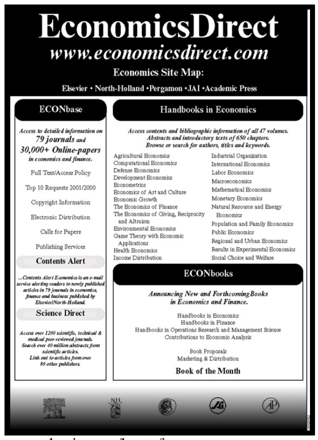
Author's Accepted Manuscript



www.elsevier.com/locate/jae

Financial Statement Comparability and Expected Crash Risk

Jeong-Bon Kim, Leye Li, Louise Yi Lu, Yangxin Yu

PII: S0165-4101(16)00002-1
DOI: http://dx.doi.org/10.1016/j.jacceco.2015.12.003
Reference: JAE1095

To appear in: *Journal of Accounting and Economics*

Received date: 20 November 2014
Revised date: 11 November 2015
Accepted date: 31 December 2015

Cite this article as: Jeong-Bon Kim, Leye Li, Louise Yi Lu and Yangxin Yu, Financial Statement Comparability and Expected Crash Risk, *Journal of Accounting and Economics,* http://dx.doi.org/10.1016/j.jacceco.2015.12.003

Financial Statement Comparability and Expected Crash Risk

Jeong-Bon Kim
University of Waterloo

Leye Li
University of New South Wales

Louise Yi Lu
Australian National University

Yangxin Yu*
City University of Hong Kong

We thank S.P. Kothari (the editor), an anonymous referee, Neil Fargher, Gary Monroe, Greg Shailer, Mark Wilson, Liandong Zhang and participants of research seminars/workshops at the Australian National University and Fudan University for their useful comments. We thank Rodrigo Verdi for generously providing the SAS program for comparability measures. Yangxin Yu acknowledges partial financial support for this project from a startup grant of the City University of Hong Kong.

*Corresponding author. E-mail: yangxin.yu@cityu.edu.hk; Tel.: +852 34427962. Postal address: The Department of Accountancy, City University of Hong Kong, 83 Tat Chee Ave., Kowloon, Hong Kong.

Abstract

This study examines the impact of financial statement comparability on ex ante crash risk. Using the comparability measures of De Franco, Kothari, and Verdi (2011), we find that expected crash risk decreases with financial statement comparability, and this negative relation is more pronounced in an environment where managers are more prone to withhold bad news. We also provide evidence that comparability can mitigate the asymmetric market reaction to bad versus good news disclosures. Our results suggest that financial statement comparability disinclines managers from bad news hoarding, which reduces investors' perceptions of a firm's future crash risk.

Keywords: financial statement comparability; expected crash risk; bad news hoarding

JEL classification: G12; M41

1. Introduction

Comparability is a unique qualitative characteristic of financial information that enhances its usefulness (Financial Accounting Standards Board, or FASB, 2010). Differing from relevance (reliability), which focuses on the predictive (confirmatory) aspect of accounting information, the FASB defines comparability as the quality of information that enables users to identify similarities and differences in financial performance across firms. In this sense, comparability is particularly important to investors in the equity and debt markets, since their investing and lending decisions essentially involve evaluations of alternative opportunities or projects and these decisions cannot be made without comparable information (FASB, 1980).

Despite the importance of comparability emphasized by policymakers, empirical studies on comparability are relatively scarce and evidence of its usefulness is limited (Schipper, 2003). De Franco et al. (2011) empirically examine the benefits of comparability by focusing on analyst forecast accuracy, coverage, and dispersion. Subsequent studies have examined the impact of comparability on debt market participants' assessment of firm credit risk (Kim et al., 2013), acquisition decisions (Chen et al., 2014), and managers' propensity to issue earnings forecasts (Gong et al., 2013). Other studies examine comparability by focusing on the adoption of International Financial Reporting Standards (IFRS) (e.g., Lang et al., 2010; DeFond et al., 2011, 2013; Barth et al., 2012, 2013; Yip and Young, 2012; Wang, 2014).

Motivated by the limited research on information comparability, this study examines the impact of financial statement comparability on ex ante crash risk, which represents investors' subjective assessment of future stock price crash risk. Interest in investors' perceptions of crash risk has been increasing, particularly since the 2008 financial crisis. In the advent of the crisis, investors' lack of confidence and fear of further decreases in prices have been identified among the various culprits behind the dramatic price declines. In discussing responses to the recent financial crisis, Blanchard (2009), then the chief economist of the International Monetary Fund (IMF), outlined, "So what are policymakers to do? First, and foremost, reduce uncertainty. Do so by removing tail risks, and the *perception* of tail risks." Thus, understanding what affects investors' perceived crash risk warrants our research.

Prior studies on crash risk often attribute stock price crashes to managers' intentional information management (Bleck and Liu, 2007; Hutton et al., 2009; Kim et al., 2011a, 2011b; Kim and Zhang, 2015). At the center of this information theory are managers' incentives and ability to hide bad news. When hidden bad news accumulates to a certain threshold, it will come out all at once, resulting in an abrupt, large-scale decline in stock price, namely, a stock price crash.

Recent studies on comparability suggest that a firm's financial reporting comparability can lower users' information acquisition and processing costs and increase the quality of financial information (De Franco et al., 2011; DeFond et al., 2011; Barth et al., 2012; Kim et al., 2013; Chen et al., 2014). For example, Kim et al. (2013) argue that comparable financial statements make it easier for investors to understand and evaluate firm performance, since fewer adjustments and less judgmental calculations with accounting numbers are needed when comparing a firm's performance with that of its peers. De Franco et al. (2011) argue that comparability facilitates information transfer among comparable firms, such that investors make sharper inferences about their economic similarities and differences.

We argue that these benefits of comparability reduce managers' incentives and ability to withhold bad news. This is because, by having access to and being able to understand information from comparable firms, investors can not only gain a better understanding of a firm's performance but also obtain some of the bad news about it through inferences based on the performance and/or disclosures of its comparable peers, even in the absence of its disclosure.[1] Since investors may have already obtained some of the undisclosed bad news about a firm by analyzing its comparable peer firms, the benefits to managers from bad news hoarding are likely to be smaller while the associated costs are likely to be higher. Therefore, the improved comparability disinclines managers from engaging in bad news hoarding behaviors. We thus predict that investors perceive those firms with more comparable financial statements to be less crash prone.

To test our prediction, we employ firm-specific measures of financial statement comparability based on De Franco et al. (2011), who define comparability as the closeness between two firms' accounting systems in mapping economic events to financial statements. We measure firm-specific ex ante crash risk as the steepness of the implied volatility smirk.[2] Using a large sample of firms with traded options from 1996 to 2013, we find that financial statement comparability is significantly and negatively associated with

[1] This notion of using information from a firm's comparable peers to assess its performance is well established in the literature. Accounting textbooks almost invariably emphasize the necessity of using a firm's comparable peers in judging its performance (e.g., Libby et al., 2009). Recent studies have documented the use of peer information in determining managers' compensation (e.g., Albuquerque, et al., 2013), in making analyst earnings forecasts and stock recommendations (e.g., Bradshaw et al., 2009; De Franco et al., 2011; De Franco et al., 2015), and in applying audit analytical procedures (e.g., Hoitash et al., 2006; Minutti-Meza, 2013).

[2] The option smirk curve is widely recognized as an indicator of investors' expected crash risk (Dumas et al., 1998; Bates, 2000). This paper uses the terms *implied volatility smirk*, *volatility smirk,* and *implied volatility skew* interchangeably.

the steepness of the implied volatility smirk.[3] For instance, we find that, on average, the volatility smirk is 9.52–11.90 percent higher for firms in the bottom decile of comparability than for firms in the top decile.[4] These results are in line with our prediction that financial reporting comparability decreases the ex ante crash risk perceived by investors in the options market.

We further explore the settings under which we expect the comparability-crash risk relation to vary cross-sectionally. We find that the negative relation between comparability and investors' perceived crash risk is more pronounced for firms in a lower-quality information environment, for firms with weaker external monitoring, and for firms operating in a less competitive industry. These results suggest that the effect of comparability on investor-perceived levels of crash risk is more pronounced when managers' incentives and/or ability to hide bad news is less constrained.

To corroborate our conjecture that financial statement comparability disinclines managers from withholding bad news, we examine the effect of comparability on voluntary corporate disclosure of bad versus good news. Kothari et al. (2009) find greater stock market reactions to managers' disclosure of bad news than to that of good news, suggesting a general tendency for managers to accumulate and withhold bad news relative to good news. Employing the methodology in Kothari et al. (2009), we find that financial statement comparability can mitigate the asymmetric market reaction to voluntary releases of positive versus negative dividend changes and that of good news versus bad news management earnings forecasts. This finding lends credence to the view that financial statement comparability tends to constrain managers' bad new hoarding behavior.

[3] Daily equity option trading data from OptionMetrics are only available from 1996 on.
[4] This economic effect is based on the ordinary least squares (OLS) results shown in Table 2.

Our study contributes to the literature in the following ways. First, we contribute to extant literature that examines the benefits of financial statement comparability. Prior studies examine the impact of comparability on analysts' (De Franco et al., 2011) and debt market participants' (Kim et al., 2013) valuation judgments. We provide evidence that comparability reduces ex ante crash risk perceived by options market participants. Understanding and managing investors' fear of an unanticipated, large-scale decline in stock price is crucial to restoring asset value (Blanchard, 2009). In this respect, our results are relevant to standard setters who emphasize an important role of financial statement comparability in nurturing and restoring investor confidence (U.S. Securities and Exchange Commission, 2008).

Second, we contribute to the growing literature that attempts to link ex ante crash risk to financial reporting transparency. Bradshaw et al. (2010) find that discretionary accruals are significantly related to investors' assessment of future crash risk. Kim and Zhang (2014) document that ex ante crash risk increases with the presence of financial restatements and internal control weaknesses. We focus on an *across-firm* accounting attribute, comparability. Importantly, we find that high comparability is associated with low ex ante crash risk, even after controlling for various aspects of reporting quality or transparency. In this respect, our results are relevant to standard setters and regulators who underscore the importance of understanding ex ante crash risk.

Third, we add to the literature on managers' asymmetric disclosure of good versus bad news. On one hand, prior studies show that managers tend to systematically withhold bad news (Kothari et al., 2009; Ali et al., 2015). On the other hand, Kasznik and Lev (1995), Skinner (1997), Baginski et al. (2002), and Kothari et al. (2009) suggest that higher litigation risk and more stringent disclosure requirements can motivate managers to release bad news more promptly. Our study adds to this literature by providing new evidence that financial statement comparability, a unique across-firm attribute of financial reporting quality, can also disincline managers from withholding bad news.

The remainder of the paper is structured as follows. Section 2 reviews the related literature and develops the hypothesis. Section 3 describes our research design. Section 4 describes the sample. Section 5 presents the main empirical results and performs robustness checks. Section 6 reports the results for additional tests. Section 7 concludes the paper.

2. Background, related literature, and empirical prediction

2.1. Financial statement comparability

The objective of general-purpose financial reporting is to provide users with information that enables them to assess the amount, timing, and uncertainty of a firm's future net cash flow. The FASB (2010) states that information is most likely to satisfy this objective when it can be readily compared with similar information reported by other entities and by the same entity in other periods. Implicit is the idea that comparability enables users to make sharper inferences about economic similarities and differences across comparable firms so that investors can better understand and evaluate firm performance.

Recent empirical studies have emerged in response to the development of empirically testable proxies for comparability (e.g., De Franco et al., 2011; Barth et al., 2012; Gong et al., 2013; Kim et al., 2013; Chen et al., 2014) and to the widespread adoption of IFRS (e.g., Lang et al., 2010; DeFond et al., 2011; Barth et al., 2012, 2013; Yip and Young, 2012).

While these studies vary in their settings or empirical measures, their general theme is that comparability lowers information acquisition and processing costs and enhances the quality of information available to investors. For example, De Franco et al. (2011) argue that comparability allows meaningful comparison among firms so that analysts can not only make sharper inferences about economic similarities and differences across comparable firms, but also better understand how economic events are translated into firm performance. Moreover, because comparable firms constitute good benchmarks for each other, information transfer among them could reduce the amount of effort exerted by analysts in understanding and analyzing their financial statements. Kim et al. (2013) argue that higher comparability facilitates more standardized or otherwise less judgmental calculations of accounting information for users, especially for firms with comparable peers.

2.2. Ex ante crash risk

It is important to examine ex ante crash risk perceived by investors for the following reasons. Since the 2008 financial crisis, stock price crash risk has increasingly attracted considerable attention from the academic and professional communities, policymakers, and the popular press. Among the various culprits behind the dramatic price declines, lack of investor confidence is of obvious concern to policymakers. Investors' fear that a firm's stock price will plummet even further in the advent of an economy-wide financial crisis could exacerbate the loss in stock value. Blanchard (2009) stated that, while it is important to remove crash risk, removing the perception of crash risk is crucial in restoring asset values, particularly during a market meltdown. Recent studies document that investors demand a much larger risk premium for *expected* crash risk than for historical crash risk.

For example, Santa-Clara and Yan (2010) find that the required compensation for the expected crash risk is more than 70 percent higher than the compensation for the actual realized risk. Bollerslev and Todorov (2011) outline that, since realized crash events are invariably rare and possibly even nonexistent over a limited calendar time span, it is the fear of such events that accounts for a surprisingly large fraction of historically observed crash or crisis events.

Notwithstanding, most prior studies on the determinants of stock price crashes have paid little attention to *ex ante expected* crash risk, though they have paid considerable attention to *ex post realized* crash risk. A notable exception is Kim and Zhang (2014), who show that accounting opacity, captured by absolute discretionary accruals, financial restatements, and internal control weaknesses, is an important determinant of expected crash risk. In this study, our analysis focuses on the role of financial statement comparability in determining ex ante expected crash risk. Consistent with prior research (Bollen and Whaley, 2004; Xing et al., 2010; Van Buskirk, 2011; Kim and Zhang, 2014), we measure expected crash risk using the option implied volatility smirk which is based on the Black-Scholes model (1973).[5]

In finance, the option smirk curve is widely recognized as an indicator of investors' expected crash risk.[6] Bates (2000) argues that the implied volatility smirk reflects investors'

[5] The use of this volatility smirk has at least three advantages over the use of ex post realized crash risk. First, the smirk is less noisy than commonly used measures of ex post realized crash risk. The former is based on ex ante volatility implied by the theoretical option pricing model of Black-Scholes (1973), while the latter is based on the actually observed crash risk, which is a function of many firm-specific and market-wide factors. Second, the smirk is an ex ante measure before investment decisions are made. It is therefore more decision relevant than ex post realized crash risk. Third, the smirk can be viewed as the investor-perceived level of crash risk. Thus, understanding the impact of comparability on the smirk can shed additional light on how and why financial statement comparability matters in shaping investors' perception of extreme negative tail risk.

[6] The Black-Scholes (1973) framework assumes continuous stock prices and constant volatility. The smirk curve suggests that the implied volatility of low strike price options, especially out-of-the-money (OTM)

perception that a significant price decline in the underlying asset is more likely. Bollen and Whaley (2004) argue that when investors know the likelihood of a negative event, the demand for OTM put options increases relative to ATM call options, resulting in the volatility skew. As Bates (2008) states, the option market could be functioning as an insurance market such that OTM put options act as portfolio insurance to hedge against future stock price drops.

2.3. Link between financial statement comparability and ex ante crash risk

Prior studies often attribute firm-specific stock price crash risk to sudden releases of bad news previously hoarded by managers (Bleck and Liu, 2007; Hutton et al., 2009). The theoretical model of Jin and Myers (2006) suggests that managers have incentives to withhold bad news from investors due to their concerns about employment, compensation, reputation, and so forth. However, there is a limit to managers' hiding and accumulating bad news within the firm. When the amount of hidden bad news accumulated over time reaches a tipping point, it is released all at once, resulting in an abrupt, large-scale decline in stock price, that is, a stock price crash.

At the center of this information-based theory is the importance of managers' ability and incentive to hide bad news from investors. If either the ability or the incentive is gone or diminishes, the bad news previously accumulated becomes too costly to keep inside the firm and will suddenly become publicly released, causing a stock price crash. Supporting this view, Hutton et al. (2009) find that discretionary accruals are positively associated

put options, is higher than that of high strike price options, especially at-the-money (ATM) call options, which is a direct departure from the Black–Scholes option pricing model. Earlier studies have attempted to understand this pricing anomaly using various modeling assumptions (e.g., Emanuel and MacBeth, 1982; Jorion and Giovannini, 1989; Bakshi et al., 1997; Andersen et al., 2002; Chernov et al., 2003).

with crash risk, suggesting that accounting opacity enables managers to hoard bad news from outsiders. Kim et al. (2011a) show a positive association between tax avoidance and crash risk. They argue that tax avoidance activities facilitate rent diversion and bad news hoarding, which increases the probability of stock price crashes. Focusing on managers' incentives, Kim et al. (2011b) document that managers' stock option incentives relate to crash risk. They argue that the stock options-based compensation motivates managerial short-termism such that managers may have incentives to hoard bad news to inflate current share prices at the expense of long-term firm value.

Recent studies on ex ante expected crash risk suggest that investors do recognize the predictive value of factors related to financial statement transparency and impound these factors into their assessment of future crash risk. Bradshaw et al. (2010) find that a firm's opacity, measured by absolute discretionary accruals, relates to investors' assessment of future crash risk as reflected in the option price. Kim and Zhang (2014) find that financial reporting opacity, measured by the magnitude of absolute discretionary accruals, the presence of financial restatements, or the presence of internal control weaknesses, is positively associated with the steepness of the implied volatility smirk.

This study examines the impact of financial statement comparability on expected crash risk. As discussed previously, comparability facilitates information about comparable peers being available to outside investors and thus makes it easier for investors to understand financial statement information across comparable firms. We argue that, by having access to and being able to understand information from comparable firms, investors could not only have a better understanding of a firm's performance but also obtain value-relevant information through inferences based on the performance and/or disclosures of the firm's comparable peers. For example, in the absence of bad news disclosure for a particular firm, investors may be able to obtain at least some of the negative information through inferences based on the performance and/or disclosures of the firm's comparable peers. This enhanced understanding of firm performance by investors plays an important role in constraining managers' ability and incentives to hoard bad news.

Maintaining the assumption that managers of firms with higher comparability have limited ability and incentives to hoard bad news, we predict that expected crash risk, captured by the options implied volatility smirk, is lower for firms with more comparable financial statements, because outside investors perceive these firms to be less crash prone. Given the scarcity of evidence on the issue, we propose and test the following hypothesis in alternative form:

Hypothesis: Financial statement comparability reduces the steepness of the option implied volatility skew, all else being equal.

FASB (2010) notes that "comparable information, however, is not useful if it is not relevant and may mislead if it is not faithfully represented" (Statement of Financial Accounting Concepts No. 8, p. 29). Thus, the benefit of comparability can be compromised under certain circumstances. In developing the hypothesis, we assume that comparability does not lead to the perverse behavior of firms attempting to mimic embellished performance of each other. However, correlation in bad behavior could arise either due to the common belief of net benefit of misconduct among comparable peers or simply from these firms' desire to make financial statements comparable.[7] The social

[7] We thank the editor for bringing this point to our attention.

psychology literature suggests that individuals in groups tend to conform to others' behaviors, sometimes even when the consensus is clearly incorrect (Asch, 1951; Milgram, 1963; Cialdini, et al.,1990; Fischer and Huddart, 2008). Since comparable firms face similar economic and competitive pressures, they may view each other as members of the reference group and/or obtain similar conclusions from their cost benefit analysis of misconduct. As such, rather than constituting a good benchmark for each other, comparable firms could be more likely to accept and mimic reporting misconduct of their peers. In this case, the hypothesized *negative* relation between comparability and the steepness of implied volatility skew becomes weakened. This in turn introduces a bias in favor of accepting the null of our hypothesis in alternative form.

3. Research design

This section presents the definitions of the research variables and the model specification. Appendix A provides more details on the variable definitions.

3.1. Measurement of perceived crash risk

The use of the volatility smirk as a proxy for ex ante crash risk is based on the theoretical works of Bates (2000) and Pan (2002). Consistent with prior research (Bollen and Whaley, 2004; Xing et al., 2010; Van Buskirk, 2011; Kim and Zhang, 2014), we measure the implied volatility smirk (IV_SKEW_{it}) of stock i's option as the difference between the implied volatility of an OTM put on day t ($IV^{OTMP}{}_{it}$) and that of an ATM call ($IV^{ATMC}{}_{it}$) on the same day:

$$IV\_SKEW_{it} = IV^{OTMP}{}_{it} - IV^{ATMC}{}_{it} \tag{1}$$

When there are multiple put or call option contracts for stock i on a particular day, we calculate the weighted average of the implied volatilities for the put or call options using the option open interest (*OPEN_INT*):

$$IV\_SKEW_{it} = \frac{\sum_j OPEN\_INT_j \times \mathrm{IV}_{\mathrm{it\,j}}^{\mathrm{OTMP}}}{\sum_j OPEN\_INT_j} - \frac{\sum_k OPEN\_INT_k \times \mathrm{IV}_{\mathrm{it\,k}}^{\mathrm{ATMC}}}{\sum_k OPEN\_INT_k} \quad (2)$$

Because delta is sensitive to the volatility of the underlying asset and the time remaining to the expiration of the option, we use the delta value to define option moneyness. Consistent with prior studies (Bollen and Whaley, 2004; Kim and Zhang, 2014), OTM puts are defined as put options with a delta value between -0.375 and -0.125 and ATM calls are defined as call options with a delta value between 0.375 and 0.625.

Following Kim and Zhang (2014), we average the daily *IV_SKEW* over the 12-month period ending three months after the fiscal year-end to mitigate potential problems associated with measurement errors inherent in a daily measurement. Appendix B provides more details of the procedure to calculate IV_SKEW_{it}.

3.2. Comparability measurement

We construct our primary measures of financial statement comparability following De Franco et al. (2011). Comparability is defined as the closeness between two firms' accounting systems in mapping economic events into financial statements. To measure the accounting function of an individual firm *i*, in each year, we run the following time-series regression using firm *i*'s 16 previous quarters of earnings (a proxy for financial statements) and stock returns (a proxy for economic events):

$$EARNINGS_{it} = \alpha_i + \beta_i RETURN_{it} + \varepsilon_{it} \quad (3)$$

where *EARNINGS* is the quarterly net income before extraordinary items deflated by the market value of equity at the end of the previous quarter and *RETURN* is the raw stock return during quarter *t*. The estimated coefficients $\hat{\alpha}_i$ and $\hat{\beta}_i$ are firm *i*'s accounting system or function that maps firm *i*'s economic events into its financial statement. For firm *j* from the same two-digit industry as firm *i*, the accounting system is proxied by $\hat{\alpha}_j$ and $\hat{\beta}_j$ (estimated using firm *j*'s time series).

To measure the closeness of the functions between firms *i* and *j*, we use each firm's economic events (proxied by $RETURN_i$ or $RETURN_j$) to calculate the estimated earnings using each firm's accounting system parameters ($\hat{\alpha}_i$, $\hat{\beta}_i$ or $\hat{\alpha}_j$, $\hat{\beta}_j$), respectively. Specifically, we calculate firm *i*'s and firm *j*'s accounting response to firm *i*'s economic events, $RETURN_{it}$:

$$E(EARNINGS)_{iit} = \hat{\alpha}_i + \hat{\beta}_i\ RETURN_{it} \tag{4}$$

$$E(EARNINGS)_{ijt} = \hat{\alpha}_j + \hat{\beta}_j\ RETURN_{it} \tag{5}$$

where $E(EARNINGS)_{iit}$ refers to the predicted earnings of firm *i,* given the accounting function and return of firm *i* in quarter *t*. Similarly, $E(EARNINGS)_{ijt}$ refers to the predicted earnings of firm *j,* given firm *j*'s accounting function and firm *i*'s return in quarter *t*. The pairwise comparability score between firm *i*'s and firm *j*'s accounting systems ($COMPACCT_{ijt}$) is calculated as negative one (-1) times the average of all pairwise comparability scores, that is, the absolute differences between the predicted earnings using firm *i*'s and firm *j*'s accounting functions, for the past 16 quarters:

$$COMPACCT_{ijt} = -\frac{1}{16} \times \sum_{t-15}^{t} \left| E(Earnings)_{iit} - E(Earnings)_{ijt} \right| \tag{6}$$

Given that $COMPACCT_{ijt}$ in Eq. (6) is nonpositive, we note that a higher value of $COMPACCT_{ijt}$, that is, a smaller absolute difference between $E(EARNINGS)_{iit}$ and $E(EARNINGS)_{ijt}$, indicates greater financial statement comparability between firms *i* and *j*.

Finally, we measure the comparability of firm *i*'s financial statements, $COMPACCT_{it}$, using (i) the average of firm *i*'s four highest comparability scores during year *t* ($COMPACCT4_{it}$), and (ii) the average of all of firm *i*'s comparability scores during year *t* ($COMPACCTIND_{it}$).[8]

Consistent with Chen et al. (2014), we convert the comparability measures into ranks to reduce noise in the estimates. For each fiscal year, we rank the comparability measures into deciles and then standardize the deciles so that they range between zero and one.[9]

3.3. Empirical model

To determine whether comparability decreases the implied volatility smirk, we employ the following baseline model, consistent with prior studies (Dennis and Mayhew, 2002; Bradshaw et al., 2010; Van Buskirk, 2011; Kim and Zhang, 2014):

$$\begin{aligned} IV\_SKEW_{it} = \beta_0 &+ \beta_1 COMPACCT_{it} + \beta_2 ATM\_IV_{it} + \beta_3 FIRM\_SIZE_{it} \\ &+ \beta_4 LEVERAGE_{it} + \beta_5 MB_{it} + \beta_6 CASHFLOW\_VOL_{it} \\ &+ \beta_7 EARNINGS\_VOL_{it} + \beta_8 SALES\_VOL_{it} + \beta_9 STOCK\_TURN_{it} \\ &+ \beta_{10} BETA_{it} + \beta_{11} IDOSY\_VOL_{it} + \beta_{12} TOTAL\_VOL_{it} + \beta_{13} NEG\_SKEW_{it} \\ &+ \beta_{14} STOCK\_RET_{it} + \beta_{15} HHI_{it} + \beta_{16} STRATEGY_{it} + \varepsilon_{it} \qquad (7) \end{aligned}$$

where *IV_SKEW* is our proxy for expected crash risk and is the average daily implied volatility skew over the 12-month period ending three months after the fiscal year-end, as defined in Eqs. (1) and (2). Our variable of interest, *COMPACCT,* is the comparability measure developed by De Franco et al. (2011). A negative coefficient on *COMPACCT*, i.e., $\beta_1 < 0$, supports our hypothesis that financial statement comparability reduces the steepness of the implied volatility skew.

[8] We obtained the SAS program for comparability measures from Rodrigo Verdi's website (http://www.mit.edu/~rverdi/acctcomp_2013.sas).
[9] Our results are also robust to the use of continuous measures of comparability.

We include in Eq. (7) a set of controls that have been suggested by prior studies to affect implied volatility smirk (e.g., Dennis and Mayhew, 2002; Bradshaw et al., 2011; Van Buskirk, 2011; Kim et al., 2014). Specifically, we control for ATM implied volatility level (*ATM_IV*), which has been found to affect expected crash risk (Dennis and Mayhew, 2002; Van Buskirk, 2011). Firm size (*FIRM_SIZE*) is controlled as it has been found to affect a firm's stock price volatility (Pástor and Veronei, 2003), credit risk (Beaver et al., 2005), and crash risk (Chen et al., 2001; Hutton et al., 2009). We control for leverage (*LEVERAGE*) in our model. Higher leverage is found to be associated with higher bankruptcy risk (Ross, 1977; Beaver et al., 2005), and recent studies find that implied volatility smirk increases in leverage (Toft and Prucyk, 1997; Kim and Zhang, 2014). We also control for market to book ratio (*MB*). Prior studies suggest that firms with a higher market to book ratio are more likely to involve bubbles, and thus, are more crash prone (Harvey and Siddique, 2000; Chen et al., 2001).

Pástor and Veronei (2003) find that uncertainty about a firm's profitability affects its stock return volatility. Thus, we include three commonly used operating uncertainty measures, cash flow volatility (*CASHFLOW_VOL*), earnings volatility (*EARNINGS_VOL*), and sales volatility (*SALES_VOL*). Hong and Stein (2003) argue that investors' belief heterogeneity affects future crash likelihood and predict that higher trading volume is associated with more negatively skewed stock return. We thus include average stock turnover (*STOCK_TURN*) to control for investors' belief heterogeneity. Prior studies suggest that steeper implied volatility smirk is associated with higher market risks (Dennis and Mayhew, 2002; Duan and Wei, 2009; Bradshaw et al., 2010). We include a firm's market beta (*BETA*) to control for its market risk. Chen et al. (2001) argue that stocks that are more volatile are more likely to crash in the future. We therefore control for a firm's stock return volatility (*TOTAL_VOL*) and idiosyncratic volatility (*IDOSY_VOL*).

Jin and Myers (2006) argue that past crashes may decrease the probability of future crashes. On the other hand, Bates (2000) suggests that the experience of a crash may increase investors' aversion to future crash risk. Thus, we control for a firm's past crash risk (*NEG_SKEW*). Chen et al. (2001) argue that stocks with high past returns could indicate that a bubble has been building up, so that these stocks could experience a larger price drop when the bubble pops. However, Bradshaw et al. (2010) and Van Buskirk (2011) find a negative relation between historical return and the slope of implied volatility smirk. We thus control for a firm's past return (*STOCK_RET*). Prior studies suggest that a firm's business strategies affect its outcome uncertainty (Miles and Snow, 1978; Hambrick, 1983). While high outcome uncertainty is found to be associated with high earnings, cash flow, and return volatility (Kale et al., 1991; Chan et al., 2001), such uncertainty may expose a firm to high potential downward crash risk. Thus, we control for a firm's business strategy (*STRATEGY*) using the strategy score as defined in Bentley et al. (2013).[10]

Finally, we control for product market competition. While intense competition is associated with higher liquidation risk or default risk (Hou and Robinson, 2006), competition improves the flow of firm-specific information (Hart, 1983; Nalebuff and Stigliz, 1983), which may deter managers' from hiding bad news. Consistent with prior studies (e.g., Giround and Muller, 2010, 2011), product market competition is measured by the Herfindahl-Hirschman index (*HHI*). Appendix A provides more detailed definitions for these variables.

[10] *STRATEGY* is constructed based on six measures: the ratio of research and development to sales, the ratio of employees to sales, change in total revenue, the ratio of marketing to sales, employee fluctuations, and capital intensity.

4. Sample and descriptive statistics

The sample period is from year 1996 to 2013. We collect widely available daily option data (including delta, opening interest, and implied volatility) from OptionMetrics' Ivy DB, monthly and quarterly stock return data from the Center for Research in Security Prices (CRSP), and quarterly and yearly financial data from Compustat.

Consistent with Kim and Zhang (2014), we apply various filters for OptionMetrics including: (i) the implied volatility of the option is not missing and is between 0.03 and 2.00; (ii) the open interest of the option is not missing and is greater than zero; (iii) the total volume of option contracts is not missing; (iv) the best offer price is equal or greater than the best bid price and the best bid price is not zero; (v) at least 60 trading days are available within the fiscal year; and (vi) the value of the option delta is between 0.375 and 0.625 (denoted ATMC) or between -0.375 and -0.125 (denoted OTMP). We apply filters for Compustat and the CRSP, including: (i) the book value of total assets and the book value of equity are greater than zero; (ii) the year-end share price is greater than \$1; (iii) the SIC code is not missing and is not between 6000 and 6999 (the financial industry is excluded); and (iv) the CRSP monthly price and volume data are available for at least six months during the fiscal year period.

Panel A of Table 1 reports the descriptive statistics for the continuous variables employed for our main tests.[11] The distributions of our comparability measures are consistent with those of De Franco et al. (2011). All the other variables, including our dependent variable, are consistent with prior studies (e.g., Bradshaw et al., 2010; Van Buskirk, 2011; Kim and Zhang, 2014). Panel B of Table 1 presents the Pearson and

[11] All continuous independent variables have been winsorized at the top and bottom one-percentiles.

Spearman correlation matrices for the variables employed in our research sample. The Pearson (Spearman) correlation between *IV_SKEW* and each of the comparability measures is between -0.134 (-0.165) and -0.199 (-0.285). Though only suggestive of the underlying association, significantly negative correlation coefficients indicate that firms with higher financial statement comparability are likely to have a less steep volatility smirk, which is consistent with our prediction.

[TABLE 1 HERE]

5. Empirical results

Throughout this paper, we use both the OLS regressions with robust standard errors adjusted for two-dimensional (firm and year) clustering (Petersen, 2009; Gow et al., 2010; Thompson, 2011) and firm fixed effects regressions to control for unobserved time-invariant firm characteristics. For our main results, we tabulate the regression results using two of the accounting comparability measures (*COMPACCT4* and *COMPACCTIND*).[12] For brevity, we tabulate only the regression results using *COMPACCT4* for all other tests, since our results for *COMPACCTIND* are consistent with those for *COMPACCT4*.

5.1. Main results

Table 2 presents the regressions results based on Eq. (7). As shown in columns (1) to (4), both accounting comparability measures (*COMPACCT4* and *COMPACCTIND*) are negatively associated with *IV_SKEW* across both the OLS and firm fixed effects specifications. This finding is consistent with our prediction that enhanced financial statement comparability decreases the steepness of the implied volatility skew. In terms of

[12] Untabulated results show that our reported results are robust to the use of two alternative measures of comparability in De Franco et al. (2011), that is: (i) the average of firm *i*'s ten highest comparability scores during year *t* and (ii) the median of all of firm *i*'s comparability scores during year *t*, for all tests.

economic significance, the volatility skew of firms in the top decile of *COMPACCT4* (as shown in columns (1) and (2) of Table 2) is, on average, 9.52 percent (7.14 percent) lower than that of firms in the bottom decile of *COMPACCT4* for the OLS (firm fixed effects) specification. The volatility skew of firms in the top decile of *COMPACCTIND* (as shown in columns (3) and (4)) is, on average, 11.90 percent lower than that of firms in the bottom decile of *COMPACCTIND* for both the OLS and firm fixed effects specifications. The above percentage numbers are obtained by dividing the estimated coefficient of the comparability measure (*COMPACCT4* or *COMPACCTIND*) by the mean of *IV_SKEW* (0.042).[13]

The coefficient estimates of the control variables are generally consistent with prior studies (e.g., Dennis and Mayhew, 2002; Bradshaw et al., 2010; Kim and Zhang, 2014). Across all four columns, firm size (*FIRM_SIZE*), earnings volatility (*EARNINGS_VOL*), sales volatility (*SALES_VOL*), beta (*BETA*), and total stock return (*STOCK_RET*) have no significant impact on the implied volatility smirk at the 5 percent level. Cash flow volatility (*CASHFLOW_VOL*) is insignificant in columns (1) and (3) of Table 2, while it is negative and significant at the 5 percent level in columns (2) and (4). Leverage (*LEVERAGE*) and the negative skewness (*NEG_SKEW*) of the stock return have a significantly positive impact on the smirk, which is consistent with the empirical evidence of Dennis and Mayhew (2002). We also find that stock volume turnover (*STOCK_TURN*)

[13] To compare the economic significance of *COMPACCT4* with that of the other determinants of the smirk, we re-estimate Eq. (7) after we rank in deciles and standardize all the other explanatory variables in the same way as for our comparability measures. Untabulated results show that the economic significance of *COMPACCT4* (14.08 percent) is lower than for *ATM_IV* (33.14 percent), *LEVERAGE* (14.98 percent), *MB* (14.29 percent), and *TOTAL_VOL* (34.16 percent) and higher than for *FIRM_SIZE* (2.95 percent), *EARNINGS_VOL* (7.50 percent), *IDOSY_VOL*(12.43 percent), *NEG_SKEW* (4.43 percent), and *STOCK_RET* (5.92 percent). In untabulated tests, we also employ continuous measures of comparability. A change of one standard deviation (1.001) in the *continuous* measure of *COMPACCT4* is related to a (1.001 × (-0.002) / 0.042=) -5.51 percent change in the level of the implied volatility smirk.

has a positive impact on the implied volatility smirk. This finding is consistent with the notion that investors' belief heterogeneity increases the expected crash risk (Chen et al., 2001; Hong and Stein, 2003). Finally, we find a significantly negative coefficient for idiosyncratic volatility (*IDOSY_VOL*) and a significantly positive coefficient for total return volatility (*TOTAL_VOL*). Kim and Zhang (2014) argue that these opposite signs are caused by the high correlation between the two volatility variables.

Overall, we provide evidence that the implied volatility smirk decreases significantly with financial reporting comparability, which supports the hypothesis that financial reporting comparability decreases investor-perceived ex ante crash risk as reflected in the steepness of the implied volatility smirk.[14]

[TABLE 2 HERE]

5.2. Alternative measures of comparability

As robustness checks, we consider three alternative measures of accounting comparability, labeled *ECOMP_COV*, *COMPACCT4_BARTH1,* and *COMPACCT4_BARTH2*. The variable *ECOMP_COV* captures earnings comovement between two firms (De Franco et al., 2011; Gong et al., 2013), *COMPACCT4_BARTH1* captures the mapping between stock price and earnings and the book value of equity, while *COMPACCT4_BARTH2* captures the relation between stock returns and firms' earnings and changes in earnings (Barth et al., 2012). The estimation procedures are detailed in

[14] To make sure that our results are not driven by options with maturities in a specific interval, following Kim and Zhang (2014), we recalculate *IV_SKEW* using options with different maturities. Unlike prior studies using options with a time to maturity of less than 60 days (e.g., Xing et al., 2010), this study focuses on the measurement of smirk on annual intervals. We therefore use options with various times to maturity to minimize the potential measurement errors of our measures and/or maximize their information content. Specifically, we use options of the following four duration series to estimate *IV_SKEW*: less than 60 days (*IV_SKEW_60*), 61–120 days (*IV_SKEW_120*), 121–180 days (*IV_SKEW_180*), and 181–360 days (*IV_SKEW_360*). Untabulated results show that the negative relation between comparability and expected crash risk is robust to these alternative measures of smirk with different times to maturity within a year.

Appendix C. Table 3 presents the regression results using *ECOMP_COV* as our test variable and Table 4 reports the same using *COMPACCT4_BARTH1* and *COMPACCT4_BARTH2*. As shown in Tables 3 and 4, overall, our main results are robust to using these alternative measures of financial statement comparability.[15]

[TABLES 3 and 4 HERE]

5.3. Other robustness tests

It is possible that financial statement comparability is influenced by firm-specific attributes that are not incorporated in our empirical model. Our analyses thus far have employed firm fixed effects regressions in which time-invariant firm-specific characteristics are controlled for. In untabulated tests, we estimate a change specification in which all the variables are measured by their changes from year *t* - 1 to year *t*. We find that our main results are robust to this change specification.

We view comparability as a distinct dimension of accounting information that allows users to perform across-firm comparisons. However, it is possible that financial statement comparability is correlated with other earnings attributes. In untabulated tests, we reestimate our main tests controlling for other earnings attributes, including: the prior three-year moving sum of absolute discretionary accruals from the modified Jones model (Dechow et al., 1995), the standard deviation of firm-level residuals from the Dechow and Dichev (2002) model during the past five years, the conservatism measure based on Khan and Watts (2009), and the likelihood of accounting restatements developed by Dechow et al. (2011). We find that our comparability measures remain significant at the conventional

[15] Though not tabulated for brevity, we also employ the *Prices Lead Earnings* measure of De Franco et al. (2011), which allows for price-leading earnings in estimating the earnings–return relation (i.e., Eq. (3)). The untabulated results are consistent with our main results.

level with an expected sign, which suggests that the documented effect of our comparability is incremental to these other earnings attributes.

6. Additional tests

6.1. Further exploration of the effect of comparability on expected crash risk

To add more credence to our argument that financial statement comparability alleviates investor-perceived level of stock price crash risk, we further examine whether the cross-sectional relation observed between comparability and crash risk vary, depending on the costs and benefits of financial statement comparability to managers.

6.1.1. High- versus low-quality information environment

Recent studies suggest that managers' ability and incentives to hoard bad news depend on the quality of a firm's information environment (Bleck and Liu, 2007; Kothari et al., 2009; Kim and Zhang, 2015). We thus expect that the benefits of comparability should be particularly useful for firms with low-quality information environments, since investors may not be able to obtain much information directly from their firm of interest; instead, they may have to refer to its comparable peers to enhance their understanding of its performance. In such an environment, the benefits of financial statement comparability are likely to be more pronounced.

To test our prediction, we use the probability of informed trade, the PIN score, developed by Easley et al. (1997) and Easley et al. (2002) to proxy for the quality of a firm's information environment, consistent with prior studies (e.g., Brown et al., 2004, 2009; Akins et al., 2012; Bhattacharya et al., 2012).[16] A high PIN score indicates a low-

[16] We obtain the PIN score from Stephen Brown's website (http:// www.rhsmith.umd.edu/faculty/sbrown/).

quality information environment.[17]

We rank firm–year observations into terciles according to their PIN scores at the beginning of the fiscal year for each sample year. We construct an indicator variable, *HPIN*, that equals one if the firm–year observation is in the top tercile and zero if it is in the bottom tercile. By construction, *HPIN* = 1 (*HPIN* = 0) indicates a low-quality (high-quality) information environment. Observations in the middle tercile are excluded from the analysis. We then add *HPIN* and its interaction with *COMPACCT4* to our model.

Column (2) in Panel A of Table 5 reports the test results for a high- versus a low-quality information environment. For comparison, we include column (1) that reports the original main test specification without the cross-sectional test variable. The coefficient of the interaction term, *COMPACCT4×HPIN*, is significantly negative ($p < 0.01$). The sum of the coefficients of *COMPACCT4* and *COMPACCT4×HPIN* is significantly negative as well ($p < 0.01$). These results indicate that the negative impact of comparability on expected crash risk is stronger for firms with low-quality information environments than for firms with high-quality information environments.

6.1.2. Strong versus weak external monitoring

Managerial opportunism in financial reporting can be curbed by external monitoring by a firm's outside stakeholders, such as institutional investors and analysts. Callen and Fang (2013) suggest that monitoring by institutional investors can reduce a firm's crash risk. Yu (2008) finds that firms with high analyst coverage engage less in opportunistic earnings management. Therefore, if the previously documented negative relation between

[17] In an untabulated test, we also use analyst forecast dispersion to proxy for the quality of a firm's information environment (Lang and Lundholm, 1993; Barron et al., 1998). Analyst forecast dispersion is measured as the standard deviation of earnings per share forecast. Our results are robust to this alternative measure of information environment quality.

comparability and ex ante crash risk is due to comparability constraining managerial reporting opportunism, such as hiding and accumulating bad news, we can predict that the relation is stronger for firms with weak external monitoring.

To test this prediction, we construct a composite measure based on the percentage of institutional shareholdings and the number of analysts following to proxy for the strength of external monitoring by outside stakeholders.[18] Specifically, we sum the decile ranks of (i) the percentage of shares held by institutional investors and (ii) the number of analysts following at the beginning of each fiscal year.

We then rank firm-year observations into terciles based on the sum of the two decile ranks. We construct an indicator variable, *LMONI*, that equals one if the firm–year observation is in the bottom tercile and zero if it is in the top tercile. By construction, *LMONI* = 1 (*LMONI* = 0) refers to weak (strong) monitoring. Observations in the middle tercile are excluded. We add *LMONI* and its interaction with *COMPACCT4* to our model. Since both the percentage of institutional shareholdings and the number of analysts following are highly correlated with firm size, we also add the interaction between *FIRM_SIZE* and *COMPACCT4* to our model.[19]

Column (2) in Panel B of Table 5 reports the test results for strong versus weak external monitoring. The coefficient of the interaction term, *COMPACCT4×LMONI*, is significantly negative (p < 0.01). The sum of the coefficients of *COMPACCT4* and *COMPACCT4×LMONI* is significantly negative (p < 0.05). These results indicate that the negative impact of comparability on expected crash risk is further exacerbated for firms

[18] We collect analyst following data from I/B/E/S and institutional shareholdings data from the Thomson Reuters Institutional holdings (13F) database.

[19] The coefficient of *FIRMSIZE×COMPACCT4* is positive and significant (t = 1.78). For brevity, we do not tabulate the results for this interaction.

with weak external monitoring than for firms with strong external monitoring.[20]

6.1.3. High versus low product market competition

Prior studies suggest a disciplinary effect of product market competition in curbing managerial opportunistic behavior (e.g., Hart, 1983; Giroud and Mueller, 2010, 2011). For example, Balakrishnan and Cohen (2013) find that product market competition can constrain managers from misreporting accounting information. Ali et al. (2014) find that managers in less competitive markets are less likely to make voluntary disclosures. Drawing upon the above findings, we now expect the impact of comparability on investor-perceived crash risk to be more pronounced for firms in a less competitive industry.

To test our prediction, we first rank firm–year observations into terciles according to their Herfindahl–Hirschman Index, *HHI*, at the beginning of a firm's fiscal year for each sample year. We construct an indicator variable, *HHHI*, that equals one if the firm–year observation is in the top tercile and zero if it is in the bottom tercile. Therefore, *HHHI* = 1 (*HHHI* = 0) indicates low (high) product market competition. Observations in the middle tercile are excluded. We then replace *HHI*, which is our control for product market competition in Eq. (7), with *HHHI* and the interaction between *HHHI* and *COMPACCT4* in our model.

Column (2) in Panel C of Table 5 reports the test results for high versus low product market competition. The coefficient of the interaction term, *COMPACCT4×HHHI*, is significantly negative ($p < 0.01$). The sum of the coefficients of *COMPACCT4* and *COMPACCT4×HHHI* is highly significant ($p < 0.01$), with an expected negative sign. These results indicate that the negative impact of comparability on expected crash risk is

[20] Our results are robust if we use only analyst coverage or institutional ownership to proxy for the strength of external monitoring.

stronger for firms with low product market competition than for firms with high product market competition.

[TABLE 5 HERE]

6.2. Effect of comparability on voluntary corporate disclosure

Kothari et al. (2009) find that stock market reactions to managers' voluntary disclosures are greater for bad news than for good news. Their finding suggests that managers tend to withhold bad news from outside investors and accumulate it within a firm, compared with their disclosure tendency for good news. To add more credence to our conjecture that financial statement comparability disinclines managers from withholding bad news, we examine whether financial statement comparability affects the asymmetric market reaction to bad versus good news disclosures.

Employing the methodology of Kothari et al. (2009), we examine stock price behavior surrounding the announcements of dividend changes and management earnings forecasts. Specifically, we define the news in dividend change announcement, *DIVCHG*, as the percentage change in dividends and the news in management earnings forecast, *FORECASTREVISION*, as the difference between management's forecast of quarterly earnings per share and analysts' most recent consensus forecast, scaled by the absolute value of the analysts' consensus forecast.[21] We then measure bad news by an indicator variable, *NEG* (*BAD*), that equals one if *DIVCHG* (*FORECASTREVISION*) is negative and zero otherwise. We employ the regression models (3) and (6) of Kothari et al. (2009). We

[21] We employ the selection criteria of Kothari et al. (2009) to retain only economically meaningful values of *DIVCHG* and *FORECASTREVISION*. Specifically, for *DIVCHG*, we require the absolute value of *DIVCHG* to be greater than 1 percent and the dividend change to occur after one year of a stable dividend pattern. For *FORCASTREVISION*, we require the absolute value of consensus analyst forecasts to be greater than five cents per share and *FORECASTREVISION* to be greater than 1 percent. Finally, we exclude the most extreme 1 percent of *DIVCHG* and *FORECASTREVISION* observations.

calculate the five-day cumulative abnormal return (*CAR*) around each announcement date, where the abnormal return is the firm's stock return minus the CRSP value-weighted market return. We also control for the Regulation Fair Disclosure (RegFD) period (*REGFD*), litigation risk (*HLIT*), and information asymmetry (*HASYMM*), which affect managers' incentives and ability to withhold bad news (Kothari et al., 2009; Ali et al., 2015). *REGFD* is an indicator variable that equals one if the announcement occurs after the passage of RegFD in October 2000 and zero otherwise, *HLIT* is an indicator variable that equals one if a firm is in the industries subject to a high incidence of litigation of Francis et al. (1994) and zero otherwise, and *HASYMM* is an indicator variable that equals one if a firm's PIN score is above the sample median and zero otherwise.

To test the effect of financial statement comparability on voluntary corporate disclosure, we include our variable of interest, *COMPACCT4*, and its interaction with the bad news indicators (*NEG* or *BAD*). A positive coefficient for *COMPACCT4×NEG* (or *COMPACCT4×BAD*) suggests that firms with greater financial statement comparability are less likely to delay the disclosure of bad news. Table 6 presents the regression results. In both Panels A and B, the coefficients of *COMPACCT4×NEG* and *COMPACCT4×BAD* are positive and highly significant ($p < 0.01$). These results are consistent with the view that financial statement comparability constrains managers' incentives and ability for bad news hoarding. The results for *REGFD*, *HLIT* and *HASYMM* are generally consistent with those of Kothari et al. (2009) and Ali et al. (2015). [22, 23]

[TABLE 6 HERE]

[22] Using our sample period, we also replicate the baseline models in Tables 2 and 4 of Kothari et al. (2009). Our results are generally consistent with theirs.

[23] We also employed a dichotomous measure based on a firm's comparability scores. The untabulated results are robust to this alternative comparability measure.

7. Conclusions

In this study, we examine whether comparability reduces investors' perception of crash risk. We find that the steepness of the volatility smirk decreases with financial statement comparability and this negative relation is more pronounced for firms with a lower-quality information environment, for firms with weak external monitoring, and for firms operating in a less competitive industry. Moreover, we find that managers' general tendency to withhold bad news relative to good news is mitigated for firms with higher financial statement comparability. These results support our argument that financial statement comparability discourages managers from hiding bad news and accumulating it within a firm, which reduces investors' perceptions of a firm's future crash risk.

Our study adds to the prior literature that examines the benefits of financial statement comparability. Our results suggest that accounting comparability reduces ex ante crash risk by helping outside investors make cross-firm comparisons of disclosure policies and firm performance. Moreover, our study extends the literature on the role of financial reporting quality in the capital market by focusing on its relation to ex ante crash risk. Thus, our results are relevant to standard setters and regulators who underscore the importance of understanding ex ante crash risk. Finally, our study adds to prior literature that focuses on the managerial asymmetric disclosure of good versus bad news (e.g. Skinner, 1997; Kothari et al., 2009; Ali et al., 2015). We show that financial statement comparability disinclines corporate managers from withholding bad news.

References

Akins, B. K., Ng, J., Verdi, R. S., 2012. Investor competition over information and the pricing of information asymmetry. The Accounting Review 87(1), 35-58.

Albuquerque, A. M., De Franco, G., Verdi, R. S., 2013. Peer choice in CEO compensation. Journal of Financial Economics 108(1), 160-181.

Ali, A., Klasa, S., Yeung, E., 2014. Industry concentration and corporate disclosure policy. Journal of Accounting and Economics 58(2), 240-264.

Ali, A., Li, N., Zhang, W., 2015. Managers' career concerns and asymmetric disclosure of bad versus good news. Working paper, University of Texas at Dallas.

Andersen, T., Benzoni, L., Lund, J., 2002. An empirical investigation of continuous-time equity return models. Journal of Finance 57(3), 1239-1284.

Asch, S. E., 1951. Effects of group pressure upon the modification and distortion of judgments, in: Guetzkow, H. S. (Eds), Groups, Leadership, and Men. Carnegie Press, Pittsburgh, pp. 177-190.

Baginski, S. P., Hassell, J. M., Kimbrough, M. D., 2002. The effect of legal environment on voluntary disclosure: Evidence from management earnings forecasts issued in US and Canadian markets. The Accounting Review 77(1), 25-50.

Bakshi, G., Cao, C., Chen, Z., 1997. Empirical performance of alternative option pricing models. Journal of Finance 52(5), 2003-2049.

Balakrishnan, K., Cohen, D. A., 2013. Competition and financial accounting misreporting. Working paper, London Business School.

Barron, O. E., Kim, O., Lim, S. C., Stevens, D. E., 1998. Using analysts' forecasts to measure properties of analysts' information environment. The Accounting Review 73(4), 421-433.

Barth, M., Landsman, W., Lang, M., Williams, C., 2012. Are IFRS-based and US GAAP-based accounting amounts comparable? Journal of Accounting and Economics 54(1), 68-93.

Barth, M., Landsman, W., Lang, M., Williams, C., 2013. Effects on comparability and capital market benefits of voluntary adoption of IFRS by US firms: Insights from voluntary adoption of IFRS by non-US firms. Working paper, Stanford University.

Bates, D., 2000. Post-'87 crash fears in the S&P 500 futures option market. Journal of Econometrics 94(1-2), 181-238.

Bates, D., 2008. The market for crash risk. Journal of Economic Dynamics and Control 32(7): 2291-2321.

Beaver, W. H., McNichols, M. F., Rhie, J. W., 2005. Have financial statements become less informative? Evidence from the ability of financial ratios to predict bankruptcy. Review of Accounting Studies 10(1), 93-122.

Bentley, K. A., Omer, T. C., Sharp, N. Y., 2013. Business strategy, financial reporting irregularities, and audit effort. Contemporary Accounting Research 30(2), 780-817.

Bhattacharya, N., Ecker, F., Olsson, P. M., Schipper, K., 2012. Direct and mediated associations among earnings quality, information asymmetry, and the cost of equity. The Accounting Review 87(2), 449-482.

Black, F., Scholes, M., 1973. The pricing of options and corporate liabilities. Journal of Political Economy 81(3), 637-654.

Blanchard, O., 2009. (Nearly) Nothing to fear but fear itself. The Economist, January 29th.

Bleck, A., Liu, X., 2007. Market transparency and the accounting regime. Journal of Accounting Research 45(2), 229-256.

Bollen, N., Whaley, R., 2004. Does net buying pressure affect the shape of implied volatility functions? Journal of Finance 59(2), 711-753.

Bollerslev, T., Todorov, V., 2011. Tails, fears, and risk premia. Journal of Finance 66(6), 2165-2211.

Bradshaw, M. T., Hutton, A. P., Marcus, A. J., Tehranian, H., 2010. Opacity, crash risk and option smirk curves. Working paper, Boston College.

Bradshaw, M. T., Miller, G. S., Serafeim, G., 2009. Accounting method heterogeneity and analysts' forecasts. Working paper, University of Chicago.

Brown, S., Hillegeist, S. A., Lo, K., 2004. Conference calls and information asymmetry. Journal of Accounting and Economics 37(3), 343-366.

Brown, S., Hillegeist, S. A., Lo, K., 2009. The effect of earnings surprises on information asymmetry. Journal of Accounting and Economics 47(3), 208-225.

Callen, J., Fang, X., 2013. Institutional investor stability and crash risk: Monitoring versus short-termism? Journal of Banking and Finance 37(8), 3047-3063.

Chan, L. K., Lakonishok, J., Sougiannis, T., 2001. The stock market valuation of research and development expenditures. Journal of Finance 56(6), 2431-2456.

Chen, C.-W., Collins, D. W., Kravet, T. D., Mergenthaler, R. J., 2014. Financial statement comparability and the efficiency of acquisition decisions. Working paper, University of Iowa.

Chen, J., Hong, H., Stein, J., 2001. Forecasting crashes: trading volume, past returns, and conditional skewness in stock prices. Journal of Financial Economics 61(3), 345-381.

Chernov, M., Gallant, A., Ghysels, E., Tauchen, G., 2003. Alternative models for stock price dynamics. Journal of Econometrics 116(1), 225-257.

Cialdini, R. B., Reno, R. R., Kallgren, C. A., 1990. A focus theory of normative conduct: recycling the concept of norms to reduce littering in public places. Journal of Personality and Social Psychology 58(6), 1015.

Dechow, P. M., Dichev, I. D., 2002. The quality of accruals and earnings: The role of accrual estimation errors. The Accounting Review 77(supplement), 35-59.

Dechow, P. M., Ge, W., Larson, C. R., Sloan, R. G., 2011. Predicting material accounting misstatements. Contemporary Accounting Research 28(1), 17-82.

Dechow, P. M., Sloan, R. G., Sweeney, A. P., 1995. Detecting earnings management. The Accounting Review 70(2), 193-225.

DeFond, M., Hu, X., Hung, M., Li, S., 2011. The impact of mandatory IFRS adoption on foreign mutual fund ownership: The role of comparability. Journal of Accounting and Economics 51(3), 240-258.

DeFond, M., Hung, M., Li, S., Li, Y., 2013. Does mandatory IFRS adoption affect crash risk?. The Accounting Review 90(1), 265-299.

De Franco, G., Kothari, S. P., Verdi, R. S., 2011. The benefits of financial statement comparability. Journal of Accounting Research 49(4), 895-931.

De Franco, G., Hope, O. K., Larocque, S., 2015. Analysts' choice of peer companies. Review of Accounting Studies 20(1), 82-109.

Dennis, P., Mayhew, S., 2002. Risk-neutral skewness: Evidence from stock options. Journal of Financial and Quantitative Analysis 37(3), 471-493.

Duan, J. C., Wei, J., 2009. Systematic risk and the price structure of individual equity options. Review of Financial Studies 22(5), 1981-2006.

Dumas, B., Fleming, J., Whaley, R., 1998. Implied volatility functions: Empirical tests. Journal of Finance 53(6), 2059-2106.

Easley, D., Kiefer, N., O'Hara, M., 1997. One day in the life of a very common stock. Review of Financial Studies 10(3), 805-835.

Easley, D., Hvidkjaer, S., O'Hara, M., 2002. Is information risk a determinant of asset returns?. Journal of Finance 57(5), 2185-2221.

Emanuel, D., MacBeth, J., 1982. Further results on the constant elasticity of variance call option pricing model. Journal of Financial and Quantitative Analysis 17(4), 533-554.

Financial Accounting Standards Board, 1980. Qualitative Characteristics of Accounting Information. Statement of Financial Accounting Concepts No. 2. Norwalk, CT: FASB. Available at http://www.fasb.org/pdf/con2.pdf.

Financial Accounting Standards Board, 2010. Statement of Financial Accounting Concepts No. 8. Available at http://www.fasb.org/jsp/FASB/Page/PreCodSectionPage&cid=1176156317989.

Fischer, P. E., Huddart, S. J., 2008. Optimal contracting with endogenous social norms. American Economic Review 98(4), 1459-75.

Francis, J., Philbrick, D., Schipper, K., 1994. Shareholder litigation and corporate disclosures. Journal of Accounting Research 32(2), 137-164.

Gong, G., Li, L. Y., Zhou, L., 2013. Earnings non-synchronicity and voluntary disclosure. Contemporary Accounting Research 30(4), 1560-1589.

Gow, I., Ormazabal, G., Taylor, D., 2010. Correcting for cross-sectional and time-series dependence in accounting research. The Accounting Review 85(2), 483-512.

Giroud, X., Mueller, H. M., 2010. Does corporate governance matter in competitive industries?. Journal of Financial Economics 95(3), 312-331.

Giroud, X., Mueller, H. M., 2011. Corporate governance, product market competition, and equity prices. The Journal of Finance 66(2), 563-600.

Hambrick, D. C., 1983. Some tests of the effectiveness and functional attributes of Miles and Snow's strategic types. The Academy of Management Journal 26(1), 5-26.

Hart, O. D., 1983. The market mechanism as an incentive scheme. The Bell Journal of Economics 14(2), 366-382.

Harvey, C. R., Siddique, A., 2000. Conditional Skewness in Asset Pricing Tests. The Journal of Finance 55, 1263–1295.

Hoitash, R., Kogan, A., Vasarhelyi, M. A., 2006. Peer-based approach for analytical procedures. Auditing: A Journal of Practice & Theory 25(2), 53-84.

Hong, H., Stein, J. C., 2003. Differences of opinion, short-sales constraints, and market crashes. Review of Financial Studies 16(2), 487-525.

Hou, K., Robinson, D. T., 2006. Industry concentration and average stock returns. The Journal of Finance 61(4), 1927-1956.

Hutton, A. P., Marcus, A. J., Tehranian, H., 2009. Opaque financial reports, R^2, and crash risk. Journal of Financial Economics 94(1), 67-86.

Jin, L., Myers, S., 2006. R^2 around the world: New theory and new tests. Journal of Financial Economics 79(2), 257-292.

Jorion, P., Giovannini, A., 1989. The time variation of risk and return in the foreign exchange and stock markets. Journal of Finance 44(2), 307-325.

Kale, J. R., Noe, T. H., Ramirez, G. G., 1991. The effect of business risk on corporate capital structure: Theory and evidence. The Journal of Finance 46(5), 1693-1715.

Kasznik, R., Lev, B., 1995. To warn or not to warn: Management disclosures in the face of an earnings surprise. The Accounting Review, 113-134.

Khan, M., Watts, R., 2009. Estimation and empirical properties of a firm-year measure of accounting conservatism. Journal of Accounting and Economics 48(2), 132-150.

Kim, J.-B., Li, Y., Zhang, L., 2011a. Corporate tax avoidance and stock price crash risk: Firm-level analysis. Journal of Financial Economics 100(3), 639-662.

Kim, J.-B., Li, Y., Zhang, L., 2011b. CFOs versus CEOs: Equity incentives and crashes. Journal of Financial Economics 101(3), 713-730.

Kim, J. B., Zhang, L., 2014. Financial reporting opacity and expected crash risk: Evidence from implied volatility smirks. Contemporary Accounting Research 31(3), 851-875.

Kim, J.-B., Zhang, L., 2015. Accounting conservatism and stock price crash risk: Firm-level evidence. Contemporary Accounting Research, forthcoming

Kim, S., Kraft, P., Ryan, S., 2013. Financial statement comparability and credit risk. Review of Accounting Studies 18(3), 783-823.

Kothari, S. P., Shu, S., Wysocki, P. D., 2009. Do managers withhold bad news? Journal of Accounting Research 47(1), 241-276.

Lang, M., Lundholm, R., 1993. Cross-sectional determinants of analyst ratings of corporate disclosures. Journal of Accounting Research 31(2) 246-271.

Lang, M., Maffett, M., Owens, E., 2010. Earnings comovement and accounting comparability: The effects of mandatory IFRS adoption. Working paper, University of North Carolina at Chapel Hill.

Libby, R., Libby, P. A., Short, D. G., 2009. Financial Accounting, sixth ed. Irwin/McGraw-Hill, New York.

Miles, R. E., Snow, C. C., 1978. Organizational strategy, structure, and process. McGraw-Hill, New York.

Milgram, S., 1963. Behavioral study of obedience. The Journal of Abnormal and Social Psychology 67(4), 371.

Minutti-Meza, M., 2013. Does auditor industry specialization improve audit quality?. Journal of Accounting Research 51(4), 779-817.

Nalebuff, B. J., Stiglitz, J. E., 1983. Prizes and incentives: towards a general theory of compensation and competition. The Bell Journal of Economics 14(1), 21-43.

Pan, J., 2002. The jump-risk premia implicit in options: Evidence from an integrated time-series study. Journal of Financial Economics 63(1), 3-50.

Pástor, L.,Veronesi, P., 2003. Stock valuation and learning about profitability. Journal of Finance 58(5), 1749-1789.

Petersen, M. A., 2009. Estimating standard errors in finance panel data sets: Comparing approaches. Review of Financial Studies 22(1), 435-480.

Ross, S. A., 1977. The determination of financial structure: the incentive-signalling approach. The Bell Journal of Economics 8(1), 23-40.

Santa-Clara, P., Yan, S., 2010. Crashes, volatility, and the equity premium: Lessons from S&P 500 options. Review of Economics and Statistics 92(2), 435-451.

Schipper, K., 2003. Principles-based accounting standards. Accounting Horizons 17(1), 61-72.

Skinner, D. J., 1997. Earnings disclosures and stockholder lawsuits. Journal of Accounting and Economics 23(3), 249-282.

Thompson, S. B., 2011. Simple formulas for standard errors that cluster by both firm and time. Journal of Financial Economics 99(1), 1-10.

Toft, K. B., Prucyk, B., 1997. Options on leveraged equity: Theory and empirical tests. Journal of Finance 52(3), 1151-1180.

U.S. Securities and Exchange Commission, 2008. Speech by SEC Chairman: International Financial Reporting Standards: The Promise of Transparency and Comparability for the Benefit of Investors around the Globe. Available at: https://www.sec.gov/news/speech/2008/spch052808cc.htm.

Van Buskirk, A., 2011. Volatility skew, earnings announcements, and the predictability of crashes. Working paper, Ohio State University.

Wang, C., 2014. Accounting standards harmonization and financial statement comparability: Evidence from transnational information transfer. Journal of Accounting Research 52(4), 955-992.

Xing, Y., Zhang, X., Zhao, R., 2010. What does the individual option volatility smirk tell us about future equity returns?. Journal of Financial and Quantitative Analysis 45(3), 641-662.

Yip, W. and Young, D., 2012. Does mandatory IFRS adoption improve information comparability? The Accounting Review 87 (5), 1767-1789.

Yu, F., 2008. Analyst coverage and earnings management. Journal of Financial Economics 88(2), 245-271.

Appendix A: Variable definitions

Main variables

IV_SKEW is the average daily implied volatility skew over the fiscal year, where the daily implied volatility skew is the difference between the implied volatility of OTM put options and that of ATM call options. The OTM puts are defined as put option contracts with a delta between -0.375 and -0.125 and the ATM calls are defined as call option contracts with a delta between 0.375 and 0.625. The daily implied volatilities of OTM puts (ATM calls) are the open interest-weighted average of all OTM puts (ATM calls) traded during the day. See Appendix B for more details. Source: OptionMetrics.

$COMPACCT_{ij}$ is negative one multiplied by the average of the absolute value of the difference of the predicted value of a regression of firm *i*'s quarterly earnings on its quarterly return using the estimated coefficients for firms *i* and *j*, respectively, over the past four years. It is calculated for each firm *i*−firm *j* pair ($i \neq j$), $j = 1, \ldots, J$, firms in the same two-digit SIC industry as firm *i*. Source: Compustat, CRSP.

COMPACCT4 is the average of the four highest $COMPACCT_{ij}$ values for firm *i*.

COMPACCTIND is the mean value of $COMPACCT_{ij}$ for firm *i* for all firms in its industry.

Control variables

ATM_IV is the average daily implied volatility of ATM call options over the fiscal year. An ATM call option is defined as a call option with a delta value between 0.375 and 0.625. The daily implied volatility is calculated as an open interest weighted average of the implied volatility for all ATM call options traded during the day. Source: OptionMetrics.

FIRM_SIZE is the natural log of the market value of equity at the end of the year. Source: Compustat.

LEVERAGE is the book value of long-term debt divided by total assets at the end of the year. Source: Compustat.

MB is the ratio of the market value of equity to the book value of equity at the end of the year, scaled by 100.[24] Source: Compustat.

CASHFLOW_VOL is the standard deviation of operating cash flows (scaled by lagged total assets) over the past five years. Source: Compustat.

EARNINGS_VOL is the standard deviation of earnings before extraordinary items (scaled by lagged total assets) over the past five years. Source: Compustat.

[24] Since the coefficient of *MB* without scaling has a very low value, we scale this variable by 100. For this reason, we also apply this scaling to *BETA*, *NEG_SKEW,* and *STRATEGY*.

SALES_VOL is the standard deviation of sales revenue (scaled by lagged total assets) over the past five years. Source: Compustat.

STOCK_TURN is the average monthly share turnover over the fiscal year. Source: CRSP.

BETA is the market beta of the firm, which is estimated from the capital asset pricing model using daily stock and market returns over the fiscal year, scaled by 100. Source: CRSP.

IDOSY_VOL is the standard deviation of the weekly firm-specific stock return over the fiscal year. Source: CRSP.

TOTAL_VOL is the standard deviation of the weekly stock return over the fiscal year. Source: CRSP.

NEG_SKEW is the negative skewness of weekly stock returns over the fiscal year, scaled by 100. Source: CRSP.

STOCK_RET is the raw yearly stock return over the fiscal year. Source: Compustat.

HHI is the Herfindahl–Hirschman Index as calculated in Giroud and Mueller (2010), which is the sum of the square of the market share of all firms within each (three-digit SIC) industry-year. Source: Compustat.

STRATEGY is the business strategy composite measure of Bentley et al. (2013), scaled by 100. Source: Compustat.

Variables in additional tests

HPIN is a dummy variable that equals one if a firm's PIN score is in the top tercile and zero if it is in the bottom tercile, where the PIN score is the measure of the probability of informed trade developed by Easley et al. (1997). Source: http://www.rhsmith.umd.edu/faculty/sbrown/.

LMONI is a dummy variable that equals one if the sum of the decile rankings of institutional shareholdings and the number of analysts following at the beginning of the fiscal year is in the bottom tercile and zero if it is in the top tercile. Source: I/B/E/S and Thomson-Reuters Institutional Holdings (13F) Database.

HHHI is a dummy variable that equals one if a firm's *HHI* is in the top tercile and zero if it is in the bottom tercile.

CAR is the five-day cumulative abnormal return around each announcement date, where the abnormal return is defined as the firm's stock return minus the CRSP value-weighted market return. Source: CRSP.

FORECASTREVISION is as defined in Kothari et al. (2009), which is the difference between management's forecast of quarterly earnings per share and analysts' most recent consensus forecast, scaled by the absolute value of the analysts' consensus forecast. Source: Zacks.

BAD a dummy variable that equals one if *FORECASTREVISION* is negative and zero otherwise.

DIVCHG is as defined in Kothari et al. (2009), which is the percentage change in the stated dividend payout. Source: CRSP.

NEG is a dummy variable that equals one if *DIVCHG* is negative and zero otherwise.

REGFD is a dummy variable that equals one if the announcement occurred after the passage of RegFD in October 2000 and zero otherwise.

HLIT is a dummy variable that equals one if a firm is one of the industries subject to a high incidence of litigation of Francis et al. (1994) and zero otherwise. Specially, those industries are biotechnology (SIC codes 2833-2838 and 8731-8734), computers (SIC codes 3570-3577 and 7370-7374), electronics (SIC codes 3600-3674), and retail (SIC codes 5200-5961).

HASYMM is a dummy variable that equals one if a firm's PIN score is above the sample median and zero otherwise.

Appendix B: Measurement of implied volatility smirk

Following prior research (Bollen and Whaley, 2004; Kim and Zhang, 2014), we first group options into five different moneyness categories according to their delta (Δ),

Category	Labels	Delta Range
1	Deep in-the-money call	$0.875 < \Delta_C \leq 0.98$
	Deep OTM put	$-0.125 < \Delta_P \leq -0.02$
2	In-the-money call	$0.625 < \Delta_C \leq 0.875$
	OTM put	$-0.375 < \Delta_P \leq -0.125$
3	ATM call	$0.375 < \Delta_C \leq 0.625$
	ATM put	$-0.625 < \Delta_P \leq -0.375$
4	OTM call	$0.125 < \Delta_C \leq 0.375$
	In-the-money put	$-0.875 < \Delta_P \leq -0.625$
5	Deep OTM call	$0.02 < \Delta_C \leq 0.125$
	Deep in-the-money put	$-0.98 < \Delta_P \leq -0.875$

with the delta values (Δ_C and Δ_P) defined as

$$\Delta_C = N\left[\frac{\ln\left((S-PVD)e^{rT}/X\right)+0.5\sigma^2 T}{\sigma\sqrt{T}}\right]$$

$$\text{and } \Delta_P = \Delta_C - 1 \qquad \text{(B.1)}$$

where S is the current stock price, PVD is daily dividends discounted at the rates corresponding to the ex-dividend dates and summed over the life of the option, X is the option's exercise price, T is the option's time to expiration, σ is the volatility of stock price, and r is the risk-free rate of interest

We measure the daily implied volatility skew (IV_SKEW_{it}) of stock i's option as the difference between the implied volatility of OTM puts ($IV^{OTMP}{}_{it}$) and that of ATM calls ($IV^{ATMC}{}_{it}$) during day t. When there are multiple put or call option contracts for stock i on a particular day, we calculate the weighted average of the implied volatilities for the put or call options, using option open interest ($OPEN\_INT$) as a weight:

$$IV\_SKEW_{it} = \frac{\sum_j OPEN\_INT_j \times IV_{it\,j}^{OTMP}}{\sum_j OPEN\_INT_j} - \frac{\sum_k OPEN\_INT_k \times IV_{it\,k}^{ATMC}}{\sum_k OPEN\_INT_k} \qquad \text{(B.2)}$$

To obtain an annual measure of the volatility smirk, following Kim and Zhang (2014), we average the daily IV_SKEW over the 12-month period ending three months after the fiscal year-end.

Appendix C: Alternative measures of comparability

C.1. Earnings comovement

Two firms can have highly comparable financial statements when their earnings comove over time, despite differences in their mappings of economic events to earnings. Following De Franco et al. (2011), we run the following regressions for firms *i* and *j* in the same industry to compute the pairwise historical correlation between their earnings:

$$EARNINGS_{it} = \alpha_{ij} + \beta_{ij}\, EARNINGS_{jt} + \varepsilon_{ijt} \quad \text{(C.1)}$$

where *EARNINGS* is income before extraordinary items. For each firm pair *i* and *j*, we use their previous 16 quarters of earnings to obtain the average R^2 value from the regression. For any individual firm *i*, earnings comovement (*ECOMP_COV)* is computed as the average of its four highest R^2 values during year *t*. We also include two control variables, *CFOCOMP_COV* and *RET_COV*, to capture the covariation in economic shocks related to cash flow expectations in the near term and over long horizons. The measures *CFOCOMP_COV* and *RET_COV* are created in an identical manner to *ECOMP_COV* except that we replace *EARNINGS* with *CFO* or *RET* in the above equation. The term *CFO* is the ratio of the quarterly cash flow from operations to the market value at the beginning of the period and *RET* is monthly stock returns.

C.2. Comparability measures of Barth et al. (2012)

We employ two alternative comparability measures developed by Barth et al. (2012): *COMPACCT4_BARTH1* and *COMPACCT4_BARTH2*. We estimate the following time-series equations using the 16 quarters of data at the end of each fiscal year *t*:

$$P_{it} = \alpha_i + \beta_{1i}\, BVE_{it} + \beta_{2i}\, NI_{it} + \varepsilon_{it} \quad \text{(C.2)}$$

$$\begin{aligned} RET_{it} = {} & \alpha_i + \beta_{1i}\,[NI_{it} / P_{it-1}] + \beta_{2i}\,[\Delta NI_{it} / P_{it-1}] + \beta_{3i}\, LOSS_{it} \\ & + \beta_{4i}\, LOSS_{it} \times [NI_{it} / P_{it-1}] + \beta_{5i}\, LOSS_{it} \times [\Delta NI_{it} / P_{it-1}] + \varepsilon_{it} \end{aligned} \quad \text{(C.3)}$$

where *P* is the stock price, *BVE* is the book value of equity per share, *NI* is net income before extraordinary items per share, *RET* is quarterly stock returns, and *LOSS* is an indicator variable that equals one if *NI* is negative and zero otherwise. We follow the algorithm used to calculate our primary comparability measures to compute *COMPACCT4_BARTH1* based on Eq. (C.2) and *COMPACCT4_BARTH2* based on Eq. (C.3), respectively.

Table 1
Descriptive statistics

Panel A: Variable distributions

	Mean	SD	5%	25%	Median	75%	95%
Implied Volatility Measure							
IV_SKEW	0.042	0.031	0.006	0.026	0.038	0.054	0.091
Comparability Measures							
COMPACCT4	-0.513	1.001	-2.140	-0.440	-0.190	-0.100	-0.040
COMPACCTIND	-3.238	2.033	-6.520	-3.810	-2.790	-2.030	-1.290
Other Control Variables							
ATM_IV	0.448	0.187	0.209	0.310	0.409	0.550	0.817
FIRM_SIZE	7.582	1.595	5.190	6.408	7.435	8.604	10.486
LEVERAGE	0.181	0.169	0.000	0.006	0.159	0.292	0.497
MB	0.037	0.040	0.009	0.017	0.025	0.041	0.105
CASHFLOW_VOL	0.080	0.110	0.012	0.027	0.049	0.089	0.238
EARNINGS_VOL	0.090	0.154	0.008	0.021	0.044	0.097	0.295
SALES_VOL	0.240	0.282	0.030	0.083	0.155	0.284	0.746
STOCK_TURN	0.225	0.181	0.053	0.109	0.176	0.283	0.555
BETA	0.011	0.005	0.003	0.008	0.011	0.015	0.021
IDOSY_VOL	0.054	0.028	0.021	0.034	0.048	0.068	0.111
TOTAL_VOL	0.061	0.031	0.025	0.039	0.054	0.076	0.122
NEG_SKEW	-0.003	0.009	-0.018	-0.009	-0.004	0.002	0.011
STOCK_RET	0.138	0.583	-0.582	-0.213	0.057	0.342	1.122
HHI	0.135	0.138	0.034	0.053	0.092	0.159	0.367
STRATEGY	0.181	0.035	0.120	0.160	0.180	0.200	0.240
n				17,057			

This panel reports the distributions of the variables in the final sample of our main test. The sample contains the firm–year observations from 1996 to 2013 with no missing values for all the variables. See Appendix A for the variable definitions.

Table 1 (continued)

Panel B: Correlations

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
IV_SKEW	(1)		**-0.165**	**-0.285**	**0.278**	**-0.121**	0.008	**-0.071**	**0.116**	**0.153**	**0.102**	**0.268**	**0.220**	**0.189**	**0.273**	**0.035**	**-0.047**	0.010	0.001
COMPACCT4	(2)	**-0.134**		**0.438**	**-0.275**	**0.198**	**-0.140**	**0.194**	**-0.190**	**-0.346**	**-0.161**	**-0.153**	**-0.211**	**-0.237**	**-0.259**	**0.032**	**-0.031**	**-0.151**	**0.064**
COMPACCTIND	(3)	**-0.199**	**0.794**		**-0.290**	**0.126**	**0.061**	-0.018	**-0.254**	**-0.397**	**-0.109**	**-0.231**	**-0.257**	**-0.204**	**-0.250**	**0.037**	**-0.054**	**0.086**	0.010
ATM_IV	(4)	**0.250**	**-0.102**	**-0.201**		**-0.626**	**-0.231**	**-0.046**	**0.562**	**0.604**	**0.385**	**0.432**	**0.312**	**0.903**	**0.929**	-0.012	**-0.165**	**-0.089**	**0.106**
FIRM_SIZE	(5)	**-0.139**	0.002	**0.023**	**-0.586**		**0.223**	**0.236**	**-0.420**	**-0.412**	**-0.308**	**-0.126**	**-0.076**	**-0.591**	**-0.556**	0.004	**0.151**	0.018	**0.060**
LEVERAGE	(6)	**0.051**	**-0.122**	**-0.023**	**-0.159**	**0.127**		**-0.115**	**-0.319**	**-0.288**	**-0.183**	**-0.127**	**-0.053**	**-0.202**	**-0.193**	0.014	-0.003	**0.096**	**-0.162**
MB	(7)	**0.026**	**0.037**	**-0.038**	**0.081**	**0.141**	**0.047**		**0.147**	**0.126**	-0.012	**0.039**	**-0.041**	**-0.027**	**-0.055**	**-0.172**	**0.298**	**-0.091**	**0.134**
CASHFLOW_VOL	(8)	**0.114**	**-0.036**	**-0.158**	**0.439**	**-0.288**	**-0.195**	**0.190**		**0.692**	**0.534**	**0.332**	**0.193**	**0.533**	**0.515**	**-0.050**	**-0.030**	**-0.106**	**0.084**
EARNINGS_VOL	(9)	**0.125**	**-0.104**	**-0.238**	**0.434**	**-0.262**	**-0.165**	**0.164**	**0.760**		**0.449**	**0.376**	**0.275**	**0.557**	**0.554**	**-0.047**	-0.018	**-0.152**	**0.118**
SALES_VOL	(10)	**0.061**	**-0.052**	**-0.058**	**0.298**	**-0.239**	**-0.118**	0.004	**0.382**	**0.332**		**0.211**	**0.163**	**0.374**	**0.377**	**-0.037**	-0.003	**0.080**	**0.099**
STOCK_TURN	(11)	**0.231**	**-0.120**	**-0.183**	**0.402**	**-0.099**	**-0.073**	**0.060**	**0.214**	**0.216**	**0.170**		**0.371**	**0.416**	**0.455**	**0.056**	-0.012	**-0.062**	**0.123**
BETA	(12)	**0.188**	**-0.164**	**-0.220**	**0.277**	**-0.081**	-0.011	-0.007	**0.107**	**0.148**	**0.105**	**0.362**		**0.229**	**0.351**	**0.026**	0.012	**0.068**	**0.043**
IDOSY_VOL	(13)	**0.205**	**-0.079**	**-0.138**	**0.882**	**-0.536**	**-0.131**	**0.075**	**0.390**	**0.377**	**0.299**	**0.413**	**0.210**		**0.959**	-0.007	**-0.187**	**-0.090**	**0.102**
TOTAL_VOL	(14)	**0.260**	**-0.107**	**-0.171**	**0.900**	**-0.500**	**-0.117**	**0.059**	**0.362**	**0.365**	**0.293**	**0.445**	**0.325**	**0.957**		-0.012	**-0.188**	**-0.061**	**0.103**
NEG_SKEW	(15)	0.012	0.016	**0.034**	**-0.041**	0.006	0.010	**-0.110**	**-0.040**	**-0.044**	**-0.032**	**0.021**	0.013	**-0.021**	**-0.071**		**-0.431**	**0.020**	**0.001**
STOCK_RET	(16)	**-0.021**	**-0.055**	**-0.091**	0.004	**0.060**	**-0.031**	**0.230**	**0.062**	**0.081**	**0.040**	**0.091**	**0.058**	-0.009	-0.005	**-0.384**		0.012	**-0.029**
HHI	(17)	0.007	**-0.086**	**0.034**	**-0.119**	**0.034**	**0.056**	**-0.042**	**-0.115**	**-0.128**	-0.011	**-0.068**	**0.021**	**-0.112**	**-0.092**	0.011	-0.007		-0.013
STRATEGY	(18)	-0.011	**0.025**	0.006	**0.090**	**0.074**	**-0.154**	**0.086**	**0.100**	**0.123**	**0.078**	**0.112**	**0.034**	**0.094**	**0.092**	0.000	-0.010	**0.033**	

This panel presents the Pearson-Spearman (below and above the diagonal, respectively) correlation matrix of the variables. **Boldface** indicates the 0.01 significance level. See Appendix A for the variable definitions.

Table 2
Effect of financial statement comparability on expected crash risk

	Dependent variable = *IV_SKEW*			
	(1)	(2)	(3)	(4)
COMPACCT4	-0.004***	-0.003***		
	(-2.89)	(-3.12)		
COMPACCTIND			-0.005***	-0.005***
			(-2.61)	(-4.97)
ATM_IV	0.014	0.019***	0.012	0.018***
	(1.18)	(5.50)	(1.03)	(5.21)
FIRM_SIZE	-0.001*	-0.000	-0.001*	-0.000
	(-1.72)	(-0.40)	(-1.79)	(-0.42)
LEVERAGE	0.013***	0.014***	0.014***	0.014***
	(4.99)	(6.49)	(5.71)	(6.59)
MB	0.023*	0.024***	0.018	0.023***
	(1.75)	(3.17)	(1.46)	(3.12)
CASHFLOW_VOL	0.007	-0.008**	0.007	-0.008**
	(1.17)	(-2.06)	(1.13)	(-2.03)
EARNINGS_VOL	0.005	0.004	0.005	0.004
	(1.10)	(1.31)	(1.09)	(1.27)
SALES_VOL	-0.003	0.002*	-0.003	0.002*
	(-1.48)	(1.89)	(-1.36)	(1.84)
STOCK_TURN	0.024***	0.018***	0.024***	0.018***
	(5.23)	(10.01)	(5.28)	(9.93)
BETA	0.088	0.107*	0.085	0.103*
	(0.35)	(1.94)	(0.34)	(1.88)
IDOSY_VOL	-0.623***	-0.062*	-0.622***	-0.063**
	(-5.13)	(-1.93)	(-5.10)	(-1.97)
TOTAL_VOL	0.626***	0.152***	0.626***	0.152***
	(5.00)	(4.72)	(5.00)	(4.72)
NEG_SKEW	0.137**	-0.042*	0.136**	-0.042*
	(2.48)	(-1.74)	(2.46)	(-1.70)
STOCK_RET	-0.001	-0.001	-0.001	-0.001*
	(-0.79)	(-1.64)	(-0.78)	(-1.77)
HHI	0.005**	0.006	0.006***	0.006
	(2.13)	(0.91)	(3.01)	(0.94)
STRATEGY	-0.024**	0.005	-0.024**	0.007
	(-1.99)	(0.44)	(-1.97)	(0.62)
Constant	0.037***	-0.000	0.039***	0.001
	(4.44)	(-0.03)	(4.28)	(0.23)
Firm/Year cluster	Yes		Yes	
Year fixed effects		Yes		Yes
Firm fixed effects		Yes		Yes
Adjusted R^2	0.156	0.287	0.157	0.288
n	17,057	17,057	17,057	17,057

This table reports the results using the comparability measures developed by De Franco et al. (2011). Both of the comparability measures are ranked into deciles and rescaled to range between zero and one. All continuous independent variables are winsorized at the top and bottom one-percentiles. The *t*-values are reported in parentheses. The *t*-values in column (1) and (3) are based on standard errors clustered by firm and year. ***, **, and * indicate significance at the 0.01, 0.05, and 0.10 levels, respectively. See Appendix A for the variable definitions.

Table 3
Effect of financial statement comparability on expected crash risk:
Earnings comovement

	Dependent variable = *IV_SKEW*	
	(1)	(2)
ECOMP_COV	-0.007***	-0.004***
	(-5.29)	(-7.55)
CFOCOMP_COV	-0.001	-0.001
	(-0.79)	(-1.14)
RET_COV	-0.006***	0.001*
	(-5.33)	(1.85)
ATM_IV	0.022**	0.022***
	(2.29)	(7.72)
FIRM_SIZE	-0.000	-0.000
	(-0.97)	(-1.14)
LEVERAGE	0.009***	0.007***
	(6.41)	(4.49)
MB	-0.008	0.021***
	(-1.00)	(3.37)
CASHFLOW_VOL	0.005	-0.004
	(0.94)	(-1.09)
EARNINGS_VOL	0.002	0.001
	(0.55)	(0.41)
SALES_VOL	-0.001	0.003***
	(-0.64)	(2.90)
STOCK_TURN	0.021***	0.017***
	(4.94)	(10.34)
BETA	0.013	0.114***
	(0.07)	(2.71)
IDOSY_VOL	-0.710***	-0.141***
	(-7.87)	(-5.59)
TOTAL_VOL	0.634***	0.144***
	(7.00)	(5.57)
NEG_SKEW	0.167***	0.012
	(3.00)	(0.65)
STOCK_RET	0.000	0.000
	(0.09)	(0.82)
HHI	0.004***	0.001
	(2.67)	(0.32)
STRATEGY	-0.013	-0.001
	(-1.47)	(-0.09)
Constant	0.037***	0.010***
	(6.18)	(2.98)
Firm/Year cluster	Yes	
Year fixed effects		Yes
Firm fixed effects		Yes
Adjusted R^2	0.165	0.313
n	16,600	16,600

This table reports the results using the comparability measures based on earnings comovement as in De Franco et al. (2011). See Appendix C for detailed information on *ECOMP_COV*, *CFOCOMP_COV*, and *RET_COV*. All the continuous independent variables are winsorized at the top and bottom one-percentiles. The *t*-values are reported in parentheses. The *t*-values in column (1) are based on standard errors clustered by firm and year. ***, **, and * indicate significance at the 0.01, 0.05, and 0.10 levels, respectively. See Appendix A for the other variable definitions.

Table 4
Effect of financial statement comparability on expected crash risk:
Comparability measure of Barth et al. (2012)

	Dependent variable = *IV_SKEW*			
	(1)	(2)	(3)	(4)
COMPACCT4_BARTH1	-0.003***	-0.001		
	(-3.19)	(-1.22)		
COMPACCT4_BARTH2			-0.004***	-0.003***
			(-4.13)	(-3.22)
ATM_IV	-0.003	0.014***	-0.005	0.008**
	(-0.75)	(3.44)	(-1.48)	(2.02)
FIRM_SIZE	-0.001***	-0.000	-0.001***	0.000
	(-5.64)	(-0.77)	(-4.86)	(0.52)
LEVERAGE	0.013***	0.016***	0.013***	0.017***
	(8.60)	(6.58)	(8.70)	(6.81)
MB	0.050***	0.027***	0.055***	0.022**
	(7.16)	(2.92)	(8.04)	(2.45)
CASHFLOW_VOL	0.003	-0.012**	0.008**	-0.005
	(0.98)	(-2.43)	(2.29)	(-0.96)
EARNINGS_VOL	0.002	0.004	0.000	0.003
	(0.98)	(1.11)	(0.00)	(1.02)
SALES_VOL	-0.000	0.002*	-0.001	0.001
	(-0.07)	(1.77)	(-0.79)	(0.37)
STOCK_TURN	0.013***	0.020***	0.015***	0.022***
	(7.85)	(8.64)	(8.90)	(9.73)
BETA	0.251***	0.072	0.197***	0.063
	(4.18)	(1.14)	(3.19)	(0.99)
IDOSY_VOL	0.023	-0.027	-0.016	-0.045
	(0.59)	(-0.74)	(-0.42)	(-1.21)
TOTAL_VOL	0.151***	0.157***	0.179***	0.170***
	(3.92)	(4.28)	(4.52)	(4.51)
NEG_SKEW	-0.071**	-0.047*	-0.076**	-0.039
	(-2.33)	(-1.70)	(-2.46)	(-1.42)
STOCK_RET	-0.000	-0.000	-0.001**	-0.001
	(-0.62)	(-0.29)	(-2.09)	(-1.16)
HHI	0.001	0.003	0.001	0.006
	(0.63)	(0.42)	(0.55)	(0.95)
STRATEGY	-0.012*	0.012	-0.007	0.009
	(-1.76)	(0.89)	(-1.04)	(0.70)
Constant	0.011***	-0.002	0.010***	-0.003
	(3.20)	(-0.42)	(3.00)	(-0.56)
Firm/Year cluster	Yes		Yes	
Year fixed effects		Yes		Yes
Firm fixed effects		Yes		Yes
Adjusted R^2	0.216	0.234	0.224	0.240
n	15,368	15,368	14,934	14,934

This table reports the results using the comparability measures of Barth et al. (2012). See Appendix C for detailed information on *COMPACCT4_BARTH1* and *COMPACCT4_BARTH2*. Both of the comparability measures are ranked into deciles and rescaled to range between zero and one. All continuous variables are winsorized at the top and bottom one-percentiles. The *t*-values are reported in parentheses. The *t*-values in column (1) and (3) are based on standard errors clustered by firm and year. ***, **, and * indicate significance at the 0.01, 0.05, and 0.10 levels, respectively. See Appendix A for the other variable definitions.

Table 5
Further exploration of the effect of comparability on expected crash risk

	Dependent variable = *IV_SKEW*	
	(1)	(2)
Panel A: High- versus low-quality information environment		
COMPACCT4 (1)	-0.005***	-0.000
	(-2.91)	(-0.15)
COMPACCT4×HPIN (2)		-0.007***
		(-3.77)
F-test: (1) + (2)		-0.007***
		(-3.56)
HPIN		0.008***
		(5.53)
Control Variables	Yes	Yes
Firm/Year Cluster	Yes	Yes
Adjusted R^2	0.122	0.126
n	10,349	10,349
Panel B: Strong versus weak external monitoring		
COMPACCT4 (1)	-0.005***	-0.015
	(-2.60)	(-1.43)
COMPACCT4×LMONI (2)		-0.007***
		(-3.16)
F-test: (1) + (2)		-0.022**
		(-2.22)
LMONI		0.007***
		(3.53)
Control Variables	Yes	Yes
Firm/Year Cluster	Yes	Yes
Adjusted R^2	0.121	0.129
n	8,240	8,240
Panel C: High versus low product market competition		
COMPACCT4 (1)	-0.004**	0.000
	(-2.41)	(0.01)
COMPACCT4×HHHI (2)		-0.008***
		(-3.64)
F-test: (1) + (2)		-0.008***
		(-4.48)
HHHI		0.005***
		(2.84)
Control Variables	Yes	Yes
Firm/Year Cluster	Yes	Yes
Adjusted R^2	0.110	0.112
n	11,327	11,327

This table reports the results of the effect of comparability on expected crash risk for firms in a high- versus low-quality information environment (Panel A), for firms with strong versus weak external monitoring (Panel B), and for firms operating in industry with high versus low product market competition (Panel C). The t-values and F-values are shown in parentheses. The t-values are based on standard errors that are clustered by firm and year. ***, **, and * indicate significance at the 0.01, 0.05, and 0.10 levels, respectively. See Appendix A for variable definitions.

Table 6
Effect of comparability on voluntary corporate disclosure

Panel A: Dividend change announcements

	Dependent variable = *CAR*	
	(1)	(2)
NEG	-0.042***	-0.043***
	(-8.14)	(-4.62)
COMPACCT4	-0.006*	-0.004
	(-1.87)	(-1.17)
COMPACCT4×NEG	0.041***	0.039***
	(4.14)	(3.48)
REGFD		0.001
		(0.39)
REGFD×NEG		0.007*
		(1.94)
HLIT		0.003
		(0.74)
HLIT×NEG		0.014
		(1.09)
HASYMM		0.001
		(0.22)
HASYMM×NEG		-0.002
		(-0.22)
DIVCHG	0.004***	0.004***
	(3.35)	(3.19)
Constant	0.007***	0.005
	(3.61)	(1.37)
Adjusted R^2	0.069	0.078
n	3,151	2,642

Panel B: Management earnings forecasts

	Dependent variable = *CAR*	
	(1)	(2)
BAD	-0.068***	-0.155***
	(-25.73)	(-7.03)
COMPACCT4	0.002	0.005**
	(0.51)	(2.26)
COMPACCT4×BAD	0.016***	0.013***
	(3.59)	(4.08)
REGFD		0.004
		(0.19)
REGFD×BAD		0.103***
		(4.71)
HLIT		-0.006**
		(-2.43)
HLIT×BAD		0.006*
		(1.90)
HASYMM		-0.004**
		(-2.16)
HASYMM×BAD		-0.010***
		(-3.45)
FORECASTREVISION	0.030***	0.024***
	(13.37)	(9.24)

Constant	0.026***	0.012
	(13.90)	(0.66)
Adjusted R^2	0.155	0.162
n	13,606	11,456

This table reports the results of the effect of financial statement comparability on asymmetric market reactions to bad news versus good news, based on the regression models (3) and (6) of Kothari et al. (2009). Panel A (B) reports the regression results using dividend change announcements (management earnings forecasts). The *t*-values are reported in parentheses. ***, **, and * indicate significance at the 0.01, 0.05, and 0.10 levels, respectively. See Appendix A for the variable definitions.