performance and "capital strength" measures (Rees and Shane, 2012; IASB, 2013; FDIC 2013, p. 149), this research offers a potential distinguishing characteristic: risk-relevance.

# 4. Future Research

In this Chapter, I discuss future research ideas regarding the following: (1) The investor usefulness of comprehensive income, OCI ,and OCI; (2) Tier 1 Capital and AOCI; and, (3) The contracting usefulness of comprehensive income, OCI, and AOCI based on my literature review in Chapter 1 and my empirical analyses in Chapters 2 and 3.

## *4.1 Investor Usefulness*

### 4.1.1 Value-Relevance

No studies of which I am aware examine short-window investor responses to news about OCI. In recent years, firms have begun disclosing statements of comprehensive income in their quarterly press releases. I performed a very brief search on Lexis/Nexis for press releases including a statement of comprehensive income, and discovered that both Royal Dutch Shell PLC and FirstMerit Corporation disclosed comprehensive income in a performance statement for the first quarter of 2011 (RDC, 2011; FMC, 2011). Thus, it appears a short-window study would be possible. In addition, the short-window method is suggested by Bamber et al. (2010) to discover whether news is conveyed by the performance statement choice itself.

The FASB currently allows two methods for presenting comprehensive income in a statement of performance. Do investors place greater valuation weights on, or respond more intensely to, OCI when net income and comprehensive income are presented in one continuous financial statement or in two consecutive statements? Bamber et al. (2010) also suggest that studies examining the consequences of presentation method (and the pricing of OCI in general) should explicitly consider recycling adjustments. Dong et al. (2013) is a recent example of a value-relevance study examining recycling adjustments for AFS securities. However, the valuation effects of other components of OCI are likely affected by recycling adjustments as well. How are the findings in previous literature affected by the explicit consideration of reclassification adjustments for all OCI components? In addition, FASB ASC paragraph 810-10-50-1A requires U.S. firms to separately report the parent and noncontrolling interest portions of comprehensive income on the face of the financial statements. FASB ASC paragraph 220-10-45-12 indicates that firms may recognize the tax effects of OCI line items in the same statement as the OCI line items or disclose them in the notes to the financial statements. Do investors price the parent and noncontrolling interest portions of OCI differently? Do investors price the tax effects of OCI components differently if the tax effects are recognized versus disclosed?[1] Many of the ideas in this section also apply to work on the risk-relevance of OCI.

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[1] I thank Amanda Gonzales for providing this discussion of reclassification of realized gains and losses, the parent and noncontrolling interest portions of comprehensive income, and the tax presentation methods available to managers under current FASB standards.

### 4.1.2 Risk-Relevance

Based on the results in Hodder et al. (2006), Khan and Bradbury (2012; 2014), and this study, I recommend five areas for future research on the risk-relevance of comprehensive income, OCI, and AOCI. The first area relates to firms' hedging activities. AFS debt securities and cash-flow hedges can be used to hedge interest-rate risk. If these financial instruments are effective (or less effective) at hedging interest-rate risk, how does hedging affect the risk-relevance of OCI? In addition, many of the OCI and AOCI component volatilities were negatively associated with risk. To what extent, if at all, do these negative associations reflect hedging activities?

Second, managers often estimate future estimated recycling adjustments for pensions. Does the market respond to management's estimates of future recycling related to OCI components? Are some managers better at predicting future recycling adjustments than others? Does greater predictive ability for future recycling adjustments represent greater manager expertise or a greater opportunity for managers to smooth earnings?

Third, unrealized gains and losses on similar financial instruments are currently recognized in different places in the financial statements. For example, unrealized gains and losses on trading securities are recognized in net income, while those on AFS securities are recognized in OCI. In addition, unrealized gains and losses on fair value hedges are recognized in net income, while those on cash-flow hedges are recognized in OCI. Does the risk-relevance of these similar instruments vary simply by where the gains and losses are recognized (net income versus OCI)?

Fourth, several of the studies directly or indirectly examine the relation between accounting volatility and earnings management (Lee et al., 2006; Amir et al., 2010). In addition, one of the main concerns expressed to the FASB on the initial comprehensive income exposure draft was that reporting comprehensive income in a performance statement would cause investors to assess firms as more volatile because other comprehensive income would be more volatile than net income. In accordance with some of the ideas raised by Hirst (2006) in his discussion of Lee et al. (2006), is the volatility of OCI, or accounting amounts in general, driven primarily by economic fundamentals, or by managers' financial reporting choices?[2] Given the concerns cited by Bamber et al. (2010) from Paragraph 60 of SFAS 130 about the originally-proposed standard on comprehensive income, one could examine whether volatility in OCI is more "beyond the control of management" than the volatility in net income (FASB, 1997,

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[2] Lee et al. (2006) examine "cherry picking," or earnings management through sales of AFS securities. Hirst (2006), in his discussion of Lee et al. (2006), notes several ideas that could be investigated to improve our understanding of the relation between accounting volatility and earnings management. First, is the volatility of OCI driven by economic fundamentals? Second, how and why does the volatility of OCI differ across firms and over time? Third, were investors, creditors, or regulators "duped" by cherry picking firms' use of the statement of changes in stockholders' equity? Fourth, why do firms cherry pick, which firms do it, and is cherry picking always suboptimal? Fifth, do some firms get rewarded for cherry picking if objectives more important than reporting transparency are met? Though I believe all of these ideas are interesting, I do not highlight all of them directly in my discussion of future research in this area.

p. 21). In other words, what constraints keep managers from manipulating components of OCI more than they manipulate components of net income?

Although an initial attempt was made at examining managerial discretion over OCI in this study, a broader question of whether firms with more volatile performance metrics also have managers who engage more or less in earnings management seems promising to examine. Further, Barton et al. (2010) provide evidence that income before extraordinary items and discontinued operations, net income, and comprehensive income are the three most conservative performance measures of the eight performance measures examined, and Goncharov and Hodgson (2011) find evidence that comprehensive income is less conservative than net income. Does the conservatism of various performance measures vary over time?[3] Which performance measures have the most volatility in conservatism? An argument could be made that conservative performance measures are simply performance measures that are managed downward at the discretion of management. Indeed, a large degree of conservatism in performance measures in a given year, or high volatility in conservatism in performance measures over time, may indicate that the firm's managers are periodically engaging in "big bath" earnings management. Thus, the degree of conservatism in a firm's performance

[3] Givoly and Hayn (2000) indicate that conservatism is increasing over time for U.S. firms from 1950 to 1998. They also postulate that "increased conservatism…will be associated with increased variability of the earnings series" (Givoly and Hayn, 2000, p. 293). They do not examine the relation between the volatility in conservatism and earnings management.

measures, or the volatility, or variability, of conservatism in a firm's performance measures, could indicate the degree of performance measure management.[4]

Fifth, what are the consequences of managers' real actions to reduce performance measure volatility, and how do accounting standards affect these real actions? Existing research and conversations with equity compensation valuation consultants indicate that managers are concerned about volatility in accounting amounts over time. Amir et al. (2010) indicate that reporting standards can induce managers to engage in real decisions to reduce the volatility in performance measures. Zhang (2009) provides further evidence that SFAS 133, an accounting standard for derivatives, reduced ineffective/speculative hedging practices. Further research could examine whether managers' attempts to reduce performance measure volatility actually result in reduced performance measure volatility and returns volatility.

### *4.2 Tier 1 Capital and AOCI*

As more data becomes available in the post-Basel-III era, and as more banks include more of AOCI in Tier 1 Capital, researchers will be better able to assess the impact of the new Tier 1 Capital calculation requirements. Commenters to the FDIC mention several real effects that may occur due to changes in regulatory capital rules.

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[4] My discussion of conservatism in this section comes from discussions with Shane Dikolli and ideas discussed with Shane Dikolli by Gerald Lobo.

The first is that the inclusion of more AOCI components in Tier 1 Capital may result in firms investing "excessively in securities with low volatility" (FDIC, 2013, p. 146). Second, commenters also assert that banks may attempt to "increase their overall capital levels to create a buffer above regulatory minimums, hedge or reduce the maturities of their AFS debt securities, or shift more debt securities into their HTM [held-to-maturity] portfolio[s]" (FDIC, 2013, p. 147). Commenters also claim that some of the above strategies may be particularly costly and difficult for small banks and could lead to a decrease in lending (FDIC, 2013). Finally, commenters also stated that the inclusion of the pension-related AOCI amount in Tier 1 Capital may even cause some banks to curtail or cancel their defined benefit pension plans (FDIC, 2013). All of these possibilities remain open to future inquiry.

## *4.3 Contracting Usefulness*

Skinner (1999) suggests that analyzing the contracting uses of comprehensive income (and thereby OCI) could inform the literature about its overall usefulness. I discuss five areas of potential research on contracting.

First, I discuss the relation between the persistence of comprehensive income and its usefulness in contracting. The intuition behind this relation in the debt contracting setting is that the use of comprehensive income, and thereby OCI, in debt contracts should increase in the persistence of comprehensive income (and OCI) (Li, 2010). As comprehensive income and OCI are featured more prominently in the financial statements than they once were, do debt contracts include comprehensive income, and thereby OCI, in debt covenants? Is the use of comprehensive income, and thereby OCI, in debt contracts increasing in persistence? Does the lower conservatism of comprehensive income relative to net income mitigate its use as a useful debt contracting measure (Goncharov and Hodgson, 2011)?

Second, Baber, Kang, and Kumar (1999) provide insights on the relation between compensation and earnings levels and changes, and between compensation and returns. Their analyses could be applied to examining the relation between levels and changes in comprehensive income, and thereby OCI, and changes in executive pay. If comprehensive income is more (less) persistent than net income, one should observe a stronger (weaker) convex relation between changes in current compensation and changes in comprehensive income than the relation documented between changes in compensation and earnings changes in Baber et al. (1999). If comprehensive income is more (less) persistent than earnings before extraordinary items, one should observe a more (less) negative relation (after some comprehensive income persistence threshold is reached) between changes in current compensation and the level of comprehensive income than the relation documented between changes in compensation and earnings levels in Baber et al. (1999).

The third area for future contracting research is the relation between compensation awards and managers' comprehensive income reporting choices. Many firms indicate in their proxy statements that compensation committees have discretion in awarding pay to executives, even after explicit performance targets for pay are established. In addition, the evidence on managers' comprehensive income presentation choices from Bamber et al. (2010) suggests that managers act as if they believe that compensation committees could reduce discretionary awards to executives when comprehensive income is volatile. The evidence from Lee et al. (2006) is less definitive on the relation between managers' reporting choices and comprehensive income volatility. Do compensation committees reduce discretionary awards to executives when comprehensive income is volatile, as hypothesized by Lee et al. (2006)? Are managers held responsible for comprehensive income in compensation contracts? Yen, Hirst, and Hopkins (2007) indicate that compensation contracting incentives were unlikely to be a motivating factor driving interested parties to write comment letters in response to the initial exposure draft on comprehensive income in 1996 because no new information was required to be disclosed in financial reports. However, Yen et al. (2007) allow for the possibility that the presentation of comprehensive income in the financial statements could alter future contracts as different emphasis is placed on comprehensive income.

Chambers et al. (2007) discuss the arguments for and against evaluating management using comprehensive income. The authors indicate that evaluating management using comprehensive income imposes discipline on managers, who should be held responsible for all value-creating or value-destroying activities of the firm, including those reflected in OCI, such as unrealized gains and losses on AFS securities. Conversely, the authors indicate that using OCI to evaluate managers could be unfair, as managers could be evaluated for economic events that are beyond their immediate control, such as security price and exchange rate fluctuations. No study of which I am aware provides direct evidence on whether executives are evaluated using comprehensive income, or are paid based on these evaluations.

In addition, no study of which I am aware provides direct evidence on what types of firms evaluate their executives using comprehensive income and OCI. Based on prior research, I would expect to find that executives in financial industries would be likely candidates for comprehensive-income- and OCI-based evaluation, while executives in non-financial industries would be less likely candidates (Dhaliwal et al., 1999). Are there specific types of non-financial firms that have significant amounts of OCI line items (Jones and Smith, 2011; Khan and Bradbury, 2012; 2014)? Moreover, can we observe a significant positive correlation between OCI items and executive pay for executives working for non-financial firms?[5] Does this correlation vary over time?

Fourth, the results from Bamber et al. (2010) imply that managers' reporting choices vary with compensation contracting variables. This finding could be surprising, given one's interpretation of the comprehensive income valuation literature. Specifically, Ohlson (1999, p. 146), in his study on transitory earnings, states that an earnings item must (1) be uninformative about manager effort and, (2) have low predictive ability for itself and other earnings items to be useless for compensation contracting purposes. Given the results from Bamber et al. (2010) and the implications from Ohlson (1999), OCI components may be useful for compensation contracting. This observation raises two questions: (1) Under what circumstances are OCI components informative about manager effort? (2) Under what circumstances do OCI components have high predictive ability for themselves or for other components of comprehensive income (Jones and Smith, 2011)?

Fifth, Baber et al. (1999) discuss a "horizon problem" induced by using accounting numbers in executive compensation contracts. The horizon problem arises "because accounting earnings do not incorporate the long-run consequences of current

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[5] I thank Shane Dikolli for this suggestion. The evidence in Biddle and Choi (2006) suggests a significant relation between comprehensive income and executive pay for non-financial firms.

investment decisions," which results in managers "discount[ing] earnings realized beyond their anticipated tenure with the firm." The authors argue that "capital markets properly value expected cashflows over an infinite horizon…, and therefore, the horizon problem is not likely to be an issue when security returns are used to evaluate performance" (Baber et al., 1999, p. 462, footnote 4). The intuition is that market measures of performance better reflect the expected value of investors' cash flows, and thus should be better measures of executive performance.

Following this intuition, if comprehensive income, which includes several measures of fair value gains and losses not included in net income, better reflects the expected value of investments than net income, it may be a better measure of executive performance than net income. Taking this argument to its limit, increasing the use of fair value accounting in performance measures should make them more useful for performance evaluation because the measures will better reflect the expected value of investments. Full-fair-value accounting, as in Hirst, Hopkins, and Wahlen (2004), Hodder et al. (2006), and Blankespoor et al. (2013) should be more useful for performance evaluation than either comprehensive income or net income if this logic reflects reality.[6] Lambert's (2010) discussion of Kothari, Ramanna, and Skinner (2010) provides a similar idea. He states:

> "Stock price is more forward-looking and "fair value" oriented than accrual accounting. That is, the conservative nature of accounting numbers is viewed to be a disadvantage of the numbers, not an advantage. In fact, in industries where accounting is more conservative, compensation is less accounting oriented (e.g., in high tech industries)."

My conversations with equity compensation experts indicate that an increasing number of firms are compensating their executives using performance awards based on stock returns. Thus, it would be interesting to examine if firms use more "forward-looking" performance measures in compensation contracts, such as comprehensive income and full-fair-value income, to address the horizon problem noted above. If firms use more "forward-looking" performance measures, what factors drive this use? In addition, it would be interesting to examine if the firms that use more "forward-looking" performance measures for their executives have better governance, better

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[6] Critics of fair value accounting contend that fair value accounting may deepen financial crises and lead to asset fire sales. However, examining a sample of banks during the most recent financial crisis, Badertscher, Burks, and Easton (2012, p. 59) provide evidence suggesting "that fair value losses had minimal effect on regulatory capital." Further, Badertscher et al. (2012, p. 59) provide "mixed evidence that banks sold securities in response to capital-depleting charges…[and find that] 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."

performance, or other unique characteristics, since these firms' boards of directors would appear more competent than other boards due to their understanding of the economic intuition of the horizon problem discussed above.

# Appendix A – Other Comprehensive Income (OCI) Components

| **Other Comprehensive Income Component (ASC 220-10-45-10A)** | **Reference** | **Variable** |
|---|---|---|
| Unrealized holdings gains and losses on available-for-sale securities. | ASC 320-10-45-1 | *AFS* |
| Unrealized holdings gains and losses that result from a debt security being transferred into the available-for-sale category from the held-to-maturity category. | ASC 830-30-45-12 | *AFS* |
| Amounts recognized in other comprehensive income for debt securities classified as available-for-sale and held-to-maturity related to an other-than-temporary impairment recognized in accordance with Section 320-10-35 if a portion of the impairment was not recognized in earnings. | ASC 320-10-35 | *AFS* |
| Subsequent decreases (if not an other-than-temporary impairment) or increases in the fair value of available-for-sale securities previously written down as impaired. | ASC 320-10-35-18 | *AFS* |
| Gains and losses (effective portion) on derivative instruments that are designated as, and qualify as, cash-flow hedges. | ASC 815-20-35-1(c) | *DERIV* |
| Gains or losses associated with pension or other postretirement benefits (that are not recognized immediately as a component of net periodic benefit cost). | ASC 715-20-50-1(j) | *PEN* |
| Prior service costs or credits associated with pension or other postretirement benefits. | ASC 715-20-50-1(j) | *PEN* |
| Transition assets or obligations associated with pension or other postretirement benefits (that are not recognized immediately as a component of net periodic benefit cost). | ASC 715-20-50-1(j) | *PEN* |

| | | |
|---|---|---|
| Foreign currency translation adjustments. | ASC 830-30-45-12 | *FC* |
| Gains and losses on foreign currency transactions that are designated as, and are effective as, economic hedges of a net investment in a foreign entity, commencing as of the designation date. | ASC 830-20-35-3(a) | *FC* |
| Gains and losses on intra-entity foreign currency transactions that are of a long-term-investment nature (that is, settlement is not planned or anticipated in the foreseeable future), when the entities to the transaction are consolidated, combined, or accounted for by the equity method in the reporting entity's financial statements. | ASC 830-20-35-3(b) | *FC* |

## Appendix B – Variable Definitions

| Variable | Description | Source(s) |
|---|---|---|
| **Comprehensive Income Components** | | |
| *NI* | Net income in millions, scaled by average total assets, x 100. Supplemented by CRSP/Compustat Bank Annual data. Missing values set equal to zero. | SNL Financial CC Bank Ann. |
| *CI* | Comprehensive income in millions, scaled by average total assets, x 100. Supplemented by CRSP/Compustat Bank Annual data. Missing values set equal to zero. | SNL Financial CC Bank Ann. |
| *OCI* | Total other comprehensive income in millions, scaled by average total assets, x 100. Supplemented by CRSP/Compustat Bank Annual data. Missing values set equal to zero. | SNL Financial CC Bank Ann. |
| *AFS* | Available-for-sale securities adjustments in millions, scaled by average total assets, x 100. Supplemented by CRSP/Compustat Bank Annual data. Missing values set equal to zero. | SNL Financial CC Bank Ann. |
| *DERIV* | Cash-flow hedge adjustments in millions, scaled by average total assets, x 100. Supplemented by CRSP/Compustat Bank Annual data. Missing values set equal to zero. | SNL Financial CC Bank Ann. |
| *PEN* | Pension-related adjustments in millions, scaled by average total assets, x 100. Supplemented by CRSP/Compustat Bank Annual data. Missing values set equal to zero. | SNL Financial CC Bank Ann. |

| | | |
|---|---|---|
| *FC* | Foreign currency translation adjustments in millions, scaled by average total assets, x 100. Supplemented by CRSP/Compustat Bank Annual data. Missing values set equal to zero. | SNL Financial<br>CC Bank Ann. |
| *OTHER* | Other items of OCI in millions, scaled by average total assets, x 100. Supplemented by CRSP/Compustat Bank Annual data. Missing values set equal to zero. | SNL Financial<br>CC Bank Ann. |
| *NIRECY* | Net income excluding recycling adjustments. The sum of *NI*, *AFSRECY*, *OTTI*, and *DERIVRECY*. | SNL Financial<br>CC Bank Ann.<br>SEC (sec.gov) |
| *AFSUGL* | *AFS* excluding recycled items. Hand-collected data obtained from firm form 10-K and 10KSB on sec.gov. | SNL Financial<br>CC Bank Ann.<br>SEC (sec.gov) |
| *AFSRECY* | *AFS* recycled items in millions (excluding credit other-than-temporary impairment charges) scaled by average total assets, x 100. Hand-collected data obtained from forms 10-K and 10KSB on sec.gov. Gains are negative, losses are positive. | SEC (sec.gov) |
| *OTTI* | Credit other-than-temporary impairment charges in millions, scaled by average total assets, x 100. Hand-collected data obtained from forms 10-K and 10KSB on sec.gov. Losses are positive. | SEC (sec.gov) |
| *DERIVUGL* | *DERIV* excluding recycled items. Hand-collected data obtained from firm form 10-K and 10KSB on sec.gov. | SNL Financial<br>CC Bank Ann.<br>SEC (sec.gov) |
| *DERIVRECY* | *DERIV* recycled items in millions, scaled by average total assets, x 100. Hand-collected data obtained from forms 10-K and 10KSB on sec.gov. Gains are negative, losses are positive. | SEC (sec.gov) |

| | | |
|---|---|---|
| **Returns Volatility** | | |
| *σRET* | Rolling five-year standard deviation of raw monthly stock returns (RET) x 100, requiring at least 49 monthly returns for each five-year period. Zero-return months excluded. | CRSP MSF |
| **Comprehensive Income Component Volatilities and Presentation Variables** | | |
| *σNI* | Rolling five-year standard deviation of *NI*. Five years of data required. | SNL Financial CC Bank Ann. |
| *σCI - σNI* | Rolling five-year standard deviation of *CI* minus the rolling five-year standard deviation of *NI*. Five years of data required. | SNL Financial CC Bank Ann. |
| *σOCI* | Rolling five-year standard deviation of *OCI.* Five years of data required. | SNL Financial CC Bank Ann. |
| *σAFS* | Rolling five-year standard deviation of *AFS*. Five years of data required. | SNL Financial CC Bank Ann. |
| *σDERIV* | Rolling five-year standard deviation of *DERIV*. Five years of data required. | SNL Financial CC Bank Ann. |
| *σPEN* | Rolling five-year standard deviation of *PEN*. Five years of data required. | SNL Financial CC Bank Ann. |
| *σFC* | Rolling five-year standard deviation of *FC*. Five years of data required. | SNL Financial CC Bank Ann. |
| *σOTHER* | Rolling five-year standard deviation of *OTHER*. Five years of data required. | SNL Financial CC Bank Ann. |
| *σNIRECY* | Rolling five-year standard deviation of *NIRECY*. Five years of data required. | SNL Financial CC Bank Ann. SEC (sec.gov) |
| *σAFSUGL* | Rolling five-year standard deviation of *AFSUGL*. Five years of data required. | SNL Financial CC Bank Ann. SEC (sec.gov) |
| *σAFSRECY* | Rolling five-year standard deviation of *AFSRECY*. Five years of data required. | SEC (sec.gov) |
| *σOTTI* | Rolling five-year standard deviation of *OTTI*. Five years of data required. | SEC (sec.gov) |

| | | |
|---|---|---|
| *σDERIVUGL* | Rolling five-year standard deviation of *DERIVUGL*. Five years of data required. | SNL Financial<br>CC Bank Ann.<br>SEC (sec.gov) |
| *σDERIVRECY* | Rolling five-year standard deviation of *DERIVRECY*. Five years of data required. | SEC (sec.gov) |
| *PRES* | Indicator variable equal to one if OCI appears consistent with ASC 220-10-45-1C ; zero otherwise. Hand-collected data obtained from forms 10-K and 10KSB on sec.gov. | SEC (sec.gov) |
| **Control Variables** | | |
| *EXP* | Total derivatives exposure, scaled by average total assets, x 100. Missing values set equal to zero. | SNL Financial |
| *EXPIND* | Indicator variable equal to one when *EXP* is missing prior to converting missing values of *EXP* to zero, zero otherwise. | SNL Financial |
| *GAP* | One-year cumulative repricing gap, equal to the absolute value of interest-sensitive assets minus interest-sensitive liabilities scheduled to reprice within one year in millions, scaled by average total assets, x 100. Missing values set equal to zero. | SNL Financial |
| *GAPIND* | Indicator variable equal to one when *GAP* is missing prior to converting missing values of *GAP* to zero, zero otherwise. | SNL Financial |
| *MVE* | Year-end price multiplied by common shares outstanding (in millions), supplemented with CRSP/Compustat Bank Annual share data and CRSP Monthly price and share data. | SNL Financial<br>CC Bank Ann.<br>CRSP MSF |

| | | |
|---|---|---|
| *BTM* | Book-to-market ratio, calculated as book value of equity, first from SNL Financial, supplemented by CRSP/Compustat Bank Annual, divided by *MVE*. | SNL Financial<br>CC Bank Ann.<br>CRSP MSF |
| *PRICE_1* | Lagged end-of-the year stock price, first from SNL Financial, supplemented by CRSP MSF. | SNL Financial<br>CRSP MSF |
| *CI_1* | Lagged *CI*. | SNL Financial |
| *ANNRET* | Annual stock return from CRSP MSF. Four non-zero monthly returns required. | CRSP MSF |
| *ANNRET_1* | Lagged *ANNRET*. Four non-zero monthly returns required. | CRSP MSF |
| **Tier 1 Capital and AOCI Components** | | |
| *TIER1RATIO* | Tier 1 Capital Ratio (BHCK7206), supplemented by (BHCK8274 / BHCKA223) x 100. | BankReg BHC |
| *TIER1NEWRATIO* | Tier 1 Capital plus AFS securities adjustment, plus AFS equity securities loss adjustment, plus cash-flow hedge derivative and pension adjustment, divided by risk-weighted assets ((BHCK8274 + BHCK8434 + BHCKA221 + BHCK4336) / BHCKA223) x 100. | BankReg BHC |
| *TIER1NOAOCIRATIO* | Tier 1 Capital plus AFS equity securities loss adjustment, divided by risk-weighted assets ((BHCK8274 +BHCKA221) / BHCKA223) x 100. | BankReg BHC |
| *AFSRATIO* | (BHCK8434 / BHCKA223) x 100. | BankReg BHC |
| *AFSEQUITYLOSSRATIO* | (-BHCKA221 / BHCKA223) x 100. | BankReg BHC |
| *AFSINCRATIO* | ((BHCK8434 + BHCKA221) / BHCKA223) x 100. | BankReg BHC |
| *DERIVPENRATIO* | (BHCK4336 / BHCKA223) x 100 | BankReg BHC |

| Tier 1 Capital and AOCI Component Volatilities | | |
|---|---|---|
| *σTIER1RATIO* | Rolling five-year standard deviation of *TIER1RATIO*. Five years of data required. | BankReg BHC |
| *σTIER1NOAOCIRATIO* | Rolling five-year standard deviation of *TIER1NOAOCIRATIO*. Five years of data required. | BankReg BHC |
| *σAFSRATIO* | Rolling five-year standard deviation of *AFSRATIO*. Five years of data required. | BankReg BHC |
| *σAFSEQUITYLOSSRATIO* | Rolling five-year standard deviation of *AFSEQUITYLOSSRATIO*. Five years of data required. | BankReg BHC |
| *σAFSINCRATIO* | Rolling five-year standard deviation of *AFSINCRATIO*. Five years of data required. | BankReg BHC |
| *σDERIVPENRATIO* | Rolling five-year standard deviation of *DERIVPEN*. Five years of data required. | BankReg BHC |

## References

Ahmed, A., Takeda, C., 1995. Stock market valuation of gains and losses on commercial banks' investment securities: an empirical analysis. *Journal of Accounting and Economics* 20, 207-225.

Amihud, Y., 2002. Illiquidity and stock returns: cross-section and time-series effects. *Journal of Financial Markets* 5, 31-56.

Amir, E., Guan, Y., Oswald, D., 2010. The effect of pension accounting on corporate pension asset allocation. *Review of Accounting Studies* 15, 345-366.

Baber, W., Kang, S., Kumar, K., 1999. The explanatory power of earnings levels vs. earnings changes in the context of executive compensation. *The Accounting Review* 74, 459-472.

Badertscher, B., Burks., J., Easton, P., 2012. A convenient scapegoat: fair value accounting by commercial banks during the financial crisis. *The Accounting Review* 87, 59-90.

Badertscher, B., Burks, J., Easton, P., 2014. The market pricing of other-than-temporary impairments. *The Accounting Review* 89, 811-838.

Bamber, L., Jiang, J., Petroni, K., Wang, I., 2010. Comprehensive income: who's afraid of performance reporting? *The Accounting Review* 85, 97-126.

Barth, M., Landsman, W., Wahlen, J., 1995. Fair value accounting: effects on banks' earnings volatility, regulatory capital, and value of contractual cash flows. *Journal of Banking and Finance* 19, 577-605.

Barton, J., Hansen, T., Pownall, G., 2010. Which performance measures do investors around the world value the most—and why? *The Accounting Review* 85, 753-789.

Basel Committee on Banking Supervision (Basel), 2006. International convergence of capital measurement and capital standards, Bank for International Settlements.

Bernard, V. 1995., The Feltham-Ohlson framework: implications for empiricists. *Contemporary Accounting Research* 11, 733-747.

Biddle, G., Choi, J., 2006. Is comprehensive income useful? *Journal of Contemporary Accounting & Economics* 2, 1-32.

Blankespoor, E., Linsmeier, T., Petroni, K., Shakespeare, C., 2013. Fair value accounting for financial instruments: does it improve the association between bank leverage and credit risk? *The Accounting Review* 88, 1143-1177.

Bloomfield, R., Nelson, M., Smith, S., 2006. Feedback loops, fair value accounting and correlated investments. *Review of Accounting Studies* 11, 377-416.

Botosan, C., Plumlee, M., 2005. Assessing alternative proxies for the expected risk premium. *The Accounting Review* 80, 21-53.

Cahan, S., Courtenay, S., Gronewoller, P., Upton, D., 2000. Value relevance of mandated comprehensive income disclosures. *Journal of Business Finance & Accounting* 27, 1273-1301.

Carhart, M., 1997. On persistence in mutual fund performance. *Journal of Finance* 52, 57-82.

Chambers, D., Linsmeier, T., Shakespeare, C., Sougiannis, T., 2007. An evaluation of SFAS No. 130 comprehensive income disclosures. *Review of Accounting Studies* 12, 557-593.

Cheng, A., Cheung, J., Gopalakrishnan, V., 1993. On the usefulness of operating income, net income, and comprehensive income in explaining equity returns. *Accounting and Business Research* 23, 195-203.

Dhaliwal, D., Subramanyam, K., Trezevant, R., 1999. Is comprehensive income superior to net income as a measure of firm performance? *Journal of Accounting and Economics* 26, 43-67.

Dong, M., Ryan, S., Zhang, X., 2013. Preserving amortized costs within a fair-value-accounting framework: reclassification of gains and losses on available-for-sale securities upon realization. *Review of Accounting Studies*, Forthcoming, Published online 28 August 2013.

Easton, P., Zmijewski, M., 1989. Cross-sectional variation in the stock market response to accounting earnings announcements. *Journal of Accounting and Economics* 11, 117-141.

Emerson, 2010. Re: file reference No. 1790-100, comprehensive income. Comment Letter No. 70.

Evans, M., Hodder, L., Hopkins, P., 2014. The predictive ability of fair values for future financial performance of commercial banks and the relation of predictive ability to banks' share prices. *Contemporary Accounting Research* 31, 13-44.

Federal Deposit Insurance Corporation (FDIC), 2013. Regulatory capital rules: regulatory capital, implementation of Basel III, capital adequacy, transition provisions, prompt corrective action, standardized approach for risk-weighted assets, market discipline and disclosure requirements, advanced approaches risk-based capital rule, and market risk capital rule. 12 CFR Chapter III, RIN 3064-AD95.

Federal Financial Institutions Examination Council (FFIEC), 2012. Consolidated reports of condition and income for a bank with domestic offices only—FFIEC 041.

Feltham, G., Ohlson, J., 1995. Valuation and clean surplus accounting for operating and financial activities. *Contemporary Accounting Research* 11, 689-731.

Financial Accounting Standards Board (FASB), 1997. Reporting comprehensive income. Statement of Financial Accounting Standards No. 130, Norwalk, CT, FASB.

Financial Accounting Standards Board (FASB), 1998. Accounting for derivative instruments and hedging activities. Statement of Financial Accounting Standards No. 133, Norwalk, CT, FASB.

Financial Accounting Standards Board (FASB), 2006. Employers' accounting for defined benefit pension and other postretirement plans. Statement of Financial Accounting Standards No. 158, Norwalk, CT, FASB.

Financial Accounting Standards Board (FASB), 2010. Conceptual framework for financial reporting. Statement of financial accounting concepts No. 8, Norwalk, CT, FASB.

Financial Accounting Standards Board (FASB), 2011. Accounting standards update no. 2011-05: comprehensive income (topic 220), Norwalk, CT, FASB.

FirstMerit Corporation (FMC), 2011. FirstMerit Corporation reports first quarter 2011 eps of $0.25 per share. PR Newswire, LexisNexis Academic, Printed 6/2/2011.

Francis, J., Schipper, K., 1999. Have financial statements lost their relevance. *Journal of Accounting Research* 37, 319-352.

Givoly, D., Hayn, C., 2000. The changing time-series properties of earnings, cash flows and accruals: has financial reporting become more conservative? *Journal of Accounting and Economics* 29, 287-320.

Goncharov, I., Hodgson, A., 2011. Measuring and reporting income in Europe. *Journal of International Accounting Research* 10, 27-59.

Gow, I., Taylor, D., Verrecchia, R., 2013. On the complementary relation between earnings and private information. Working paper.

Graham, J., Harvey, C., Rajgopal, S., 2005. The economic implications of corporate financial reporting. *Journal of Accounting Economics* 40, 3-73.

Gupta, S., 1995. Determinants of the choice between partial and comprehensive Income tax allocation: the case of the domestic international sales corporation. *The Accounting Review* 70, 489-511.

Haw, I., Hu, B., Hwang, L., Wu, W., 2004. Ultimate ownership, income management, and legal and extra-legal institutions. *Journal of Accounting Research* 42, 423-462.

Hirst, D., 2006. Discussion of 'cherry picking, disclosure quality, and comprehensive income reporting choices: the case of property-liability insurers.' *Contemporary Accounting Research* 23, 693-700.

Hirst, D., Hopkins, P., 1998. Comprehensive income reporting and analysts' valuation judgments. *Journal of Accounting Research* 36, 47-75.

Hirst, D., Hopkins, P., Wahlen, J., 2004. Fair values, income measurement, and bank analysts' risk and valuation judgments. *The Accounting Review* 79, 453-472.

Hodder, L., Hopkins, P., Wahlen, J., 2006. Risk-relevance of fair-value income measures for commercial banks. *The Accounting Review* 81, 337-375.

Hunton, J., Libby, R., Mazza, C., 2006. Financial reporting transparency and earnings management. *The Accounting Review* 81, 135-157.

Institute for Digital Research and Education UCLA (IDRE). Stata web books: Regression with Stata: Chapter 2 – Regression Diagnostics from http://www.ats.ucla.edu/stat/stata/webbooks/reg/chapter2/statareg2.htm (accessed multiple times during 2013 and 2014).

International Accounting Standards Board (IASB), 2013. A review of the conceptual framework for financial reporting. Discussion Paper DP/2013/1, IFRS Foundation.

Jann, B., 2010. Robreg: Stata module providing robust regression estimators. Available from http://ideas.repec.org/c/boc/bocode/s457114.html.

Jones, D., Smith, K., 2011. Comparing the value relevance, predictive value, and persistence of other comprehensive income and special items. *The Accounting Review* 86, 2047-2073.

Kanagaretnam, K., Mathieu, R., Shehata, M., 2009. Usefulness of comprehensive income reporting in Canada. *Journal of Accounting and Public Policy* 28, 349-365.

Khan, S., Bradbury, M., 2012. Risk relevance of comprehensive income. Working paper.

Khan, S., Bradbury, M., 2014. Volatility and risk relevance of comprehensive income. *Journal of Contemporary Accounting and Economics* 10, 76-85.

Koonce, L., 2006. Discussion of 'feedback loops, fair value accounting and correlated Investments.' *Review of Accounting Studies* 11, 417-427.

Kothari, S.P., Ramanna, K., Skinner, D., 2010. Implications for GAAP from an analysis of positive research in accounting. *Journal of Accounting and Economics* 50, 246-286.

Lambert, R., 2010. Discussion of 'implications for GAAP from an analysis of positive research in accounting. *Journal of Accounting and Economics* 50, 287-295.

Landsman, W., Miller, B., Peasnell, K., Yeh, S., 2011. Do investors understand really dirty surplus? *The Accounting Review* 86, 237-258.

Lang, M., Maffett, M., 2011. Transparency and liquidity uncertainty in crisis periods. *Journal of Accounting and Economics* 52, 101-125.

Lee, Y., Petroni, K., Shen, M., 2006. Cherry picking, disclosure quality, and comprehensive income reporting choices: the case of property-liability insurers. *Contemporary Accounting Research* 23, 655-692.

Leone, A., Minutti-Meza, M., Wasley, C., 2014. Influential observations and inference in accounting research. The Bradley Policy Research Center Financial Research and Policy Working Paper No. FR 14-06.

Li, N., 2010. Negotiated measurement rules in debt contracts. *Journal of Accounting Research* 48, 1103-1144.

Lipe, M., 1998. Discussion of comprehensive income reporting and analysts' valuation judgments. *Journal of Accounting Research* 36, 77-83.

Lipe, R., 1986. The information contained in the components of earnings. *Journal of Accounting Research* 24, 37-64.

Liu, J., Nissim, D., Thomas, J., 2002. Equity valuation using multiples. *Journal of Accounting Research* 40, 135-172.

Maines, L., McDaniel, L., 2000. Effects of comprehensive-income characteristics on nonprofessional investors' judgments: the role of financial-statement presentation format. *The Accounting Review* 75, 179-207.

Nichols, D., Wahlen, J., Wieland, M., 2009. Publicly traded versus privately held: implications for conditional conservatism in bank accounting. *Review of Accounting Studies* 14, 88-122.

O'Hanlon, J., Pope, P., 1999. The value-relevance of UK dirty surplus accounting flows. *British Accounting Review* 31, 459-482.

Ohlson, J., 1995. Earnings, book values, and dividends in equity valuation. *Contemporary Accounting Research* 11, 661-687.

Ohlson, J., 1999. On transitory earnings. *Review of Accounting Studies* 4, 145-162.

PricewaterhouseCoppers LLP (PWC), 2012. A closer look: US Basel II regulatory capital regime and market risk final rule.

Rees, L., Shane, P., 2012. Academic research and standard setting: the case of other comprehensive income. *Accounting Horizons* 26, 789-815.

Rogers, J., Skinner, D., Van Buskirk, A., 2009. Earnings guidance and market uncertainty. *Journal of Accounting and Economics* 48, 90-109.

Royal Dutch Shell PLC (RDC), 2011. Royal Dutch Shell plc 1st quarter 2011 results. PR Newswire, Lexis Nexis Academic, Printed June 2, 2011.

Ryan, S., 2012. Risk reporting quality: implications of academic research for financial reporting policy. *Accounting and Business Research* 42, 295-324.

Shadish, W., Cook, T., Campbell, D., 2002. Experimental and quasi-experimental designs for generalized causal inference. Boston, MA, Houghton Mifflin Company.

Skinner, D., 1999. How well does net income measure firm performance? A discussion of two studies. *Journal of Accounting and Economics* 26, 105-111.

Venkatachalam, M., 1996. Value-relevance of banks' derivatives disclosures. *Journal of Accounting and Economics* 22, 327-355.

Verardi, V., Croux, C., 2009. Robust regression in Stata. *The Stata Journal* 9, 439-453.

Vuong, Q., 1989. Likelihood ratio tests for model selection and non-nested hypotheses. *Econometrica* 57, 307-333.

Yen, A., Hirst, D., Hopkins, P., 2007. A content analysis of the comprehensive income exposure draft comment letters. *Research in Accounting Regulation* 19, 53-79.

Zhang, H., 2009. Effect of derivative accounting rules on corporate risk-management behavior. *Journal of Accounting and Economics* 47, 244-264.

# Biography

Dirk Ervin Black was born March 14, 1983 in Provo, Utah. He earned a MAcc, a B.S. in Accounting, and a Minor in Economics from Brigham Young University in 2007. He earned a Ph.D. in Business Administration from Duke University in 2014. He co-authored "U.S. Managers' Use of 'Pro Forma' Adjustments to Meet Strategic Earnings Targets" in the *Journal of Business Finance and Accounting* in 2009, "Has Regulation of Pro Forma Reporting in the U.S. Changed Investors' Perceptions of Pro Forma Earnings Disclosure" in the *Journal of Business Finance and Accounting* in 2012, "A Discussion of 'Divestitures of Equity by Executives and Future Equity Granting Patterns'" in the *Journal of Management Accounting Research* in 2013, and "CEO Pay-for-Complexity and the Risk of Managerial Diversion from Multinational Diversification" in *Contemporary Accounting Research* in 2014. He received a Deloitte Foundation Doctoral Fellowship in 2012, was awarded the Best 3rd Year Doctoral Student Paper at the AAA Southeast Regional Meeting for "SFAS 123R and the CEO Contracting Use of Relative Performance Evaluation" in 2012, was the AAA Representative to the AFAANZ Doctoral Symposium in 2013, and was a participant at the AAA Deloitte Doctoral Consortium in 2013. He is a member of the American Accounting Association (AAA), a Certified Public Accountant licensed in the State of Alabama, and a member of the American Institute of Certified Public Accountants (AICPA).