

# “Revisiting the impact of intrinsic financial risks on the firm value of banks in ASEAN-5 countries: a panel data approach”

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# REVISITING THE IMPACT OF INTRINSIC FINANCIAL RISKS ON THE FIRM VALUE OF BANKS IN ASEAN-5 COUNTRIES: A PANEL DATA APPROACH

## Abstract

The paper aims to explore the impact of financial risks on the firm value of banks in ASEAN-5 countries. The study used the panel data regression model to analyze the available data for 63 commercial banks in ASEAN-5 countries from 2009 to 2017, totaling 567 observations. GMM dynamic estimation was also used for robustness and comparison purposes. The financial risk was measured using the non-performing loans ratio (NPL), the loan to deposit ratio (LD), the liquid asset ratio (LATA), the cost to income ratio (CIR), and the net interest margin (NIM), while firm value was measured using the enterprise value. The study used controlled variables proxied by size, GDP growth and the inflation rate, while the correlation between credit risk and interest rate risk (CR•IR) was also determined. Given the results of the study, credit risk proxy by non-performing loans ratio has a significant positive effect on the firm value, the liquidity risk (LD) has a significant positive impact on the firm value of ASEAN banks, while LATA has a significant negative effect on the firm value. Operational risk (CIR) and interest rate risk (NIM) have a significant negative impact on the firm value of ASEAN-5 banks. Bank size and inflation rate significantly and negatively affect the firm value, while GDP growth is found to have a significant positive impact on the firm value of ASEAN-5 banks. An insignificant interaction is found between credit risk and interest rate risk (CR•IR). The GMM estimation also supported these findings. The results obtained will be an important signal for policy makers, which is useful for the effective mobilization and allocation of credits to productive areas and helps manage inherent risks. The study provides implications for all countries regarding the financial risks associated with the value of the firm. Therefore, this study offers new insights into this relationship by providing useful information to the academics, policy makers, governments, and other stakeholders and serves as a benchmark for further study in this area.

## Keywords

panel data analysis, financial risks, commercial banks,  
profitability, firm value, ASEAN-5

## JEL Classification

G21, G32

## INTRODUCTION

Financial institutions are the major economic agents of change whose financial soundness is of interest to corporate investors due to their vital role in driving economic activities that would be impossible when an institution is faced with resilience and fragility. The stability of the financial system helps to support the pace of economic progress, reduce inherent risks and restore investor confidence (Riahi, 2018). Theoretical debates recognize financial stability as a prerequisite for sustainable growth, minimizing asymmetry through coordinated markets and then transforming the market signal of steady growth into the optimistic expectations into macro-stability (Ghosh, 2015; Sheedy & Lubojanski, 2018). The performance of the banking system is an important prerequisite that drives its core function as a financial

intermediary and supports economic growth, providing prerequisites for availability of unused capital to the active business by expediting capital inflows into the economy (Ghosh, 2015; Adzobu, Agbloyor, & Aboagye, 2017).

In addition to deposits and credits, securities transactions, investment funds, etc., banking products and services have diversified coverage. Competition in the banking sector has increased, regulations have taken new shapes and the interaction between several trends has led to financial market instability resulting in the manifestation of the financial crisis (Acharya & Schaefer, 2006; Adzobu, Agbloyor, & Aboagye, 2017). This shocking fact demands an empirical question of how relevant and vital are financial risks to banks? The volatility of the financial system triggered the world economic crises in 2007/2008, and as a contagion effect, it has spread to other countries in Europe, Asia and Africa, creating increasingly threatening risks, including credit, liquidity and market risks. The latter has made a large contribution and has become a major cause of variability in the performance of banks.

At least since the last financial crisis, there has been a comprehensive theoretical and empirical analysis of the financial risk in banks, but little emphasis has been placed on firm value because current studies fail to conclude a functioning relation between financial risk factors and the firm value. However, there is a general inconsistency in the results of empirical studies on risks and profitability nexus (Al-Tamimi, Miniaoui, & Elkelish, 2015). This paper aims to bridge this gap by analyzing the impact of financial risks on the firm value of banks among Asean-5 countries. This research is important in the context of applying radical reforms in the financial industry over the last centuries. These developments improve the need to manage, measure and control risks in banks. Rapid market volatility and a new regulatory system necessitate an integrated strategy to assess financial risk and asset liability by banks.

The study of ASEAN-5 countries is based on the growing role they play in the region. The past ten years saw a steady 5% growth rate during the same period in comparison to the global economic growth rate of 3 percent. The ASEAN region is recognized as rapidly growing emerging market, perceived to be remarkable with the enactment of the ASEAN Banking Integration Framework (ABIF). This empirical paper aims to investigate the components of financial risks in the ASEAN commercial banking sector and its significant effect on the firm value of banks, taking into account the macroeconomic environment.

The study offers an important tool to regulators in the five ASEAN countries, such as Malaysia, Singapore, Indonesia, Philippines and Thailand, and provides valuable guidelines for both individual and institutional investors to estimate and evaluate the company's value when making global investment choices. Besides, this study offers a synthetic comparison between a developed market (Singapore) and emerging markets and bridges the gap in the empirical literature by incorporating various measures of bank risks using a robust estimation to make a conclusive finding.

The subsequent segments of this study are, therefore, structured as follows: section 1 provides the review of literature; section 2 explicates the methodology; section 3 presents the empirical findings; and the conclusion ends this research.

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## 1. LITERATURE REVIEW

Risk studies are ubiquitous in financial economics and serve as the basis for much of the corporate finance literature. There are very few thoughts on the fundamental role of risk in determining the firm value of financial institutions. Several em-

pirical literatures have cited the risk-return nexus from Bowman's seminal work, which has significantly contributed to risk of organizational decision making. Bowman's (1980) study argues for the reality and the assumed association between risk and return commonly referred to as the "paradox". The study argued against the common belief that

higher returns emanate from higher risk, but, however, affirmed that there was a likelihood for banks with lower risk profiles to achieve higher return.

The development of the Bowman's theory in successive years validates the argument that banks in distress actually take on more risk (Bowman, 1982). These findings were reinforced through further research in subsequent years including content analysis, which provides further support to strengthening the position of the research that lower profits trigger increased risks (Bowman, 1984). Bowman's work, extensively recognized, has faced more critics in empirical studies. Studies by Bromiley (1991) supported the findings of Bowman, which confirmed that a strong negative influence existed between risk-taking and performance. The analysis of the review of literatures allows this study to conclude that the main risks facing banking institutions are financial risks and their mechanisms.

### 1.1. Empirical literature

Compared to Western states, the development of a market economy in ASEAN countries is relatively late. The excessive profit maximization in the banking industry has caused intense competition among banks. Some banking institutions see non-standard and unfair competition as a means to expand business scale and increase market share. Selected literatures have investigated an extensive range of risk component variables and their significant influence on bank performance but in an entirely different context. There is little research on the ASEAN region.

The empirical influence of capital, credit, liquidity and operational risks on Islamic banks' performance in the GCC countries was examined by Al-Tamimi, Miniaoui, and Elkelish (2015). The results point to a significant negative nexus between capital risk and operational risk and profitability. Specifically, both capital risk and operational risk are identified as the most important risks to banks in the region. The link between financial risk and profitability was examined by Haque and Wani (2015) in ten Indian banks. The findings revealed a significantly positive association between capital risk, insolvency risk and firm performance, whereas the influence of credit risk was significant

and negative. Furthermore, liquidity risk and interest-rate risk have an insignificant positive impact on performance.

Furthermore, Tafri, Hamid, Meera, and Omar (2009) explored the influence of financial risks on the Malaysian banks' profitability. Using the GLS method, the results of the study explain the significant effect of credit risk on profitability on both conventional and Islamic banks. For conventional banks, there is a weak relationship between the interest-rate risk and ROE and insignificant for Islamic banks, while interest rate risk has a significant effect on ROA for conventional banks. Conversely, there is an insignificant association between liquidity risk and profitability measures.

A systematic review of literature shows that other critical factors, besides risk, influence the firm value of commercial banks. Some of these crucial factors are mostly characterized as internal determinants (such as organization and internal efficiency, size) and external determinants often classified as macroeconomic factors that have a significant impact on banks' operating environment and extend their performance. The external determinant factors often utilized are GDP growth, inflation, and interest rates. Menicucci and Paolucci (2016) empirically investigated the effect of internal determinants on the European banks' profitability. They revealed a significant positive impact of capital ratio, deposit ratio and bank size on profitability, whilst high asset quality gave rise to lower profitability level.

Finally, the profitability determinants of banks was examined by Sufian and Chong (2008) in the Philippines. The results disclosed a significant negative impact of size, credit risk and expense preference behavior on profitability of a bank, measured as ROA. However, there is a significant and positive relationship between non-interest income and capitalization and profitability. Inflation rate, which represents the macroeconomic determinants, has a significant negative impact on profitability, while an insignificant relationship exists among economic growth, money supply, market capitalization and profitability. Therefore, a natural extension of this line of inquiry is to examine the impact of financial risks on the firm value of banks in ASEAN-5 countries.

## 1.2. Hypotheses development

*H1: Liquidity risk significantly influences the firm value of a bank.*

One of the crucial internal determinants of the firm value in banks is the liquidity risk, since bank's probable inability to finance increases on the asset side of the balance sheet or in accommodating reductions in liabilities and because of its ability to become a source of bank liquidation (Athanasoglou, Delis, & Staikouras, 2006). The firm value of banks can be in danger when the liquidity needed to fund illiquid asset position cannot be obtained. Meanwhile, some studies have found a positive significant effect of liquidity risk on banks' financials. (Naceur & Kandil, 2008; Distinguin, Roulet, & Tarazi, 2012). However, some studies report a negative influence of liquidity risk on bank performance (Marozva, 2015; Athanasoglou, Delis, & Staikouras, 2006; Arif & Anees, 2012). Hence, the study hypothesizes a significant relationship between liquidity risk and firm value.

*H2: Credit risk significantly influences the firm value.*

When new loans are offered at a comparatively cheaper rate, the average outstanding loan yields lower interest income, implying that the actual interest income is expected to decline, which then reduces the value of a firm. To generate more reasonable earnings, commercial banks expand the magnitude of their loans and, as a result, an increase in non-performing loans may lead to higher loan loss thereby affecting the value of a firm (Athanasoglou, Brissimis, & Delis, 2008; N. Arora, N. G. Arora & Kanwar, 2018). On the contrary, studies perceived that a controlled and desired level of loan growth enhances profit and reduces future loan losses. Therefore, the study expects a significant nexus between credit risk and firm value.

*H3: Operational risk significantly affects the firm value.*

The management of operational risk helps banks to maximize future projected cash flows through the decline in the projected costs of operational loss. Studies have shown that an upsurge in op-

erating losses resulting from service delivery can reduce the anticipated profit and lower the value of a firm (Isshaq & Bokpin, 2009). As a result, significant exposure to operational risk may have an effect on bank revenues. Few empirical studies report that a link between operational risk and firm performance is significant and positive (Demirovic & Thomas, 2007). While some studies advocate a significant negative relationship (Al-Tamimi, Miniaoui, & Elkelish, 2015; Yousfi, 2014). Therefore, this study hypothesizes a significant nexus between operational risk and firm value.

*H4: Interest-rate risk significantly affects the firm value.*

The dramatic shift in interest rates may result in a discrepancy between interest paid on deposits and interest earned on loans (Aruwa & Musa, 2014). Given the factors affecting the overall performance of financial markets, investors may incur losses resulting from interest-rate risk. A constant increase in interest rate does not deprive bank customers of the opportunity to borrow, which leads to an increase in the borrower's interest payments on loans. When many of banks choose to take on similar exposures and presumably respond to the same or similar market signals, the changes in interest rate exposed the banking sector's net interest margin. However, some previous studies support the negative effect of interest rate risk on firm performance (Aruwa & Musa, 2014; Nofiyanti, 2014; Yousfi, 2012). Hence, the study postulates a significant nexus between interest-rate risk and firm value of banks.

## 2. METHODOLOGY

### 2.1. Data sources

This study analyzes panel data for 63 commercial banks in ASEAN-5 countries, countries with emerging and developed economies, for the period 2009–2017. The period was selected to examine the ASEAN banking sector exposure to financial risk following the saga of the financial crisis. The panel is made up of ten Malaysian banks, three Singaporean banks, 25 Indonesian banks, 14 Philippine banks and 11 Thai banks as accessed through the Thomson Reuter database. The data on firm value and financial risk variables

**Table 1.** Data distribution by country and year

Year	Malaysia	Singapore	Indonesia	Philippines	Thailand	Obs. per year
2009	10	3	25	14	11	63
2010	10	3	25	14	11	63
2011	10	3	25	14	11	63
2012	10	3	25	14	11	63
2013	10	3	25	14	11	63
2014	10	3	25	14	11	63
2015	10	3	25	14	11	63
2016	10	3	255	14	11	63
2017	10	3	25	14	11	63
Number of observations	90	27	225	126	99	567

are collected from the unconsolidated statements of banks, while the macro-economic variables are sourced from the World Bank Development Indicators. The research focuses on commercial banks, representing one of the dynamically developing categories of depository institutions in the ASEAN region. The datasets were verified to prevent inconsistencies and errors resulting in a balanced panel of 567 bank observations.

With regard to data availability, there is very little and limited information available for banks in Singapore. Data are available primarily for the three local Singapore's banks, which are the largest banks in the country. In addition, the three banks are considered to be the three largest banks in the ASEAN region in terms of assets.

## 2.2. Variable definitions

### 2.2.1. Firm value

Enterprise value is a proxy used for firm value to ascertain undervalued firms (Lifland, 2011). The measurement is preferred because it offers predicted returns to investors and acquirers and costs that are useful for firm valuation that represents the overall market value of the firm (Lifland, 2011; Bhullar & Bhatnagar, 2013). Thus, the proxy for firm value is denoted by the enterprise value divided by earnings before interest, taxes, depreciation and amortization.

### 2.2.2. Risk components

The NPL to gross loan ratio intrinsically explained the loan portfolio of banks. Apparently, this ratio evaluates the asset quality based on the loan portfolio and represents the larger proportion of

default and/or defaulting loans made by a bank (Tafri, Hamid, Meera, & Omar, 2009). This ratio reflects banks' credit risk and/or is used as a measure to determine the problems in the credit quality.

The ratio of bank loans and advances to total deposits and liquid assets to total assets ratio were used in this study to proxy liquidity risk, often used in other studies (Adzobu, Agbloyor, & Aboagye, 2017; Al-Tamimi, Miniaoui, & Elkelish, 2015; Marozva, 2015; Said & Tumin, 2011). Hence, the bank liquidity risk decreases as the proportion of the liquid assets increase (Said & Tumin, 2011; Tafri, Hamid, Meera, & Omar, 2009). Therefore, the expected relationship with the firm value is negative.

The ratio of cost to income is employed to assess operational risk (Adnan, Htay, Rashid, & Meera, 2011; Pasiouras & Kosmidou, 2007; Ponce, 2012). Research argues that minimizing operational cost will enhance efficiency and, therefore, improve revenues. Hence, the study expected a negative nexus with the firm value.

NIM is the proxy for interest rate risk and is measured by the net interest income divided by average interest earned assets. This relates to the change in the interest paid to lenders and the interest revenue derived in relation to the rate of interest earning assets (Dumicic & Ridzak, 2013; Tarus, Chekol, & Mutwol, 2012; Khrawish, 2011).

The study also explores the relations between credit risk and interest-rate risk, which extends research by Ho and Saunders (1981), and Angbazo (1997). The literature review argues that they have an interactive effect on each other. Hence, the study expects a positive association with the firm value.

### 2.2.3. Control variables

In most cases, potential economies or diseconomies of scale are cases captured by the size of banks and are proxied using the natural log of total assets (Adzobu, Agbloyor, & Aboagye, 2017; Alhassan, Kyereboah-Coleman, & Andoh, 2014; Athanasoglou, Brissimis, & Delis, 2008). The link between bank size and firm value is assumed to be positive (Smirlock, 1985).

The influence of a macroeconomic variable on the firm value is often controlled by using GDP growth (Sinha & Sharma, 2016; Dumicic & Ridzak, 2013; Tafri, Rahman, & Omar, 2011). The direction of economic progress is explained by the favorable economic growth in any country that stimulates household income and other businesses.

Finally, inflation rate is employed in this study as a control variable. Ćurak, Pepur, and Poposki (2013) found that the low inflation rate and stable price suggest positive economic growth and, possibly, an increase in the firm value of banks. This study suggests a negative relationship with firm value.

## 2.3. Model specification

The research philosophy from the ontology standpoint relies on objectivism as an approach to perceive social reality. The study tends to examine the cause and effect of social phenomena based on how risk factors affect firm value. At the same, the attaining new empirical knowledge is in line with empiricism, applicable to this study and chosen as the epistemology standpoint. Furthermore, the research approach used is a deductive method, which helps to present findings that can be completely different from prior studies. The estimation technique employed is the panel data analysis; it provides informative data with less variability and less collinearity, by which the problems from omitted variables are significantly reduced.

For the robustness purpose, comparison was carried out using the Generalized Method of Moments<sup>1</sup> (Arellano & Bover, 1995; Blundell & Bond, 1998). Due to endogeneity and the existence of serial correlation, the estimator is perceived to

solve this problem in a model; and it is preferred for data with few time series and several panel. The lags of a dependent variable were incorporated as explanatory variables in the model under the dynamic model estimation. The lag of the firm value measurement was regarded as endogenous in the main model and all other factors were exogenous.

$$FV_{it} = \beta_0 + \beta_1 LR_{it} + \beta_2 CR_{it} + \beta_3 OR_{it} + \beta_4 IRR_{it} + \beta_5 CR \cdot IRR_{it} + \beta_6 SIZE_{it} + \beta_7 GDP_{it} + \beta_7 INFL_{it} + \varepsilon_{i,t}, \quad (1)$$

$$FV_{it} = \alpha_0 + \delta FV_{it-1} + \sum_{a=1}^a \beta_a LR_t^a + \sum_{b=1}^b \beta_b CR_t^b + \sum_{c=1}^c \beta_c OR_t^c + \sum_{d=1}^d \beta_d IRR_t^d + \sum_{e=1}^e \beta_e CR_t^e + \sum_{f=1}^f \beta_f CR \cdot IRR_t^f + \sum_{g=1}^g \beta_g SIZE_t^g + \sum_{h=1}^h \beta_h GDP_t^h + \sum_{i=1}^i \beta_i INFL_t^i + \varepsilon_{it} + \mu_{it}, \quad (2)$$

where FV denotes Firm value; NPL represents Non-performing loans; LD denotes the Loan to total deposit ratio; LATA represents the Liquid assets to total assets ratio; CIR denotes the Cost to income ratio; NIM indicates Net Interest Margin; SIZE denotes Natural log of bank assets; GDP denotes GDP growth rate; and INFL signifies inflation rate.

## 3. FINDINGS AND DISCUSSIONS

This section interprets and discusses the results obtained, providing a breakdown of empirical outcomes by aggregate and by country.

### 3.1. Descriptive statistics

Table 2 provides descriptive statistics for all the variables modelled in this study.

Table 2 highlights the minimum, maximum, mean and standard deviation of all the variables

<sup>1</sup> The table for the GMM estimation could not be included, and elaborated explanations could not be made due to space limitations.

**Table 2.** Summary of descriptive statistics per country: mean, standard deviation, min and max for 2009–2017

Var.	Mean for ASEAN banks	SD	Min	Max	Mean for Malaysia	SD	Min	Max	Mean for Singapore	SD	Min	Max
FV	.102	.153	-2.144	1.187	.110	.040	.001	.251	.134	.022	.086	.177
NPL	.027	.024	-.005	.245	.020	.012	.004	.077	.013	.005	.005	.027
LD	.952	.271	.314	4.112	.919	.116	.505	1.185	.973	.050	.839	1.056
LATA	.091	.072	.001	.767	.089	.114	.007	.767	.073	.030	.040	.143
CIR	.062	.036	.003	.401	.056	.067	.019	.401	.024	.010	.016	.052
NIM	.175	.092	-.423	.456	.209	.057	.042	.317	.280	.070	.143	.395
SIZE	.215	.028	.156	.277	.185	.010	.156	.204	.195	.002	.190	.200
GDP	.049	.021	-.015	.152	.047	.023	-.015	.074	.045	.042	-.006	.152
INFL	.032	.019	-.009	.064	.022	.009	.005	.038	.017	.020	-.005	.052

  

Var.	Mean for Indonesia	SD	Min	Max	Mean for Philippines	SD	Min	Max	Mean for Thailand	SD	Min	Max
FV	.078	.192	-2.144	1.102	.070	.131	-.070	.956	.177	.138	.069	1.187
NPL	.019	.014	-.005	.091	.041	.036	.005	.245	.036	.020	.013	.137
LD	.957	.134	.583	1.404	.711	.163	.314	1.119	1.270	.397	.850	4.112
LATA	.089	.031	.033	.233	.158	.058	.027	.343	.015	.007	.001	.030
CIR	.081	.025	.003	.165	.049	.015	.026	.087	.052	.012	.022	.082
NIM	.128	.097	-.423	.342	.219	.078	.026	.456	.166	.064	-.035	.283
SIZE	.246	.016	.215	.277	.194	.011	.166	.217	.204	.011	.177	.218
GDP	.053	.005	.046	.062	.057	.019	.011	.076	.031	.026	-.006	.075
INFL	.047	.017	.014	.064	.029	.012	.006	.047	.015	.016	-.009	.038

Note: FV – Firm value; NPL – Non-performing loans; LD – Loan to total deposit ratio; LATA – Liquid assets to total assets ratio; CIR – Cost to income ratio; NIM – Net Interest Margin; SIZE; GDP growth; INFL – inflation rate.

employed in the study for the ASEAN banks. The firm value of ASEAN banks has a mean of 0.1020 (10%), with a deviation of 15% from the mean. The non-performing loans have a mean of 2.7%, with a 2.4% deviation from the mean. This implies that the loan expansion of ASEAN banks is less rapid. The total loan to deposit ratio has a mean of 95%, implying that the ASEAN-5 banking industry acquires large lending base. Also, the average liquid to total asset ratio for ASEAN banks was at 9%. The cost of income ratio has a mean of 6% for the ASEAN banks. Besides, the average net interest margin of ASEAN banks was at 18%. That is, most of ASEAN banks on average realize high interest from lending activities. The average size of ASEAN banks was approximately USD 21 million, while the average GDP growth rate was 5%. Finally, the average inflation rate accounted for 3% in the ASEAN economy with a 2% deviation from the mean for the period analyzed.

### 3.2. Panel data analysis

This study used the panel data regression that accounts for the cross-sectional and time-series dimension of the dataset. In addition, a diagnostic test was also conducted before proceeding to testing panel data regression. The outcome of the variance inflation factor shows no multicollinearity in the models, since the coefficient of VIF is less than 10 and the mean is less than 5.

**Table 3.** Hausman model specification test

Firm value (FV)	Model
Chi2 =	15.64
Prob. > chi2 =	0.0286
Justification	FEM

Note: \* means significance at 1%, \*\* significance at 5%.

The first step before the Hausman test is to perform the fixed and random effects to determine which of the models will be used for the analysis. Table 3 indicates that the Hausman specification test is significant, which means that the choice of a fixed effects model in this study is justified. Therefore, the fixed effect is used as the analytical model for ASEAN aggregate data. The “Driscoll-Kraay standard error” was used to treat heteroskedasticity and autocorrelation in the model.

### 3.3. Empirical results

Table 4 gives the coefficient estimates of the analysis for the ASEAN banks, using the firm value as a dependent variable.

**Table 4.** Panel data analysis – ASEAN-5 banks

Variables	ASEAN banks		
	Coefficient	t-stats	Probability
NPL	.0756	2.78	0.024**
LD	.0050	4.67	0.002***
LATA	−0.0490	−3.81	0.005***
CIR	−0.0698	−2.68	0.028**
NIM	−0.0237	−3.92	0.004***
SIZE	−0.4130	−2.35	0.047**
GDP	.0330	2.53	0.035**
INFL	−0.0454	−2.99	0.017**
CR*IR	−0.0156	−1.80	0.109
_cons	.0519	2.43	0.041**
R-sqd	0.1404		
Prob. > F	0.0000		
Observations	567		
Hausman test	FEM (Fixed Effect Model)		
Autocorrelation	H <sub>0</sub> is rejected ( <i>p</i> -value = 0.0065*) Discroll-Kraay		
Heteroskedasticity	H <sub>0</sub> is rejected ( <i>p</i> -value = 0.0002**)		

**Note:** FV – Firm value; NPL – Non-performing loans; LD – Loan to total deposit ratio; LATA – Liquid assets to total assets ratio; CIR – Cost to income ratio; NIM – Net Interest Margin; SIZE; GDP growth; INFL – inflation rate. \*\*\* indicate significance at 1%, \*\* significance at 5%, \* significance at 10%.

The result of the empirical model explicates that the credit risk and firm value are significant and positively related. This suggests that with a 1% improvement in credit risk, the firm value will increase by approximately 8%, *ceteris paribus*. The implication is that at high risk exposure of banks to non-performing assets, the firm value improves as a result of the significant exposure. This is in contrast to the findings of Jia and Chen (2008). The loan to de-

posit ratio had a significant and positive effect on firm value; this implies that with a 1% improvement in the loan to deposit ratio, the firm value will increase by around 0.5%, *ceteris paribus*. The liquidity risk variable (the liquid asset ratio) had a significant negative effect on the firm value at a 1% significance level. The implication is that a 1% decrease in liquidity risk will increase the firm value by approximately 5%. This implies that an increase in liquid asset ratio exposed banks to liquidity risk as a result of unused funds that are not channeled towards investment, thereby leading to a significant reduction in firm value. The results also suggest that the emergence of excessive liquidity is due to less investment leading to stagnation in profit growth and firm value. Conversely, low returns are expected when banks are obliged to hold liquid assets under prudential measures, which may result in low bank profitability. This contradicts Du, Wu, and Liang (2016) who revealed a significant positive nexus.

Conversely, there is a significant and negative relationship between operational risk and firm value at the 5% significance level. This implies that a decrease in operational risk by 1% will increase the value of firm by approximately 7%, *ceteris paribus*. The implication is that when banks focus more on controlling operating costs, it naturally lowers their operating expenses, thus leading to higher turnover and firm value. Hence, the main cause for high operational failures is the failure of banks to control their fixed costs. Also, the interest rate risk (net interest margin) had a significant negative impact on firm value at the 1% significance level. This means that a decrease in interest-rate risk by 1% will increase the firm value by approximately 2%, *ceteris paribus*. This implies that the increase in earning assets financed by paying liabilities and the cost of borrowed funds will negatively affect the firm value of banks. The firm value is affected in the event of a rise or decrease in the interest rate if the size or maturity dates of assets and interest-rate liabilities are imbalanced. Unexpected fluctuations in interest rate changes, the difference between the period of cash flows and the timing of changes in interest rates, which are subject to a bank’s income and the economic value of its assets and liabilities, are exposed to interest rate risk.

Further results revealed that the bank size had a significant negative impact on the firm value, im-

plying that a decrease in size of banks by 1% will increase the firm value by approximately 41%, ceteris paribus. The implication is that the bank does not benefit from economies of scale according to its size. GDP had a significant positive impact on the value of a firm as expected; this implies that with a 1% improvement in economic conditions, the firm value will increase by approximately 3%, ceteris paribus. This suggests that favorable economic growth significantly improves the firm value of banks. However, inflation rate had a significant negative impact on the value of a firm. This suggests that a decline in inflation rate by 1% will increase the firm value by approximately 4%, ceteris paribus. Conversely, the interactive term of CR-IR had no significant effect on the firm value. Finally, the empirical findings indicate that the firm value is significantly affected by financial risks and by macro-economic variables.

### 3.3.1. Estimation results by country

This subsection analyzes the effect of financial risks on the firm value for each commercial bank by country. According to the Hausman test esti-

mates, the models, where the p-value of chi-square is significant, imply that the fixed effect (FEM) is supported. However, when the p-value of chi-square is not significant, the null hypothesis is accepted and the random effect (REM) is used. All variables in the empirical model for the five countries does not have a multicollinearity problem. If there is an autocorrelation problem without the heteroskedasticity problem, the model is treated using the panel corrected standard errors (PCSEs). However, the robust standard errors are used to cope with the potential heteroskedasticity problem in the absence of autocorrelation problem. Finally, the Discroll-Kraay standard errors are used to deal with potential heteroskedasticity and autocorrelation problems.

The result of the empirical model for Malaysian banks indicates an insignificant nexus between credit risk and firm value. The loan to deposit ratio had a significantly positive impact on firm value. The result is inconsistent with Tafri, Hamid, Meera, and Omar (2009), Ariffin and Tafri (2014). The liquidity risk variable (liquid asset ratio) shows a significant and negative impact on firm value at

**Table 5.** Panel data analysis by country

Var/Decision	Malaysia		Singapore		Indonesia		Philippines		Thailand	
	Coef.	t-stats	Coef.	t-stats	Coef.	t-stats	Coef.	t-stats	Coef.	t-stats
NPL	.0046	0.35	-.1621	-2.77***	10.9753	0.80	-2.2401	-4.24***	.0392	2.84***
LD	.0305	1.72*	.4186	3.58***	.0002	0.04	-.1401	-2.12*	.0488	3.03***
LATA	-.0346	-7.22***	-.0361	-2.92***	-.3532	-2.15**	-1.3967	-7.64***	.0108	2.37**
CIR	.0679	8.02***	-.0824	-2.88***	.0105	0.57	-.1997	-2.71**	-.7874	-2.40**
NIM	.0348	2.27**	-.1721	-3.83***	.8788	1.33	-.1137	-3.74***	-.0279	-0.24
SIZE	.3280	6.11***	-.1176	-1.67*	-.7658	-0.65	-2.1869	-3.37***	-2.2849	-5.80***
GDP	.0027	0.15	.0082	0.85	-.1537	-1.93**	.0425	3.05***	.0720	0.84
INFL	-.0081	2.02**	.4970	0.48	-.0139	-0.02	-.0122	-1.28	-.3420	-1.61
CR*IR	-1.1505	-0.34	33.8139	3.67***	-2.6045	-0.67	5.4256	2.45**	-4.2859	-3.57***
_cons	.8973	7.26***	-1.9337	-3.04***	-.1668	-0.74	-4.2307	-3.47***	.5454	6.33***
R-sqd	0.6378		0.6489		0.0313		0.4721		0.6642	
Prob. > F	0.0000		0.0003		0.0008		0.0000		0.0000	
Obs.	90		27		225		126		99	
Hausman test	FEM – 102.29 0.0000***		REM – 2.79 0.9034		REM – 2.50 0.9274		FEM – 16.08 0.0066***		REM – 3.56 0.8285	
Auto-correlation	Reject – 23.668 Ho 0.0009***		Accept – 4.632 Ho 0.1643		Accept – 0.765 Ho 0.3903		Reject – 116.715 Ho 0.0000***		Accept – 0.331 Ho 0.5777	
Heteroskedasticity	Accept – 0.07 Ho 0.7891		Accept – 2.77 Ho 0.1058		Reject – 262.86 Ho 0.0000***		Reject – 120.76 Ho 0.0000***		Reject – 171.11 Ho 0.0000***	

Note: FV – Firm value; NPL – Non-performing loans; LD – Loan to total deposit ratio; LATA – Liquid assets to total assets ratio; CIR – Cost to income ratio; NIM – Net Interest Margin; SIZE; GDP growth; INFL – inflation rate. \*\*\* indicate significance at 1%, \*\* significance at 5%, \* significance at 10%.

the 1% significance level. This is contrary to Du, Wu, and Liang (2016). Furthermore, operational risk, interest-rate risk, bank size and inflation rate all have a significant positive effect on firm value of Malaysian banks. However, a significant and negative relationship exists between GDP and firm value, while the CR-IR is insignificant.

The empirical model for Singaporean banks shows that credit risk, the liquid asset ratio (LATA), operational risk, interest-rate risk and bank size have a significant negative effect on firm value. The nexus between loan to deposit ratio (LA) and the CR-IR with firm value is significant and positive. This is inconsistent with Ariffin and Tafri (2014). However, GDP growth and inflation rate have no significant effect on firm value. The findings for Indonesia illustrate that both liquid asset ratio (LATA) and GDP growth have a significant negative impact on firm value, while the other variables are not significant. The model for Philippine banks indicates that the credit, liquidity, operational and interest-rate risks and GDP growth all have a significant negative effect on firm value of banks. However, inflation rate is insignificant with firm value.

The model for commercial banks in Thailand reveals a significant positive relationship among credit risk, liquidity risk and firm value, implying that improvement in both will result in a rise in firm value. While operational risk, bank size and CR-IR have a significant negative effect on firm value. However, the nexus between interest-rate risk, GDP growth, inflation rate and firm value is insignificant.

### 3.4. Robustness checks

The study used the GMM estimation to compare with a fixed-effect model with a view of offering additional validity to empirical results. The model used to analyze aggregate data was re-evaluated using the GMM system to establish the reliability of previous estimates, as suggested by Goddard and Wilson (2009). The Sargan test and Arellano-Bond test for autocorrelation were conducted before analyzing the dynamic panel estimation. The null hypothesis in the Sargan test implies that over-identifying constraints are valid, and the study accepts the null hypothesis since the Sargan test's p-values are higher than 5 percent (0.2504), suggesting that the models used are valid.

The Arellano-Bond test's null hypothesis for zero autocorrelation states that the differenced error term is not serially correlated in the first or second order. Hence, the second-order autocorrelation is not significant (p-value = 0.2595) for the regression estimated using GMM. This simply implies that the model is thus suitable and the estimates are consistent and efficient, and that the two conditions for system-GMM estimators are met; hence, the model is specified correctly. The results reveal that liquidity risk (LATA), operational risk and CR-IR have a significant negative relationship with the firm value. However, credit risk, loan to deposit ratio, interest-rate risk, bank size, GDP growth and inflation rate have a significant positive relationship with the firm value. This suggests that the financial risk components are relevant in the context of ASEAN-5 countries.

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## CONCLUSION

This study introduces a new perspective on the systematic exploration of cause-and-effect relationships between financial risk components and the firm value of ASEAN-5 countries. Research findings are believed to be vital for managers, investors, policy-makers and scholars, while some conclusions were also drawn based on the empirical work. A further contribution of this study is based on the introduction of a new firm value-related variable (enterprise value) other than the traditional firm value-related variable (Tobin's q), and a long-term firm value analysis is expected to be new and useful empirical evidence. It also estimates enterprise value as a robust measure of firm value over other proxies used, as it provides researchers with predictable revenue and cost streams.

The study concludes that the components of financial risks (credit, liquidity, operational and interest rate risks) are more significant for banks in the context of ASEAN-5 banks. In addition, the study rec-

ommends that the bank-specific and macroeconomic factors are taken into account when formulating policy to enhance and improve firm value. Therefore, the results of the study confirm the hypotheses and allow regulatory agencies in emerging countries to be more proactive in implementing and formulating sound risk management framework that can strengthen the competitive banking sectors.

This empirical research provides an important signal to policy makers that is useful to effectively mobilize and allocate credits to productive areas and help in managing inherent risks. Inadequate investment of unused funds should be minimized as they may impede the financial system from developing effectively. The financial activities of banks should be paramount to the policy makers regarding cost-oriented regulatory, operational and effective participation in the credit market. Furthermore, managers and policy makers should focus on promoting effective and healthy competition and a supportive environment that encourages innovation to increase risk-sharing and improved firm value.

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