# Mark-to-Market Accounting and Information Asymmetry in Banks

Ray Ball
The University of Chicago Booth School of Business
5807 South Woodlawn Avenue
Chicago, IL 60637-1610
Tel. (773) 834-5941
ray.ball@chicagobooth.edu

Sudarshan Jayaraman
Olin Business School
Washington University in St. Louis
Campus Box 1133
One Brookings Drive
St. Louis, MO 63130
jayaraman@wustl.edu

Lakshmanan Shivakumar
London Business School
Regent's Park
London, NW1 4SA
United Kingdom
lshivakumar@london.edu

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## Abstract

We examine the relation between mark-to-market (MTM) accounting for securities and information asymmetry among bank investors. Relative to the historical cost method, MTM accounting incorporates more timely information in the financial statements. The primary effect of more timely *disclosure* of information most likely is to reduce information asymmetry. Nevertheless, models in which accelerating the public release of underlying asset values triggers private information acquisition (McNichols and Trueman, 1994; Demski and Feltham, 1994; Kim and Verrecchia, 1991) imply some offsetting increase in asymmetry due to differential information production among investors. Furthermore, and incrementally to disclosure effects, we hypothesize that *recognition* (incorporating MTM gains and losses in earnings) can increase information asymmetry through a variety of channels. Finally, based on the reasoning in Ball, Jayaraman and Shivakumar (2012), we hypothesize that MTM accounting for securities lowers the likelihood of analyst following and of management forecasting, further exacerbating information asymmetry.

Consistent with the above arguments, we document an economically and statistically significant relation between banks' use of MTM accounting and their bid-ask spreads, analyst following and management forecasting. A difference-in-differences design at the introduction of mandatory MTM accounting by SFAS No. 115 reveals a significant increase in spreads for affected banks. There is no such increase for banks that previously used MTM on a voluntary basis. Further, we find similar increases for banks that previously disclosed but did not MTM their gains and losses in earnings, consistent with the hypothesis that information asymmetry arises primarily from recognition effects and not from investors receiving more timely information through disclosure. Similarly, banks exercising the option under SFAS No. 159 to widen their use of MTM accounting experience increases in spreads compared to non-adopters, though these results could be confounded by financial crisis effects. Overall, our results point to a previously undocumented adverse informational consequence of using MTM accounting relative to historical cost. These results should not be interpreted as advocating abandoning MTM accounting, but as highlighting the tradeoffs involved in choosing historical cost versus MTM rules.

## 1. Introduction

We examine the relation between information asymmetry and mark-to-market (MTM) accounting in banks. MTM accounting records securities at their estimated realizable market prices, known as "fair values." Compared to booking securities at historical cost (HC), under which securities' realizable values are formally incorporated in the financial statements only at liquidation through sale or maturity, MTM accounting incorporates price information in earnings and balance sheets in a more timely fashion. At first blush, marking to market would appear likely to do nothing but reduce information asymmetry. This conclusion would be consistent with the "classical" accounting literature, which viewed market prices as both objective (independent of economic actors) and providing sufficient information for economic actions (notably, Chambers, 1966). It also would be in line with the specific MTM measurement rules issued by the International Accounting Standards Board (IASB) and its U.S. standard-setting counterpart, the Financial Accounting Standards Board (FASB).[1]

While the primary effect of more timely *disclosure* of information most likely is to reduce information asymmetry, there are many reasons to expect MTM accounting to exacerbate information asymmetry that were not envisaged by its proponents. Models in which accelerating the public *disclosure* of underlying asset values triggers private information acquisition (McNichols and Trueman, 1994; Demski and Feltham, 1994; Kim and Verrecchia, 1991) imply some offsetting increase in asymmetry due to differential information production among investors. Incrementally to disclosure effects, *recognition* (incorporating MTM gains and losses in earnings and on balance sheets) can increase asymmetry through a variety of channels. First, recognition directly affects management compensation and regulatory capital, which provides incentives for managers to trade in imperfectly liquid markets and manipulate the traded asset

[1] Whittington (2008) provides a summary.

prices used in MTM accounting (Heaton et al., 2010; Milbradt, 2009), or incentives to manipulate subjective estimates of fair value when traded prices are unavailable, to a degree that is difficult for uninformed investors to discern. Second, recognition of MTM gains and losses can induce manager trading behavior that creates an unknown degree of excess volatility in the asset prices used in MTM accounting (Allen and Carletti, 2008; Plantin et al., 2008; Gorton et al., 2010). Third, there is imperfect information about whether MTM price changes included in earnings are due to shocks to discount rates (which subsequently reverse in earnings) or shocks to cash flows (which do not reverse), the implication being that uninformed investors experience less precise earnings expectations and earnings surprises. Fourth, unpredictable MTM components of earnings make it more difficult to verify whether managers were truthful in their earnings forecasts, making credible commitment to truthful disclosure more costly (Ball, Jayaraman and Shivakumar, 2012), so we expect MTM accounting to lower the likelihood of management forecasting and analyst following, further exacerbating information asymmetry.[2]

These reasons all involve discarding the assumption of frictionless markets that underlies "classical" accounting theory and underpins MTM accounting generally. The frictions include: costs of trading in asset markets, which limit liquidity and permit both manipulation of period-end traded prices and subjective estimation of non-traded "fair values"; agency costs, which make it efficient to contract with managers on imperfect performance metrics such as accounting earnings and costly to detect and eliminate self-interested manipulation of the metrics by managers; and costs of managers credibly committing to truthful disclosure in forecasts.

We pay particular attention to securities that are classified under the accounting rules as "trading securities," which by definition are those purchased principally for the purpose of sale

[2] We conceptualize information asymmetry as the informational advantage of informed relative to uninformed traders in equity markets. Informed traders are defined broadly as those with access to private information. This category includes not only insiders such as managers who are privy to information due to their association with the firm but also outsiders such as hedge funds and mutual funds that expend resources to acquire private information.

in the near term. They attract the purest form of MTM accounting: they are reported on balance sheets at fair value (defined below), and their realized and unrealized gains and losses in fair value are included in current-period earnings. This asset class includes investments in bonds, notes, equities, derivatives, mortgage-backed securities and other securitized loans, but does not include unsecuritized loans.

Studying a large panel of banks from the period 1996 to 2010, we document that bank shares are quoted at approximately one-fifth wider bid-ask spreads if the bank invests in trading securities, controlling for other bank characteristics. We also show that banks that have trading securities are less likely to be followed by financial analysts, are less likely to release management forecasts, and have stock prices that reflect information in a less timely fashion. In contrast with these results, we are unable to detect an association between information asymmetry and either available-for-sale securities or held-to-maturity securities, neither of which is reported using MTM in its purest form. [3]

It is possible that the above associations are driven by unobservable characteristics of the underlying securities or imperfect controls for correlated bank characteristics, rather than by marking trading securities to market *per se*. To provide better identification of the effect of MTM accounting on information asymmetry, we exploit the introduction of MTM accounting for trading securities by SFAS 115 in 1993. This "quasi-natural" experiment allows a more valid inference about causality running from MTM accounting to information asymmetry, using a difference-in-differences specification. We find that the passage of SFAS 115 results in a pronounced increase in bid-ask spreads for banks with trading securities compared to those without. The increase is sharp, occurring essentially immediately, so it is unlikely that the spread

[3] The insignificant results for AFS suggest that the asymmetry effects of MTM are to recognition of fair values changes in earnings but not on balance sheets. We discuss this issue in detail below.

changes after SFAS 115 were due to sudden changes in the characteristics of trading securities themselves or in the securities banks selected. We also find that the introduction of SFAS 115 was not accompanied by changes in spreads as a function of other categories of investment securities (*AFS* and *HTM*) for which the new rule did not require full MTM accounting.

To assuage concerns about comparing banks across diverse business models, we then differentiate between three categories of voluntary bank behavior prior to MTM becoming mandatory for trading securities under SFAS 115: banks that were voluntarily using MTM; banks that were not voluntarily using MTM but disclosed fair values without recognizing them in the financial statements; and those that did neither, and reported only historical costs. We find there is no increase in spreads for banks that previously used MTM on a voluntary basis. Among banks that previously did not MTM their gains and losses, those that previously disclosed have similar increases to those that previously did not disclose, consistent with the hypothesis that information asymmetry arises primarily from recognition effects and not from investors receiving more timely information through disclosure of market price information.

As an alternative shock to MTM accounting rules, we examine the introduction of the "fair value option" in SFAS 159 (FASB, 2007). Effective in 2008, SFAS 159 allowed firms to choose a variety of individual financial assets and liabilities to be reported at fair value, with unrealized gains and losses included in earnings for the period. Using a similar difference-in-differences specification (but correcting for self-selection of the fair value option), we find a significant increase in spreads for banks that opted to report financial assets and liabilities at fair values compared to those that did not. Additional tests verify that these inferences are robust to controlling for possible confounding effects of the recent financial crisis.

The advantages of testing MTM accounting in the banking industry include: substantial exploitable dispersion across banks in whether they hold MTM-able assets and, if they do, in the

size of their portfolios[4]; exploitable quasi-exogenous changes in MTM rules for identification; a relatively homogenous sample; and availability of valid measures of the information environment (spreads, analyst following, frequency of management forecasts, timeliness with which stock prices obtain information).

While we believe this is the first study to provide direct evidence of the effect of MTM accounting for securities on information asymmetry for banks, we view its contribution more broadly. At a basic level, we view it as an empirical test of the assumption that one can design and evaluate rules for financial reporting independent of the effects of those rules on managers' and investors' behaviors, and in turn on the properties of the financial information reported.

We hasten to add that our results should not be interpreted as suggesting that standard setters should abandon mark-to-market accounting in favor of historical cost. Several caveats are in order. First, the asymmetry effects we identify appear to be associated with recognition rather than disclosure. Second, the results pertain to one class of marketable securities in banks, and are not obviously generalizable to other assets and industries. Third, information asymmetry and welfare effects are not equivalent. While we show that reporting securities in the financial statements at market value rather than historical cost increases information asymmetry and thus imposes costs on one set of market participants (i.e., uninformed traders), our study does not examine whether the accounting rules are beneficial or costly for the economy as a whole. The idea that the private value of information need not coincide with its social value has a rich history in information economics (e.g., Hirshleifer, 1971; Verrecchia, 1982). Thus, an ordinal ranking of alternative accounting systems – if it existed – would depend on a wider range of costs and benefits.

[4] Citibank had $394 billion in trading asset accounts at the end of 2006, over 20% of total assets and over three times total Tier 1 and Tier 2 capital. Its trading assets were approximately equally split between investments in (i) debt securities (ii) equity securities (iii) government securities and (iv) derivatives and securitized loans.

Consequently, we view our results as an early exploration of the economic trade-offs between the MTM and HC measurement regimes, as envisaged for example by Plantin, Sapra and Shin (2008), Allen and Carletti (2008) and Gorton, He and Huang (2010). Understanding these trade-offs is important because market frictions and incentive effects are likely to differ substantially across jurisdictions, firm status (e.g., public versus private), industries and asset and liability characteristics. For example, the optimal enforcement by an individual country of the MTM rules in International Financial Reporting Standards (IFRS), which have been adopted by over 100 countries, would appear to be a function of the effects we study.

Sections 2 and 3 develop our hypotheses and summarize related literature. Section 4 outlines the history of MTM for investment securities, which has been substantially influenced by banking crises, and describes the currently prevailing accounting rules. Section 5 defines the variables we use and describes their measurement, section 6 describes the sample and data, section 7 outlines the results, and section 8 concludes.

## 2. Hypotheses

In a world of frictionless markets, prices guide all actions and information asymmetry is not an issue.[5] In this section, we discuss how various frictions interact with disclosure and recognition of price information in financial statements to exacerbate information asymmetry.

### *2.1. Effect of public information on informed trading*

One reason to expect a relation between MTM accounting and information asymmetry is that when private information is not costless to acquire and process, public disclosure can affect investors differently. For example, McNichols and Trueman (1994), Demski and Feltham (1994) and Kim and Verrecchia (1991, 1994) demonstrate ways in which disclosure can stimulate an

[5] Nor are firms, banks, financial statements, earnings expectations, accounting rules or any institutional variable.

increase in private information and hence in informed trading.[6] Due to holding costs, the return to private information acquisition depends on how long the informed trader has to hold the affected asset, and in turn on how quickly the acquired information becomes public. When information is made public earlier, informed traders invest more in private information acquisition and consequently have a greater informational advantage. Thus, by accelerating the public release of information about the value of banks' security holdings, MTM accounting can stimulate more informed trading and generate greater information asymmetry than would historical cost accounting.[7]

*2.2. Incentives to manipulate "fair values" under MTM rules*

Incrementally to disclosure-related effects, the act of using MTM to calculate reported earnings and balance sheet numbers (i.e. accounting "recognition") can affect information asymmetry through a variety of channels. One such channel exists because booking MTM gains and losses directly affects management compensation and regulatory capital, creating incentives to manipulate MTM "fair values." Manipulation can occur in two broad ways: trading at period-end to manipulate asset prices in imperfectly liquid markets (Heaton et al., 2010; Milbradt, 2009); or manipulating subjective estimates of fair value when traded prices are unavailable. Either way, fair value manipulation more likely is indiscernible by uninformed investors but less so by insiders, fellow traders and other professional investors.[8]

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[6] The information advantage of informed traders in Kim and Verrecchia (1994) derives from superior ability to process public signals. In McNichols and Trueman (1994), Demski and Feltham (1994) and Kim and Verrecchia (1991), it derives from preempting the public signal.

[7] The alternative hypothesis is that public and private information are substitutes because public information reduces the informed trader's incentive to gather and trade on private information (Verrecchia, 1982; Diamond, 1985).

[8] Evidence of both surfaced in commentary on the $5 billion trading losses incurred recently by a J.P. Morgan trader. Writing in the *Wall Street Journal*, Burne et al. (2012) report evidence of strategic trading: "In the meantime, some traders are reviewing the volume on the index in which J.P. Morgan focused much of its recent trading. The data appear to show that the bank benefited from month-end price moves that coincided with unusually heavy trading volume." Before his identity was revealed, the trader was dubbed the "London whale" by other traders, due to the size of his trades and the splash they made in the market. Zuckerman and Fitzpatrick (2012) subsequently report evidence of managers manipulating their fair value marks: "After reviewing

*2.2.1 Manipulating traded prices*. Illiquid asset markets afford managers the opportunity to trade strategically and influence period-end MTM closing prices (Heaton et al., 2010; Milbradt, 2009). There is evidence of period-end price manipulation in several contexts. Carhart et al. (2002) report evidence that manipulation occurs primarily in the last half hour before the daily close and is more intense at quarter-ends. Gallagher et al. (2009) report that mutual fund managers purchase illiquid stocks in which they already hold overweight positions on the last day of the quarter. In a study that cleverly excludes alternative explanations (such as rebalancing) to manipulation, Comerton-Forde and Putniņš (2011) investigate SEC prosecutions for closing price manipulation by firm managers, substantial shareholders, mutual fund managers and brokers. They report that these manipulations are associated with substantial abnormal day-end returns and subsequent reversals, as well as increased trading volume and wider spreads. Strategic manipulation of closing prices by managers obscures the true performance and financial position of the bank, which we expect to place managers and other informed traders at an informational advantage.

Gorton et al. (2010) model the effects of MTM in the context of principal-agent compensation contracts. They note (p.139) that: "The agency relation we study is pervasive in security and derivatives trading. Professional traders work at hedge funds, mutual funds, money management firms, and banks." In their model, the informativeness of security prices is reduced by coordinated manipulation by agents (i.e., managers) as well as by the shape of their compensation contract with principals (i.e., shareholders). Here too, we expect this manipulation would place managers and other informed traders at an informational advantage.

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emails and voice-mail messages, the bank has concluded that Bruno Iksil, the J.P. Morgan trader nicknamed for the large positions he took in the credit markets, was urged by his boss to put higher values on some positions than they might have fetched in the open market at the time."

*2.2.2 Manipulating fair value estimates*. When traded prices are unavailable, the accounting rules (subsequently formalized in SFAS 157) require managers to estimate the price a security would have obtained in a hypothetical transaction at the report date. This procedure is has several relevant properties. First, it bases fair value estimates on information that is internal to the firm rather than externally available in the asset markets. Second, it inevitably involves subjective estimation that is open to abuse (Watts, 2003; Benston, 2008), a notorious example being Enron's manipulation of its MTM numbers (Benston and Hartgraves, 2002; Haldeman, 2006). Both are potential sources of information asymmetry.

*2.3. Excess price volatility under MTM rules*

Similar predictions emerge from the Allen and Carletti (2008) and Plantin et al. (2008) models in which excess volatility is generated by feedback loops from security price changes to trading by managers to security price changes, etc. Allen and Carletti (2008) argue that limited liquidity distorts banks' investment decisions and the prices of securities in which they invest. The authors conclude (p. 359) that "using market prices to value the assets of financial institutions may not be beneficial when financial markets are illiquid." It seems reasonable to assume that informed investors such as institutions and bank managers might be differentially informed about the incidence of such distortions than uninformed traders such as individuals.

Plantin et al. (2008) argue that when management incentives or regulatory intervention decisions are based on reported earnings, MTM encourages trading behavior that exaggerates security price changes, providing an alternative source of MTM-induced excess price volatility that degrades the information value of prices. Here too it seems reasonable to assume that bank managers are more aware than uninformed investors of the exaggerating effects of their own trading behaviour. Furthermore, the increased price volatility they induce increases the potential

profits to informed traders from private information acquisition, widening the disadvantage of uninformed investors.[9]

The feedback loops discussed above seem especially relevant for banks, because fluctuations in their earnings affect their regulatory capital. Adrian and Shin (2010) report evidence that banks actively manage their capital to asset ratios. Burkhardt and Strausz (2009) show that increased transparency can exacerbate asset substitution.

*2.4. Precision of the earnings signal under MTM rules*

An additional reason to expect a relation between MTM accounting and information asymmetry stems from the important role of earnings expectations in share price formation, and the converse role of earnings "surprises." Changes in the prices of banks' securities holdings can emanate from shocks to the individual securities' expected returns (which are expected to reverse in earnings over time) or from shocks to the securities' expected future cash flows (which are not). The precision with which investors are able to separate these shocks directly affects the precision with which they form earnings expectations and, conversely, the precision of the future earnings signal (its surprise). MTM gains and losses therefore appear likely to cause uninformed investors to form less precise earnings expectations and experience less precise earnings signals than informed investors.[10] Consistent with this thesis, Cohen, Gompers and Vuolteenaho (2002) report evidence that informed institutions exploit the lesser ability of uninformed individual investors to distinguish cash flow and discount rate shocks.

The hypothesis that uninformed investors are at a disadvantage in separating cash flow and discount rate shocks is a corollary to the following observation in Cochrane (2011, p. 1088):

[9] The Allen and Carletti (2008) and Plantin et al. (2008) models, and the other recognition-based arguments in this paper, rest on the premise that compensation contracts, investors and analysts pay attention to earnings and balance sheet information as reported, without stripping out MTM effects. We provide arguments and evidence to support this premise below.

[10] Appendix provides a numerical example.

> "I am not arguing that mark-to-market accounting is bad, or that fudging the numbers is a good idea. The point is only that what you *do* with a mark-to-market number might be quite different in a world driven by discount-rate variation than in a world driven by cashflow variation. The mark-to-market value is no longer a sufficient statistic."

This effect of MTM could be expected to compound the effects of other factors outlined above. Furthermore, the complexity of trading securities such as derivatives and mortgage-backed securities would seem to make separating cash flow and discount rate shocks unusually difficult.

*2.5. Effect of MTM on management forecasting and analyst following*

Finally, we propose that MTM accounting reduces the ability of bank managers to credibly convey private information by issuing earnings forecasts, and also reduces the incidence of analyst forecasts. Because MTM gains and losses are difficult to forecast, reported earnings provide a noisier confirmation of the truthfulness of managers' disclosures of private information via forecasts, lessening their credibility (Ball, 2001; Ball and Shivakumar, 2008; Ball, Jayaraman and Shivakumar, 2012). In addition, imperfect information about the decomposition of MTM gains and losses into shocks to expected cash flows and expected returns reduces the precision of managers' private information about future earnings. Similar arguments apply to analyst forecasts. We therefore expect MTM accounting to be associated with a reduced incidence of both analyst and management earnings forecasts, further compounding the informational disadvantage of uninformed investors.

*2.6. Focus on trading securities*

We focus on securities classified as "trading" in part because they attract the purest form of MTM accounting. SFAS 115 (FASB, 1993, ¶12a) defines the category as follows: "…securities that are bought and held principally for the purpose of selling them in the near term (thus held for only a short period of time) shall be classified as *trading securities.*" ¶13 requires their unrealized gains and losses to be included in earnings. We also report results for the other

security categories under SFAS 115: available-for-sale (*AFS*), reported on balance sheets at fair value, but with gains and losses booked in accumulated other comprehensive income (AOCI) and recognised in earnings only at liquidation; and held-to-maturity (*HTM*), reported at amortized historical cost. The *Trading* category includes investments in bonds, notes, equities, derivatives, mortgage-backed securities and other securitized loans, but does not include unsecuritized loans.

*2.7. Available-for-sale securities*

While available-for-sale (*AFS*) securities also are marked-to-market on the balance sheet, we do not expect them to be as closely associated with information asymmetry as trading securities.

First, the SFAS 115 security classification rules suggest that *AFS* gains and losses have less impact on bank share prices. *Trading* designates positions held for profit-making, and trading profits likely are a value-relevant signal of banks' trading ability. In contrast, the *HTM* designation applies (¶7) "only if the reporting enterprise has the positive intent and ability to hold those securities to maturity," for example to hedge a future outlay, in which case price changes for the security are approximately hedged from the shareholder perspective. Similarly, the *AFS* category comprises all other securities, which largely comprise passive investments on which the bank earns a spread over its borrowing costs, creating a quasi-hedge position. The quasi-hedge also implies low value-relevance of security price changes (in contrast with information about the size of the spread).

Second, consistent with the above, the evidence suggests that investors treat unrealized gains and losses reported in AOCI as relatively less informative than those recognized in earnings. Badertscher et al. (2011) find that unrealized *AFS* gains/losses generate an insignificant market reaction in the period prior to 2009. Similarly, Dong et al. (2012) find that the coefficient

on unrealized *AFS* gains/losses in a value-relevance regression is statistically weak and economically smaller than that on net income.[11] Finally, consistent with lower demand from investors for information about unrealized gains and losses included in AOCI, Appendix 2 presents evidence that managers and analysts following banks in our sample forecast earnings, not AOCI.

Third, many of the effects on information asymmetry surveyed in this section involve strategic trading by managers, to manipulate period-end prices, to comply with regulatory ratios, or to pre-empt trading by other managers. The opportunity to trade strategically is limited for *AFS* securities, because under SFAS 115 rules this would risk them being classified as *Trading*, which "generally reflects active and frequent buying and selling" (¶12a).

Fourth, many of the effects of MTM on information asymmetry surveyed in this section derive from the recognition of MTM gains and losses in reported earnings, which is the most commonly followed metric of firm performance (see Section 2.8). Periodic *AFS* gains and losses flow through accumulated other comprehensive income (AOCI) until realization.[12]

Finally, most *AFS* gains and losses do not affect regulatory capital, so leverage-based feedback loops linking MTM accounting to price distortion, as in Allen and Carletti (2008), are less applicable.[13]

*2.8. Do economic actors exclude trading income or include AFS income?*

The recognition-based arguments summarized above assume that investors, financial analysts, managers and regulatory bodies do not simply eliminate fair value revisions.[14] The

[11] We do not evaluate the cause of this phenomenon. For example, it could be due to investor irrationality.
[12] While *AFS* losses arising from "other than temporary impairments" (OTTI) affect reported earnings, the timing of when these losses are recognized in earnings is discretionary, so they do not necessarily give rise to the same incentives for managers, investors and analysts as does MTM accounting for trading securities. Further, concerns have been raised about the diligence with OTTI losses have been taken in practice (e.g., Vyas, 2011).
[13] Unrealized losses (gains) on *AFS equity* securities are deducted from (included in) Tier 1 (Tier 2) capital, but most sample banks hold little or none (the median proportion of equities is 0%; the upper quartile is 7%).

Gorton et al. (2010), Allen and Carletti (2008) and Plantin et al. (2008) models assume managers are incentivized on the basis of earnings or balance sheet ratios that reflect MTM gains and losses. Similarly, the prediction of reduced management forecasting based on Ball, Jayaraman and Shivakumar (2012) assumes that the earnings variable being forecast includes MTM gains and losses, as does the argument that MTM requires separating shocks to expected returns and to cash flows when forming earnings expectations and estimating the signal in actual earnings.

We conjecture that completely eliminating fair value revisions from earnings would not necessarily result in a more efficient contracting variable, or a more accurate prediction of future cash flows, because fair valued assets are a large component of banks' asset portfolios are the relevant for forecasting in cases where they pertain to revisions in future cash flows. Further, contracting on earnings excluding MTM gains and losses could increase moral hazard, and not predicting an important component of bank profit could signal managerial incompetence.

To address this issue, in Appendix 2 we provide evidence of whether sophisticated market participants, namely analysts and managers, exclude trading income or include unrealized gains and losses on *AFS* securities in their projections of future earnings. We find little or no evidence that analysts or managers of our sample banks adjust their earnings forecasts by either excluding trading income or including unrealized *AFS* income. Further, they do not provide sufficient information to allow investors to make the adjustments themselves.

### *2.9. Hypothesis summary*

Based on the above arguments, our primary hypothesis is that a variety of market frictions interact with MTM to exacerbate information asymmetry. The MTM effects potentially stem from both the disclosure of price information and its recognition in the financial statements.

[14] Even if this assumption was invalid, the acceleration of public disclosure effects discussed in section 2.1 would still hold, and would predict that MTM accounting increases information asymmetry.

We also hypothesize that the incorporation of MTM gains and losses in earnings has incremental effects relative to its mere incorporation in balance sheet asset and liability values. The primary hypothesis is stated in the null, while the second hypothesis is directional:

*H1:* *The use of mark-to-market accounting does not increase information asymmetry relative to historical cost accounting.*

*H2:* *The effect of mark-to-market accounting on information asymmetry is larger when fair value gains and losses are incorporated in earnings than in accumulated other comprehensive income (AOCI).*

## 3. Related literature

Two recent studies of accounting and information asymmetry are related. Liao et al. (2010) examine the relation between MTM (under SFAS 157) and information asymmetry, but their analysis is restricted to the financial crisis period, and their tests do not disentangle the effect of MTM accounting from properties of the underlying securities. Muller et al. (2011) examine information asymmetry consequences of fair value accounting, but study European real estate firms, which pose different valuation challenges than marketable securities.

In earlier work, Barth (1994) reports pre-SFAS 115 evidence that fair values of investment securities provide significant incremental explanatory power over historical costs for banks' share prices and returns. Barth et al. (1995) document that pre-SFAS 115 MTM reporting increases banks' earnings volatility. Bernard et al. (1995) evaluate the effect of MTM on regulatory capital in Danish banks, and report evidence of earnings management generally but not to avoid regulatory capital constraints. They caution against generalizing the results outside the Danish regulatory framework. Morgan (2002) documents that banks and insurance companies face greater credit-rating dispersion. He attributes this to the specialised nature of banks' underlying assets making it difficult for outsiders to assess risk. However, from a sample that straddles the passage of SFAS 115, Flannery et al. (2004) conclude that banks' assets are not

unusually opaque and that bank stocks, if anything, had lower bid-ask spreads, return volatility and analyst forecast errors than comparable non-bank firms. None of these studies directly examines the relation between MTM accounting and information asymmetry.

Prior literature reports mixed evidence on the relation between information asymmetry general measures of financial reporting quality. Lafond and Watts (2008) and Bhattacharya, Desai and Venkataraman (2012) find that higher reporting quality, measured as conservatism or as the mapping of accruals into cash flows, leads to lower information asymmetry. In contrast, Haggard, Howe and Lynch (2011) find that information asymmetry increases after firms report large negative special items. These studies focus on the combined effects of accounting standards generally, as distinct from a specific standard such as SFAS 115. Moreover, the earnings attributes examined in prior studies capture the effects of discretionary choices on when to recognize revenues and expenses, and on how they reflect underlying cash flows, whereas MTM accounting gives little discretion to managers on the timing of gain and loss recognition but (we hypothesize) it leads to manager action that distorts underlying price information. Lastly, the evidence in prior studies generally is based on cross-sectional analysis, documenting association rather than causality between reporting quality and information asymmetry, whereas we are able to exploit differential effects occurring when MTM was mandated under SFAS 115. [15]

## 4. Mark to Market Accounting: History and Current Rules

The history of accounting for securities holdings is one of banking crises and political and regulatory reactions to them. This section describes the major events. We later exploit these changes to improve identification of MTM accounting.

[15] Based on lead-lag analysis, Lafond and Watts (2008) conclude that information asymmetry changes lead conservative reporting.

*4.1. MTM prior to 1938*

Bank supervisors required a variant of MTM for all securities until after the Great Depression, when it was dropped in favor of cost-based reporting. In the aftermath of the downturn, MTM was alleged to have marked bank assets down to the point where they could not maintain regulatory capital adequacy ratios without curtailing loans, thereby contracting business and household spending. In a letter dated November 1, 1990 to the Securities and Exchange Commission Chairman, then Federal Reserve Chairman Alan Greenspan stated[16]:

> "… prior to 1938, banking organizations were required for supervisory purposes to use market value accounting for their investment securities portfolios. Serious concerns on the part of the U.S. Treasury and the bank regulators over how this affected the banks' financial performance and investment decisions led the agencies to abandon in that year the use of this accounting concept for supervisory purposes."

A similar scenario was replayed seventy years later.

*4.2. Lower-of-cost-or-market method until 1993*

The required method of accounting for public financial reporting until 1993 was lower-of-cost-or-market (LCM). Under this method, securities were recorded on balance sheets at cost, with losses (but not gains) written off in current-period earnings. The diligence with which losses were taken in practice subsequently came into question.

*4.3. SFAS 115 categorizes securities and mandates MTM accounting for trading securities*

After the savings and loans crisis of the 1980s, it was the LCM method's turn to come under pressure from regulatory bodies. FASB identified the Office of the Comptroller of the Currency, the Federal Home Loan Bank Board, the Securities and Exchange Commission and the American Institute of Certified Public Accountants as proposing a change to market pricing.[17] Proponents of MTM argued that historical-cost based financial statements obscured

[16] Greenspan (1990) and United States Securities and Exchange Commission (2008).
[17] Financial Accounting Standards Board (1993, ¶30-36).

underlying economic changes. Inadequate loss recognition practices allegedly allowed troubled financial institutions to operate without supervisory intervention, and encouraged managers to undertake excessive risk in the hope of recovering financial strength. The major CPA firms joined the call for greater use of market values in both public and regulatory accounting.

Against this, some commentators expressed concerns about the reliability of fair value numbers and the possibility of management manipulation. Banks also questioned the relevance of short term fair value gains and losses in cases such as default-free debt securities that are intended to be held to maturity and without the intent of sale. In response to these pressures, FASB (1993) issued SFAS 115, effective for fiscal periods commencing after December 15, 1993 (i.e., primarily affecting financial statements commencing with first quarter 1994). The fundamental provisions of this standard remain in effect today, though it has been amended over time in ways that are not central to our analysis.

SFAS 115 requires firms to classify their investment securities into three categories – trading, available-for-sale and held-to-maturity – and gives different roles to securities' fair values in each category. Securities classified as *Trading* are reported on balance sheets at fair value, with both realized and unrealized gains and losses in fair value included in earnings in the period in which they arise. Debt securities that the firm has a positive intent as well as an ability to hold to maturity are classified as held-to-maturity *(HTM)* and are reported on balance sheets at amortized historical cost, and gains and losses in their market values do not affect earnings, except for losses due to "other than temporary impairments" (FASB, 1993, ¶16). All securities not classified as either *HTM* or *Trading* are classified as available-for-sale (*AFS*) and are reported on balance sheets at fair value, but with unrealized gains and losses excluded from earnings until the securities are liquidated by sale or maturity. They also are subject to the "other than temporary impairment" rules.

*4.4. SFAS 159 introduces the "fair value option" for many financial assets and liabilities*

FASB issued SFAS 159 in 2007, effective for fiscal years commencing after November 15, 2007, giving firms an irrevocable option to use MTM accounting for a range of financial securities, including their own debt. The option is exercisable on a security by security basis, but once exercised it cannot be reversed. FASB's objective was stated as follows (FASB, 2007 ¶1):

> This Statement is expected to expand the use of fair value measurement, which is consistent with the Board's long-term measurement objectives for accounting for financial instruments.

*4.5. Summary: Premises underlying MTM rules for trading securities*

Like the "classical" accounting literature that preceded them, the post-1993 accounting rules for trading securities are premised on a world in which asset markets are perfectly liquid and frictionless, and prices provide sufficient information for users' decisions. The assumption of unbounded liquidity is implied by valuing unlimited quantities of a security held at period-end (and hence have not been sold) at a fixed unit selling price, which is why FASB (2006, preamble) uses the phrase "hypothetical transaction." Furthermore, under SFAS 115, the mere existence of quotations in a recognized national market is sufficient to calculate a "fair value" for unlimited quantities of a security (FASB, 1993 ¶3a), independent of liquidity in that market:

> The fair value of an equity security is readily determinable if sales prices or bid-and-asked quotations are currently available on a securities exchange registered with the Securities and Exchange Commission (SEC) or in the over-the-counter market, provided that those prices or quotations for the over-the-counter market are publicly reported by the National Association of Securities Dealers Automated Quotations systems or by Pink Sheets LLC.

SFAS 157 explicitly provides that a level 1 fair value – the highest quality in its measurement pecking order, and almost invariably the basis used for trading securities – is independent of the size of the bank's holdings and its potential effect on the security's price (FASB, 2006 ¶27):

> If the reporting entity holds a position in a single financial instrument (including a block) and the instrument is traded in an active market, the fair value of the position shall be measured within Level 1 as the product of the quoted price for the individual instrument times the quantity held. The quoted price shall not be adjusted because of the size of the position relative to trading volume (blockage factor). The use of a blockage factor is prohibited, even if a market's normal daily trading volume is not sufficient to absorb the quantity held and placing orders to sell the position in a single transaction might affect the quoted price.

An implied premise of these MTM accounting rules is frictionless markets with unbounded liquidity. However, markets do not have unlimited liquidity, and actions in markets are not costless, so the picture changes after considering frictions such as the effect of public information on private information acquisition, on investors that process the information, or on the incentives of managers trading in illiquid markets. Whether these effects are important enough to materially influence information asymmetry is an empirical issue, to which we now turn.

## 5. Definition and measurement of variables

The following two sub-sections describe the information asymmetry and MTM accounting variables. Sections 5.3 and 5.4 present control variables and empirical specifications.

### *5.1. Bid-ask spread (SPREAD)*

We use the relative bid-ask spread (*SPREAD*) to measure information asymmetry between informed and uninformed traders, as first discussed by Bagehot (1971). Bagehot's intuition subsequently was modelled by Copeland and Galai (1983), Kyle (1985) and Glosten and Milgrom (1985). We define *SPREAD* as the quarterly average of the monthly differences between the closing ask and closing bid quotes, scaled by the average of the ask and the bid, and expressed in percentage terms:[18]

[18] The results are robust to using quarterly averages of daily spreads.

$$SPREAD_{i,t,q} = \frac{1}{M_{i,t,q}} \sum_{m=1}^{M_{i,t,q}} \frac{(ASK_{i,m} - BID_{i,m})}{(ASK_{i,m} + BID_{i,m})/2} * 100$$

where $M_{i,t,q}$ is the number of months in quarter $q$ of year $t$ for bank $i$ for which month m's closing bids ($BID_{i,m}$) and closing asks ($ASK_{i,m}$) are available.

*5.2. TRADING, AFS and HTM securities*

The importance to shareholders of banks' investments in securities is measured using both balance sheet and income statement variables. Because our hypotheses address the equity market effects of MTM accounting, we scale banks' security investments relative to their market value of equity, not total assets.[19] The difference is important because banks are relatively highly levered. The balance sheet variable for trading securities (*TRADING*) is the ratio of the balance sheet value of trading assets (data item 3545) to market value of equity.[20] Similarly, available-for-sale securities (*AFS*) and held-to-maturity securities (*HTM*) are measured as the ratio of the balance sheet values of these securities (1773 and 1754) to the market value of equity. We also study an indicator variable *TRADEDUM* that takes the value 1 if the bank carries any trading securities on its balance sheet as of the end of the quarter and 0 otherwise.

From the income statement we measure the importance of trading income to shareholders (*TRADING_INC*) as the ratio of trading income (A220) to average trading assets (as defined above). Similarly, realized income on *AFS* securities (*AFS_REAL_INC*) is the ratio of realized gains and losses on *AFS* securities (3196) to average *AFS* securities, and unrealized income on *AFS* securities (*AFS_UNREAL_INC*) is the quarterly change in the balance of unrealized holding

[19] Security investments are also scaled by market value of equity for consistency with prior studies, including Erel, Nadauld and Stulz (2011) and Flannery et al. (2004). Results are robust to scaling by total assets.

[20] The Federal Reserve datasets (described below) prefix "BHCK" for all bank holding company financial data, "RCFD" for balance sheet data for commercial banks and "RIAD" for income statement data for commercial banks.

gains/losses on *AFS* securities (8434) divided by average *AFS* securities.[21] All balance sheet and income statement items are measured as of the beginning of the quarter.

### *5.3. Control variables*

Other characteristics of the composition of banks' balance sheets are associated with information asymmetry (Morgan, 2002; Flannery et al., 2004). We control for *LOANS* defined as total loans and leases (2122) and loan loss allowance (*LLA*) defined as allowance for loan and lease losses (3123), both scaled by market value of equity. Following Fahlenbrach and Stulz (2011), we also control for capital strength using the Tier 1 capital ratio (*TIERONE*), measured as the ratio of Tier 1 capital (8274) to total assets (2170).[22]

Firm and market characteristics such as bank size and stock liquidity are important determinants of bid-ask spreads (Stoll, 2000). We control for size using the end of quarter log of market value of equity (*LNMVE*) and for stock liquidity using turnover (*TURN*) measured as the log of the total number of shares traded during the quarter divided by total shares outstanding, where the data are from the monthly CRSP file.[23] We control for stock return volatility (*RETVOL*) measured as the standard deviation of daily returns over the quarter, for the inverse of the end-of-quarter closing stock price (*PRCINV*), for mean differences in spreads between commercial banks and bank holding companies using an indicator variable (*BHC*), and year

[21] Income statement items in regulatory filings are adjusted to reflect that they are reported on a cumulative basis.

[22] We do not control for both Tier 1 capital and the tangible equity ratio as in Fahlenbrach and Stulz (2011) because they are highly correlated in our sample (>0.83). Our results are robust to including the tangible equity ratio instead and also to defining this ratio based on Compustat data, as in Fahlenbrach and Stulz (2011).

[23] One could argue that controlling for stock liquidity is inappropriate because differences in trading volume are a manifestation of information asymmetry in a world with discretionary liquidity traders (Admati and Pfleiderer, 1988). While the results are robust to excluding turnover, we control it for two reasons. First, we are interested in the adverse selection component of spreads, and trading volume captures (albeit imperfectly) the inventory component (Jayaraman, 2008). Second, since our proxy for information-asymmetry (viz. bid-ask spreads) captures the effects of trading between informed and uninformed investors, controlling for turnover in the spread regressions could potentially soak up some of the effects, leading to a conservative bias in the results Finally, the results are robust to directly using the adverse selection component of the bid-ask spread (discussed in the robustness tests).

fixed effects due to the decreasing trend in bid-ask spreads over time (Chordia et al., 2008). All balance sheet variables are measured as of the start of the current quarter.

*5.4. Regression specifications:*

To empirically test Hypothesis H1 and H2, we regress bid-ask spreads on trading securities, *AFS* and *HTM*. Three variations of the basic specification are estimated. The first uses the indicator variable *TRADEDUM* to capture the presence of trading securities while the second employs the continuous variable *TRADING*. The third variation estimates the latter model within the sub-set of banks with trading assets (*TRADEDUM* =1). Standard errors are clustered two-way: by bank and by year-quarter.[24] These regressions models are:

$$SPREAD_{i,t,q} = \alpha_0 + \alpha_1 TRADEDUM_{i,t,q-1} + \alpha_2 AFS_{i,t,q-1} + \alpha_3 HTM_{i,t,q-1} + \alpha_4 LOANS_{i,t,q-1} + \alpha_5 LLA_{i,t,q-1} + \alpha_6 TIERONE_{i,t,q-1} + \alpha_7 LNMVE_{i,t,q} + \alpha_8 TURN_{i,t,q} + \alpha_9 RETVOL_{i,t,q} + \alpha_{10} PRCINV_{i,t,q} + \alpha_{11} BHC_i + \sum YEAR - dummies + \varepsilon_{i,t,q} \quad (1)$$

$$SPREAD_{i,t,q} = \alpha_0 + \alpha_1 TRADING_{i,t,q-1} + \alpha_2 AFS_{i,t,q-1} + \alpha_3 HTM_{i,t,q-1} + \alpha_4 LOANS_{i,t,q-1} + \alpha_5 LLA_{i,t,q-1} + \alpha_6 TIERONE_{i,t,q-1} + \alpha_7 LNMVE_{i,t,q} + \alpha_8 TURN_{i,t,q} + \alpha_9 RETVOL_{i,t,q} + \alpha_{10} PRCINV_{i,t,q} + \alpha_{11} BHC_i + \sum YEAR - dummies + \varepsilon_{i,t,q} \quad (2)$$

If MTM accounting reduces information asymmetry, we expect $\alpha_1 < 0$ in both Equations (1) and (2) and for $\alpha_1 < \alpha_3$ in Equation (2). Alternatively, if MTM accounting increases information asymmetry, we expect $\alpha_1 > 0$ in both Equations (1) and (2) and $\alpha_1 > \alpha_3$in Equation (2). The prediction from hypothesis *H2*, that the relation between *AFS* and information asymmetry is weaker, is that $abs(\alpha_1) > abs(\alpha_2)$ in Equation (2). We offer no prediction for $\alpha_3$ by itself.

[24] We do not include bank fixed effects in these regressions as there is very little time-series variation in *TRADEDUM* amongst our sample banks. Out of the 907 banks in our sample, around 75% do not hold trading securities at any point in time (i.e., *TRADEDUM*=0 for all sample years). An additional 10% hold trading securities in every quarter (i.e., *TRADEUM*=1 for all sample years). Thus, including bank fixed effects would result in identifying regressions based on TRADEDUM off of 15% of the sample. We do, however, report results from including bank fixed effects in robustness tests and include bank fixed effects in all our diff-in-diff tests.

## 6. Data and Sample Descriptive Statistics

The sample period for our initial analyses commences in 1996, because the classification of investment securities into *AFS* and *HTM* is available only pursuant to the passage of SFAS 115.[25] Financial statement data for bank holding companies are from the Federal Reserve's Consolidated Financial Statements for Bank Holding Companies (FRY-9C).[26] Commercial banks' financials are from the Federal Reserve's Report of Condition and Income ("Call reports").[27] Data on bid-ask spreads and other microstructure variables are from CRSP. The final sample with non-missing data for all variables covers the period 1996:Q1 to 2010:Q4 and comprises 24,753 bank-quarter observations for 907 unique banks. We subsequently study a smaller sample over 1988 to 1998 to compare pre- and post-SFAS 115 effects.

Panel A of Table 1 presents descriptive statistics for the overall sample and for the sub-samples of bank-quarters with and without investments in trading assets. For the 17% of bank-quarters with trading assets, these assets average 16.3% of the bank's market value.[28] *AFS* and *HTM* securities for the median bank amount to 119% and 3.6% of market value respectively, and these proportions do not vary substantially between banks with and without trading assets. Loans

[25] Although SFAS 115 was issued in 1993, the sample starts in 1996 because a FASB amnesty in 1995 allowed banks to conduct a one-time reclassification of *HTM* securities (Hodder et al., 2002). Results are robust to including 1994 and 1995.

[26] Form FRY-9C is filed quarterly by large BHCs (the cutoff was $150 million prior to 2006 and $500 million thereafter). BHCs below the cutoff file form FRY-SP semi-annually. If the top-tier of a multi-tiered BHC is exempted from filing, the lower tier files. 98.24% of the data are from consolidated financials for the top tier, 1.23% are from lower-tiered BHCs, 13 firm-quarter observations are where both top and lower tiers filed FRY-9Cs, and 28 observations are where a sample commercial bank is part of a BHC that also is in the sample. The results are robust to deleting the lower-tier observations.

[27] In addition to matching bank regulatory entity codes with CRSP using PERMCOs available through the New York Fed link (http://www.newyorkfed.org/research/banking_research/datasets.html), we match based on CUSIPs from the SNL database. This increases the sample by approximately 10%. Results are robust to using only the PERMCO-matched sample. We do not use SNL financial data because when a bank restates one year, SNL populates the entire trading assets field to "NA," including years without restatement. As a result, the frequency of "NA" trading assets was much larger in SNL than in the FRY-9C database. When we raised this with SNL using Bank of America as a specific example, they rectified that specific instance. We have received no confirmation that similar fixes will be applied for other banks.

[28] Around 8% of commercial banks in the sample hold trading assets.

dominate the asset portfolios of the sample banks, which lend approximately $6.53 for every $1 of market value of shareholders' equity. There is some evidence that loans are more prevalent on the balance sheets of banks without trading assets. Banks with trading assets are substantially larger, with an average market value of equity of approximately $9 billion compared with $412 million for those without trading assets. Similarly, sample banks trade at an average of $23.5 per share, with trading asset banks averaging $34.5 and those without averaging $21.3. The mean Tier 1 capital ratio *TIERONE* of banks with and without trading assets is 8.0% and 9.0%.

The average relative bid-ask spread for the overall sample is 2.08%, while the median is 1.30%. Bank-quarters with trading assets have lower spreads (mean and median of 0.96% and 0.44% respectively) than those without (2.32% and 1.58%). Banks with trading assets also exhibit greater stock turnover but only slightly lower stock return volatility than those without. We recommend caution in interpreting these univariate differences. Bank characteristics, and in particular bank size, vary between banks with and without trading assets, and larger stocks generally exhibit smaller spreads, lower turnover and greater liquidity.

Panel B reports that bank holding companies constitute 96% of the sample, with the remainder being commercial banks. These institution types are time-invariant. Panel C reports that approximately 82% of the banks are listed on Nasdaq, followed by 13% on NYSE and the remainder on AMEX.

## 7. Results

### *7.1. Graphical evidence on spreads*

Figure 1 presents evidence of the association between bid-ask spreads and the three categories of investment securities considered separately. The figure plots the median value of *SPREAD* (orthogonalized with respect to bank-level determinants) as a function of the proportion

invested in each category. For *AFS* securities, the observations are sorted into equally sized quintiles. For *TRADING* and *HTM* securities, the first group denotes banks with no investments in that category, and then the observations with positive amounts invested are sorted into equally sized quartiles.

Panel A of Figure 1 shows that orthogonalized *SPREAD* increases monotonically in the five *TRADING* groups. In contrast, Panel B and Panel C indicate no distinct patterns in spreads as a function of *AFS* and *HTM* securities, respectively. While suggestive of a positive association between the use of MTM accounting and information asymmetry, these preliminary results for individual security categories are without controls for amounts invested in the other two categories, even though the spreads are orthogonalized with respect to other bank characteristics.

### *7.2. Regression-based evidence on spreads*

The primary test of how trading securities are associated with information asymmetry is provided by estimating the relation between the relative amount invested by banks in trading securities and their bid-ask spreads. Table 2 presents the results from estimating the multivariate regression equations (1) and (2) where *SPREAD* is the dependent variable. Columns (1) and (2) are based on the entire sample while column (3) is based on the sub-sample of banks with investments in trading securities. Regressions have year fixed effects and robust standard errors that are clustered two-way, by bank and by quarter.

The 0.388 coefficient on the indicator variable *TRADEDUM* for the full sample in column (1) is positive and statistically significant (*t*-statistic = 4.06). Given the sample mean *SPREAD* of 2.08% and the fact that 17.1% of the sample comprises banks with trading securities, the coefficient implies that banks that invest in trading securities experience spreads that are approximately one-fifth higher on average than those of banks that do not, holding other

categories of investment securities and bank characteristics constant.[29] The association between spreads and treasury securities thus appears statistically and economically significant.[30]

The 0.965 coefficient on the continuous variable *TRADING* in column (2) is statistically significant (*t*-statistic = 4.42). It implies a 1% increase in trading securities as a percent of equity (the mean is 16.3%) is associated with an approximately 1% average increase in spread (compared with the mean of approximately 2%). Further, consistent with hypothesis *H1*, the coefficient on *TRADING* is significantly higher than that on *HTM*, suggesting that the use of MTM accounting increases bid-ask spreads relative to using historical cost accounting. Also, consistent with hypothesis *H2*, the coefficient on *AFS* is significantly smaller than that on *TRADING*, indicating that the effect of MTM accounting on information asymmetry is weaker when fair value gains and losses are routed through AOCI instead of net income.

For the smaller subsample of bank-quarters with positive holdings of trading securities reported in column (3), the estimated coefficient 0.511 for *TRADING* is smaller but remains significant statistically (*t*=2.88). It implies that a 1% increase in trading securities as a percent of equity is associated with an approximately 1% average increase in spread, compared with the mean spread for this sub-sample of approximately 1%. Here again, the coefficient on *TRADING* is significantly larger than that on *HTM* and *AFS*.

Further, consistent with the graphical evidence, we are unable to detect a significant association between *SPREAD* and either *AFS* securities or *HTM* securities. In particular, the insignificant coefficient on *AFS* is consistent with our ex-ante prediction that the effect of MTM accounting is likely to be weaker for *AFS* securities than for trading securities. This evidence is consistent with the findings of Badertscher et al. (2011) and Dong et al. (2012) that investors, in

[29] More precisely, 19.3%, calculated as 0.388/[2.08-0.171x0.388].
[30] Results are robust to mitigating the effect of outliers by using log spreads or estimating robust regressions.

general, do not regard unrealized gains and losses on *AFS* securities as being informative. In contrast, the positive coefficient on *TRADEDUM* is consistent with mark-to-market accounting increasing information asymmetry in banks.

The coefficients on the microstructure controls generally are consistent with prior studies, in that spreads are lower for the larger, more liquid and less volatile banks.[31] The negative and significant coefficient on *BHC* suggests that, after controlling for other factors, *BHC*s are associated with lower spreads than commercial banks.

The general picture that emerges is that trading assets are associated with higher information asymmetry in the market for bank shares, but this does not appear to extend to the other categories of securities, i.e., *AFS* and *HTM*.[32] In the following subsections, we explore how trading securities affect other informational characteristics of the bank. In particular, we explore analyst following, frequency of management forecasts and intra-period timeliness.

### *7.3. Analyst following*

There are opposing views on the effect of trading securities on analyst following. On one hand, analysts are less likely to follow banks whose earnings are less predictable (Lang and Lundholm, 1996) due to MTM gains and losses. On other hand, these banks are likely to draw greater analyst following, because other things equal the marginal benefit of information acquisition increases in information asymmetry. Thus, the association between the presence of trading securities and analyst following is an empirical question.

[31] One exception is the insignificant coefficient on *LOANS*. Relative to prior studies finding a positive coefficient, our specification includes a richer set of microstructure controls and our standard errors are clustered two-way.

[32] As one would expect, trading liabilities also are associated with spreads, but the 0.65 correlation with trading assets makes it problematic to estimate separate effects. When we regress trading liabilities on trading assets and include the orthogonal component in the regression, the coefficients on trading assets and (residual) trading liabilities both are positive and significant in the whole sample. Trading liabilities remains positive but becomes insignificant in the sub-sample with trading assets. These results are robust to including bank fixed effects.

We estimate a probit model because approximately 83% of the bank-quarters have no analyst following. We define *ANALYST* as an indicator variable that takes the value 1 if the bank is followed by one or more analysts in a given quarter, and regress it on *TRADEDUM* (and also *TRADING*) and controls. Consistent with the effect of earnings predictability dominating the effect of the demand for information acquisition, we report a negative and significant ($t$ = -3.59) coefficient on *TRADEDUM* in column (1) of Table 3, Panel A. The estimated probability of being followed by one or more analysts is 2.5% lower for banks with trading securities.[33] The coefficient on *TRADING* is negative and significant in Panel B, indicating that analysts are less likely to follow banks with trading securities. Further, the coefficient on *TRADING* is significantly lower than that on *HTM*, suggesting that using MTM accounting relative to HC accounting reduces the likelihood of analyst following.

*7.4. Management forecasts*

The next indicator of information asymmetry we examine is whether management forecasting propensity is influenced by the presence of trading securities. Here too there are opposing arguments. On one hand, greater information asymmetry increases the demand for information from market participants, thereby increasing the benefits of issuing a forecast. On the other hand, the higher difficulty in forecasting earnings in these banks is likely to reduce the supply of management forecasts by making them less credible. This argument is based on the hypothesis in Ball (2001), Ball and Shivakumar (2008) and Ball, Jayaraman and Shivakumar (2012), that managers can more credibly commit to issuing truthful forecasts when the accuracy of the disclosures can be subsequently confirmed at the announcement of actual earnings. Mark-to-market returns on security investments due to price changes after the forecast date introduce

[33] In comparison, a one standard deviation increase in firm size (which has one of the highest marginal effects in the regression) increases the probability of analyst following by 6.3%.

variability into the actual earnings outcome, which reduces its capacity to signal the management's ex-ante forecast accuracy. The benefits of forecasts then are reduced because they convey less credible private information, so managers engage in less forecasting.

Results are reported in column (2) of Table 3. We estimate a probit model of the likelihood of issuing a management forecast because 97% of our sample banks do not issue any. Consistent with the supply effect dominating, there is a negative and significant ($t$ = -2.47) coefficient on *TRADEDUM* in Panel A, implying that banks with trading securities are 1.3% less likely to issue a management forecast than those without.[34] Further, the coefficient on *TRADING* in Panel B is not only negative and significant, but also statistically different from that on *HTM*.

*7.5. Intra-period Timeliness (IPT)*

One indicator of the effect on the information environment of including MTM gains and losses in quarterly earnings is how late in the quarter the market impounds earnings information in stock prices. While informed trading that pre-empts the public signal increases the timeliness of stock prices, lower management forecasting and analyst following reduces it.[35] We use the Butler, Kraft and Weiss (2007) measure of intra-period timeliness (*IPT*), which captures how early in the year the bank's total annual information is incorporated in its stock price. The *IPT* measure is calculated as the sum over $m$ (= 1 to 11) of the ratio of the buy-and-hold return over months 1 through $m$ ($BH_m$) to the annual buy-and-hold return over months 1 through 12 ($BH_{12}$), plus 0.5. More timely banks should have larger values of *IPT*. We study the decile rank of the bank's average *IPT* over all years.

[34] In comparison, a one standard deviation increase in firm size increases the likelihood of management forecasting by 3.7%. Management forecasts occur with low frequency, but this is because they occur when managers have value-relevant private information, and hence their price impact is relatively large (Ball and Shivakumar, 2008).

[35] One cannot draw welfare implications from this measure, which compares the *timing* but not the *amount* of information impounded (which is held constant).

We regress *IPT* on the trading securities indicator variable *TRADEDUM*, *AFS* securities, *HTM* securities, and controls. Since *IPT* is an annual measure, we only retain the fourth quarter's financial data for this test. Results are presented in column (3) of Table 3. The coefficient on *TRADEDUM* is negative and significant ($t$ = -2.49), indicating that banks with trading assets are associated with less timely incorporation of news into stock prices. The IPT of banks with trading securities is estimated as 5.3% lower than those without trading securities. Results based on *TRADING* in Panel B are consistent in sign but weaker in statistical significance. Overall, the evidence from these informational characteristics (analyst following, management forecasting frequency) reinforce those based on spreads, and indicate that MTM accounting is associated with greater information asymmetry relative to HC accounting and that the existence of trading securities lowers information timeliness.

*7.6. Robustness tests*

We perform extensive tests to verify the robustness of the results. They include: using fixed effects to address cross-sectional differences in bank characteristics that could be correlated with both information asymmetry and banks' exposures to trading securities; using only the adverse selection component of the spreads, estimated from the George, Kaul and Nimalendran (1991) decomposition; using income statement measures of the composition of bank's security portfolios; using propensity score matching to control for differences in underlying characteristics between banks; using both robust and rank regressions to mitigate the effect of outliers; and investigating the effects of the 1998 SFAS 133 introduction of rules for derivatives and hedges, of the 1999 repeal of the Glass-Steagall Act, and of various changes in the regulatory filing threshold for banks. Results of these tests are reported in Appendix 3.

*7.7. Effects of changes in MTM accounting rules.*

It is possible that the above associations are driven by unobservable characteristics of the underlying securities or imperfect controls for bank characteristics, rather than by marking trading securities to market *per se*, which would make banks' investments in trading securities endogenous. In this subsection we exploit changes in MTM rules to better identify cause and effect.

*7.7.1. Exploiting SFAS 115 as a shock to MTM accounting rules.*

We initially address endogeneity concerns by examining changes in the association between information asymmetry and trading assets around the introduction of MTM by SFAS 115 in 1993, which provides a (relatively) clean exogenous shock. Before that date, the accounting rules valued trading securities at historical cost adjusted for downward revisions in value (known as "lower of cost or market").[36] This mandatory rule change permits an examination of changes in spreads *for the same bank* after the rule shock. We conduct a difference-in-differences analysis, comparing spread changes in the treatment group (banks with trading securities) with spread changes in the control group (banks without trading securities). To control for possible changes in banks' business models around the introduction of SFAS, we exclude banks with trading securities in only one of the pre and post SFAS 115 periods.[37]

Figure 2 plots average spreads that are orthogonalized with respect to the control variables and year effects against the year relative to the introduction of SFAS 115. The solid line represents banks with trading securities (*Trading*) while the dotted line indicates those without trading securities (*Non-trading*). There is considerable overlap between the two lines in

[36] Beatty, Chamberlain and Magliolo (1996) report that at the time of passage of SFAS 115, the market value of securities was higher than book values for virtually all banks because interest rates were essentially at their lowest point in 30 years. Thus, "lower of cost or market" can be treated as then equivalent to historical cost.
[37] Results are robust to including these banks.

the pre-period, during which the two groups are not significantly different. In contrast, spreads increase sharply from year 1 onwards for *Trading*, while they remain flat for *Non-trading*.

Table 4 reports the following difference-in-differences regression specification:[38]

$$SPREAD_{i,q} = \alpha_0 + \alpha_1 TRADEDUM_{i,q-1} + \alpha_2 TRADEDUM * POST_{i,q-1} + \alpha_3 LOANS_{i,q-1} + \alpha_4 LLA_{i,q-1} + \alpha_5 TANGEQ_{i,q-1} + \alpha_6 LNMVE_{i,q} + \alpha_7 TURN_{i,q} + \alpha_8 RETVOL_{i,q} + \alpha_9 PRCINV_{i,q} + \alpha_{10} BHC_i + \sum_t \alpha_{11,t} YEAR_t + \varepsilon_{i,q} \quad (3)$$

*POST* is an indicator variable that takes the value of 1 for the five years after implementation of SFAS 115 (i.e., 1994 to 1998) and 0 for the five years before (i.e., 1988 to 1992). We omit the transition year 1993, and require banks to have at least one observation in each of the pre- and post-periods.

The coefficient on *TRADEDUM* indicates the effect of trading assets on spreads in the pre-period, while *TRADEDUM*POST* indicates change in this effect between the pre- and post-periods. The year fixed effects subsume the coefficient on *POST* and control for time trends in bid-ask spreads, thus allowing for a clean identification of the incremental effect of trading assets on spreads through the coefficient on *TRADEDUM*POST*. This coefficient can be interpreted as the incremental change in bid-ask spreads between the pre and post periods for banks with trading assets relative to those without. If MTM contributes to information asymmetry associated with trading assets, then the expected coefficient on *TRADEDUM*POST* is positive. On the other hand, if MTM improves the transparency of trading assets, the expected coefficient is negative. To check whether these results are unique to MTM for trading securities, we interact *POST* with non-trading investment securities that are not marked to market (*INVSEC*).[39]

[38] *TIERONE* is available only from 1996, so we substitute the tangible equity ratio (*TANGEQ*), defined as total equity minus intangible assets divided by total tangible assets. Results are robust to using the *TRADING* variable.
[39] Prior to SFAS 115, firms were not required to separately report available-for-sale and held-to-maturity securities.

In Panel A of Table 4 we present two variants of equation (3), one with year fixed effects and the other with year and bank fixed effects. We cluster the former by bank and year-quarter and the latter by year-quarter. The coefficient on *TRADEDUM*POST* is positive and significant in both specifications, indicating that the association between bid-ask spreads and trading assets is stronger after SFAS 115 mandated MTM accounting. [40] The mean (unreported) spread for banks with trading assets in the pre-period is 3.20 per cent. The estimated 1.499 per cent increase after SFAS 115, after controlling for both bank and year fixed effects, is around 47%. In contrast, the coefficient on *INVSEC*POST* is insignificant in both specifications, indicating there is no change in spreads as a function of banks' holdings of the other categories of investment securities, namely *AFS* and *HTM*. Thus, the effect of mandating MTM accounting is economically substantial and restricted to trading securities.[41]

*7.7.2. Exploiting pre-SFAS 115 use of MTM*

We are able to exploit the additional important fact that some banks were using MTM accounting even prior to the introduction of SFAS 115. They apparently were encouraged to do so by bank regulators (Comptroller of the Currency, 1990, pp. 23-24) and auditors (American Institute of Certified Public Accountants, 1990), so the extent to which the decision was voluntary is unclear. Thus, our next analysis splits banks with trading securities into those that were not using MTM prior to SFAS 115 (we denote these *Non-MTM*) and those that were (denoted *MTM*). [42] We hand-collect the 1991 10-Ks of all sample banks with trading assets in the

[40] When 1994 and 1995 are excluded from the post-SFAS 115 period, the coefficient on *TRADEDUM*POST* increases from 1.127 in the firm-fixed effects regression to 1.199, with a *t*-statistic of 8.06, and the coefficient on *INVSEC*POST* decreases from 0.039 to 0.026.

[41] These results are robust to estimating the regressions over a 3-year window centred on the SFAS 115 adoption year, as well as to retaining banks that do not have trading assets in both the pre and the post SFAS 115 periods.

[42] In their 1991 annual reports, 67% of the sample banks state that trading assets are accounted for at market value, and 18% state that they use either lower of cost of market value or a mixture of market value and lower of cost or market value. The remaining 15%, which are ambiguous about their method, are included in the *Non-MTM* sample. Potential classification errors should attenuate our results and introduce a conservative bias.

pre-period.[43] We introduce an additional level of differencing in our diff-in-diff tests by comparing post SFAS 115 changes in spreads between *Non-MTM* banks and *MTM* banks.

These results are presented in Panel A of Figure 3, where the solid line denotes differential spreads for *Non-MTM* banks and the dotted line plots spreads for *MTM* banks. There are three noteworthy points in this picture. First, the dotted line lies above the solid line in the pre-period (and significantly so), indicating that banks that used MTM to value trading securities had larger spreads than banks *that also had trading securities* but did not value them using MTM. Second, there is an upward spike in the solid line in the post-SFAS period, but no such spike in the dotted line, indicating that spreads increased after the introduction of SFAS No. 115 for *Non-MTM* banks but not for *MTM* banks. Third, the solid and dotted lines overlap significantly in the post-period, indicating that the pre-period difference in spreads between the two groups (which had differential use of MTM accounting) disappears once SFAS No. 115 is introduced. These results are what one would expect if our earlier results are due to the change in accounting treatment rather than confounding factors.

The regression models reported in Panel B of Table 4 reveal similar evidence. To obtain better identification, these tests compare changes in information asymmetry after SFAS 115 for banks (i) without trading assets at any stage, (ii) with trading assets that were entirely marked-to-market in the pre- and the post-periods and (iii) with trading assets that were not marked-to-market in the pre-period. We denote banks' use of mark-to-market accounting in the pre-period by the indicator variable *MTM*. We then interact *TRADEDUM* with *MTM* as follows:

$$SPREAD_{i,q} = \alpha_0 + \alpha_1 MTM_i + \alpha_2 TRADEDUM_{i,q-1} + \alpha_3 MTM * TRADEDUM_{i,q-1} +$$

$$\alpha_4 MTM * POST_{i,q-1} + \alpha_5 TRADEDUM * POST_{i,q-1} + \alpha_6 MTM * TRADEDUM *$$

[43] We choose 1991 because that is the earliest year for which the Global Access database provides 10Ks on CDs. When the accounting approach used by a bank is ambiguous, we treat them as not having employed MTM accounting in the pre-SFAS period to be conservative. Our results are unaffected by dropping those banks.

$$POST_{i,q-1} + \alpha_7 LOANS_{i,q-1} + \alpha_8 LLA_{i,q-1} + \alpha_9 TANGEQ_{i,q-1} + \alpha_{10} LNMVE_{i,q} +$$

$$\alpha_{11} TURN_{i,q} + \alpha_{12} RETVOL_{i,q} + \alpha_{13} PRCINV_{i,q} + \alpha_{14} BHC_i + \sum YEAR + \varepsilon_{i,q} \quad (4)$$

The coefficients of interest are those on *MTM*TRADEDUM*, *TRADEDUM*POST* and *MTM*TRADEDUM*POST*. As in equation (3), we expect spreads to increase with the implementation of SFAS 115 for banks with trading assets generally, implying a positive coefficient on *TRADEDUM*POST*. For the subset of those banks that used fair values in the pre-SFAS 115 period, we expect both higher spreads in the pre-period (implying a positive coefficient on *MTM*TRADEDUM*) and a resulting attenuation of the post-SFAS 115 effect (implying a negative coefficient on *MTM*TRADEDUM*POST*).

Panel B of Table 4 presents results for five-year periods before and after the adoption of SFAS 115, with and without bank fixed effects.[44] The 0.789 coefficient on *MTM*TRADEDUM* is positive and economically and statistically significant ($t$ = 4.06 with bank fixed effects), confirming that pre-period spreads are larger for banks with trading securities and MTM accounting than for those with trading securities but no MTM accounting. The 1.580 coefficient on *TRADEDUM*POST* also is positive and statistically significant ($t$ = 7.22 with bank fixed effects), confirming that *Non-MTM* banks experience an increase in spreads associated with trading securities after they were required to adopt MTM. Finally, the -1.238 coefficient on *MTM*TRADEDUM*POST* is negative and economically and statistically significant ($t$ = -5.56 with bank fixed effects), approximately offsetting the coefficient on *TRADEDUM*POST* and indicating little change in spreads when mandatory MTM for trading securities replaced voluntary use of the method.

[44] The pre-SFAS classification of banks into MTM and non-MTM is based on their 1991 10-Ks to reduce manual data collection. As a test for classification error, we also examine results for shorter three-year periods pre-SFAS and post-SFAS. These results are similar to the tabulated ones. The results also are robust to retaining banks with trading securities in any one of the two periods, and to using continuous values of *TRADING* and to dropping the years 1994 and 1995.

These results indicate that the change in spreads associated with trading securities around the adoption of SFAS 115 is positive and both economically and statistically significant for banks that did not employ MTM in the pre-period, and that the change is essentially zero for those that did. The results reinforce our interpretation that the results are driven by the change in accounting treatment brought about by SFAS 115.

The above analysis controls for whether a bank invests in trading securities, and compares changes in spreads around SFAS 115 for banks that previously accounted for them voluntarily using MTM accounting with the spread changes for banks that SFAS 115 required to use MTM for the first time. This mitigates the concern that properties of banks' business models are correlated omitted variables. However, one concern persists. As Panel B of Figure 3 indicates, the proportion of trading securities differs between *Non-MTM* and *MTM* banks in both the pre and post periods, questioning our implicit assumption that the two groups are similar in all respects expect for the accounting treatment. To mitigate this concern, we perform a matched sample analysis, matching each *Non-MTM* bank with the *MTM* bank that is closest in the magnitude of trading securities in the pre-period.

Panel A of Figure 4 shows that the mean pre-period proportions of trading securities are similar between *Non-MTM* banks (16% of *MVE*) and *MTM* banks (15.1% of *MVE*). While these numbers follow mechanically from the matching, the true effectiveness of the matching procedure can be seen from the mean post-period proportions, which are 0.316 for *Non-MTM* banks and an indistinguishable 0.303 for *MTM* banks. Panel B of Figure 4 and Panel C of Table 4 show that the results based on this matched sample are similar to those presented before. In particular, *MTM* banks have higher spreads in the pre-period than *Non-MTM* banks (the coefficient on *MTM*TRADEDUM* is positive and significant), the introduction of SFAS 115 results in a significant increase in spreads for *Non-MTM* banks (the coefficient on

*TRADEDUM*POST* is positive and significant) but not for *MTM* banks (the coefficient on *MTM*TRADEDUM*POST* is negative and significant). Overall, our results are robust to matching *Non-MTM* and *MTM* banks on the amount of trading assets.

*7.7.3. Identifying recognition versus disclosure effects*

SFAS 115 also provides a rare opportunity to identify the separate effects of disclosure and recognition, because some non-MTM banks (i.e., not previously using MTM in their books) had been disclosing fair value information in the pre-period. Consequently, SFAS 115 resulted in those banks that previously disclosed fair values now taking the incremental step of recognizing them (i.e., booking the MTM gains and losses that hitherto had only been disclosed).

To disentangle the effects of recognition and disclosure, we review the 1991 10-Ks of banks that were not using MTM accounting in the pre-period to ascertain whether they were disclosing fair values of their trading assets. We then re-run the Panel B regressions with an additional indicator (*FVDISC*) to denote those non-MTM banks that disclosed fair values of trading assets in the pre-period (approximately 25%).[45] These results are presented in Table 4 Panel D.

For the pre-SFAS 115 period, the coefficient on *FVDISC*TRADEDUM* is insignificant (*t*-stat = 0.02) indicating that spreads of non-MTM banks that disclosed FVs in the pre-period are not different from those of non-MTM banks that did not previously disclose. In contrast, the 1.172 coefficient on *MTM*TRADEDUM* is positive and significant (and similar in magnitude to the 1.260 estimate in Panel B), indicating that banks that were using MTM accounting in the pre-period, and thus recognising MTM gains and losses in earnings, had higher pre-period spreads than non-MTM banks that both did and did not disclose fair values. This evidence is consistent

[45] The remaining 75% includes not only those that provide no details of fair values (59%) but also those for which we could not find the underlying 10-Ks (16%).

with an incremental effect of recognition relative to disclosure on spreads. In other words, recognizing MTM gains and losses in earnings increases information asymmetry but disclosure of these gains and losses *per se* does not.

For the post-115 period, the coefficient on *TRADEDUM*POST* is positive (1.908, slightly higher than the 1.816 in Panel B), indicating that banks that were neither disclosing nor recognizing MTM gains/losses in the pre-period experienced increases in information asymmetry after the passage of SFAS 115. Further, the -0.180 coefficient on *FVDISC*TRADEDUM*POST* is insignificant, indicating that non-MTM banks that did not also recognize but disclosed FVs in the pre-period experienced an increase in spreads that is not significantly different from those that did not disclose.[46] This provides further direct evidence of an effect of recognition *per se* on information asymmetry. In contrast, the coefficient on *MTM*TRADEDUM*POST* remains negative and significant, indicating that banks that were already recognizing in the pre-period did not experience the same increase. The net effect for these banks is not significantly different from zero, indicating no change in spreads around the passage of SFAS 115.

Overall, these results provide strong evidence that the relation between MTM accounting for securities and information asymmetry is primarily a recognition, not disclosure, effect.

*7.7.4. Falsification test of SFAS 115 results.*

To check whether our estimates of the effect of the SFAS 115 shock are not merely capturing a pre-existing time trend, we run a falsification test, where we back-date its introduction by three years and re-estimate the diff-in-diff regressions. These results are presented in Figure 5 and Panel E of Table 4. Figure 5 shows that neither banks with trading securities (*Trading*) nor those without (*Non-Trading*) experience a material change in residual

[46] The 1.728 sum of *TRADEDUM*POST* and *FVDISC*TRADEDUM*POST* is significantly greater than zero, implying that these banks experienced an increase in spreads upon the passage of SFAS 115.

spreads around this pseudo shock. This contrasts with the changes observed in Figure 2 for the actual shock. The result is confirmed in Panel E of Table 4, where the coefficient on *TRADEDUM*POST* (defined around the pseudo shock date) is insignificant whether or not we include bank fixed effects. The coefficient on *INVSEC*POST* also remains insignificant. These results provide reassurance that our SFAS 115 tests are truly due to a shock to the accounting treatment rather than the continuation of a pre-existing time-trend.

*7.8. Voluntary adoption of SFAS 159.*

Effective 2008, SFAS 159 gave firms an irrevocable option to expand the use of MTM accounting on a range of individual financial assets and liabilities. Because the standard mandates including unrealized gains and losses on these assets and liabilities in current-period earnings, we expect its effects are akin to those for trading securities under SFAS 115. We therefore predict that spreads increase for banks that elect their "fair value option."

Election of the fair value option (*FVO*) is voluntary and raises a self-selection problem.[47] The primary purpose of SFAS 159 (Para. 1) was to allow entities "the opportunity to mitigate volatility in reported net income caused by measuring related assets and liabilities differently without having to apply complex hedge accounting provisions." As Chang, Liu and Ryan (2011) note, the *FVO* enabled firms to account symmetrically for the two sides of economic hedges in a simpler fashion than using hedge accounting. As a result, the *FVO* was adopted by banks to remedy accounting mis-matches due to failure to qualify for stringent hedge accounting for financial instruments.

We correct for this self-selection using a two-stage approach. In the first stage, we estimate a probit model of banks' adoption of the *FVO*. In the second stage, we regress spreads on *FVO*, *FVO*POST* and inverse Mills ratio from the first stage. As in Chang et al., the

[47] Self-selection issue is a lesser concern in our analysis of SFAS 115, which was mandatory.

determinants of banks' SFAS 159 elections in the first stage estimation are the amount of loans held for sale (*HFS_LOANS*), the total notional amount of derivatives (*DERIV*), the volatility of bank earnings (*EARNVOL*), the correlation between bank earnings and bank stock returns (*RET_EARN_CORR*), an indicator variable to denote whether banks recognize a gain or loss on ineffective hedges (*INEFF_HED_DUM*), and total bank assets (*TOASS*). Based on the evidence in Chang et al., we expect positive coefficients on *LOANS_HFS*, *DERIV*, *EARNVOL* and *INEFF_HED_DUM* and a negative coefficient on *RET_EARN_CORR*.

We identify adopters as banks that either reported gains/losses under SFAS 159 in the first quarter of 2008 (the first period for which this data field is populated in FRY-9C).[48] SFAS 159 gave firms the further option of adopting its provisions before 2008, which Chang et al. (2011) conclude was exercised for opportunistic reasons, so we exclude banks with non-missing values for "net change in in value of financial instruments under a FVO" (data item BHCKF229) before 2008. [49] The sample for this analysis comprises of 341 banks, of which 37 exercised the SFAS 159 option for the first time in 2008:Q1 and 304 banks (excluding 10 early adopters) that did not. The indicator *FVO* takes the value of 1 for adopters and 0 for non-adopters and the indicator *POST* denotes the pre- and post-SFAS 159 periods (years 2005-2007 and 2008-2010, respectively). The coefficient on the interaction variable *FVO*POST* denotes the incremental effect of SFAS 159 on adopters relative to non-adopters.

The advent of SFAS 159 coincides with the recent financial crisis, so the post-period bid-ask spreads are significantly larger. The median spread in the post-period is 0.861% of price, more than double the 0.412% median in the pre-period. The mean spread is affected by outliers

[48] The screen is whether or not either BHCKF551 (net gains/losses recognized in earnings on assets under FVO) or BHCKF553 (net gains/losses recognized in earnings on liabilities under FVO) is non-missing and non-zero.
[49] See also Henry (2008), Song (2008) and Guthrie et al. (2011). We are unable to use the earnings-based fields as they are populated only from 2008:Q1 onwards.

(the 99th percentile increase is 1192%) and more than trebles. To mitigate the effect of outliers we estimate the regressions using the log of the spread.[50, 51]

The results of the first-stage prediction model are presented in Panel A of Table 5. We use pooled data from both the pre and the post periods for estimating the choice model.[52] Consistent with banks attempting to mitigate the lack of hedge accounting applicability by exercising the fair value option, several of the hedge accounting related variables load in the significant direction in the prediction model. In particular, the coefficients on *LOANS_HFS* and *DERIV* are positive and significant, indicating that banks with loans held for sale and those with more derivatives are more likely to adopt the *FVO*. Further, *INEFF_HED_DUM* that signifies the presence of an ineffective hedge is also positive, but slightly below conventional cut-offs for statistical significance. In contrast to the Chang et al. result, we find a negative but insignificant coefficient on *EARNVOL*. The pseudo $R^2$ of the model is 18%.

Panel B of Table 5 presents the second stage results of changes in bid-ask spreads around *FVO* adoption augmented with the Inverse Mills ratio (*MILLS*) from the first stage. The first two specifications investigate three years around SFAS 159 adoption: Model (1) is a two-way clustered OLS regression while Model (2) uses bank fixed effects. First, we find that the coefficient on *MILLS* is significant, and more importantly subsumes the statistical significance of the *FVO* indicator (which is significant if *MILLS* is excluded), implying the probit model does a good job of capturing differences in economic characteristics between adopters and non-

[50] The results are robust to other techniques such as using the ranks of spreads and estimating a robust regression.

[51] Although we include the inverse of the stock price as a control variable in all the specifications, we perform additional sensitivity tests to verify that our results are not confounded by declining stock prices during the crisis period. First, we compare the cumulative stock returns (in excess of value weighted market returns) from 2008 to 2010 of SFAS 159 adopters and non-adopters. Adopters experience mean (median) returns of -45% (-44%) compared to -39% (-40%) for non-adopters. These differences are not statistically significant. Second, we estimate rank regressions using the bid-ask spread scaled by the average stock price in the pre-adoption period and find slightly stronger results.

[52] We use the pooled data to ensure time-variation in the Inverse Mills ratio, as otherwise the Mills ratio would be subsumed by the bank fixed effects in the second-stage regression.

adopters. Second, consistent with our hypothesis, the coefficient on *FVO*POST* is positive and significant in both specifications, indicating that banks that exercise the fair value option experience larger increases in spreads, compared to those that do not. Because spreads are logged, the coefficient of 0.094 on *FVO*POST* in Model (2) implies an incremental increase of 9.9% in spreads for *FVO* adopters relative to non-adopters.

To alleviate any direct effect of the financial crisis on spreads (which are scaled by price), Models (3) and (4) compare 2010 with 2006, omitting the intermediate years. The coefficient on *FVO*POST* remains positive and significant, and increases in economic significance. Overall, these results are consistent with our hypothesis that exercising the SFAS 159 fair value option increases information asymmetry.

## 8. Conclusions

In a large sample of banks we find that mark-to-market accounting is associated with greater information asymmetry, as evidenced by increased bid-ask spreads, reduced management earnings forecasting, reduced analyst following, and slower arrival of information in the share market. This result is evident in cross-sectional analyses and also in designs that obtain clean identification via the introduction of MTM by SFAS 115 and the fair value option by SFAS 159. The results consistently indicate that mark-to-market accounting increases information asymmetry in banks relative to historical cost accounting.

The effect appears to arise primarily from recognition (i.e., including MTM gains and losses in earnings) and not from disclosure. This conclusion accords with the intuition that timely disclosure of security price information alleviates the latent information asymmetry that would occur in the absence of disclosure. It also accords with arguments that faster recognition *per se* has adverse effects on asymmetry due to various information acquisition costs, agency costs and

other salient market frictions. It is inconsistent with simplistic, perfect-market theories with no role for any type of market frictions, which would seem to predict that using MTM accounting, as distinct from historical cost methods, reduces information asymmetry.

We caution that our hypotheses and evidence do not imply that MTM accounting should be abandoned: they simply address a hitherto unsuspected adverse effect on information asymmetry of the method. Nor do our results have any direct implication for the controversial role of MTM accounting in the financial crisis, though it is feasible that the effects we document on information asymmetry could have adversely affected the market for banks' shares and investor sentiment during the crisis. Nevertheless, we believe our results suggest a re-thinking of the belief of classical accounting theorists that market prices provide sufficient information for investor decisions. We view our study as an early exploration of the economic trade-offs between the MTM and HC measurement regimes, as envisaged for example by Plantin, Sapra and Shin (2008), Allen and Carletti (2008) and Gorton, He and Huang (2010). Understanding these trade-offs is important because asset and labor market frictions are likely to differ substantially across jurisdictions, firm status (e.g., public versus private), industries and asset and liability characteristics.

## Appendix 1

### Decomposing MTM Gains and Losses: A Simple Two-period Example

At t= 0 a bank buys a 2-period zero-coupon bond for $82.645 with a single expected cash flow at t=2 of $100 and an expected return in both periods of 10% (i.e., assume for simplicity a flat term structure). At t=1 the bond is selling at $83.333 and is marked to market at that price. In the absence of any shocks, its expected price would have been $90.909 = $82.645 + 10% expected return, so there has been a negative shock of $7.576 during period 1.

The uninformed investor does not know whether the shock is to expected return or to expected cash flow, or both. Assume for simplicity they are mutually exclusive explanations (i.e., the two sources of shocks are uncorrelated). The alternative interpretations then are: (1) an increase in expected return to 20%, holding expected t=2 cash flow constant at $100; and (2) a decrease in expected t=2 cash flow to $91.667, holding expected return constant at 10%.

This generates a source of uncertainty about future earnings for the uninformed investor. If (1) is the correct interpretation of the MTM amount at t=1, then the expected earnings from the security at t=2 is +$16.667, a 20% return on $83.333. However, if (2) is the correct interpretation of the MTM amount at t=1, then the expected earnings from the security at t=2 is +$8.333, a 10% return on $83.333. Consequently, uninformed investors establish less precise earnings expectations, and trade at an informational advantage.

Suppose the investment is liquidated at t=2 for $100. If (1) is the correct interpretation of the MTM amount at t=1, then there is no shock at t=2 because $100 gives a 20% return on $83.333. However, if (2) is the correct interpretation of the MTM amount at t=1, then there is a positive shock of +$8.333 at t=2 because the expected liquidating cash flow was $91.667. Uninformed investors do not know whether the amount included in t=2 earnings is a surprise or not. They would need to know the decomposition of the prior period MTM gains and losses (i.e., into cash flow shock versus expected return shock) to figure that out.

## Appendix 2

### Do analyst forecasts and management forecasts adjust reported earnings to exclude trading income or include unrealized *AFS* income?

**Analyst forecasts:**

We downloaded all available analyst reports from Thomson One for our sample banks over the period 1999 to 2010. To minimize data collection, we reviewed only "initiating coverage" reports for banks already followed by several analysts. The resulting sample is analyst reports for 114 of our sample banks (out of a maximum of 233 that had analyst following). We then performed a keyword text search to ascertain whether analysts either exclude trading income or include *AFS* unrealized income to their earnings forecasts. We also examined whether these reports contain enough information for investors to incorporate the adjustments themselves.

*Trading income.* For trading income, we searched on "trading income" or "trading revenue" or "trading gain" or "income from trading" or "revenue from trading" or "gain from trading". Results were as follows:

1. Only 22 of the 114 banks had analyst reports that provided any mention of trading income.[53]
2. Among the 22 banks with some analyst reference to trading income, there was minimal quantitative information about future trading income that would allow investors to make their own adjustments. Only 3 of the 114 banks (Bank of America, Chase and Goldman Sachs) had any quantitative analyst estimate of future trading income. Further analysis revealed that these estimates were not routine, but were confined to just a few years.[54]
3. There were 4 instances of analysts discussing the effect of trading income on their EPS estimates. A 2004 report by Marquis Investment Research on Bank of America estimated EPS without trading income. Similarly, Bear Sterns performed a sensitivity analysis of Goldman Sachs' 2005 EPS to changes in trading revenues. Finally, while initiating coverage of PNC Financial Services in 2008, Boenning & Scattergood notes that "…we are initiating our 2008 and 2009 adjusted operating EPS (AOEPS) estimates of $4.35 and $5.17, respectively. Our estimates do not include trading gains/losses, mark-to-market adjustments to the value of certain loans held for sale, gains/contra-gains associated with the company's

[53] Bank of America, BB&T, BOK Financial, Capital One, Chase, Citigroup, Commerce Bancshares, Doral Financial Corp, Goldman Sachs, Morgan Stanley, National Penn Bancshares, Northern Trust Corp, PNC Financial Services, State Street Corp, Stifel Financial, Suntrust Bank, Union Bankshares, Valley National Bancorp, Wells Fargo, Western Alliance, Wintrust Financial Corp, and Zions Bancorp.

[54] Bank of America (2004, 2005, 2007, 2009); Chase (2001, 2002, 2009, 2010); Goldman Sachs (2002, 2005, 2010).

exposure to a Long Term Incentive Program…" Boenning & Scattergood also adopt this practice for Valley National Bancorp's earnings estimate for 2009:Q2.

4. In the remainder of the 22 cases, references to trading income either pertained to the past, or when referring to the future were either qualitative (e.g., strong growth expected) or combined with other revenue items (commissions in the case of Northern Trust Corp; brokerage revenue in the case of BOK Financial; and underwriting in the case of Zions Bancorp).

In sum, there is some frequency with which analysts either forecast earnings net of MTM gains and losses on trading securities or provide information for investors to incorporate the adjustments themselves, but it is very low.

*AFS income*. We searched for "available-for-sale" or "AFS." Not surprisingly, this generated a lot more hits (61 banks) as most banks in our sample hold *AFS* securities. Results from analysing these data are:

1. There was not a single instance when analysts incorporated *AFS* unrealized gains and losses into their earnings forecasts.
2. There were only 5 instances where analysts predicted future *AFS* unrealized gains and losses. These were Howe Barnes Hoefer & Arnett Inc.'s report on FirstMerit Corp issued in 2009, Moors & Cabot Capital Markets Research's initiating coverage report on PNC Financial Services and S&T Bancorp in 2004, Morgan Stanley's report on State Street Corp in 2005 and Jefferies & Company's report on Wintrust Financial in 2010.
3. Most references to *AFS* discuss the current holdings of the bank.
4. With only a few exceptions, analysts discussing *AFS* balances did not provide projections. The exceptions were largely idiosyncratic to individual analysts. For example, John Pancari, an analyst with J.P Morgan, consistently provided estimates of future *AFS* holdings (but not *AFS* income) for banks on which he initiated coverage during the sample period (Boston Private Financial Holdings in 2006, Cullen/Frost Bankers in 2004, FirstMerit Corp in 2005, First Financial Bankshares in 2007, First Midwest Bancorp in 2005, First Republic Bank in 2006 and Valley National Bancorp in 2005). Other instances of analyst projections of *AFS* balances were Jefferies & Company's initiating coverage of Franklin Resources in 2009, Compass Point's initiating coverage of Cullen/Frost Bankers in 2010, Oppenheimer's initiation of East West Bancorp in 2006, Wells Fargo Securities' initiation of PNC Financial

Services in 2009, HSBC's initiating coverage of State Street Corp in 2006, Maxim Group's report on SVB Financial in 2009, Oppenheimer's initiating coverage of SVB Financial in 2006, Maxim Group's initiating coverage of Western Alliance Bancorp in 2009 and Oppenheimer's initiating coverage of Western Alliance Bancorp in 2007.

5. Some analysts discussed *AFS* unrealized gains and losses in the context of the tangible equity ratio. They either explicitly excluded these from the computation of the equity ratio or discussed the presence of these gains/losses (e.g., Associated Banc Corp, Bank of the Ozarks, BB&T, Community Bank System, Heartland Financial, State Street Corp, WesBanco). While a few reports referred to the *AFS* portfolio being likely to generate negative earnings due to possible OTTI losses in the future (e.g., BOK Financial, CNB Financial Corp., Webster Financial Corp, Zions Bancorp), we found quantitative estimates in only two cases (BOK Financial and Zions Bancorp).

Overall, we conclude that analysts typically do not exclude trading income or include *AFS* unrealized income into their earnings forecasts. Further, except in few cases, they do not also provide enough information for investors to make these modifications themselves.

**Management forecasts:**

A similar exercise for management forecasts finds even starker results. We downloaded the most recent forecast on Factiva made by each bank during our sample period. This resulted in 196 press releases out of a maximum of 206 announcements. We then performed a similar text-based search as that for analyst reports and found the following:

1. None contains any mention of future trading income or unrealized *AFS* income.
2. The text search for trading income (i.e., "trading income", "trading revenue", "trading gain", "income from trading", "revenue from trading" or "gain from trading") produced just 2 hits in the 196 banks. Both referred to past performance.
3. Searching for either "available-for-sale" or "AFS" produced 9 hits, with all instances again referring to past performance.

We interpret these results as strong evidence that bank managers do not adjust their earnings forecasts by either excluding trading income or including unrealized *AFS* income. Further, they do not provide sufficient information to allow investors to make these adjustments themselves.

## Appendix 3
## Robustness Tests

*A.1 Including bank fixed effects.*

One concern is that our specifications might omit cross-sectional differences in bank characteristics that are correlated with both information asymmetry and trading securities. The regression controls ameliorate this concern, but nevertheless we examine the sensitivity of the results to including bank fixed effects that absorb all time-invariant differences between banks. Bank fixed effects subsume the *BHC* indicator, which is dropped. Standard errors are clustered by year-quarter.

The opposing concern with including bank fixed effects in the *TRADEDUM* specification is that for most banks it is time invariant. Close to 74% of the sample banks never have trading assets and hence have *TRADEDUM*=0 throughout the sample period, so *TRADEDUM* also would be subsumed. Further, approximately one third of the remaining banks have trading assets in every quarter and hence have *TRADEDUM* = 1 throughout. We therefore are able to estimate the *TRADEDUM* specification with bank fixed effects for only approximately 17% of the total sample of bank-quarters, so the results should be interpreted cautiously.

Panel A of Table AX shows that the coefficient on *TRADEDUM* in column (1) remains positive but weakly significant (at the 10% level) with the inclusion of bank fixed effects. The 0.458 coefficient on the continuous variable *TRADING* in column (2) remains positive and significant at the 1% level in the overall sample and significantly larger than that of *HTM* and *AFS*. Similar results are observed in column (3) for the *TRADING* > 0 sub-sample.[55] Overall, the association between information asymmetry and trading securities is somewhat weakened but survives controlling for unobservable time-invariant differences among banks.

[55] Although *HTM* is also significant, this result is fragile and not robust across sub-periods or to alternate scalars.

*A.2 Using the adverse selection component of bid-ask spreads*

Next, we verify that the results are robust to using only the adverse selection component of the bid-ask spread (Demsetz, 1968), using the George, Kaul and Nimalendran (1991) decomposition into inventory, order-processing and adverse selection components. We present results based on their adverse selection component for a reduced sample of banks in Panel B of Table AX.[56] The coefficient on *TRADEDUM* remains positive and highly significant. The economic significance is also similar to that based on the relative spread. Given the mean adverse selection component of 1.51%, the coefficient of 0.194 indicates that the presence of trading securities increases the adverse selection component of bid-ask spreads by 13%.[57] Further, the coefficient on *TRADING* is not only positive and highly significant in the overall sample and the *TRADEDUM*=1 sub-sample, but also significantly larger than those of *HTM* and *AFS*.[58] Overall, the results are robust to using the adverse selection component of the bid-ask spread.

*A.3 Income statement measures of trading assets.*

We examine the robustness of our results to using income statement data to measure the importance to shareholders of the three security categories. In particular, we examine whether there is an association between bid-ask spreads and the variances of reported income from trading and other securities. The volatility of trading income (*TRADING_INC_VOL*) is calculated as the standard deviation of five quarterly observations of unrealized and realized gains/losses on trading assets scaled by total bank earnings.[59] Equivalent calculations estimate

[56] We thank Nimal Nimalendran for providing us with the adverse selection component of the bid-ask spread.
[57] More precisely, 0.194/(1.51-(0.178*0.194))
[58] These inferences are robust to including bank fixed effects.
[59] The results are robust to using alternate scalars viz., total assets, total equity, *MVE*, and Tier 1 capital.

the volatility of realized *AFS* income (*AFS_REAL_INC_VOL*) and the volatility of unrealized *AFS* income (*AFS_UNREAL_INC_VOL*).

These results presented in Panel C of Table AX are consistent with the balance sheet-based results. The estimated coefficient on *TRADING_INC_VOL* is positive and significant, irrespective of controlling for income from *AFS* securities. Further, the coefficients on *AFS_REAL_INC_VOL* and *AFS_UNREAL_INC_VOL* are insignificant, indicating that income from *AFS* securities is unrelated to information asymmetry.

*A.4 Propensity score matching*

To control more effectively for differences in underlying characteristics between banks with and without trading securities, we perform a propensity-score based matching. This method involves matching the treatment firm (i.e., banks with trading securities) with a control firm along several dimensions and then estimating the regressions. We compute the propensity scores based on economic characteristics such as bank size and proportion of loans and also on the maturity structure of bank assets and liabilities. The results for bid-ask spreads and the other informational characteristics are robust to using this matching technique. These results and those in subsequent sub-sections, are not tabulated to conserve space.

*A.5 Introduction of SFAS 133*

In 1998, FASB introduced SFAS 133, which established accounting and reporting standards for derivative instruments and for hedging activities. To check whether the adoption of SFAS 133 had a significant effect on the classification of trading securities, we re-estimate Regressions (1) and (2) separately for the pre-SFAS 133 period (i.e., years 1996 to 2000) and the post-SFAS 133 periods (2001-2005). We find a positive and significant coefficient on *TRADEDUM* and *TRADING* in each period and that the coefficients are not significantly

different between the periods, suggesting that the results are unaffected by changes in classifying derivative/hedging instruments under SFAS 133.

*A.6 Glass–Steagall Act*

The repeal of the Glass-Steagall Act in November 1999 eliminated the separation between investment banking and commercial banking in the U.S. and effectively allowed the same bank holding company to control both a commercial bank and an investment bank. To verify that our results are not affected by consequential changes in the asset structure of sample banks, we re-estimate Regressions (1) and (2) for the pre and post 1999 periods. Here too, we find a significant coefficient on *TRADEDUM* and *TRADING* in each of the periods and that the coefficients are not significantly different between the periods, suggesting that the abolition of Glass-Steagall Act did not have a noticeable effect on the results.

*A.7 Changes in regulatory filing threshold*

Effective March 2006, the Federal Reserve increased the asset-size threshold for filing Form FRY9-C from $150 million to $500 million, thereby changing the composition of our sample. We perform three robustness checks: testing for significant changes in results after the increase in the reporting threshold; excluding BHCs with assets below $500 million consistently throughout the sample period; and deleting 2005 and later years. In all cases the results remain robust economically and statistically.

*A.8 Mitigating the effect of outliers*

To verify that the results are not influenced by spread outliers, particularly during the financial crisis, we estimate two alternate regression specifications – a robust regression (assigning higher weight to better-behaved observations) and a rank regression (using spread ranks). Our conclusions remain unaffected.

## Table AX: Robustness tests

### Panel A: Including bank-fixed effects

The dependent variable is the percentage relative bid-ask spread. *TRADEDUM* is an indicator variable denoting the presence of trading securities. *TRADING*, *AFS* and *HTM* denote the proportion of trading, *AFS* and *HTM* securities to market value of equity respectively. *LOANS* denotes the proportion of loans to market value of equity. *LLA* denotes loan loss allowance as a proportion of market value of equity. *TIERONE* is the ratio of Tier 1 capital to total assets. *LNMVE* denotes the log of market value of equity in millions. *TURN* denotes log of turnover and is defined as the ratio of total shares traded to total shares outstanding. *RETVOL* denotes stock return volatility during the quarter based on daily stock returns. *PRCINV* denotes the inverse of the average stock price during the quarter. *BHC* is an indicator variable that denotes bank holding companies. All balance sheet variables are defined as of the start of the quarter while *SPREAD*, *LNMVE*, *TURN*, *RETVOL* and *PRCINV* are defined as of the current quarter. The first two sets of results are from regressions using the entire sample, while the last set is from regressions using only bank-quarters where *TRADING*>0. All specifications include year fixed effects, bank fixed effects and robust standard errors clustered by year-quarter.

| | Entire sample (1) | | Entire sample (2) | | *TRADING>0* (3) | |
|---|---|---|---|---|---|---|
| | Coeff. | *t*-stat | Coeff. | *t*-stat | Coeff. | *t*-stat |
| Intercept | 5.855 | 19.09 | 5.847 | 18.99 | 2.480 | 7.44 |
| *TRADEDUM* | 0.100 | 1.86 | | | | |
| *TRADING* | | | 0.458 | 3.09 | 0.392 | 2.85 |
| *AFS* | 0.013 | 0.77 | 0.016 | 0.91 | 0.062 | 3.03 |
| *HTM* | 0.119 | 3.93 | 0.120 | 3.93 | 0.097 | 2.37 |
| *LOANS* | -0.002 | -0.28 | -0.004 | -0.72 | 0.002 | 0.27 |
| *LLA* | -0.284 | -1.34 | -0.245 | -1.18 | -0.611 | -2.58 |
| *TIERONE* | -1.904 | -2.32 | -1.962 | -2.36 | 3.424 | 1.74 |
| *LNMVE* | -0.526 | -9.18 | -0.521 | -9.09 | -0.224 | -3.97 |
| *TURN* | -6.264 | -10.86 | -6.450 | -10.56 | -3.002 | -4.55 |
| *RETVOL* | 46.506 | 12.54 | 46.560 | 12.47 | 23.288 | 4.35 |
| *PRCINV* | 0.192 | 0.65 | 0.224 | 0.73 | 2.753 | 4.21 |
| *p*. value of differences: | | | | | | |
| *TRADING* vs. *HTM* | | | 0.018 | | 0.066 | |
| *TRADING* vs. *AFS* | | | 0.002 | | 0.025 | |
| Year effects | Yes | | Yes | | Yes | |
| Bank effects | Yes | | Yes | | Yes | |
| Adj. $R^2$ | 0.65 | | 0.65 | | 0.66 | |
| Obs. | 24,753 | | 24,753 | | 4,230 | |

## Panel B: Using the adverse selection component of the spread

The dependent variable is the adverse selection component of the spread as constructed in George et al. (1991). *TRADEDUM* is an indicator variable denoting the presence of trading securities. *TRADING*, *AFS* and *HTM* denote the proportion of trading, *AFS* and *HTM* securities to market value of equity respectively. *LOANS* denotes the proportion of loans to market value of equity. *LLA* denotes loan loss allowance as a proportion of market value of equity. *TIERONE* is the ratio of Tier 1 capital to total assets. *LNMVE* denotes the log of market value of equity. *TURN* denotes log of turnover and is defined as the ratio of shares traded to shares outstanding. *RETVOL* denotes stock return volatility during the quarter. *PRCINV* denotes the inverse of the average stock price. *BHC* is an indicator variable that denotes bank holding companies. All balance sheet variables are defined as of the start of the quarter while *SPREAD*, *LNMVE*, *TURN*, *RETVOL* and *PRCINV* are defined as of the current quarter. The first two sets of results are from regressions using the entire sample, while the last set is from regressions using only bank-quarters where *TRADING*>0. All specifications include year fixed effects, bank fixed effects and robust standard errors clustered by year-quarter.

| | Entire sample (1) | | Entire sample (2) | | *TRADING>0* (3) | |
|---|---|---|---|---|---|---|
| | Coeff. | *t*-stat | Coeff. | *t*-stat | Coeff. | *t*-stat |
| Intercept | 4.231 | 22.84 | 4.199 | 23.04 | 2.551 | 8.77 |
| *TRADEDUM* | 0.194 | 3.38 | | | | |
| *TRADING* | | | 0.602 | 3.40 | 0.254 | 3.57 |
| *AFS* | 0.006 | 0.47 | 0.008 | 0.58 | 0.017 | 0.74 |
| *HTM* | 0.002 | 0.09 | 0.007 | 0.27 | -0.014 | -0.31 |
| *LOANS* | -0.003 | -0.32 | -0.004 | -0.49 | 0.000 | -0.01 |
| *LLA* | -0.027 | -0.12 | -0.035 | -0.15 | -0.187 | -0.73 |
| *TIERONE* | -0.001 | -0.16 | -0.002 | -0.21 | -0.008 | -0.56 |
| *LNMVE* | -0.418 | -17.11 | -0.405 | -17.84 | -0.222 | -9.59 |
| *TURN* | -4.756 | -8.80 | -4.926 | -9.42 | -2.502 | -5.92 |
| *RETVOL* | 26.226 | 6.36 | 25.933 | 6.27 | 11.743 | 4.39 |
| *PRCINV* | -1.021 | -2.84 | -0.947 | -2.49 | 0.730 | 1.76 |
| *p*. value of differences: | | | | | | |
| *TRADING* vs. *HTM* | | | 0.001 | | 0.001 | |
| *TRADING* vs. *AFS* | | | 0.001 | | 0.002 | |
| Year effects | Yes | | Yes | | Yes | |
| Bank effects | No | | No | | No | |
| Adj. $R^2$ | 0.59 | | 0.59 | | 0.57 | |
| Obs. | 21,207 | | 21,207 | | 3,772 | |

## Panel C: Using income statement variables

The dependent variable is the percentage relative bid-ask spread. *TRADING_INC_VOL* is defined as the standard deviation of three (or five where available) observations of realized and unrealized gains/losses on trading assets scaled by net income. *AFS_REAL_INC_VOL* denotes volatility of realized gains/losses on *AFS* securities while *AFS_UNREAL_INC_VOL* is defined as the volatility of unrealized gains/losses on AFS securities. Each of these has been scaled by net income. *LOANS* denotes the proportion of loans to market value of equity. *LLA* denotes loan loss allowance as a proportion of market value of equity. *TIERONE* is the ratio of Tier 1 capital to total assets. *LNMVE* denotes the log of market value of equity in millions. *TURN* denotes log of turnover and is defined as the ratio of total shares traded to total shares outstanding. *RETVOL* denotes stock return volatility during the quarter based on daily stock returns. *PRCINV* denotes the inverse of the average stock price during the quarter. *BHC* is an indicator variable that denotes bank holding companies. All balance sheet variables are defined as of the start of the quarter while *SPREAD*, *LNMVE*, *TURN*, *RETVOL* and *PRCINV* are defined as of the current quarter. All specifications include year fixed effects and robust standard errors clustered two-way: by bank and year-quarter.

| | (1) | | (2) | |
|---|---|---|---|---|
| | Coeff. | *t*-stat | Coeff. | *t*-stat |
| Intercept | 3.454 | 9.93 | 3.470 | 10.05 |
| *TRADING_INC_VOL* | 0.088 | 2.71 | 0.105 | 2.10 |
| *AFS_REAL_INC_VOL* | | | -0.018 | -0.54 |
| *AFS_UNREAL_INC_VOL* | | | -0.008 | -0.40 |
| *LOANS* | 0.009 | 0.73 | 0.009 | 0.73 |
| *LLA* | -0.587 | -1.73 | -0.579 | -1.70 |
| *TIERONE* | -0.037 | -0.02 | -0.001 | -0.05 |
| *LNMVE* | -0.192 | -6.18 | -0.192 | -6.00 |
| *TURN* | -3.169 | -3.89 | -3.181 | -3.91 |
| *RETVOL* | 25.212 | 3.80 | 25.736 | 3.79 |
| *PRCINV* | 2.301 | 2.68 | 2.240 | 2.53 |
| *BHC* | -0.752 | -4.13 | -0.765 | -4.26 |
| *p*. value of differences: | | | | |
| *TRADING_INC_VOL* vs. *AFS_UNREAL_INC_VOL* | | | 0.085 | |
| *TRADING_INC_VOL* vs. *AFS_REAL_INC_VOL* | | | 0.099 | |
| Year effects | Yes | | Yes | |
| Adj. $R^2$ | 0.43 | | 0.43 | |
| Obs. | 3,712 | | 3,690 | |

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## Table 1: Descriptive statistics

The sample comprises of quarterly data for U.S. bank holding companies and commercial banks for the period 1996:Q1 to 2010:Q4. Data for bank holding companies are obtained from the Federal Reserve's Consolidated Financial Statements for Bank Holding Companies (FRY-9C) and those for commercial banks from Federal Reserve's Report of Condition and Income ("Call reports"). *TRADING* indicates the proportion of trading securities to market value of equity as of the beginning of the quarter. *SPREAD* denotes the average monthly relative bid-ask spread over the quarter, expressed in percentage terms. *TRADEDUM* is an indicator variable that denotes the presence of trading securities. *AFS* and *HTM* indicate the proportion of available-for-sale and held-to-maturity securities as of the beginning of the quarter respectively. *LOANS* denotes the proportion of loans to market value of equity as of the start of the quarter. *LLA* represents loan loss allowance scaled by market value of equity as of the start of the quarter. *MVE* denotes the average daily market value of equity (in millions) over the quarter. *TIERONE* is the ratio of Tier 1 capital to total assets. *TURN* denotes the log of turnover, defined as the ratio of shares traded to shares outstanding. *RETVOL* denotes stock return volatility during the quarter based on daily stock returns. *PRICE* denotes the average closing stock price during the quarter.

### Panel A: Main variables

| | **Entire sample** | | ***TRADING*>0** | | ***TRADING*=0** | |
|---|---|---|---|---|---|---|
| | **Mean** | **Median** | **Mean** | **Median** | **Mean** | **Median** |
| *SPREAD* | 2.084 | 1.301 | 0.958 | 0.443 | 2.316*** | 1.578*** |
| *TRADEDUM* | 0.171 | 0.000 | – | – | – | – |
| *TRADING* | 0.028 | 0.000 | 0.163 | 0.023 | – | – |
| *AFS* | 1.637 | 1.187 | 1.611 | 1.098 | 1.643 | 1.204*** |
| *HTM* | 0.309 | 0.036 | 0.288 | 0.030 | 0.313** | 0.038 |
| *LOANS* | 6.532 | 4.532 | 6.082 | 3.896 | 6.625*** | 4.663*** |
| *LLA* | 0.116 | 0.059 | 0.123 | 0.057 | 0.114 | 0.060*** |
| *MVE* | 1,919.801 | 147.542 | 9,234.586 | 1,729.805 | 412.149*** | 115.933*** |
| *TIERONE* | 0.088 | 0.084 | 0.080 | 0.077 | 0.090*** | 0.086*** |
| *TURN* | 0.053 | 0.029 | 0.102 | 0.063 | 0.043*** | 0.024*** |
| *RETVOL* | 0.025 | 0.020 | 0.024 | 0.019 | 0.025*** | 0.021*** |
| *PRICE* | 23.546 | 20.697 | 34.525 | 31.359 | 21.283*** | 19.470*** |

**Panel B: Composition of sample by institution type**

| | Obs. | % of total |
|---|---|---|
| Bank holding companies | 23,719 | 95.82% |
| Commercial banks | 1,034 | 4.18% |
| **Total** | **24,753** | **100.00%** |

**Panel C: Composition of sample by listed exchange**

| | Obs. | % of total |
|---|---|---|
| Amex | 1,356 | 5.48% |
| Nasdaq | 20,266 | 81.87% |
| NYSE | 3,131 | 12.65% |
| **Total** | **24,753** | **100.00%** |

## Table 2: Association between trading securities and bid-ask spreads

The dependent variable is the percentage relative bid-ask spread (*SPREAD*) during the quarter. *TRADEDUM* is an indicator variable denoting the presence of trading securities. *TRADING* represents the ratio of trading securities to market value of equity as of the start of the quarter. *AFS* and *HTM* denote the proportion of *AFS* securities and *HTM* securities to market value of equity respectively. *LOANS* denotes the proportion of loans to market value of equity. *LLA* denotes loan loss allowance as a proportion of market value of equity. *TIERONE* is the ratio of Tier 1 capital to total assets. *LNMVE* denotes the log of market value of equity in millions. *TURN* denotes the log of turnover and is defined as the ratio of total shares traded to total shares outstanding. *RETVOL* denotes stock return volatility during the quarter based on daily stock returns. *PRCINV* denotes the inverse of the average stock price during the quarter. *BHC* is an indicator variable that denotes bank holding companies. All balance sheet variables are defined as of the start of the quarter while the market microstructure variables viz., *SPREAD*, *LNMVE*, *TURN*, *RETVOL* and *PRCINV* are defined as of the current quarter. The first two sets of results are from regressions using the entire sample, while the last set is from regressions using only bank-quarters where *TRADING*>0. All specifications include year fixed effects and robust standard errors clustered two-way: by bank and year-quarter.

| | Entire sample (1) | | Entire sample (2) | | *TRADING>0* (3) | |
|---|---|---|---|---|---|---|
| | Coeff. | *t*-stat | Coeff. | *t*-stat | Coeff. | *t*-stat |
| Intercept | 5.827 | 16.89 | 5.775 | 16.77 | 3.667 | 8.44 |
| *TRADEDUM* | 0.388 | 4.06 | | | | |
| *TRADING* | | | 0.965 | 4.42 | 0.511 | 2.88 |
| *AFS* | 0.010 | 0.47 | 0.016 | 0.71 | 0.056 | 1.28 |
| *HTM* | 0.036 | 0.81 | 0.043 | 1.00 | 0.036 | 0.50 |
| *LOANS* | 0.005 | 0.47 | 0.002 | 0.18 | -0.002 | -0.19 |
| *LLA* | -0.398 | -1.44 | -0.341 | -1.18 | -0.676 | -1.84 |
| *TIERONE* | -0.843 | -0.79 | -0.902 | -0.84 | 1.041 | 0.53 |
| *LNMVE* | -0.507 | -12.32 | -0.481 | -12.41 | -0.209 | -6.58 |
| *TURN* | -7.394 | -9.83 | -7.708 | -9.99 | -3.854 | -4.16 |
| *RETVOL* | 58.084 | 11.25 | 57.974 | 11.18 | 30.171 | 4.41 |
| *PRCINV* | -0.506 | -1.16 | -0.467 | -1.04 | 2.736 | 2.56 |
| *BHC* | -0.543 | -2.77 | -0.566 | -2.88 | -0.975 | -4.81 |
| *p*. value of differences: | | | | | | |
| *TRADING* vs. *HTM* | | | 0.000 | | 0.015 | |
| *TRADING* vs. *AFS* | | | 0.000 | | 0.005 | |
| Year effects | Yes | | Yes | | Yes | |
| Adj. $R^2$ | 0.53 | | 0.53 | | 0.46 | |
| Obs. | 24,753 | | 24,753 | | 4,230 | |

## Table 3: Association between trading securities and other informational characteristics

*ANALYST* is an indicator variable that denotes whether or not the bank is covered by financial analysts during the quarter. *IPT* indicates the annual intra-period-timeliness measure of Butler et al. (2007). *MGTFORE* is an indicator variable that denotes whether or not a management forecast was issued during the quarter. *TRADEDUM* is an indicator variable denoting the presence of trading securities. *AFS, HTM, LOANS* and *LLA* denote the proportion of *AFS* securities, *HTM* securities, loans and loan loss allowance as a proportion of market value of equity. *TIERONE* is the ratio of Tier 1 capital to total assets. *LNMVE* denotes the log of market value of equity in millions. *TURN* denotes log of the ratio of total shares traded to total shares outstanding. *RETVOL* denotes stock return volatility during the quarter based on daily stock returns. *PRCINV* denotes the inverse of the average stock price during the quarter. *BHC* is an indicator variable that denotes bank holding companies. *ANNSPREAD* denotes the bid-ask spread around the earnings announcement date. All balance sheet variables are defined as of the start of the quarter while *SPREAD*, *LNMVE*, *TURN*, *RETVOL* and *PRCINV* are defined as of the current quarter. All specifications include year fixed effects and robust standard errors clustered two-way: by bank and year-quarter.

### Panel A: Using the indicator *TRADEDUM*

| | *ANALYST* (1) | | *MGTFORE* (2) | | *IPT* (3) | |
|---|---|---|---|---|---|---|
| | Coeff. | *t*-stat | Coeff. | *t*-stat | Coeff. | *t*-stat |
| Intercept | -1.625 | -2.74 | -4.225 | -9.87 | 5.513 | 10.31 |
| *TRADEDUM* | -0.103 | -3.59 | -0.211 | -2.47 | -0.266 | -2.49 |
| *AFS* | -0.002 | -0.51 | 0.004 | 0.12 | 0.078 | 1.62 |
| *HTM* | -0.020 | -1.24 | 0.031 | 0.58 | 0.016 | 0.20 |
| *LOANS* | 0.002 | 0.51 | 0.011 | 0.49 | -0.043 | -3.06 |
| *LLA* | 0.020 | 0.16 | -0.464 | -0.52 | 0.165 | 0.45 |
| *TIERONE* | 0.079 | 0.13 | -2.861 | -1.76 | -2.701 | -1.31 |
| *LNMVE* | 0.130 | 6.95 | 0.258 | 10.21 | -0.044 | -0.86 |
| *MB* | -0.661 | -1.64 | -0.162 | -0.34 | 0.485 | 0.64 |
| *RETVOL* | 2.694 | 0.43 | 10.996 | 3.33 | 20.065 | 4.32 |
| *BHC* | 0.219 | 2.91 | 0.591 | 2.28 | 0.085 | 0.39 |
| *ANALYST* | – | – | – | – | – | – |
| *ANNSPREAD* | – | – | – | – | – | – |
| Year effects | Yes | | Yes | | Yes | |
| Adj. $R^2$ | 0.02 | | 0.13 | | 0.06 | |
| Obs. | 24,753 | | 21,955 | | 5,510 | |

**Panel B: Using continuous *TRADING***

| | *ANALYST* (1) | | *MGTFORE* (2) | | *IPT* (3) | |
|---|---|---|---|---|---|---|
| | Coeff. | *t*-stat | Coeff. | *t*-stat | Coeff. | *t*-stat |
| Intercept | -1.609 | -2.71 | -4.120 | -9.52 | 5.243 | 9.30 |
| *TRADING* | -0.245 | -4.24 | -0.461 | -2.44 | -0.080 | -0.30 |
| *AFS* | -0.004 | -0.88 | 0.002 | 0.05 | 0.076 | 1.59 |
| *HTM* | -0.021 | -1.37 | 0.021 | 0.41 | 0.013 | 0.17 |
| *LOANS* | 0.002 | 0.54 | 0.006 | 0.28 | -0.045 | -3.07 |
| *LLA* | 0.020 | 0.15 | -0.463 | -0.53 | 0.186 | 0.49 |
| *TIERONE* | 0.001 | 0.12 | -0.029 | -1.78 | -0.025 | -1.22 |
| *LNMVE* | 0.126 | 7.54 | 0.241 | 9.68 | -0.080 | -1.51 |
| *MB* | -0.724 | -1.77 | -0.295 | -0.62 | 0.638 | 0.81 |
| *RETVOL* | 2.834 | 0.45 | 11.841 | 3.52 | 19.896 | 4.21 |
| *BHC* | 0.222 | 2.91 | 0.587 | 2.28 | 0.103 | 0.49 |
| *ANALYST* | – | – | – | – | – | – |
| *ANNSPREAD* | – | – | – | – | – | – |
| *p*. value of diff. *TRADING* vs. *HTM* | 0.000 | | 0.017 | | 0.738 | |
| Year effects | Yes | | Yes | | Yes | |
| Adj. $R^2$ | 0.02 | | 0.13 | | 0.06 | |
| Obs. | 24,753 | | 21,955 | | 5,510 | |

## Table 4: Changes in bid-ask spreads around the implementation of SFAS No. 115

This panel comprises data for 1988 to 1998, the five years before and after implementation of SFAS 115 in 1993 (excluding 1993). Banks with trading assets in either the pre or post periods are dropped. The dependent variable is percentage spread. *POST* denotes the post SFAS 115 period. *TRADEDUM* is an indicator variable denoting trading securities. *INVSEC* denotes investment securities (other than trading assets) scaled by market value of equity, computed as disclosed in the pre-period and as the sum of *AFS* and *HTM* securities in the post-period. *LOANS* and *LLA* denote loans and loan loss allowance as a proportion of market value of equity. *TANGEQ* indicates the tangible equity ratio. *LNMVE* denotes the log of market value of equity. *TURN* denotes turnover defined as the ratio of shares traded to shares outstanding. *RETVOL* denotes stock return volatility based on daily stock returns. *PRCINV* denotes the inverse of the average stock price. *BHC* is an indicator variable that denotes bank holding companies. All balance sheet variables are defined as of the start of the quarter while *SPREAD*, *LNMVE*, *TURN*, *RETVOL* and *PRCINV* are defined as of the end. Models (1) and (3) include year effects while Models (2) and (4) include year and bank fixed effects.

**Panel A: Entire sample**

| | *TRADING* securities | | | | *INVSEC* securities | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | | (2) | | (3) | | (4) | |
| | Coeff. | *t*-stat | Coeff. | *t*-stat | Coeff. | *t*-stat | Coeff. | *t*-stat |
| Intercept | 5.072 | 6.58 | 4.976 | 9.07 | 3.835 | 5.00 | 3.409 | 5.17 |
| *TRADEDUM* | -0.252 | -1.07 | -0.367 | -2.74 | | | | |
| *TRADEDUM*POST* | 1.691 | 5.37 | 1.499 | 8.00 | | | | |
| *INVSEC* | | | | | -0.018 | -0.25 | 0.001 | 0.01 |
| *INVSEC*POST* | | | | | 0.079 | 0.89 | 0.043 | 0.75 |
| *LOANS* | -0.050 | -1.79 | -0.023 | -1.76 | -0.034 | -1.13 | -0.010 | -0.64 |
| *LLA* | 0.059 | 0.10 | -0.761 | -2.55 | -0.231 | -0.37 | -1.000 | -3.27 |
| *TANGEQ* | -8.411 | -2.30 | -3.285 | -1.60 | -7.622 | -1.95 | 0.720 | 0.33 |
| *LNMVE* | -0.750 | -7.50 | -0.761 | -6.40 | -0.538 | -6.37 | -0.550 | -4.25 |
| *TURN* | -26.289 | -14.57 | -19.904 | -16.96 | -25.820 | -14.49 | -20.202 | -17.22 |
| *RETVOL* | 193.008 | 17.54 | 166.790 | 18.71 | 197.907 | 18.23 | 170.818 | 19.19 |
| *PRCINV* | 0.633 | 0.31 | 6.225 | 3.23 | 0.776 | 0.37 | 6.460 | 3.29 |
| *BHC* | 0.042 | 0.15 | – | – | -0.011 | -0.04 | – | – |
| Year effects | Yes | | Yes | | Yes | | Yes | |
| Bank effects | No | | Yes | | No | | Yes | |
| Adj. $R^2$ | 0.80 | | 0.86 | | 0.80 | | 0.86 | |
| Obs. | 8,476 | | 8,476 | | 8,476 | | 10,117 | |

**Panel B: Banks not previously marking to market (*Non-MTM*) vs. those that were (*MTM*)**

This panel comprises data for 1988 to 1998, which covers five years before and after the implementation of SFAS 115 in 1993, excluding the implementation year. Banks with trading assets in only the pre or only the post period are dropped. The dependent variable is percentage relative bid-ask spread. *MTM* denotes banks that report trading securities using MTM accounting in the pre-period. *POST* denotes the post SFAS 115 period. *TRADEDUM* is an indicator variable denoting the presence of trading securities. *LOANS* and *LLA* denote loans and loan loss allowance as a proportion of market value of equity. *TANGEQ* indicates the tangible equity ratio. *LNMVE* denotes the log of market value of equity in millions. *TURN* denotes log of turnover defined as the ratio of total shares traded to total shares outstanding. *RETVOL* denotes stock return volatility during the quarter based on daily stock returns. *PRCINV* denotes the inverse of the average stock price during the quarter. *BHC* is an indicator variable that denotes bank holding companies. All balance sheet variables are defined as of the start of the quarter while *SPREAD*, *LNMVE*, *TURN*, *RETVOL* and *PRCINV* are defined as of the current quarter. The regression includes year fixed effects and robust standard errors clustered two-way: by bank and by year-quarter.

| | (1) | | (2) | |
|---|---|---|---|---|
| | Coeff. | *t*-stat | Coeff. | *t*-stat |
| Intercept | 5.294 | 6.86 | 4.972 | 9.05 |
| *MTM* | -0.567 | -1.80 | – | – |
| *TRADEDUM* | -0.715 | -2.69 | -0.510 | -2.84 |
| *MTM*TRADEDUM* | 1.260 | 3.63 | 0.789 | 4.06 |
| *MTM*POST* | 1.861 | 4.80 | 1.175 | 5.60 |
| *TRADEDUM*POST* | 1.816 | 4.67 | 1.580 | 7.22 |
| *MTM*TRADEDUM*POST* | -1.915 | -4.21 | -1.238 | -5.56 |
| *LOANS* | -0.053 | -1.93 | -0.024 | -1.85 |
| *LLA* | 0.091 | 0.15 | -0.747 | -2.51 |
| *TANGEQ* | -8.569 | -2.36 | -3.740 | -1.81 |
| *LNMVE* | -0.792 | -7.51 | -0.775 | -6.53 |
| *TURN* | -26.108 | -14.52 | -19.885 | -17.28 |
| *RETVOL* | 192.003 | 17.44 | 166.726 | 18.69 |
| *PRCINV* | 0.711 | 0.34 | 6.180 | 3.20 |
| *BHC* | 0.070 | 0.25 | – | – |
| Year effects | Yes | | Yes | |
| Bank effects | No | | Yes | |
| Adj. $R^2$ | 0.81 | | 0.86 | |
| Obs. | 8,476 | | 8,476 | |

## Panel C: Matched sample analysis

This panel comprises data for 1988 to 1998, which covers five years before and after the implementation of SFAS 115 in 1993, excluding the implementation year. Banks with trading assets in only the pre or only the post period are dropped. The dependent variable is percentage relative bid-ask spread. *MTM* denotes banks that report trading securities using MTM accounting in the pre-period. *POST* denotes the post SFAS 115 period. *TRADEDUM* is an indicator variable denoting the presence of trading securities. *LOANS* and *LLA* denote loans and loan loss allowance as a proportion of market value of equity. *TANGEQ* indicates the tangible equity ratio. *LNMVE* denotes the log of market value of equity in millions. *TURN* denotes log of turnover defined as the ratio of total shares traded to total shares outstanding. *RETVOL* denotes stock return volatility during the quarter based on daily stock returns. *PRCINV* denotes the inverse of the average stock price during the quarter. *BHC* is an indicator variable that denotes bank holding companies. All balance sheet variables are defined as of the start of the quarter while *SPREAD*, *LNMVE*, *TURN*, *RETVOL* and *PRCINV* are defined as of the current quarter. The regression includes year fixed effects and robust standard errors clustered two-way: by bank and by year-quarter.

| | (1) | | (2) | |
|---|---|---|---|---|
| | Coeff. | *t*-stat | Coeff. | *t*-stat |
| Intercept | 5.893 | 6.87 | 5.079 | 8.62 |
| *MTM* | -0.490 | -1.33 | – | – |
| *TRADEDUM* | -0.575 | -2.09 | -0.534 | -2.96 |
| *MTM*TRADEDUM* | 1.431 | 3.50 | 0.597 | 2.49 |
| *MTM*POST* | 1.757 | 6.02 | 2.239 | 9.52 |
| *TRADEDUM*POST* | 1.724 | 4.31 | 1.524 | 7.10 |
| *MTM*TRADEDUM*POST* | -1.350 | -3.01 | -2.180 | -8.84 |
| *LOANS* | -0.073 | -2.54 | -0.031 | -2.25 |
| *LLA* | 0.490 | 0.67 | -0.509 | -1.41 |
| *TANGEQ* | -8.339 | -2.24 | -3.908 | -1.78 |
| *LNMVE* | -0.915 | -7.15 | -0.796 | -5.79 |
| *TURN* | -28.645 | -12.47 | -19.941 | -14.97 |
| *RETVOL* | 192.320 | 16.57 | 169.903 | 18.15 |
| *PRCINV* | 0.489 | 0.23 | 5.646 | 2.79 |
| *BHC* | 0.080 | 0.29 | – | – |
| Year effects | Yes | | Yes | |
| Bank effects | No | | Yes | |
| Adj. $R^2$ | 0.80 | | 0.86 | |
| Obs. | 6,955 | | 6,955 | |

**Panel D: Separating disclosure and recognition effects- Banks not previously marking to market and not disclosing fair values, those not marking to market but disclosing fair values, and those that were marking to market**

This panel comprises data for 1988 to 1998, which covers five years before and after the implementation of SFAS 115 in 1993, excluding the implementation year. Banks with trading assets in only the pre or only the post period are dropped. The dependent variable is percentage relative bid-ask spread. *FVDISC* denotes banks not using MTM accounting in the pre-period but disclosing fair values while *MTM* denotes banks that report trading securities using MTM accounting in the pre-period. *POST* denotes the post SFAS 115 period. *TRADEDUM* is an indicator variable denoting the presence of trading securities. *LOANS* and *LLA* denote loans and loan loss allowance as a proportion of market value of equity. *TANGEQ* indicates the tangible equity ratio. *LNMVE* denotes the log of market value of equity in millions. *TURN* denotes log of turnover defined as the ratio of total shares traded to total shares outstanding. *RETVOL* denotes stock return volatility during the quarter based on daily stock returns. *PRCINV* denotes the inverse of the average stock price during the quarter. *BHC* is an indicator variable that denotes bank holding companies. All balance sheet variables are defined as of the start of the quarter while *SPREAD*, *LNMVE*, *TURN*, *RETVOL* and *PRCINV* are defined as of the current quarter. The regression includes year fixed effects and robust standard errors clustered two-way: by bank and by year-quarter.

| | (1) | | (2) | |
|---|---|---|---|---|
| | Coeff. | *t*-stat | Coeff. | *t*-stat |
| Intercept | 5.327 | 6.90 | 4.896 | 8.94 |
| *FVDISC* | -0.121 | -0.36 | – | – |
| *MTM* | -0.525 | -1.43 | – | – |
| *TRADEDUM* | -0.691 | -2.32 | -0.426 | -2.16 |
| *FVDISC*TRADEDUM* | 0.010 | 0.02 | 0.272 | 1.09 |
| *MTM*TRADEDUM* | 1.172 | 2.91 | 0.585 | 2.78 |
| *FVDISC*POST* | -0.271 | -0.70 | 0.457 | 1.55 |
| *MTM*POST* | 1.932 | 4.87 | 1.077 | 4.91 |
| *TRADEDUM*POST* | 1.908 | 4.55 | 1.611 | 7.05 |
| *FVDISC*TRADEDUM*POST* | -0.180 | -0.34 | -0.527 | -1.42 |
| *MTM*TRADEDUM*POST* | -1.972 | -4.08 | -1.070 | -4.33 |
| *LOANS* | -0.052 | -1.90 | -0.023 | -1.78 |
| *LLA* | 0.090 | 0.15 | -0.750 | -2.55 |
| *TANGEQ* | -8.455 | -2.30 | -3.611 | -1.76 |
| *LNMVE* | -0.799 | -7.50 | -0.758 | -6.36 |
| *TURN* | -26.209 | -14.61 | -19.964 | -17.64 |
| *RETVOL* | 191.742 | 17.42 | 166.607 | 18.72 |
| *PRCINV* | 0.682 | 0.33 | 6.202 | 3.21 |
| *BHC* | 0.071 | 0.25 | – | – |
| Year effects | Yes | | Yes | |
| Bank effects | No | | Yes | |
| Adj. $R^2$ | 0.81 | | 0.87 | |
| Obs. | 8,373 | | 8,373 | |

**Panel E: Falsification test**

This panel comprises data for 1987 to 1993, which covers three years before and after the pseudo implementation of SFAS 115. Banks with trading assets in only the pre or only the post period are dropped. The dependent variable is percentage spread. *POST* denotes the post pseudo SFAS 115 period. *TRADEDUM* is an indicator variable denoting trading securities. *INVSEC* denotes investment securities (other than trading assets) scaled by market value of equity, computed as disclosed in the pre-period and as the sum of *AFS* and *HTM* in the post-period. *LOANS* and *LLA* denote loans and loan loss allowance as a proportion of market value of equity. *TANGEQ* indicates tangible equity ratio. *LNMVE* denotes the log of market value of equity in millions. *TURN* denotes log of turnover. *RETVOL* denotes stock return volatility during the quarter. *PRCINV* denotes the inverse of the average stock price during the quarter. *BHC* is an indicator variable that denotes bank holding companies. All balance sheet variables are defined as of the start of the quarter while *SPREAD*, *LNMVE*, *TURN*, *RETVOL* and *PRCINV* are defined as of the current quarter. Models (1) and (3) include year fixed effects while Models (2) and (4) include year and bank fixed effects.

| | *TRADING* securities | | | | *INVSEC* securities | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | | (2) | | (3) | | (4) | |
| | Coeff. | *t*-stat | Coeff. | *t*-stat | Coeff. | *t*-stat | Coeff. | *t*-stat |
| Intercept | 6.083 | 5.89 | 7.544 | 9.12 | 6.033 | 5.72 | 8.679 | 9.17 |
| *TRADEDUM* | 0.603 | 2.70 | 0.161 | 1.09 | | | | |
| *TRADEDUM*POST* | 0.002 | 0.01 | 0.049 | 0.23 | | | | |
| *INVSEC* | | | | | -0.053 | -0.81 | -0.105 | -2.84 |
| *INVSEC*POST* | | | | | 0.003 | 0.05 | 0.022 | 0.60 |
| *LOANS* | -0.073 | -2.77 | -0.047 | -2.23 | -0.067 | -2.39 | -0.039 | -1.72 |
| *LLA* | 0.366 | 0.53 | -0.381 | -0.80 | 0.408 | 0.58 | -0.354 | -0.73 |
| *TANGEQ* | -4.585 | -0.82 | 3.341 | 0.69 | -7.058 | -1.23 | 2.103 | 0.44 |
| *LNMVE* | -1.111 | -7.07 | -1.522 | -8.30 | -1.012 | -7.11 | -1.697 | -8.75 |
| *TURN* | -31.210 | -14.00 | -22.355 | -18.85 | -30.497 | -13.90 | -22.121 | -19.28 |
| *RETVOL* | 182.891 | 16.30 | 161.483 | 18.67 | 183.497 | 16.35 | 161.303 | 18.78 |
| *PRCINV* | 0.511 | 0.25 | 3.569 | 2.38 | 0.399 | 0.20 | 3.197 | 2.18 |
| *BHC* | 0.085 | 0.27 | – | – | 0.130 | 0.41 | – | – |
| Year effects | Yes | | Yes | | Yes | | Yes | |
| Bank effects | No | | Yes | | No | | Yes | |
| Adj. $R^2$ | 0.82 | | 0.89 | | 0.82 | | 0.89 | |
| Obs. | 5,128 | | 5,128 | | 5,128 | | 5,128 | |

## Table 5: Effect of the SFAS 159 fair value option on bid-ask spreads

The sample is 37 Bank Holding Companies (BHCs) that elected the fair value option under SFAS 159 in 2008:Q1, and 304 banks that did not elect. Early adopters are deleted from the sample. The pre-period consists of the years 2005-2007 while the post-period consists of years 2008-2010. 2008:Q1 has been deleted from the sample. Only banks that existed in both periods are included. *SPREAD* denotes the percentage relative-bid ask spread.

### Panel A: First stage – probit model

The dependent variable is *FVO*, an indicator variable that takes 1 for banks adopting the Fair Value Option under SFAS 159. Non-adopters take the value 0. *LOANS_HFS* denotes the amount of loans held for sale as a proportion of lagged market value of equity. *DERIV* denotes the notional amount of derivatives during the quarter scaled by total assets. *EARNVOL* denotes earnings volatility defined as the standard deviation of five annual measures of net income divided by total equity. *RET_EARN_CORR* denotes the correlation between quarterly stock returns and quarterly earnings scaled by total assets. The correlations are computed annually based on four quarters' observations. *INEFF_HED_DUM* is an indicator variable that takes the value of 1 if the bank reports gains or losses on ineffective hedges. *TOTASS* denotes the total assets of the bank expressed in billions of dollars.

| | Pr (*FVO* = 1) | |
|---|---|---|
| | Coeff. | *t*-stat |
| Intercept | -1.593 | -12.43 |
| *LOANS_HFS* | 0.255 | 1.95 |
| *DERIV* | 2.255 | 2.16 |
| *EARNVOL* | -0.129 | -0.28 |
| *RET_EARN_CORR* | 0.061 | 0.87 |
| *INEFF_HED_DUM* | 0.236 | 1.46 |
| *TOTASS* | 0.004 | 1.77 |
| Pseudo. $R^2$ | 0.18 | |
| Obs. | 7,166 | |

**Panel B: Second stage – Effect of *FVO* on bid-ask spreads**

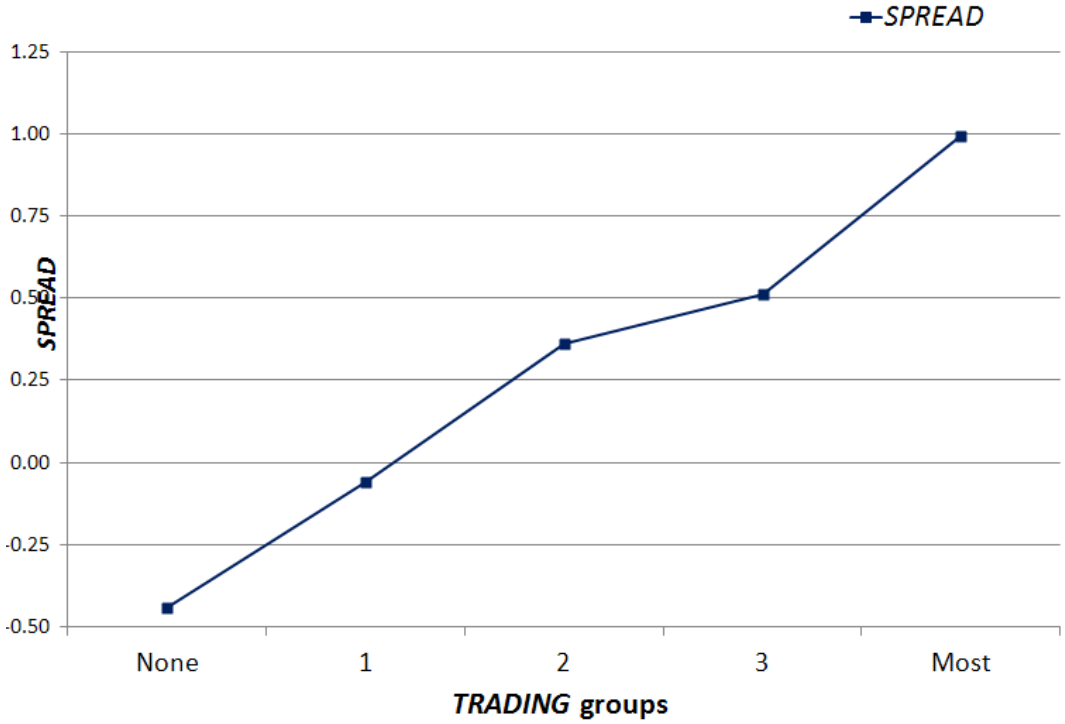
This panel comprises data for BHCs for the period 2005 to 2010 (excluding 2008:Q1), which covers 3 years before and after SFAS 159. Models (1) and (2) are for the entire period 2005-2010 while Models (3) and (4) compare 2006 and 2010. Banks without data in either the pre or post period are dropped. The dependent variable is percentage relative spread. *FVO* is an indicator variable that takes 1 for banks adopting the Fair Value Option under SFAS 159. Non-adopters take the value 0. Early adopters are deleted from the sample. *POST* denotes the post SFAS 159 period. *LOANS* and *LLA* denote loans and loan loss allowance as a proportion of MVE. *TANGEQ* indicates the tangible equity ratio. *LNMVE* denotes the log of market value of equity in millions. *TURN* denotes log of turnover defined as the ratio of shares traded to shares outstanding. *RETVOL* denotes stock return volatility during the quarter based on daily returns. *PRCINV* denotes the inverse of the average stock price. *MILLS* denotes the Inverse Mills ratio from the probit model of Panel A. All balance sheet variables are defined as of the start of the quarter while *SPREAD*, *LNMVE*, *TURN*, *RETVOL* and *PRCINV* are defined as of the end. Models (1) and (2) include year fixed effects and robust errors clustered two-way: by bank and by year-quarter. Models (3) and (4) include year and bank fixed effects and robust errors clustered by year-quarter.

| | 3 years around adoption | | | | 2006 vs. 2010 | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | | (2) | | (3) | | (4) | |
| | Coeff. | *t*-stat | Coeff. | *t*-stat | Coeff. | *t*-stat | Coeff. | *t*-stat |
| Intercept | 0.203 | 0.45 | -2.024 | -5.96 | -0.110 | -0.25 | -1.578 | -4.53 |
| *FVO* | 0.097 | 1.02 | – | – | 0.068 | 0.79 | – | – |
| *FVO*POST* | 0.199 | 2.15 | 0.094 | 2.03 | 0.246 | 2.33 | 0.162 | 2.31 |
| *LOANS* | 0.002 | 0.54 | 0.003 | 1.11 | 0.001 | 0.19 | -0.001 | -0.40 |
| *LLA* | -0.046 | -0.74 | -0.042 | -0.80 | -0.144 | -2.38 | -0.038 | -0.43 |
| *TANGEQ* | 2.842 | 2.07 | 1.141 | 1.13 | 1.806 | 1.50 | 2.356 | 1.46 |
| *LNMVE* | -0.716 | -19.82 | -0.581 | -11.41 | -0.735 | -22.43 | -0.712 | -12.04 |
| *TURN* | -1.861 | -4.97 | -0.789 | -3.62 | -1.385 | -2.22 | -0.467 | -1.59 |
| *RETVOL* | 8.422 | 4.46 | 8.302 | 5.24 | 10.050 | 3.87 | 7.394 | 3.14 |
| *PRCINV* | -0.352 | -2.09 | 0.106 | 0.98 | 0.011 | 0.12 | 0.222 | 2.05 |
| *MILLS* | -0.907 | -6.86 | -0.088 | -1.78 | -0.836 | -5.81 | -0.138 | -1.40 |
| Year effects | Yes | | Yes | | Yes | | Yes | |
| Bank effects | No | | Yes | | No | | Yes | |
| Adj. $R^2$ | 0.75 | | 0.85 | | 0.79 | | 0.87 | |
| Obs. | 7,166 | | 7,166 | | 2,420 | | 2,420 | |

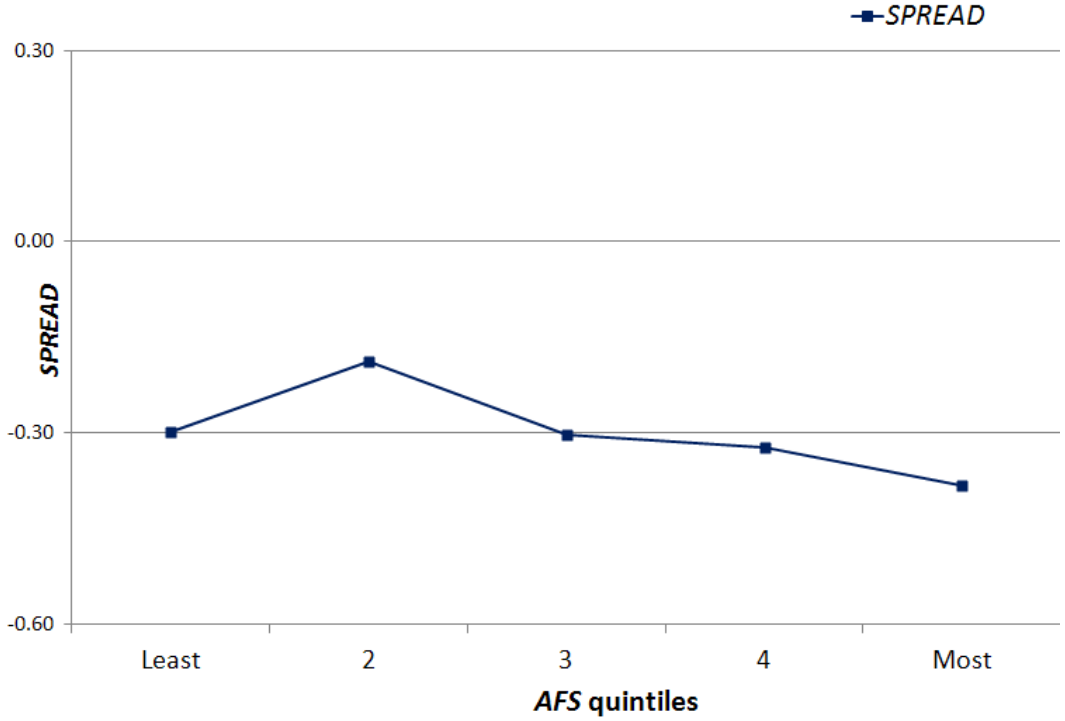
## Figure 1: Association between *SPREAD* and investment securities

This figure presents trends in orthogonalized *SPREAD* (i.e., spreads orthogonalized with respect to bank-level determinants) across groups of trading securities (*TRADING*) in Panel A, AFS securities (*AFS*) in Panel B and HTM securities (*HTM*) in Panel C. *TRADING*, *AFS* and *HTM* are each scaled by lagged market value of equity.

### Panel A: Orthogonalized *SPREAD* across groups of trading securities (*TRADING*)



**Panel B: Orthogonalized *SPREAD* across quintiles of AFS securities (*AFS*)**




**Panel C: Orthogonalized *SPREAD* across groups of HTM securities (*HTM*)**

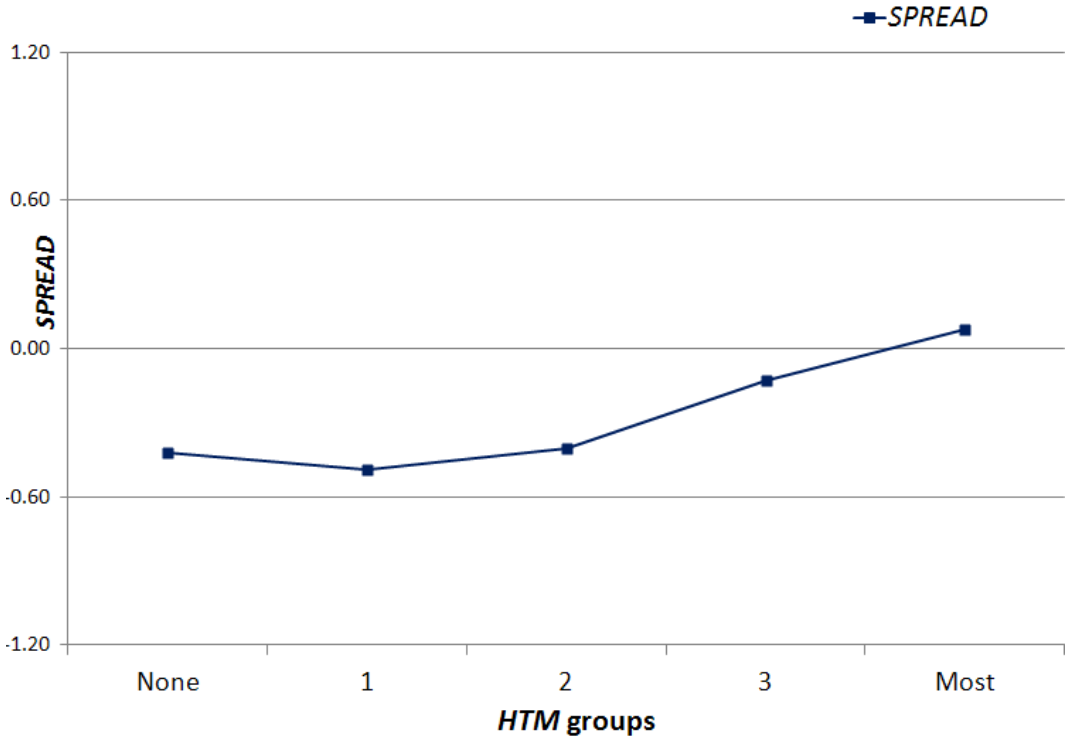


**Figure 2: Spread changes around the introduction of SFAS 115 for banks with and without trading securities**

The x-axis plots years relative to introduction of SFAS 115. The y-axis plots average residual spreads, orthogonalized with respect to controls and year effects. The solid (dotted) line denotes banks that have (do not have) trading securities on the balance sheet.

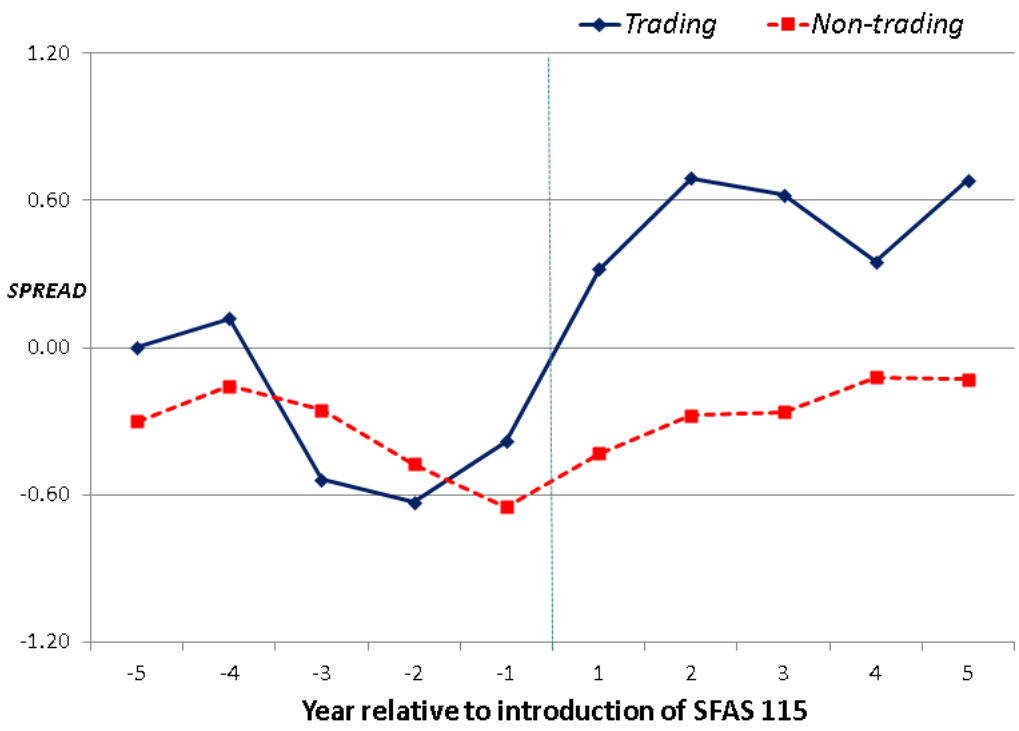
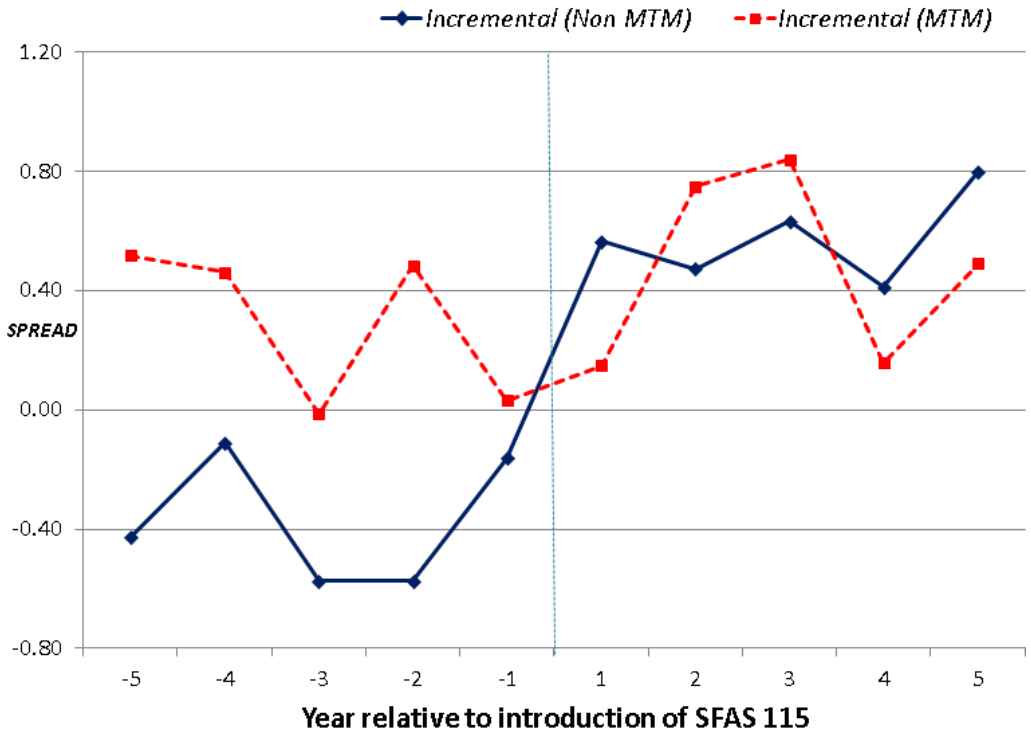


**Figure 3: Banks not previously marking to market (*Non-MTM*) vs. those that were (*MTM*)**

The x-axis plots years relative to SFAS 115. The y-axis plots differential residual spreads (*Trading* less *Non-trading*). The solid (dotted) line denotes banks with trading securities that don't use (use) MTM accounting.

**Panel A: Differential spread**




**Panel B: Trading asset portfolio**

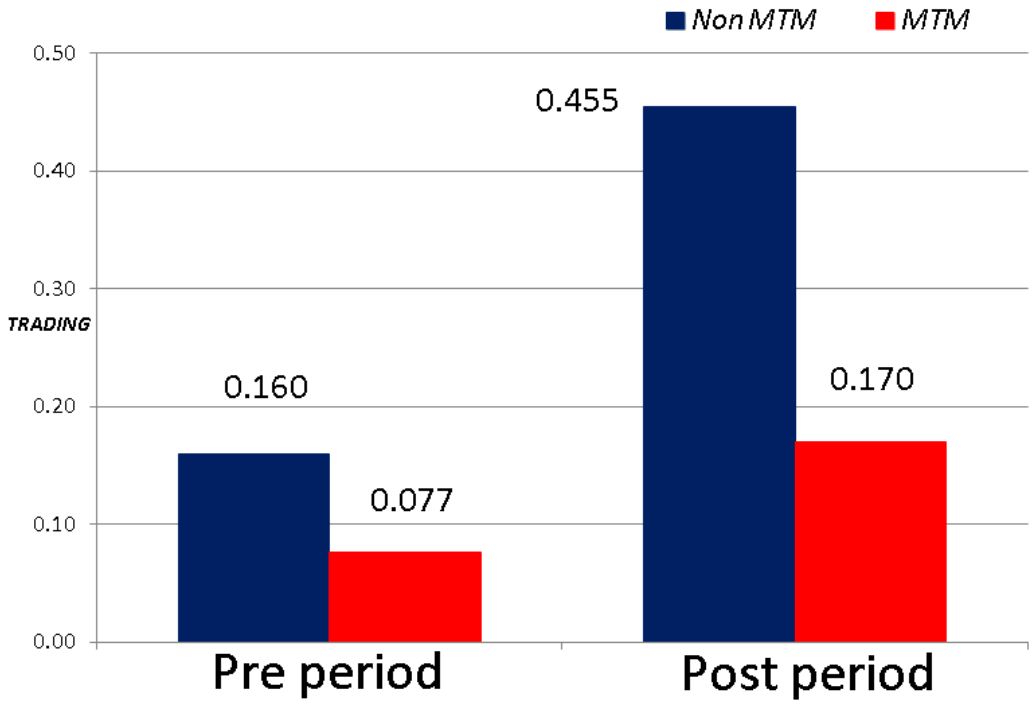
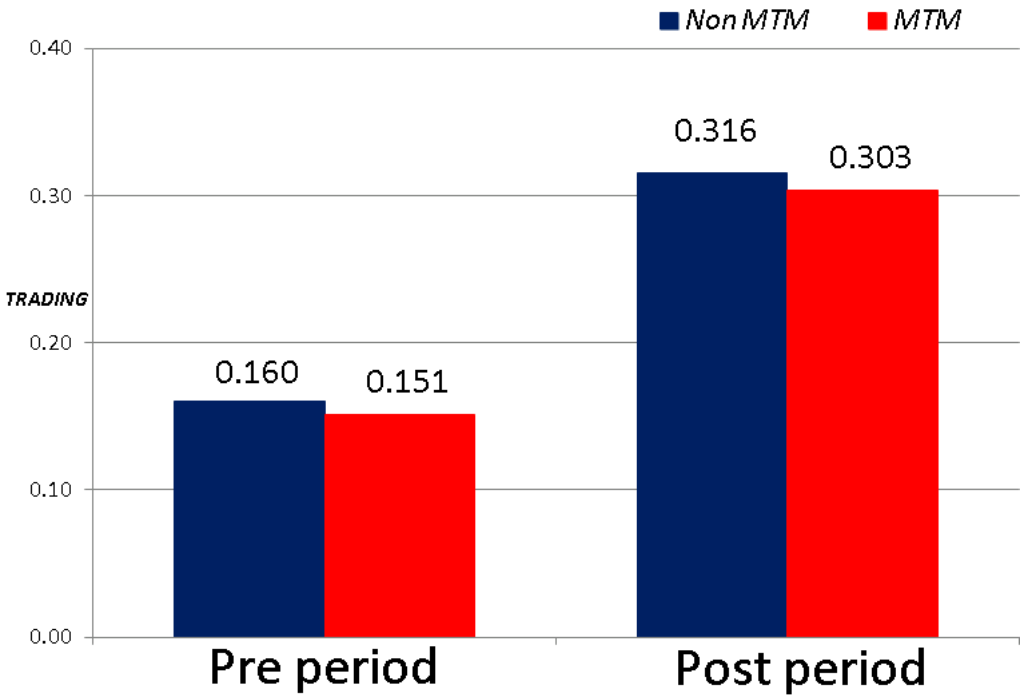


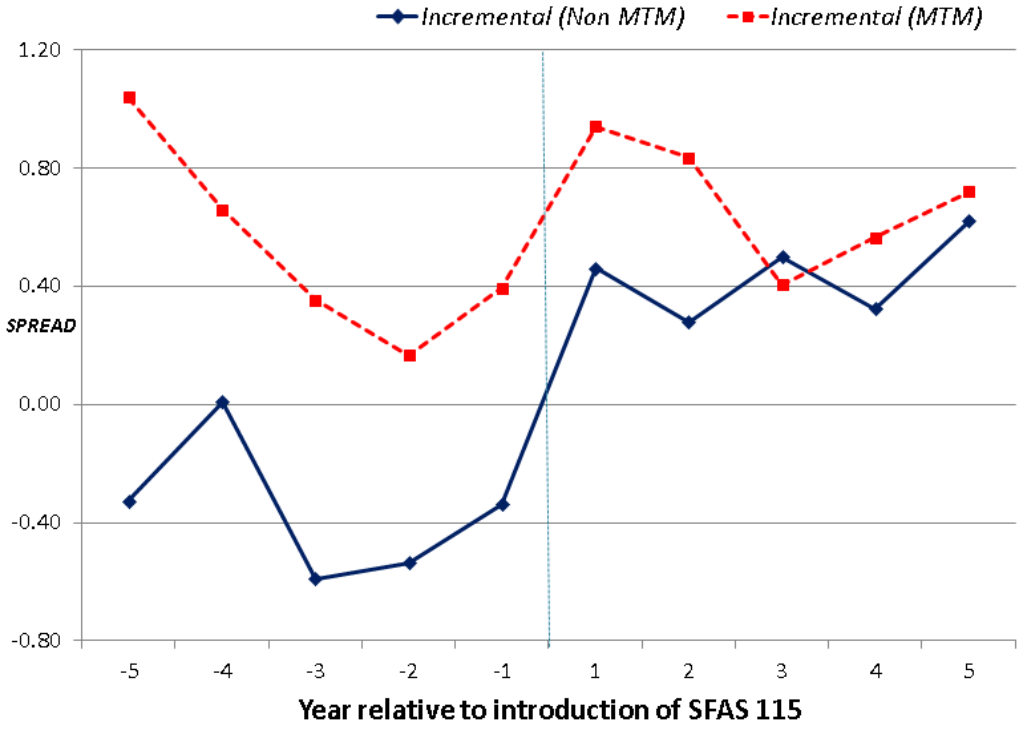
**Figure 4: Matched sample analysis**

The x-axis plots years relative to SFAS 115. The y-axis plots differential residual spreads (*Trading* less *Non-trading*). The solid (dotted) line denotes banks with trading securities that don't use (use) MTM accounting.

**Panel A: Trading asset portfolio**




**Panel B: Differential spread**



## Figure 5: Pseudo SFAS No. 115 shock

This figure replicates Figure 2, but for a pseudo-shock at a different date (three years prior to the actual date), to test whether the Figure 2 results are due to a trend in spreads. The x-axis plots years relative to pseudo introduction of SFAS 115. The y-axis plots residual spreads. The solid (dotted) line denotes banks that have (do not have) trading securities.