Risk Taking Behavior and Capital Adequacy in a Mixed Banking System: New Evidence from Malaysia using Dynamic OLS and Two-step Dynamic System GMM Estimators

Hishamuddin Abdul Wahab and Saiful Azhar Rosly and Abul Mansur M. Masih

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Risk Taking Behavior and Capital Adequacy in a Mixed Banking System: New Evidence from Malaysia using Dynamic OLS and Two-step Dynamic System GMM Estimators

Hishamuddin Abdul Wahab[1], Saiful Azhar Rosly[2], Abul Mansur Mohammed Masih[2],

[1]Universiti Sains Islam Malaysia (USIM)
[2]International Centre for Education in Islamic Finance (INCEIF)

ABSTRACT

The financial and banking crises around the world have prompted the regulators to revise, among others, the capital level of the banks to deal with the excessive risks taken by the banks, both conventional and Islamic. This study is the first attempt to investigate the relationship between risky assets and capital level in a mixed banking system applying the panel VECM and dynamic GMM estimators. The Malaysian mixed banking system is used as a case study taking panel data covering the period from December 2006 to October 2013. Our statistical results based on dynamic OLS (DOLS) tend to indicate that there is a positive relationship between the capital ratio (CAR) and risk weighted asset ratio (RWA) in the long run and also, the causality analysis based on panel VECM and two-step dynamic System GMM tends to indicate unidirectional causality in that the RWA is positively driven by CAR. Our results appear to suggest that higher capital buffer (excess capital above regulatory capital requirement) might have opened up more space for bank managers to taking risky positions while assisted by increasing domestic demand for credit facilities under favorable economic condition of Malaysia. In other words, high capital growth and capital buffer provides an extra cushion for Malaysian banks to pursue relatively riskier financing activities. For the full-fledge Islamic banks (IB) and Islamic bank subsidiaries (IBS), the existence of a cointegrating relationship between RWA and CAR suggests that the way the managers of Islamic banks behave towards risky assets follows the conventional practice.

Keywords: Risk-taking, DOLS, Panel VECM, two-step dynamic System GMM

1. Introduction

Over the last two decades, the major global/regional financial and banking crises such as, the Asian financial crisis, the sub-prime crisis, the Eurozone crisis have prompted the financial regulators to revise, among others, the capital adequacy ratio of the banks to absorb unexpected losses from the excessive risks taken by the banks. For many years, the importance of regulatory capital requirement has been highlighted to enhance the stability of banking system. The regulatory requirement shapes the nature of risk taking behaviour of the banking firms.. The issue arises when the existence of such a capital requirement might elevate the degree of riskiness on bank's asset portfolio. Many empirical studies have been conducted using different datasets across different banking systems such as Rime (2001) who conducted the study on Switzerland banks, Konishi and Yasuda (2004) on Japanese banks, Jokipii and Milne (2011) on US commercial banks and others. While most of the literature put concentration on the contemporaneous relationship between capital adequacy and risky assets, this paper intends to analyse the risk-taking behaviour of the banks under dynamic setting taking the Malaysian mixed banking system (i.e. consisting of both conventional and Islamic) as a case study.

The setting of minimum capital in a financial institution is crucial to avoid insolvency problem primarily during sluggish economy. On the positive side, the capital requirement is perceived to be a regulatory monitoring tool which forces banks to 'behave' nicely in their planning decision towards asset portfolio. By controlling the loans and financing products to the market, capital adequacy managed to provide cushion and preserve the solvency of the financial institution. In addition, such a capital clause paradigm is likely to be more effective especially for banks with relatively low capital levels compared with their counterparts which have strong fundamentals and capital (Shrieves and Dahl, 1992). Under the Malaysian banking environment, as Islamic banks are still in infancy phase, the relationship between the adjustment of capital and risk-taking behaviour is remain vague and warrants further investigation.

The positive relationship between capital and bank risk exposure happens when the presence of excess of minimum capital requirement induces bank to resort to risky asset portfolio. Several reasons have been identified by the literature to explain such a phenomenon. First, it is related to the reduction in monitoring incentives by bank managers towards their financing customer as they possess excessive optimism towards their capital fundamental which subsequently reduces the quality of bank's asset portfolio. Diwantripont and Tirole (1994) explained the rationale of risk taking incentive by bank manager driven by the force of several groups of stakeholder where the capital control will navigate the management to allocate their portfolio with greater risk and hence, profit. It is also not surprising to see that the excess capital above minimum capital requirement can be a stimulus towards greater risky assets portfolio especially for constrained capital banks, as they need to increase their profit to meet the regulatory requirement.

The major aim of this study is to investigate the relationship between the risk-taking appetite and capital adequacy in a mixed banking system such as Malaysia, with special reference to financial risk-taking. We use dynamic Ordinary Least Squares (DOLS) method introduced by Stock and Watson (1993) to capture the long run elasticity of the parameters. On top of that, the interest is also devoted to investigating short run and long run causality by applying the panel error correction modelling (Panel VECM) with the application of the two-step dynamic System Generalised Method of Moments (GMM) as proposed by Arellano and

Bover (1995) and Blunder and Bond(1998). According to Masih and Masih (1996), the conventional OLS suffers from severe problems of simultaneity[1] and endogeneity bias under dynamic setting which causes adverse impact on the statistical inference. In that case, the results generated by the OLS regression tend to be spurious in nature. Besides that, under the classical OLS regression, it is subjected to several strong assumptions related to the residuals in order to avoid common regression problems such autocorrelation, heteroscedasticity and multicollinearity. Due to inexorable problems in classical OLS, it is not feasible to utilise the OLS system for dynamic estimation but instead with the application of the DOLS in estimating the long run, it can cater to the endogeneity problem by incorporating the first difference of the nonstationary regressors and also the leads and lags of the first difference regressors (Masih, Masih, 1996). Besides that, for the short and long run causality estimates, we used the dynamic system GMM as a remedy for the endogeneity problem suffered from OLS by replacing the biased variables with the instrumental variables. In addition, the slope and significance of the error correction term estimated from the panel VECM can provide important information on the direction of long run causality between variables and also the speed of short run adjustment to the long run equilibrium in the event of a displacement from the long run equilibrium.

The contribution of the paper lies mainly in making the first attempt to investigate the relationship between the level of risky assets and capital ratio in a mixed banking system applying the dynamic OLS for estimating the elasticities and the two-step dynamic GMM estimator for discerning the direction of Granger-causality between the variables. The Malaysian mixed banking system is used as a case study taking panel data covering the period from December 2006 to October 2013.

By investigating the short and long run relationship for the risk taking factors, the finding will be fruitful for policymaker and bank management in shaping more prudent exercise in allocating asset portfolio. For the next part, a comprehensive review on the related literature will be presented in part 2. Then, it will be followed by the nature of banking industry in Malaysia in part 3. In part 4, the data and methodology will be explained. In section 5, the empirical discussions will be presented before making some concluding remarks and drawing policy implications in section 6.

2. Literature review

Capital is a key element in the regulatory framework. The recent US subprime banking crisis in 2008 has shed some lights to the importance of maintaining sufficient level of capital to insulate bank's assets from the adverse market conditions. The inadequate capital faced by the western banks has been partly blamed for the banking crisis. Prior to the crisis, given the favourable market environment, most of US banks placed their short term deposit funds into the long term risky investment assets including the real estate securities (e.g. mortgage securities). These business activities continued for several years without diligent checking on the potential risks from the sketchy real estate mortgages. This imprudent practice among bankers had exposed banks to the interest rate risk where banks could not

[1] Simultaneity bias and endogeneity problems faced by OLS are common in practice. The simultaneity problem is a problem associated with the simultaneous equation. The problem arises when the list of regressors do correlated each other under the simultaneous system (Masih and Masih, 1996). On the other hand, the endogeneity bias happens under dynamic setting of OLS where the inclusion of the lag dependant variable on the right hand side together with other explanatory variables make the lag dependant variable correlated with error term.

facilitate their investment commitments from the unanticipated changes in interest rate during the market turmoil. Consequently, most of US banks' capitals significantly fall below the minimum capital requirement from this crisis and clamped their ability to fully absorb unexpected losses from the sudden and pronounced loan defaults. Consequently, banks severely faced a significant decline in capital growth and massive imbalances on the balance sheet.

Given that the banking industry is heavily regulated in most countries, the management of capital usually takes into account the regulatory capital requirement. The right allocation of assets in accordance with the regulatory capital threshold can protect rights of depositors and deposit insurers from the losses arising from default risk. According to the Basel II Accord, the 8% requirement for capital ratio means that a bank should hold capital for at least 8% that varies according to perceived aggregated risks of the bank's loans. In other words, in order to meet the capital standard, a bank has two options where the first option is to increase capital or reduce asset portfolio whereby the second option is to channel the investment in less risky assets such as government securities. For instance, during the Asian financial crisis in 1997, the loan growth of Malaysian banks was recorded around 3-4% only. This figure shows that most of Malaysian banks were retracting their lending for fear of loan default during the crisis in order to sustain capital adequacy within the regulatory capital threshold. The identical practice was also implemented by Korean banks where they had tighten their loan supply and shifted their investment to the government securities (Berger and Udell, 1994). From here, it is understood that the regulatory setting of minimum capital requirement can encourage bank manager to reduce risky lending to some extent (Vanhoose, 2007). The bank's response towards capital adequacy clause becomes more effective with a combination of bank proactive strategies in monitoring moral hazard that contributes towards escalation of risky assets. However, there is also situation when high capital cushion is established, a bank will respond in reverse direction, which tends to pursue riskier business portfolios especially for banks with capital constraint. The lower capitalized banks have limited resources and they try to optimize their resources by expanding their loan supply. To some extent, they relax their credit screening by not being selective and not assessing their risks objectively. Furthermore, the subsidy towards the insurance deposit can also increase the level of risk beyond the level that is perceived as optimal from the standpoint of a bank (Jeitschko and Jeung, 2005).

The theoretical model concludes that any increase in capital will reduce the proportion of risky assets (Zhang *et al.* 2008). In other words, well capitalised banks are less induced to resort into risky portfolio (Jeitschko and Jeung, 2005). But, several factors such as asymmetric information, moral hazard incentive, competitiveness, agency problem, and deposit insurance tends to make the theoretical expectation obscure. Several studies have been committed to examining the relationship between the risk taking and capital adequacy under different banking landscape. Given by mixed findings, there are two strands of the relationship between capital and risk, namely positive relationship (Blum (1999), Shrieves and Dahl (1992) and Jokipii and Milne (2011)) and negative relationship (Konishi and Yasuda (2004), Rime (2001) and Zhang *et al.* (2008)).

For the negative relationship between capital and risk, several studies support the theoretical expectation, such as Konishi and Yasuda (2004) and Zhang *et al.* (2008). Konishi and Yasuda (2004) tested the relationship between the capital level and risky asset on a panel data of Japanese regional banks that covered data for 10 years commencing from 1990 to 1999. By adopting time series cross sectional (TSCS) regression, with several variables incorporated into the model such as bank shareholding, franchise value, value of shares, and dummies for the acceptance from Ministry officer, they found that the implementation of the capital adequacy clause minimised risk taking activities for commercial banks. In another study, Zhang *et al.* (2008) demonstrated the effect on the implementation of the "Regulation Governing Capital Adequacy of Commercial Banks" towards the selection of risky asset for 12 commercial Chinese banks using the GMM method proposed by Arellano and Bond (1991). They found that the implementation of such regulatory rule managed to control the allocation of bank's assets in risky portfolio.

On the other hand, several studies showed positive relationship where the implementation of capital adequacy does induce bank manager to increase risky loans. These findings are supported by several reasons. First, the capital requirement basically restricts the risk return frontier for a bank, where the enforcement for such clause tends to stimulate bank to reconfigure the allocation of their asset portfolio towards the risky one. The same stand has been endorsed in the finding by Jokipii and Milne (2011). Based on the empirical investigation on the short-run relationship between capital buffer and risky assets for unbalanced panel of US commercial banks and bank Holding Companies (BHC) that covered a duration of 23 years from 1986 to 2008, they found positive bidirectional relationships, i.e., capital adequacy affects the risky assets positively, and vice versa. In other study, using a simple theoretical time structure model under the dynamic setting, Blum (1999) showed that the capital adequacy clause would inflate the degree of bank riskiness. This conclusion is derived from the fact that under binding regulation, the equity tomorrow is perceived to be more valuable to the bank. This makes extra willingness by bank manager to resort in additional risky investment today as opportunity cost in elevating the value of equity tomorrow especially for well capitalised bank. Shrieves and Dahl (1992) conducted a test on the relationship between the excess of capital ratio and bank risk for cross sectional data that comprised nearly 1,800 FDIC-insured independent and holding company affiliated commercial banks. By defining the capital ratio as an excess of capital from the regulatory minimum capital requirement, they found positive association between the changes in capital and the changes in risky loans. Lee and Hsieh (2013) studied the impacts of bank capital on profitability and risk of 2276 banks across 42 Asian countries over a period of 1994–2008. This large-scale study used the two-step GMM procedure to capture the relationship and they found positive association between the capital level and the bank's profitability and risk. Francis and Osborne (2012) analysed the changes in balance sheet items in response to capital requirement. Using balance sheets and confidential capital requirement information of 254 UK commercial banks from 1996 to 2007, through fixed panel analysis, they concluded that the bank's capitalisation (internal capital) is positively related to the regulatory capital requirement. Plus, they found that loan growth is positively related to the increase in excess capital. The recent study by Karim *et al.* (2013) found identical sign of relationship between capital level and lending and deposit behaviour across Islamic banks (IBs) and conventional banks (CBs). Through a sample of varied financial institutions (186 commercial and 52 Islamic banks) of 14 OIC countries, they used pooled EGLS regression to investigate the relationship between deposit and lending activities of IBs and CBs. They found that there was a positive relationship between capital level and lending activities of CBs, given that the capital of CBs exceeded the minimum requirement. The positive relationship was also demonstrated for IBs, implying that IBs with small capital prefer to expand their financing acitivities at higher risks when they have excess capital above the minimum capital requirement.

Some studies found no statistical significance evidence of the association between capital adjustment and risky portfolio. For instance, under the Switzerland banking environment, Rime (2001) analysed the adjustment of capital level and risky assets for Swiss banks using the simultaneous equation. Rime (2001) concluded that when the capital is adjusted close to the threshold level of capital adequacy, it induces bank to raise their capital base. However, from the analysis, there was no statistical evidence of the impact of capital level to the risky assets. It was also observed that the positive association between the capital and risky asset is not fully influenced by the regulatory clause but rather reflects the managerial private incentive. Hence the relationship between capital ratios and risks taken by the banks remains empirically unresolved.

3. The overview of banking sector in Malaysia

Under the wave of liberalisation of financial institutions in Malaysia, Malaysian banking industry has experienced rapid business expansion shown by the exponential growth in their loans portfolio and operations. The strong fundamentals and higher domestic demand of Malaysian banking industry have helped banks to expand their operations into foreign markets despite the recent negative spillover effects of the US Subprime crisis. The crisis had also devastated the capital base of major financial institutions globally. It is undeniable that Malaysian banks were affected by the negative spillover effect of the subprime crisis, but to a lesser extent due to the stringent regulation by the central bank, Bank Negara Malaysia (BNM). BNM as a regulatorory agency acts to preserve the stability and resilience of the monetary and financial structure in order to maintain the growth of Malaysian economy. The Malaysia banking sector comprises of three major types of banking institutions namely the commercial banks, investment banks, and Islamic banks. As there is a new regulation imposed by the BNM to obligate commercial banks to offer Shariah-based financial products, a new category for Islamic banking windows is incorporated in this study where this new category of banking system serves as an interesting case study. The trend becomes more evident recently as Malaysia aims to become the hub for regional Islamic finance centre that can potentially attracts investment from the GCC countries. Supported by the high demand for Shariah-compliant products, the central bank has made a proactive measure by providing licences to conventional bank to offer Shariah-based products by introducing Islamic banking subsidiaries and windows as well as the establishment of full-fledged Islamic banks.

Under the Islamic banking system, the modus operandi is quite distinct compared to the conventional counterparts, given that the Islamic banking activities are defined by Shariah principles. In essence, there are a number of basic principles that become the heart for Islamic products, such as prohibition of interest (*riba*), uncertainty (*gharar*), gambling (*qimar*), and deception (*maysir*) (Iqbal and Mirakhor, 2007). The crux feature that singularises Islamic banking from conventional banking can be seen from its prohibition of *riba*. Conventional banks earn profits by attracting deposits at low interest rates, then making loans using these deposit funds to borrowers at higher interest rates. Essentialy, conventional banks make profits from the spread between the interest rate received from borrowers and the interest rate paid to depositors. Based on the law of riba, it is not permissible for the Islamic bank to receive predetermined interest from borrowers and to give the predetermined interest to depositor as these products are loans Riba is a contractual increase from a loan. When a conventional bank issues a deposit product, the product is based on a loan contract. Likewise, when the bank gives a financing facility, the facility is based on a loan contract too. As an alternative to riba, , the profit and loss sharing (PLS) system was introduced to evidence the application of trading (al-bay) and hence profit sharing among the counterparties in the

Islamic financial transactions (Iqbal and Mirakhor, 2007). However, due to the market imperfections and asymmetric information problems, the effectiveness of PLS system under the mixed banking systems is hardly applied into the real market (Karim *et al.*, 2013) since the PLS system embraces business risk as well as financial risk. This argument deserves further empirical investigation by way of examining the relationship between capital adequacy and asset risks under a mixed banking system.

4. Data, methodology and model specification

4.1 Data and variables

The dataset for this study is based on the monthly bulletin statistics of the Bank Negara Malaysia across mixed Malaysian banking systems for a duration of 83 months (Dec 2006–Oct 2013). The data consists of four types of bank which are Islamic banks, Islamic banking subsidiaries, conventional commercial banks, and conventional investment banks. The analysis on the long run panel cointegration relationship for the risk taking behaviour is basically involved a set of variables which are risk-weighted asset (RWA), capital ratio (CAR), and interest rate. The RWA variable is used as a proxy for the risk taking while CAR represents the level of bank's capital. The definitions for all variables are as follow:

a. Risk-weighted asset (log risk-weighted asset over log total asset)
b. Capital ratio (log capital base[2]/log total asset)[3]
c. Financing/Interest rate (base loan rate and base financing rate (BLR_BFR))[4]

4.2 Panel Cointegration Test

The major purpose of conducting panel cointegration test is to examine the existence of long-run cointegrating relationship between the capital level and risky assets. Besides that, cointegration can test the problem of spurious regression emanating from the nonstationary series. Once the cointegrating relationship is established, the results from the statistical inference provide important theoretical information that helps us to understand the connection between the level of bank's capital and the extent of risky assets. For panel cointegration test, several routines are employed with the basis of the traditional Engle Granger residual-based approach and Johansen maximum likelihood approach. Following the Engle and Granger (1987) framework, if a cointegrating relationship is established, there is an error correction term that is useful to relate the long-run relationship and short-run dynamics under the error correction model. Several panel cointegration tests have been established under the Engle and

[2] The capital base series is actually combination of Tier I and Tier 2 capital (Bank Negara Malaysia Statistics). The same proxy of capital adequacy was also used by Karim et al. (2013)

[3] The main reason we do not employ the risk-weighted capital adequacy ratio (RWCAR) as proposed by the Basel II framework (also applied by Jacques and Nigro (1997)) is to prevent the serious classical multicollinearity problem between the variables. As risk-weighted asset has been assigned as a dependant variable in the system, it is not appropriate to use RWCAR. One remedy to tackle this problem is to find substitute as a proxy for the capital ratio, i.e., by changing the denominator with the total assets instead of risk based assets. This new proxy of capital ratio (CAR) follows the studies of Shrieves and Dahl (1992) and Rime (2001).

[4] The rationale for incorporating the interest rate as a control variable in the model is lies from the fact that the interest rate has potential to increase the risk-taking appetite among banks (Delis and Kouretas, 2011).

Granger (1987), namely Kao (1999) test and Pedroni (2000) test. The Kao test employs the Dickey Fuller (DF) and Augmented Dickey Fuller (ADF) methods that examine the stationary of residuals to assess the presence of the cointegrating relationship. However, there are several restrictive assumptions of the Kao test which are: (i) Kao test imposes the homogeneity on the cointegrating vector and AR coefficients; (ii) Several multiple regressors are not permissible in the cointegrating vector; and (iii) Kao test caters for single unique cointegrating relationship only.

For the second type of residual-based test, i.e., Pedroni test, the test is perceived to be superior than Kao test due to its contribution that relaxes several assumptions of the Kao test. The test relaxes the first assumption of Kao test by permitting the cointegrating vector to vary across different units of the panel. The test also authorises the heterogeneity effects in the error terms across the groups. Furthermore, the test incorporates several variables in the cointegrating vector, which relaxes the second restriction of the Kao test. The Pedroni test also caters for the endogeneity bias in the OLS estimation by replacing the estimates with the Fully Modified OLS (FMOLS) and produces the unbiased and consistent estimators.

For the Johansen maximum likelihood-based approach, Larsson *et al.* (2001) relax the third assumption of the Kao test. This test can deal with more than one cointegrating vector because it does not make apriori assumption of unique cointegrating vector as stated in the Kao test. Besides that, apart from the Engle-Granger procedure that emphasises the selection of the dependent variable, the Larsson *et al.* (2001) approach is much more practical as it assumes that all variables are endogenous without the need to specify which variable to be dependent variable at the first place. This test avoids arbitrary choice problem of dependent variable (Masih & Masih, 1996). In other words, the Johansen likelihood system avoids any sensitivity problem towards the selection of variable that needs to be normalised.

4.3 Dynamic OLS

The dynamic panel methodology has been chosen as the main theme for data analysis because of the dynamic nature of risk-taking activities that varies over time. The traditional OLS cannot be employed for dynamic estimation as the OLS estimator suffers from the endogeneity bias, heteroscedasticity and autocorrelation problems that cater to the inefficiency problem. Thus, it is not feasible to establish an efficient long-run relationship estimator using the traditional OLS. One of the alternatives in estimating consistent long-run estimator is by employing Stock and Watson (1993) model namely Dynamic Ordinary Least Square (DOLS). Stock and Watson (1993) have shown that through the Monte Carlo simulation, DOLS is much better than other models especially for small observations. By utilising DOLS, it provides several benefits such as, allowance for different orders of integration among regressors (more than order 1) and caters for the simultaneity problem among regressors. Stock and Watson (1993) basically adopt the parametric approach in dealing with different order of integrated variables with the assumption that those variables are found to be cointegrated. Besides that, the DOLS can solve the simultaneity bias especially for small sample by incorporating the leads and lags value of the change in the regressors (Masih & Masih, 1996). The application of DOLS in our estimation seems to be practical since our data span are just too short (83 observations) and possess higher potential for simultaneity bias if the traditional OLS is implemented. Therefore, we aim to provide a unified methodological approach that employs DOLS in time series analysis to investigate the long-run relationship between the risk taking appetite and capital ratio. By establishing the long-run relationship, we have dealt with the theoretical part which is beneficial for policy implication.

4.4 Estimation of Panel VECM Using two-step Dynamic System Generalised Method Moment (GMM)

According to Engle and Granger (1987), if there is a cointegrating relationship, there is always a corresponding error correction model that can explain the changes of dependent variable as a function of disequilibrium from the long-run cointegrating relationship (captured by the lagged error correction term, (e_{t-1}). Instead of using the traditional ECM, we estimate the panel VECM using the two-step dynamic system GMM framework. The standard generalised method of moments (GMM) has been initially proposed by Arellano and Bond (1991) specifically to deal with the endogeneity and simultaneity bias faced by OLS in estimating dynamic equation. In order to find the optimal substitutes towards the bias of the lagged dependent variable, Arellano and Bond (1991) have proposed the usage of first difference lag levels for each variable as instrumental variables. The use of difference estimators in the dynamic panel GMM model can eliminate bias that is potentially sourced from omitted variables in cross sectional estimates. However, there is a practicality problem associated with the standard GMM where difference estimator can only eliminate the potential omitted variables bias. To cater to the problem, Arellano and Bover (1995) and Blunder and Bond (2000) suggested the system GMM. The system GMM adds the level form moment conditions on top of difference form moment conditions, specifically to reduce the imprecision and biases associated with the difference estimators. The system GMM estimators also offer a greater flexibility to the variance-covariance structure. Besides, the dynamic GMM model is perfectly designed to cater to the endogeneity bias arising from the short macro panel data that can cause inconsistency problem to the estimates (Lee and Hsieh, 2013).

In order to employ the dynamic system GMM for panel VECM estimation, a slightly different routine needs to be done. From the long-run relationship (estimated by DOLS), we test the stationary of the error terms. Once we obtain the stationary residual from the DOLS, we proceed to the error correction model. In this step, we have a dynamic panel error correction model that includes the p lags of the dependent variable as covariates that contain unobserved panel-level effects, fixed or random. By construction, the unobserved panel-level effects are correlated with the lagged dependent variables, making the estimates inefficient. The use of dynamic system GMM can effectively reduce the endogeneity bias. In this study, due to small number of cross sections, it is not appropriate to conduct the two-step system GMM with many regressors. Thus, we estimate the panel VECM for two variables only, capital level and risky assets. The error correction model is presented as follows:

$$\Delta RWA_{it} = \theta_{1j} + \sum_{k} \theta_{11ik} \Delta CAR_{it-k} + \lambda_{1i} e_{it-1} + \mu_{1it}$$
$$\Delta CAR_{it} = \theta_{2j} + \sum_{k} \theta_{21ik} \Delta RWA_{it-k} + \lambda_{2i} e_{it-1} + \mu_{2it}$$

where e_{it-1} is the lagged error term obtained from the long-run equation before. We do the two-step system GMM estimation for each equation using a special *Stata 11* command, *xtdpdsys*. For robustness checking, the application of the joint test using the Wald F-test is conducted in order to examine the significance of the short-run and long-run relationships. In order to provide consistent and efficient estimates, we conduct several post-estimation procedures. We run the Sargan test for over-identifying restrictions to ensure the validity of our instruments (H_0: overidentifying restrictions are valid). Based on the Chi-square statistics of Sargan test, if the Sargan statictics is smaller than the critical value, the null hypothesis for validly over-identifying restrictions cannot be rejected which implies that the instrumental variables estimated using the dynamic system GMM are accurate. In contrast, if there is a rejection of null hypothesis, the intrumental variables used in our study are inappropriate. For the second post-estimation procedure, we run Arellano Bond test to examine the null hypothesis of the absence of first (level form) and second order serial correlation induced by the difference estimators under the dynamic system GMM. After we conduct Sargan test, we do Windmeijer (2005) finite sample correction on the standard errors, specifically to avoid the standard errors downward bias.

5. Empirical findings

5.1 Panel Cointegration

It is crucial to ensure that the capital level and risky assets are cointegrated to signify the existence of long-run relationship. The null hypothesis for all tests is that there is no cointegrating relationship between variables. As there are two channels in testing cointegration, namely via residual as proposed by Engle and Granger (1987) and Larsson *et al.* maximum likelihood (as adopted by Johannsen), we present the result from Pedroni test, which represents the Engle and Granger residual-based system and Johansen Fisher test as representative for the maximum likelihood method.

Table 1 illustrates the summary of Pedroni test, which consists of seven statistics. There are four statistics explain the “within dimensions” (panel variance, panel rho, panel PP and panel ADF) and the remaining three statistics (group rho, group PP and group ADF) represent the “between dimensions” statistics. The “within dimensions” approach tests the existence of cointegrating relationship by pooling the autoregressive coefficients across the panel groups while the “between dimensions” method simply averages the individual group coefficients (Pedroni, 1999). All the statistics are asymptotically follow the standard normal distribution. For within dimensions test, it can be seen that three statistics values (Panel rho, PP, and ADF) are larger than critical value at 5% significance level, thus contributing to the rejection of null hypothesis. From these significant results, there is adequate statistical evidence to emphasise the existence of one unique long-run cointegration relationship among variables where RWA is defined as a dependent variable[5]. In the same vein, for between dimensions, all statistics are significant at 5% level, leading to the rejection of null hypothesis. Thus, these statistics results show the existence of a cointegrating relationship when RWA becomes dependent variable, validating the results of within dimension statistics.

[5] It has been proven that by assigning other explanatory variables as dependent variable, Pedroni test shows no cointegrating relationship. Due to the non-existence of cointegrating relationship, the result will not be discussed.

Table 1: Pedroni panel cointegration test (residual-based)

Test	Statistics	p-value
Within Dimension		
Panel v-statistics	0.3069	0.3794
Panel rho-statistics	-1.8887	0.0295**
Panel PP-statistics	-3.5898	0.0002***
Panel ADF-statistics	-2.1162	0.0172**
Between Dimension		
Group rho-statistics	-2.4842	0.0065***
Group PP-statistics	-5.4918	0.0000***
Group ADF-statistics	-3.9405	0.0000***

*indicates 10% level of significance, ** indicates 5% level of significance, ***indicates 1% level of significance

To investigate whether there is more than one cointegrating relationship, we conduct Johansen Fisher maximum likelihood test, which is based on two statistics namely trace and maximal eigen statistics, as presented in Table 2. Based on the maximal eigen statistics, the first row shows the higher maximal eigen statistics than the critical value. Thus, there is enough evidence to reject the null hypothesis of no cointegrating relationship (H_0: r=0) and implies the existence of one cointegrating relationship, consistent with the finding from the Pedroni residual test. Looking on the second row, there is no enough evidence to reject the null hypothesis (H_0, r≤1) as the underlying p-value of the statistics (0.6508) is greater than 5% significance level. For the subsequent rows (where null hypothesis: r≤2), the p-value is lower than 5% level, leading to the rejection of the null hypothesis. Therefore, from the maximal eigen statistics, the results suggest that there are one and three cointegrating relationships. In the same vein, results from the Trace statistics also support the finding of maximal eigen statistics where there is rejection towards null hypothesis of r=0 and r≤2, respectively, shown by the small p-values below 5% significance level. In a nutshell, based on the statistical results of the cointegration test, there is sufficient evidence to conclude the existence of the long run relationship between the bank's capital and riskiness of assets.

Table 2: Johansen Fisher panel cointegration test (based on maximum likelihood)

H_0	H_1	Statistics	Probability
Maximal Eigen Statistics Λ			
r=0	r>0	27.33	0.0006***
r≤1	r>1	5.968	0.6508
r≤2	r=3	20.18	0.0097**
Trace Statistics			
r=0	r>0	29.48	0.0003***
r≤1	r>1	10.44	0.2356
r≤2	r=3	20.18	0.0097**

*indicates 10% level of significance, ** indicates 5% level of significance, ***indicates 1% level of significance

5.2 Panel VECM using Dynamic System GMM

As demonstrated by Engle and Granger (1987), if there is a cointegrating relationship between variables, any short-run shock that renders to the disequilibrium from the long-run equilibrium will be captured by the error correction model (ECM), which is represented by the lag of the residual value $e_{i,t-1}$. Besides, information on the causality relationship can be obtained to determine the leader and follower between the risk-taking behaviour and capital adequacy[6]. In order to do that, we conduct panel VECM using the two-step dynamic system GMM estimation. In order to estimate the panel VECM, we need to get the residual from long-run relationship as presented by the DOLS. It is important to ensure the right selection of dependent variable for the DOLS model as the residual value generated from the DOLS shapes the finding for causality analysis. Then, we capture the residual from DOLS estimates, as an input for the panel VECM[7].

In our prior discussions, the main reason we use instrumental variables under the system GMM is to eliminate any potential bias due to correlation between the residual term and the lagged dependent variable. Optimal lag for difference estimators is chosen at 1, as it satisfies the Sargan test of overidentifying restrictions and fulfills all the essential classical assumptions of the error term. The interest rate factor is omitted because our aim is to examine the causality between the risky assets and capital level. As shown in Table 3, there are several noteworthy information these panel VECM estimates have to offer. Let refer to the first part of Table 3, i.e., when the RWA is assigned as the dependent variable. Based on the joint test result for the panel VECM (through global Wald statistics), the Chi Square statistics is larger than the critical value, indicating the rejection of the null hypothesis (H_0: $\theta_{11i,k}$=0, for all *i*) at 5% significance level. This result infers the statistical significance of the short-run and the long-run CAR in explaining the risk-taking behaviour. Next, long term causality can be captured from the the slope and statistical significance of the error correction term (ECT). The null hypothesis for the ECT is H_0: λ_{1i}=0 for all banks (*i*). Looking at the ECT term in Table 3, the probability of the statistics is less than 10% that implies the statistical significance of the ECT. As the lag error correction term contains the component of long-term cointegrating relationship, the significance of error correction term indicates the convergence of the short-run displacement to the long-run equilibrium with a particular speed adjustment determined by the magnitude of coefficient for the error correction term. The slope for ECT term (λ_{1i}) is returned as 3.87, signifying fast adjustment in an event of disturbance from the long-run RWA function. In addition, the significance of the error correction term proves that the variable RWA is an endogenous variable, i.e., the extent of risky assets (RWA) depends on the level of bank's capital (CAR), which is economically sensible.

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[6] Due to the lack number of cross sections (i.e four mixed banking systems), the analysis on panel VECM using Dynamic System GMM can only be done between two variables only using the *STATA 11* package. As primary objective of this study is to investigate the role of capital adequacy to the risk taking behavior, we have chosen two variables namely RWA and CAR to estimate the short run dynamic of the panel VECM via GMM.

[7] The residual generated from the DOLS has been tested and found to be stationary, proven by the Pedroni cointegration test.

Table 3: Optimal Generalised Method of Moments (GMM) model for relationship between risk-taking (RWA) and capital ratio (CAR)

	System GMM (Arellano and Bover (1995), Blunder and Bond (1998))
Dependent variable: ΔRWA_t	
General vector error specification:	$\Delta RWA_{it} = \theta_{1j} + \sum_k \theta_{11ik} \Delta RWA_{it-k} + \sum_k \theta_{12ik} \Delta CAR_{it-k} + \lambda_{1i} e_{it-1} + \mu_{1it}$
Independent (instrumental) variables	
ΔRWA_{t-1}	-7.0851 (0.081)*
ΔCAR_{t-1}	3.4202 (0.107)
e_{t-1}	3.8740 (0.09)*
Constant	-0.0037 (0.06)*
Global Wald Test (χ^2)	11.97 (0.0025)***
ECT test	2.72 (0.09)*
Sargan Test (χ2)	$1.10\text{x}10^{-23}$(1.000)
Arellano-Bond autocorrelation in first differenced errors	
Order 1	-0.84754(0.3967)
Order 2	-0.7811(0.4347)
Dependent variable: ΔCAR_t	
General vector error specification:	$\Delta CAR_{it} = \theta_{2j} + \sum_k \theta_{21ik} \Delta CAR_{it-k} + \sum_k \theta_{22ik} \Delta RWA_{it-k} + \lambda_{2i} e_{it-1} + \mu_{2it}$
Independent variables	
ΔCAR_{t-1}	0.2739 (0.763)
ΔRWA_{t-1}	-0.4013(0.377)
e_{t-1}	-1.7163 (0.36)
Constant	-0.0001 (0.773)
Global Wald Test (χ^2)	561.10 (0.0000)***
ECT test (χ^2)	0.83 (0.362)
Sargan Test (χ^2)	
Arellano-Bond autocorrelation in first differenced	$2.89\text{x}10^{-18}$(1.000)
Order 1	-0.02665(0.9787)
Order 2	0.24545(0.8061)

Value in parentheses refers to the p-value of Z-statistics except for the Sargan test, Wald test and ECT test
*indicates 10% level of significance, ** indicates 5% level of significance, ***indicates 1% level of significance

On the other hand, looking on the second part of Table 3, the error correction term is found to be statistically insignificant (nonrejection of null hypothesis H_0: $\theta_{21i,k}=0$, for all *i*) at a conventional level of 10%, when CAR becomes a dependent variable. There is no Granger causality in the long run. This result evidences the exogeneity feature of the CAR as a change in CAR is not adjusted by the error correction term. In other words, the insignificant error correction term would suggest that any short-run adjustment to the long-run adjustment does not exist through the channel of RWA as an explanatory variable. In a nutshell, there is unidirectional causality where CAR granger causes RWA (CAR→RWA) and not for RWA→CAR. To validate our finding, we conduct the post-estimation tests comprising the Sargan test and Arellanon-bond autocorrelation tests. For the Sargan test, the intruments used in this dynamic system GMM are found to be valid, driven by the insignificance of the Sargan statistics where the corresponding p-value is larger than the 5% level leading to the non-rejection of null hypothesis. Furthermore, our difference estimators are not suffer from the first and second order serial correlation problem as proven by the high p-values of the Arellano-bond test.

5.3 Long-Run Relation between Risky Weighted Asset (RWA) and Capital Adequacy

The long-run relationship is crucial for policy implications[8]. Once we have found the long-run causality, we estimate the long-run relationship between the risk-taking behaviour and capital level together with interbank rate as a control variable using the DOLS. Based on our previous result, the equation that produces stationary error term only exists when RWA is chosen as a dependent variable. Hence, we can estimate a long-run relationship from this equation. We normalise the coefficient of RWA equal to one and regress the equation with dynamic OLS, as proposed by Stock and Watson (1993) using the *Stata* procedure. Besides providing remedial measures towards the simultaneity bias problem, DOLS is favourable because the estimates from this model are much more consistent and efficient for small sample. We also provide estimation of DOLS when CAR is opted as a dependent variable. The results generated by the *Stata 11* package are as follows:

Table 4: Optimal DOLS model for risk-taking factors

Dependent Variable	RWA	CAR	BLR_BFR
RWA	-	1.1253 *(0.0000)****	-0.0049 *(0.0000)****
CAR	0.2382 *(0.0370)***	-	0.0025 *(0.0200)***

Wald (Chi square (2))=104.64, p-value = 0.0000, R^2= 0.8296 (Dependent variable: RWA)
Wald (Chi square (2))= 8.64, p-value = 0.015, R^2= 0.1477 (Dependent variable: CAR)
Values in parenthesis are p-values of the Student t-statistics
*indicates 10% level of significance, ** indicates 5% level of significance, ***indicates 1% level of significance

The coefficients above reflect the long-run elasticity. From the global Wald test, it can be seen that at 5% significance level, the Chi square value is statistically significant given by the small value of corresponding p-value. Therefore, we can reject the null hypothesis that the risky assets do not depend on CAR and financing rate. From the R^2 result, the outcome is acceptable as the R^2 output is more than 80%. The R^2 value implies that the variability of the RWA is explained by all determinants by 82.96%.

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[8] The step for establishing long run relationship using DOLS is parallel with Long run structural modeling (LRSM) step as applied in time series analysis.

Based on Table 4, both variables namely CAR and financing rates (BLR_BFR) are statistically significant in relation to RWA where the p-values are relatively smaller than 5% level. The slope for CAR is positive while BLR_BFR (financing rate) coefficient is negative with different elasticities. The slope for the CAR coefficient is 1.12, implying that 1% increase in the CAR will elevate the propensity for bank's manager to resort in risky assets by 1.12%. This finding confirms the findings of Jokipii and Milner (2011), Blum (1999), and Shrieves and Dahl (1992). Next, the elasticity of financing rate with respect to risky assets is -0.0049, implying that 1% increase in the rate reduces the level of risky assets by 0.0049%. The inference behind this result maintains that both variables are important sources in contributing the escalation of the level of risky asset in the bank's balance sheet.

Table 5: Optimal DOLS for each type of Bank

Banks	CAR	BLR_BFR	#Lead	#Lag
Dependant variable: RWA				
Full-fledged Islamic banks (IB)	1.2108	-0.0021	6	1
	*(0.0000)****	*(0.0000)****		
Islamic banking subsidiaries (IBS)	1.1313	-0.0056	0	11
	*(0.0000)****	*(0.0776)**		
Conventional Commercial banks (CCB)	1.0968	0.0099	0	0
	(0.0000) **	*(0.0142)***		
Conventional Investment banks (CIB)	-0.2789	0.0109	0	0
	(0.5305)	*(0.0783)*		

Values in parenthesis are p-values of the Student *t*-statistics
Lead and lag specifications are based on Schwarz Information Criterion (SIC)
*indicates 10% level of significance, ** indicates 5% level of significance, ***indicates 1% level of significance

In order to get a clearer picture about the impact of bank's capital on risk-taking behavior for each type of bank, Table 5 provides DOLS estimation for each group. It is interesting to see that the Islamic banks (IB) evidence significant and positive coefficients for the capital ratio, CAR. It appears that coefficient for CAR is 1.21 suggesting that 1% increase in capital would elevate the RWA by 1.21%. For the case of Islamic banking subsidiaries (IBS), it can observed that there is also statistical significance of CAR at 5% level as shown in Table 5 with coefficient of 1.13. Thus, the risk preference of IB and IBS strongly depends on the level capital they hold. Bank Islam (IB) and CIMB Islamic bank (IBS) show drastic changes (growth) in risk-weighted assets (RWA) compared to CIMB bank. For instance, based on Table 6, we can see that the growth of RWA of CIMB Islamic bank can reach up to 92.5% in year 2011 compared to the growth of RWA of CIMB Bank that reached up to maximum level of 15% in year 2008. In other words, the variation of risky assets of Islamic banks is higher than the case of conventional banks. From here, we can say that the higher growth of capital of IB and IBS shows higher persistence of risk taking (significant changes in RWA) compared to conventional bank. Further evidences from the Monthly Bulletin Statistics of BNM 2013 showed that the size of risky portfolios of IB and Islamic banking subsidiaries has continued to expand exponentially from approximately RM40 billion risky assets in 2006 to almost RM210 billion in 2013, indicating relatively greater risk taking activities.

Based on Table 6, a bank with higher capital buffer shows greater risk taking. For instance, in 2009, Bank Islam and CIMB Islamic bank showed a slightly higher level of capital buffer i.e., 9.3% and 9.2% accordingly, and at the same time exhibited large growth of

RWA (Islamic Bank: 77.7%, CIMB Islamic Bank: 8.2%). Once the regulatory capital requirement has been met, these banks tend to hold more risky assets. However, there are occasions where lower capital buffer showed greater changes in RWA. For instance, in 2008, CIMB Islamic bank displayed 3.7% capital buffer followed by 67.2% growth of RWA, whereas CIMB bank showed 5.9% capital buffer with lower RWA growth, i.e., 15.4%. The justification behind these mixed findings is that, risk taking activities cannot be explained by a single factor, i.e., capital buffer alone, but need to consider the influence of capital growth (changes in capital) to amount of risky assets. In this case, despite CIMB Islamic bank displayed a minimal level of capital buffer (3.7%) in 2008, but the bank reported a high capital growth, i.e., 17.4% in the same year. Thus the dominance of capital growth over the capital buffer has significantly increased the risk taking.

There is insufficient evidence to suggest that the risk taking activities undertaken by Islamic banks are explained by the implementation of profit and loss sharing (PLS) system as argued by Karim *et al.* (2013). The PLS system as defined by the PSIA is hardly utilised by Islamic banks today in their efforts to attact funding. Instead the GIA dominated Islamic banking deposits. It also means that all assets funded by GIA must be cushioned by capital against unexpected losses. In a way, Islamic banks must therefore allocate more capital if they wish to offer risky assets funded by GIA. From here, we can say that the nature of risk taking behaviour by Islamic banks follows their conventional counterparts as these risky assets are funded by the deposit funds which require Islamic banks to cushion the risky assets against bank capital.

More specifically, we argue that the high capital growth and large capital buffer (excess of capital adequacy ratio and 8% minimum capital) play significant role to risk taking in the Islamic banking business. The high capital growth of IBs contributes to the capital buffer and motivates them to invest further in risky assets. According to Figure 1, it can be seen that the portions of capital buffer for both Bank Islam and CIMB Islamic Bank were considerably identical, ranging around 5%-10% from 2007 to 2013, which provides extra safety net for both banks to resort into risky assets. So far, the size of assets with above 50% risk weights for IB and IBS is considerably large[9]. According to Table 6, from 2007 to 2009, Bank Islam and CIMB Islamic bank reported higher portions of risk weighted assets (with risk weight above 50%) which were ranging around 79% to 90%. CIMB Islamic bank registered a slightly higher level of risky assets primarily due to the fact that the management of CIMB Islamic bank that is still driven by the discipline of the parent bank, where risk-behaviour is influenced by the market forces.

For the case of conventional commercial banks (CCBs), the coefficient CAR is stated at 1.09, implying that 1% increase in capital increases the level of risky assets by 1.09%, which is slightly lower than the case of IB and IBS. The significant and positive coefficients of CAR suggest that well-capitalised conventional banks are less constrained to the capital requirement, which in return maintain the incentive for CBs to resort into risky lending activities.

[9] We define risky assets as a class of assets that have risk weights more than 50%.

Table 6: Risk–weighted assets (attributable to credit risk), capital level and capital buffer

	Bank Islam	CIMB Islamic Bank	CIMB Bank	CIMB Investment bank
Year 2012				
Total Risky Assets (RM'000)	19,361,943 (Δ: 34.0%)	19,554,311(Δ: 33.2%)	94,244,713 (Δ: 12.5%)	1,387,711 (Δ: 28.3%)
Total Capital (RM'000)	3,165,657 (Δ: 11.6%)	2,939,795 (Δ: 24.1%)	18,390,759 (Δ: 7.2%)	435,396 (Δ: -5.8%)
Capital buffer	5.8% (Δ: -3.0%)	5.3% (Δ: -3.9%)	8.3%(Δ: 1.0%)	13.0%(Δ: 1.2%)
Year 2011				
Total Risky Assets (RM'000)	14,444,198 (Δ: 15.6%)	14,677,578 (Δ: 92.5%)	83,785,262 (Δ: -3.9%)	1,081,967 (Δ: 5.2%)
Total Capital (RM'000)	2,837,670 (Δ: 11.3%)	2,369,357 (Δ: 71.5%)	17,158,160 (Δ: 9.7%)	462,250 (Δ: 36.1%)
Capital buffer	8.8% (Δ: -1.0%)	9.2% (Δ: 5.9%)	7.3%(Δ: 0.2%)	11.8%(Δ: 2.7%)
Year 2010				
Total Risky Assets (RM'000)	12,489,781 (Δ: 11.2%)	7,623,657 (Δ: -20.4%)	87,236,173 (Δ: -8.5%)	1,028,430 (Δ: -37.3%)
Total Capital (RM'000)	2,548,582 (Δ: 13.9%)	1,538,771 (Δ: 34.0%)	15,645,747 (Δ: 3.4%)	339,731 (Δ: 1.0%)
Capital buffer	9.8% (Δ: 0.5%)	3.3%(Δ: -5.9%)	7.1%(Δ: 0.3%)	9.1%(Δ: 0.0%)
Year 2009				
Total Risky Assets (RM'000)	11,235,706 (Δ: 8.2%)	9,576,915 (Δ: 77.7%)	95,407,662 (Δ: -6.8%)	1,640,696 (Δ: 30.0%)
Total Capital (RM'000)	2,236,421 (Δ: 46.2%)	1,148,243 (Δ: 72.5%)	15,124,664 (Δ: 1.6%)	336,285 (Δ: -42.2%)
Risk Weights				
0%	0.0%	0.0%	0.0%	0.0%
1%-20%	11.9%	4.3%	4.6%	72.5%
21%-50%	5.3%	16.0%	11.8%	2.0%
51%-100%	79.1%	79.7%	83.7%	25.4%
>100%	3.7%	0.0%	0.0%	0.0%
Capital buffer	9.3% (Δ: 4.5%)	9.2% (Δ: 5.5%)	6.8% (Δ: 0.9%)	9.1% (Δ: -18.5%)
Year 2008				
Total Risky Assets (RM'000)	10,379,448 (Δ: 7.8%)	5,388,024 (Δ: 67.2%)	102,314,159 (Δ: 15.4%)	1,261,439 (Δ: -40.3%)
Total Capital (RM'000)	1,529,707 (Δ: 8.1%)	665,673 (Δ: 17.6%)	14,888,208 (Δ: 19.4%)	581,336 (Δ: -20.9%)
Risk Weights				
0%	0.0%	0.0%	0.0%	0.0%
1%-20%	6.3%	10.5%	4.4%	43.3%
21%-50%	9.1%	6.8%	11.7%	1.6%
51%-100%	84.6%	82.8%	83.8%	55.1%
>100%	0.0%	0.0%	0.0%	0.0%
Capital buffer	4.8% (Δ: 0.1%)	3.7% (Δ:-4.7%)	5.9%(Δ: 1.7%)	27.6%(Δ: 11.6%)
Year 2007				
Total Risky Assets (RM'000)	9,625,776	3,222,032	88,659,741	2,114,219
Total Capital (RM'000)	1,415,625	565,939	12,473,558	734,639
Risk Weights				
0%	0.0%	0.0%	0.0%	0.0%
1%-20%	1.1%	4.7%	5.8%	17.1%
21%-50%	12.7%	4.7%	10.6%	1.0%
51%-100%	86.2%	90.6%	83.5%	81.6%
>100%	0.0%	0.0%	0.0%	0.3%
Capital buffer	4.7%	8.4%	4.2%	16.0%

Source: Respective Annual Reports

Note: 1. Capital buffer is calculated as an excess between RWCAR and 8% Basel II CAR.

2. RWCAR is taken after deducting proposed dividends.

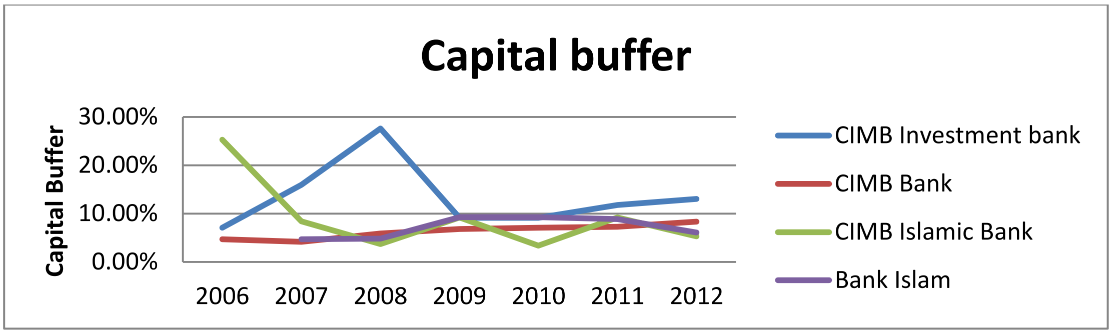
3. Risk weight information is not disclosed in bank's annual report starting from year 2010. Thus, we only provide the actual size of risky assets attributable to credit risk starting from year 2010.

4. Δ represents growth/change

For instance, for the case of CIMB bank, the size of risky assets attributable to the credit risk were moving at the same ratio i.e. 83% (for >50% risky weight) from 2007 to 2008. This moderate expansion of risky assets is attributed to their larger capital size which has helped CBs to improve their capital adequacy ratio especially after the Global financial crisis in 2008. The less variation of risky assets of CIMB bank is also driven by the sound capital of CBs makes them less constrained to the minimum capital requirement as they enjoyed dominance in banking business opportunities supported by the large resources, enhanced technology and expertise that continuously improves their profitability. In terms of excess capital i.e., capital buffer, Figure 1 portrays the stable pattern of capital buffer of CIMB Bank which had moved around 5% to 10% from 2006 to 2013. Again, the excess capital holding has provided extra protection for a well-capitalised bank such as CIMB to take positions in risky assets, but to a lesser extent than Islamic banks. Perhaps, one of the reasons is that well capitalised CIMB bank reported stable growth in capital where the highest growth was reported at 19% in 2008 compared to vigorous capital growth shown by Islamic banks (for instance, capital growth of CIMB Islamic: 72.5% in 2005). In 2012, CIMB bank showed a considerably higher portion of capital buffer, i.e., 8.3% compared to Bank Islam (5.8%) and CIMB Islamic (5.3%). However, the risk taking activities are much more evident in Bank Islam and CIMB Islamic as the rates of changes of risky assets were reported at 34% and 33.3% respectively. Hence, the higher capital growth of Bank Islam (11.6%) and CIMB Islamic (24.1%) relative to CIMB bank (7.2%) had largely influenced the bank manager to expand the size of risky assets. In a nutshell, if there is an increase in capital level (i.e., positive capital growth), followed by a large capital buffer, then the propensity for a bank to taking risky assets is much higher.

A close observation on Table 6 reveals that the repercussions of the US Subprime crisis had significantly affected the risk taking activities of investment banks that focus mainly on underwriting and securities trading businesses. For the case of CIMB Investment bank, there was a slight drop of the portion of risky assets (with 100% weight) from 81.6% in 2007 to around 25.4% in 2008. The reduction in risk taking had also reduced the capital buffer especially after the crisis from 25% to around 10% in 2009 as portrayed in Figure 1. In terms of long run significance of capital under the DOLS specification, taking reference to Table 5, the variable CAR is found to be statistically insignificant, shown by the large p-value of the slope beyond the 5% level in Table 5. It is clear that the business activities and operations of investment banks are quite distinct than its counterparts. An investment bank acts as a broker or financial advisor for small retail investors or for many large institutional clients including corporations, financial institutions, government, hedge funds, and pension funds. The bank specializes in a wide range of transactions of financial securities including selling, underwriting, becomes intermediaries between issuers and investors, facilitating mergers and acquisitions and assisting in issuance of a new corporate stock for initial public offer (IPO). From all these activities, an investment bank puts greater emphasis on managing various contractual securities arrangements instead of running commercial banking business activities such as taking deposit and providing loans to customers. Thus the nature of risks and profits faced by investment banks is totally different from commercial banks. The investment banks earn profits through brokerage service fees where earnings were based on market performance. The nature of risk taking by investment bank strongly depends on the capital market conditions.

Figure 1: Capital buffer across mixed banking systems



Source: Respective Banks' Annual Reports

6. Concluding Remarks and Policy Implications

The soundness of financial institutions is strongly related to the extent of capital they have. The issue of capital requirement as regulated under the Basel II Accord earns a round of discussion among bankers, market players, academicians and policy makers especially after several episodes of the financial crises. Taking the lessons from the Global crisis, a bank should have a sufficient level of capital to run banking business. In order to do that, banks need to meticulously reallocate their investment to achieve the best optimal combination of investment instruments and meet their risk-return target so that it can maintain a sufficient level of capital throughout the operations.

Given by the long-run relationship and short-run panel VECM results, the risk-taking behaviour is strongly affected by the capital ratio (CAR) in a positive direction for Malaysian banking industry, which is basically in line with the findings by Jokipii and Milne (2011) and Blum (1998). We can say that banks that are having vigorous capital growth (especially for small capital of IB and IBS) are much more likely to resort into risky financing. Second explanation can be explained from the capital excess viewpoint. When the BNM sets the regulatory capital adequacy ratio in accordance with the the Basel II Accord, bank managers will channel resources into risky assets after satisfying the threshold capital level. To some extent this can adversely impact banks' balance sheets. In the context of Malaysian banking environment, such risk taking phenomenon is driven by the large capital buffer above the minimum requirement, as shown in Figure 1.This exponential growth of risky loan facilities is also accommodated by a favourable domestic demand, stabilising financial growth and progressive fiscal consolidation. Despite the monetary policy tightening, the excess capital above the regulatory capital requirement provides an additional safety net that makes bank's managerial team becomes complacent in dealing with risky assets. The high capital buffer also increases the level of confidence by depositors, which subsequently enhances the demand for deposits that becomes an important source to support financing activities.

Interestingly, the similar risk-behaviour is evidence in full fledge Islamic banks (IB) and Islamic bank subsidiaries (IBS), as shown by the existence of significant positive relationship between the capital and the risky assets.. It appears that the way Islamic banks and conventional banks behave to risk taking is almost identical. In other words, Islamic banks follow the market force in expanding their financing products. While the bulk of assets were funded by the general investment accounts (GIA) as deposits, capital requirement on the risky exposures is not exempted. Hence, we argue that the profit and loss sharing (PLS) system in IB and IBS, does not play significant role in influencing the holding of risky assets. This is because Islamic banking assets have only financial risks to worry about. The exclusion of business or commercial risk in banking assets is evident by the fact that Islamic banks have no exposure to true sale, leasing and equity positions. It only leaves capital and capital buffer as important factor in explaining risk-taking behaviour of commercial banks. There is enough evidence to show that well capitalised commercial banks especially in emerging market of Malaysia have more sound financial supervisory practice and tight screening procedure. Worth noting is that risk taking is stable for commercial banks than their counterparts as they enjoy dominant competition. The sound capital position of a conventional commercial bank can provide greater flexibility for the bank to pursue wider business opportunities. Besides, the enhanced capital of a commercial bank can provide them enhanced security, enhanced human expertise, better technology and strategies to deal with unexpected and abrupt losses, thus widening the bank's profitability.

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