Accounting, Organizations and Society 46 (2015) 81–95

Contents lists available at ScienceDirect

Accounting, Organizations and Society

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

# The impact of risk modeling on the market perception of banks' estimated fair value gains and losses for financial instruments☆

Gauri Bhat[a,1], Stephen G. Ryan[b,*]

[a] Cox School of Business, Southern Methodist University, 6212 Bishop Blvd., Dallas, TX 75275-0333, United States
[b] Leonard N. Stern School of Business, New York University, 44 West 4th Street, Suite 10-73, New York, NY 10012-1118, United States

ARTICLE INFO

*Article history:*
Received 5 June 2014
Revised 15 April 2015
Accepted 16 April 2015
Available online 7 May 2015

ABSTRACT

We examine whether and how measures of market and credit risk modeling identified from banks' financial reports enhance the returns-relevance of their estimated annual unrealized fair value gains and losses for financial instruments. To capture differences in market liquidity and fair valuation difficulties across types of financial instruments, we distinguish unrealized gains and losses that are recorded in net income versus recorded in other comprehensive income versus calculable using financial statement note disclosures. We predict and generally find that banks' market (credit) risk modeling enhances the returns-relevance of their unrealized fair value gains and losses, more so for less liquid instruments subject to greater market-risk-related (credit-risk-related) valuation difficulties and during periods for which market (credit) risk is higher. We obtain these findings both for banks' unadjusted risk modeling measures and for the portions of these measures that we model as attributable to banks' risk modeling activities, but not for the portions we model as attributable to banks' disclosure of these activities.



## Introduction

We examine whether and how banks' risk modeling enhances the returns-relevance of their estimated annual unrealized fair value gains and losses (FVGL) on financial instruments. FVGL are changes in fair value during periods that are not yet realized through cash received or paid. When the markets for banks' financial instruments are sufficiently illiquid that observable market inputs do not suffice to determine the fair values of those instruments, banks must estimate FVGL by developing valuation models and identifying the inputs necessary to implement those models. These activities require risk modeling both to predict uncertain future cash flows and to determine appropriate rates to discount those cash flows. To conduct risk modeling effectively, banks must invest in adequate personnel and information systems and apply managerial judgment appropriately and with discipline, with inadequate investment (self-interested application of judgment) introducing unintentional (intentional) noise and bias in FVGL. Banks' investment in risk modeling and other risk management activities that discipline fair value estimation appears to vary considerably across banks and time.[2]

Banks and their financial instruments exhibit two primary types of risk, market risk and credit risk. Banks engage in two corresponding types of risk modeling activities, market risk modeling (MRM) and credit risk modeling (CRM). Market risk is variability in the value of a position attributable to changes in market prices. Interest rate risk is the primary market risk for most banks. This risk manifests through: (1) discounting effects, which are larger for longer duration positions; (2) prepayment of fixed-rate mortgage-related assets (both securities and loans); and (3) the exercise of other interest rate options, which may be standalone derivatives or embedded in traditional financial instruments. MRM involves analyzing the durations of banks' financial instruments and the resulting sensitivity of their net interest income and value of eq-

☆ This paper was presented at the Accounting, Organizations & Society Conference on Accounting Estimates on October 23–25, 2014 sponsored by the Deloitte & Touche LLP. We are grateful for helpful comments from the editor, Hun Tong Tan, two anonymous reviewers, and conference participants, as well as accounting workshop participants at Rice University.

* Corresponding author. Tel.: +1 (212) 998 0020.
*E-mail addresses:* gbhat@smu.edu (G. Bhat), sryan@stern.nyu.edu (S.G. Ryan).
[1] Tel.: +1 (214) 768 2964.

[2] For example, Mikes (2011) discusses detailed case studies of two banks and extensive interviews at five additional banks indicating that the quality of risk management varies considerably across banks and time. Only 28% (2%) of our sample banks disclose in their Form 10-K filings that they employed a chief risk officer in 2013 (2002).

http://dx.doi.org/10.1016/j.aos.2015.04.004
0361-3682/

uity to interest rate movements. It also involves simulating the effects of interest rate movements on the prepayment of fixed-rate mortgages and exercise of other interest-rate options. Credit risk is variability of the value of funded assets attributable to uncertainty about default probabilities, losses given default, and timing of default, as well as variability of the value of unfunded loan commitments due to uncertainty about draws on those commitments, which are more likely to occur during worse economic times. CRM involves analysis of these parameters based on attributes of the borrowers, borrowing contracts, borrowers' performance to date on the contracts, and relevant economic conditions.

We argue that banks' MRM and CRM activities enhance the quality of their estimates of FVGLs on financial instruments when two conditions hold: (1) the relevant markets for those instruments are sufficiently illiquid that prices or other information from these markets do not substantially determine the instruments' fair values; and (2) the instruments exhibit features, such as embedded options or complex structuring, that increase the difficulty of estimating the instruments' fair values. As a first cut to capture the applicability of these conditions, we distinguish FVGL that are recorded in net income versus recorded in other comprehensive income versus calculable using financial statement note disclosures (cädiscloseddä). Fig. 1 summarizes current relevant U.S. generally accepted accounting principles, under which FVGL are recorded in net income for most trading and risk management instruments and in other comprehensive income for available-for-sale securities and cash-flow-hedge derivatives. FVGL are disclosed for most of banks' other primary types of financial instruments, including their largest asset, loans, and largest liability, deposits. We propose three main hypotheses below that we test by examining whether and how MRM and CRM enhance the returns-relevance of these three types of FVGL from 2002 to 2013.

Our first and most general hypothesis is that banks' MRM and CRM enhance the returns-relevance of their FVGL, more so for FVGL on less liquid and more difficult-to-fair-value financial instruments. In testing this hypothesis, we exploit the fact that banks' financial instruments for which FVGL are disclosed, such as loans and deposits, usually are less liquid and more difficult to fair value than their other instruments. Our second hypothesis is that banks' MRM also enhances the returns-relevance of their FVGL recorded in other comprehensive income. Available-for-sale securities and cash-flow-hedge derivatives typically are near credit riskless. Moreover, to the limited extent that banks experience credit losses on these instruments, banks typically record these losses in net income under impairment accounting rules. Hence, interest rate risk is the primary risk reflected in FVGL recorded in other comprehensive income. We expect this hypothesis to hold only for available-for-sale securities and cash-flow-hedge derivatives that are both less than highly liquid and exhibit fair valuation difficulties, such as mortgage-backed and asset-backed securities, so that MRM is essential to estimate the fair values of the instruments accurately. Our third hypothesis is that banks' CRM primarily impacts the returns-relevance of their disclosed FVGL, because banks assume credit risk primarily through their funded loans and unfunded loan commitments.

To test these hypotheses, we identify banks' risk modeling activities from disclosures in their Form 10-K filings. As described in the Appendix cäRisk modeling measures and chief risk officer indicatordä, we hand collect disclosures of five MRM activities (interest rate gap analysis, interest rate sensitivity analysis, Value-at-Risk analysis, stress testing, and backtesting) and four CRM activities (statistical credit risk measurement, credit scoring, internal credit risk rating, and stress testing). We equally weight these activities to construct indices of banks' MRM and CRM. This approach raises the issue that many bank-year financial reports include little about risk modeling activities, particularly CRM early in our sample period. Since all banks must engage in at least minimal levels of MRM and CRM to make investment and financing decisions and to estimate the fair values of financial instruments for which market data do not suffice for the task, it appears that some banks do not disclose these activities. Hence, non-disclosure of a risk modeling activity does not imply absence of the activity. We assume, however, that our MRM and CRM measures capture meaningful variation in risk modeling intensity across banks and time.

We test all hypotheses using both one-stage and two-stage approaches. The one-stage approach regresses returns for the twelve months ending four months after the fiscal year end on net income before FVGL recorded in net income[3] and the three types of FVGL (recorded in net income, recorded in other comprehensive income, and disclosed), separately and interacted with the unadjusted MRM and CRM measures, as well as control variables. We frame and test our hypotheses as restrictions on the one or more coefficients on the interactions of banks' unadjusted MRM and CRM measures with specific types of FVGL. Empirical results using this approach support our main hypotheses with one explainable exception.

We use the two-stage approach to help ensure that the one-stage approach results are attributable to banks' risk modeling activities rather than to their choice to disclose these activities. In this approach, we first regress banks' unadjusted MRM and CRM measures on proxies for their discipline over risk modeling, technical sophistication, risk exposures, and risk tolerance, which we expect primarily indicate banks' risk modeling activities rather than their disclosure of those activities. We use the explained (unexplained) portions of banks' unadjusted MRM and CRM measures from these first-stage models as measures of banks' risk modeling activities (disclosure of these activities) in second-stage returns models. The estimated coefficients on the MRM and CRM activity measures in the two-stage approach yield the same inferences as the estimated coefficients on the unadjusted measures in the one-stage approach, whereas the estimated coefficients on the MRM and CRM disclosure measures generally are insignificant. These results are consistent with the one-stage approach results being driven by banks' risk modeling rather than their disclosure of that modeling.

We further hypothesize that MRM more strongly impacts the returns-relevance of FVGL that are recorded in other comprehensive income or disclosed in years with high interest rate volatility, and that CRM more strongly impacts the returns-relevance of disclosed FVGL during the financial crisis. To test these predictions, we interact the primary test variables with indicator variables for years with above-median interest rate volatility or the crisis period 2007–2009. Empirical results for the unadjusted MRM and CRM measures and the MRM and CRM activity measures generally support these further hypotheses.

Our study contributes to the extensive literature beginning with Barth (1994) that empirically examines the extent and determinants of the value-relevance of fair values and the returns-relevance of FVGL for financial instruments. Our study is most related to recent papers examining disclosures of fair valuation inputs and other measures of the reliability of recognized fair value estimates under Statement of Financial Accounting Standards (FAS) 157 (2006, Accounting Standards Codification (ASC) 820), which became effective in 2008. In particular, Chung, Goh, Ng, and Yong

[3] Net income before FVGL recorded in net income includes realized gains and losses that are distinct from FVGL except for two types of impairment write-down that are included in net income and thus are accounted for in the same fashion as realized losses. First, net income includes all or the credit loss portion of other-than-temporary impairment write-downs of available-for-sale and held-to-maturity securities. Second, net income includes losses on loans held for sale recognized at fair value under the lower-of-cost-or-fair-value measurement basis.