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The Moderating Effects of Capital Regulation and Supervisory Power on the Risk-Sensitivity of Bank Capital Requirements

Mohamed Albaity[(1)]

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Abstract:

Based on bank data from 61 of the largest banks in Asia and the Middle East, this paper presents an analysis of the effects that capital regulation and stringent supervisory actions have on the extent to which bank capital requirements are risk sensitive. While bank-specific factors, namely banks' buffer, deposit, loans and supervisory power, are statistically-significant, there is no clear evidence to prove that capital regulation and GDP growth rate affect the risk sensitivity of banks. Using a robust one-step system GMM estimator, our results indicate that stricter supervisory power combined with capital regulatory regimes does enhance the risk sensitivity of banks. Our findings have two policy implications. First, the extent to which risk-based capital requirements are effective at controlling bank risk acts independently of the capital requirements set by authorities. Second, bank-specific factors have a more significant impact on risk at the bank level than external factors. To supervise and manage bank-risk level, there is a distinct requirement, at least in emerging economies, for regulators to monitor the operation and performance of banks in addition to verifying their compliance with capital requirements.

Keywords: Bank Capital Requirements, Capital Regulation, Government Debt to GDP, Risk-weighted Assets, Supervisory Power.

JEL Classification: G21, G34, G33, G28

(1) College of Business Administration - University of Sharjah (Sharjah - U.A.E.)
malbaity@sharjah.ac.ae

1. Introduction

It is not uncommon for bank owners and regulators to disagree on bank capital requirements. Bank capital is very different to the capital requirements of non-financial entities because it is highly regulated and managed by each country's central bank. In the majority of cases, such regulations are based on the Basel Committee's minimum risk-weighted capital adequacy requirement, which is 8 percent. It is important that such regulations are in place because banks sit at the core of an economy's financial system. In the event the banks fail, the entire financial system may collapse. However, although capital requirement regulations are in place in the majority of countries, the financial crises that have been observed in many parts of the world in recent years highlight only too clearly that these regulations are unable to prevent economic disasters.

The first Basel regulation, Basel 1, was first introduced in 1988 and it was designed to take both credit and market risk into consideration. In 2004, in the aftermath of the 1997-1998 Asian crisis, Basel 1 was replaced with Basel 2. The more recent financial crisis highlighted the need for further refinement of the capital requirements regulations. This led to the development of Basel 3, which will come into full force in 2018.

Until recently, research on the Basel regulations and their associated outcomes has largely focused on developed countries (Shrieves & Dahl, 1992; Jacques & Nigro, 1997; Calem & Rob, 1999; Flannery & Rangan, 2008), and the findings of these studies have varied significantly from study to study. A limited amount of studies have examined emerging economies; however, these too have resulted in inconsistent results (Ahmad et al., 2008; Davies, 2005; Fischer, 2002). It was not until more recently that researchers turned their attention to larger samples that consisted of entities from both developed and developing regions of the world (Acharya, Philippon, Richardson, & Roubini, 2009; Vallascas & Hagendorff, 2013;

Albaity & Toobaee, 2017). On the whole, the existing research findings indicate that regulations that demand a high capital requirement can place a costly burden on banks and the societies they serve. Furthermore, high capital regulations are typically associated with the development of a credit crunch that subsequently undermines domestic demand. Berger et al. (1998) also highlighted how there is a potential causal relationship between bank capital and bank risk. A small number of studies have evaluated bank managers' perceptions of the implementation of capital regulations (Calem & Rob, 1999; Furlong & Keeley, 1989; Sharpe, 1978). Few studies have assessed the extent to which the 8% minimum capital requirement acts as a barrier that prevents banks from taking high risks and, as such, are truly indicative of bank risk. Research that was more recently conducted by Acharya, Philippon, Richardson, and Roubini (2009) and Vallascas and Hagendorff (2013) found that banks tend to hold insufficient capital in the lead up to a financial crisis because, in reality, the capital requirements that are dictated by the regulations are not sufficiently aligned with the true level of risk that is inherent in the banks' activities. Between 2000 and 2010, Vallascas and Hagendorf (2013) conducted an empirical analysis of a sample of major international banks through which they assessed the risk sensitivity of capital requirements in terms of a bank's portfolio risk. Similar to the findings of Allen, Carletti and Marquez (2011), they discovered that the majority of the banks involved in the research were still exposed to high risk despite the fact they were fully compliant with the regulatory capital requirements outlined in the relevant legislation. This indicates that the ultimate effectiveness of risk-based capital regulation is directly correlated with the extent to which the capital requirement accurately reflects the level of portfolio risk a bank carries. However, a study on Canadian banks that was performed by Guidara et al. (2013) did not agree with this finding. Guidara et al. found that Canadian banks were less impacted by the recent global financial crisis than the US and European banks and were better capitalized. In fact, both the leverage buffers and the regulatory capital of

Canadian banks exceeded Basel requirements. The researchers concluded that, in combination with the leverage constraints that are imposed by the Canadian authorities, the Basel regulations play an important role in controlling the amount of risk banks enter into. As such, when applied in addition to capital regulations, leverage constraints can increase a bank's risk management during times of economic issues.

The majority of developed countries adhere to the Basel Committee's capital requirement guidelines, albeit with some disparities. For example, different countries employ different techniques to calculate risk-weighted capital ratios, which represent a fundamental aspect of the minimum capital regulation ratios. As such, the extent to which each country respects the Basel guidelines varies according to the legal, accounting, supervisory, and regulatory frameworks, and other economic factors such economic cycles, valuation and provisioning practices, and lending activities (Le Lesle & Avramova, 2012). This essentially entails that the Basel regulations are not implemented in a uniform manner across the majority of countries (Moosa, 2010). In the United States, large banks that hold total assets in excess of $250 million are mandated to adhere to the regulatory requirements outlined in Basel II. However, in the European Union, Basel II is implemented via the Credit Requirement Directive (CRD) for all credit institutions and investment firms (Moosa, 2010). Elsewhere in the world, emerging economies have experienced some challenges related to the implementation of Basel II and events in this area have highlighted how adhering to the regulatory requirements outlined in Basel II depends as much on a cultural shift in the regulatory frameworks that govern these countries as it does on a major overhaul of the existing regulatory bodies (Davies, 2005; Fischer, 2002). As a result of this, very few emerging economies have yet to fully embrace and implement Basel II.

The variations in the adherence to Basel regulations across jurisdictions

have frequently been overlooked in previous studies. However, failing to take such differences into consideration can undoubtedly lead to bias in the outcomes of studies on bank capital requirements. The current study aimed to close this gap by integrating two country-level variables into the regression model that are designed to take supervisory power and the stringency of the capital guidelines into consideration. It is reasonable to assume that a regulatory body that has a stringent supervisory power will be more effective than one with a low level of power. However, the study outlined in this paper was based on the hypothesis that a financial system that operates a very strict capital regulatory framework will not necessarily be safer than one that is characterized by less stringent capital guidelines. As such, this study aimed to ascertain the extent to which a stringent capital regulatory and supervisory framework impacted the risk sensitivity of the capital requirement.

Vallascas and Hagendorff (2013) conducted an in-depth analysis of the relationship between risk-weighted asset and the asset volatility of banks. They assessed the extent to which the capital regulatory measure of risk is accurately reflective of the market's perception of a bank's portfolio risk. The current research extended on this analysis by evaluating the moderating effects that country-level variables have on the risk sensitivity of bank capital. We evaluated the risk sensitivity of capital requirements by calculating the differences between the levels of rigor capital requirements that are in place across different jurisdictions. Hence, the main research question that underpinned this research was as follows: Does the extent to which capital regulations control the level of risk banks take depend on the strictness with which the Basel capital regulation guidelines are enforced? To answer this question, we assessed how the stringency of capital regulations and the depth of supervisory power control bank risk and asset volatility. This is achieved by examining the way in which capital regulation and supervisory power have an interaction effect on asset volatility. The fact that the regulatory practices and supervisory powers that

are in force in different countries are not equal may entice bankers in some countries to undertake regulatory capital arbitrage (Ledo, 2011; Vallascas & Hagendorff, 2013). While the banks that operate in the countries in which capital regulations are strictly enforced via a powerful supervisory entity may be expected to be less likely to partake in capital arbitrage activities, this study was not based on a solid theoretical stance. As such, no theoretical assumptions were applied in terms of the relationship between the variables of interest and the impact they have on the model. The purpose of the study was to examine the dynamic relationships that can be observed in the data. For example, we were interested in understanding whether a stringent capital regulation and strong supervisory power would increase the extent to which capital regulation is risk sensitive. We also sought to identify whether the relationship between risk-weighted asset and the interaction terms between asset volatility and stringent capital regulation, as well as with the interaction term between asset volatility and supervisory power, were positive or negative. It is anticipated that the results of this study will provide meaningful insights into how the prudential regulations in place in some countries and their associated effectiveness can be improved to better control the degree of risks banks take.

The sample that was involved in this research consisted of 61 major banks from 16 countries across Asia and the Middle East. The data was derived from the work of Vallascas & Hagendorff (2013) and spanned a period extending from 2000 to 2010. Valascas and Hagendorff's data was based on a sample size of 246 banks, of which 103 were located in the United States. However, only banks that are located in Asia and the Middle East were included in the current research to avoid a situation in which the data was skewed by developed markets. Unlike the majority of previous studies, which have employed fixed or random panel data regression, the current study employed a one-step and bootstrap GMM as a means of avoiding the two-step GMM biases that are typically associated with a small sample size (Inkmann, 2012). On the whole, the results of this

study indicated that the lag of the risk sensitivity, banks' loans, supervisory power, banks' deposit, banks' buffer, and government debt-to-GDP ratio are of significance. However, there was no solid evidence to prove the view that economic growth has a major impact on the extent to which capital requirements are risk-sensitive. The empirical evidence that was collected as part of this research indicated that the extent to which risk-based capital requirements are efficient is not dependent on how strictly capital regulation is enforced. This indicates that establishing and implementing stringent capital regulation guidelines may not deter banks from engaging in risky practices and, as such, strict supervisory power is not directly correlated with the risk sensitivity of capital regulation. These findings are in agreement with previous studies that have found that capital regulations do not effectively control bank risk. Furthermore, as the coefficient of GDP growth was found to be statistically insignificant in the current study, our results indicate that there are no pro-cyclical effects of risk-based capital regulation in Asia and Middle Eastern countries. The empirical evidence suggests that bank-specific variables have a more significant influence on the level of risk banks enter into than macro-economic variables. This indicates that it is important to closely monitor bank operations and performance in addition to assessing the extent to which they comply with bank capital requirements.

The remainder of this paper is organized as follows. Sections 2 and 3 present the literature review and methodology respectively. Section 4 presents an overview of the results, and Section 5 includes the conclusion.

2. Literature Review:

Bank regulators prescribe to the view that bank capital regulation is imperative to prevent banks from taking significant risks. The World Financial Crisis that was initiated in 2007 clearly highlighted the need for regulators to monitor and oversee the amount of capital that banks have access to. Some scholars argue that inadequate bank capitalization

can undermine the insolvency and safety of banks (Kim & Santomero, 1988; Berger et al., 1995). As such, regulators typically prefer banks to have access to large amounts of capital and to regulate banks to ensure that the required capital levels are maintained such that the solvency of the deposit insurance can be assured. One of the problems associated with national deposit insurance schemes is that they introduce a moral hazard issue. In situations in which bank managers have an underlying motivation to offer riskier loans without being required to pay enhanced interest rates on deposits, the bank's shareholders will be prepared to accept a high portfolio risk because this will increase the value of deposit insurance. One of the fundamental objectives of capital regulations is to diminish this moral hazard issue. However, according to Vallascas & Hagendorff (2013), capital regulations can offset the incentives for bank shareholders to shift risk provided that the required amount of capital that the banks are required to hold is aligned with the bank portfolio risk (Calem & Rob, 1999; Furlong & Keeley, 1989; Sharpe, 1978).

Some studies have highlighted the discrepancies that exist between the economic risks of banks and the regulatory assessment. According to reports that were published by the Basel Committee, discrepancies such as these, directly contributed to the recent global financial crisis because banks did not have access to an adequate amount of capital (Basel Committee, 2009, 2011). Merton (1995), Jones (2000), and Hellwig (2010) described how the discrepancy between the economics of risk and regulatory assessment serves to encourage larger banking institutions to enter into capital arbitrage, which subsequently distorts regulatory capital ratio measures. Acharya et al. (2009) examined the factors that contributed to the recent financial crisis and concluded that the current capital regulatory requirements that are in place played a key role in the events because they are limited to one metric: capital-to-risk weight assets. Acharya, Schnabl, and Suarez (2013) demonstrated that, in advance of the recent global financial crisis, securitization made it possible for banks to hold less regulatory capital.

Thus, to retain risks on their balance sheets while simultaneously receiving a reduction in regulatory capital, banks engaged in aggressive asset securitization activities.

Vallascas and Hagendorff (2013) studied the link between the market assessment of bank portfolio risk and the regulatory assessment of risk by studying data that was acquired from a population of international banks between 2000 and 2010. They employed the bank asset volatility for the market assessment of risk and the concentration of risk-weighted assets (as represented by risk-weighted assets over total assets) as a proxy for the regulatory assessment of risk. Their findings indicated that there was a positive relationship between the two variables. That is, a small, yet significant, increase in capital requirements can be observed in response to uplift in the market assessment of bank portfolio risk. Vallascas and Hagendorff studied the moderating effect of the IRB approach on the risk sensitivity of capital and concluded that the implementation of the IRB approach serves to increase the risk sensitivity of regulatory capital requirement. However, when the IRB approach is used, the increase in portfolio risk has a relatively small impact on capital requirements.

Although the effectiveness and evolution of risk-based capital regulation have been examined by many different researchers in a multitude of ways, the role that country-specific variables play in enhancing the extent to which risk-based capital regulation is risk sensitive is yet to be studied in depth. For example, risk-weight assets can be calculated in a myriad of ways. Yet, these calculations directly inform risk-based capital regulation across various countries. Le Lesle and Avramova (2012) listed the ways in which the risk-weight asset calculation can vary and described how factors such as business cycle, lending, valuation and provisional practices, and regulatory, accounting, and legal frameworks can all contribute to discrepancies in the resulting model. According to Moosa (2010), variations in the way in which the Basel guidelines are implemented in different countries entails

that risk-based capital regulations have never truly been established. Furthermore, some commentators are of the opinion that banks that operate in emerging economies will experience problems implementing Basel II because it demands a major cultural shift in regulation and an accompanying overhaul of the existing regulating bodies (Ahmad et al., 2008; Davies, 2005; Fischer, 2002). As such, it is only possible to evaluate the efficiency with which risk-based capital regulation enhances the risk sensitivity of capital requirements if the differences in the ways in which the regulations are enforced and enacted in different jurisdictions are considered.

3. Data and Research Methodology:

The study described in this paper was based on the same bank data as that employed by Vallascas and Hagendorff (2013) with some changes in scope. Their sample consisted of data related to 650 of the world's largest international banks between 2000 and 2010. Islamic banks, pure investment banks, long-term credit banks, banks that were subsidiaries of other banks, and government-owned financial institutions were excluded from the scope of their study. The current study was limited to large banks that operate in Asia and the Middle East and that they exhibit similar characteristics in terms of organizational structure, managerial knowledge and skill, and corporate culture. Banks in these areas of the world were selected for the purpose of this study because they have yet to attract the attention of scholars to the same extent as the banks in developed nations like Europe and the United States. The final sample that was considered in this study consisted of 61 banks that operated in 16 different countries and consisted of 575 observations in total. These are presented in Table 1.

Studies on bank capital regulation in these countries are very limited, and the majority of research that has been performed is limited to bank data from a single country.

Table 1. Sample distribution by country and year

	Banks	%	Observations	%
Panel A: Sample distribution by country				
AUSTRALIA	8	13.1%	77	13.4%
CHINA	2	3.3%	15	2.6%
HONG KONG	4	6.6%	39	6.8%
INDIA	2	3.3%	16	2.8%
ISRAEL	5	8.2%	54	9.4%
JAPAN	13	21.3%	141	24.5%
KUWAIT	2	3.3%	12	2.1%
MALAYSIA	6	9.8%	56	9.7%
PAKISTAN	1	1.6%	6	1.0%
QATAR	2	3.3%	13	2.3%
REPUBLIC OF KOREA	2	3.3%	22	3.8%
SAUDI ARABIA	6	9.8%	46	8.0%
SINGAPORE	3	4.9%	33	5.7%
TAIWAN	1	1.6%	6	1.0%
THAILAND	3	4.9%	33	5.7%
UNITED ARAB EMIRATES	1	1.6%	6	1.0%
Total	61	100.0%	575	100.0%
Panel B: Sample distribution by year				
2000			33	5.7
2001			39	6.8
2002			42	7.3
2003			50	8.7
2004			53	9.2
2005			63	11.0
2006			63	11.0
2007			61	10.6
2008			59	10.3
2009			59	10.3
2010			53	9.2
Total			575	100.0%

The panel regression model presented below was employed to estimate the risk sensitivity of the capital requirement to bank portfolio risk.

$$RWATA_{i,t} = \beta_0 + \beta_1 \times RWATA_{i,t-1} + \beta_2 \times Asset\ volatility_{i,t} + \beta_3 \times Stringency\ of\ capital\ regulation_{k,t} \times Asset\ volatility_{i,t} + \beta_4 \times Supervisory\ power_{k,t} \times Asset\ volatility_{i,t} + \beta_5 \times Other\ Bank\ specific\ controls + \beta_6 \times Other\ Country\ specific\ controls + \beta_7 \times Year_t + \varepsilon_{i,t}$$

The model dependent variable (RWATA) was considered to represent a proxy for the regulatory assessment of the bank portfolio risk. Following the approaches employed by Avery and Berger (1991), Shrieves and Dahl (1992), Berger (1995), and Vallascas and Hagendorff (2013), the risk-weighted asset was determined to represent the proportion of risk-weighted assets over total assets. In the case of the banks in the sample that were subject to Basel I regulations, the ratio was defined using Eq. (1):

$$RWATA = \frac{RWA_{CR} + 12.5 \times C_RWA_{MR}}{TA} = \frac{RWA_{CR} + RWA_{MR}}{TA} \quad (1)$$

where, is the amount of risk-weighted assets related to a bank's credit risk, is the amount of capital required for market risk exposure, is the amount of risk-weighted assets and is related to market risk, and is the total assets.

Basel II is different to Basel I in that it provides banks with an opportunity to adopt either a standardized approach to assigning risk weights to assets or the IRB approach. Furthermore, the operational risk is included in the risk-weighted asset calculation in Basel II. As such, we can calculate the risk-weighted assets under Basel II using Eq. (2):

$$RWATA = \frac{RWA_{CR_SD(IRB)} + 12.5 \times (C_RWA_{MR} + C_RWA_{OR})}{TA} = \frac{RWA_{CR} + RWA_{MR} + RWA_{OR}}{TA} \quad (2)$$

where, is the amount of risk-weighted assets related to the credit risk and is calculated according to either the standard or IRB approach, is the amount of capital required for market risk exposure, and is the amount of capital required for the operational risk exposure.

The three main independent variables in the current study were as follows: volatility of bank assets, stringency of capital regulation, and supervisory power. The volatility of the bank's assets was viewed as a proxy for the market perception of its asset portfolio risk. The approach suggested by Flannery and Rangan (2008) was employed to estimate the total risk exposure resulting from a bank's asset volatility, as per Eq. (3):

$$\sigma_A = (\frac{E}{A}) \times \sigma_E \quad (3)$$

where, is the standard deviation of the bank's daily equity returns over a year, is the market value of the bank's equity at the end of the year, and is the quasi-market value of the bank assets (the market value of equity plus the book value of debt) at year end. The resulting measure of is subsequently annualized by multiplying the standard deviation for the year by the square root of 250 (the approximate number of trading days in a year). The measure combines all risks, including liability returns, asset returns, changes in the off-balance-sheet book, and operating efficiencies (Flannery & Rangan, 2008).

In the current research, two independent variables: a country's capital regulation and regulatory supervisory power, were employed as per the work of Barth, Caprio Jr, and Levine (2004), and the associated data was extracted from the World Bank's website. The capital regulation variable was deemed to be indicative of the level of stringency with which the capital regulations were enforced, while the supervisory power variable was deemed to be representative of the strength of the bank regulators' supervisory power. To this end, the latter variable measured the extent to

which the official regulators were able to intervene to prevent and address problems. In addition to these variables, country-level variables pertaining to government debt over GDP ratio and GDP growth rate were also evaluated.

The bank-specific control variables that were of interest in the current study were loans (ratio of customer loans to total assets), ROA (ratio of return on assets), size (natural logarithm of total assets), deposits (total deposits over total liabilities), capital buffer (difference between bank's regulatory capital ratio and minimum regulatory minimum), and noninterest income (ratio of noninterest income to total operating income). Furthermore, the model we employed included three dummy variables: a dummy variable for IRB (value equal to 1 if bank adopts IRB approach in a given year and zero otherwise), a dummy variable for Basel II (value equal to 1 if bank has adopted Basel II in a given year and zero otherwise), and a standardized variable (value equal to 1 for adopting standard approach in a given year and zero otherwise). Finally, year was a vector of time dummies, and was the idiosyncratic error term.

The primary goal of this study was to understand the moderating impacts that country-specific variables had on the relationship between economic risk and the regulatory assessment of risk (RWATA). As such, it was important to include supervisory power, economic risk, and the interaction terms between asset volatility with capital regulation stringency in the model. To prevent multicollinearity, the asset volatility was mean-centered before being added to the regression. A country that operates a stringent regulatory capital regime under the influence of a strong supervisory agency will offer fewer opportunities for banks to participate in capital arbitrage. As such, these conditions improve the risk-sensitivity of capital regulation. It was anticipated that the coefficients for both interaction terms would be positively significant.

The bank size variable coefficient is unclear. Larger banks can more readily engage in capital arbitrage. As such, they typically come under stricter regulatory scrutiny than small firms (Vallascas & Hagendorff, 2013). The assumption in the current research was that there would be a positive relationship between ROA and RWATA on the basis that banks that are profitable do not have a strong incentive to enter into capital arbitrage. Along the same line of thinking, we anticipated that we would observe a positive correlation between RWATA and deposits because banks that have higher deposits are also less likely to enter into capital arbitrage. A significant negative relationship between RWATA and capital buffer was expected on the basis that highly capitalized banks may be subject to less regulatory intervention (Calem & Rob, 1999). A positive relationship was anticipated between loans and RWATA because higher risk weights are typically assigned to customer loans than those assisted to alternative loan types. Also, we also anticipated that we would observe a negative correlation between Noninterest income and RWATA. Banks that have a higher amount of noninterest income are more likely to engage in more non-lending activities (lower risk weights). According to a study by the Basel Committee (2006), the minimum capital requirements of banks that adopted Basel II were lower than those that adopted Basel I for a given level of portfolio risk. As such, we anticipated that we would identify a negative correlation between RWATA and Basel II adoption. Furthermore, some studies have found that, while low-risk lending is better treated under the IRB method, banks that have low-risk loans in their asset portfolio are more likely to adopt the IRB approach (Hakenes & Schnabel, 2011; Repullo & Suarez, 2004). As such, we anticipated that we would identify a negative correlation between RWATA and IRB adoption.

We also examined the pro-cyclical impacts of risk-based capital regulations that could be observed in the countries that implemented Basel II. In accordance with the studies of Vallascas and Hagendorff (2013) and many others, we used real GDP growth as a proxy for business cycle, and

anticipated that a higher RWATA would be observed during periods of economic downturn. We also expected to observe a negative beta coefficient for the variable GDP growth. A government that both regulates bank capital and has liabilities to its own banking sector, may have a propensity to increase the risk weights on any risky loans as a means of easing its debt financing (Schliephake, 2013). As such, we expected to observe a positive relationship between government debt and RWATA.

According to the results of some studies, the regulatory assessment of a bank's portfolio risk (RWATA is used as a proxy of this in this study) may partially indicate the market assessment of a bank's portfolio asset risk. For example, if the RWATA increases, investors may take this as a sign that there is a need to adjust their expectations with regard to the bank's portfolio risk (Vallascas & Hagendorff, 2013). This reverse causality could cause result in a correlation between the asset volatility and the error term. Some other endogeneity issues, moreover, can be considered among the explanatory variables. For instance, Shrieves and Dahl (1992) and Rime (2001) highlighted how banks typically update risk-weighted asset and capital buffer simultaneously. As such, introducing capital buffer into the model as a bank-specific variable may result in endogeneity problems. The research described in this paper adhered to the approach recommended by Vallascas and Hagendorff (2013). In our calculations, all bank-specific variables were treated as endogenous variables while the country characteristic measures were perceived to be strictly exogenous variables. As such, our data were analyzed using the system GMM. Blundell and Bond (1998) recommended the use of system GMM with data samples that consisted of a limited number of time periods in combination with many individuals that were not strictly exogenous independent variables, fixed effects, and heteroskedasticity and autocorrelation within individuals (Roodman, 2009). This study covered a maximum number of 11 years and 61 banks; as such, the N>T GMM method was clearly preferable. Furthermore, asset volatility and bank-specific control variables were viewed as representing

endogenous variables. For these reasons, system GMM was determined to represent the most suitable estimator for this study.

To comply with the requirements of the system GMM identification, we employed the first lag difference of bank characteristics as instruments in the level equation and the second and third lags of bank characteristics as instruments in the difference equation. Equally, the first lag difference of asset volatility, and the second and third lags of asset volatility were used as instruments for the level and difference equations respectively. We also employed the level (difference) of annual volatility of domestic stock markets as a further instrument within the level (difference) equation. This correlates with asset volatility (r = 0.18) but not RWATA (r = -0.08). Through the use of this instrument, we were able to take into consideration the economic conditions that have an impact on market perceptions of bank portfolio risk (Flannery & Rangan, 2008). Given that the one-step system GMM estimator exhibits a propensity to bias the estimated standard errors downward, we employed the procedure employed by Windmeijer (2005) to address the standard errors and reduce the bias. The descriptive statistics of the variables are presented in Table 2.

Table 2. Descriptive statistics of variables

	Mean	Median	Std. Deviation	Min	Max
(%) RWATA	65.10%	63.32%	14.87%	33.98%	227.44%
(%) Asset Volatility	4.02%	2.75%	3.95%	0.48%	35.30%
Size	17.62	17.51	1.24	15.02	21.46
(%) ROA	0.90%	0.80%	0.95%	-7.27%	4.91%
(%) Capital Buffer	4.57%	3.94%	3.20%	-11.30%	30.10%
(%) Deposits	76.29%	80.57%	15.08%	0.40%	96.30%
(%) Loans	61.13%	60.38%	9.91%	35.15%	90.64%
(%) Noninterest	31.76%	32.81%	15.88%	-44.65%	213.26%

Basel II	36.	00.	48.	00.	1.00
IRB	13.	00.	34.	00.	1.00
Standardized	22.	00.	42.	00.	1.00
Capital Regulation	3.97	4.00	1.66	1.00	8.00
Supervisory Power	11.36	12.00	1.51	8.00	14.00
Government Debt to (%) GDP	72.53%	43.05%	54.47%	18.32%	174.98%
(%) GDP Growth	2.18%	2.55%	1.97%	-4.83%	9.91%

4. One-step system GMM regression results

Table 3 contains the regression results. The regression was run twice: Once before the crisis period (2001-2007), and once on the full sample (2000-2010). This was important because we needed to ensure that we did not ignore the effects that the recent financial crisis had on the macroeconomic variables. As the results clearly show, there was a negative coefficient of the banks' buffer in all specifications. This indicates that there was a significant negative association between RWATA and bank buffer. However, the coefficient sign for deposits was only negatively significant in six of the models, indicating that highly capitalized banks may fall under less regulatory scrutiny. Vallascas and Hagendorff (2013) argued that the presence of a negative coefficient in terms of capital buffer is indicative of an absence of a robust regulatory risk assessment and that this subsequently allows banks to boost their capital by permitting them to under-report portfolio risk when they hold capital buffer.

As Table 3 highlights, there was a positive and significant coefficient with regard to the interaction term between the capital regulation and the asset volatility during both the sub-sample and full-sample periods. This suggests that higher asset volatility in combination with capital regulation has a positive impact on the risk sensitivity of capital requirements. As such, if banks operate in countries in which their level of capital is strictly

monitored, the portfolio risk of the banks is not aligned with the market perception of risk. It is possible to quantify this effect by calculating the increase in capital per unit of assets when the asset volatility increases by 1%, under minimum capital ratio of 8% for minimum and maximum of capital regulation in our sample. For minimum value of capital regulation in our sample (=1), the additional capital holds because a 1-percentage point increase in the asset volatility under minimum capital ratio of 8% ranges between 0.061 and 0.63 percentage points, while for the maximum of capital regulation in our sample (=8), this capital injection ranges between 0.183 and 0.197 percentage points.(1) The results clearly indicate that the implementation of strict capital regulatory regimes results in more risk-sensitive capital requirements. However, in reality, the relationship between asset volatility and RWATA remains very weak. Our results indicate that the power of supervision does not have a significant moderating impact on the risk sensitivity of the capital regulation.

Table 3. One-step system GMM regression results

Panel A: Regression Analysis								
	(Full sample period (2001-2010				(Before crisis period (2001-2007			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
L.RWATA	***0.81	***0.82	***0.82	***0.84	***0.81	***0.82	***0.82	***0.84
	(7.03)	(7.07)	(7.39)	(7.20)	(7.25)	(7.07)	(7.39)	(7.20)
AsVol	0.33	0.23	0.48	0.38	0.31	0.23	0.48	0.38
	(0.98)	(0.64)	(1.45)	(1.05)	(0.92)	(0.64)	(1.45)	(1.05)
Size	-0.012	-0.007	-0.01	-0.01	-0.01	-0.01	-0.01	-0.1
	(-1.63)	(-0.84)	(-1.41)	(-0.74)	(-1.48)	(-0.84)	(-1.41)	(-0.74)
ROA	0.729	0.82	0.50	0.47	0.78	0.82	0.50	0.47
	(0.85)	(0.98)	(0.61)	(0.56)	(0.96)	(0.98)	(0.61)	(0.56)
Buffer	*-0.55	*-0.47	*-0.51	*-0.51	*-0.48	*-0.47	*-0.52	*-0.52
	(-1.82)	(-1.65)	(-1.77)	(-1.72)	(-1.69)	(-1.69)	(-1.77)	(-1.72)

(1) C = (estimated coefficient of the Asset volatility + estimated coefficient of the interaction term between Asset volatility and Capital regulation * Capital regulation) * 0.01 * 0.08 * 100

Deposits	*-0.15	*-0.17	-0.14	*-0.16	*-0.16	*-0.17	-0.14	*-0.16
	(-1.66)	(-1.83)	(-1.56)	(-1.73)	(-1.67)	(-1.83)	(-1.56)	(-1.73)
Loans	**0.36	**0.34	**0.34	**0.34	**0.35	**0.34	**0.34	**0.34
	(2.61)	(2.51)	(2.55)	(2.53)	(2.54)	(2.51)	(2.55)	(2.53)
Noninterest	0.01	0.01	0.02	0.01	0.02	0.01	0.02	0.01
	(0.41)	(0.24)	(0.49)	(0.22)	(0.48)	(0.24)	(0.49)	(0.22)
Basel2	0.03		0.03		0.03		0.03	
	(0.95)		(1.12)		(0.97)		(1.12)	
IRB		-0.01		0.01		-0.01		-0.01
		(-0.48)		(0.29)		(-0.48)		(-0.29)
Standard		0.05		0.06		0.05		0.05
		(1.36)		(1.49)		(1.36)		(1.49)
CapReg	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
	(-1.43)	(-1.46)	(-1.50)	(-1.57)	(-1.41)	(-1.46)	(-1.50)	(-1.57)
SupPow	*0.02	*0.03	0.02	*0.02	*0.02	*0.03	0.02	*0.02
	(1.76)	(1.89)	(1.53)	(1.69)	(1.74)	(1.89)	(1.53)	(1.69)
GovDbt-GDP	**-0.06	***-0.05	**-0.06	**-0.05	**-0.06	**-0.05	**-0.06	***-0.05
	(-2.05)	(-1.92)	(-2.00)	(-1.93)	(-2.01)	(-1.92)	(-2.00)	(-1.92)
GDP-growth	0.70	0.62	0.73	0.66	0.69	0.62	0.73	0.66
	(1.25)	(1.19)	(1.31)	(1.28)	(1.23)	(1.19)	(1.31)	(1.28)
Assvolcapreg	0.30	**0.25			**0.29	**0.25		
	(0.92)	(1.72)			(1.94)	(1.72)		
Asvolsupow			*0.33	*0.35			*0.33	*0.35
			(2.69)	(2.65)			(2.69)	(2.65)
Time fixed effects Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations 301		301	301	301	301	301	301	301
Number of banks 41		41	41	41	41	41	41	41

m2-statistics (p) 0.274	0.207	0.372	0.266	0.280	0.207	0.372	0.266
Hansen J-statistics (p) 0.9	0.89	0.9	0.88	0.92	0.88	0.89	0.93
Panel B: Percentage point increase in capital per unit of assets implied by 1% increase in the Asset volatility under minimum capital ratio of 8% (capital regulation = Supervisory power = 0) computed as the estimated coefficient of the Asset volatility *0.01*0.08*100							
increase in the 1% Asset Volatility 0.004	0.015	-0.366	-0.679	-0.048	-0.029	-0.076	-0.280

Note: L.RWATA denotes lagged RWATA, AsVol denotes Asset volatility, Size denotes natural logarithm of total assets, ROA denotes return on assets, Buffer denotes capital buffer, Noninterest denotes noninterest income, CapReg denotes capital regulation, SupPow denotes supervisory power, GovDbtGDP denotes government debt to GDP, Assvolcapreg denotes Asset volatility * Capital regulation, Asvolsupow denotes Asset volatility * Supervisory power.

Turning our attention to the control variables, the results of our analysis indicate that there is a significant negative relationship between capital buffer and RWATA in Model 1 only. Furthermore, there is a significant negative relationship between RWATA and deposits. This finding is not in line with our assumption that banks that have access to more deposits are less likely to use capital arbitrage strategies. Our results indicate that there is a significant positive relationship between customer loans and RWATA. Again, this is contrary to our previous expectation as, according to the Basel guidelines, higher risk weights are assigned to customer loans than to alternative forms of lending. The results also depict a positive, albeit insignificant, association between RWATA and the adoption of Basel 2 guidelines in advance of the period of the financial crisis. These findings indicate that, before the crisis period, the minimum capital requirements of the banks that adopted Basel 2 were not significantly different to those that used Basel 1 at a given level of portfolio risk. Furthermore, the negative

coefficient of the IRB dummy variable is aligned with the theories of Repullo and Suarez (2004) and Hakenes and Schnabel (2011), who argued that low-risk lending is typically perceived to be more advantageous under the IRB approach.

Turning our attention to the country-specific variables, the capital regulation coefficient is negative and insignificant. This indicates that capital requirement is not an effective factor in the countries involved in the research. However, supervisory power does influence the level of risk that banks located in these countries take. The moderating variable of supervisory power and capital regulation had a positive and significant impact on bank risk sensitivity. This entails that the banks that operate in the countries in which a stringent capital regulatory regime is in place that is monitored by a powerful supervisory power will be more likely to execute capital arbitrage strategies. Furthermore, the government debt-to-GDP coefficient was determined to be of statistical significance. This finding is in agreement with Schliephake's (2013) view that a government that both regulates and borrows from its banking sector will be incentivized to overregulate risky investments in comparison to government bonds. In addition, the GDP growth coefficient is statistically insignificant. From these findings, we can conclude that the risk-based capital regulation of banks in Asia and Middle Eastern countries does not have any pro-cyclical effects. This finding is contrary to that of Feess and Hege (2012) and Repullo and Suarez (2004). In addition, these scholars asserted that regulatory measures of credit risk increase during an economic downturn.

The analysis performed in the current study found that the lagged RWATA coefficient was positive and significant (at the 1% level) across all specifications. Furthermore, the Hansen J-statistics was insignificant (at all significance levels) in any specification. These findings confirm the validity of our instruments. Moreover, the m2-statistics were insignificant (at any customary level during the post-crisis period and at the 1% and 5% levels

across the full sample period). This indicates that there was no serious second-order serial correlation in the results. As a means of verifying the robustness of the findings, we ran the sample excluding Australia, and this did not result in a change in the results. As such, the conclusions were still valid in terms of the Asia and Middle East contexts.

5. Conclusion:

In the study described in this paper, we assessed the extent to which capital regulation and supervisory power have a moderating impact on the risk sensitivity of capital requirements. We employed a sample of 61 different banks located in 16 countries across Asia and the Middle East spanning the 2000-2010 period. The results of the analysis revealed that, while there is a positive correlation between the stringency of the capital regulatory regime that is in place and the risk sensitivity of the capital regulation, the relationship between the market perception of risk and the regulatory assessment of risk remains very weak in economic terms, even in situations in which countries operate very strict capital regulatory regimes. There is a distinct lack of evidence to indicate that supervisory power has a moderating impact on the risk sensitivity of capital requirements. The majority of the banks that were included in our sample were located in emerging economies; as such, their banking sectors are in the process of financial reform and/or have yet to achieve full compliance with supervisory requirements. According to Brownbridge & Kirkpatrick (2010), the financial reforms that are typically implemented in less developed areas of the world generally exhibit two weaknesses. First, the legislation that is implemented tends to omit fundamental prudential restrictions or include provisions that are not sufficiently precise. Second, the regulatory authorities that are in place do not have the required personnel to supervise the activities of banks.

The outcomes of the research described in this paper have two implications for future policies. First, given the fact that the efficiency of risk-based capital requirements acts independently of the stringency

of capital regulation, there is no guarantee that the implementation of a very stringent capital regulation system will prevent banks from taking excessive risk. Second, bank-specific factors have a more significant impact on risk at the bank level than external factors such as government debt and gross domestic products. To supervise and manage bank-risk level, there is a distinct requirement, in emerging economies at least, for regulators to monitor the operation and performance of banks in addition to verifying their compliance with capital requirements.

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APPENDIX:

Capital regulation and Supervisory Power

Following Laeven and Levine (2009) and Vallascas and Hagendorff (2013), we construct two variables based on the database that designed by Barth et al. (2004) to capture the stringency of capital requirements and the power of supervision to enforce those guidelines. The first variable, which is capital regulation, measures the regulatory approach to assessing and verifying the degree of capital at risk in banks of a country. The variable is constructed based on these questions (Yes=1, No=0): Is the minimum capital asset ratio requirement risk weighted in line with the Basel guidelines? Does the minimum ratio vary as a function of market risk? Are market values of loan losses not realized in accounting books deducted from capital? Are unrealized losses in securities portfolios deducted? Are unrealized foreign exchange losses deducted? What fraction of revaluation gains is allowed as part of capital? Are the sources of funds to 2be used as capital verified by the regulatory or supervisory authorities? Can the initial disbursement or subsequent injections of capital be done with assets other than cash or government securities? Can initial disbursement of capital be done with borrowed funds? We construct the variable using the updated values from the World Bank website(1).

The second variable, which is supervisory power, measures the extent to which official supervisory authorities have the authority to take specific actions to prevent and correct problem. We construct this variable based on Barth et al. (2004) using updated values from the World Bank website. The measure is created based on Yes/No answers to these questions (Yes=1, No=0): Does the supervisory agency have the right to meet with external auditors to discuss their report without the approval of the bank? Are auditors required by law to communicate directly to the supervisory

(1) http://go.worldbank.org/SN2USW978P02

agency any presumed involvement of bank directors or senior managers in illicit activities, fraud, or insider abuse? Can supervisors take legal action against external auditors for negligence? Can the supervisory authority force a bank to change its internal organizational structure? Are off-balance sheet items disclosed to supervisors? Can the supervisory agency order the bank's directors or management to constitute provisions to cover actual or potential losses? Can the supervisory agency suspend the directors' decision to distribute: Dividends? Bonuses? Management fees? Can the supervisory agency legally declare—such that this declaration supersedes the rights of bank shareholders—that a bank is insolvent? Does the Banking Law give authority to the supervisory agency to intervene—that is, suspend some or all ownership rights—a problem bank? Regarding bank restructuring and reorganization, can the supervisory agency or any other government agency do the following: Supersede shareholder rights? Remove and replace management? Remove and replace directors?

الآثار المعتدلة لتنظيم رأس المال والسلطة الرقابية على حساسية المخاطر لمتطلبات رأس مال البنك

محمد البيتي[1]

ملخص البحث:

استنادا إلى بيانات البنك من 61 من أكبر البنوك في آسيا والشرق الأوسط، تقدم هذه الورقة تحليلا للآثار التي تترتب على تنظيم رأس المال والإجراءات الإشرافية الصارمة على مدى حساسية متطلبات رأس المال المصرفي. وفي حين أن العوامل الخاصة بالبنوك، وهي المخزونات الاحتياطية والودائع والقروض والسلطة الإشرافية للبنوك، ذات دلالة إحصائية، لا توجد أدلة واضحة تثبت أن تنظيم رأس المال ومعدل نمو الناتج المحلي الإجمالي يؤثران على حساسية المخاطر لدى المصارف. وباستخدام GMM، تشير نتائجنا إلى أن قوة الإشراف الأكثر صرامة المقترنة بالنظم التنظيمية لرأس المال تزيد من حساسية المخاطر لدى البنوك. هذه النتائج لها اثنان من الآثار المترتبة على السياسات. أولا، مدى فعالية متطلبات رأس المال القائمة على المخاطر في التحكم في مخاطر البنوك بشكل مستقل عن متطلبات رأس المال التي تضعها السلطات. وثانيا، يكون للعوامل الخاصة بالبنك أثر أكثر أهمية على المخاطر على مستوى المصرف من العوامل الخارجية. وللرقابة على مستوى المخاطر المصرفية وإدارتها، تظهر هناك حاجة واضحة، في الاقتصادات الصاعدة على الأقل، إلى قيام الهيئات الرقابية برصد تشغيل المصارف وأدائها بالإضافة إلى التحقق من امتثالها لمتطلبات رأس المال.

الكلمات الدالة: متطلبات رأس المال المصرفي، تنظيم رأس المال، الديون الحكومية بالنسبة إلى الناتج المحلي الإجمالي، والأصول المرجحة بالمخاطر، والسلطة الإشرافية.

(1) كلية إدارة الأعمال - جامعة الشارقة (الشارقة - الإمارات العربية المتحدة)
malbaity@sharjah.ac.ae