CORPORATE GOVERNANCE, REGULATION AND BANK RISK-TAKING BEHAVIOUR IN DEVELOPING ASIAN COUNTRIES

Hiep Ngoc Luu*

Abstract

Using data from ten selected developing Asian countries, this paper investigated empirically the influences of corporate governance and regulations on bank risk-taking behaviour. We found sufficient evidence that corporate governance mechanism has strong effect on the level of risk taken by bank: bank with large owner(s) is associated with higher risk-taking, while board size is found to be negatively related to bank risk level, indicating that the bigger the size of the board, the less risk the bank is willing to take. Additionally, we also found that banks with more powerful CEO tend to engage in less risky activities. Meanwhile, an increase in board independence forces banks to assume more risk. Nevertheless, managerial shareholdings appear to have no direct impact on the level of risk banks undertake. Our results further showed that regulatory pressure brought about by the host-country regulators influences neither banks' risk-taken levels nor their capital adequacy ratios. However, raising regulatory capital adequacy ratio, instead of forcing banks to reduce their risk level, does induce them to take more risk. Thus, banking regulations do not appear to be effective in developing Asian countries. Other variables, such as loan loss reserve and GDP growth also help to predict bank risk-taken pattern. Nonetheless, bank size has no direct impact on shaping the risk-taking behaviour of banks.**

JEL Classification: C33, C36, G21, G28, G32

Key words: Banks, Corporate Governance, Risk, Developing Asian Countries

* *University of St Andrews, the UK*

** *I am especially grateful to Dr. Manouche Tavakoli from the University of St. Andrews and Prof. Dr. Ron Beadle from Northumbria University for their helpful comments. I also thank Trang Huyen Thi Vu and Vu Quang Trinh for their excellent assistance. This paper's views and findings and are mine, and do not necessary reflect those of the University of St Andrews.*

1. Introduction

In the wake of the recent global financial crisis, various debates have been raised on the causes of bank failures. The dominant findings are that banks had taken much more risk than they could afford[1].

In fact, worldwide regulators have long time been putting significant effort on forcing banks to comply with banking regulations to prevent them from excessive risk-taking. In reality, the implementations of new regulations were commonly followed by an increase in banks' capital adequacy ratio (CAR). Nevertheless, the evidence so far might not be sufficient to judge whether regulation led to that increase. And even if banking regulation does induce banks to increase their capital level, one may step further to ask: Does higher capital requirement really help to reduce banks risk? Although a broad body of research has been trying to address this question, the answer still remains unclear.

According to Shrieves and Dahl (1992), Haubrich and Wachtel (1993), and Roy (2005), in respond to the increased capital requirement, there are several courses of actions banks can follow: they can either (1) increase the amount of regulatory capital, (2) reduce high-risk assets, or (3) shirk total assets. Furthermore, banks can also simultaneously increase both risk and regulatory capital levels, given the fact that the growth rate of capital is higher than that of the risk level, *ceteris paribus*[2]. As a result, an increase in regulatory capital requirement alone does not necessary mean lower risk-taken level by banks and regulation by itself might not effectively explain the bank's risk-taken pattern.

To date, a number of studies have been made on determining which factors may influence bank risk-taking behaviour other than regulations. Although

[1] See among: Berger and Bouwman, 2010; Bologna (2011); Gertler, Kiyotaki and Queralto (2011); Marc, Stromberg and Wagner (2012); Vazquez and Federico (2012); and IMF (2014).

[2] See Appendix 2 for more information.

many researches have focused on quantitative variables such as profitability, size, lending, GDP, inflation, interest rates, etc. (see, for example: Shrives and Dahl, 1992; Demsetz and Strahan, 1997; Konishi and Yasuda, 2004; Gonzalez, 2005; Maddaloni and Peydró, 2010; Cole and White, 2011), few empirical studies have been conducted on the roles of corporate governance. It is probably because corporate governance in general is fundamentally qualitative in nature, and thus, they are still more "art" than "science".

But certainly, corporate governance cannot be excluded. Through the history of modern finance, there are many cases in which only one person could bring the whole organisation to failure[3]. Even when various sophisticated mathematical models were brought in to place with the hope of enhancing and achieving a sound risk measurement and management practice, the last financial crisis showed that those models could not prevent banks from catastrophe. In fact, this was much more a failure of management than of risk models. People, but not computer, determine risk measurement and management processes, conduct risk models, and make decisions. Thus, when they were blinded by the massive potential profits, they stopped being careful. Even worse, they could distort, manipulate, modify, and make-up risk models and investment policies to meet a particular private interest (Laux and Leuz, 2010, and Barberis, 2011). As a result, one may claim that appropriate risk management is not all about banking regulations and sophisticated mathematical models, but more about sound corporate governance practices.

Thus, this paper investigates mainly the possible influences of corporate governance mechanisms and banking regulation on banks risk-taking behaviour. Although there are limited existing empirical studies on the potential influences of corporate governance and regulations on banks risk-taking behaviour (except Laeven and Levine, 2008; and Berger, Imbierowicz and Christian, 2014), to our knowledge, there is no research has been conducted for the case of developing Asian countries.

Unlike in developed nations, where corporate governance framework are often formed at relatively high professional and transparent levels (Doidge, et al., 2007), in developing Asian countries, a number of constrains existed and prevent firms from establishing sound corporate governance practices such as weak or non-existent law enforcement mechanisms, lack of adherence to regulatory frameworks, lack of transparency and disclosure, and weak monitoring systems (Okpara, 2011). As a result, corporate governance and regulations in these nations have not been attracted appropriate attention as it should have; and the study on the roles of corporate governance and banking regulations on bank risk-taking behaviour in developing Asian countries has been largely neglected.

Therefore, this study prepared as a contribution to the work of enhancing corporate governance practice in developing Asian countries by investigating the association between corporate governance, regulations and bank risk-taking behaviour. Regardless of the different estimation methods applied, we found sufficient evidence that both of corporate governance and regulatory capital requirement variables have direct impact on the level of risk bank undertake.

The remainder of the paper is organised as follows. Section 2 discusses the relevant literatures. Section 3 describes the data and econometric. Section 4 presents the test results. Section 5 provides robustness tests and section 6 draws conclusions.

2. Literature Reviews

Long before the recent financial crisis, the agency relationship between an institution's managers and its shareholders had already been examined.

Jensen and Meckling (1976), among others, argued that managers with relatively no shares interests in their banks would behave in a risk-averse manner, rather than seeking to maximise shareholders' wealth through engaging in more risk-taking activities. The possible explanation is that although higher risk taking may associate with greater expected returns in the future, when facing the trade-off between the potential earnings and the risk of income, bank managers may wish to give up some potential earnings to make their income riskless (Smith and Stulz, 1985). This is because non-shareholding managers may have a little bonus if the business performs exceptional well, but they may lose their reputation, job, and human capital investment if the bank goes into trouble. Thus, they have more reasons to act in a risk-averse manner. Nevertheless, bank managers could have greater incentives to take more risk if their ownerships increase, for example: through stocks or stock options scheme (Hubbard and Palia, 1995). According to Smith and Stulz (1985), an increase in ownerships could make the manager's expected utility a convex function of the bank's value. Since then, the manager's interests will be more in line with those of outside shareholders, even though his expected utility function is still a concave function of his wealth (See also Arrow, 1963; Huberman, et al., 1983).

Subsequently, Saunders, et al. (1990) pointed out that in the US during the period from 1979 to 1982, shareholders-controlled banks[4] exhibited

[3] For example, it is the case of Nick Leeson, who had forced a 223 year old Barings Bank to bankrupt dramatically; or it can be the case of Iguchi, who was responsible for $1.1 billion loss in unauthorised trading of Daiwa bank, which subsequently forced the bank to be banned in the US.

[4] A shareholder-controlled bank refer to a bank in which managers hold a large proportion of bank's stocks, and

considerably greater risk-taking behaviour than managerially-controlled banks[5]. They argued that a bank's shareholders can maximise their call/put option values through increasing the risk of the bank's underlying assets[6]. However, since in many cases, shareholders do not directly manage the business, the degrees to which how much risk will be taken depend partially on the risk-taking incentives of the bank's managers. Similar to Jensen and Meckling (1976), Saunders, et al. (1990) claimed that if a bank manager does not have a substantial share interest, he or she will likely to act in a more risk-adverse manner. On the other hand, if the bank manager holds substantial amount of bank shares and/or stock options, he or she will have more incentives to engage in greater risk-taking activities.

Consistent with the above literatures, Gorton and Rosen (1995), who focused on the US banks from 1984 to 1990, showed that an increase in shareholdings forces bank managers to make more risky loans and fewer safe loans. Anderson and Fraser (2000) obtained a similar result for the period of 1987-1989. They found a significant and positive relationship between managerial shareholdings and the level of risk bank willing to take. However, when different time period was chosen, from 1992 to 1994 - the period followed by a number of banking regulations[7], the result turned to be negative and statistically significant, illustrating that an increase in managerial shareholdings was actually associated with a reduction in bank risk. A possible explanation is that during the period of regulation tightening, banks managers could attract high visibility of public and regulators, so they might wish to protect their careers and reputations rather than taking more risk and acting in moral hazard manner.

In line with the recent financial turmoil, Gropp and Köhler (2010) showed that shareholder-controlled banks took more risk than managerially-controlled banks and as a consequence, they exposed to greater losses during the crisis. Most recently, Berger et al. (2014) investigated the roles of corporate governance in bank default based on the sample consists of 85 defaulted and 256 non-defaulted US banks during the period 2007-2010. They pointed out that higher shareholdings induce non-executive managers[8] to engage in more risk-taking activities because of moral hazard problem[9]. This may eventually lead to bank default.

While agency theory suggests that owners tend to take more risks than non-shareholding managers, corporate governance theory claims that the degree and ability of a bank's owners to take risk depending upon the firm's ownership structure (Jensen and Meckling, 1976). According to Shleifer and Vishny (1986), larger shareholders with greater voting rights have more power and motivations to influence corporate decisions than smaller shareholders. In line with Shleifer and Vishny (1986), Laeven and Levine (2008) step further and state that banks with large owners who have substantial cash flow rights tend to take greater risk than widely-held banks[10].

Meanwhile, testing for the influence of board independence on an institution's overall risk, Erkens, et al. (2012) found that firms with more independent board experienced lower stock returns during the crisis. This probably due to independent directors and firm shareholders might well encouraged non-shareholding managers to maximise shareholders' wealth through taking more risk in the period prior to the financial meltdown[11].In contrast to this view, Berger, et al. (2014) observed that default banks (due to excessive risk-taking) had smaller boards and fewer independent directors relative to their board size than non-default banks. They explained that independent directors are often those with high reputation and high public visibility and therefore, they could behave in a relatively "safe" manner in order to protect their careers and reputations. This is in line with what suggested by principal-agent models that the incentive for independent directors to protect their reputations distorted firms' investment strategies towards relatively safe projects (see, for example: Hirshleifer and Thakor, 1992; and Brandes, et al., 2005). Nevertheless, when examining the empirical

therefore, they will be more likely to act in the bank's shareholders' value-maximising interest. It is also referred to the bank in which owner(s) also manage the organisation.

[5] A managerially-controlled bank refer to a bank in which managers does not have substantial share interest and more likely to act in their own utility-maximising value.

[6] See, for example: Galai and Masulis (1976); Jensen and Meckling (1976); and Merton, 1977.

[7] Financial Institutions Reform, Recovery, and Enforcement Act (FIRREA) in 1989; Federal Deposit Insurance Corporation Improvement Act (FDICIA) in 1991.

[8] For example: vice presidents, department heads, etc. – those are not chief officers (Berger, et al., 2014)

[9] Managers may not wish to take more risk because they have a number of tied up in their organisations. If the business goes into trouble, then the reputation and career of the managers could be damaged. Furthermore, their personal wealth could be negatively affected much more than a diversified shareholder. As a result, firm managers may wish to take fewer risks, especially during the period when their actions and performance are carefully observed by the public and regulators (See more, for example: Parrino et.al. (2005), and Saunders and Cornett, (2006)).

[10] Widely-held banks are banks with no large owners who have a substantial equity stake in the bank.

[11] One common feature we could observe from previous crises (i.e. the 1987 Black Monday crisis, the 2001 Dotcom crisis, and the 2007/2008 Credit Crunch) is that: prior to each financial turmoil, there often a long "successful time" in the market, where massive returns could be generated quickly.

results for the US banking system over the 2007-2010 period, Berger, et al. (2014) found that there is no statistical evidence of existing direct influence of independent directors on a bank's default probability.

Another crucial factor which may contribute to shape bank risk-taking behaviour is regulation. According to Kim and Santomero (1994), one intended objective of banking regulations is to mitigate the risk-taking incentive of banks owners by forcing them to place more of their personal wealth at risk in banks. This could often be achieved through increasing the amount of capital requirements. In reality, both Basel I and Basel II Capital Accords require banks to meet a minimum capital adequacy ratio (CAR) of 8 percent[12]. However, in many developing countries, the minimum levels of capital requirement have been set much higher by the host-country regulators[13,14].This reflects concerns of the regulators about higher macroeconomic volatility in developing countries, compared to developed nations. Nevertheless, following what we have discussed in the introduction, higher capital requirement does not necessary lead to lower risk-taking level of banks. Although Jacques and Nigro (1997)argue that regulatory pressure brought about by regulations did effectively force banks to reduce their risks, Koehn and Santomero (1980),Kim and Santomero (1988), and Blum (1999), are among those who found a positive relationship between regulations and bank's risk-taken levels, indicating that higher capital requirement led to a raise in risk-taken level of banks. According to Roy (2005), this happened because more stringent capital requirements restricted banks' risk-return frontiers, and thus, induced them to compensate losses in utility from the upper-limit on leverage with the optimal option of raising portfolio risk. Besides, undercapitalised banks could increase their capital adequacy ratio (CAR) and meet the minimum capital requirement by increasing the amount of their regulatory capital and/or reducing their portfolio risks. Meanwhile well-capitalised banks may choose to reduce capital or to increase risk levels, given the fact that their CARs still remain equal or greater than the minimum capital required. Subsequently, Laeven and Levine (2008), who claimed to be the first to conduct empirical study on the joint effect of ownership structures and regulations on bank risk-taking behaviour, found that regulations have different influences on bank risk-taking depending on the comparative power of owners in the governance structure of each bank. However, again, they did not concentrate on developing and developing nations. Furthermore, they did not condition on possible effects of regulatory pressure on well-capitalised and under-capitalised banks[15]. This is particularly important because banking system in developing countries is not as transparent and developed as in advanced nations. Additionally, similar to most of the existing studies, Laeven and Levine (2008) attempted to capture the true risk position of banks by making use of Z-score as an indicator of a bank's risk level. However, since our interest is on banks' risk-taking decision, the regulatory risk measured by the ratio of risk-weighted-assets[16] to total assets will be employed as a proxy to measure a bank's risk-taking level. This allows us to examine the degree of risk the bank is willing to take as well as the willingness of its owners to place their wealth at risk in the bank.

As far as it could be ascertained, this is the first paper combining a wide range of factors, namely corporate governance, regulation, accounting and macroeconomics, to explain the risk-taking behaviour of banks in developing Asian countries. As a result, our study might serve as a good reference for developing Asian banks if they wish to build up a sound risk management practice in line with banking regulations.

3. Data and Model Specification

3.1 Data and Sample Description

Data were collected from a wide range of sources, including *Bankscope*, the WorldBank database as well as from banks' websites and annual reports. The time period chosen was from 2009 to 2012, which allows us to investigate the bank risk-taking behaviour after the global financial crisis in 2007/2008.

We also collected data from only the ten largest commercial banks in each country. This is because Basel capital requirements are generally applied only for the largest and/or internationally active banks while smaller domestic banks are often kept outside the jurisdiction of such regulations (Gottschalk, 2010). However, since corporate governance information is not always available, we collect data

[12] See BIS (1988) and BIS (2004)

[13] Host-country regulators are regulators those from the country where the Basel accord is implemented, while Home-country regulators are regulators those from The Bank for International Settlement

[14] For example, the minimum capital requirement is consistently kept at 10% in Philippine (2009-2012); 11% in Brazil (2009-2012), 12% in UAE and Jordan (2010-2012), and 12% in Turkey (2009-2012).

[15] Well-capitalised banks refer to banks those hold their CAR levels of at least equal or above the minimum standards (i.e. 8% capital requirement as suggested by the Basel Committee) set by the state regulators; while under-capitalised banks are banks those hold CAR levels of less than the minimum threshold applied by the host-country regulators.

[16] Risk-weighted-asset refers to banks' assets those are weighted by factors representing their riskiness and potential for default. Risk weight function translates a bank's exposure into specific capital requirement.

from the next biggest banks until we reach to 10 commercial banks in each country.

With regard to the countries of studying, ten developing Asian countries were selected as follows: China, India, Indonesia, Jordan, Philippine, Saudi Arabia, Thailand, Turkey, UAE and Vietnam. Thus, our sample consists of 100 banks from ten developing Asian countries over the period from 2009 to 2012.

3.2 The Model

Following the literature review, the model consists of four sets of explanatory variables to investigate four different factors that influenced the bank risk-taking behaviour: *CORPORATE GOVERNANCE*, *ACCOUNTING*, *REGULATION*, and *MACROECONOMICS.* Thus, the estimated equation will be:

$$RISK_{i,t} = \alpha + \beta * CORPORATE\ GOVERNANCE_{i,t} + \theta * ACCOUNTING_{i,t} + \gamma * REGULATION_{j,t} + \lambda * MACROECONOMICS_{j,t} + \mu_{i,t} \quad (1)$$

Where:

- $RISK_{i,t}$ is the risk-taken level at bank i, during time t
- $CORPORATE\ GOVERNANCE_{i,t}$ is matrix of corporate governance variables
- $ACCOUNTING_{i,t}$ is a matrix of accounting variables
- $REGULATION_{j,t}$ measures the regulatory pressure brought about by the Basel rules in country j at time t
- $MACROECONOMICS_{j,t}$ is a matrix of macroeconomic variables
- $\mu_{i,t}$ is the error term
- α, β, γ, θ, and λ are vectors of coefficient estimates

Risk Variable

Most of the empirical works so far have adopted Z-score to measure bank risk (for example, Konishi and Yasuda, 2004; Laeven and Levine 2008; Teresa and M. Dolores, 2008). Since Z-score illustrates the distance from insolvency (Roy, 1952), the higher the z-score, the more stable the bank is. Nevertheless, in this paper, we adopt a different approach. The ratio of total risk-weighted-assets to total assets (RWA/A) is employed as a proxy to measure the entire risk-taken at a bank *(RISK).*The reason behind this chosen is that the concept of risk-weighted-assets has been commonly employed as a standard measure of risk in banking supervision and regulation (BCBS, 2010), and has been used extensively in the empirical banking study since it is considered to be a true ex-ante measure of bank risks (see, for example: Shrieves and Dahl, 1992; Jacques and Nigro, 1997; Rime, 2001; Aggarwal and Jacques, 2001; Roy, 2005). Besides, in our study, we do not attempt to concentrate on the exact risk levels of banks. Instead, the purpose here is to measure the degree of risk that bank and its owners willing and decide to take. Since risk-weighted-asset reflects the degree of personal wealth that banks owner willing to place at risk in the bank to trade-off for future returns, by examining the ratio of risk-weighted-assets to total assets at the bank, the pattern of the bank risk-taken behaviour could be observable.

Corporate Governance Variables

Bank ownership structure *(OWNERSHIP)* is the first factor to look at. *OWNERSHIP* is a dummy variable indicating whether the bank has a large owner or is widely-held. It takes a value of one if the bank has a large owner and zero otherwise. Following Laeven and Levine (2008), the cut-off point chosen is 20%, illustrating that the banks are classified as having large owner(s) if one of its shareholders holds at least 20% of the banks shares. Otherwise, the bank is classified as widely-held.

MANAGERIAL is another dummy variable. It indicates whether the bank manager also has substantial share interest or not; or whether a large owner is a bank manager. *MANAGERIAL* takes a value of one if a bank manager also hold substantial amount of firm's shares, and zero otherwise. Equivalently, it equals one if a large owner also has a seat on the management board and zero if the bank has no shareholding managers.

Bank directors also play an important part in shaping bank risk-taking behaviour. According to Fama and Jensen (1983) board of directors is the 'apex body' of a firm internal governance system and considered to be the first line of defence (Weisbach, 1988). In this paper, we investigate the influences of boards to bank risk-taken levels thought two different aspects: board size *(BOARD_SIZE)* and board independence *(INDEPENDENCE).*Board size is taken into account because it can serve as an indication of monitoring and advisory role, which may have an overall influence on bank strategies. Group decision-making gives rise to more diverse opinions, and the final decisions reflect the group members' compromised views on risky projects, resulting in rejecting or accepting those projects. In this paper, board size *(BOARD_SIZE)* is defined as the natural logarithm of total number of directors on the board.

Meanwhile, the latter variable *INDEPENDENCE* is defined as the ratio of independent directors to the total number of members on the board of directors. It is included into the *RISK* equation because independent directors are perceived

to be better monitors of managers since they wish to maintain their reputation in the industry (Pathan, 2009). Additionally, they also contribute to finalise banks' strategic decisions and policies during the meetings of the boards.

CEO power *(CEO_DUALITY)* is another variable that need to take into consideration when examining the role of corporate governance on bank risk-taking. *CEO_DUALITY* is a dummy variable employed to capture the influence of CEO over bank board decisions. It takes a value of one if the CEO is also the Chairman of the board, and zero otherwise. According to Boyd (1995), CEO will have greater controlling power if he or she also acts as the chairman of the board. This is because, by assuming the duality function, the CEO may find it easier to influence the board's monitoring ability and consequently, makes it more difficult for stakeholders to influence and monitor the management. Thus, CEO's power could be an important determinant variable in explaining bank risk-taking manner.

Regulatory Variables

REG is a dummy variable taking a value of one if the bank is well-capitalised and zero otherwise. In this context, undercapitalised banks are defined as whose with CAR levels were less than the minimum threshold (i.e. 8% capital requirement as suggested by the Basel Committee) required by the host-country regulator, while well-capitalised banks are those with CAR levels higher than the minimum requirement.*REG* measures the impact of regulatory pressure brought about by Basel rules on banks risk-taking behaviour.

Meanwhile, capital adequacy ratio (*CAR*) is employed to measure the amount of shareholders' wealth bank place at risk. International regulations (like Basel I and Basel II) often require banks to hold a minimum CAR level of 8%. However, in many developing countries, the CAR requirements are set even higher, reflecting the concern of the host-country regulators about greater macroeconomic volatilities in those countries. In our study, CAR is collected from *Bankscope* as well as firms' annual reports.

Accounting Variables

A number of accounting variables are used to explain for the risk-taking levels of banks. Consistent with previous studies (Anderson and Fraser, 2000; Laeven and Levine, 2008; Berger, et al., 2014), the natural log of assets is employed to measure bank size (*SIZE*). Bank size is taken into account because it may have an influence on bank risk-taking level due to its relationship with diversification strategy, investment opportunities and bank's accessibility to capital market.

The ratio of loan loss provision to total assets (*LLOSS*) is used to measure the expense banks set aside to cover bad loans. It is included in the RISK equation because higher loan loss may lead to a reduction in the nominal amount of risk-weighted assets (Rime, 2011).

Macroeconomics Variables

Along with the above banks specific variables, we also employ a macroeconomics variable, namely: GDP growth (*GDP*), to explain for the possible effects of macroeconomic conditions on bank risk-taking decisions. GDP growth is important to study because macroeconomic conditions in developing and developing nations are shown to be of much higher volatility compared to developed nations (Aizenman, 2003; Kose, et al., 2004; and Pisani, 2011).

As a result, equation (1) is now expressed as bellows:

$$RISK_{i,j,t} \begin{cases} \alpha + \beta_1 * OWNERSHIP_{i,t} + \beta_2 * MANAGERIAL_{i,t} + \beta_3 * BOARD\_SIZE_{i,t} \\ +\beta_4 * INDEPENDENCE_{i,t} + \beta_5 * CEO\_DUALITY_{i,t} + \theta_1 * SIZE_{i,t} + \theta_2 * LLOSS_{i,t} \\ + \gamma_1 * REG_{j,t} + \gamma_2 * CAR_{i,t} + \lambda_1 * GDP_{j,t} + \mu_{i,t} \end{cases} \quad (2)$$

Where subscripts *i* denotes individual banks, *j* is a country index and *t* is a time index (t= 2009,…, 2012). $\alpha, \beta, \gamma, \theta$, and λ are vectors of coefficient estimates. μ is the error term. The definition of the variables in the regression eq.(2) is presented in Section 3.2 and also is summarised in Tables 1 and 2.Section 4 will provide the empirical results and discussions of this regression equation.

3.3 Descriptive Statistics and Correlation Matrix

The definitions for each of the variables in the equation (2) are presented in Table 1, while the descriptive statistics of these variables are shown in Table 2.

The Pearson's pair-wise correlation matrix in Table 3 shows that the correlations among variables are not strong. The maximum value of correlation coefficient is 0.43which is between the board size (*BOARD_SIZE*) and bank size (*SIZE*) variables, indicating that multicollinearity among the regressors should not be a concern.

Table 4 provides the mean value of the regression variables across 10 observed countries. To be specific, column 2 and 3 of Table 4 presents the average values of ownership and shareholding managerial variables across all banks for each country

in the sample. It can be seen that, most of these values (except for China in column 3) are greater than 0.5, implying that most of banks in our sample have large owner(s). Besides, for the majority of the banks, managers are also shareholders.

Meanwhile, the mean values of (*INDEPENDENCE*) variable are provided in column 4 of Table 4. Since this variable is measured as the ratio of total independent directors to the total number of directors of the board, the closer the mean value to 1, the more independent the board. As can be seen from column 4 of Table 4, Indian banks, on average have more independent boards than banks in other developing Asian countries. Besides, the mean value is 0.65 further indicate that, on average, independent directors take majority of seats in a BOD of Indian banks. Contrary to that, BOD in Vietnamese banks seems to be less independent since the mean value of *(INDEPENDENCE)* variable for the country is very small.

The mean values of CEO's power variable (*CEO_DUALITY*) are shown in column 6 of Table 4. Recall that (*CEO_DUALITY*) is a dummy variable, which takes the value of one if the CEO is also the board chair, and zero otherwise, the very small mean values indicate that the roles of CEO and chairman are separated in most of the observed banks.

Another interesting feature to note from Table 4 is that the average capital adequacy levels in our ten observed developing countries are all greater than the minimum level of 8% recommended by the Basel committee (Basel I and Basel II), especially in the cases of UAE and Saudi Arabia when the average CARs are kept as high as 22.03% and 23.52%, respectively. It is in line with what we have argued previously about the important of higher capital requirements in developing nations.

4. Empirical Results

In Table 5, we present the estimation results of the model based on the Panel Pooled OLS estimation method. With respect to the corporate governance variables, the results are rather mixed. First of all, consider the influence of large owners (*OWNERSHIP*) on bank risk-taking behaviour, the coefficient estimate is positive and statistically significant, indicating that banks having large shareholders, who own at least 20 percent of total shares, are associated with higher risk. This result is consistent with the prior findings of Jensen and Meckling (1976); Shleifer and Vishny (1986); Saunders, Strock and Travlos (1990), and Laeven and Levine (2008), and supports the view that large owners have greater incentives and powers to induce the bank's managers to take more risks.

Turning to *BOARD_SIZE*, we found that bank with a large board of directors is associated with less risk-taking. The coefficient on *BOARD_SIZE* is -0.06, suggesting that, other things being equal, a one percent increase (decrease) in board size would reduce (increase) the level of risk-taken by bank by 0.06 units. Thus, this in line with what found by Blanchard and Dionne (2004), Cheng (2008), and Pathan (2009), that board size is negatively related to bank risk. The possible explanation is as follow. According toYermack (1996), directors may find it is easier to communicate with each other in a small size board, and thus they can be able to effectively achieve a compromised view on risky projects and overall strategies[17]. As a consequence, small board may have better influence, monitor and control the decisions of banks managers. Meanwhile, since one essential duty of the board is to ensure that the firm is led in the way that serves the shareholders' best interests (Volonté, 2015), banks with strong board power over the managing power of managers have higher incentive to take risk due to shareholders have reasons to prefer more risks than non-shareholdings managers (Galai and Masulis, 1976; Jensen and Meckling, 1976; Merton, 1977; and Pathan, 2009).

Next, by looking at the coefficient of *INDEPENDENCE*, we found sufficient evidence of a positive relationship between board independence and bank risk. That is, the more independent the board, the higher amount of risk banks willing to take. It is an interesting result and contrast to the view that independent directors are likely to act in a relatively risk-averse manner because they are more sensitive to the regulatory compliance and public visibility. This could be due to the fact that, in developing Asian countries where the regulations and law enforcement mechanisms are weak or even non-existent, independence directors might have more incentive to encourage non-shareholding managers to take more risks because greater risk-taking might result in higher future returns, which in turn, could bring those independent directors with greater compensations.

Regarding the impact of CEO's power, the parameter estimate on *CEO_DUALITY* is negative and statistically significant, indicating that, *ceteris paribus*, banks having CEOs also taking the role as chairman of the board will assume less risk than other banks. This is probably because by obtaining the duality functions, CEOs have gained more controlling and monitoring power to influence over the board decisions. As a result, since CEOs may wish to secure their reputations and careers, an increase in CEO's power might lead to a reduction in risk-taken by banks.

While large owners (*OWNERSHIP*), board size (*BOARD SIZE*), board independence (*INDEPENDENCE*) and CEO's power (*CEO DUALITY*) are all have significant influences on bank risk-taking behaviour, we cannot find any evidence of a relationship between managerial shareholding (*MANAGERIAL*) and bank risk since the coefficient

[17]See more, for example: Lipton and Lorsch (1992); Jensen (1993); Hermalin and Weisbach (2003).

estimate on *MANAGERIAL* is not statistically significant. Therefore, for the ten chosen developing Asian countries during the period from 2009 to 2012, bank managers' decisions on risky projects are not affected by the amount of shares they held at bank. Or in another word, higher shareholdings of bank managers do not lead to an increase in overall risk taken by bank.

Turning to accounting variables, loan loss reserve (*LLOSS*) is positively and statistically significant. Therefore, it provides strong empirical evidence that the more reserve bank set aside to cover for bad loans, the more risk the bank willing to take. Though this is contrast to what we have expected about a negative relationship, it can be explained that banks might attempt to take more risk because they wish to gain more returns to compensate for the amount of wealth they place aside to cover for bad loan. Meanwhile, bank size (*SIZE*) does not appear to be statistically significant, implying that size does not have any direct effect on bank risk-taking behaviour.

With regard to microeconomic variable (*GDP*), Table 5 shows that there is a direct negative relationship between GDP growth and bank risk level, that is: reduction in GDP growth induce bank to take more risk, *ceteris paribus*.

Another important feature can be drawn from Table 5 is that both of the two regulatory variables are not statistically significant. According to Roy (2005), if regulatory pressures (*REG*) brought about by the host-country regulators were effective, then undercapitalised banks should have decreased their *RISK* more than capitalised banks. However, since the coefficient estimate on *REG* is not statistically significant, we cannot find any empirical evidence of a direct influence of regulatory pressure on the level of risk taken by banks. Similarly, the coefficient on *CAR* is positive but insignificant, suggesting that the level of capital adequacy did not have any effect on the bank chosen level of risk. As a result, the regression results shown in Table 5 suggest that banking regulation and the power of the host-country regulators not seem to be effective in shaping the bank risk-taking behaviour in our ten chosen developing Asian countries during a four-year period after the 2007/2008 global financial crisis.

5. Robustness Tests

5.1. Instrumental Variables and Two-stage-least-squares (2SLS)

The reported coefficient estimates in Table 5 and their associated interpretations could be bias if one (or more) of the right-hand-side variables are in fact endogenously formed. Endogeneity problem arises when a regressor correlated with the error term[18]. As a result, the test for endogeneity is considerably important to conduct to see if it is the case when a regressor is correlated with the error term. If there is evidence of endogeneity, then the OLS gives bias results and we need to re-estimate the model using instrumental variables (IV) (Bound, et al., 1995; Angrist and Krueger, 2001). Otherwise, if there is no endogeneity problem, OLS method provides consistent and efficient estimators, suggesting that IV is not necessary to perform.

In this study, we employ IVs along with the two-stage-least-squares (2SLS) estimation method to address for the endogeneity problems (if there is any). But first of all, as mentioned above, the Durbin-Wu-Hausman (DWH) test to test for the endogeneity under the null hypothesis that H_o: All variables are exogenous, is needed to perform. If the coefficient estimated is not statistically different from zero, then we do not reject the null hypothesis, and the regressor is suggested to be exogenous. Thus there is no need to perform IV estimation. On the other hand, if the coefficient estimate is statistically different from zero, then the null hypothesis will be rejected, which indicates that the regressor is in fact endogenous and thus, we need to use instrumental variable(s) and 2SLS estimation.

In our model, we suspect that the level of bank capital adequacy (*CAR*) could be endogenously formed. According to Shireves and Dahl (1992), Jacques and Nigro (1997), Rime (2001) and Roy (2005), CAR is not directly observable since they may vary cross-sectionally. Nevertheless, there are some set of observable variables factors which may have an impact on the bank capital adequacy level. First of all, lagged CAR (*LCAR*) is chosen as an instrumental variable because lagged values are less likely to be influenced by current shocks but are likely to be correlated with the current capital level. Besides, we include bank profitability which measured by return on assets (*ROA*) as additional instrumental variable since we argue that, more profitable banks may wish and have more opportunities to take greater risk to remain high level of profitability in the future. As a result, together, *LCAR*, *ROA* and all other exogenous right-hand-side variables constitute our set of instruments.

Table 6A presents the result of DWH test. Since the p-values reported are very small (less than 0.001) and thus, statistically significant, the null hypothesis of all variables are exogenous is rejected. As a result, the DWH test suggests that *CAR* is an endogenous variable and therefore, we need to correct it using instrumental variables and the 2SLS estimation.

[18] Endogeneity problem arises when a regressor correlated with the error term. Since the OLS estimation assumes that all regressors within an OLS estimation must be independent from each other and should have no relationship with the error term, correlated with the error term cause these assumptions to be violated (See for example: Gujarati and Porter, 2008; Wooldridge, 2013).

Next, given the requirements to use IVs, we need to step further to examine if our chosen instrument variables are valid. This can be done by performing the Sargan test for over-identification restrictions under the null hypothesis that all instrumental variables are exogenous. Table 6B illustrates the Sargan and Basmann test results and since the p-values are both statistically insignificant, the null hypothesis cannot be rejected, implying that our instrumental variables are valid.

After acknowledging that there is a problem of endogeneity and our instrument variables are valid, we re-estimate the model by employing the 2SLS estimation method. Table 6B shows the main regression results of the 2SLS estimation. The findings remain the same as with those reported in Table 5 except that the coefficient on *CAR* is now turned to be statistically significant. Therefore, there is empirical evidence that an increase in capital adequacy ratio induce banks in developing Asian countries to take more risk. This is consistent with the findings of Koehn and Santomero (1980), Kim and Santomero (1988), and Blum (1999) that regulatory capital and bank risk level are positively related because more stringent capital requirements restricted banks' risk-return frontiers, and thus, induced them to compensate losses in utility from the upper-limit on leverage with the optimal option of raising portfolio risk (Roy, 2005). However, again, regulatory pressure brought about by the host-country regulators in our ten chosen developing Asian countries appears to have no direct influence on their banks risk-taken levels since the estimated coefficient is not statistically significant.

Although they are not the main concentrate of this study, the results for the first-stage regression of equation (2) also provide some useful information and are presented in Table 7A. One interesting feature to note from table 7A is that, in ten chosen developing Asian countries during the period from 2009 to 2012, banking regulations do not have any direct impact on the bank capital level. Turning to corporate governance variables, we find that all five variables appear to have no direct influence on bank capital adequacy level due to the estimated coefficients are all statistically insignificant. On the other hand, the parameter estimates on bank profitability (*ROA*) and lagged CAR (*LCAR*) indicate that increase in profitability and the preceding year capital level are both induce banks to raise their capital adequacy ratio. Meanwhile, GDP growth (*GDP*) is shown to be negatively related to bank chosen level of capital adequacy.

5.2 Generalised Method of Moments (GMM)

An alternative method to deal with the problem of endogeneity is the Generalised Method of Moments (GMM) estimation. Compared to other estimation methods like 2SLS, although the coefficient estimates should often remained similar in magnitude and sign, the GMM estimation results are generally found to be statistically more robust *(*Anwar and Nguyen, 2010).Additionally, according to Greene (2008), the GMM estimation offers consistent and efficient estimates in the presence of arbitrary heteroskedasticity. As a result, GMM is less likely to be misspecified.

With regard to the validity of the selected instrumental variables, the Hansen J-test is employed to test for the over-identification restrictions. The test result is shown in the bottom of Table 8 and since the Hansen J-statistic is statistically insignificant ($p = 0.9374$), our instrumental variables are believed to be valid.

The GMM regression results are shown in Table 8, while Table 9 provides the comparisons between Pooled OLS, 2SLS and GMM estimation results. In the first column of Table 9, we present results for the pooled OLS estimation, while the results for 2SLS and GMM estimations are shown in the second and third column, respectively. It can be seen that, after dealing with the problem of endogeneity, GMM provides very similar results to what delivered by 2SLS. In column 3, after re-estimating the model by making the use of GMM estimation, the coefficient on *CAR* is 0.003, which equal to the coefficient reported after the 2SLS estimation. Besides, since both of the coefficients (under GMM and 2SLS estimations) are reported to be highly significant at 1 percent level, there is strong empirical evidence that an increase in capital adequacy ratio induce banks in developing Asian countries to take more risk. Nevertheless, similar to the cases of pooled OLS and 2SLS, *REG* reported in GMM regression is still not statistically significant. Therefore, we found consistent evidence that regulatory pressure brought about by the host-country regulators did not have any effect on the risk taking behaviour of banks in developing Asian countries.

Turning to corporate governance variables, in column 1, under the pooled OLS method, we find that only one out of the five variables is not statistically significant (*MANAGERIAL*). All four remaining variables are shown to be directly influenced the bank risk-taken level. To be specific, while *ONWERSHIP* and *INDEPENDENCE* have positive impacts on bank risk, *BOARD_SIZE* and *CEO_DUALITY* are both negatively related to the level of risk bank undertake. In column 2, we obtain similar results even after solving for the endogeneity problem by making use of 2SLS estimation method. Again, there is a positive relationship between the power of large owner (*OWNESHIP*) and bank risk-taken level and between board independence and the amount of risk bank wish to take. Meanwhile, board size and CEO power are continuously shown to be inversely related to bank risk like what observed under OLS estimation.

Finally, those relationships do not change when we re-estimate the model using GMM estimation. The regression results in Table 8 and column 3 of Table 9 show that while *MANAGERIAL* is still not statistically significant, all other corporate governance variables are shown to have persistently strong influence on bank risk-taken level like what have been found in the cases using pooled OLS and 2SLS estimations. Thus, we can see that, even after controlling for the problems of endogeneity and heteroskedasticity, the power of owners (*OWNERSHIP*) and board independence (*INDEPENDENCE*) are found to be consistently and positively related to bank risk-taken level. Meanwhile, CEO power (*CEO_DUALITY*) and board size (*BOARD_SIZE*) are shown to be consistently and negatively related to bank risk. However, we still cannot find any evidence of a direct impact of managerial shareholdings (*MANAGERIA*L) on bank risk level, regardless of the estimation methods applied.

With regard to all other variables, namely *SIZE*, *LLOSS*, and *GDP*, the results delivered by GMM estimation method are consistent to what have been observed in OLS and 2SLS regressions. Thus, it provides strong evidence that except bank size, loan loss reserve and GDP growth are all have a direct impact on shaping the bank risk-taking behaviour in developing Asian countries during the period from 2009 to 2012.

2. Conclusion

This paper investigates the influence of corporate governance and banking regulations on bank risk-taking decisions in developing Asia countries after the recent global financial crisis. Our main finding is that both corporate governance mechanism and capital adequacy requirement does have significant impacts on shaping the risk-taking behaviour of banks and the results appear robust regardless of the different estimation approaches applied (namely, pooled OLS, 2SLS, and GMM). To be specific, while banks with large owner(s) tend to take greater risk than widely-held banks, CEO's power is found to have a negative impact on bank risk-taking behaviour, meaning that if CEOs have more power to influence the board decisions, they may have greater incentive and power to take less risk in order to protect their chair and other private benefits. Thus, our findings are in line with theories predicting that there is a potential conflict of interests between the principal and the agent. Additionally, we also found sufficient evidence that the more independent the board, the higher risk banks willing to take. Contrary to that, an increase in board size induces banks to take less risk. However, we cannot find any empirical evidence of a relationship between managerial shareholding and bank risk, suggesting bank managers' decisions on risky projects are not directly influenced by the amount of shares they held at bank. Turning to banking regulations, although regulatory pressure brought about by the national regulation and host-country regulators does not have any direct effect on bank risk-taken level, an increase in capital adequacy ratio does, in fact, force banks to assume more risks.

Thus, the results from our study offer some important implications which might assist risk managers, regulators, policymakers, and other market participants in developing Asian countries in building up a sound risk management practice. First of all, it can be seen that the on-going stringent banking regulation in these countries has not been effectively induced banks to reduce their risks. It might eventually have an adverse effect by forcing banks to increase their risk-taken level. This could be a worrisome issue, particularly in the case of developing Asian countries where there are already existed a high level of macroeconomic volatility. The reason is because, the lack of State monitor, control, and law enforcement mechanisms could bring risk-loving investors, bank owners and other market participants with greater risk-taking incentive and chances to act in moral hazard manner. Thus if regulations and State regulators fail to prevent banks from excessive risk taking, then the market could become increasingly volatility, which in turn, might lead to significant negative consequences in the future.

Secondly, along with other quantitative variables like loan loss reserve, profitability, size, and GDP, changes in corporate governance (including ownership structure, board characteristics (i.e. size and independency), and CEO's power) could be considered as very useful risk indicators for banks managers, regulators and other market participants. Certainly, controlling for corporate governance practice is always important though not an easy job to do; and our results support the on-going efforts of various bank regulations and regulators to impose more stringent rules on bank compensation schemes, code of ethics, and ownership structures.

References

1. Aizenman, J., 2003. Volatility, employment and the patterns of FDI in developing markets. Journal of Development Economics. 72(2), pp.585–601.
2. Angrist, J. D. and Krueger, A. B., 2001. Instrumental Variables and the Search for Identification: From Supply and Demand to Natural Experiments. Journal of Economic Perspectives. 15(4), pp.69-85.
3. Aggarwal, R and Jacques, K. T., 2001. The impact of FDICIA and prompt corrective action on bank capital and risk: Estimates using a simultaneous equation model. Journal of Banking and Finance. 25(2011), pp.1139-1160.
4. Anderson, R. C. and Fraser, D. R., 2000. Corporate control, bank risk taking, and the health of the banking industry. Journal of Banking & Finance. 24 (2000), pp.1383-1398.

5. Arrow, K. J., 1963.Uncertainty and the Welfare Economics of Medical Care. American Economic Review.53 (1963), pp.95-973.
6. Barberis, N., 2011.Psychology and the Financial Crisis of 2007-2008. Working Paper.
7. Baum, C. F. and Schaffer, M. E., 2003. Instrumental variables and GMM: Estimation and testing. The Stata Journal. 3(1), pp.1-31.
8. BCBS, 1988. International convergence of capital measurement and capital standards. Bank for International Settlement.
9. BCBS, 2004. International Convergence of Capital Measurement and Capital Standards: A Revised Framework. Bank for International Settlement.
10. BCBS, 2010. Basel III: A global regulatory framework for more resilient banks and banking systems. Bank for International Settlements.
11. Berger, A. L., Imbierowicz, B. and Rauch, C., 2014. The Roles of Corporate Governance in Bank Failures During the Recent Financial Crisis. Working papers series.
12. Blanchard, D. and Dionne, G., 2004. The Case for Independent Risk Management Committees, Risk. 17, 5, S19-S21.
13. Blum, j., 1999. Do capital adequacy requirements reduce risks in banking? Journal of Banking and Finance. 23 (1999), pp.755-771.
14. Bound, J., Jaeger, A. A. and Bake, R. R., 1995. Problems With Instrumental Variables Estimation When the Correlation Between the Instruments and the Endogenous Explanatory Variable. Journal of the American Statistical Association. 90(430), pp.443-450.
15. Boyd, B. K., 1995. CEO duality and firm performance: a contingency model. Strategic Management Journal. 16(4), pp.301–312.
16. Brandes, P. Dharwadkar, R. and Das, D., 2005. Understanding the rise and fall of stock options compensation: Taking principal–agent conflicts to the institutional (battle)field. Human Resource Management Review. 15 (2005), pp.97 – 118.
17. Cole, R. A. and White, L. A., 2012, Déjà Vu all over again: The causes of US commercial bank failures this time around, Journal of Financial Services Research. 42(1), pp.5-29.
18. Demsetz, R. and Strahan, P., 1997. Size, Diversification and Risk at U.S. Banking Companies. Journal of Money, Credit and Banking. 29, pp.300-313.
19. Doidge, C., Karolyi, G. A. and Stulz, R. M., 2007. Why do countries matter so much for corporate governance? Journal of Financial Economics. 86 (2007), pp.1-39.
20. Erkens, D. H., Hung, M. and Matos, P., 2012. Corporate governance in the 2007-2008 financial crisis: Evidence from financial institutions worldwide. Journal of Corporate Finance. 18(1), pp.389-411.
21. Fama, E. F. and Jensen, M. C., 1983. Separation of ownership and control. Journal of Law and Economics. 26, pp.301-325.
22. Galai, D. And Masulis, R.W., 1976. The option pricing model and the risk factor of stock. Journal of Financial Economics. 3, pp.53-81.
23. Gonzalez, F., 2005. Bank regulation and risk-taking incentives: An international comparison of bank risk. Journal of Banking & Finance. 29(2005), pp.1153–1184.
24. Gorton, G. and Rosen, R., 1995. Corporate Control, Portfolio Choice and the Decline of Banking. Wharton Financial Institutions Center. 95(09).
25. Gottschalk, R. ed., 2010. The Basel Capital Accords in Developing Countries: Challenges for Development Finance.
26. Greene, H., 2008. Econometric analysis. 6th ed. New York: Prentice Hall.
27. Greener, I., 2006. Nick Leeson and the Collapse of Barings Bank: Socio-Technical Networks and the 'Rogue Trader'. Organization. 13(3), pp.421–441.
28. Gujarati, D. N. and Porter, D. C., 2008. Basic Econometrics. 5th ed. New York: McGraw−Hill.
29. Haubrich, J. G. and Wachtel, P., 1993. Capital requirements and shifts in commercial bank portfolio. Economic Review. 29 (third quarter), pp.2-15.
30. Hermalin, B. E. and Weisbach, M. S., 2003. Boards of directors as an endogenously determined institution: A survey of the economic literature. FRBNY Economic Policy Review. 9, pp.7-26.
31. Hirshleifer, D. and Thakor, A. V., 1992. Managerial conservatism project choice and debt. The Review of Financial Studies. 5(3), pp.437-470.
32. Hubbard, R. G. and Palia, D., 1995. Benefits of control, managerial ownership, and the stock returns of acquiring firms. RAND Journal of Economics. 26(4), pp. 782-792.
33. Huberman, G. Mayers, D. and Smith, C. W., 1983.Optimal Insurance Policy Indemnity Schedules. Bell Journal of Economics.14 (1983), pp.415-426.
34. Hussain, M. E. and Hassan, M. K., 2005. Basel Capital Requirements and Bank Credit Risk Taking in Developing Countries. University of New Orleans. Working Paper.
35. Jensen, M., 1993. The Modern Industrial Revolution, Exit, and the Failure of Internal Control Systems. Journal of Finance 48(3), pp.831-80.
36. Jacques, K. and Nigro, P., 1997. Risk-Based Capital, Portfolio Risk, and Bank Capital: A Simultaneous Equations Approach. Journal of Economics and Business. 49(6), pp.533-547.
37. Jensen, M. and Meckling, W., 1976. The Theory of the Firm: Managerial Behavior, Agency Costs, and Ownership Structure. Journal of Financial Economics, 3, pp.305-360.
38. Kim, D. and Santomero, A. M., 1988. Risk in Banking and Capital Regulation. Journal of Finance. 43(5), pp.1219-1233.
39. Kim, D., and Santomero, A. M., 1994. Risk in banking and capital regulation. Journal of Finance. 43, pp.1219-1233.
40. Klein, A., 1998. Firm performance and board committee structure. Journal of Law and Economics. 41, pp.137–165.
41. Koehn, M. and Santomero, A. M., 1980. Regulation of Bank Capital and Portfolio Risk. Journal of Finance. 35(5), pp.1235-1244.
42. Konishi, M. and Yasuda, Y., 2004. Factors affecting bank risk taking: Evidence from Japan. Journal of Banking and Finance. 28(1), pp.215-232.
43. Kose, M. A., Prasad, Eswar. S. and Terrones, Marco. E., 2004. How Do Trade and Financial Integration Affect the Relationship between Growth and Volatility?
44. Laeven, L. and Levine, R., 2008. Bank governance, regulation and risk taking. Journal of Financial Economics, 93(2), pp.259-275.

45. Laux, C. and Leuz, C., 2010Did Fair-Value Accounting Contribute to the Financial Crisis? Journal of Economic Perspectives. 24(1), pp.93-118.
46. Lipton, M. and Lorsch. J., 1992. A Modest Proposal for Improved Corporate Governance. Business Lawyer. 48(1), pp. 59-7.
47. Maddaloni, A. and Peydró, J. L., 2010. Bank risk-taking, securitization, supervision and low interest rates evidence from the Euro area and the U.S. lending standards. European Central Bank working paper series.
48. Merton, R.C., 1977. An analytic derivation of the cost of deposit insurance and loan guarantees. Journal of Banking and Finance 1, pp.3-11.
49. OECD, 2014. Corporate Governance Factbook.
50. Okpara, J. O., 2011. Corporate governance in a developing economy: barriers, issues, and implications for firms. Corporate Governance: The international journal of business in society. 11(2), pp.184-199.
51. Parrino, R. Poteshman, A. M. And Weisbach, M. S., 2005. Measuring investment distortions when risk-averse managers decide whether to undertake risky project. Financial Management. 34, pp.21-60.
52. Pathan, S., 2009. Strong boards, CEO power and bank risk-taking. Journal of Banking and Finance. 33(7), pp.1340-1350.
53. Pisani, M., 2011. Financial Openness and Macroeconomic Instability in Developing Market Economies. Open Economies Review. 22(3), pp.501-532.
54. Rime, B., 2001. Capital requirements and bank behaviour: Empirical evidence for Switzerland. Journal of Banking and Finance. 25, pp.789-850.
55. Roy, A. D., 1952. Safety first and the holding of assets. Econometrica, 20, pp.431-449.
56. Roy, P. V., 2005. The impact of the 1988 Basel Accord on banks' capital ratio and credit risk-taking: an international study. Working Paper Series.
57. Saunders, A. and Cornett, M. M., 2006. Financial Institutions Management: A Risk Management Approach. McGraw-Hill: New York.
58. Saunders, A., Strock, E. and Travlos, N. G., 1990. Ownership Structure, Deregulation, and Bank Risk Taking. Journal of Finance. 45(2), pp.643-654.
59. Shleifer, A. and Vishny, R., 1986. Large shareholders and corporate control. Journal of Political Economy. 94, pp.461-488.
60. Shrieves, R. E. and Dahl, D., 1992. The relationship between risk and capital in commercial banks. Journal of Banking and Finance, 16(1992), pp.439-457.
61. Smith, C. W. and Stulz, R. M., 1985.The Determinants of Firms' Hedging Policies. Journal of Financial and Quantitative Analysis.20 (4), pp.391-405.
62. Teresa, G. M. and M. Dolores, R. F., 2008. Risk-taking behaviour and ownership in the banking industry: The Spanish evidence. Journal of Economics and Business. 60(4), pp. 332-354.
63. Volonté, C., 2015. Boards: Independent and committed directors? International Review of Law and Economics. 41, pp.25-37.
64. Weisbach, M. S., 1988. Outside directors and CEO turnover. Journal of Financial Economics. 20, pp.431-460.
65. Wooldridge, J. M. 2013. Introductory Econometrics. 5th ed. Mason: Cengage Learning
66. Yermack, D., 1996. Higher Market Valuation of Companies with a Small Board of Directors. Journal of Financial Economics.40 (2), pp.185-212.

Appendix 1

Table 1. Description of Variables

The table shows descriptions of the main regression variables. Besides, their units of measurement are also reported.

Variable Name	Unit	Description
Dependent Variable		
RISK	Ratio	Ratio of total risk-weighted-assets (RWA) to total assets (A)
Corporate Governance variables		
OWNERSHIP	Dummy	Dummy variable indicating whether the bank has large ownership or well diversification
MANAGERIAL	Dummy	Dummy variable indicating whether the bank senior manager also has substantial share interest or not; Or whether a substantial Shareholder also manage the bank or not
INDEPENDENCE	Ratio	Ratio of independent directors to the total number of members of the board of directors
BOARD_SIZE	Integer	Natural Log of the number of members of the board of directors
CEO_DUALITY	Dummy	Dummy variable indicating whether the Chairman of the BOD is also the CEO of the same bank
Accounting Variables		
SIZE	Integer	Natural Log of total assets in $ thousand
LLOSS	Ratio	Ratio of loan loss provision to total assets
Macroeconomic Variable		
GDP	%	Annual percentage growth rate of GDP
Regulatory Variable		
REG	Dummy	Dummy variable indicating whether the bank meet the minimum capital requirement set by the country regulators or not
CAR	Ratio	Ratio of total regulatory capital requirement (K) to total risk-weighted-asset (RWA)

Table 2. Summary Statistic of Regression Variables

This table provides summary statistics of the main regression variables. Sample consists of 100 banks from 10developing Asian countries. The time period chosen was range from 2009 to 2012. Unless otherwise indicated, the detailed definition of each variable follows what presented in Table 1.

Variable Name	Number of banks	Mean	Standard Deviation	Minimum	Maximum
Dependent Variable					
RISK	100	0.70	0.14	0.00	1.06
Corporate Governance variables					
OWNERSHIP	100	0.80	0.39	0.00	1.00
MANAGERIAL	100	0.74	0.43	0.00	1.00
INDEPENDENCE	100	0.30	0.26	0.00	1.00
BOARD_SIZE	100	2.35	0.29	1.38	2.94
CEO_DUALITY	100	0.06	0.25	0.00	1.00
Accounting Variables					
SIZE	100	16.45	1.69	12.45	21.74
LLOSS	100	0.01	0.03	-0.02	0.65
Macroeconomic Variable					
GDP	100	5.1	3.69	-5.20	10.40
Regulatory Variable					
REG	100	0.98	0.13	0.00	1.00
CAR	100	16.77	10.19	7.24	183

Table 3. Correlation matrix of main regression variables

This table reports the correlations between the main regression variables based on the pooled sample of 100 banks from 10 developing Asian countries over the 4-year period from 2009 to 2010. Please refer to Table 1 for variable definitions.

	OWNERSHIP	*INDEPEN DENCE*	*MANAGE RIAL*	*BOARD_ SIZE*	*CEO_ DUALITY*	*SIZE*	*LLOSS*	*REG*	*CAR*	*GDP*
OWNERSHIP	1									
INDEPEN DENCE	-0.1685	1								
MANAGE RIAL	-0.2129	0.0950	1							
BOARD_ SIZE	0.0317	0.1646	-0.0689	1						
CEO_ DUALITY	-0.0203	0.0115	-0.0255	0.0389	1					
SIZE	0.1148	-0.0043	-0.0970	0.4346	-0.0720	1				
LLOSS	0.0598	-0.0963	-0.0920	-0.0240	-0.0246	-0.1306	1			
REG	0.1283	0.0813	-0.0781	0.2004	0.0359	0.0769	0.0161	1		
CAR	-0.0774	0.0144	0.0327	-0.0831	0.0241	-0.1310	0.0763	0.1096	1	
GDP	-0.0762	0.1349	-0.0608	0.1670	0.1124	0.2062	-0.0596	-0.0103	-0.1424	1

Table 4. List of countries

This table reports country averages of the main regression variables. The sample consists of 100 commercial banks from 10 developing Asian countries. The time period chosen was range from 2009 to 2012. Unless otherwise indicated, the detailed definition of each variable follows what presented in Table 1.

Country	*RISK*	*OWNER SHIP*	*MANAGE RIAL*	*INDEPEN DENCE*	*BOARD SIZE*	*CEO DUALITY*	*SIZE*	*LLOSS*	*GDP*	*REG*	*CAR*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
China	0.56	0.73	0.38	0.36	2.78	0.20	19.53	0.002	9.15	1.00	12.28
India	0.68	0.53	0.98	0.65	2.31	0.15	15.90	0.005	7.53	1.00	17.81
Indonesia	0.68	1.00	0.58	0.19	2.44	0.15	15.37	0.007	5.90	1.00	16.64
Jordan	0.62	0.60	0.88	0.22	2.33	0.18	15.14	0.006	3.28	0.98	17.81
Philippine	0.70	1.00	0.60	0.37	2.46	0.00	15.41	0.003	4.80	1.00	16.72
Saudi Arabia	0.86	0.80	1.00	0.54	2.26	0.00	17.08	0.006	5.90	1.00	23.52
Thailand	0.75	0.98	0.65	0.34	2.55	0.00	16.74	0.008	3.32	1.00	15.43
Turkey	080	1.00	0.50	0.09	2.28	0.00	16.84	0.030	3.82	1.00	17.03
UAE	0.81	0.88	0.90	0.24	2.15	0.00	16.62	0.011	1.50	1.00	22.03
Vietnam	0.58	0.58	1.00	0.05	1.98	0.00	15.91	0.004	5.80	0.85	11.06

Table 5. Pooled Ordinary Least Squares Regression Results

This table presents the result for the Pooled OLS estimates of equation (2):

$$RISK_{i,j,t} = \begin{cases} \alpha + \beta_1 * OWNERSHIP_{i,,j,t} + \beta_2 * MANAGERIAL_{i,j,t} + \beta_3 * BOARD\ SIZE_{i,j,t} \\ + \beta_4 * INDEPENDENCE_{i,j,t} + \beta_5 * CEO\ DUALITY_{i,j,t} + \theta_1 * SIZE_{i,j,t} \\ + \theta_2 * LLOSS_{i,j,t} + \gamma_1 * REG_{i,j,t} + \gamma_2 * CAR_{i,j,t} + *GDP_{j,t} + \mu_{i,j,t} \end{cases}$$

The sample consists of 100 commercial banks from 10 developing Asian countries. The time period chosen was range from 2009 to 2012. Unless otherwise indicated, the detailed definition of each variable follows what presented in Table 1.
Significant codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.'

RISK	Coefficient	Std. Error	t	Pr (>|t|)	
C	0.777242	0.088389	8.793	0.0000	***
OWNERSHIP	0.084802	0.018313	4.630	0.0000	***
MANAGERIAL	0.023944	0.016244	1.474	0.1413	
BOARD SIZE	-0.064713	0.026443	-2.447	0.0148	*
INDEPENDENCE	0.128436	0.027271	4.709	0.0000	***
CEO DUALITY	-0.067481	0.027628	-2.442	0.0150	*
SIZE	-0.004112	0.004666	-0.881	0.3787	
LLOSS	0.636898	0.199359	3.194	0.0015	**
REG	0.050701	0.054315	0.933	0.3512	
CAR	7.09E-05	0.000691	0.102	0.9183	
GDP	-0.005976	0.001957	-3.054	0.0024	**
R^2	0.174191				
No. Obs.	400				

Table 6A. Durbin-Wu-Hausman test

Tests of endogeneity		
H_0: Variables are exogenous		
Durbin (scores) chi2(1)	= 15.1544	(p = 0.0001)
Wu-Hausman F(1,388)	= 15.2786	(p = 0.0001)

Table 6B. Sargan test

Tests of overidentifying restriction		
H_0: All instrumental variables are exogenous		
Sargan (score) chi2(1)	= 0.007199	(p = 0.9324)
Basmann chi2(1)	= 0.006983	(p = 0.9334)

Table 7A. First-stage regressions

This table presents the result for the 1st stage of the two-stage-least-squares estimates of equation (2):

$$RISK_{i,j,t} = \begin{cases} \alpha + \beta_1 * OWNERSHIP_{i,,j,t} + \beta_2 * MANAGERIAL_{i,j,t} + \beta_3 * BOARD\ SIZE_{i,j,t} \\ + \beta_4 * INDEPENDENCE_{i,j,t} + \beta_5 * CEO\ DUALITY_{i,j,t} + \theta_1 * SIZE_{i,j,t} \\ + \theta_2 * LLOSS_{i,j,t} + \gamma_1 * REG_{i,j,t} + \gamma_2 * CAR_{i,j,t} + \varphi * GDP_{j,t} + \mu_{i,j,t} \end{cases}$$

Where the endogenous r,h.s variable is estimated as bellows:

$$CAR_{i,t} = \begin{cases} \alpha + \delta_1 * ONWERSHIP_{i,j,t} + \delta_2 * MANAGERIAL_{i,j,t} + \delta_3 * BOARD\ SIZE_{i,j,t} \\ + \delta_4 * INDEPENCE_{i,j,t} + \delta_5 * CEO\_DUALITY_{i,t} + \psi_1 * SIZE_{i,j,t} + \psi_2 * LLOSS_{i,j,t} \\ + \omega * GDP_{i,t} + \lambda * REG_{i,j,t} + \zeta_1 * ROA + \zeta_2 * LCAR + \varepsilon_{i,t} \end{cases}$$

In the above equation, bank profitability (measured by *ROA*), lagged CAR (*LCAR*) and other exogenous r.h.s variables are used as instrumental variables to predict *CAR*.

Significant codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.'

CAR	Coefficient	Std. Error	t	Pr (>|t|)	
C	8.798292	5.279743	1.67	0.096	.
OWNERSHIP	-1.485974	1.097910	-1.35	0.177	
MANAGERIAL	-0.260233	0.970256	-0.27	0.789	
BOARD SIZE	-0.661050	1.579711	-0.42	-0.42	
INDEPENDENCE	1.479565	1.650289	0.90	0.371	
CEO DUALITY	1.226210	1.658143	0.74	0.460	
SIZE	-0.223547	0.278694	-0.80	0.423	
LLOSS	5.004194	11.90446	0.42	0.674	
GDP	-0.344849	0.115755	-2.98	0.003	**
REG	4.651190	3.235274	1.44	0.151	
ROA	1.706016	0.514826	3.31	0.001	**
LCAR	0.534525	0.039231	13.62	0.000	***
R^2	0.3808				
No. Obs.	400				

Table 7B. Two-stage-least-squares Regression Results of Bank Risk-taken Level

This table presents the result for the two-stage-least-squares estimates of equation (2):

$$RISK_{i,j,t} = \begin{cases} \alpha + \beta_1 * OWNERSHIP_{i,,j,t} + \beta_2 * MANAGERIAL_{i,j,t} + \beta_3 * BOARD\ SIZE_{i,j,t} \\ + \beta_4 * INDEPENDENCE_{i,j,t} + \beta_5 * CEO\ DUALITY_{i,j,t} + \theta_1 * SIZE_{i,j,t} \\ + \theta_2 * LLOSS_{i,j,t} + \gamma_1 * REG_{i,j,t} + \gamma_2 * CAR_{i,j,t} + *GDP_{j,t} + \mu_{i,j,t} \end{cases}$$

In the first stage of the 2sls estimation, bank profitability which is measured by return on assets (*ROA*) and lagged CAR are employed as additional instrumental variables, along with all exogenous variables to get the predicted value of the endogenous variables (*CAR).* Then the empirical CAR in equation (2) will be replaced by the predicted *CAR* from the first stage and OLS regression will be performed at the second stage of the 2sls.

Significant codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.'

RISK	Coefficient	Std. Error	z	Pr (>|z|)	
C	0.699983	0.092606	7.56	0.000	***
OWNERSHIP	0.093606	0.018854	4.96	0.000	***
MANAGERIAL	0.023061	0.016596	1.39	0.165	
BOARD SIZE	-0.057310	0.027085	-2.12	0.034	*
INDEPENDENCE	0.125681	0.027868	4.51	0.000	***
CEO DUALITY	-0.072072	0.028249	-2.55	0.011	*
SIZE	-0.002622	0.004782	-0.55	0.583	
LLOSS	0.566726	0.204512	2.77	0.006	**
REG	0.012294	0.056419	0.22	0.828	
CAR	0.003756	0.001208	3.11	0.002	**
GDP	-0.004695	0.002027	-2.32	0.021	*
R^2	0.1138				
No. Obs.	400				

Table 8. Generalised Method of Moment Regression Results of Bank Risk-taken Level

This table presents the result for the GMM estimates of equation (2):

$$RISK_{i,j,t} = \begin{cases} \alpha + \beta_1 * OWNERSHIP_{i,,j,t} + \beta_2 * MANAGERIAL_{i,j,t} + \beta_3 * BOARD\ SIZE_{i,j,t} \\ + \beta_4 * INDEPENDENCE_{i,j,t} + \beta_5 * CEO\ DUALITY_{i,j,t} + \theta_1 * SIZE_{i,j,t} \\ + \theta_2 * LLOSS_{i,j,t} + \gamma_1 * REG_{i,j,t} + \gamma_2 * CAR_{i,j,t} + * GDP_{j,t} + \mu_{i,j,t} \end{cases}$$

In GMM estimates, bank profitability which is measured by return on assets (*ROA*) and lagged CAR, along with all exogenous variables are employed as instrumental variables. Besides, the Hansen's J-test of over-identification restrictions is also reported at the bottom of the table.

Significant codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.'

RISK	Coefficient	Robust Std. Error	z	Pr (>|z|)	
C	0.7016262	0.0817993	8.58	0.000	***
OWNERSHIP	0.0937576	0.0170745	5.49	0.000	***
MANAGERIAL	0.0230214	0.0177463	1.30	0.195	
BOARD SIZE	-0.0575084	0.0274406	-2.10	0.036	*
INDEPENDENCE	0.1253224	0.0245661	5.10	0.000	***
CEO DUALITY	-0.0719336	0.0331635	-2.17	0.030	*
SIZE	-0.0026918	0.0044144	-0.61	0.542	
LLOSS	0.5660592	0.1569123	3.61	0.000	***
REG	0.0124853	0.0357518	0.35	0.727	
CAR	0.0037444	0.0014256	2.63	0.009	**
GDP	-0.0046947	0.0019129	-2.45	0.014	*
R^2	0.1142				
Hansen's J-test	0.006164			0.9374	
No. Obs.	400				

Table 9. Comparison between Pooled OLS, 2SLS, and GMM Regression Results of Bank Risk-taken Level

This table presents the result for the Pooled OLS, 2SLS, and GMM estimates of equation (2):

$$RISK_{i,j,t} = \begin{cases} \alpha + \beta_1 * OWNERSHIP_{i,j,t} + \beta_2 * MANAGERIAL_{i,j,t} + \beta_3 * BOARD\ SIZE_{i,j,t} \\ + \beta_4 * INDEPENDENCE_{i,j,t} + \beta_5 * CEO\ DUALITY_{i,j,t} + \theta_1 * SIZE_{i,j,t} \\ + \theta_2 * LLOSS_{i,j,t} + \gamma_1 * REG_{i,j,t} + \gamma_2 * CAR_{i,j,t} + * GDP_{j,t} + \mu_{i,j,t} \end{cases}$$

The regression results using Pooled OLS estimation method is shown in column (1), while the regression results using 2SLS and GMM are provided in the second and third column, respectively. Figures in parentheses are t-statistics while p-values are in brackets.

Significant codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.'

RISK	Pooled OLS	2SLS	GMM
C	0.777*** (0.000)	0.699*** (0.000)	0.701*** (0.000)
OWNERSHIP	0.084*** (0.000)	0.093*** (0.000)	0.093*** (0.000)
MANAGERIAL	0.023 (0.141)	0.023 (0.165)	0.0230 (0.195)
BOARD SIZE	-0.064* (0.014)	-0.057* (0.034)	-0.057* (0.036)
INDEPENDENCE	0.128*** (0.000)	0.125*** (0.000)	0.125*** (0.000)
CEO DUALITY	-0.067* (0.015)	-0.072* (0.011)	-0.071* (0.030)
SIZE	-0.004 (0.378)	-0.002 (0.583)	-0.002 (0.542)
LLOSS	0.636** (0.0015)	0.566** (0.006)	0.566*** (0.000)
REG	0.050 (0.351)	0.012 (0.828)	0.012 (0.727)
CAR	7.09E-05 (0.918)	0.003** (0.002)	0.003** (0.009)
GDP	-0.005** (0.002)	-0.004* (0.021)	-0.004* (0.014)
R^2	0.174191	0.1138	0.1142
No. Obs.	400	400	400

Appendix2. Regulation and bank risk-taking behaviour

There are (at least) three possible courses of actions that a bank can do in respond to the higher capital requirement:(i) Increase total regulatory capital; (ii) Reduce the risk-taken; or (iii) Shirk total assets:

$$\widehat{CAR} = \widehat{K} - \widehat{RISK} - \hat{A}$$

Proof of the above equation:

First, the decomposed form of regulatory capital isanalysed to investigate how banks respond to the new capital requirements:

$$Regulatory\ Capital\ = \frac{Regulatory\ Capital}{RWA} * \frac{RWA}{A} * \frac{A}{1}$$

Or in other words:

$$K = \frac{K}{RWA} * \frac{RWA}{A} * \frac{A}{1}$$

Where

- K = regulatory capital set aside by the bank
- RWA = risk-weighted-asset
- A = total asset
- K/RWA = CAR = capital adequacy ratio
- RWA/A = RISK = bank risk level

Then, taking log and differentiating (w.r.t time) of both sides, the above equation will become:

$$\frac{\partial log(K)}{\partial t} = \frac{\partial log(CAR)}{\partial t} + \frac{\partial log(RISK)}{\partial t} + \frac{\partial log(A)}{\partial t}$$

It is therefore:

$$\frac{\Delta K}{K} = \frac{\Delta CAR}{CAR} + \frac{\Delta RISK}{RISK} + \frac{\Delta A}{A}$$

Next, using the standard circumflex notation for proportional change ($\widehat{K} = \frac{\widehat{K}}{K}$), we get:

$$\widehat{K} = \widehat{CAR} + \widehat{RISK} + \hat{A}$$

Or

$$\widehat{CAR} = \widehat{K} - \widehat{RISK} - \hat{A}$$