

How does the market assess unobservable fair value gains or losses?*

市場如何評價不可觀察之公允價值損益？

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Abstract: This study aims to explore how the market assesses unobservable fair value gains or losses arising from changes in fair value estimates, primarily because they are included in earnings, which is an important indicator for market participants in evaluating a firm. Based on the U.S. 355 banks and 12,107 quarterly observations over the period from 2008 to 2022, this study provides the following evidence. First, unobservable fair value gains or losses have the informativeness, as reflected in their positive relationship with share returns. Second, the disaggregation of unobservable fair value gains or losses reveals that losses carry more informativeness than gains. This asymmetric market response reflects loss aversion in behavioral finance, as participants react more strongly to negative information. Finally, by separating unobservable fair value gains or losses from assets and liabilities, the empirical findings show that the market responds significantly to gains or losses from assets, while those from liabilities cause confusion or uncertainty and are not significantly associated with share returns. The robustness of the main empirical findings is confirmed through additional analyses, including deferred share returns, a two-stage least squares (2SLS) estimation, and matched samples based on propensity score matching (PSM). Market participants incorporate a return premium to mitigate the effects

* The financial support of the National Science Council, Taiwan, Republic of China (MOST 110-2410-H-305-026) is gratefully acknowledged. This study appreciates Mr. Tzu-Cheng Peng as a doctoral student to provide databases from WRDS subscribed by National Taiwan University for data analysis.

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of uncertainty in high information risk environments. During periods of market volatility, the market responded negatively to unobservable fair value gains or losses, providing evidence of investor skepticism toward their assessment of fair value measurements.

Keywords: Unobservable fair value gains or losses, level fair value inputs, market assessment.

摘要：本研究主要探究市場如何評價來自公允價值估計值的變動數所產生的不可觀察公允價值損益，原因在於此等損益計入盈餘之中，而盈餘為市場參與者評估公司價值的重要指標。基於研究期間自 2008 年至 2022 年的美國 355 家銀行，12,107 筆季別觀察值，本研究提供如下實證：不可觀察公允價值損益具有資訊內涵，反應於其與股價報酬的正向關聯；將第三等級公允價值損益進行拆解之後，實證發現，相較於利益，損失具有資訊內涵，此項不對等的市場反應與財務行為學的損失趨避理論為一致，亦即市場參與者對於負向資訊的反應較為強烈；不可觀察公允價值損益進行資產及負債來源的區分，實證顯示股價報酬明顯反應於資產價值變動，然而，對於負債價值變動的資訊，或因混淆或資訊不確定，缺乏與股價報酬的顯著關連。經由數項額外測試，包括股價報酬以落後一個月的季窗期為調整計算，兩階段(two-stage least squares, 2SLS)模型以及傾向分數配對 (Propensity Score Matching, PSM) 的配對樣本，進一步支持主要實證的結果。高資訊風險的環境下，市場參與者以報酬溢價減緩資訊不確定對自身產生的影響。市場動盪期間，投資人對於資訊失去信心，市場對於不可觀察的公允價值損益及損益組成成份的資訊內涵，確實產生弱化效果。

關鍵詞：不可觀察公允價值損益、第三等級公允價值輸入值、市場評價。

1. Introduction

Financial statements provide useful information for market participants to make informed economic decisions. The underlying implications of board setters by developing and revising accounting standards are to bring transparency,

accountability and efficiency to financial market for financial statement users to gather useful information. To reduce costs of digesting accounting information, financial statements encourage market participants having confidence in accounting information to enter the capital market when making their decisions. Based on the intent of board setters by expanding fair value accounting to measure assets and/or liabilities, financial statements provide more relevant and less reliable information at this time. According to Statement of Financial Accounting Standards (SFAS) No. 157 (currently Accounting Standards Codification (ASC) 820), *Fair Value Measurements*, issued in 2007, the fair value hierarchy gives the highest priority to quoted prices (unadjusted) in active markets for identical assets or liabilities (Level 1) and the lowest priority to unobservable inputs (Level 3) due to the availability of inputs relevant to the asset or liability and the relative reliability of the inputs involving the selection of appropriate valuation techniques.² A three-level fair value hierarchy is set up by maximizing the use of observable inputs and minimizing the use of unobservable inputs. It is essential for requiring judgments to consider factors specific to the asset or liability and assess the significance of a particular input to the fair value measurement in its entirety (para.22, SFAS 157). The extant literature on fair value measurement has investigated the trade-off between the fundamental qualitative characteristics on relevance and reliability (nowadays faithfully representation) across the three levels of the fair value hierarchy (Levels 1, 2, and 3) (e.g., Song *et al.*, 2010). Even though the majority of prior studies suggest that Level 3 inputs are of lower reporting quality (Song *et al.*, 2010), more subjective (Laghi *et al.*, 2012), and discounting market pricing (Bagna *et al.*, 2014; Goh *et al.*, 2015) compared to Level 1 and Level 2 inputs, they are still widely used in practice due to their informativeness (Fiechter *et al.*, 2022; Lawrence *et al.*, 2016). In contrast to prior literature, which has primarily focused on Level 3 assets and liabilities on a recurring basis, this study shifts the

² Institutional background in section 2 provides a brief explanation of fair value hierarchy including three-level inputs in SFAS 157.

focus to the resulting fair value gains or losses included in earnings.³ In accordance with SFAS 157, gains or losses from unobservable Level 3 inputs included in earnings, attributable primarily to changes in unrealized gains or losses on assets and liabilities still held at the reporting date, are required to be disclosed only in the notes rather than recognized separately on the face of the financial statements (para. 32(c), SFAS 157).⁴ The main reason for the requirement of SFAS 157 to disclose Level 3 inputs in the notes is that these inputs are not directly observable. Compared with Level 1 and Level 2 inputs, Level 3 inputs involve managerial discretion, and market participants do indeed respond in the market by pricing them at a discount (Bagna *et al.*, 2014; Goh *et al.*, 2015; Laghi *et al.*, 2012).⁵ Given this, using the market response in terms of share returns as a basis for exploring the informativeness of unobservable fair value gains or losses included in earnings, which is an important indicator for market participants in evaluating a firm, after controlling for other factors (e.g., Fiechter *et al.*, 2022), this study aims to investigate whether unobservable fair value estimates positively influence the economic implications of accounting information in financial statements. In addition, this study examines whether the market responds differently to the components of unobservable fair value gains or losses. By distinguishing between gains and losses, this study builds on the

³ This study does not focus on assets and liabilities that are measured at fair value on a non-recurring basis (for example, impaired assets).

⁴ Since the note disclosures are not subject to a standardized format, this study is unable to clearly distinguish between realized and unrealized gains or losses on Level 3 assets and liabilities based on the footnotes alone. However, in accordance with SFAS 157, by analyzing changes in ending balances of Level 3 assets and liabilities, it is inferred that the reported amounts primarily represent unrealized gains or losses. This inference forms the basis of the study's analysis. Please refer to appendix B for an example of note disclosures related to fair value measurements.

⁵ Due to managers' discretionary use of Level 3 inputs, academic discussion on the concern of discretionary fair value gains or losses remains limited, with Fiechter and Meyer (2012) being the only study addressing this issue. In the additional tests, this study employs a two-stage least squares (2SLS) approach to examine the market response to unobservable fair value gains or losses. The first-stage model adopts Fiechter and Meyer's (2012) Level 3 fair value gains or losses model, and discretionary gains or losses should exert a certain degree of control over the relationship between unobservable fair value gains or losses and share returns in the second stage.

prospect theory, which suggests that market participants react differently to gains and losses. Moreover, this study separates unobservable fair value gains or losses from assets versus liabilities. Compared with fair value gains or losses from assets, those from liabilities may lead to limited market reactions due to the information uncertainty caused by their counterintuitive effect on earnings. In sum, this study provides empirical evidence that market participants respond differently to unobservable fair value gains or losses and their components, even when discretionary elements are involved, suggesting that the market differentiates among accounting information with information content.

To examine the market response to unobservable fair value gains or losses, which are also referred to as Level 3 fair value gains or losses, this study uses the U.S. bank holding companies (banks) as a sample to clarify issues regarding unobservable fair value estimates.⁶ There are three reasons to select the U.S. banks as a research sample. A primary reason is that financial assets and financial liabilities as a major group of total assets available for measuring at fair value in the banking industry. The second reason by choosing banks as a research sample is that the banking industry is regulated by the U.S. Federal Reserve Board (FRB). The bank holding companies need to file regulatory reports for their adherence to rules issued by the FRB. The required format for consolidated financial statements is available for this study to gather necessary data that are not stated on Form 10-K, 10-Q or 8-K. Finally, bank holding companies are primarily listed on New York Stock Exchange (NYSE). The securities listed or traded on a stock exchange provide share price for this study to ascertain the market response to Level 3 fair value estimates. This study provides empirical evidence as follow: First, the market has a positive assessment of unobservable fair value gains or losses, implying that even though fair value gains or losses of Level 3 inputs with lower reliability relative to observable fair value gains or losses, market participants have recognized the informativeness of fair value

⁶ In this study, Level 3 fair value gains or losses are treated solely as a component of earnings, rather than as an element of comprehensive income (CI), since the scope of items included in earnings and in comprehensive income differs.

accounting relying on Level 3 inputs and have responded through stock prices. Second, disaggregating unobservable fair value gains or losses into Level 3 fair value gains and Level 3 fair value losses, the market only responds to losses, while the market response to gains is not significant. Finally, this study separates unobservable fair value gains or losses attributable to financial assets and financial liabilities and the findings indicate a significant positive relationship between share returns and unobservable fair value gains or losses on financial assets, while no significant relationship is found with Level 3 fair value gains or losses on financial liabilities. These results indicate that, compared to fair value changes arising from financial liabilities, those arising from financial assets are perceived as more credible by market participants. The Level 3 fair value changes in financial liabilities through gains or losses reported in earnings may lead market participants to make counterintuitive inferences.

This study offers the following contributions. First, while fair value accounting has been widely studied, relatively few works have focused on how the market reacts to Level 3 fair value gains or losses, which are often viewed as the least reliable due to their unobservable inputs. However, this study examines how market participants perceive Level 3 fair value gains or losses reported by the U.S. banks. Second, by decomposing unobservable fair value gains or losses, this study provides empirical evidence further demonstrating that the market's interpretation of such accounting information is consistent with loss-aversion theory. It is noted that this study distinguishes only between gains or losses arising from unobservable fair value changes that constitute components of earnings, rather than following prior literature in dividing Level 3 fair value gains or losses into Level 3 other comprehensive income, realized gains or losses, and unrealized gains or losses (Fiechter *et al.* 2022; Kolev, 2019). The focus of this study lies in the notion that market participants regard earnings as an indicator in evaluating a firm. Because the content and format of disclosures in the notes to financial statements are largely determined by each individual firm, the classification of gains or losses used in this study—compared with the more detailed segmentation of Level 3 gains or losses in prior literature—results in a

lower likelihood of data bias resulting from manual processing. In addition, by distinguishing unobservable fair value gains or losses based on whether they arise from assets or liabilities, this study finds that, compared with those from assets, gains or losses resulting from changes in the fair value of liabilities have a counterintuitive effect on earnings, which in turn influences market participants' valuations. Finally, this study provides empirical evidence for regulators, board setters, listed firms, and market participants through note disclosures on Level 3 fair value inputs in the financial statements. Market participant behavior in using accounting information may be influenced by individual psychological factors, which are beyond the control of board setters. Nevertheless, full disclosure—particularly regarding firm-specific assumptions or valuation models used as the basis for fair value estimates—should further improve information transparency and decision usefulness.

The remainder of this study is organized as follows. Section 2 discusses the institutional background of accounting standards regarding fair value hierarchy. Section 3 presents the prior literature on fair value hierarchy and hypothesis development on how the market responds to unobservable fair value estimates, especially Level 3 gains or losses, by decomposing them into components of earnings. Section 4 and 5 display the research methodology and sample selection and data sources. Section 6 and 7 present main findings and additional analyses. Section 8 concludes this study.

2. Institutional background

SFAS 157, *Fair Value Measurements*, to define fair value, establish a framework for measuring fair value, and expand disclosures about fair value measurements in a manner intends to expand the use of fair value accounting. The definition of fair value in SFAS 157 is the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date (para. 5, SFAS 157). This statement setting up the fair value hierarchy is to increase consistency and comparability in

fair value measurements and related disclosures. Besides, SFAS 157 emphasizes that fair value is a market-based measurement, not an entity-specific measurement and prescribes that a fair value measurement should be determined based on the assumptions that market participants would use in pricing the asset or liability. Due to market incompleteness, market prices of assets and/or liabilities do not exist for many assets and/or liabilities. Accordingly, SFAS 157 creates a three-level fair value hierarchy to distinguish between observable inputs and unobservable inputs. Observable inputs indicate that market data comes from sources independent of the reporting entity. The unobservable inputs are intended to allow for situations in which there is little, if any, market activity for the asset or liability at the measurement date. The reporting entity's own data used to develop unobservable inputs shall be adjusted if information is reasonably available without undue cost and effort that indicates that market participants would use different assumptions. To measure fair value, valuation techniques shall maximize the use of observable inputs and minimize the use of unobservable inputs for the benefits of market participants. The fair value hierarchy separates the inputs to valuation techniques used to measure fair value into three broad levels: Level 1, Level 2 and Level 3 inputs.⁷ Among the three levels, the fair value hierarchy gives the highest priority to Level 1 inputs due to quoted prices in active markets and the lowest priority to unobservable Level 3 inputs (para. 22, SFAS 157). This statement indicates that the availability of inputs relevant to the asset or liability and the relative reliability of the inputs might affect the selection of appropriate valuation techniques. For the lowest priority of unobservable (Level 3) inputs, they are inputs that reflect the

⁷ Level 1 inputs are quoted prices (unadjusted) in active markets for identical assets or liabilities that the reporting entity has the ability to access at the measurement date (para.24, SFAS 157). Level 2 inputs are inputs other than quoted prices included within Level 1 that are observable for the asset or liability, either directly or indirectly (para.28, SFAS 157). Level 3 inputs are unobservable inputs for the asset or liability. Unobservable inputs shall reflect the reporting entity's own assumptions about the assumptions that market participants would use in pricing the asset or liability. Moreover, unobservable inputs shall be developed based on the best information available in the circumstances, which might include the reporting entity's own data that shall be adjusted (para.30, SFAS 157).

reporting entity's own assumptions about the assumptions market participants would use in pricing the asset or liability developed based on the best information available in the circumstances (para. 21(b), SFAS 157). The relative reliability of inputs based on the priority of three-level inputs might affect the selection of appropriate valuation techniques (para. 23, SFAS 157).

SFAS 157 requires that the reporting entity shall disclose fair value information in financial statements to enable market participants to assess inputs used to develop those measurements for assets and liabilities that are measured at fair value on a recurring basis in periods subsequent to initial recognition, especially, for recurring fair value measurements using significant unobservable Level 3 inputs and the effect of the measurements on earnings (or changes in net assets) for the period (para. 32, SFAS 157). Moreover, for unobservable Level 3 inputs, a reconciliation of the beginning and ending balances shall be presented separately for changes during the period attributable to the following: (1) Total gains or losses for the period (realized and unrealized), segregating those gains or losses included in earnings (or changes in net assets), and a description of where those gains or losses included in earnings (or changes in net assets) are reported in the statement of income (or activities), (2) Purchases, sales, issuances, and settlements (net), and (3) Transfers in and/or out of Level 3 (for example, transfers due to changes in the observability of significant inputs) (para. 32(c), SFAS 157).

In short, reporting entities are required to recognize or derecognize assets and/or liabilities measured at fair value to follow SFAS 157's regulations promulgated by the Financial Accounting Standards Board (FASB).⁸ Even though detailed disclosures on unobservable Level 3 inputs shall be presented separately in notes of financial statements, no format is required for disclosing these inputs. Moreover, a fair value measurement should be determined based on the assumptions that market participants would use in pricing the asset or liability. In contrast, whether reporting entities indeed measure assets and/or liabilities at fair value based on market participants' assumptions or their own assumptions

⁸ The banking industry shall further comply with the FRB's regulations.

and valuation techniques used by reporting entities does not state in any place of notes in financial statements. Whether the expanded disclosures on the fair value hierarchy provide useful information for market participants is an empirical issue for this study to investigate.

3. Prior literature and hypothesis development

To preface a discussion of related hypotheses on unobservable fair value estimate, this study reviews prior literature regarding the fair value hierarchy, especially Level 3 inputs as follows.

3.1 Prior studies on the fair value hierarchy

For the relevance of accounting information on the three-level fair value hierarchy in comparison to historical cost accounting, Kolev (2019) as the first paper documents a significant relation between share prices and fair values of net financial assets. To support the informativeness of the fair value hierarchy, a line of literature provides evidence from the capital market on useful information of the fair value hierarchy for market participants to make decisions on capital allocation (Bagna *et al.*, 2014; Goh *et al.*, 2015; Laghi *et al.*, 2012; Song *et al.*, 2010). Nevertheless, to confront the criticism of fair value accounting in response to the 2007-2008 financial crisis, the FASB still insists on expanding fair value accounting by promulgating the expanded disclosures on Level 3 inputs. The intent of the FASB to expand the use of fair value accounting is supported by Elbannan and Elbannan (2015) that the information environment quality does moderate the differences between fair value levels in their effect on synchronicity. Lawrence *et al.* (2016) document the informativeness of Level 3 fair value measurements similar to that of Level 1 and Level 2 inputs. Chung *et al.* (2017) indicate that expanded disclosures are necessary for Level 3 inputs to increase market pricing of firm value, to reduce the information risk arising from Level 3 fair value estimates, and to alleviate investors' concerns about fair value estimates. Chung *et al.* (2017) further state that the proper classification of assets and/or liabilities, especially valued at the fair value hierarchy, in financial

statements shall be important for firms to consider market participants' pricing into account. Black *et al.* (2018) provide supportive evidence on the relation between the fair value hierarchy and conditional accounting conservatism and clearly specify that external auditors and board independence invoke conservatism because monitoring institutional investors drive the demand for conservatism. Fiechter *et al.* (2022) document that changes in Level 3 fair value estimates recognized in earnings are more relevant to returns than those recognized in other comprehensive income. Moreover, the study of Fiechter *et al.* (2022) supports the usefulness of the segregated disclosures of Level 3 fair value estimates.

In contrast to the relevant information provided by the fair value hierarchy, some literature argues the reliability concern on three-level inputs. In this regard, Kolev (2019) indicates a higher relation between Level 1 inputs and share prices than that between Level 2 and Level 3 inputs and share prices and states the reliability issue on SFAS 157's priority in the fair value hierarchy. To argue against the reliability issue on Level 3 fair value inputs, Song *et al.* (2010) confirm high reporting quality of Level 1 and Level 2 inputs relative to that of Level 3 inputs. Laghi *et al.* (2012) investigating the correlation between market capitalization and earnings provide evidence of the existence of a correlation with varying of fair value inputs. Laghi *et al.* (2012) further document that Level 3 inputs are more subjective than Level 1 and Level 2 inputs. The study of Laghi *et al.* (2012) on the reliability concern is supported by the evidence of Bagna *et al.* (2014) on the discounting of Level 3 financial instruments by the market. Goh *et al.* (2015) further document price discounting of Level 3 inputs relative to Level 1 and Level 2 inputs.

Taken together, based on the intent of the FASB to expand fair value accounting as a measurement model, this study intends to ascertain whether unobservable fair value estimates of the fair value hierarchy standing for accounting information affect favorably earnings quality after the tradeoff between relevance and reliability and how the market responds to Level 3 inputs despite supporting or opposing fair value accounting.

3.2 Hypotheses development

This study places emphasis on Level 3 fair value estimates with slight increase in relevance due to relative decrease in reliability compared to Level 1 and 2 inputs. To consider earnings informativeness used by market participants to evaluate firm value, financial information on assets and/or liabilities measured at fair value with changes in fair value is essential for market participants by deciding whether they efficiently and effectively allocate their capital. To present earnings information with increased relevance and decreased reliability under fair value accounting, supplementary information shall be disclosed in notes of financial statements for market participants to assess unobservable Level 3 inputs using to develop fair value measurements. In effect, expanded disclosures on Level 3 fair value estimates retain the somewhat extent of reliability to earnings by enabling financial statement users to incorporate useful information into their decision. Accordingly, this study investigates the underlying implications of Level 3 fair value estimates as an important component in earnings for financial statement information and proposes the following hypotheses based on market reaction to unobservable fair value gains or losses.

This study focuses on the market assessment due to the fact that financial statements convey useful information to market participants based on investor rationality and market efficiency. Information disclosure on Level 3 fair value gains or losses in notes of financial statements as one component of earnings relies on whether the information quality enables a better working securities market. In effect, unobservable fair value gains or losses are to be useful for equity investors when increased relevance outweighs any reduction in reliability. From the perspective of accounting information, prior literature provides empirical evidence of a positive relationship between earnings quality and earnings response coefficients, implying equity investors indeed value earnings quality on account of the persistence estimate of different components of earnings (Li, 2011; Ramakrishnan and Thomas, 1998). In terms of unobservable fair value gains or losses as one component included in earnings, the market shall

respond to these gains or losses by their persistence to buy or sell a firm's shares. The changes in fair value of assets and/or liabilities included in earnings lead to changes in asset and/or liability value randomly and their persistence has an effect on current period. The positive association between Level 3 fair value gains or losses and share returns is supported by Fiechter *et al.* (2022).⁹ By contrast, Level 3 fair value gains or losses are disclosed in notes of financial statements for helping equity investors to interpret the persistence of the contemporaneous earnings number that is subject to manager judgment (Jones and Smith, 2011). Even though the reliability issue is a concern for market participants, firms shall minimize the use of Level 3 inputs. Given market participants' limited attention to accounting information in notes of financial statements (Ahmed *et al.*, 2006; Hirshleifer and Teoh, 2003), unobservable fair value gains or losses with higher relevance but lower reliability still constitute useful information, thereby being reflected in share returns. This study proposes the following hypothesis on the market responds to unobservable fair value gains or losses as useful information:

H1: All else being equal, share returns is positively associated with unobservable fair value gains or losses.

Under the prospect theory (referred to as the loss-aversion theory) provided by Kahneman and Tversky (1979), the risk-averse investors evaluate prospective gains and losses differently even the total effect on them is the similar. That is to say, market participants perceive a risky investment decision differently in the face of fair value gains and fair value losses. However, risk aversion leads individuals prefer conservative accounting to fair value accounting for making their decisions based on their utility for unobservable fair value gains or losses. Supportive evidence that unobservable fair value losses on illiquid assets are

⁹ The study of Fiechter *et al.* (2022) begins with Level 3 comprehensive income (CI) and further separates it into earnings and other comprehensive income (OCI), examining the associations of Level 3 CI, Level 3 earnings, and Level 3 OCI with returns. In contrast, this study focuses solely on the association between Level 3 fair value gains or losses included in earnings and returns.

perceived as more credible than gains is documented by Fiechter *et al.* (2022). Young *et al.* (2022) suggest that the higher sensitivity of cash compensation to Level 3 fair value losses than that to unobservable fair value gains indicates an incentive system that penalizes executives more for unobservable fair losses than it rewards them for Level 3 fair value gains. Due to market participants' behavior depending in a complex way on risk-aversion with respect to gains and risk-taking with respect to losses, this study expects differential market response to unobservable fair value gains and Level 3 fair value losses. This study converts a loss into a positive value by making it easier to compare whether the market response to gains and losses exist differently and proposes the following hypothesis:

H2: All else being equal, a positive association between share returns and unobservable fair value gains differs from its association with Level 3 fair value losses.

From a conceptual standpoint, the valuation of liabilities should be treated in the same manner as the valuation of assets (Barth and Landsman, 1995). It is noteworthy that changes in fair value of assets relative to liabilities reveal different implications (Schneider and Tran, 2015). In essence, an improvement of financial positions for a firm results in an increase of fair value on an assets, thus an unrealized gain being recognized in earnings; by contrast, a deterioration of a firm's credit quality leading to a decrease of fair value of the liability is recognized as an unrealized gain in earnings. In relative terms, an improvement in a firm's credit risk is reported as a loss in the income statement. The concern for misinterpretation of the changes in fair value on liabilities due to the counterintuitive income statement effect has been consistently noted in academic studies (e.g., Barth *et al.*, 2008; Chasteen and Ransom, 2007; Chung *et al.*, 2017; Gaynor *et al.*, 2011). The above counterintuitive results reported for liabilities may mislead financial statement users into perceiving fair value gains as positive signals and losses as negative signals. However, evidence provided by Gaynor *et*

al. (2011) bolsters the assert that market participants may not necessarily be able to disentangle the counterintuitive income statement effect. In this context, share returns reflect how market participants perceive the discrepancy in recognizing changes in fair value of assets and liabilities. As Elbannan and Elbannan (2015) indicate that liabilities are viewed as having a stronger impact on cash flows than assets due to the fact that debt dominates the capital structure in the financing industry. Therefore, monitoring liabilities is critical to disciplining the risk-taking behavior of financial firms. To examine whether changes in Level 3 fair value assets or liabilities reveals accounting information in a way that strengthens or misleads the understanding of market participants as to the economic reality of firms, this study partitions financial instruments into financial assets and financial liabilities and proposes the following hypothesis:¹⁰

H3: All else being equal, a positive association between share returns and unobservable fair value gains or losses from assets differs from its association with Level 3 fair value gains or losses from liabilities.

4. Research methodology

This study establishes the following returns equations to explain how the market assesses unobservable fair value gains or losses. For hypothesis one, this study constructs a baseline equation to examine market participants' response to unobservable fair value gains or losses by using share returns as a proxy for the market reaction:

$$R_3MONTH_{it} = b_0 + b_1FVGL3_{it} + b_2EBGL3_{it} + b_3\Delta EBGL3_{it} + b_4SIZE_{it} \\ + b_5LEV_{it} + b_6CR_{it} + b_{7-9}Quarter\ FE_i + \gamma_{it}$$

¹⁰ Using the notes to the financial statements, this study is able to differentiate Level 3 inputs applied to assets and liabilities. However, as SFAS 157 does not mandate disclosure of the detailed types of assets and liabilities, the study cannot further access gains or losses data for these Level 3 asset and liability categories.

The above returns equation stands for the share returns on Level 3 fair value gains or losses and controls. The dependent variable in the baseline equation is buy-and-hold returns during period t (R_3MONTH).¹¹ This study uses a three-month return interval to capture information flows for 10-Q filing to the U.S. Securities and Exchange Commission (SEC) within 40 to 45 days after the end of current quarter. The interval starts with the first month of current period and ends the last month of current period by compounding the monthly returns over three months. Observations of R_3MONTH with only one month of return data within a given period are excluded.

As a primary variable of interest in the baseline equation, gains or losses on recurring Level 3 position of assets or liabilities ($FVGL3$) is one important item in earnings. This study intends to investigate how market participants react to changes in unobservable Level 3 fair value assets or liabilities. In addition, by separating $FVGL3$ into Level 3 fair value gains ($FVGL3G$) and Level 3 fair value losses ($FVGL3O$) to examine H2, this study establishes an extended equation to empirically examine whether the market responds differently to unobservable fair value gains and Level 3 fair value losses due to risk-averse market participants to investment decision. Moreover, this study considers whether the market evaluates for fair value gains or losses on assets differently from fair value gains or losses on liabilities, thus constructing a regression equation to separate $FVGL3$ into Level 3 fair value gains or losses on assets ($FVGL3A$) and those on liabilities ($FVGL3L$) for the verification of H3. Based on the dependent variable, share returns, all main variables of interest including $FVGL3$, $FVGL3G$, $FVGL3O$, $FVGL3A$, and $FVGL3L$ are deflated by the beginning-of-period market value of equity.

A set of control variables in returns equations includes earnings before Level 3 fair value gains or losses ($EBGL3$), changes in earnings before Level 3 fair value gains or losses ($\Delta EBGL3$), firm size ($SIZE$), debt to asset ratio (LEV), and total capital ratio (CR). These controls are expected to be related with share

¹¹ The proxy for quarterly returns is calculated based on daily returns (R_DAILY). The empirical results of this proxy as a dependent variable in regression models are reported in footnote 19.

returns in the banking industry. Easton and Harris (1991) evaluate the degree of correlation between security returns and the estimate of unexpected earnings and document a stronger correlation between returns and two variables of levels of earnings and earnings changes than that between returns and respective variable. Their discussion reveals a fact of the market response to levels of earnings before income taxes, extraordinary items, and Level 3 fair value gains or losses (*EBGL3*) and change in earnings ($\Delta EBGL3$) for this study. Similarly, based on the dependent variable, share returns, these two earnings variables regarding *EBGL3* and $\Delta EBGL3$ are deflated by the beginning market value of equity. The market's earnings expectations for these two variables depend on their earnings persistence and this study expects positive relationships between returns and these two components of earnings variables. Firm size (*SIZE*), the natural logarithm of total assets, is primarily used to control economies of scale in banks. To control financing structures for banks, this study uses debt to asset ratio (*LEV*). This study expects an association between *LEV* and share returns (*R_3MONTH*). In addition, banks maintaining total risk-based capital at the minimum requirements serve as a buffer for avoiding corrective actions taken by regulators. It is reasonably expected that a positive relation between total capital ratio (*CR*) and share returns (*R_3MONTH*). To control for time series data spanning 60 quarters over the research period from year 2008 to 2022, this study includes time variables (*Quarter FE*) representing three quarters of a specific year with clustered standard errors by bank to control for quarter time-fixed effects.¹²

5. Sample selection and data

This study comprises approximate 478 U.S. bank holding companies (banks) and collects quarterly data from the first quarter of 2008 through the fourth quarter of 2022.¹³ The sample period of this study spans 60 quarters over 15

¹² The variables are defined in appendix A.

¹³ The beginning of the sample period is from 2008 due to the effective year beginning in 2008 under SFAS 157.

fiscal years. To gather the primary variable of interest for fair value gains or losses on recurring Level 3 position of assets and/or liabilities (*FVGL3*), this study manually collects this data from notes of the annual report.¹⁴ Changes in various types of Level 3 assets and liabilities measured at fair value on a recurring basis are necessary data (*FVGL3*) for this study to collect as follows: total net gains (losses) included in earnings, purchases, additions, sales, settlements, and transfers into (out of) Level 3. Due to information on *FVGL3* involving complexity to identify and comprehend by copying different types of assets and liabilities with related amounts from notes without standard formats to display, *FVGL3* is retrieved by this study online. Except for *FVGL3*, data on variables including quarterly earnings before income taxes and extraordinary items (*EBGL*), changes in *EBGL* ($\Delta EBGL$), total assets (*SIZE*), debt to asset ratio (*LEV*), and total risk-based capital ratio (*CR*) are gathered from *Bank Regulatory*.¹⁵ Data on security prices are obtained from database *CRSP* for this study to compute returns. Panel A of Table 1 presents bank selection. This study includes banks with Level 3 fair value gains or losses data available through hand-collection, as well as financial data from *Bank Regulatory* and market data from *CRSP*. By excluding observations with missing data and deleting outliers of all continuous variables at the top and bottom 1% of their distributions for mitigating the effect of extreme values on empirical analyses, this study obtains a final sample consists of 355 banks with 12,107 observations. Panel B of Table 1 present data regarding frequency of 12,107 observations by type of unobservable fair value gains or losses and fiscal quarter. As shown in Panel B of Table 1, Level 3 fair value gains or losses across different categories are evenly distributed across the four quarters of each year. Compared to other fair value types with over 400 observations, unobservable fair value gains or losses arising

¹⁴ The appendix B illustrates the 2021 and 2020 annual reports of Popular, Inc. on *Note 28 Fair Value Measurement* displaying the changes in Level 3 assets and liabilities measured at fair value on a recurring basis.

¹⁵ The information of bank holding companies (banks) with total consolidated assets of U.S. \$1 billion or more is reported to the Federal Reserve Bank of Chicago. Necessary data information of banks is able to download from database *Bank Regulatory*.

from liabilities occur less frequently, with fewer than 200 observations in each quarter, which is consistent with prior literature (Kolev, 2019). A possible reason for the smaller number of observations on gains or losses from liabilities is that, during the financial crisis, changes in the fair value of financial liabilities resulting from fluctuations in a firm's creditworthiness sparked controversy. This controversy prompted the FASB to begin deliberating revisions to the regulations governing fair value measurement for assets and liabilities, particularly the recognition and derecognition of changes in the fair value of liabilities.¹⁶ A noteworthy point is that the total number of observations in which the sample simultaneously reports both gains or losses on asset and those on liability is 402. As a result, the sum of unobservable fair value gains or losses on assets (FVGL3A) (3,187) and on liabilities (FVGL3L) observations (598) does not equal the total number of FVGL3 observations (3,383). This This phenomenon is similarly observed across all quarters. Panel B supports the reason that this study uses quarter-fixed effects to control for time variation. In addition, observations with Level 3 fair value gains or losses account for approximately 30% of the total observations (3,383 out of 12,107), which explains why this study focuses on banks that apply fair value accounting to both financial assets and financial liabilities.

¹⁶ To identify accounting issues to enhance investors' confidence in financial markets, the Financial Accounting Standards Board (FASB) has issued Accounting Standards Update (ASU) No. 2016-01, *Recognition and Measurement of Financial Assets and Liabilities*, as an amendment of the FASB Accounting Standards Codification® (the source of authoritative generally accepted accounting principles (GAAP) recognized by the FASB to be applied by nongovernmental entities). The revisions pertaining to fair value liabilities require firms to changes in the fair value of the liability due to fluctuations in instrument-specific credit risk during the holding period are recognized in other comprehensive income (OCI). The main amendment to ASU No. 2016-01 regarding fair value liabilities is that firms shall recognize in other comprehensive income (OCI) for changes in the fair value of the liability due to fluctuations in instrument-specific credit risk during the holding period. Upon derecognition of the liability, the cumulated amount of OCI is fully recognized as gains or losses in net income.

Table 1
Sample selection and frequency statistics

Panel A: Bank selection						
All bank holding companies by comparing from hand-collection, <i>Bank Regulatory</i> , and <i>CRSP</i>						478
Less: banks missing total assets information and lacking share price at each quarter-end						112
Remaining number of banks						368
Less: banks deleting continuous variables at the top and bottom 1% of their distributions						13
Final number of banks						355
Panel B: Frequency of observations by fair value type and fiscal quarter						
<u>Fiscal Quarter</u>	<u>FVGL3</u>	<u>FVGL3G</u>	<u>FVGL3O</u>	<u>FVGL3A</u>	<u>FVGL3L</u>	<u>Total Obs.</u>
1	821	394	427	776	148	3,080
	(27%)	(13%)	(14%)	(25%)	(5%)	(100%)
2	855	393	462	804	149	3,116
	(27%)	(13%)	(15%)	(26%)	(5%)	(100%)
3	856	382	474	803	151	3,022
	(28%)	(13%)	(16%)	(27%)	(5%)	(100%)
4	851	405	446	804	150	2,889
	(29%)	(14%)	(15%)	(28%)	(5%)	(100%)
N of Level 3 GL	3,383	1,574	1,809	3,187	598	12,107
	(28%)	(13%)	(15%)	(26%)	(5%)	(100%)

Note. This table presents the firm selection in panel A and frequency of observations by fair value type and fiscal quarter in Panel B.

Table 2 presents descriptive statistics for the variables used in the research models. The quarterly share returns including the mean (0.185), median (0.169), and standard deviation (-0.563) are comparable regardless of whether returns are calculated using monthly (*R_3MONTH*) or daily data (*R_DAILY*). It is noted that unobservable fair value gains or losses are generally attributable to both profits

and losses, with the majority arising from assets. The breakdown of the sources of Level 3 fair value gains or losses is also evident in Table 2. Given that unobservable fair value gains and unobservable fair value losses are categorized by their underlying sources and scaled by the beginning market value of equity, it is observed that Level 3 fair value gains or losses remain zero through the 75th percentile. For control variables, earnings before Level 3 fair value gains or losses (*EBGL3*) and changes in earnings before Level 3 fair value gains or losses (Δ *EBGL3*) report respective mean values of 0.0297 and -0.0050. The difference between the mean value of *EBGL3* and Δ *EBGL3* can be interpreted as the former capturing the earnings level for a period, and the latter reflecting the variation in earnings across quarters. The firm size (*SIZE*) is measured by the natural logarithm of total assets. According to *SIZE*, the sample banks have mean total assets of \$4.9 billion (median of \$3.9 billion) to file consolidated financial statements to FRC and are economically significant over a period of 2008 to 2022.¹⁷ The maximum value and minimum value of the debt to asset ratio (*LEV*) is 0.9603 and 0.7854, implying that liabilities represent a significant share in the banking industry. At this point, this study once again clarifies the context in which banks serve as the sample for the discussion of fair value accounting. Finally, the FRB imposes capital adequacy requirements on banks as a means to safeguard the interests of the stakeholders. Total capital ratio (*CR*) reveals that 8.08% of the minimum value of sample banks falls short of the required capital adequacy ratio threshold.¹⁸

Table 3 presents the Pearson and Spearman correlation matrix among the variables used in the main analysis. Both Pearson and Spearman correlations indicate that in a univariate sense current returns (*R_3MONTH*) are significantly positively correlated with *EBGL3* and Δ *EBGL3*. It is noted that the high Pearson and Spearman correlations are observed between Level 3 fair value gains or

¹⁷ Please refer footnote 15 for bank holding companies to file consolidated financial statements to Federal Reserve Bank of Chicago.

¹⁸ The FRB implements Basel III regulations, requiring a capital adequacy ratio of 10.5% since 2019. The sample period of this study covers 2008 to 2022, with only 47 observations falling below the 10.5% capital adequacy ratio threshold occurring after 2019.

Table 2
Descriptive statistics

<u>Variable</u>	<u>Mean</u>	<u>S.D.</u>	<u>Min</u>	<u>25%</u>	<u>Median</u>	<u>75%</u>	<u>Max</u>
Dependent Variables							
R_3MONTH	0.0185	0.1691	-0.5629	-0.0620	0.0179	0.1018	0.6280
R_DAILY	0.0185	0.1690	-0.5628	-0.0619	0.0178	0.1020	0.6279
Primary Variables of Interest							
FVGL3	-0.0002	0.0024	-0.0300	0.0000	0.0000	0.0000	0.0101
FVGL3G	0.0002	0.0009	0.0000	0.0000	0.0000	0.0000	0.0101
FVGL3O	-0.0004	0.0022	-0.0300	0.0000	0.0000	0.0000	0.0000
FVGL3A	-0.0002	0.0025	-0.0688	0.0000	0.0000	0.0000	0.0162
FVGL3L	0.0000	0.0011	-0.0292	0.0000	0.0000	0.0000	0.0718
Control Variables							
EBGL3	0.0297	0.1698	-2.2929	0.0212	0.0521	0.0839	0.2085
ΔEBGL3	-0.0050	0.0963	-1.0050	-0.0391	0.0214	0.0295	0.8500
SIZE	15.4136	1.5484	12.8499	14.2139	15.1820	16.3023	21.3871
LEV	0.8943	0.0250	0.7854	0.8790	0.8957	0.9108	0.9603
CR	14.7616	2.9507	8.0800	12.9000	14.2801	16.0900	29.3600

Note. This table provides descriptive statistics for the variables used in the regression analyses. Across all variables, full sample is 355 banks with 12,107 bank-quarter observations.

losses (*FVGL3*) and the variables derived from its decomposition, namely, between *FVGL3* and *FVGL3G* ($P=0.396$, $S=0.739$), *FVGL3* and *FVGL3O* ($P=0.934$, $S=0.784$), *FVGL3* and *FVGL3A* ($P=0.905$, $S=0.923$), *FVGL3G* and *FVGL3A* ($P=0.345$, $S=0.688$), and *FVGL3O* and *FVGL3A* ($P=0.850$, $S=0.718$). The significant correlations of these coefficients do not pose a multicollinearity issue for the multivariate models in this study because the highly correlated decomposed variables of Level 3 fair value gains or losses are not included in the same model when testing the same hypothesis. The significant correlation coefficients are also observed between *EBGL3* and *ΔEBGL3* ($P=0.560$, $S=0.698$), as the former is a level variable while the latter is a change variable. This study further examines the variables associated with different hypotheses separately using the Variance Inflation Factor (VIF), and the results show that all VIF values are below 10. Thus, this study does not expect any multicollinearity

problems arising from our model specifications.

Table 3
Correlation matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) R_3MONTH	1.000	0.032	0.034	0.015	0.038	-0.022	0.263	0.166	0.056	-0.066	0.116
(2) FVGL3	0.040	1.000	0.739	0.784	0.923	0.180	0.031	0.013	0.046	-0.037	0.011
(3) VGL3G	0.020	0.396	1.000	0.161	0.688	0.113	0.037	0.026	0.277	-0.085	0.006
(4) VGL3O	0.035	0.934	0.041	1.000	0.718	0.161	0.010	-0.005	-0.188	0.024	0.010
(5) VGL3A	0.043	0.905	0.345	0.850	1.000	-0.078	0.034	0.015	0.061	-0.041	0.018
(6) VGL3L	-0.010	0.165	0.095	0.142	-0.271	1.000	-0.008	0.005	-0.047	0.024	-0.029
(7) EBGL3	0.194	0.076	0.001	0.082	0.078	-0.010	1.000	0.698	0.099	-0.315	-0.027
(8) EBGL3	0.152	0.009	0.003	0.009	0.012	-0.007	0.560	1.000	0.047	-0.011	0.070
(9) SIZE	0.042	0.019	0.201	-0.058	0.027	-0.021	0.105	0.054	1.000	-0.315	-0.027
(10) LEV	-0.068	-0.062	-0.012	-0.063	-0.067	0.015	-0.203	-0.110	-0.248	1.000	-0.394
(11) CR	0.108	0.028	0.016	0.024	0.028	-0.002	0.157	0.102	-0.018	-0.472	1.000

Note. This table reports Pearson correlations below and Spearman correlations above the diagonal. The correlation table depicts pair-wise correlations between variables used in the main analyses. Correlation coefficients with two-tailed test significance levels above 10% are indicated in bold.

6. Main findings

This study deals with cross-sectional data to use cluster standard errors by bank (Gow *et al.*, 2010; Petersen, 2009) and reports the regression estimations of research models in Table 4.

Table 4 reports the coefficients and z-statistics of all regression equations. It is noted that the F-statistics are all greater than 88 for research models to verify three hypotheses even though adjusted R-squared values are around 6.2%. The H1 column in Table 4 presents a positive association between *FVGL3* and current returns (coeff=1.932, z=2.21) at 5% significance level. This result supports hypothesis one that unobservable fair value gains or losses provide useful information to market participants. Additionally, all control variables report their significant relationships with current returns. Earnings before income taxes, extraordinary items, and Level 3 fair value gains or losses (*EBGL3*) are

positively associated with R_3MONTH (coeff=0.133, $z=8.28$) at the 1% significance level. In a similar manner, a positive association between change in earnings before income taxes, extraordinary items, and Level 3 fair value gains or losses ($\Delta EBGL3$) and R_3MONTH is reported (coeff=0.128, $z=4.30$) at the 1% significance level. Firm size ($SIZE$) is positively related with contemporaneous returns (coeff=0.003, $z=3.43$) at 1% significance level. This result indicates that market participants tend to place a higher valuation on large banks, implying that such banks are perceived to have lower information risk, greater operational efficiency, and even more effective corporate governance. Debt to asset ratio (LEV) reports a positive association with R_3MONTH at 5% significance level (coeff=0.130, $z=2.29$), suggesting that the market responds positively to banks with higher financial leverage and possibly views this ratio as a signal of growth potential or efficient capital structure. Finally, total capital ratio (CR) is positively associated with R_3MONTH (coeff=0.005, $z=8.58$) at 1% significance level, thus implying that a higher capital adequacy ratio in banks serves as a means to avoid corrective actions taken by regulatory and to enhance investors' perceptions of operational soundness.

For hypothesis two, as shown in the H2 column, there is a positive association between Level 3 fair value gains ($FVGL3G$) and R_3MONTH (coeff=2.219), but it is not statistically significant ($z=1.03$). In contrast, unobservable fair value losses ($FVGL3O$) are positively and significantly related with current returns (coeff=1.899, $z=2.04$) at 5% significance level. Consistent with prior literature (Fiechter *et al.*, 2022; Young *et al.*, 2022), the findings suggest that the market responds more strongly to losses than to gains, indicating an asymmetric reaction to financial performance. The analysis of unobservable fair value gains and Level 3 fair value losses yields empirical evidence to support hypothesis two that risk-averse market participants assess gains differently from losses. This empirical result of hypothesis 2 supports the loss-aversion theory cited in the hypothesis development section by this study. Control variables exhibit similar relationships with R_3MONTH as in the empirical results for hypothesis one.

As to hypothesis three regarding fair value gains or losses arising from assets and liabilities, the H3 column of Table 4 presents a significant and positive association between fair value gains or losses from assets (*FVGL3A*) and *R_3MONTH* (coeff=2.078, $z=2.35$) at 5% significance level; on the contrary, fair value gains or losses from liabilities (*FVGL3L*) report positive but not statistically significant relationship with current returns (coeff=0.116, $z=0.06$). Based on the comparison between fair value gains or losses arising from assets and those from liabilities, this study suggests that the market's perception of higher information uncertainty regarding liabilities measured at fair value may influence market participants to allocate their capital for these banks. The information uncertainty mainly stems from the counterintuitive income statement effect of unobservable fair value gains or losses from liabilities, whereby some market participants can interpret the signals embedded in them, whereas others are misled by their opposite effects. Hence, the FASB amended the regulations governing fair value measurement for assets and liabilities to enhance transparency in the market and to mitigate the risk of misleading market participants through accounting information. This empirical evidence concerning fair value gains or losses from assets and those from liabilities provides support for hypothesis three that the market exhibits differential response to fair value gains or losses depending on whether they originate from assets or liabilities. Control variables present similar relationships with *R_3MONTH* as in the empirical results for hypothesis one and two.

In summary, this study provides evidence of the market reaction to the informativeness of unobservable fair value gains or losses. As Level 3 fair value gains or losses are disaggregated into gains and losses, market participants indeed exhibit a stronger response to losses than to gains. This result is consistent with the prospective theory, suggesting that market participants derive different utilities from gains and losses. When distinguishing fair value changes by assets and liabilities, the market tends to react more strongly to gains or losses from assets than from liabilities. This result suggests that market participants respond differently depending on the composition of their unobservable fair value gains

or losses. Furthermore, information about gains or losses on liabilities is characterized by uncertainty. Specifically, when an increase in risk reduces the fair value of liabilities, it results in gains on liabilities that increase earnings; conversely, when risk decreases and leads to losses on liabilities, earnings are reduced. This represents a counterintuitive income statement effect.^{19,20,21}

¹⁹ This study uses an alternative measure of quarterly returns derived from daily returns (*R_DAILY*) as the basis for calculation. The (untabulated) empirical analyses of current returns models indicate that F-values of the alternative share returns equations are approximately 80. The coefficient of 1.940 for *FVGL3* is significantly positive with *R_DAILY* at 5% level (z-stat=2.21). The disaggregation of *FVGL3* into *FVGL3G* (coeff=2.213, z-stat=2.21) and *FVGL3O* (coeff=1.910, z-stat=1.02) provides qualitatively similar results to those of main findings. Moreover, the separation of *FVGL3* into *FVGL3A* (coeff=2.086, z-stat=2.38) and *FVGL3L* (coeff=0.121, z-stat=0.06) presents similar results to those of main findings. All control variables in these alternative share returns equations provide similar empirical results to those of main findings.

²⁰ This study uses market-adjusted quarterly returns, where the market return is the equal-weighted return, as an alternative dependent variable (*MR_3MONTH*). The (untabulated) empirical result of market-adjusted quarterly returns with a F-value of above 120 and an adjusted R-squared of 0.09 reports a positive association of *FVGL3* and *MR_3MONTH* (coeff=1.608, z-stat=2.16) at the 5% significance level. The separation of *FVGL3* into *FVGL3G* (-1.832, z-stat=-1.31) and *FVGL3O* (coeff=2.183, z-stat=2.76) presents insignificantly negative and significantly positive associations with *MR_3MONTH*. To classify *FVGL3* into assets and liabilities components, respective positive coefficients for *FVGL3A* (coeff=1.701, z-stat=2.29) at 5% significance level and for *FVGL3L* (coeff=0.4410, z-stat=0.25) failing to reach statistical significance at conventional levels are reported. These findings are similar to those of main analyses. In other words, even after controlling for market returns, market participants indeed interpret the informativeness of different components of unobservable fair value gains or losses of individual banks differently. In addition, compared to *MR_3MONTH*, where the market return is the equal-weighted return, this study uses market-adjusted returns, where the market return is value-weighted return, as a proxy of dependent variable (*MRV_3MONTH*) in research models; however, none of the three hypotheses are supported. Based on the analysis of this market-adjusted returns (*MRV_3MONTH*), the study infers that value-weighted return may be affected by the pandemic to affect the rise and fall of individual stock prices, leading to increased volatility in overall market returns.

²¹ Considering the relationship between risk factors and share returns, this study includes beta (a measure of market risk) (*BETA*), idiosyncratic risk (*IDV*), total return volatility (*TRV*), and momentum risk (*UMD*) separately as a control variable in the *R_3MONTH* model. The empirical results show that among the risk variables mentioned above, all except *UMD* are significantly positively associated with share returns (*BETA*: coeff=0.020, z-stat=4.5; *IDV*: coeff=0.278, z-stat=6.6; *TRV*: coeff=0.264, z-stat=6.9; *UMD*: coeff=and 0.005, z-stat=0.53). Furthermore, under the condition that each risk variable is included as a control variable in the *R_3MONTH* model, all three hypotheses are supported.

Table 4
Share returns (R_3MONTH) on level 3 fair value gains or losses

<u>Variable</u>	<u>Expected Sign</u>	<u>H1</u>		<u>H2</u>		<u>H3</u>	
Intercept	?	-0.191 (-3.11)	***	-0.190 (-3.14)	***	-0.192 (-3.15)	***
FVGL3	+	1.932 (2.21)	**				
FVGL3G	+			2.129 (1.03)			
FVGL3O	+			1.899 (2.04)	**		
FVGL3A	+					2.078 (2.38)	**
FVGL3L	+					0.116 (0.06)	
EBGL3	+	0.133 (8.28)	***	0.133 (8.28)	***	0.133 (8.27)	***
ΔEBGL3	+	0.128 (4.30)	***	0.128 (4.30)	***	0.129 (4.31)	***
SIZE	+	0.003 (3.43)	***	0.003 (3.39)	***	0.003 (3.39)	***
LEV	+/-	0.130 (2.29)	**	0.130 (2.30)	**	0.132 (2.33)	**
CR	+	0.005 (8.58)	***	0.005 (8.61)	***	0.005 (8.64)	***
Time fixed effect		yes		yes		yes	
Firm fixed effect		yes		yes		yes	
N		12,107		12,107		12,107	
Adj. R2		0.061		0.061		0.061	
F-value		88.08		79.26		79.47	

Note. a. Variables are as defined in Appendix A. b. z-statistics are reported in parentheses. c. *, **, and *** indicate significance level at 10%, 5% and 1%, respectively.

7. Additional analyses

7.1 An alternative measure of share returns (R_DEF)

This study takes into account the market response to the accounting information on financial statements released after the end of the quarter and therefore measures a bank's current returns during a quarter using a proxy for share returns, denoted as R_DEF . This proxy is calculated by compounding monthly returns over a three-month interval, starting from the second month of the current quarter and ending in the first month following the quarter. The

empirical results of R_DEF models are reported in Table 5.

The F-statistic values and adjusted R-squared are close to those reported in the main findings of current returns models to be consistently above 80 and respective 6.5%, indicating strong model significance. The H1 column of Table 5 indicates that a positive association between $FVGL3$ and R_DEF (coeff=2.794, $z=3.10$) at 1% significance level. This result supports hypothesis one. Additionally, the association between control variables including $EBGL3$, $\Delta EBGL3$, $SIZE$, and CR and R_DEF yields empirical results consistent with those of the main findings of current returns equations. Only LEV lacks a statistically significant association with R_DEF . A possible explanation for this insignificant relationship is that alternative return measures may not fully reflect the underlying financial structure as indicated by debt to asset ratio. The H2 column reports a positive relationship between $FVGL3O$ and R_DEF (coeff=3.027, $z=3.16$) at 1% significance level compared to an insignificant positive association between $FVGL3G$ and R_DEF (coeff=1.404, $z=0.84$). The empirical evidence reinforces the notion that market participants react more strongly to unobservable fair value losses than to Level 3 fair value gains. Hypothesis 2 is further supported. The associations between the control variables and R_DEF in the H2 column are comparable to those observed in the H1 column. Finally, the H3 column presents a significant and positive association between $FVGL3A$ and R_DEF (coeff=2.910, $z=3.25$), whereas unobservable fair value gains or losses arising from liabilities ($FVGL3L$) fail to exhibit a significant relationship with R_DEF (coeff=1.345, $z=0.80$). This finding provides further empirical support for hypothesis three, implying that market participants assess firm value with reference to fair value gains or losses attributable to assets, rather than those related to liabilities. The control variable associations with R_DEF in the H3 column closely resemble those in the H1 column.²²

²² This study employs an alternative measure of share returns for the current period (R_4MONTH), calculated based on the three monthly returns of the current period and the first monthly return of the subsequent period, that is, a total of four monthly returns. The (untabulated) empirical results still support the three hypotheses of this study.

Table 5
Additional tests: An alternative measure of
share returns (R_DEF) on level 3 fair value gains or losses

<u>Variable</u>	<u>Expected Sign</u>	<u>H1</u>		<u>H2</u>		<u>H3</u>	
Intercept	?	-0.162 *** (-2.70)		-0.169 *** (-2.83)		-0.163 *** (-2.72)	
FVGL3	+	2.794 *** (3.10)					
FVGL3G	+			1.404 (0.84)			
FVGL3O	+			3.027 *** (3.16)			
FVGL3A	—					2.910 *** (3.25)	
FVGL3L	+					1.345 (0.80)	
EBGL3	+	0.062 *** (3.85)		0.062 *** (3.83)		0.062 *** (3.84)	
ΔEBGL3	+	0.206 *** (6.73)		0.206 *** (6.75)		0.206 *** (6.74)	
SIZE	+	0.004 *** (4.70)		0.004 *** (4.80)		0.004 *** (4.67)	
LEV	+ / —	0.052 (0.90)		0.057 (0.98)		0.054 (0.92)	
CR	+	0.005 *** (9.16)		0.005 *** (9.19)		0.005 *** (9.19)	
Time fixed effect		yes		yes		yes	
Firm fixed effect		yes		yes		yes	
N		12,107		12,107		12,107	
Adj.R2		0.064		0.064		0.065	
F-value		93.67		84.40		84.47	

Note. a. Variables are as defined in Appendix A. b. z-statistics are reported in parentheses.

c. *, **, and *** indicate significance level at 10%, 5% and 1%, respectively.

7.2 A two-stage least squares (2SLS) estimation to mitigate endogeneity issues

To date, the only FVGL3 model proposed by Fiechter and Meyer (2012) includes explanatory variables limited to the context of the 2008 financial crisis. To address endogeneity issues, this study conducts a 2SLS estimation, adopting a modified version of the FVGL3 equation proposed by Fiechter and Meyer (2012) as the first-stage model. The FVGL3 equation includes ten independent variables, namely firm size (*PSIZE*) measured by natural logarithm of total assets,

debt-to-asset ratio (*PLEV*), non-performing loans (*PNPA*), Level 3 assets (*FVA3*), Level 3 liabilities (*FVL3*), mortgage-backed securities categorized into held-to-maturity (*MBS_HTM*), available-for-sale (*MBS_AFS*), and trading (*MBS_TRD*), non-recurring fair value assets (*NONFA*), and transferred into or out of Level 3 inputs in assets and liabilities (*TRANSFER*). Except for *PSIZE* and *PLEV*, all independent variables are scaled by total assets. In addition, only *TRANSFER* is measured contemporaneously, while the remaining independent variables are lagged. The *FVGL3* equation is constructed based on the decision of whether to measure assets or liabilities at fair value using Level 3 inputs (*FVGL3D*), where a value of 1 indicates banks using Level 3 inputs to measure assets and liabilities, and 0 otherwise. All independent variables are expected to be negatively associated with *FVGL3D* (Fiechter and Meyer, 2012). A probit model for *FVGL3D* is developed using ten explanatory variables, and the corresponding inverse Mills ratio (*MILL*) is subsequently derived by calculating $\phi(z_i,t)/\Phi(z_i,t)$, where z_i , t , ϕ , and Φ stand for the fitted value of the probit regression index function, standard normal density, and normal cumulative probability, respectively. Accordingly, *MILL* is incorporated into the *R_3MONTH* equation of the second-stage model as a control variable. Table 6 reports the empirical results of 2SLS estimation. As shown in the *FVGL3D* column of Table 6, *PSIZE* (coeff=0.120, $z=44.05$), *PLEV* (coeff=-1.256, $z=-34.28$), *PNPA* (coeff=2.970, $z=12.48$), *FVA3* (coeff=1.131, $z=5.25$), *MBS_HTM* (coeff=-0.490, $z=-8.05$), and *MBS_AFS* (coeff=0.122, $z=3.09$) are significantly associated with *FVGL3D*. In addition, the second-stage model includes 12,107 observations in total, of which 3,383 related to Level 3 fair value gains or losses are used for the empirical analysis. The empirical results reveal that *FVGL3* (coeff=1.937, $z=2.21$), *FVGL3O* (coeff=1.906, $z=2.04$), and *FVGL3A* (coeff=2.084, $z=2.38$) are all positively and statistically significantly associated with *R_3MONTH*. Overall, the 2SLS estimation helps mitigate endogeneity concerns and provides robust support for the three hypotheses.

Table 6

Additional tests: Test results for two-stage least squares (2SLS) model

Variable	Expected Sign	FVGL3D		H1		H2		H3	
Intercept	?	0.344 (15.07)	***	-0.190 (-3.08)	***	-0.189 (-3.12)	***	-0.191 (-3.11)	***
FVGL3	+			1.937 (2.21)	**				
FVGL3G	+					2.115 (1.01)			
FVGL3O	+					1.906 (2.04)	**		
FVGL3A	+							2.084 (2.38)	***
FVGL3L	+							0.118 (0.06)	
EBGL3	+			0.133 (8.14)	***	0.133 (8.14)	***	0.133 (8.13)	***
ΔEBGL3	+			0.128 (4.29)	***	0.128 (4.30)	***	0.129 (4.29)	***
PSIZE/SIZE	—/+	0.120 (44.05)	***	0.003 (1.47)		0.003 (1.46)		0.003 (1.44)	
PLEV/LEV	—/?	-1.256 (-34.28)	***	0.132 (2.23)	**	0.131 (2.23)	**	0.134 (2.28)	**
CR	+			0.005 (8.53)	***	0.005 (8.57)	***	0.005 (8.59)	***
PNPA	—	2.970 (12.48)	***						
FVA3	—	1.131 (5.25)	***						
FVL3	—	-0.414 (-1.01)							
MBS_HTM	—	-0.490 (-8.05)	***						
MBS_AFS	—	0.122 (3.09)	***						
MBS_TRD	—	0.170 (0.38)							
NONFA	—	-0.005 (-9.04)	***						
TRANSFER	—	0.037 (0.25)							
MILL	?			0.002 (0.13)		0.002 (0.12)		0.003 (0.16)	
Time fixed effect		no		yes		yes		yes	
Firm fixed effect		no		yes		yes		yes	
N		12,107		12,107		12,107		12,107	
Adj. R2		0.164		0.061		0.062		0.062	
F-value		237.59		79.26		72.05		72.24	

Note. a. Variables are as defined in Appendix A. b. z-statistics are reported in parentheses. c. *, **, and *** indicate significance level at 10%, 5% and 1%, respectively.

7.3 An alternative sample generated using the Propensity Score Matching (PSM)

There is an asymmetric distribution between observations with and without unobservable fair value gains or losses (FVGL3 vs. NON_FVGL3), as FVGL3 observations account for only about 30% of the total sample. To reduce selection bias, this study employs the PSM method to enhance the validity of the market response to unobservable fair value gains or losses by creating mutually exclusive sets of observations with similar propensity scores. For the implementation of PSM, this study specifies five lagged variables—scaled by total assets except for those measured using specific methods—namely firm size (*PSIZE*, the natural logarithm of total assets), debt-to-asset ratio (*PLEV*), non-performing loans (*PNPA*), Level 3 assets (*FVA3*), and Level 3 liabilities (*FVL3*)—to compute weights for all observations, thereby obtaining the propensity scores. To optionally match observations in the treated (FVGL3) and control (NON_FVGL3) groups by minimizing the total absolute difference in propensity scores across all matches, this study employs nearest neighbor matching to select, with replacement, the control unit (NON_FVGL3) nearest to each treated unit (FVGL3) for a one-to-one matching ratio. Ultimately, a matched sample of 5,366 observations is constructed, consisting of 3,383 in the FVGL3 group and 1,983 in the NON_FVGL3 group. Table 7 reports the empirical results of a matched sample through PSM. As shown in the three columns of Table 7, all three hypotheses continue to be supported for *FVGL3* (coeff= 2.778, $z = 2.88$), *FVGL3O* (coeff= 2.074, $z = 2.10$), and *FVGL3A* (coeff= 2.345, $z = 2.59$).

7.4 Information risk environment

Market participants face information risk in their investment decisions. The increase or decrease of information risk is primarily determined by the quality of accounting information provided by firms. Nevertheless, related studies have indicated a positive relationship between information risk and share returns. This

Table 7
Additional tests: An alternative sample generated
using the propensity score matching (PSM)
for share returns (R_3MONTH) on level 3 fair value gains or losses

<u>Variable</u>	<u>Expected Sign</u>	<u>H1</u>		<u>H2</u>		<u>H3</u>	
Intercept	?	-0.107 (-1.34)		-0.098 (-1.22)		-0.105 (-1.33)	
FVGL3	+	2.778 (2.88)	***				
FVGL3G	+			2.745 (1.31)	*		
FVGL3O	+			2.074 (2.10)	**		
FVGL3A	—					2.345 (2.59)	***
FVGL3L	+					0.208 (0.11)	
EBGL3	+	0.088 (3.47)	***	0.090 (3.56)	***	0.089 (3.53)	***
ΔEBGL3	+	0.211 (4.43)	***	0.209 (4.38)	***	0.210 (4.39)	***
SIZE	+	0.001 (0.65)		0.001 (0.63)		0.001 (0.65)	
LEV	+ / —	0.098 (1.28)		0.088 (1.15)		0.096 (1.27)	
CR	+	0.004 (5.42)	***	0.004 (5.35)	***	0.004 (5.46)	***
Time fixed effect		yes		yes		yes	
Firm fixed effect		yes		yes		yes	
N		5,366		5,366		5,366	
Adj.R2		0.062		0.061		0.061	
F-value		40.42		35.67		35.91	

Note. a. Variables are as defined in Appendix A. b. z-statistics are reported in parentheses. c. *, **, and *** indicate significance level at 10%, 5% and 1%, respectively.

is because market participants require a return premium to recompense for bearing information risk (e.g., Goel *et al.*, 2021; Tsai *et al.*, 2020). The focus of this study is on the disclosure of Level 3 fair value gains or losses in the notes to the financial statements of firms. The notes may include disclosures such as the classification of asset and liability types and transfers into or out of Level 3 inputs; however, disclosures often do not contain information on the parameters involved in the estimation of Level 3 fair value gains or losses or the valuation

models chosen by the firm. These disclosures expose market participants to varying levels of information risk. Accordingly, this study divides the full sample into two subsamples based on information risk for further analysis. The information risk is measured by the bid-ask spread in this study.²³ The full sample is split into two subsamples using the median bid-ask spread as a threshold. A lower-than-median bid-ask spread is indicative of low information risk, whereas a higher-than-median spread reflects high information risk. The empirical results for two subsamples are reported in Table 8. In the low information risk column of Table 8, the primary variables for H1, H2, and H3 report that apart from the significantly positive relationship between Level 3 fair value gains (*FVGL3G*) and *R_3MONTH* (coeff=4.712, *z*=1.79), the other primary variables do not exhibit any significant associations with share returns. This study infers that when information risk is low, market participants benefit from the protection offered by regulators, analysts, or institutional investors, the capital market environment leads market participants to adopt a more relaxed attitude toward information assessment, resulting in a significant positive association between unobservable fair value gains and share returns. Conversely, in the high information risk column, *FVGL3* (coeff=2.727, *z*=2.26), *FVGL3O* (coeff=2.979, *z*=2.32), and *FVGL3A* (coeff=2.934, *z*=2.47) are positively associated with *R_3MONTH*, thus supporting all hypotheses and aligning with prior research that unobservable fair value gains or losses and their categories are associated with higher share returns in a higher information risk environment. It is inferred in this study that in an environment characterized by high information risk, market participants should evaluate information more cautiously to protect their capital. This phenomenon is consistent with the information content of unobservable fair value gains or losses in hypothesis 1, the loss-aversion theory posited in hypothesis 2, and the counterintuitive income statement effect described in hypothesis 3.

²³ The bid-ask spread used in this study is defined as the three-month average of the difference between the bid and ask prices at the end of each month, scaled by the average of the bid and ask prices.

Table 8
Additional tests: Share returns (R_3MONTH) on level 3 fair value gains or losses under information risk environment

Variable	Expected Sign	LOW INFORMATION RISK			HIGH INFORMATION RISK		
		H1	H2	H3	H1	H2	H3
Intercept	?	-0.063 (-1.28)	-0.039 (-0.75)	-0.063 (-1.28)	-0.599 *** (-5.13)	-0.610 *** (-5.21)	-0.604 *** (-5.18)
FVGL3	+	0.183 (0.14)			2.727 ** (2.26)		
FVGL3G	+		4.712 ** (1.79)			0.073 (0.03)	
FVGL3O	+		-1.085 (-0.70)			2.979 *** (2.32)	
FVGL3A	—			0.243 (0.17)			2.934 *** (2.47)
FVGL3L	+			-0.699 (-0.30)			0.505 (0.20)
EBGL3	+	0.174 ** (2.01)	0.179 ** (2.07)	0.174 ** (2.00)	0.122 *** (7.44)	0.122 *** (7.39)	0.122 *** (7.43)
ΔEBGL3	+	0.436 *** (3.44)	0.435 *** (3.45)	0.436 *** (3.44)	0.093 *** (3.08)	0.093 *** (3.08)	0.093 *** (3.09)
SIZE	+	-0.004 *** (-3.58)	-0.005 *** (-4.02)	-0.004 *** (-3.61)	0.007 *** (2.47)	0.007 *** (2.56)	0.007 *** (2.48)
LEV	+/-	0.175 *** (3.38)	0.166 *** (3.16)	0.175 *** (3.39)	0.419 *** (3.84)	0.427 *** (3.90)	0.424 *** (3.89)
CR	+	0.002 *** (4.44)	0.002 *** (4.22)	0.002 *** (4.45)	0.009 *** (9.45)	0.009 *** (9.46)	0.009 *** (9.47)
Time fixed effect		yes	yes	yes	yes	yes	yes
Firm fixed effect		yes	yes	yes	yes	yes	yes
N		6,054	6,054	6,054	6,053	6,053	6,053
Adj.R2		0.077	0.078	0.077	0.066	0.066	0.066
F-value		57.34	52.33	51.61	48.25	43.49	43.62

Note. a. Variables are as defined in Appendix A. b. z-statistics are reported in parentheses. c. *, **, and *** indicate significance level at 10%, 5% and 1%, respectively.

7.4 The impact of market volatility

During the financial crisis, market participants lost confidence in information and faced increased liquidity risk. Stock markets across the world suddenly crashed after increasing instability caused by the COVID-19 pandemic

in 2020.²⁴ This study aims to examine how the market responds to information on unobservable fair value gains or losses during the period of market volatility. A dummy variable, *FD*, was introduced, with the years 2008 to 2009 and first two quarters of 2020 set as 1, and all other periods as 0.²⁵ This dummy variable is then interacted with primary variables. The empirical results are presented in Table 9. Notably, *FD* is negatively associated with *R_3MONTH* at 1% significance level under the three hypothesis columns of Table 9. This result suggests that during the stock market volatility period, the market participants showed adverse reaction to Level 3 fair value gains or losses. The interaction terms between primary variables and *FD*, including *FVGL3xFD* (coeff=-2.315, *z*=-1.39), *FVGL3OxFD* (coeff=-2.480, *z*=-1.36), and *FVGL3AxFD* (coeff=-2.602, *z*=-1.58), present negative relationships with share returns at 10% significance level, indicating that the market volatility weakened the effect of fair value information.

8. Conclusions

This study primarily investigates how the market assesses Level 3 fair value gains or losses. Empirical evidence in main analyses shows that market participants respond positively to fair value gains or losses, suggesting that unobservable fair value inputs carry informativeness. In essence, Level 3 inputs inherently rely on management's assumptions and choice of valuation models. As these details are not disclosed in the financial statement notes, Level 3 fair value measurements involve a degree of managerial discretion. In light of this, this study further classifies Level 3 fair value gains or losses in two ways. First, by distinguishing between gains and losses, the results reveal that losses contain value-relevant information for the market, whereas gains do not appear to

²⁴ Wikipedia reports that even the market crash ended on April 2020, the Dow Jones Industrial Average was further impacted by the imposition of import tariffs on oil in the following months and it reached a peak in September 2020.

²⁵ This study also includes the first three quarters of 2008 in the market volatility period, and the empirical results are similar to those in Table 9.

Table 9
Additional tests: The impact of market volatility on share returns
(R_3MONTH) on level 3 fair value gains or losses

Variable	Expected Sign	H1		H2		H3	
Intercept	?	-0.115 (-2.30)	**	-0.104 (-2.07)	**	-0.114 (-2.28)	**
FD	?	-0.083 (-19.73)	***	-0.084 (-19.13)	***	-0.083 (-19.80)	***
FVGL3	+	1.811 (1.71)	*				
FVGL3xFD	—	-2.315 (-1.39)	*				
FVGL3G	+			2.631 (1.58)	*		
FVGL3GxFD	—			2.675 (0.45)			
FVGL3O	+			1.578 (1.30)	*		
FVGL3OxFD	—			-2.480 (-1.36)	*		
FVGL3A	—					2.100 (2.04)	**
FVGL3AxFD	—					-2.602 (-1.58)	*
FVGL3L	+					-1.146 (-0.36)	
FVGL3LxFD	—					0.631 (0.17)	
EBGL3	+	0.111 (7.10)	***	0.111 (7.12)	***	0.110 (7.08)	***
ΔEBGL3	+	0.102 (3.50)	***	0.102 (3.50)	***	0.102 (3.50)	***
SIZE	+	-0.000 (-0.06)		-0.000 (-0.44)		-0.000 (-0.11)	
LEV	+/-	0.152 (3.12)	***	0.145 (2.98)	***	0.152 (3.12)	***
CR	+	0.003 (6.58)	***	0.003 (6.52)	***	0.003 (6.61)	***
Time fixed effect		yes		yes		yes	
Firm fixed effect		yes		yes		yes	
N		12,107		12,107		12,107	
Adj.R2		0.094		0.094		0.094	
F-value		115.12		97.62		97.61	

Note. a. Variables are as defined in Appendix A. b. z-statistics are reported in parentheses. c. *, **, and *** indicate significance level at 10%, 5% and 1%, respectively.

influence investor behavior. Second, by categorizing unobservable fair value gains or losses based on their source—assets versus liabilities—the findings indicate that gains or losses arising from assets are informative, while those from liabilities do not significantly affect investor decisions. This study conducts additional tests to validate the main empirical findings. These additional analyses, which incorporate deferred share returns, 2SLS estimation, matched samples based on PSM, information risk environment, and the impact of market volatility yield results that are broadly consistent with the primary empirical evidence.

The main purpose of this study lies in providing empirical evidence on how the market perceives unobservable fair value gains or losses. The FASB promote the use of fair value accounting as a basis for measuring assets and/or liabilities, based on the premise that fair value provides more relevant information to market participants. However, concerns about reliability issue arise—particularly with Level 3 fair value gains or losses, which is the focus of this study. Although such accounting information affects earnings, current standards only require disclosure of transfers into or out of different asset or liability categories. The manner in which accounting information is disclosed can convey information value to the market. Although Level 3 fair value estimates may involve managerial judgment and subjectivity, which could influence investor decision-making, more detailed disclosures of valuation techniques and assumptions regarding the Level 3 fair value inputs may enhance the transparency of Level 3 fair value measurements. Enhancing disclosure can improve information quality and may help restore or preserve investor confidence in accounting information, thereby helping to prevent a loss of trust similar to that caused by market volatility.

Appendix A: Variable definitions

<u>Variable</u>	<u>Definition</u>
Dependent variables:	
<i>R_3MONTH</i>	Buy-and-hold returns by compounding the monthly returns over three months during period t ;
<i>R_DAILY</i>	Buy-and-hold returns by compounding the daily returns over three months during period t ;
<i>R_DEF</i>	Buy-and-hold returns by compounding the monthly returns over three months starting with the second month of period t and ends the first month after period t ;
Primary variables of interest:	
<i>FVGL3</i>	Gains or losses on recurring Level 3 position of assets or liabilities during period t divided by beginning market value of equity;
<i>FVGL3G</i>	Gains on recurring Level 3 position of assets or liabilities during period t divided by beginning market value of equity;
<i>FVGL3O</i>	losses on recurring Level 3 position of assets or liabilities during period t divided by beginning market value of equity;
<i>FVGL3A</i>	Gains or losses on recurring Level 3 position of assets during period t divided by beginning market value of equity;
<i>FVGL3L</i>	Gains or losses on recurring Level 3 position of liabilities during period t divided by beginning market value of equity;
Control variables:	
<i>EBGL3</i>	Quarterly earnings before income taxes, extraordinary items, and gains or losses on recurring Level 3 position of assets or liabilities during period t divided by beginning market value of equity;
$\Delta EBGL3$	Changes in quarterly earnings before income taxes, extraordinary items, and gains or losses on recurring Level 3 position of assets or liabilities during period t divided by beginning market value of equity;
<i>SIZE</i>	Natural logarithm of total assets at the end of period t ;
<i>LEV</i>	Debt to asset ratio, measured by dividing total liabilities by total assets at period t ;
<i>CR</i>	Total risk-based capital ratio at period t ;
<i>Quarter FE</i>	Quarter time-fixed effects;

Appendix B: An example of disclosure in the notes to the financial statements regarding fair value measurement of consolidated financial statements of POPULAR, INC.

The following tables present the changes in Level 3 assets and liabilities measured at fair value on a recurring basis for the years ended December 31, 2021 and 2020:

<u>Year ended December 31, 2021</u>							
In thousands	MBS classified as debt securities available-for-sale	CMOs classified as trading account debt securities	Other securities classified as trading account debt securities	Mortgage servicing rights	Total assets	Contingent Consideration	Total liabilities
Balance at January 1, 2021	\$ 1,014	\$ 278	\$ 381	\$ 118,395	\$ 120,068	\$ -	\$ -
Gains (losses) included in earnings		(1)	(101)	(10,216)	(10,318)		
Gains (losses) included in OCI	(13)				(13)		
Additions		29		13,391	13,419	9,241	9,241
Settlements	(175)	(107)			(282)		
Balance at December 31, 2021	\$ 826	\$ 198	\$ 280	\$ 121,570	\$ 122,874	\$ 9,241	\$,241
Changes in unrealized gains (losses) in earnings relating to assets still held at December 31, 2021	\$ -	\$ (1)	\$ (45)	\$ 6,410	\$ 6,364	\$ -	\$ -

<u>Year ended December 31, 2020</u>						
In thousands	MBS classified as debt securities available-for-sale	CMOs classified as trading account debt securities	Other securities classified as trading account debt securities	Mortgage servicing rights	Total assets	
Balance at January 1, 2020	\$ 1,182	\$ 530	\$ 440	\$ 150,906	\$ 153,058	
Gains (losses) included in earnings		(1)	(59)	(42,055)	(42,115)	
Gains (losses) included in OCI	(18)				(18)	
Additions		4		9,544	9,548	
Settlements	(150)	(255)			(405)	
Balance at December 31, 2020	\$ 1,014	\$ 278	\$ 381	\$ 118,395	\$ 120,068	
Changes in unrealized gains (losses) in earnings - held at Dec 31	\$ -	\$ -	\$ 27	\$ (19,327)	\$ (19,300)	

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