Research in Accounting Regulation xxx (2014) xxx–xxx

Contents lists available at ScienceDirect

Research in Accounting Regulation

journal homepage: www.elsevier.com/locate/racreg

Adjustment of valuation inputs and its effect on value relevance of fair value measurement ☆

Hui Du [a], Sherry Fang Li [b], Randall Zhaohui Xu [a,*]

[a] School of Business, University of Houston-Clear Lake, 2700 Bay Area Blvd, Houston, TX 77058, United States
[b] College of Business Administration, Rider University, 2083 Lawrenceville Road, Lawrenceville, NJ 08648, United States

ARTICLE INFO

Article history:
Available online xxxx

Keywords:
Fair value transfers
FAS 157-3
FAS 157-4
Value relevance

ABSTRACT

The fair value accounting standards; i.e., FAS 157, FAS 157-3 and FAS 157-4, specify the circumstances where firms need to adjust valuation inputs to fair value measurements in response to changes in market conditions. Such an adjustment inherently involves substantial management judgment and is accompanied with transfers of assets and liabilities among the different levels of the fair value hierarchy. We study the effect of adjusting valuation inputs to reflect market variations on value relevance of fair value measurements by comparing the value relevance of fair value assets between the banks that make transfers of assets and the banks that make no transfers. Overall, we find a significant increase in value relevance of fair value measurements for banks that transferred assets into/out of the Level 3 category. Our study examines a challenging situation in the application of fair value standards; i.e., determining fair value when there is a change in market conditions. Fair value measurement under such a situation involves substantial management judgment and potential estimate errors and manipulation. Our findings provide useful information for researchers, regulators and accounting professionals to assess the market's perception of the reliability of fair value information when management exercises substantial discretion in adjusting valuation inputs under changing market conditions.

1. Introduction

To increase the consistency and comparability of fair value measurements, Financial Accounting Standards 157 (FAS 157), *fair value measurements,* provides a single definition of fair value as the price that would be received when selling an asset or paid to transfer a liability in an *orderly transaction* between market participants at the measurement date.[1] It also stipulates the fair value hierarchy, which requires companies to maximize the use of observable inputs (i.e., Level 1 and Level 2 inputs that are quoted prices in an active market), when available, and to minimize the use of unobservable inputs (i.e., Level 3 inputs that are based on valuation models and companies' own estimates) in determining fair value (FASB, 2006).[2] Since market-based inputs are both more verifiable and more reliable indicators of market participants' assumptions than unobservable inputs, there had not been much controversy over the appropriate use of observable inputs vs. unobservable inputs in fair value measurement until the financial crisis in 2008.

☆ *Data availability:* All data are available from public sources.

* Corresponding author. Address: 2700 Bay Area Blvd, Box 42, Houston, TX 77058, United States. Tel.: +1 281 283 3145.
E-mail address: xuzhao@uhcl.edu (R.Z. Xu).

[1] As stated in FAS 157, an orderly transaction is a transaction that assumes exposure to the market for a period prior to the measurement date to allow for marketing activities that are usual and customary for transactions involving such assets or liabilities; it is not a forced transaction (for example, a forced liquidation or distress sale).

[2] FAS 157 allows companies to measure fair value using unobservable inputs, such as discounted cash flow models, to the extent observable inputs are not available. However, it reiterates that in all cases, fair value measurement shall reflect an exit price from the perspective of market participants who hold the assets and the unobservable inputs developed by the companies should reflect information about the market participants' assumptions on the assets price that is reasonably available.

http://dx.doi.org/10.1016/j.racreg.2014.02.005
1052-0457/

In the recent financial crisis, the rapid decline in asset value and uncertainties about the severity of underlying risk made market participants pull away and caused illiquidity in otherwise liquid markets. Companies faced a challenge in determining the appropriate inputs for fair value measurement in such a volatile market. They contended that quoted prices from a depressed market do not represent a good measure of fair value and securities shall be valued based on their underlying cash flow. However, investors and regulators remained doubtful about the reliability of fair value measurement using unobservable inputs.[3] In the early stages of the financial crisis, the SEC insisted on companies using "observable inputs, even when the market is less liquid than historical market volumes, unless those prices are the result of a forced liquidation or distress sale" to estimate fair value (SEC, 2008a). Auditors also took a cautious approach by following FAS 157 to limit the use of Level 3 unobservable inputs in fair value measurements due to potential litigation exposure (Yanez, 2008). Subsequently, amid the outcry from the financial institutions for regulatory forbearance[4], the FASB issued the FASB Staff Position (FSP) on Financial Accounting Standards (FAS) 157-3 in October 2008 (FASB, 2008) and FSP FAS 157-4 in April 2009 (FASB, 2009) to provide further guidance for determining fair value in accordance with FAS 157 when the markets are not active and to clarify the criteria on determining when the market becomes inactive or illiquid and whether a transaction is not orderly.

Following FAS 157 and the additional guidance, as the market for asset classes changes from active to inactive or recovers from illiquidity, companies should adjust the mixture of observable and unobservable inputs to fair value measurement accordingly. The adjustment of valuation inputs could generate more reliable fair value measurement if the selected inputs more closely correspond to variations in market conditions. On the other hand, such adjustments make the process of fair value determination exposed to more risk of estimate errors and management manipulations. As markets for asset classes moved from active to inactive, there were fewer transactions in the market and more transactions were likely to not be orderly. However, the fair value standards caution that even in an inactive market it is not appropriate to assume that all market transactions are necessarily not orderly and can be excluded from consideration. In addition, unobservable inputs by their nature involve significant management judgments and discretion. Since valuation inputs largely affect the reliability of the resulting fair value measurement, it is important to investigate how investors perceive the effect of the adjustment of valuation inputs on the reliability of fair value measurement, particularly when the determination process involves substantial management judgment and accounting discretion.

Our study attempts to examine the impact of adjusting valuation inputs in response to market variations on the reliability of fair value measurement. Specifically, we identify banks that adjust their valuation inputs through transfers of assets and liabilities into/out of the Level 3 category in the fair value hierarchy and compare the value relevance of those banks' fair value assets with that of banks that make no transfers. Following the fair value accounting standards, when markets are inactive and transactions are not orderly, companies should weigh less or not use quoted market prices in estimating fair value and use more unobservable inputs. When significant unobservable market inputs are used for fair value measures, assets and liabilities classes should be transferred from the Level 1 and Level 2 categories into the Level 3 category. In contrast, when market conditions return to normal and relevant observable market inputs become available for items in the Level 3 category, companies need to use observable inputs in fair value measurement and transfer the items out of the Level 3 category into the Level 1 or Level 2 categories. The adjustments of valuation inputs in the form of transfers should make the resulting fair value measurements more closely reflect market conditions. Once perceived by investors, the adjustments would be reflected in the value relevance of the fair value measurements.

FAS 157 requires companies to reconcile balances of their Level 3 assets and liabilities and make disclosure on transfers of assets and liabilities into and/or out of the Level 3 category in their financial reports. By identifying banks that made transfers of assets into and/or out of the Level 3 category from their SEC filings, we investigate whether banks with such transfers have an increase in value relevance of their fair value assets relative to banks without transfers.[5] We also compare the effect of transfers on value relevance in the pre-guidance and the post-guidance periods to examine the effect of FAS 157-3 and FAS 157-4.

Using a sample of 2524 quarterly observations in the banking industry in 2008 and 2009, we document increased value relevance in all three levels of fair value assets for the banks that make transfers of assets from Level 1 or Level 2 into and/or out of Level 3 compared with banks that do not make such transfers. Level 3 assets show the highest increase in value relevance for banks making transfers in comparison with banks making no transfers, followed by Level 1 assets.

To ensure the documented increase in value relevance is not driven by variations in bank characteristics among the transfer and non-transfer banks, we conduct additional tests to examine the effect of bank size and the amount of fair value assets and liabilities on the value relevance of fair value measurements. We find that bank size does not have consistent associations with value relevance. Similarly, the amount of fair value assets has a mixed

[3] Dorminey and Apostolou (2012) document substantial investor confusion over the income effects of fair value recognition of hedging derivatives in the bank industry.

[4] Financial institutions alleged that fair value accounting forced them to record huge asset write-downs on the basis of market conditions that were inactive and transactions that were not orderly (Wallison (2008a, 2008b)), although recent research (e.g., Badertscher, Burks, & Easton 2012) find evidence that fair value accounting has minimal effect on commercial banks' regulatory capital and did not lead to increased sales of securities during the crisis.

[5] We focus our study on fair value assets because the majority of the items carried at fair value are assets and there are very few transfers of liabilities into and out of the Level 3 category. The impact of the fair value guidance on the value relevance of fair value liabilities should be rather minor.

Please cite this article in press as: Du, H., et al. Adjustment of valuation inputs and its effect on value relevance of fair value measurement. *Research in Accounting Regulation* (2014), http://dx.doi.org/10.1016/j.racreg.2014.02.005

association with levels of value relevance. The findings suggest that the increased value relevance for the transfer banks in comparison with the non-transfer banks is not driven by their difference in firm characteristics such as size and amount of fair value assets. Rather, transfers of assets and liabilities between the fair value categories seem to play a significant role in the improvement of value relevance.

Since transfers of assets and liabilities into the Level 3 category occur under completely different market conditions and involve different valuation issues from transfers out of Level 3, we separately test the effect of transfers of assets into and transfers of assets out of the Level 3 category on value relevance. Consistent with our overall results, value relevance of all three levels of fair value assets is significantly improved for banks that made transfers *into* Level 3 compared to banks that made no transfers. The results are similar but less robust when we examine banks that made transfers *out of* Level 3, as there is a significant increase in value relevance for only Level 2 and Level 3 assets.

Given that FAS 157-3 and FAS 157-4 clarify the application of FAS 157 under extreme market conditions, it is important to assess the effect of the fair value guidance on value relevance of fair value information. Partitioned sample analysis shows that the increase in value relevance of Level 3 assets for banks making transfers in comparison with banks making no transfers are more significant in the post-guidance period than in the pre-guidance period. The result is consistent with Bhat, Frankel, and Martin (2011), which find a significant positive market reaction at the issuance of FAS 157-4. However, we do not find any increase of value relevance for Level 1 or Level 2 assets in the post-guidance period in comparison with the pre-guidance period.

We extend the literature by examining an important issue in the application of fair value accounting standards; i.e., how the market perceives the adjustment of valuation inputs to fair value measurement in response to changes in market conditions. As the market moves from active to inactive or vice versa, companies are required to adjust the mixture of observable and unobservable valuation inputs and transfer assets and liabilities across the three levels in the fair value hierarchy. The process involves substantial management judgment in assessing whether the market conditions are severe enough to make market quotes unrepresentative of fair value and warrant a switch from observable inputs to unobservable inputs. In addition, once unobservable inputs are used, fair value measurement is inherently subject to more estimate errors and even managerial manipulation (Benston, 2008). Therefore, we examine transfers of assets among the three levels in the fair value hierarchy and investigate the effect of the transfers on value relevance of fair value measurement. We find significant improvement in value relevance of fair value assets for banks that made transfers of assets. Our findings are consistent with prior research that suggests that management may credibly incorporate their private information about firms' performance into financial reporting in certain instances (Altamuro & Zhang, 2013; Houmes, Boylan, & Crosby, 2012; Subramanyam, 1996). Our study complements yet differs from recent fair value studies that investigate factors influencing the use of Level 3 inputs (Botosan, Carrizosa, & Huffman, 2011), factors that affect the amount of fair value disclosures (Goh, Ng, & Yong, 2011), and the association between fair value measurement and subsequent restatements (Huang & Lin, 2011).

Our findings have implications for regulators, standard-setters and the financial reporting community. Shortly after the issuance of FAS 157-3 and FAS 157-4, investor advocates and accounting professionals expressed serious concerns about "the excessive pressure (on the standard-setters) ... to make rapid, piecemeal, uncoordinated and prescribed changes to standards" (FCAG, 2009) and potential negative consequences of the standards on the quality of financial reporting (Pulliam & McGinty, 2009). The overall improvement in the value relevance of fair value assets in the post-guidance period as documented by our study may help ease the concerns of investor advocates over the quality of fair value standards.

The next section presents the background and hypotheses development. Section 3 describes the research design. Section 4 presents empirical results. The final section discusses conclusions and implications.

2. Background and hypotheses development

2.1. Background: FAS 157 and subsequent fair value guidance

FAS 157 establishes a coherent framework by applying a three-level fair value hierarchy to prioritize the inputs used to measure fair value. Level 1 and Level 2 inputs are quoted prices that are observable in active markets for identical assets or liabilities (Level 1) or quoted prices for similar assets or liabilities and in less active markets (Level 2). Level 3 inputs are unobservable inputs that "reflect the reporting entity's own assumptions about the assumptions that market participants would use in pricing the asset or liability" (FASB, 2006). Companies are required to maximize the use of observable inputs and minimize the use of unobservable inputs in fair value measurement. Unobservable inputs may be used to the extent observable inputs are not available.

During the financial crisis in 2008, financial institutions complained[6] that mark-to-market accounting required them to mark down their assets at a depressed market price.[7] In response to the complaints, the SEC sent a letter to public companies in March 2008, which reiterated the FAS 157's position of using "actual market prices, or observable inputs, even when the market is less liquid ... unless

[6] Examples of complaints about fair value accounting standards include the American Bankers Association. (2008) and Wallison (2008a, 2008b).

[7] Despite the banking industry's blame on fair value accounting for contributing to the financial crisis (Joseph-Bell, Joas, & Bukspan, 2008), the studies by various government agencies (GAO, 2013; SEC, 2008b) concluded that fair value accounting standards did not appear to be a major contributor to the bank failures as two-thirds of small failed banks' assets were not subject to fair value accounting. Badertscher et al. (2012) provides empirical evidence that fair value accounting has a minimal effect on commercial banks' regulatory capital and did not lead to increased sales of securities during the crisis.

Please cite this article in press as: Du, H., et al. Adjustment of valuation inputs and its effect on value relevance of fair value measurement. *Research in Accounting Regulation* (2014), http://dx.doi.org/10.1016/j.racreg.2014.02.005

prices are the result of a forced liquidation or distress sale" (SEC, 2008a). Auditors in general also tend to give substantial weight to observable market prices in valuing fair assets in spite of the depressed market conditions.[8] Thus, companies were wary about using Level 3 inputs in spite of the volatile market conditions in the early stage of the financial crisis.

While FAS 157 touches upon transfers of assets and liabilities between the three levels of fair value hierarchy when there is a change in the observability of significant valuation inputs (FAS 157, paragraph 32), it does not specify the conditions that would cause the changes in observability of valuation inputs. FASB issued further guidance to clarify the issue. On October 10, 2008, the FASB issued FSP FAS 157-3, *Determining the Fair Value of a Financial Asset When the Market for That Asset Is Not Active*. FAS 157-3 provides guidance for measuring fair value of a financial asset when the market is inactive or the transactions are not orderly and provides insight on how to recognize an inactive market. It emphasizes that it is inappropriate to conclude that in an illiquid market either (1) all market transactions can be excluded from consideration when determining fair value or (2) every market transaction is indicative of fair value. In the absence of relevant observable inputs, it is appropriate to transfer a financial asset to Level 3 and use a company's own assumptions to measure the item's fair value. Management assumptions must consider the risk of nonperformance and illiquidity of the market.

In April 2009, the FASB issued FSP FAS 157-4, *Determining Fair Value When the Volume and Level of Activity for the Asset or Liability Have Significantly Decreased and Identifying Transactions That Are Not Orderly*. FAS 157-4 requires a company to place little, if any, weight on prices of transactions that the company concludes are not orderly. More importantly, FAS 157-4 provides detailed and practical criteria on determining when a market is inactive and what transactions are not orderly. The guidance also requires more transparent disclosures to provide financial statement users with an understanding of significant management judgments involved in the use of Level 3 inputs.

In summary, the additional guidance clarifies that under distressed market conditions more transactions are likely to be not orderly and companies need to either make significant adjustments to the market prices or give less weight to the market-based inputs in fair value measurements. When relevant observable inputs are unavailable in an inactive market, the asset and liability classes previously classified as Level 1 or Level 2 would be transferred into Level 3 for valuation. On the contrary, when the markets for asset or liability classes return to normal conditions, relevant observable inputs based on the market prices would become available as main inputs to fair value measurements. Then the items previously transferred into the Level 3 category would be transferred out of Level 3 into Level 1 or Level 2.

[8] Level 3 inputs that inherently involve significant judgments increase the chance of additional auditor scrutiny and amplify potential litigation risks (Yanez, 2008). Ettredge, Xu, and Yi (2013) find that auditors charge higher fees for auditing less verifiable Level 2 and Level 3 assets than for Level 1 assets that are valued with observable market quotes. Botosan et al. (2011) show that banks facing higher litigation risk hold less Level 3 assets.

2.3. Prior research on value relevance of fair value accounting

Fair value estimates are considered to be value-relevant if a significant association is found between a company's fair value estimates and its stock returns under the assumption that the significant association indicates the fair values are relevant to investors and sufficiently reliable to be reflected in the company's stock prices (Barth, Landsman, & Rendleman, 2001). The coherent framework and enhanced disclosures mandated by FAS 157 on fair value measurements provide an opportunity to test the value relevance of the three levels in the fair value hierarchy. Consistent evidence has been found to support the prioritized fair value measures required by FAS 157. While fair value measurements in all three levels are value-relevant, the value relevance of Level 1 is the highest and the value relevance of Level 3 is the lowest (Song, Thomas, & Yi, 2010; Goh, Ng, & Yong, 2009).

Since our study examines the effect of the adjustment of valuation inputs in response to market variations on value relevance, we next review the literature for evidence about how the value relevance of fair value measures may vary with market conditions. When financial assets are actively traded, studies have consistently documented that fair values of these assets are value-relevant (Barth, 1994; Eccher, Ramesh, & Thiagarajan, 1996; Xu, Anandarajana, & Curatolab, 2011). When financial assets are less actively traded, evidence of fair value relevance becomes less consistent. While Carroll, Linsmeier, and Petroni (2003) still find thinly traded securities as value-relevant, Petroni and Wahlen (1995) find that fair values of less actively traded bonds are not value-relevant. Goh et al. (2009) find that the value relevance of fair value assets declines when market became more illiquid during the first three quarters of 2008.

Another strand of fair value accounting literature focuses on managerial opportunism that could affect the reliability of fair value measurements. The substantial management judgment involved in the adjustment of valuation inputs could open the gate for management bias or even abuses that has been documented in literature. Beaver and Venkatachalam (2003) find that the market assigns lower pricing for the discretionary component of bank loans if the management motivation for discretion is opportunistic. Several studies show that management use value increasing or decreasing discretion on valuation model assumptions based on various incentives in the case of stock option expense reporting (Aboody, Barth, & Kasznik, 2006; Bartov, Mohanram, & Nissim, 2007; Hodder, Mayew, McAnally, & Weaver, 2006). In addition, the value relevance of fair value estimates is more reliable in the presence of external appraisals as opposed to internal appraisals (Dietrich, Harris, & Muller, 2000; Muller & Riedl, 2002), even though Barth and Clinch (1998) find no difference between external and internal appraisals. More recently, Huang and Lin (2011) find a positive association between the fair value Level 3 assets and liabilities and subsequent financial restatements and auditor industry expertise partially relieves the chance of restatements.

On the other hand, accounting literature has shown that management uses reporting discretion to convey private

Please cite this article in press as: Du, H., et al. Adjustment of valuation inputs and its effect on value relevance of fair value measurement. *Research in Accounting Regulation* (2014), http://dx.doi.org/10.1016/j.racreg.2014.02.005

information for improved communication (Demski, 1998; Sankar & Subramanyam, 2001) and the market attaches value to discretionary accruals (Subramanyam, 1996). Specifically related to fair value accounting, Altamuro and Zhang (2013) argue that management have better information about their assets' fair value over an inactive market and incorporate their private information into the valuation inputs. They find that fair value of mortgage servicing rights valued using valuation models (Level 3 inputs) have a higher association with future servicing fee revenues than fair value of mortgage servicing rights based on market inputs (Level 2 inputs).

2.4. Hypothesis development

The transfers of assets into or out of Level 3 essentially represent adjustments of valuation inputs based on changes in market conditions. The transfers involve substantial management judgments in determining the appropriate valuation inputs from various sources of information. Furthermore, valuation of Level 3 assets and liabilities uses significant unobservable inputs such as management's assumptions and valuation models, which is inherently harder to verify than the market-based observable inputs. Prior studies have found evidence of noise or bias in fair value measurement when management exercises discretion in valuation inputs (Aboody et al., 2006; Bartov et al., 2007; Beaver & Venkatachalam, 2003; Benston, 2008; Hodder et al., 2006). The substantial management estimates involved in the valuation process may cause concerns among the investors and decrease the value relevance of the fair value measurements. On the other hand, prior research shows that in certain instances management may exercise their discretion in financial reporting to convey their private information about their companies' operations (Demski, 1998; Sankar & Subramanyam, 2001; Subramanyam, 1996). Similarly, management may have an information advantage over an inactive market about an asset's fair value and use their private information to credibly report fair value (Barth, Landsman, & Rendleman, 1998; Altamuro & Zhang, 2013). If the adjusted valuation inputs more closely reflect management's private information on fair value under the current market conditions, the banks that make transfers of assets may experience improvement in the relevance and reliability of fair value measurements.

Therefore, it is subject to empirical investigation whether the transfers of assets among the different levels in the fair value hierarchy translate into enhanced value relevance of fair value measurements. We state our hypothesis one in the null form:

H1. Value relevance of the three levels of fair value assets for the banks that transfer assets into and out of Level 3 assets is not different from the value relevance of the fair value assets for the banks that make no transfers.

It is worth noting that transfers of assets into the Level 3 category represent completely different market conditions from transfers of assets out of the Level 3 category. According to FAS 157-3, when observable inputs are questionable due to inactive market conditions for a financial asset, the asset "will be classified within Level 3 of the fair value hierarchy because ... significant adjustments using unobservable inputs are required to determine fair value" (FASB, 2008). On the contrary, transfers of assets out of Level 3 would arise from market recovery in which orderly transactions occur and observable inputs become available. Given prior evidence of the potential association between the value relevance of fair value measurements and the level of market activities (e.g., Barth, 1994; Carroll et al., 2003; Goh et al., 2009), it is necessary to conduct a separate investigation into the effect of the transfers of assets into the Level 3 category and the transfers of assets out of the Level 3 category on value relevance of fair value assets. We present our H2a and H2b also in the null form as the following:

H2a. Value relevance of the three levels of fair value assets for the banks that transfer assets into Level 3 is not different from the value relevance of the fair value assets for the banks that make no transfers.

H2b. Value relevance of the three levels of fair value assets for the banks that transfer assets out of Level 3 is not different from the value relevance of the fair value assets for the banks that make no transfers.

The issuance of FAS 157-3 and FAS 157-4 provides further guidance for determining fair value when the market is inactive or illiquid. It clarifies the rules to determine whether a transaction is not orderly and assess whether the market conditions require a change in the mixture of valuation inputs between observable market quotes and unobservable management assumptions. The guidance may help banks more appropriately apply fair value accounting standards and achieve better fair value measurements. Thus, the transfer of assets between the levels in the fair value hierarchy may lead to a more significant improvement in value relevance of banks' reported fair value measurements in the period after the guidance (post-guidance) was issued and adopted than in the period before the issuance of the guidance (pre-guidance). We state hypothesis three as follows:

H3. The improved value relevance of the three levels of fair value assets for the banks that transfer assets into and out of Level 3 assets over the banks that make no transfers is greater in the post-guidance period than in the pre-guidance period.

3. Research design

3.1. Sample description

Our sample consists of quarterly data of all US commercial banks (SIC 6000–6100) during January 1, 2008 to December 31, 2009. Accounting data are obtained from the COMPUSTAT quarterly file, and stock price data are obtained from CRSP. We keep only banks with the fiscal year ending on December 31 to align the macroeconomic

Please cite this article in press as: Du, H., et al. Adjustment of valuation inputs and its effect on value relevance of fair value measurement. *Research in Accounting Regulation* (2014), http://dx.doi.org/10.1016/j.racreg.2014.02.005

environments of our sample banks during the sample period. Our final sample contains 2524 bank quarters.

Among the 2524 bank quarters, we manually identified 393 bank quarters that transferred assets and liabilities into/out of the Level 3 category from the financial reports (10-Q and 10-K) banks filed with the SEC during 2008 and 2009. The amounts of transferred assets or liabilities and whether a transfer is into or out of Level 3 are also hand collected from banks' SEC filings.

3.2. Regression models

We test Hypotheses 1, 2, and 3 based on the regression model in Song et al. (2010), which estimates the estimate the association between share prices and fair values of assets and liabilities. To test the difference in value relevance of fair value assets between banks that make transfers and banks that make no transfers (i.e., Hypothesis 1), we interact the dummy variable *Transfer* with the three levels of fair value assets and liabilities in the following regression (Model 1). Positive coefficients for the interactive variables would indicate an improvement in value relevance of fair value assets and liabilities for the banks that make transfers over the banks that make no transfers. A detailed description of our research design and test variables may be found in Appendix A.

$$\begin{aligned} PRC_{it} = {} & a_0 + a_1 Transfer_{it} + a_2 NFVA_{it} + a_3 FVA1_{it} \\ & + a_4 FVA2_{it} + a_5 FVA3_{it} + a_6 NFVL_{it} + a_7 FVL12_{it} \\ & + a_8 FVL3_{it} + a_9 NI_{it} + a_{10} TrfFVA1_{it} \\ & + a_{11} TrfFVA2_{it} + a_{12} TrfFVA3_{it} + a_{13} TrfFVL12_{it} \\ & + a_{14} TrfFVL3_{it} + \varepsilon_{it} \end{aligned} \quad (1)$$

To make separate investigation of the effect of transfers-in and transfers-out on value relevance (i.e. H2), we estimate the following two regression models (Model 2a and Model 2b).

$$\begin{aligned} PRC_{it} = {} & a_0 + a_1 Transferin_{it} + a_2 NFVA_{it} + a_3 FVA1_{it} \\ & + a_4 FVA2_{it} + a_5 FVA3_{it} + a_6 NFVL_{it} + a_7 FVL12_{it} \\ & + a_8 FVL3_{it} + a_9 NI_{it} + a_{10} TrfinFVA1_{it} \\ & + a_{11} TrfinFVA2_{it} + a_{12} TrfinFVA3_{it} \\ & + a_{13} TrfinFVL12_{it} + a_{14} TrfinFVL3_{it} + \varepsilon_{it} \end{aligned} \quad (2a)$$

$$\begin{aligned} PRC_{it} = {} & a_0 + a_1 Transferout_{it} + a_2 NFVA_{it} + a_3 FVA1_{it} \\ & + a_4 FVA2_{it} + a_5 FVA3_{it} + a_6 NFVL_{it} \\ & + a_7 FVL12_{it} + a_8 FVL3_{it} + a_9 NI_{it} \\ & + a_{10} TrfoutFVA1_{it} + a_{11} TrfoutFVA2_{it} \\ & + a_{12} TrfoutFVA3_{it} + a_{13} TrfoutFVL12_{it} \\ & + a_{14} TrfoutFVL3_{it} + \varepsilon_{it} \end{aligned} \quad (2b)$$

These two regression models are essentially the same as Model 1 except that in Model 2a, the variable of *Transfer* is replaced by *Transferin* that equals 1 for banks that transfer assets into Level 3 and 0 for banks that make no transfers. In Model 2b, *Transfer* is replaced by *Transferout* that equals 1 for banks that transfer assets out of Level 3 and 0 for banks that make no transfers. All other variables are defined the same as in Model 1. In other words, we examine the effect of transfers-in on value relevance using a sample that consists of the banks that make transfers of assets into Level 3 and all banks making no transfers. We examine the effect of transfers-out on value relevance using a sample that consists of banks that make transfers of assets out of Level 3 and all banks making no transfers.

FAS 157-3 was issued on October 10, 2008 and became effective upon issuance. FASB issued FAS 157-4 on April 4, 2009, which is effective for fiscal periods after June 15, 2009 and can be early adopted for periods after March 15, 2009. We partitioned the eight quarters in our sample into two periods, the pre-guidance period (i.e., Q1 and Q2 of 2008) and post-guidance adoption period (i.e., from Q3, 2008 to Q4, 2009) and run Model 1 using the subsamples in the two periods to test H3. We then compare the coefficients of the fair value assets variables between the sub-sample periods to investigate the effect of the issuance of the fair value guidance on value relevance.

4. Results

4.1. Sample descriptive statistics

As shown in Table 1, our sample contains 393 bank quarters that made transfers of assets and liabilities into and/or out of Level 3, ranging from 15 banks in the first quarter of 2008 to 80 banks in the last quarter of 2008. The vast majority of the transfers involve fair value assets. There are 384 bank quarters that made transfers of fair value assets and only 35 bank quarters that made transfers of fair value liabilities.[9] With respect to the size of the transfers, the average ratio of the amount of assets transferred into/out of Level 3 category over the total amount of fair value assets is also 4.5%, whereas the average ratio of the amount of liabilities transferred into/out of Level 3 category over the total amount of fair value liabilities is 23.3%. The size of the transfers varies considerably across the quarters.

Table 2 Panel A presents descriptive statistics for the full sample of 2524 bank quarters. The banks in the sample have average total assets of $17.954 billion. The means of Levels 1, 2 and 3 fair value assets as a percentage of total assets are 1%, 14.3% and 0.5%, respectively, whereas the means of Levels 1, 2 and 3 fair value liabilities as a percentage of total assets are only 0%, 0.05% and 0.1%, respectively. Consistent with prior research (e.g., Altamuro & Zhang, 2013; Song et al., 2010), Level 2 assets account for the majority of the items carried at fair value. Due to the relatively small size of Level 1 fair value liabilities, we combined Level 1 and Level 2 liabilities for the regression analyses (see the next section).

In Panel B we compare variable means for bank quarters with transfers of fair value assets/liabilities (393 firm quarters) and bank quarters without such transfers (2131 firm quarters). The statistics indicate that the banks that make transfers of assets and liabilities into/out of Level 3 are

[9] The total number of transfers of assets and transfers of liabilities exceeds 393 because there are banks that transferred both assets and liabilities in the same quarter.

Please cite this article in press as: Du, H., et al. Adjustment of valuation inputs and its effect on value relevance of fair value measurement. *Research in Accounting Regulation* (2014), http://dx.doi.org/10.1016/j.racreg.2014.02.005

Table 1
Analysis of transfers of fair value assets and liabilities during 2008–2009.

Period	Number of transfers	TransferAL/FV	Number of transfers of assets	TransferA/FVA	Number of transfers of liabilities	TransferL/FVL
Q1, 2008	15	0.013	15	0.014	1	0.001
Q2, 2008	36	0.030	36	0.030	2	0.000
Q3, 2008	71	0.077	69	0.075	6	0.656
Q4, 2008	80	0.078	79	0.078	8	0.364
Q1, 2009	43	0.020	42	0.023	4	0.001
Q2, 2009	37	0.010	36	0.011	2	0.007
Q3, 2009	42	0.028	40	0.031	6	0.096
Q4, 2009	69	0.030	67	0.031	6	0.120
Total	393	N/A	384	N/A	35	N/A
Average	N/A	0.045	N/A	0.045	N/A	0.233

This table provides the statistics of the transfers of assets and liabilities in and out of the Level 3 category during the eight quarters in 2008 and 2009. TransferAL/FV is the sample average of the ratio of the amount of assets and liabilities transferred by a bank in/out of Level 3 category during a quarter over the total of amount of fair value assets and liabilities. TransferA/FVA (TransferL/FVL) is the sample average of the ratio of the amount of assets (liabilities) transferred by a bank in/out of Level 3 category during a quarter over the total of amount of fair value assets (liabilities).

significantly larger and have more fair value assets and liabilities than the banks that made no transfers, especially in the level 2 assets and level 2 liabilities categories.

Panel C provides descriptive information for each of the two sub-sample periods; i.e., pre-guidance period (the first two quarters of 2008) and post-guidance period (the last two quarters of 2008 and the four quarters of 2009). There are 563 and 1961 bank quarters in the two periods, respectively. Consistent with the full sample statistics, Level 2 fair value assets account for most of the items carried at fair value in all three periods.

4.2. Regression analysis

To test Hypothesis 1, we estimate Model 1 on the full sample and report the regression results in Table 3. The coefficients on the three levels of fair value assets/liabilities (FVA1, FVA2, FVA3, FVL12 and FVL3) represent the valuations of these assets/liabilities for banks that made no transfers of assets and liabilities. Consistent with Song et al. (2010), the coefficients on the assets are all significantly positive while the coefficients on the liabilities are all significantly negative. The dummy variable Transfer is significantly negative, which represents an adjustment to the positive regression intercept for the banks that make transfers. The coefficients on the interaction terms reflect the incremental value relevance of fair value assets/liabilities for banks that made transfers of assets and liabilities into/out of the Level 3 category over the banks that made no transfers. The coefficients on the three asset interaction terms are all significantly positive, indicating that investors perceive all levels of the reported fair value assets to be more value relevant for banks that made transfers than for banks that made no transfers. The coefficients on the liability interaction terms are not significantly different from zero. This may be due to the relatively small number of banks that made transfers of fair value liabilities. The limited number of transfers of fair value liabilities put a constraint on our ability to obtain a reliable regression analysis of the effect of the transfers of liabilities on value relevance. Therefore, we focus on investigating the effect of transfers of fair value assets on value relevance, while the fair value liabilities are included in the model to control for the effect of the transfers of liabilities.

Various factors could affect the value relevance of fair value measurements. If the banks that make transfers of assets happen to have certain characteristics that are associated with value relevance, it would be unclear whether the documented improvement in value relevance should be attributed to the transfers of assets among the levels of the fair value hierarchy or to those firm characteristics. In our sample, the banks that make transfers of assets are on average larger and carry more fair value assets than banks that make no transfers. The difference in value relevance of fair value assets between the two groups of banks may be due to the possibility that investors simply perceive the fair value measurements reported by banks that are larger and have more assets measured at fair value to be more value relevant than those reported by banks that are smaller and carry less assets at fair value. As an attempt to distinguish the potential factors affecting value relevance, we conduct supplemental analysis to examine the effect of bank size and the amount of fair value assets on value relevance of fair value measurements.

We partition our sample by bank size and by the amount of fair value assets, respectively, and compare the value relevance of fair value assets between the subsamples. Table 4 presents the results of the additional analysis. We find that bank size does not have consistent associations with value relevance. The results indicate that value relevance of Level 1 and Level 3 assets is higher for large banks than for small banks but the value relevance of Level 2 assets is higher for small banks than for large banks. Similar to bank size, the amount of fair value assets also has a mixed effect on value relevance. Banks that have more fair value assets have a higher level of value relevance for Level 1 assets and lower value relevance for Level 2 assets compared with banks that have less fair value assets. Overall, the tests suggest that our documented difference in value relevance is not driven by firm size and the amount of fair value assets. Transfers of assets among the

Please cite this article in press as: Du, H., et al. Adjustment of valuation inputs and its effect on value relevance of fair value measurement. *Research in Accounting Regulation* (2014), http://dx.doi.org/10.1016/j.racreg.2014.02.005

Table 2
Descriptive statistics.

	Mean	Std. Dev.	Quartile 1	Median	Quartile 3	*N*
Panel A: whole sample statistics						
TA	17,954	144,454	705	1433	3585	2524
FVA1/TA	0.010	0.030	0.000	0.000	0.003	2524
FVA2/TA	0.143	0.112	0.070	0.131	0.192	2524
FVA3/TA	0.005	0.014	0.000	0.000	0.003	2524
FVL1/TA	0.000	0.002	0.000	0.000	0.000	2524
FVL2/TA	0.005	0.057	0.000	0.000	0.001	2524
FVL3/TA	0.001	0.003	0.000	0.000	0.000	2524
NFVA	138.49	100.41	85.30	125.50	165.53	2524
FVA1	2.36	16.91	0.00	0.03	0.47	2524
FVA2	24.43	36.34	8.12	17.69	30.34	2524
FVA3	0.95	3.37	0.00	0.00	0.44	2524
NFVL	149.26	109.93	92.05	133.72	176.99	2524
FVL12	2.09	28.14	0.00	0.00	0.02	2524
FVL3	0.12	0.95	0.00	0.00	0.00	2524
NI	−0.22	1.23	−0.19	0.10	0.26	2524
PRC	11.70	10.16	5.45	9.56	15.60	2524

	Banks with transfers		Banks without transfers		*t*-Test comparing means	
	Mean	*N*	Mean	*N*	*t*-Stats	*p*-Value
Panel B: variable means for banks with transfers and banks without transfers						
TA	96,778	393	3439	2131	5.20	<0.01
FVA1/TA	0.012	393	0.009	2131	1.62	0.11
FVA2/TA	0.184	393	0.136	2131	5.68	<0.01
FVA3/TA	0.015	393	0.003	2131	10.55	<0.01
FVL1/TA	0.001	393	0.000	2131	4.91	<0.01
FVL2/TA	0.028	393	0.001	2131	3.71	<0.01
FVL3/TA	0.002	393	0.000	2131	4.28	<0.01
NFVA	153.48	393	136	2131	3.34	<0.01
FVA1	3.06	393	2.22	2131	1.26	0.20
FVA2	40.28	393	21.43	2131	4.83	<0.01
FVA3	3.58	393	0.45	2131	8.99	<0.01
NFVL	170.07	393	145.25	2131	4.32	<0.01
FVL12	12.15	393	0.23	2131	3.35	<0.01
FVL3	0.49	393	0.05	2131	3.86	<0.01
NI	−0.30	393	−0.21	2131	1.14	0.25
PRC	13.88	393	11.31	2131	4.42	<0.01

	Pre-guidance		Post-guidance	
	Mean	*N*	Mean	*N*
Panel C: variable means by sample periods				
TA	19,316	563	17,586	1961
FVA1/TA	0.015	563	0.008	1961
FVA2/TA	0.131	563	0.147	1961
FVA3/TA	0.004	563	0.005	1961
FVL1/TA	0.000	563	0.000	1961
FVL2/TA	0.006	563	0.005	1961
FVL3/TA	0.000	563	0.001	1961
NFVA	141.74	563	137.47	1961
FVA1	3.724	563	1.96	1961
FVA2	21.762	563	25.11	1961
FVA3	0.850	563	0.96	1961
NFVL	150.70	563	148.66	1961
FVL12	2.349	563	2.01	1961
FVL3	0.113	563	0.12	1961
NI	0.06	563	−0.30	1961
PRC	14.50	563	10.91	1961

The whole sample includes 2524 firm-quarters during the eight quarters from January 1, 2008 to December 31, 2009. The pre-guidance period covers the first two quarters of the sample period, the adopting-guidance period covers the middle four quarters, and the post-guidance period covers the last two quarters. TA is total assets. FVA1/TA (FVL1/TA) is Level 1 assets (liabilities) deflated by total assets. FVA2/TA (FVL2/TA) is Level 2 assets (liabilities) deflated by total assets. FVA3/TA (FVL3/TA) is Level 3 assets (liabilities) deflated by total assets. NFVA (NFVL) is non-fair value assets (liabilities) per share. FVA1, FVA2, and FVA3 are fair value assets per share from Levels 1, 2, and 3 inputs, respectively. FVL12 and FVL3 are fair value liabilities per share from Levels 1 and 2 combined and Level 3 inputs, respectively. NI is net income before extraordinary items per share. PRC is the stock price at the end of the month in which a bank files 10-Q or 10-K with the SEC.

Please cite this article in press as: Du, H., et al. Adjustment of valuation inputs and its effect on value relevance of fair value measurement. *Research in Accounting Regulation* (2014), http://dx.doi.org/10.1016/j.racreg.2014.02.005

Table 3
Effect of transfers of fair value assets and liabilities on value relevance.

Variable	Coefficient	*p*-Value
Panel A: analysis of value relevance for whole sample		
Intercept	4.01	<0.01
Transfer	−1.76	0.01
NFVA	0.59	<0.01
FVA1	0.78	<0.01
FVA2	0.67	<0.01
FVA3	0.25	0.01
NFVL	−0.61	<0.01
FVL12	−0.75	<0.01
FVL3	−1.63	<0.01
NI	1.65	<0.01
TrfFVA1	0.19	<0.01
TrfFVA2	0.06	<0.01
TrfFVA3	0.46	<0.01
TrfFVL12	−0.01	0.88
TrfFVL3	0.57	0.25
Number of observations	2524	
−2 Log likelihood	16,209	

This table provides the result of panel data maximum likelihood regression analysis of share price on non-fair value and fair value assets and liabilities and earnings, controlling for the firm and quarter fixed effect. The total sample period covers the eight quarters from Jan 1, 2008 to Dec. 31, 2009. To avoid the effect from extreme outliers, observations with studentized residuals greater than 2 in the estimation of the regression model are eliminated, following Belsley et al. (1980) and Fox (1991). NFVA is non-fair value assets per share. FVA1, FVA2, and FVA3 are fair value assets per share from Levels 1, 2, and 3 inputs, respectively. NFVL is non-fair value liabilities per share. FVL12 and FVL3 are fair value liabilities per share from combined Levels 1 and 2 and Level 3 inputs, respectively. NI is net income before extraordinary items per share. Transfer is a dummy variable that equals 1 for firm-quarters with transfers of assets and liabilities in and out of the Level 3 category and 0 otherwise. TrfFVA1, TrfFVA2, TrfFVA3, TrfFVL12 and TrfFVL3 are interaction terms of Transfer with FVA1, FVA2, FVA3, FVL12 and FVL3.

Table 4
Effect of bank characteristics on value relevance of assets and liabilities carried at fair value.

Variable	Coefficient	*p*-Value
Panel A: large vs. small banks		
Post157-4	4.56	<0.01
BigSz	4.26	<0.01
NFVA	0.59	<0.01
FVA1	0.64	<0.01
FVA2	0.70	<0.01
FVA3	0.32	0.01
NFVL	−0.62	<0.01
FVL12	−0.73	<0.01
FVL3	−1.61	<0.01
NI	1.89	<0.01
FVA1BigSz	0.19	<0.01
FVA2BigSz	−0.07	<0.01
FVA3BigSz	0.69	<0.01
FVL12BigSz	0.06	0.80
FVL3BigSz	0.82	0.24
Number of observations	2524	
−2 Log Likelihood	16,215	
Panel B: banks with high and low amounts of assets and liabilities carried at fair value		
Intercept	4.78	<0.01
HighFV	2.29	<0.01
NFVA	0.65	<0.01
FVA1	0.71	<0.01
FVA2	0.86	<0.01
FVA3	1.05	<0.01
NFVL	−0.69	<0.01
FVL12	−0.14	0.59
FVL3	−1.71	0.03
NI	1.73	<0.01
FVA1HighFV	0.19	0.04
FVA2HighFV	−0.14	<0.01
FVA3HighFV	−0.17	0.24
FVL12HighFV	−0.60	0.02
FVL3HighFV	0.84	0.33
Number of observations	2524	
−2 Log Likelihood	16,266	

This table provides the result of panel data maximum likelihood regression analysis of share price on non-fair value and fair value assets and liabilities and earnings, controlling for the firm and quarter fixed effect. The total sample period covers the eight quarters from Jan 1, 2008 to Dec. 31, 2009. BigSz is a dummy variable that equals 1 if a bank's total assets are above the sample median value and 0 otherwise. FVA1BigSz, FVA2BigSz, FVA3BigSz, FVL12BigSz and FVL3BigSz are interaction terms of BigSz with FVA1, FVA2, FVA3, FVL12 and FVL3. HighFV is a dummy variable that equals 1 if a bank's ratio total assets and liabilities carried at fair value over total assets is above the sample median value and 0 otherwise. FVA1HighFV, FVA2HighFV, FVA3HighFV, FVL12HighFV and FVL3HighFV are interaction terms of HighFV with FVA1, FVA2, FVA3, FVL12 and FVL3.

levels of the fair value hierarchy play an important role for the improved value relevance of fair value assets.

Next, we examine whether the types of transfers (transfers-in or transfers-out[10]) affect the value relevance of fair value estimates and we present the results in Table 5. The test results indicate that transfers-in and transfers-out have a similar effect on the value relevance of banks' reported fair value measurements. As discussed in the hypothesis section, transfers-in are more likely to occur when the market conditions deteriorate and transfers-out tend to occur when the market recovers and activities increase. The increased level of value relevance associated with both transfers-in and transfers-out suggest that adjusting valuation inputs and transferring assets among the levels of fair value hierarchy to reflect changes in market conditions generally improve fair value measurements no matter whether the market activity levels are high or level.

Lastly, we repeat the regression analysis using two subsamples and compare regression coefficients between the pre-guidance and post-guidance periods to explore whether the issuance of FAS 157-3 and FAS 157-4 affects the value relevance of fair value information.[11] The results are presented in Table 6. We focus on Level 3 assets in the analysis. FAS 157-3 and FAS 157-4 tend to have a larger impact on Level 3 assets since both provide further guidance for banks to identify the specific situations where fair value should be measured with less market inputs and more unobservable Level 3 inputs. Our results suggest that in

[10] There are 256 bank quarters that made transfers of assets into Level 3 and 137 bank quarters that made transfers of assets out of Level 3 in our sample.

[11] We use the z-test to compare the regression coefficients for the two subsample periods. Clogg, Petkova, and Haritou (1995) and Brame, Paternoster, Mazerolle, and Piquero (1998) show that the z-test yields an unbiased estimate of standard errors on the difference of two regression coefficients obtained from separate samples. The approach is also used in Altamuro and Zhang (2013).

Please cite this article in press as: Du, H., et al. Adjustment of valuation inputs and its effect on value relevance of fair value measurement. *Research in Accounting Regulation* (2014), http://dx.doi.org/10.1016/j.racreg.2014.02.005

Table 5
Effect of transfer-ins and transfer-outs of fair value assets and liabilities on value relevance.

Variable	Transfer-ins			Transfer-outs	
	Coefficient	*p*-Value	Variable	Coefficient	*p*-Value
Intercept	3.90	<0.01	Intercept	4.34	<0.01
Transferin	−1.53	0.02	Transferout	−2.50	<0.01
NFVA	0.61	<0.01	NFVA	0.57	<0.01
FVA1	0.79	<0.01	FVA1	0.77	<0.01
FVA2	0.68	<0.01	FVA2	0.65	<0.01
FVA3	0.26	<0.01	FVA3	0.23	<0.01
NFVL	−0.63	<0.01	NFVL	−0.59	<0.01
FVL12	−0.77	<0.01	FVL12	−0.72	<0.01
FVL3	−1.65	<0.01	FVL3	−1.61	<0.01
NI	1.62	<0.01	NI	1.71	<0.01
TrfinFVA1	0.28	<0.01	TrfoutFVA1	0.05	0.62
TrfinFVA2	0.05	<0.01	TrfoutFVA2	0.08	<0.01
TrfinFVA3	0.49	<0.01	TrfoutFVA3	0.44	<0.01
TrfinFVL12	−0.01	0.90	TrfoutFVL12	−0.08	0.47
TrfinFVL3	0.37	0.47	TrfoutFVL3	2.15	<0.01
Number of observations	2387			2268	
−2 Log likelihood	15,418			14,575	

This table provides the result of panel data regression of share price on non-fair value and fair value assets and liabilities and earnings, controlling for the firm and quarter fixed effect. The sample period covers the eight quarters during 2008 to 2009. To avoid the effect from extreme outliers, observations with studentized residuals greater than 2 in the estimation of the regression model are eliminated, following Belsley et al. (1980) and Fox (1991). NFVA is non-fair value assets per share. FVA1, FVA2, and FVA3 are fair value assets per share from Levels 1, 2, and 3 inputs, respectively. NFVL is non-fair value liabilities per share. FVL12 and FVL3 are fair value liabilities per share from combined Levels 1 and 2 and Level 3 inputs, respectively. NI is net income before extraordinary items per share. Transferin (Transferout) is a dummy variable that equals 1 for firm-quarters with transfers of assets and liabilities into (out of) the Level 3 category and 0 for banks with no transfers. TrfinFVA1 (TrfoutFVA1), TrfinFVA2 (TrfoutFVA2), TrfinFVA3 (TrfoutFVA3), TrfinFVL12 (TrfoutFVL12) and TrfinFVL3 (TrfoutFVL3) are interaction terms of Transfer-in (Transfer-out) with FVA1, FVA2, FVA3, FVL12 and FVL3.

Table 6
Effect of transfers on value relevance in the pre-guidance and post-guidance periods.

Variable	Pre-guidance		Post-guidance	
	Coefficient	*p*-Value	Coefficient	*p*-Value
Intercept	5.00	<0.01	3.47	<0.01
Transfer	−2.80	0.05	−1.34	0.02
NFVA	0.59	<0.01	0.61	<0.01
FVA1	0.72	<0.01	0.82	<0.01
FVA2	0.68	<0.01	0.69	<0.01
FVA3	0.47	<0.01	0.18	0.07
NFVL	−0.60	<0.01	−0.63	<0.01
FVL12	−0.80	<0.01	−0.81	<0.01
FVL3	−1.88	0.02	−1.49	<0.01
NI	2.40	<0.01	1.41	<0.01
TrfFVA1	0.49	<0.01	0.10	0.17
TrfFVA2	0.06	0.11	0.06	<0.01
TrfFVA3	0.17	0.51	0.58	<0.01
TrfFVL12	0.03	0.82	0.02	0.87
TrfFVL3	−0.60	0.57	0.70	0.21
Number of observations	563		1961	
−2 Log Likelihood	3466	12,587		

Comparison of coefficients between pre-guidance vs. post-guidance period

	z-Stats	*p*-Value
TrfFVA1	1.97	0.05
TrfFVA2	0.12	0.90
TrfFVA3	1.90	0.06

This table provides the result of panel data maximum likelihood regression analysis of share price on non-fair value and fair value assets and liabilities and earnings, controlling for the firm and quarter fixed effect. The pre-guidance period covers the first two quarters of the sample period from Q1, 2008 to Q2, 2008, and the post-guidance period covers the six quarters from Q3, 2008 to Q4, 2009. To avoid the effect from extreme outliers, observations with studentized residuals greater than 2 in the estimation of the regression model are eliminated, following Belsley et al. (1980) and Fox (1991). NFVA is non-fair value assets per share. FVA1, FVA2, and FVA3 are fair value assets per share from Levels 1, 2, and 3 inputs, respectively. NFVL is non-fair value liabilities per share. FVL12 and FVL3 are fair value liabilities per share from combined Levels 1 and 2 and Level 3 inputs, respectively. NI is net income before extraordinary items per share. Transfer is a dummy variable that equals 1 for firm-quarters with transfers of assets and liabilities in and out of the Level 3 category and 0 otherwise. TrfFVA1, TrfFVA2, TrfFVA3, TrfFVL12 and TrfFVL3 are interaction terms of Transfer with FVA1, FVA2, FVA3, FVL12 and FVL3.

Please cite this article in press as: Du, H., et al. Adjustment of valuation inputs and its effect on value relevance of fair value measurement. *Research in Accounting Regulation* (2014), http://dx.doi.org/10.1016/j.racreg.2014.02.005

the pre-guidance period the investors seem to perceive a similar level of value relevance of Level 3 assets for banks that made transfers and for banks that made no transfers. In the post-guidance period, they perceive the reported fair value of Level 3 assets to be more value relevant for banks that made transfers than for banks that made no transfers. Overall, the evidence is consistent with the issuance of FAS 157-3 and FAS 157-4 leading to an improvement in the value relevance of Level 3 assets that are valued with significant unobservable inputs.[12]

The timing for the issuance of the fair value guidance coincided with several changes in the financial market. In the course of the financial crisis, banks may have made substantial changes to the composition of their assets classes carried at fair value. The government bailout program affected many banks' control and ownership. The debate over fair value accounting and increased public attention may also affect investors' perception of the value relevance of reported fair value. In addition, there has been a remarkable change in market activity levels in the early and later stages of the financial crisis. Therefore, the documented improvement in value relevance in the post-guidance period is subject to the effect of various confounding factors. The design of our test model provides control for the contemporaneous factors. In the sub-sample analysis, we separate the pre-guidance period from the post-guidance period. We first compare the value relevance of fair value assets between the transfer and non-transfer banks in the same sub-sample period and then compare the regression coefficients between the two sub-sample periods. The difference-in-difference design could help tease out the effect of the other contemporaneous confounding factors.

5. Conclusions

We study the effect of adjusting valuation inputs in response to market variations on value relevance by comparing the value relevance of fair value assets between banks that make transfers of assets into/out of the Level 3 category of the fair value hierarchy and banks that make no transfers. According to the fair value accounting standards, when observable Level 1 and Level 2 inputs become unavailable in an inactive or illiquid market, companies need to make transfers into the Level 3 category where substantial unobservable inputs are used to estimate fair value. When the market recovers and Level 1 and Level 2 inputs become available, companies need to transfer assets out of Level 3 back into Level 1 and Level 2 and use observable market-based inputs to determine fair value.

We find a significant increase in value relevance of all three levels of fair value assets for banks that make transfers compared to banks that do not make such transfers. The results are robust given that we conduct additional tests to examine the effect of bank size and the amount of fair value assets and liabilities on value relevance. Further analyses show that transfers of assets into and transfers of assets out of the Level 3 category have a similar effect on value relevance of fair value information. In addition, the increase in value relevance of Level 3 assets for banks that make transfers mainly occur in the period after the fair value guidance was issued. Overall, we conclude that value relevance of fair value measurements is improved when companies adjust valuation inputs to reflect changes in market conditions.

Our study examines a challenging situation in the application of fair value standards where fair value measurement involves substantial management judgment and potential estimate errors and manipulation. Our findings provide useful information for researchers, regulators and accounting professionals to assess the market's perception of the reliability of fair value information generated under volatile market conditions and to evaluate the effect of allowing management discretion in determining appropriate valuation inputs. Furthermore, the issuance of the fair value guidance initially created controversy among the banking industry, the investor advocates, and the accounting professional organizations. The overall positive effect we find in our study should alleviate concerns expressed by investor advocates and accounting professionals over fair value standards.

Our study is subject to a number of limitations. Due to the substantial amount of effort involved in hand-collecting data from the SEC filings, we limit our sample to the banking industry in the eight quarters from 2008 to 2009. We select the banking industry because banks tend to have more assets and liabilities carried at fair value. Our sample period from 2008 to 2009 coincides with the financial crisis and a period of a volatile market. The level of value relevance for fair value assets and liabilities in a stable market may differ from that in a volatile market. Therefore, readers may need to exercise caution in generalizing our findings to firms in other industries and to other periods.

The data statistics demonstrate a significant difference in bank size and amount of fair value assets between bank quarters that made transfers and bank quarters that did not make transfers. The differences raise questions on whether the two groups of banks have different types of assets mix and whether banks that did not make transfers did not do so because their assets are less likely in markets that became chaotic.[13] While this is an interesting aspect to be examined, the lack of data makes us unable to conduct further analysis on this issue.[14]

In addition, we focus on investigating the effect of adjusting valuation inputs to reflect market variations and transfers of assets between the three categories in the fair value hierarchy based on value relevance of fair value measurements. We leave to future research the examination of the effect of corporate governance and opportunistic management incentives on value relevance.

[12] Due to the small number of transfer-out banks in the pre-guidance period, we do not conduct sub-period regression analysis on transfers-in and transfers-out.

[13] We thanks the anonymous reviewers and the editor for suggesting the possibility that assets transfers could be correlated with banks' assets mix.

[14] A large portion of our sample banks do not provide detailed information on their fair value assets mix in their financial reports.

Please cite this article in press as: Du, H., et al. Adjustment of valuation inputs and its effect on value relevance of fair value measurement. *Research in Accounting Regulation* (2014), http://dx.doi.org/10.1016/j.racreg.2014.02.005

Acknowledgement

We thank the discussant and the audiences in the 2011 AAA annual meeting for their insightful comments that helped to improve the paper.

Appendix A. Details of research design

Following the methodology in Song et al. (2010), we use the share-deflated specification to control for the size effects and examine the associations between stock prices and the various categories of fair value assets and liabilities by estimating the following model (Model 1):

$$\begin{aligned} PRC_{it} = {} & a_0 + a_1 Transfer_{it} + a_2 NFVA_{it} + a_3 FVA1_{it} \\ & + a_4 FVA2_{it} + a_5 FVA3_{it} + a_6 NFVL_{it} + a_7 FVL12_{it} \\ & + a_8 FVL3_{it} + a_9 NI_{it} + a_{10} TrfFVA1_{it} \\ & + a_{11} TrfFVA2_{it} + a_{12} TrfFVA3_{it} + a_{13} TrfFVL12_{it} \\ & + a_{14} TrfFVL3_{it} + \varepsilon_{it} \end{aligned} \quad (1)$$

Where for bank i at time t:

PRC = price per share measured on the 10-Q filing month end;
Transfer = 1 if the bank makes transfers of assets and liabilities into and out of Level 3, and 0 otherwise;
NFVA = non-fair value assets per share;
FVA1 = Level 1 assets per share;
FVA2 = Level 2 assets per share;
FVA1 = Level 3 assets per share;
NFVL = non-fair value liabilities per share;
FVL12 = Level 1 and Level 2 liabilities combined per share;
FVL3 = Level 3 liabilities per share;
NI = net income per share;
TrfFVA1 = *Transfer* ∗ *FVA1*
TrfFVA2 = *Transfer* ∗ *FVA2*
TrfFVA3 = *Transfer* ∗ *FVA3*
TrfFVL12 = *Transfer* ∗ *FVL12*
TrfFVL3 = *Transfer* ∗ *FVL3*

Due to the relatively small size of Level 1 fair value liabilities in our sample (see Table 2), we combine Level 1 and Level 2 liabilities (Song et al., 2010). Following Belsley, Kuh, and Welsch (1980), Fox (1991) and Song et al. (2010), we eliminate the extreme outliers with studentized residuals greater than 2 when estimating Model 1. Our test statistics are based on heteroscedasticity robust standard errors to control for the possible correlations within clusters, consistent with Rogers (1993) and Song et al. (2010). We run Model 1 using maximum likelihood estimation controlling for the quarter and firm fixed effects.

References

Aboody, D., Barth, M. E., & Kasznik, R. (2006). Do firms understate stock option-based compensation expense disclosed under FAS 123? *Review of Accounting Studies, 11*(4), 429–461.
Altamuro, J., & Zhang, H. (2013). The financial reporting of fair value based on model inputs versus market inputs: Evidence from mortgage servicing rights. Review of Accounting Studies, forthcoming.
American Bankers Association. (2008). Letter to Robert H. Herz, Chairman, Financial Accounting Standards Board. November 13.
Badertscher, B. A., Burks, J. J., & Easton, P. D. (2012). A convenient scapegoat: fair value accounting by commercial banks during the financial crisis. *The Accounting Review, 87*(1), 59–90.
Barth, M. E. (1994). Fair value accounting: Evidence from investment securities and the market valuation of banks. *The Accounting Review, 69*(1), 1–25.
Barth, M. E., & Clinch, G. (1998). Revalued financial tangible, and intangible assets: Associations with share prices and non-market-based value estimates. *Journal of Accounting Research, 36*(3), 199–233.
Barth, M. E., Landsman, W. R., & Rendleman, R. J. Jr., (1998). Option pricing-based bond value estimates and a fundamental components approach to account for corporate debt. *The Accounting Review, 73*(1), 73–102.
Barth, M. E., Landsman, W. R., & Rendleman, R. J. Jr., (2001). The relevance of the value relevance literature for accounting standard setting: Another view. *Journal of Accounting and Economics, 31*(1–3), 77–104.
Bartov, E., Mohanram, P., & Nissim, D. (2007). Managerial discretion and the economic determinations of the disclosed volatility parameter for valuing ESOs. *Review of Accounting Studies, 12*(1), 155–179.
Beaver, W., & Venkatachalam, M. (2003). Differential pricing of components of bank loan fair values. *Journal of Accounting, Auditing & Finance, 18*(1), 41–67.
Belsley, D. A., Kuh, E., & Welsch, R. E. (1980). *Regression diagnostics: Identifying influential data and sources of collinearity*. New York: John Wiley & Sons Inc.
Benston, G. J. (2008). The shortcomings of fair value accounting described in SFAS 157. *Journal of Accounting and Public Policy, 27*(2), 101–114.
Bhat, G., Frankel, R., & Martin, X. (2011). Panacea, Pandora's box, or placebo: Feedback in bank holdings of mortgage-backed securities and fair value accounting. *Journal of Accounting and Economics, 52*(2–3), 153–173.
Botosan, C.A., Carrizosa, R., & Huffman, A. (2011). Factors influencing banks' use of level 3 valuation inputs during the financial crisis. Working paper, University of Utah.
Brame, R., Paternoster, R., Mazerolle, P., & Piquero, A. (1998). Testing for the equality of maximum likelihood regression coefficients between two independent equations. *Journal of Quantitative Criminology, 141*, 245–261.
Carroll, T. J., Linsmeier, T. J., & Petroni, K. R. (2003). The reliability of fair value versus historical cost information: Evidence from closed-end mutual funds. *Journal of Accounting, Auditing & Finance, 18*(1), 1–23.
Clogg, C. C., Petkova, E., & Haritou, A. (1995). Statistical methods for comparing regression coefficients between models. *American Journal of Sociology, 100*, 1261–1293.
Demski, J. (1998). Performance measure manipulation. *Contemporary Accounting Research, 15*(3), 261–285.
Dietrich, J. R., Harris, M. S., & Muller, K. A. III, (2000). The reliability of investment property fair value estimates. *Journal of Accounting and Economics, 30*(2), 125–158.
Dorminey, J. W., & Apostolou, B. (2012). Hedging derivatives in the banking industry: Evidence of investor confusion. *Research in Accounting Regulation, 24*(2), 65–73.
Eccher, E. A., Ramesh, K., & Thiagarajan, S. R. (1996). Fair value disclosures by bank holding companies. *Journal of Accounting and Economics, 22*(1–3), 79–117.
Ettredge, M. L., Xu, Y., & Yi, H. (2013). Fair value measurements, auditor industry expertise, and audit fees: Evidence from the banking industry. Working Paper, University of Kansas.
Financial Accounting Standards Board (FASB). (2006). *Fair Value Measurements*. Statement of Financial Accounting Standards No. 157. Norwalk, CT: FASB.
Financial Accounting Standards Board (FASB). (2008). *Determining the Fair Value of a Financial Asset When the Market for That Asset IS Not Active*. FASB Staff Position FSP No. 157–3. Norwalk, CT: FASB.
Financial Accounting Standards Board (FASB). (2009). *Determining Fair Value When the Volume and Level of Activity for the Asset or Liability Have Significantly Decreased and Identifying Transactions That Are Not Orderly*. FASB Staff Position FSP No. 157-4. Norwalk, CT: FASB.
Financial Crisis Advisory Group (FCAG). (2009). Report of the Financial Crisis Advisory Group. July 28, 2009. Available at: <http://www.fasb.org/cs/ContentServer?c=Document_C&pagename=FASB%2FDocument_C%2FDocumentPage&cid=1176156365880>.
Fox, J. (1991). *Regression diagnostics*. Newbury Park, CA: Sage.
Government Accountability Office (GAO). (2013). GAO-13-71: Causes and Consequences of Recent Bank Failures. Available at <http://www.gao.gov/assets/660/651154.pdf>.

Please cite this article in press as: Du, H., et al. Adjustment of valuation inputs and its effect on value relevance of fair value measurement. *Research in Accounting Regulation* (2014), http://dx.doi.org/10.1016/j.racreg.2014.02.005

Goh, B., Ng, J., & Yong, K. (2009). Market pricing of banks' fair value assets reported under SFAS 157 during the 2008 economic crisis. Working paper, Singapore Management University.

Goh, B., Ng, J., & Yong, K. (2011). Fair value disclosures beyond SFAS 157's three-level estimates. Working paper, Singapore Management University.

Hodder, L., Mayew, W., McAnally, M., & Weaver, C. (2006). Employee stock option fair-value estimates: Do managerial discretion and incentives explain accuracy? *Contemporary Accounting Research, 23*(4), 933–975.

Houmes, R., Boylan, R., & Crosby, W. (2012). On the value relevance of SFAS No. 158. *Research in Accounting Regulation, 24*(2), 112–114.

Huang, H. S. Lin, S.W. (2011). Financial restatements and fair value measurement. Working paper, SUNY college of Old Westbury.

Joseph-Bell, J., Joas, R., & Bukspan, N. (2008). Banks: The fight over fair value. Business Week, S&P ratings news, October 15, 2008.

Muller, K. A., III, & Riedl, E. J. (2002). External monitoring of property appraisal estimates information asymmetry. *Journal of Accounting Research, 40*(3), 865–881.

Petroni, K., & Wahlen, J. M. (1995). Fair values of equity and debt securities and share prices of property liability insurer. *The Journal of Risk and Insurance, 62*(4), 719–737.

Pulliam, S., & McGinty, T. (2009). Congress helped banks defang key rule. *The Wall Street Journal*.

Rogers, W. H. (1993). Regression standard errors in clustered samples. *Stata Technical Bulletin, 13*, 19–23.

Sankar, M. R., & Subramanyam, K. R. (2001). Reporting discretion and private information communication through earnings. *Journal of Accounting Research, 29*(2), 365–386.

Securities and Exchange Commission SEC. (2008a). Sample Letter Sent to Public Companies on MD&A Disclosure Regarding the Application of SFAS 157 (Fair Value Measurements), March. Available at: <http://www.sec.gov/divisions/corpfin/guidance/fairvalueltr0308.htm>.

Securities and Exchange Commission SEC. (2008b). Report and recommendations pursuant to Section 133 of the Emergency Economic Stabilization Act of 2008: Study on mark-to-market accounting. Available at: <www.sec.gov/news/studies/2008/marktomarket123008.pdf>.

Song, C. J., Thomas, W. B., & Yi, H. (2010). Value relevance of FAS No. 157 fair value hierarchy information and the impact of corporate governance mechanisms. *The Accounting Review, 85*(4), 1375–1410.

Subramanyam, K. R. (1996). The pricing of discretionary accruals. *Journal of Accounting and Economics, 22*(1–3), 249–281.

Wallison, P. J. (2008a). Fair value accounting: A critique. *American Enterprise Institute for Public Policy Research*.

Wallison, P. J. (2008b). Judgment too important to be left to the accountants. *Financial Times*.

Xu, W., Anandarajana, A., & Curatolab, A. (2011). The value relevance of goodwill impairment. *Research in Accounting Regulation, 23*(2), 145–148.

Yanez, A. J. (2008). Fair value roundtable: A Litigator's perspective. *Journal of Accountancy*.

Please cite this article in press as: Du, H., et al. Adjustment of valuation inputs and its effect on value relevance of fair value measurement. *Research in Accounting Regulation* (2014), http://dx.doi.org/10.1016/j.racreg.2014.02.005