



## Audit committees' oversight of bank risk-taking

Jerry Sun<sup>a,\*</sup>, Guoping Liu<sup>b</sup>

<sup>a</sup>Odette School of Business, University of Windsor, Windsor, ON N9B 3P4, Canada

<sup>b</sup>Ted Rogers School of Management, Ryerson University, Toronto, ON M5B 2K3, Canada



### ARTICLE INFO

#### Article history:

Received 19 February 2013

Accepted 16 December 2013

Available online 22 December 2013

#### JEL classification:

G21

G34

#### Keywords:

Banks

Risk-taking

Risk management

Audit committees

### ABSTRACT

This study examines whether audit committee effectiveness affects bank risk-taking and risk management effectiveness. We find that banks with long board tenure audit committees have lower total risk and idiosyncratic risk, and banks with busy directors on their audit committees have higher total risk and idiosyncratic risk. These suggest that high audit committee effectiveness may constrain bank risk-taking activities. We also find that firm performance is more positively associated with bank risk for banks with long board tenure, more female audit committee members, or large size audit committees than for other banks, consistent with the notion that audit committee effectiveness may increase risk management effectiveness. However, this finding should be interpreted cautiously as it is contrary to the results on audit committee busyness.

© 2013 Elsevier B.V. All rights reserved.

### 1. Introduction

To maximize the value of their equity, bank shareholders have incentives to encourage management to engage in excessive risk-taking activities. This is because high risk of bank assets increases the value of deposit insurance and adds no extra cost to shareholders (Merton, 1977). Bank risk-taking has been more valuable since the mid-1980s, when bank charter value, which is regarded as an offset against the value of excessive risk-taking, decreased significantly due to deregulation and increased competition. Since the main duty of boards of directors is to protect shareholders' interests, high quality boards may, through the oversight of risk management, encourage bank management to take excessive risk in order to benefit shareholders. As a result, high quality board governance may increase banks' excessive risk-taking.

Nevertheless, high quality boards should also constrain excessive risk-taking activities that benefit management themselves at the expense of shareholders. Moreover, directors are concerned with monetary and reputational losses from lawsuits that are more likely to occur when banks take high risk. Due to the recent financial crisis, regulators have strengthened the oversight role of boards of directors in risk assessment and risk management. To protect themselves, high quality boards have incentives to seek high regulatory compliance by discouraging management to

engage in excessive risk-taking. Those boards may act more conservatively to avoid lawsuits arising from risk-taking. Thus, it is also likely that high quality board governance decreases banks' excessive risk-taking.

There exists limited research on the effect of board governance quality on bank risk-taking. Pathan (2009) documents a negative association between board independence and bank risk, suggesting that high quality board governance may lead to low risk-taking. However, Minton et al. (2010) find that financial expertise of independent directors on the board is positively associated with bank risk, which indicates that high quality board governance may lead to high risk-taking. These mixed findings necessitate further research on this issue. More importantly, boards of directors usually play an oversight role through their operating committees such as the audit committee. Although audit committees are regarded as having the responsibility for the oversight of risk management, there is little evidence on how audit committee effectiveness affects bank risk management. This study aims to fill in this void.

First, our study examines whether audit committee effectiveness is associated with bank risk-taking. Given that bank risk-taking is extensively influenced by the recent financial crisis, we are interested in the 2008–2010 period. Using a sample of 298 firm-year observations over the period, we find that audit committee members' board tenure is negatively associated with bank risk measured by total risk or idiosyncratic risk. We also find that audit committee members' busyness is positively associated with bank

\* Corresponding author. Tel.: +1 51925330003122.

E-mail addresses: [jyksun@uwindsor.ca](mailto:jyksun@uwindsor.ca) (J. Sun), [gliu@ryerson.ca](mailto:gliu@ryerson.ca) (G. Liu).

risk measured by total risk or idiosyncratic risk. Since directors' long board tenure or low busyness reflects high governance quality, our findings suggest that high audit committee effectiveness may lead to low bank risk-taking. Second, our study examines whether audit committee effectiveness is associated with the relationship between firm performance and bank risk. Overall, we find that firm performance is more positively associated with bank risk when banks have long board tenure, more female audit committee members, or large size audit committees. These results are consistent with the notion that high audit committee effectiveness may lead to high risk management effectiveness. However, this notion is challenged by other findings that firm performance is more positively associated with bank risk when banks have busy audit committees.

This study contributes to the literature in the following ways. First, our study extends the limited research on the relationship between board governance quality and bank risk-taking. Pathan (2009) and Minton et al. (2010) only examine board characteristics. Unlike their studies, we investigate the role of audit committees in monitoring bank risk and risk management. We provide novel evidence that audit committee effectiveness may affect bank risk-taking and risk management effectiveness. Second, this study also adds to a stream of research on the oversight role of audit committees. Prior research in this area (e.g., Klein, 2002; Bedard et al., 2004; Abbott et al., 2004; Karamanou and Vafeas, 2005) examines the role of audit committees in monitoring the financial reporting process, whereas our study focuses on audit committees' oversight role of risk management. As regulators have strengthened the risk oversight of board governance after the recent financial crisis, it is important to explore how effectively audit committees can oversee bank risk management.

The rest of the paper is organized as follows. Section 2 introduces background and reviews related studies. Section 3 develops hypotheses. Section 4 discusses research design. Section 5 conducts empirical analyses. Section 6 concludes.

## 2. Background and related studies

### 2.1. Bank risk-taking

The financial crisis of 2008 triggered by the collapse of sub-prime mortgage market has resulted in tremendous bank losses in the U.S.<sup>1</sup> It further led to the worst U.S. economic recession since the Great Depression. To find the causes of the financial crisis, the U.S. Congress appointed the Financial Crisis Inquiry Commission in 2009. A report issued by the Commission in January 2011 and endorsed by a majority of its members pointed out that one of the main causes of the financial crisis is that financial firms engaged in excessive risk-taking.

Bank shareholders have incentives to seek more risk-taking activities for their own interests. Banks' preference for excessive risk-taking arises from deposit insurance and the "too-big-to-fail" policy. Deposit insurance is intended to guarantee the deposits so as to protect bank deposits from losses in the event of bank defaults. Merton (1977) shows that the value of deposit insurance to bank shareholders is determined by the value of a put option on the value of the bank's assets at an exercise price equal to the depositors' claim, which increases in the risk of the bank's assets. However, deposit insurance premium is not sufficiently sensitive to the risk of the bank's assets, resulting in banks' excessive risk-taking. In addition, the "too-big-to-fail" policy induces risk-taking by providing implicit guarantees from the government since the

failure of a financial institution will severely affect the economy and thus it must be bailed out.

The moral hazard behavior of risk-taking can be mitigated by the charter value of banks. The charter value is the value of a bank being able to continue to do business in the future, and it exists only if the bank can survive. Excessive risk-taking increases insolvency risk and lowers the likelihood of bank survival. Thus, the charter value can act as a mechanism of self-imposed risk discipline. There is a strand of research that examines the relationship between risk-taking and charter value. Marcus (1984) develops a model predicting that banks will take less risk when they have a high charter value. Using the market-value capital-to-asset ratio and the interest cost on large certificates of deposit as proxies for bank risk, Keeley (1990) documents a negative relationship between risk-taking and charter value. However, Galloway et al. (1997) report that charter value's function as a risk-taking disincentive has been seriously impaired after the mid-1980s since bank charter values fell significantly as a result of deregulation and increased competition. The notion of charter value being a self-imposed risk-discipline device is also challenged by Park (1997) who shows that bank risk can increase with charter value if regulation is lax.

### 2.2. Oversight role of audit committees

Since 1940, the U.S. Securities and Exchange Commission (SEC) has recommended publicly traded companies to appoint a special committee of the board of directors to nominate external auditor and review audit engagement. Listed companies have been required to establish an audit committee by the New York Stock Exchange (NYSE) in the 1970s, followed by the National Association of Securities Dealers (Nasdaq) and the American Stock Exchange (AMEX) in the 1980s. The recommended scope of audit committees has been expanded beyond external audit matters in the late 1980s, when the Treadway Commission strengthened audit committees' oversight role in the financial reporting process.

There exists pervasive evidence that audit committees play an effective role in monitoring auditing and accounting. Carcello and Neal (2000) examine whether audit committee effectiveness affects auditors' issuance of going concern reports. They report that high audit committee independence increases the likelihood that the external auditor issues a going-concern report for a firm experiencing financial distress. Abbott et al. (2003) investigate the relationship between audit committee effectiveness and audit fees. They find that audit fees increase with audit committee independence and accounting or financial expertise, suggesting that clients with high audit committee effectiveness demand more audit effort to enhance financial reporting quality. Klein (2002) examines the effect of audit committee effectiveness on earnings management. She documents that earnings management measured by discretionary accruals is less for firms with high audit committee independence than for firm with low audit committee independence. Likewise, Bedard et al. (2004) suggest that high quality audit committees can effectively constrain earnings management. Moreover, Abbott et al. (2004) find that financial restatement is less likely to occur when firms have high audit committee independence. Karamanou and Vafeas (2005) report that the voluntary disclosure of management earnings forecasts is positively associated with the effectiveness of audit committee structures. These studies demonstrate that high quality audit committees effectively fulfill their main duty of monitoring the financial reporting process.

In addition to the oversight of financial reporting, audit committees have the responsibility for overseeing risk management. In 1999, the Blue Ribbon Committee recommended audit committees to "inquire of management, the director of internal

<sup>1</sup> The estimated losses for U.S. banks totaled \$885 billion according to the International Monetary Fund (IMF).

auditing, and the independent accountant about significant risks or exposures and assess the steps management has taken to minimize such risk to the company".<sup>2</sup> Risk assessment and risk management have been of particular concern since the collapse of Enron. The enactment of the Sarbanes–Oxley Act (SOX) in 2002 has significantly increased the authorities and responsibilities of audit committees in monitoring management. In 2002, the NYSE Corporate Accountability and Listing Standards Committee recommended that audit committees should discuss guidelines and policies on governing the process of risk assessment and risk management, whereas it is the job of the CEO and senior management to assess and manage the company's exposure to risk.

The importance of audit committees' oversight of risk management has been more emphasized as a result of the financial crisis of 2008. In 2009, the KPMG conducted a survey of audit committee members' reaction to the financial crisis. According to the survey, most of audit committee members responded that they have increased their "hands-on involvement" with management because of the financial crisis, suggesting that they intended to change the nature and scope of their oversight to improve the company's risk management. However, those audit committee members were concerned that their risk oversight responsibilities may still be unclear. More than half of the survey respondents said that risk oversight was not clearly delineated as the responsibilities of the board or its standing committees.

To reinforce the board's responsibilities for risk governance, the SEC issued the Proxy Disclosure Enhancements rules in 2009, which require the disclosure of the board's role with regard to risk oversight in the company's annual proxy statements starting in February 2010. As an example of how financial firms describe their boards' role of risk oversight in practice, we randomly choose a firm from our sample and review its disclosure of the board's risk oversight in its 2010 proxy statement. Below is an excerpt of the disclosure:

*"It is a key responsibility of our Chief Executive Officer, Chief Financial Officer, General Counsel, and other members of our senior management team to identify, assess, and manage the Company's exposure to risk. Our Board plays an important role in overseeing management's performance of these functions. The Board of Directors has approved the charter of the Audit Committee, which provides that the primary responsibilities of the Audit Committee include the assessment of the Company's policies with respect to risk assessment and risk management. The Audit Committee regularly discusses with management and the Company's independent auditors the Company's risk assessment and risk management processes, including major risk exposures, risk mitigants and the design and effectiveness of the Company's processes and controls to prevent and detect fraudulent activity. Furthermore, the Audit Committee and the Board as a whole receive regular reports from management and our independent auditors on prevailing material risks and the actions being taken to mitigate them. Management also reports to the Audit Committee and the Board on steps being taken to enhance our risk management processes and controls in light of evolving market, business, regulatory, and other conditions".*

### 2.3. Board governance and bank risk

There are a few studies that investigate the relationship between board governance and bank risk-taking. Pathan (2009) examines whether strong boards affect bank risk-taking. Using a

sample of 212 large U.S. bank holding companies over 1997–2004, he finds that board independence is negatively associated with bank risk measured by banks' total risk, idiosyncratic risk, and systematic risk. He also finds that board size is negatively related to bank risk. His commentary on the negative relationship between board independence and bank risk is that independent directors may be more sensitive to regulatory compliance so that they act more conservatively to reduce legal liability or reputational losses from bank defaults. As to the negative relationship between board size and bank risk, he comments that the results are consistent with the argument that strong bank boards positively affect bank risk-taking.<sup>3</sup>

Minton et al. (2010) investigate how U.S. financial institutions' risk-taking is related to the independence and financial expertise of the board of directors. For the full sample of 1266 observations over the period 2003–2008, they document that board independence are negatively associated with total risk, while the percentage of financial experts among independent directors is positively associated with total risk. For a sub-sample of 761 observations based on large financial institutions over the full period, they still find a positive association between financial expertise of independent directors and total risk, but no significant association between board independence and total risk. Their results suggest that firms with more independent directors who possess financial expertise engage in more risk-taking. In addition, their findings indicate that banks may not be better off with more independent financial experts on the board, especially during the crisis period.

## 3. Hypotheses development

### 3.1. Audit committee effectiveness and bank risk-taking

Merton (1977) indicates that banks can benefit from taking excessive risk although the benefit is restrained by bank charter value. As the charter value decreases due to deregulation and increased competition, shareholders might be more interested in taking risky projects that can increase firm value. High quality boards of directors should well represent shareholders in protecting their interests, and thus may encourage management to engage in more risk-taking. Minton et al. (2010) find that financial expertise of independent directors is positively associated with bank risk, suggesting that high board effectiveness may lead to high risk-taking. As the board of directors oversees management's risk taking activities through its audit committee, audit committee effectiveness reflects the extent to which management is monitored by the board of directors and shareholders. In this case, audit committee effectiveness would be positively associated with bank risk-taking.

On the other hand, regulators and depositors are concerned with bank risk-taking, especially after the recent financial crisis. Lately, the regulators have more pressure to regulate the oversight of risk-taking. In 2009, the SEC issued the Proxy Disclosure Enhancements rules to strengthen the role of boards in assessing and managing risk. Due to increased regulatory requirements on risk oversight, boards are likely to be more sensitive to regulatory compliance, and act more conservatively to mitigate legal liability or reputational losses from bank defaults. Pathan (2009) documents a negative association between board independence and bank risk, consistent with the notion that high quality boards are concerned with bank risk-taking. Similarly, high quality audit committees may also have incentives to reduce bank risk for

<sup>2</sup> Refer to the Blue Ribbon Committee on Improving the Effectiveness of Corporate Audit Committees (1999).

<sup>3</sup> Small size boards are regarded as strong boards in Pathan (2009).

regulatory compliance. In addition, high quality audit committee may reduce management taking excessive risk for making profits in the short run when these risk-taking activities are not truly value-maximizing (Cheng et al., 2010). Such opportunistic behavior is more prevalent in banking industry where management's performance is evaluated based in part on earnings they can make relative to their peers (Rajan, 2006). High quality audit committees can constrain such opportunistic behavior that is not beneficial to shareholders, and thus mitigate risk-taking.

Since audit committee effectiveness could be either positively or negatively related to bank risk-taking, we develop a non-directional hypothesis as follows:

**H1.** Audit committee effectiveness is significantly associated with bank risk-taking.

### 3.2. Audit committee effectiveness and risk management effectiveness

Based on the option theory, bank management is encouraged by shareholders to invest in high-risk projects. This may result in management taking opportunities to seek rents from inefficient investment projects that could not generate high return expected for the high level of risk. Audit committees are likely to influence management's decisions through the oversight of risk assessment and risk management. When audit committees discover a high-risk but low-return project in which management plans to invest, the board of directors can deny the management's proposal. Given that high quality audit committees can deter high-risk/low-return projects and maintain high-risk/high-return projects, we expect that bank performance will be more positively associated with risk-taking for banks with high audit committee effectiveness than for banks with low audit committee effectiveness.

However, the board of directors is also concerned with litigation risk because lawsuits usually result in monetary and reputational losses. This concern becomes more apparent since regulators have strengthened the responsibilities of the board of directors for risk oversight. Moreover, high quality independent directors have more reputational capital and should be more concerned with reputational losses.<sup>4</sup> Under the pressure of regulatory compliance, those directors may be excessively involved in banks' operations to restrain management's ability to garner profits. As a result, banks with high monitoring effectiveness of audit committees may miss or abort highly profitable projects, resulting in more inefficient investments. Thus, it is also likely that bank performance is less positively associated with risk-taking for banks with high audit committee effectiveness than for banks with low audit committee effectiveness. We formulate the following hypothesis:

**H2.** Audit committee effectiveness is significantly associated with the relationship between firm performance and bank risk-taking.

## 4. Research design

### 4.1. Sample selection

We begin to select financial firms from the Execucomp database that provides data of CEOs for the S&P 1500 companies. Like Minton et al. (2010), we identify firms with the Standard Industry Classification (SIC) codes of 602, 603, 6211, and 6282 as financial firms. Using the narrower classification of financial firms facilitates

to reduce unobservable heterogeneity among firms within each category, and thus can mitigate the issue of omitted variables and improve comparability. The Execucomp database includes 94, 106, and 109 financial firms for years 2008, 2009, and 2010, respectively. We then manually collect data of those financial firms' audit committees and boards from their proxy statements downloaded from the EDGAR database. We also collect those firms' financial statement data from the Compustat database and stock market data from the CRSP database. After the exclusion of observations with missing data, the final sample consists of 298 firm-year observations, consisting of 91, 103, and 104 financial firms for years 2008, 2009, and 2010, respectively. Panel A in Table 1 reports the breakdown of the final sample by year, while Panel B in Table 1 reports the breakdown of the final sample by specific industry. There are 202 (67.79%) observations from Commercial Banks (SIC code: 602), 31 (10.40%) observations from Savings Institutions (SIC code: 603), 39 (13.09%) observations from Security Brokers, Dealers, and Flotation (SIC code: 6211), and 26 (8.72%) observations from Investment Advice (SIC code: 6282).

### 4.2. Measurement of audit committee effectiveness

We measure audit committee effectiveness in multiple dimensions. Based on the literature on board of directors and its committees, we consider the following six audit committee characteristics that presumably affect audit committee effectiveness.

- (1) *Accounting or financial expertise.* Bedard et al. (2004) find that firms with accounting experts on the audit committee engage in less aggressive earnings management. Krishnan and Visvanathan (2008) document a positive association between accounting conservatism and audit committees' accounting or financial expertise. Dhaliwal et al. (2010) find that firms have higher accruals quality when their audit committees have at least one accounting or financial expert. These studies suggest that accounting or financial expertise plays an important role in the oversight of managers. Following Krishnan and Visvanathan (2008), we define directors with accounting or financial expertise as directors who are (or were) certified public accountants, auditors, principal or chief financial officers, controllers, or principal or chief accounting officers. Our first measure of audit committee effectiveness is the proportion of directors with accounting or financial expertise on the audit committee (ACEXP).
- (2) *Board tenure.* Beasley (1996) indicates that firms with long average board tenure of outside directors are less likely to have financial reporting fraud. Bedard et al. (2004) find less aggressive earnings management for firms with long

**Table 1**  
Sample breakdown.

Year	Frequency	Percent (%)	
<i>Panel A. By year</i>			
2008	91	30.54	
2009	103	34.56	
2010	104	34.90	
Total	298	100.00	
SIC code	Industry description	Frequency	Percent (%)
<i>Panel B. By SIC code</i>			
602	Commercial banks	202	67.79
603	Savings institutions	31	10.40
6211	Security brokers, dealers, and flotation	39	13.09
6282	Investment advice	26	8.72
Total		298	100.00

<sup>4</sup> Independent directors may be more concerned with reputational than monetary losses from lawsuits because the risk of those directors' out-of-pocket liability is tiny (Black et al., 2006).



average board tenure of outside directors on the audit committee. Dhaliwal et al. (2010) document a positive relationship between accruals quality and the average board tenure of audit committee members. Long board tenure directors have more experience and commitments on monitoring managers, resulting in more effective oversight.<sup>5</sup> We define long board tenure directors as directors with 10 or more years of board tenure (Sun et al., 2009). Our second measure of audit committee effectiveness is the proportion of long board tenure directors on the audit committee (*ACTEN*).

- (3) *Busy directors*. Beasley (1996) reports that the likelihood of accounting fraud is positively related to the average number of directorships held by outside directors. Core et al. (1999) find that CEO compensation is positively associated with the percentage of busy outside directors. Ahn et al. (2010) show that acquiring firms with busy boards experience more negative abnormal returns. Jiraporn et al. (2008) document that multiple directorships lead to a deeper diversification discount. Fich and Shivdasani (2006) find that busy boards, those in which a majority of outside directors have three or more additional directorships, display patterns associated with weaker corporate governance. Jiraporn et al. (2009a,b) further find that directors with more additional board seats serve on few board committees and are more likely to be absent from board meetings.<sup>6</sup> We define busy directors as outside directors who serve on three or more boards of the S&P 1500 companies. Our third measure of audit committee effectiveness is the proportion of busy directors on the audit committee (*ACBSY*).
- (4) *Block shareholdings*. Klein (2002) finds that earnings management is lower when outside block shareholders sit on the audit committee. Outside directors with block shareholdings have greater incentives to oversee managers because directors' shareholdings represent a mechanism to align the interests of outside directors to the interests of shareholders (Shivdasani, 1993). Our fourth measure of audit committee effectiveness is the proportion of directors, who hold at least 1% of shares of the firm, on the audit committee (*ACBLK*).
- (5) *Female directors*. Gul et al. (2011) find that stock prices of firms with gender-diverse boards are more informative, suggesting that boards' gender diversity may act as a supplementary mechanism for corporate governance. Srinidhi et al. (2011) show a positive relationship between the presence of female audit committee members and earnings quality. This suggests that female directors are more effective monitors than their male counterparts. Our fifth measure of audit committee effectiveness is the proportion of female directors on the audit committee (*ACFMD*).
- (6) *Audit committee size*. Baxter and Cotter (2009) argue that large audit committees are more likely to have members with varied expertise for effective oversight. Zhou and Chen (2004) report that audit committee size is negatively related to earnings management through loan loss provisions for a high earnings management group of commercial banks, suggesting that banks' large audit committees may have higher monitoring effectiveness. Our sixth measure of audit committee effectiveness is the number of audit committee members (*ACSIZE*).

<sup>5</sup> Vafeas (2003) argues that long board tenure may lead to the entrenchment problem and thus impair board governance quality. However, there is a lack of empirical evidence on the negative relationship between board tenure and outside directors' monitoring effectiveness.

<sup>6</sup> Some studies (e.g., Fama and Jensen, 1983; Shivdasani, 1993; Field et al., 2013) argue that more additional directorships indicate greater reputational capital, which will enhance outside directors' incentives to monitor managers. However, there is little evidence in support of that argument.

#### 4.3. Measurement of risk-taking

Based on prior research on bank risk-taking (e.g., Anderson and Fraser, 2000; Chen et al., 2006; Pathan, 2009), we measure risk-taking by total risk (*TRISK*), idiosyncratic risk (*IRISK*), and systematic risk (*SRISK*). *TRISK* is computed as the natural logarithm of the standard deviation of daily stock returns for each fiscal year.

Like Pathan (2009), we measure *IRISK* and *SRISK* by estimating the following equation:

$$R_{it} = \alpha_i + \beta_{1i}R_{mt} + \beta_{2i}INTEREST_t + \varepsilon_{it} \quad (1)$$

where  $R_{it}$  = stock return for the financial firm,  $R_{mt}$  = market return on S&P 500 index,  $INTEREST_t$  = yield on the three-month Treasury-bill rate.

Eq. (1) is estimated for each firm and fiscal year. *IRISK* is computed as the natural logarithm of the standard deviation of residual values from Eq. (1). *SRISK* is measured by the coefficient on  $R_{mt}$  in Eq. (1), i.e.,  $\beta_{1i}$ .

#### 4.4. Models

First, we examine the effect of audit committee effectiveness on risk-taking based on the following model:

$$\begin{aligned} RISK = & a_0 + a_1ACEXP + a_2ACTEN + a_3ACBSY + a_4ACBLK \\ & + a_5ACFMD + a_6ACSIZE + a_7BDIND + a_8BDSIZE \\ & + a_9SIZE + a_{10}LEV + a_{11}FREQ + a_{12}CEODUL \\ & + a_{13}CEOWN + a_{14}CV + year\ dummies + \varepsilon \end{aligned} \quad (2)$$

where

*RISK* = risk taking, measured by total risk (*TRISK*), idiosyncratic risk (*IRISK*), and systematic risk (*SRISK*), respectively.<sup>7</sup>

*ACEXP* = accounting or financial expertise, measured by the proportion of directors with accounting or financial expertise on the audit committee.

*ACTEN* = board tenure, measured by the proportion of directors with 10 or more years of board tenure on the audit committee.

*ACBSY* = busy directors, measured by the proportion of directors, who serve on three or more boards of the S&P 1500 companies, on the audit committee.

*ACBLK* = block shareholdings, measured by the proportion of directors, who hold at least 1% of shares of the firm, on the audit committee.

*ACFMD* = female directors, measured by the proportion of female directors on the audit committee.

*ACSIZE* = audit committee size, measured by the number of audit committee members.

*BDIND* = board independence, measured by the proportion of independent directors on the board.

*BDSIZE* = board size, measured by the number of directors on the board.

*SIZE* = firm size, measured by the natural logarithm of total assets.

*LEV* = financial leverage, measured by the ratio of total liabilities to total assets.

*FREQ* = frequency of trading, measured by the average daily trading volume of shares in a year divided by the number of shares outstanding at the beginning of the year.

*CEODUL* = CEO duality, coded "1" if the CEO is the chairman of the board and "0" otherwise.

*CEOWN* = CEO ownership, measured by the percentage of the CEO's shareholdings.

<sup>7</sup> The calculation of these three risk-taking measures has been discussed in Section 4.3.

CV = charter value, measured by Tobin's q, i.e., the ratio of the sum of the market value of common equity and the book value of total liabilities to the sum of the book value of both common equity and total liabilities.

Given that high audit committee effectiveness leads to low (high) risk-taking, we expect that the coefficients on *ACEXP*, *ACTEN*, *ACBLK*, *ACFMD*, and *ACSIZE* will be negative (positive), whereas the coefficient on *ACBSY* will be positive (negative). In Eq. (2), we also include several control variables. Similar to audit committee characteristics, coefficients on *BDIND* and *BDSIZE* are unsigned. Based on *Pathan (2009)*, we expect negative coefficients on *SIZE* and *CEODUL*, but positive coefficients on *LEV*, *FREQ*, and *CEOOWN*. Since low bank charter value leads to more risk-taking (*Marcus, 1984*), the coefficient on *CV* is expected to be negative. In addition, year dummy variables are added in the model to control for fixed year effects.

Second, we examine the effect of audit committee effectiveness on the association between firm performance and risk-taking by estimating the following model:

$$\begin{aligned}
 PERF = & b_0 + b_1 ACEXP + b_2 ACTEN + b_3 ACBSY + b_4 ACBLK \\
 & + b_5 ACFMD + b_6 ACSIZE + b_7 RISK + b_8 ACEXP * RISK \\
 & + b_9 ACTEN * RISK + b_{10} ACBSY * RISK + b_{11} ACBLK \\
 & * RISK + b_{12} ACFMD * RISK + b_{13} ACSIZE * RISK \\
 & + b_{14} BDIND + b_{15} BDSIZE + b_{16} SIZE + b_{17} LEV + b_{18} CIR \\
 & + b_{19} AGE + b_{20} GRATE + year\ dummies + \epsilon \quad (3)
 \end{aligned}$$

where

*PERF* = firm performance, measured by return on equity, return on assets, Tobin's q, and stock return, respectively.

*CIR* = cost income ratio, measured by the ratio of total expenses to total revenues.

*AGE* = firm age, measured by the number of years from the first data year of the firm in the CRSP database to the current year.

*GRATE* = GDP growth rate.

We use both accounting- and market-based performance measures. The accounting-based measures include return on equity (*ROE*) and return on assets (*ROA*), computed as the ratio of income before extraordinary items to common equity or to total assets, respectively. Our first market-based measure is Tobin's q (*TOBIN*), computed as the ratio of the sum of the market value of common equity and the book value of total liabilities to the sum of the book value of both common equity and total liabilities. Another market-based measure is stock return (*RET*), measured as the monthly compounded stock return in a fiscal year. If high audit committee effectiveness leads to high (low) effectiveness of risk management, the coefficients on *ACEXP \* RISK*, *ACTEN \* RISK*, *ACBLK \* RISK*, *ACFMD \* RISK*, and *ACSIZE \* RISK* are expected to be positive (negative), whereas the coefficient on *ACBSY \* RISK* is expected to be negative (positive).

We include *BDIND* and *BDSIZE* in the model as prior research (e.g., *Hermalin and Weisbach, 1991; John and Senbet, 1998*) suggests that board composition may affect firm performance. Since the relationship between board characteristics and firm performance is ambiguous, the coefficients on *BDIND* and *BDSIZE* are unsigned. As *Hutchinson and Gul (2004)* find that firm size and financial leverage are related to firm performance, *SIZE* and *LEV* are added in the model. Based on their study, we expect a positive coefficient on *SIZE*, and a negative coefficient on *LEV*. Although *Athanasoglou et al. (2008)* find a positive relationship between cost income ratio and bank profitability, *Dietrich and Wanzenried (2011)* document that cost income ratio is negatively associated with profitability. Thus, the coefficient on *CIR* is unsigned. As *Beck*

*et al. (2005)* indicate that old banks are more profitable than new banks due to their experience and stability, we expect a positive coefficient on *AGE*. Prior research (e.g., *Molyneux and Thornton, 1992; Athanasoglou et al., 2008; Dietrich and Wanzenried, 2011*) also finds evidence on a positive association between GDP growth and bank profitability. Thus, the coefficient on *GRATE* is expected to be positive.

### 5. Empirical analyses

We report descriptive statistics of all variables in *Table 2*. The mean of each bank risk measure is 3.60% for total risk (*TRISK*), 2.50% for idiosyncratic risk (*IRISK*), and 1.53 for systematic risk (*SRISK*) over the period 2008–2010, which has increased from 2.26%, 1.98%, and 0.52 over the period 1997–2004 in *Pathan (2009)*, respectively. Overall, the current financial crisis had a huge

**Table 2**  
Descriptive statistics (N = 298).

Variable	Mean	Median	Std	Q1	Q3
<i>TRISK</i>	0.036	0.038	0.018	0.024	0.048
<i>IRISK</i>	0.025	0.026	0.014	0.018	0.034
<i>SRISK</i>	1.525	1.427	0.497	1.166	1.793
<i>ROE</i>	0.014	0.067	0.248	0.016	0.103
<i>ROA</i>	0.011	0.007	0.043	0.001	0.011
<i>TOBIN</i>	1.241	1.028	0.908	0.990	1.067
<i>RET</i>	-0.010	0.019	0.370	-0.277	0.222
<i>ACEXP</i>	0.474	0.400	0.273	0.250	0.667
<i>ACTEN</i>	0.401	0.400	0.292	0.200	0.667
<i>ACBSY</i>	0.046	0.000	0.127	0.000	0.000
<i>ACBLK</i>	0.028	0.000	0.096	0.000	0.000
<i>ACFMD</i>	0.148	0.167	0.160	0.000	0.250
<i>ACSIZE</i>	4.272	4.000	1.188	3.000	5.000
<i>BDIND</i>	0.753	0.778	0.120	0.667	0.846
<i>BDSIZE</i>	11.836	12.000	2.903	10.000	14.000
<i>SIZE</i>	9.505	9.269	1.701	8.356	10.128
<i>LEV</i>	0.828	0.888	0.175	0.866	0.908
<i>CIR</i>	0.751	0.701	0.224	0.613	0.827
<i>AGE</i>	24.007	24.000	10.858	14.000	34.000
<i>GRATE</i>	-0.003	-0.004	0.023	-0.031	0.024
<i>FREQ</i>	0.014	0.012	0.009	0.008	0.017
<i>CEODUL</i>	0.554	1.000	0.498	0.000	1.000
<i>CEOOWN</i>	0.017	0.006	0.033	0.002	0.015

*TRISK*, total risk, is measured by the standard deviation of daily stock returns for each fiscal year. *IRISK*, idiosyncratic risk, is measured by the standard deviation of residual values from Eq. (1). *SRISK*, systematic risk, is measured by the coefficient on *R<sub>mt</sub>* in Eq. (1). *ROE*, return on equity, is measured by the ratio of income before extraordinary items to common equity. *ROA*, return on assets, is measured by the ratio of income before extraordinary items to total assets. *TOBIN*, Tobin's q, measured by the ratio of the sum of the market value of common equity and the book value of total liabilities to the sum of the book value of both common equity and total liabilities. *RET*, stock return, is measured as the monthly compounded stock return in a fiscal year. *ACEXP*, accounting or financial expertise, is measured by the proportion of directors with accounting or financial expertise on the audit committee. *ACTEN*, board tenure, is measured by the proportion of directors with 10 or more years of board tenure on the audit committee. *ACBSY*, busy directors, is measured by the proportion of directors, who serve on three or more boards of other S&P 1500 companies, on the audit committee. *ACBLK*, block shareholdings, is measured by the proportion of directors, who hold at least 1% of shares of the firm, on the audit committee. *ACFMD*, female directors, is measured by the proportion of female directors on the audit committee. *ACSIZE*, audit committee size, is measured by the number of audit committee members. *BDIND*, board independence, is measured by the proportion of independent directors on the board. *BDSIZE*, board size, is measured by the number of directors on the board. *SIZE*, firm size, is measured by the natural logarithm of total assets. *LEV*, financial leverage, is measured by the ratio of total liabilities to total assets. *CIR*, cost income ratio, is measured by the ratio of total expenses to total revenues. *AGE*, firm age, is measured by the number of years from the first data year of the firm in the CRSP database to the current year. *GRATE* is GDP growth rate. *FREQ*, frequency of trading, is measured by the average daily trading volume of shares in a year divided by the number of shares outstanding at the beginning of the year. *CEODUL*, CEO duality, is coded "1" if the CEO is the chairman of the board and "0" otherwise. *CEOOWN*, CEO ownership, is measured by the percentage of the CEO's shareholdings.

**Table 3**  
Pearson correlation (N = 298).

	ACTEN	ACBSY	ACBLK	ACFMD	ACSIZE	BDIND	BDSIZE	SIZE	LEV	CIR	AGE	GRATE	FREQ	CEODUL	CEOOWN	CV	TRISK	IRISK	SRISK
ACEXP	-0.15***	0.05	-0.05	0.03	-0.06	-0.00	-0.01	0.22***	0.06	-0.07	-0.06	0.01	0.14**	0.08	-0.04	-0.03	0.05	0.04	0.10
ACTEN		-0.15***	-0.01	-0.08	0.03	-0.14**	0.16***	0.05	0.28***	-0.08	0.26	-0.02	-0.13**	0.27***	0.23***	-0.19***	-0.09	-0.08	-0.08
ACBSY			-0.06	-0.05	0.09	0.19**	-0.03	0.39***	-0.18**	-0.04	0.11	-0.05	0.15**	0.01	-0.04	0.10	0.12	0.04	0.18**
ACBLK				-0.03	-0.08	-0.06	-0.04	-0.13**	-0.00	-0.00	-0.06	-0.04	-0.11*	-0.04	0.08	0.01	0.02	0.04	-0.06
ACFMD					-0.04	0.06	-0.00	0.02	-0.06	0.08	0.08	0.02	-0.00	-0.04	0.05	-0.04	-0.01	-0.02	-0.03
ACSIZE						0.26**	0.39***	0.33***	0.22**	-0.06	0.17**	0.06	0.10	0.02	-0.18**	-0.25**	-0.00	-0.01	0.09
BDIND							-0.00	0.27***	0.15**	-0.01	0.16	0.06	0.13**	0.10	-0.16	-0.25**	-0.01	-0.02	0.07
BDSIZE								0.43**	0.31***	0.03	0.38***	-0.02	0.16**	0.08	-0.24**	-0.33***	0.11	0.10	0.18**
SIZE									0.40	-0.00	0.51***	0.01	0.43***	0.25***	-0.20**	-0.39***	0.13	0.10	0.31**
LEV										0.08	0.23**	-0.16	0.06	0.22**	-0.08	-0.15**	0.07	0.15**	0.01
CIR											0.01	-0.16	0.44***	0.02	0.07	-0.15**	0.52	0.58	0.42
AGE												0.02	0.20	0.22**	-0.00	-0.23**	0.05	0.02	0.19**
GRATE													-0.27**	0.00	-0.05	-0.01	-0.64**	-0.55**	-0.51**
FREQ														0.11	-0.12	-0.11	-0.11	-0.11	-0.11
CEODUL															0.19	-0.20**	-0.20**	-0.20**	-0.20**
CEOOWN																0.12	0.12	0.12	0.12

\* Significance at 10% level (two-tailed tests).  
 \*\* Significance at 5% level (two-tailed tests).  
 \*\*\* Significance at 1% level (two-tailed tests).

impact on bank risks. On average, bank audit committees have 47.4% accounting or financial experts, 40.1% long board tenure directors, 4.6% busy directors, 2.8% block shareholders, 14.8% female directors, and 4 members. The means of board independence (*BDIND*) and board size (*BDSIZE*) are 75.30% and 12 members, respectively, compared to 64.52% and 13 members in [Pathan \(2009\)](#), suggesting that recently more independent directors sit on the board.

[Table 3](#) presents correlation coefficients for independent variables used in the regression models to examine whether there are highly correlated variables. We find that the largest absolute value of correlation coefficients is 0.71 for a negative correlation between financial leverage (*LEV*) and charter value (*CV*). To further address this multicollinearity issue, we check variance inflation factors (*VIF*) for all independent variables. We find that all *VIF* values are less than 10. Thus, it is unlikely that multicollinearity is a severe issue in our analyses.

We present the results of analyzing the relationship between audit committee effectiveness and bank risk-taking in [Table 4](#). Column 3 of [Table 4](#) reports the results based on total risk (*TRISK*). We find that the coefficient on *ACTEN* is negative and significant (*t*-statistic = -2.16). Since audit committee members' long board tenure reflects their monitoring effectiveness, this finding suggests that high audit committee effectiveness leads to low bank risk-taking. We also document that the coefficient on *ACBSY* is positive and significant (*t*-statistic = 2.52). This is consistent with a negative relationship between audit committee effectiveness

**Table 4**  
The effect of audit committee effectiveness on risk-taking.

Variable	Predicted sign	<i>TRISK</i> Coefficient ( <i>t</i> -statistic)	<i>IRISK</i> Coefficient ( <i>t</i> -statistic)	<i>SRISK</i> Coefficient ( <i>t</i> -statistic)
Intercept	±	-3.850*** (-24.11)	-4.290*** (-23.89)	1.205*** (4.98)
<i>ACEXP</i>	±	0.025 (0.51)	0.001 (0.02)	0.052 (0.71)
<i>ACTEN</i>	±	-0.107** (-2.16)	-0.127** (-2.28)	-0.034 (-0.46)
<i>ACBSY</i>	±	0.306** (2.52)	0.238* (1.75)	0.289 (1.57)
<i>ACBLK</i>	±	0.083 (0.63)	0.142 (0.96)	0.036 (0.18)
<i>ACFMD</i>	±	0.010 (0.13)	0.006 (0.07)	-0.111 (-0.92)
<i>ACSIZE</i>	±	-0.005 (-0.45)	-0.013 (-0.94)	0.004 (0.24)
<i>BDIND</i>	±	-0.075 (-0.64)	-0.092 (-0.70)	-0.028 (-0.15)
<i>BDSIZE</i>	±	0.011** (2.07)	0.013** (2.22)	0.015 (1.85)
<i>SIZE</i>	-	-0.035** (-2.89)	-0.064** (-4.75)	0.010 (0.53)
<i>LEV</i>	+	0.194* (1.73)	0.621*** (4.94)	-0.410** (-2.42)
<i>FREQ</i>	+	20.842*** (12.65)	26.649*** (14.39)	26.601*** (10.67)
<i>CEODUL</i>	-	-0.026 (-0.93)	-0.023 (-0.73)	-0.054 (-1.28)
<i>CEOOWN</i>	+	0.953** (2.14)	0.932* (1.87)	0.370 (0.55)
<i>CV</i>	-	-0.042** (-2.04)	-0.016 (-0.71)	-0.088** (-2.85)
Year dummies		Included	Included	Included
<i>N</i>		298	298	298
<i>F</i> -value		66.27***	54.21***	25.95***
Adjusted <i>R</i> <sup>2</sup>		77.86%	74.14%	57.34%

\* Significance at 10% level (two-tailed tests).  
 \*\* Significance at 5% level (two-tailed tests).  
 \*\*\* Significance at 1% level (two-tailed tests).

**Table 5**

The effect of audit committee effectiveness on the association between accounting-based performance measures and risk-taking.

Variable	Predicted sign	<i>TRISK</i> Coefficient (t-statistic)	<i>IRISK</i> Coefficient (t-statistic)	<i>SRISK</i> Coefficient (t-statistic)
<i>Panel A. ROE</i>				
Intercept	±	0.270 (0.61)	0.236 (0.49)	1.000*** (6.04)
ACEXP	±	0.301 (1.02)	0.382 (1.20)	0.072 (0.56)
ACTEN	±	0.639** (2.32)	0.663** (2.19)	-0.294** (-2.39)
ACBSY	±	-0.164 (-0.28)	-0.078 (-0.14)	-0.725** (-2.10)
ACBLK	±	-0.909 (-1.17)	-0.815 (-1.04)	0.235 (0.78)
ACFMD	±	-0.590 (-1.25)	-0.792 (-1.60)	-0.445** (-1.98)
ACSIZE	±	-0.051 (-0.75)	-0.062 (-0.83)	-0.016 (-0.57)
RISK	±	-0.127 (-1.06)	-0.118 (-0.99)	-0.166 (-1.65)
ACEXP * RISK	±	0.074 (0.86)	0.090 (1.06)	-0.017 (-0.22)
ACTEN * RISK	±	0.180** (2.23)	0.170** (2.12)	0.234*** (2.91)
ACBSY * RISK	±	-0.028 (-0.15)	0.001 (0.00)	0.385* (1.95)
ACBLK * RISK	±	-0.267 (-1.13)	-0.222 (-1.01)	-0.198 (-1.00)
ACFMD * RISK	±	-0.145 (-1.03)	-0.187 (-1.38)	0.229 (1.59)
ACSIZE * RISK	±	0.020 (-0.64)	-0.014 (-0.72)	0.007 (0.40)
BDIND	±	-0.088 (-0.93)	-0.090 (-0.95)	-0.049 (-0.52)
BDSIZE	±	-0.004 (-0.99)	-0.005 (-1.08)	-0.004 (-0.90)
SIZE	+	0.010 (1.06)	0.008 (0.91)	0.008 (0.81)
LEV	-	-0.166** (-2.28)	-0.129* (-1.71)	-0.190** (-2.58)
CIR	±	-0.662*** (-10.20)	-0.640*** (-9.51)	-0.731*** (-13.64)
AGE	+	-0.001 (-0.60)	-0.001 (-0.66)	-0.001 (-0.53)
GRATE	+	-1.857** (-2.48)	-1.661*** (-2.63)	-0.704 (-1.31)
Year dummies		Included	Included	Included
N		298	298	298
F-value		15.65***	15.85***	16.23***
Adjusted R <sup>2</sup>		50.88%	51.21%	51.85%
<i>Panel B. ROA</i>				
Intercept	±	0.125* (1.74)	0.128 (1.63)	0.269*** (10.13)
ACEXP	±	-0.018 (-0.38)	-0.012 (-0.22)	0.022 (1.09)
ACTEN	±	0.132*** (2.95)	0.140*** (2.84)	-0.065*** (-3.31)
ACBSY	±	0.055 (0.57)	0.033 (0.34)	0.017 (0.31)
ACBLK	±	-0.038 (-0.30)	-0.028 (-0.22)	-0.008 (-0.16)
ACFMD	±	-0.046 (-0.61)	-0.023 (-0.28)	0.028 (0.78)
ACSIZE	±	0.007 (0.68)	0.009 (0.75)	-0.007 (-1.64)
RISK	±	-0.028 (-1.44)	-0.026 (-1.33)	-0.037** (-2.28)
ACEXP * RISK	±	-0.007 (-0.51)	-0.004 (-0.32)	-0.011 (-0.88)
ACTEN * RISK	±	0.037*** (2.81)	0.035*** (2.70)	0.052*** (4.01)
ACBSY * RISK	±	0.010 (0.35)	0.004 (0.16)	0.005 (0.17)
ACBLK * RISK	±	-0.016	-0.013	0.013

(continued on next page)



Table 5 (continued)

Variable	Predicted sign	<i>TRISK</i> Coefficient (t-statistic)	<i>IRISK</i> Coefficient (t-statistic)	<i>SRISK</i> Coefficient (t-statistic)
<i>ACFMD</i> * <i>RISK</i>	±	(-0.43) -0.011	(-0.37) -0.003	(0.42) -0.027
<i>ACSIZE</i> * <i>RISK</i>	±	(-0.47) 0.003	(-0.15) 0.003	(-1.18) 0.004
<i>BDIND</i>	±	(0.79) -0.033**	(0.86) -0.033**	(1.56) -0.029*
<i>BDSIZE</i>	±	(-2.18) -0.002**	(-2.13) -0.002**	(-1.95) -0.001*
<i>SIZE</i>	+	(-2.35) -0.001	(-2.52) -0.001	(-1.81) -0.001
<i>LEV</i>	-	(-0.76) -0.135***	(-0.81) -0.133***	(-0.54) -0.142***
<i>CIR</i>	±	(-11.40) -0.067***	(-10.83) -0.070***	(-12.08) -0.067***
<i>AGE</i>	+	(-6.36) 0.000	(-6.41) 0.000	(-7.86) 0.000*
<i>GRATE</i>	+	(1.62) -0.114	(1.59) -0.056	(1.75) -0.090
Year dummies		(-0.94)	(-0.54)	(-1.05)
N		Included 298	Included 298	Included 298
F-value		19.64***	19.45***	20.86***
Adjusted R <sup>2</sup>		56.86%	56.60%	58.40%

\* Significance at 10% level (two-tailed tests).

\*\* Significance at 5% level (two-tailed tests).

\*\*\* Significance at 1% level (two-tailed tests).

and bank risk-taking as high audit committee busyness indicates low audit committee effectiveness. We report the results for idiosyncratic risk (*IRISK*) in Column 4 of Table 4. Similarly, we find a negative and significant coefficient on *ACTEN* ( $t$ -statistic = -2.28) and a positive and significant coefficient on *ACBSY* ( $t$ -statistic = 1.75). The results on systematic risk (*SRISK*) are provided in Column 5 of Table 4. With the exception of *ACTEN* and *ACBSY* in Column 3 and Column 4, other audit committee characteristics are not significantly related to risk-taking.

The results in Table 4 show that audit committee members with long board tenure are more likely to constrain bank management's excessive risk-taking activities. This may be because those audit committee members have a strong desire for regulatory compliance owing to their high reputational capital. Moreover, those audit committee members may have greater experience and expertise to constrain management's risk-taking than other members. The results in Table 4 also show that busy audit committee members are less likely to constrain bank risk-taking activities. A possible explanation is that those audit committee members have not expended enough effort on the oversight of bank risk. Overall, these results are consistent with the notion that high quality audit committees constrain bank risk-taking. Nevertheless, not all of the six audit committee characteristics are significantly related to risk-taking. It is likely that the negative effect of those audit committee characteristics on risk-taking is diluted or even offset by their positive effect.

Table 5 provides the results on how audit committee effectiveness affects the relationship between risk-taking and accounting-based firm performance measures. Panel A of Table 5 shows the results for return on equity (*ROE*). We find that the coefficient on *ACTEN* \* *RISK* is positive and significant for *TRISK*, *IRISK*, and *SRISK* ( $t$ -statistic = 2.23, 2.12, and 2.91, respectively), suggesting that bank management is able to manage total risk, idiosyncratic risk, and systematic risk more effectively when more long board tenure directors sit on the audit committee. We also find a positive and significant coefficient on *ACBSY* \* *RISK* for *SRISK* ( $t$ -statistic = 1.95). This indicates that audit committee members with more additional directorships manage systematic risk in a better way.

Panel B of Table 5 shows the results for return on assets (*ROA*). We find that the coefficient on *ACTEN* \* *RISK* is positive and significant for *TRISK*, *IRISK*, and *SRISK* ( $t$ -statistic = 2.81, 2.70, and 4.01, respectively), consistent with the results for return on equity (*ROE*). Combined with the results in Table 4, the results on accounting-based performance measures indicate that long board tenure audit committee members not only mitigate bank risk-taking activities but also enhance the effectiveness of risk management.

Table 6 reports the results on how audit committee effectiveness influences the relationship between risk-taking and market-based firm performance measures. In Panel A of Table 6, we present the results for Tobin's  $q$ . Similar to the results on accounting-based firm performance measures, the coefficient on *ACTEN* \* *RISK* is positive and significant for *SRISK* ( $t$ -statistic = 3.67). This further supports the notion that long board tenure directors can better oversee risk management. The coefficient on *ACFMD* \* *RISK* is positive and significant for both *TRISK* and *IRISK* ( $t$ -statistic = 2.16 and 2.06, respectively). This suggests that female audit committee members are more effective in the oversight of risk management. In addition, the coefficient on *ACSIZE* \* *RISK* is positive and significant for *TRISK* and *SRISK* ( $t$ -statistic = 2.06 and 2.70, respectively), suggesting that banks with large audit committees have high risk management effectiveness.

In Panel B of Table 6, we provide the results for stock return. A positive and significant coefficient on *ACEXP* \* *RISK* for *SRISK* ( $t$ -statistic = 1.99) indicates that audit committees' accounting or financial expertise enhances risk management effectiveness. Consistent with the results for *ROE*, the coefficient on *ACBSY* \* *RISK* is positive and significant for *SRISK* ( $t$ -statistic = 2.01), suggesting that audit committee members with more additional directorships manage systematic risk more effectively.

To summarize our findings in Tables 5 and 6, evidence for *ROE*, *ROA*, and Tobin's  $q$  shows that audit committees' long board tenure leads to a high positive association between risk-taking and firm performance. Evidence for Tobin's  $q$  suggests that female audit committee members and large audit committees monitor risk management more effectively. Evidence for stock return suggests that audit committee members' accounting or

**Table 6**

The effect of audit committee effectiveness on the association between market-based performance measures and risk-taking.

Variable	Predicted sign	<i>TRISK</i> Coefficient (t-statistic)	<i>IRISK</i> Coefficient (t-statistic)	<i>SRISK</i> Coefficient (t-statistic)
<i>Panel A. Tobin's q</i>				
Intercept	±	2.477 (1.58)	4.512*** (2.63)	7.568*** (13.10)
ACEXP	±	-0.037 (-0.04)	-0.693 (-0.61)	-0.375 (-0.84)
ACTEN	±	1.328 (1.36)	0.817 (0.76)	-1.580*** (-3.68)
ACBSY	±	-0.723 (-0.34)	-0.373 (-0.18)	1.141 (0.95)
ACBLK	±	1.814 (0.66)	1.576 (0.57)	-1.540* (-1.45)
ACFMD	±	3.218* (1.94)	3.912** (2.22)	-0.185 (-0.24)
ACSIZE	±	0.459* (1.92)	0.380 (1.43)	-0.277*** (-2.79)
RISK	±	-0.962** (-2.27)	-0.415 (-0.98)	-1.426*** (-4.04)
ACEXP * RISK	±	-0.026 (-0.08)	-0.197 (-0.65)	0.270 (1.00)
ACTEN * RISK	±	0.420 (1.47)	0.235 (0.82)	1.030*** (3.67)
ACBSY * RISK	±	-0.240 (-0.37)	-0.085 (-0.15)	-0.495 (-0.72)
ACBLK * RISK	±	0.574 (0.69)	0.455 (0.58)	0.976 (1.42)
ACFMD * RISK	±	1.077** (2.16)	1.163** (2.42)	-0.152 (-0.30)
ACSIZE * RISK	±	0.146** (2.06)	0.111 (1.55)	0.166*** (2.70)
BDIND	±	-0.865** (-2.59)	-0.889*** (-2.65)	-0.862*** (-2.65)
BDSIZE	±	-0.027* (-1.77)	-0.030* (-1.91)	-0.020 (-1.34)
SIZE	+	-0.037 (-1.10)	-0.036 (-1.07)	-0.024 (-0.71)
LEV	-	-3.240*** (-12.53)	-3.328*** (-12.46)	-3.339*** (-13.03)
CIR	±	-0.399* (-1.74)	-0.678*** (-2.84)	-0.234 (-1.25)
AGE	+	0.002 (0.50)	0.002 (0.49)	0.002 (0.55)
GRATE	+	-0.497*** (-0.19)	1.808*** (0.81)	-1.963*** (-1.05)
Year dummies		Included	Included	Included
N		298	298	298
F-value		17.85***	17.85***	19.28***
Adjusted R <sup>2</sup>		54.37%	54.37%	56.38%
<i>Panel B. Stock return</i>				
Intercept	±	0.730 (0.90)	0.928 (1.04)	0.609** (2.03)
ACEXP	±	0.148 (0.27)	-0.113 (-0.19)	-0.384* (-1.66)
ACTEN	±	-0.090 (-0.18)	-0.026 (-0.05)	0.253 (1.14)
ACBSY	±	-0.652 (-0.60)	-0.804 (-0.75)	-1.226* (-1.96)
ACBLK	±	-0.430 (-0.30)	-0.081 (-0.06)	0.857 (1.56)
ACFMD	±	0.604 (0.70)	0.811 (0.89)	-0.043 (-0.11)
ACSIZE	±	-0.032 (-0.26)	-0.066 (-0.48)	0.028 (0.54)
RISK	±	0.033 (0.15)	0.086 (0.39)	0.013 (0.07)
ACEXP * RISK	±	0.032 (0.20)	-0.043 (-0.28)	0.278** (1.99)
ACTEN * RISK	±	-0.029 (-0.20)	-0.011 (-0.08)	-0.173 (-1.19)
ACBSY * RISK	±	-0.192 (-0.57)	-0.206 (-0.71)	0.719** (2.01)

(continued on next page)

Table 6 (continued)

Variable	Predicted sign	<i>TRISK</i> Coefficient (t-statistic)	<i>IRISK</i> Coefficient (t-statistic)	<i>SRISK</i> Coefficient (t-statistic)
<i>ACBLK</i> * <i>RISK</i>	±	-0.140 (-0.32)	-0.030 (-0.07)	-0.555 (-1.56)
<i>ACFMD</i> * <i>RISK</i>	±	0.212 (0.82)	0.250 (1.00)	-0.016 (-0.06)
<i>ACSIZE</i> * <i>RISK</i>	±	-0.010 (-0.26)	-0.018 (-0.49)	-0.020 (-0.62)
<i>BDIND</i>	±	0.027 (0.16)	0.033 (0.19)	-0.031 (-0.19)
<i>BDSIZE</i>	±	-0.000 (-0.01)	-0.000 (-0.00)	0.000 (0.04)
<i>SIZE</i>	+	0.003 (0.22)	0.005 (0.28)	-0.002 (-0.12)
<i>LEV</i>	-	-0.169 (-1.26)	-0.184 (-1.33)	-0.113 (-0.85)
<i>CIR</i>	±	-0.553*** (-4.65)	-0.561*** (-4.54)	-0.505*** (-5.22)
<i>AGE</i>	+	-0.002 (-0.71)	-0.001 (-0.68)	-0.001 (-0.67)
<i>GRATE</i>	+	3.107** (2.27)	2.950** (2.55)	3.200*** (3.30)
Year dummies		Included	Included	Included
N		298	298	298
F-value		6.00***	6.04***	6.90***
Adjusted R <sup>2</sup>		26.10%	26.27%	29.44%

\* Significance at 10% level (two-tailed tests).

\*\* Significance at 5% level (two-tailed tests).

\*\*\* Significance at 1% level (two-tailed tests).

financial expertise improves the effectiveness of systematic risk management. Nevertheless, we find evidence for *ROE* and stock return that firm performance is more positively associated with systematic risk when a large proportion of audit committee members are busy directors. Overall, our findings are consistent with the notion that high audit committee effectiveness is associated with banks' high risk management effectiveness.

We also conduct several additional analyses as follows. First, we run two-stage least-squares regressions to address possible endogeneity due to reverse causality. Similar to Dhaliwal et al. (2010), the first-stage regression models each audit committee characteristic on firm characteristics including firm size, sales growth, financial leverage, capital intensity, R&D intensity, free cash flows, market-to-book ratio, firm age, CEO ownership, CEO duality, and board size. In the second stage, Eqs. (2) and (3) are estimated by replacing each audit committee characteristic with its fitted value from the first-stage regression. We find that the coefficient on *ACTEN* in Eq. (2) is negative and significant for *TRISK*, *IRISK*, and *SRISK* (*t*-statistic = -2.37, -2.18, and -1.67, respectively), while the coefficient on *ACBSY* is positive and significant for *TRISK* and *IRISK* (*t*-statistic = 2.44 and 1.86, respectively). These findings are consistent with the notion that high quality audit committees constrain bank risk-taking.

The results of the second-stage regressions also show that the coefficient on *ACTEN* \* *SRISK* for *ROE*, the coefficients on *ACTEN* \* *TRISK*, *ACTEN* \* *IRISK*, and *ACTEN* \* *SRISK* for *ROA*, and the coefficients on *ACTEN* \* *TRISK* and *ACTEN* \* *SRISK* for Tobin's *q* are positive and significant (*t*-statistic = 1.73, 3.20, 2.61, 6.45, 2.64 and 6.88, respectively). We also find that the coefficients on *ACFMD* \* *IRISK*, *ACSIZE* \* *TRISK*, *ACSIZE* \* *IRISK*, and *ACSIZE* \* *SRISK* for Tobin's *q* are positive and significant (*t*-statistic = 2.21, 3.33, 2.20, and 5.91, respectively). These results also suggest that high audit committee effectiveness leads to banks' high risk management effectiveness.

Second, we run fixed effects regressions with standard errors clustered by firm to address possible endogeneity due to omitted variables. The results from Eq. (2) indicate that the

coefficient on *ACTEN* is negative and significant for *TRISK* and *IRISK* (*t*-statistic = -1.66 and -1.72, respectively), and the coefficient on *ACBSY* is positive and significant for *TRISK* (*t*-statistic = 2.07). For the results from Eq. (3), the coefficient on *ACTEN* \* *SRISK* for *ROE* and the coefficients on *ACTEN* \* *TRISK*, *ACTEN* \* *IRISK*, and *ACTEN* \* *SRISK* for *ROA* are positive and significant (*t*-statistic = 2.20, 2.13, 2.07, and 2.34, respectively). In addition, the coefficients on *ACFMD* \* *TRISK*, *ACFMD* \* *IRISK*, *ACSIZE* \* *TEISK*, and *ACSIZE* \* *IRISK* for Tobin's *q* and *ACEXP* \* *SRISK* for stock return are positive and significant (*t*-statistic = 1.72, 1.78, 2.17, 2.07 and 2.11, respectively). Overall, the results of the fixed effects regressions are consistent with those obtained from the main analyses.

Third, to assess the potential bias arising from unobservable variables, we examine how much stronger the selection on unobservables relative to the selection on observables would have to be to explain away the full estimated effect (Altonji et al., 2005; Nunn and Wantchekon, 2011). Following Jiraporn et al. (2013) and Chintrakarn et al. (2013), we compute the ratio of a coefficient on an audit committee characteristic in Eq. (2) (or an interaction term of the audit committee characteristic and a measure of risk-taking in Eq. (3)) to the difference between this coefficient and that estimated from a restricted model in which only firm size is included as a control variable. The higher this ratio, the more effect needs to be explained away by the selection on unobservables (Jiraporn et al., 2013). We document the following ratios based on this additional analysis: 1.75 for *ACTEN* and 76.05 for *ACBSY* in modeling *TRISK*; 2.49 for *ACTEN* and 1.13 for *ACBSY* in modeling *IRISK*; 3.00 and 4.11 for *ACTEN* \* *TRISK*, 2.36 and 4.38 for *ACTEN* \* *IRISK*, 5.20 and 3.47 for *ACTEN* \* *SRISK* in modeling return on equity and return on assets, respectively; 3.58 for *ACTEN* \* *SRISK*, 1.81 for *ACFMD* \* *TRISK*, 1.37 for *ACFMD* \* *IRISK*, 4.42 for *ACSIZE* \* *TRISK*, and 5.35 for *ACSIZE* \* *SRISK* in modeling Tobin's *q*; and 14.63 for *ACEXP* \* *SRISK* in modeling stock return. These ratios suggest that it is unlikely that the results of our main analyses are primarily driven by unobservables, and yet it is not impossible in few cases.

## 6. Conclusions

This study examines whether audit committee effectiveness affects bank risk-taking and risk management effectiveness. We document lower total risk and idiosyncratic risk for banks with long board tenure audit committees, and higher total risk and idiosyncratic risk for banks with busy directors on audit the committee. These findings suggest that high audit committee effectiveness may constrain bank risk-taking activities. We also find that firm performance is more positively associated with bank risk for banks with long board tenure, more female audit committee members, or large size audit committees than for other banks, consistent with the notion that audit committee effectiveness may increase risk management effectiveness. However, this finding should be interpreted cautiously because it is contrary to the results on audit committee busyness.

There is limited research on the effect of board governance quality on bank risk-taking. Pathan (2009) and Minton et al. (2010) document mixed evidence on this issue. Our study provides further evidence by focusing on the board's major oversight committee, i.e., audit committee. To the best of our knowledge, there is rare research on the risk oversight of audit committees. In addition, we examine the effect of board governance on risk management effectiveness, which has not been addressed in Pathan (2009) or Minton et al. (2010). Our study provides an implication to regulators and shareholders that audit committees' long board tenure members may not only mitigate banks' risk-taking activities but also enhance the effectiveness of bank risk management.

## Acknowledgement

We thank an anonymous reviewer for valuable comments and suggestions.

## References

- Abbott, L., Parker, S., Peters, G., Raghunandan, K., 2003. The association between audit committee characteristics and audit fees. *Auditing: A Journal of Practice and Theory* 22, 17–32.
- Abbott, L., Parker, S., Peters, G., 2004. Audit committee characteristics and restatements. *Auditing: A Journal of Practice and Theory* 23, 69–87.
- Ahn, S., Jiraporn, P., Kim, Y., 2010. Multiple directorships and acquirer returns. *Journal of Banking and Finance* 34, 2011–2026.
- Altonji, J., Elder, T., Taber, C., 2005. Selection on observed and unobserved variables: assessing the effectiveness of Catholic schools. *Journal of Political Economy* 113, 151–184.
- Anderson, R., Fraser, D., 2000. Corporate control, bank risk taking, and the health of the banking industry. *Journal of Banking and Finance* 24, 1383–1398.
- Athanasoglou, P., Brissimis, S., Delis, M., 2008. Bank-specific, industry-specific and macroeconomic determinants of bank profitability. *Journal of International Financial Markets, Institutions and Money* 18, 121–136.
- Baxter, P., Cotter, J., 2009. Audit committees and earnings quality. *Accounting and Finance* 49 (2), 267–290.
- Beasley, M., 1996. An empirical analysis of the relation between the board of director composition and financial statement fraud. *The Accounting Review* 71, 443–465.
- Beck, T., Cull, R., Afeikhena, J., 2005. Bank privatization and performance: empirical evidence from Nigeria. *Journal of Banking and Finance* 29 (8–9), 2355–2379.
- Bedard, J., Chtourou, S., Courteau, L., 2004. The effect of audit committee expertise, independence, and activity on aggressive earnings management. *Auditing: A Journal of Practice and Theory* 23, 13–35.
- Black, B., Cheffins, B., Klausner, M., 2006. Outside director liability. *Stanford Law Review* 58 (4), 1055–1159.
- Carcello, J., Neal, T., 2000. Audit committee composition and auditor reporting. *The Accounting Review* 75 (4), 453–467.
- Chen, C., Steiner, T., Whyte, A., 2006. Does stock option-based executive compensation induce risk-taking? An analysis of the banking industry. *Journal of Banking and Finance* 30, 915–945.
- Cheng, I., Hong, H., Scheinkman, J., 2010. Yesterday's Heroes: Compensation and Creative risk-Taking. NBER Working Paper.
- Chintrakarn, P., Jiraporn, N., Jiraporn, P., 2013. The effect of entrenched boards on corporate risk-taking: testing the quiet life hypothesis. *Applied Economics Letters* 20, 1067–1070.
- Core, J., Holthausen, R., Larcker, D., 1999. Corporate governance, chief executive officer compensation, and firm performance. *Journal of Financial Economics* 51, 371–406.
- Dhaliwal, D., Naiker, V., Navissi, F., 2010. The association between accruals quality and the characteristics of accounting experts and mix of expertise on audit committees. *Contemporary Accounting Research* 27, 787–827.
- Dietrich, A., Wanzenried, G., 2011. Determinants of bank profitability before and during the crisis: evidence from Switzerland. *Journal of International Financial Markets, Institutions and Money* 21, 307–327.
- Fama, E., Jensen, M., 1983. The separation of ownership and control. *Journal of Law and Economics* 26, 301–325.
- Fich, E., Shivdasani, A., 2006. Are busy boards effective monitors? *Journal of Finance* 61, 689–724.
- Field, L., Lowry, M., Mkrtychyan, A., 2013. Are busy boards detrimental? *Journal of Financial Economics* 109, 63–82.
- Galloway, T., Lee, W., Roden, D., 1997. Banks' changing incentives and opportunities for risk taking. *Journal of Banking and Finance* 21, 509–527.
- Gul, F., Srinidhi, B., Ng, A., 2011. Does board gender diversity improve the informativeness of stock prices? *Journal of Accounting and Economics* 51, 314–338.
- Hermalin, B., Weisbach, M., 1991. The effects of board composition and direct incentives on firm performance. *Financial Management* 20 (4), 101–112.
- Hutchinson, M., Gul, F., 2004. Investment opportunity set, corporate governance practices and firm performance. *Journal of Corporate Finance* 10 (4), 595–614.
- Jiraporn, P., Kim, Y., Davidson, W., 2008. Multiple directorships and corporate diversification. *Journal of Empirical Finance* 15, 418–435.
- Jiraporn, P., Singh, M., Lee, C., 2009a. Analyzing ineffective corporate governance: director busyness and board committee memberships. *Journal of Banking and Finance* 33 (5), 819.
- Jiraporn, P., Davidson, W., DaDalt, P., Ning, Y., 2009b. Too busy to show up? An analysis of directors' absences. *Quarterly Review of Economics and Finance* 49 (3), 1159–1171.
- Jiraporn, P., Liu, Y., Kim, Y., 2013. How do powerful CEOs affect analyst coverage? *European Financial Management* (in press). Available from: <<http://onlinelibrary.wiley.com/doi/10.1111/j.1468-036X.2012.00655.x/abstract>>.
- John, K., Senbet, L., 1998. Corporate governance and board effectiveness. *Journal of Banking and Finance* 22, 371–401.
- Karamanou, I., Vafeas, N., 2005. The Association between corporate boards, audit committees, and management earnings forecasts: an empirical analysis. *Journal of Accounting Research* 43 (3), 453–486.
- Keeley, M., 1990. Deposit insurance, risk, and market power in banking. *American Economic Review* 80, 1183–1200.
- Klein, A., 2002. Audit committee, board of director characteristics, and earnings management. *Journal of Accounting and Economics* 33, 75–400.
- Krishnan, G., Visvanathan, G., 2008. Does the SOX definition of an accounting expert matter? The association between audit committee directors' accounting expertise and accounting conservatism. *Contemporary Accounting Research* 25, 827–857.
- Marcus, A., 1984. Deregulation and bank financial policy. *Journal of Banking and Finance* 8, 557–565.
- Merton, R., 1977. An analytic derivation of the cost of deposit insurance and loan guarantees. *Journal of Banking and Finance* 1, 3–11.
- Minton, B., Tailard, J., Williamson, R., 2010. Do Independence and Financial Expertise of the Board Matter for Risk Taking and Performance? Working Paper. The Ohio State University.
- Molyneux, P., Thornton, J., 1992. Determinants of European bank profitability: a note. *Journal of Banking and Finance* 16 (6), 1173–1178.
- Nunn, N., Wantchekon, L., 2011. The slave trade and the origins of mistrust in Africa. *American Economic Review* 101, 3221–3252.
- Park, P., 1997. Risk-taking behavior of banks under regulation. *Journal of Banking and Finance* 21, 491–507.
- Pathan, S., 2009. Strong boards, CEO power and bank risk-taking. *Journal of Banking and Finance* 33, 1340–1350.
- Rajan, R., 2006. Has finance made the world riskier? *European Financial Management* 12, 499–533.
- Shivdasani, A., 1993. Board composition, ownership structure, and hostile takeovers. *Journal of Accounting and Economics* 16, 167–198.
- Srinidhi, B., Gul, F., Tsui, J., 2011. Female directors and earnings quality. *Contemporary Accounting Research* 28, 1610–1644.
- Sun, J., Cahan, S., Emanuel, D., 2009. Compensation committee governance quality, chief executive officer stock option grants, and future firm performance. *Journal of Banking and Finance* 33, 1507–1519.
- Vafeas, N., 2003. Length of board tenure and outside director independence. *Journal of Business Finance and Accounting* 30, 1043–1064.
- Zhou, J., Chen, K., 2004. Audit Committee, Board Characteristics and Earnings Management by Commercial Banks. Working Paper, SUNY at Binghamton.