Profits and Risks of ASEAN Commercial Banks: Granger Causality Test

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Abstract. The purpose of this chapter is to the profit and risk causality of ASEAN commercial banks. Using data from 118 ASEAN commercial banks from 2002 to 2017, we measure returns by the ratio of net return to total assets (ROA) and net return to equity (ROE). Banking risk is measured by the Zscore index. We set up panel vector auto regression (PVAR) to estimate this relationship. Our result indicate that there is a causal relationship between ASEAN banks returns andd risks, supporting the “bad management”, “skimping”, and “moral hazard” hypothesis of . The result of this study is the basis for providing governance implications for executive managers to improve the bank’s profitability while ensuring safety.

Keywords: Bank profitability, risk, PVAR, ASEAN.

1. INTRODUCTION

The Asian financial crisis in 1997 and the US in 2008 have shown concerns about the stability of financial systems in Asian countries. Profits are often attributable to the fragility of banks. Profits and risk are the key issues that bank managers always pay close attention to. In the Southeast Asian context, after the 2008 financial crisis, the rapid growth of banking consolidation has changed banking financial structures such as financial integration, privatization and deregulation, mergers and acquisitions, financial reforms, and foreign banking penetration. Furthermore, investment banks, mutual funds, and insurance companies are currently competing with the core businesses of commercial banks.

In this context, bank profits and risk are very important to the existence and development of commercial banks. Therefore, the relationship between bank profit and risk has always attracted academics around the world in recent years. However, most studies assess the one-way impact between bank profit and risk as studies. Few studies have analyzed the Granger Causality relationship between returns and risks in ASEAN emerging markets, except for studies in Africa, America, or Asia in Chinese financial...
markets. The above analysis shows that studying the causal relationship between profitability and risk of commercial banks in ASEAN is very important and valuable.

2. RELATED LITERATURE AND HYPOTHESES

Profits and risks in the banking system have an interwoven relationship that is both a driving force for banks to improve productivity and operational efficiency as well as a factor affecting the stability of the banking system. An entity will not invest in a risk portfolio if it does not expect to receive a return commensurate with the risk. In other words, these discussions are not intended to answer the question of why a bank cannot achieve maximum returns under risky operating environments. The relationship between risk and banking performance was first studied by, associated with hypotheses: the “bad luck”, “bad management”, ‘skimping” and “moral hazard”.

The impact of risk on returns:

The “bad luck” hypothesis states that an increase in bad debt and Granger-cause reduces banking efficiency and leads to a decline in profits. At this time, an increase in bad debt is influenced by factors such as macro GDP, inflation, unemployment, lower interest rates, increasing money supply,… Which forces commercial banks to increase management activities credit portfolio, especially near maturity credits. The increase in management, debt sale,…, increased costs, reducing the banking efficiency, leading to a decline in profits. By the above argument, the author hypothesizes:

H1: The increase of risk is the cause of the decline in profits

The impact of returns on risk:

The “bad management” hypothesis show that low-cost efficiency and declining profitability are the signals of poor governance such as loan portfolio management, credit supervision, operating cost management,…, At the same time, managers do not fully control and supervise expenses, resulting in low cost-effectiveness, lower profits, which will increase the reaction of the NPLs. Thus, low banking efficiency leading to reduced profitability is a sign of weak and causal business performance causing bad debts (NPLs) to rise. The expectation in this relationship is negative between bad debt and bank profits. This also means a negative relationship between bad debt and bank profits.

The “Skimping” hypothesis tested is similar to bad management but the signal is reversed, meaning a negative causal relationship from bank profits to bad debt. Here, the key decision of the bank lies in the conflict between short-term operating costs and problems with loan quality. Therefore, a bank that wants to maximize profits in the long term must choose to cut costs in the short term 9such as ignoring the cost of credit appraisal, monitoring loans…) should suffer the consequences of bad debt appears in the future. At this point, the higher the bank’s efficiency, the higher the bank’s profits will have negative effects on Granger’s bad debt. This negative relationship is supposed to trade future loan performance (long-term profit maximization expectation) for short-term efficiency of bank costs.

Contrary to the “skimping” hypothesis of, the “risk-averse management” hypothesis by argued that senior executives often tend to avoid risks, thus increasing
costs for monitoring, controlling, and guaranteeing loans to reduce bad debt. Therefore, the concern about the effects of the financial crisis and asymmetric information explains the relationship to be in the same direction, meaning that the cost-effectiveness increases proportionally with the rate of increase of the impact returns positively reduce the bad debt ratio.

Finally, the “moral hazard” hypothesis refers to the conflicting relationship between risk and bank returns and that low-capital banks often have an incentive to invest in risky assets, and in the long run, the risk will increase. Therefore, banks with relatively low capital will be the cause of inefficient loans. Conversely, high-capital banks often do not face the ethical risk or ineffective loans. Meanwhile, the cost-effectiveness is assessed by these loans. This, showing that the inefficiency in terms of costs will lead to a decline in profits is the basis for increasing banking risks in the future. By reasoning above, the thesis proposes the following hypothesis:

\[ H2: \text{The decrease in profit will be the cause of the increased risk.} \]

3. METHODOLOGY

3.1. Data

Data of studies are taken from Bank scope’s source. To avoid frequency, we consider the consolidated financial report. We filter the data as commercial banks, including listed and unlisted banks, and eliminate banks with less than five reporting years and those with the latest reporting year smaller than 2016. After cleaning the data, our final sample included 118 commercial banks in eight countries: Cambodia, Indonesia, Laos, Malaysia, Philippines, Singapore, Thailand, and Vietnam, between 2002-2017. It is unanimously converted to USD currency at the local currency/USD exchange rate from the IMF source.

3.2. Calculating based profit and risk

Bank profit is measured by ROA and ROE, in particular:

\[ \text{ROA} = \frac{\text{Net profit}}{\text{Total assets}}, \text{ and } \text{ROE} = \frac{\text{Net profit}}{\text{Total equity}} \]

Based on financial statement data, bank risks are measured by the Zscore index. The Zscore is used to measure the solvency risk of commercial banks. It is a reverse proxy of the firm’s probability of failure, and it combines profits, leverage, and volatility back in a single measure. For each bank I and time t, it is determined as follows:

\[ Z_{score} = \frac{\text{ROA}_{it} + \frac{E_{it}}{TA_{it}}}{\delta \text{ROA}_{it}} \]

Where ROA is the return on assets; E/TA is the ratio of equity to total assets; ROA is the standard deviation of return on assets. The higher the Zscore, the greater the stability, and the lower the risk.

3.3. Panel VAR model

We consider the causal relationship between profit and risk through a system of the PVAR model. The two variables included in the model are profit and risk, and lags of the two variables, in which the short-term dynamic relationship is defined.
Following, and, the dynamic relationship between endogenous variables is shown in the PVAR equation as follows:

\[ m_{it} = \theta_i + \theta m_{it-1} + \epsilon_{it} \]  \hspace{1cm} (3.1)

Where, \( m_{it} \) consists of two random variables, profit, and risk, \( \theta_i \) is a (kx1) vector of the blocking coefficient vector constant over time given for each specific bank, \( \sigma(\tau) \) is the matrix (kx k) of the coefficient of the lag variable (the parameter to estimated), \( \sigma(\tau) \equiv \sum_{j=1}^{p} \sigma_{j} \tau_{j}^{-1} \), to collect the unique and cross effects of these lag variables depends on observation. And \( \epsilon_{it} \) is a (1xk) vector of errors measurement with characteristics, \( E(\epsilon_{it}) = 0, (E, \epsilon_{it} \epsilon_{it}') = \sum \epsilon, E(\epsilon_{it} \epsilon_{it}') = 0 \) for all t. The coefficient of \( \theta_i \) in equation (3.1) is correlated with the error part, and through least square regression OLS will bias coefficients as in and.

For solving the above issue, especially in highly observable table data with few timelines, we are advised to transform the model to eliminate the fixed effects individually and then use the system GMM estimation method to use the delay of observation as an instruments’ variable.

After performing the regression system PVAR equation, we estimate the impulse response functions (IRF) and variance decomposition (VDC) to identify the orthogonal shocks between the profit variable and the risk variable. We use the IFRS to assess the current and future response of profit to the shock of risk and the opposite. Variance decomposition calculates the percentage of shift on profit explained by the shock of risk over time and the opposite.

In particular, we determine the causal relationship between profit and risk according to the two PVAR equations with the following structure:

\[ \text{Pro}_{it} = f(\beta, \text{Pro}_{i,lag} \text{Risk}_{i,lag} \epsilon_i, \eta_{it}) \]
\[ \text{Risk}_{it} = f(\gamma, \text{Risk}_{i,lag} \text{Pro}_{i,lag} \epsilon_i, \eta_{it}) \]  \hspace{1cm} (3.2)

Where \( i \) is the bank, \( t \) is the time, \( \text{Risk} \) is measured by Zscore index for the bank \( i \) in time \( t \), \( \text{pro} \) is the profit for the bank \( i \) in time \( t \), \( \text{lag} = (1,\ldots,j) \).

4. EMPIRICAL RESULTS AND DISCUSSION

4.1. Profit and risk results

Table (1) statistics describe the variables for the number of observations (Obs), average (Mean), standard deviation (std.Dev), minimum (Min), and maximum (Max) of for banks.

| Variable | Obs  | Mean | Std. Dev | Min   | Max   |
|----------|------|------|----------|-------|-------|
| ROA      | 1,694| 0.017| 0.053    | -0.052| 1.568 |
| ROE      | 1,694| 0.561| 0.280    | -4.099| 0.911 |
| Zscore   | 1,694| 1.787| 1.404    | -0.293| 30.396|

Note: Zscore is risk, ROA and ROE are profits
Table (1) shows the average ROA of 0.017, the average ROE of 0.561. Next, the average Zscore of 1.787, which is similar to the average of 30.59 for the Asia Pacific commercial banks.

4.2. Panel VAR result

For performing the regression PVAR model, it needs to select the optimal lag length \( j \) of the independent variable in the system of Eq.(3.2). We select the lag length so that the minimum values of MBIC, MAIC, MQIC, and CD are maximum. The result in table 2 shows that the optimal lag length is one, which is similar to and.

| lag | CD   | Jpvalue | MBIC | MAIC | MQIC |
|-----|------|---------|------|------|------|
| 1   | -5.534 | .       | .    | .    | .    |
| 2   | -42.995 | .       | .    | .    | .    |
| 3   | -12.395 | .       | .    | .    | .    |
| 4   | -20.554 | .       | .    | .    | .    |

Note: The values of MBIC, MAIC, MQIC are minimum, CD is maximum.

For the PVAR estimation, the condition necessary to perform the analysis of values obtained from the model, it needed to test the stationarity of the variables in the model. Because this study use unbalanced table data, Fisher 3 Phillips-Perron (PP) panel unit root test is consistent with the null hypothesis \( H_0 \) that all table data does non-stationarity. The results of the ADF test are usually very sensitive to the choice of lag length, so the optimal lag length standard is taken from the result of Table 2. The results of the Fisher Phillips-perron panel unit root test in Table 3 show that all four tests obtained p-value with a significance level below 5%, so they reject the null hypothesis \( H_0 \) that all panel series non-stationary for profit and risk in banks, meaning ROA, ROE, and Zscore in unbalanced data panel is PVAR satisfies stop condition. Table 4 shows all the eigenvalues lie inside the unit circle so PVAR satisfies the stability condition (see Figs. 1 and 2)

| Variable | Statistic | p-value |
|----------|-----------|---------|
| ROA      | Inverse chi-squared(236) | P | 1094.833 | 0.000 |
| ROE      | Inverse chi-squared(236) | P | 791.354  | 0.000 |
| Zscore   | Inverse chi-squared(236) | P | 836.633  | 0.000 |
|          | Inverse normal           | Z | -14.311  | 0.000 |
Inverse logit t(594)  L*  -18.772  0.000
Modified inv. chi-squared  Pm  27.646  0.000

Note: lag length is one; base on Dickey-Fuller test.

Table 4. Eigenvalue stability condition in PVAR

| Eigenvalue     | Imaginary | Modulus |
|----------------|-----------|---------|
| Real           |           |         |
| Model: ROA and Zscore |           |         |
| 0.908          | 0         | 0.908   |
| -0.743         | 0         | 0.743   |
| Model: ROE and Zscore |           |         |
| 0.758          | 0         | 0.758   |
| -0.120         | 0         | 0.120   |

Note: The stability condition of PVAR when all the eigenvalues lie inside the unit circle (see Figs. 1 and 2)

Fig.1. Stability condition of PVAR: ROA and Z-score.

Fig.1. Stability condition of PVAR: ROE and Z-score.
Table 5 shows both panel VAR estimates model (1) Granger causality between ROA and Zscore, and model (2) between ROE and Zscore for all sample banks.

The impact of bank risk (Zscore) on bank profit (ROA) is positive and significant at 10% (column 2, model (1) of Table 5). On the other hand, the impact of bank profit (ROA) on risk is negative and significant at 1%. Thus, the change in bank risk ratio is the cause of the change in bank profit. Opposite, the change in bank profit (ROA) is also the cause of the change in bank risk. In other words, an increase in Zscore, a decrease in risk leads to bank profits increase. However, an increase in profit (ROA) leads to a decrease in Zscore, bank risk increase. This result supports hypothesis H2 and “bad management”, “skimming” and “moral hazard” of , which is similar to , and .

In column 3, model (2) of Table 5 shows, the change in bank risk is the cause of the change in bank profit. Opposite, the change in bank profit is not the cause of the change in bank risk. The impact of bank risk (Zscore) on bank profit (ROE) is negative and significant at 1%. Reducing bank risk will decrease bank profit (ROE).

Table 5. Granger causality analysis results: ROA Zscore (1) and ROE Zscore (2)

| Variable | ROA (1) | ROE (2) |
|----------|---------|---------|
| L.ROA    | -1.386*** | [-3.18] |
| L.Zscore | 0.0387*  | -0.0376*** |
|          | [1.71]   | [-3.15] |
| L.ROE    | -0.0664  | [-0.41] |
|          | Zscore   | Zscore  |
| L.ROA    | -38.15*** | [-3.15] |
| L.Zscore | 1.551**  | 0.705 |
|          | [2.55]   | [1.46] |
| L.ROE    | -1.178   | [-0.50] |
| N        | 1457     | 1457    |
| Hansen's J chi2(8) | 10.77931 | 7.0974706 |
| p-value  | 0.215    | 0.526   |

Note: This table presents the coefficient estimation for the two baseline variables in the PVAR model. T statistics in brackets, *** p<0.01, ** p<0.05, * p<0.1; PVAR –Granger causality Wald test: H0 is excluded variable does not Granger-cause equation variable, H1 is excluded variable Granger-causes equation variable.

4.3. Impulse response functions and variance decompositions

The result in Fig.3 shows a shock to the Zscore, which results in a strong decrease in the ROA for the first stage but this immediately increases and lasts, then continues to hold this pattern for the next stage (in the upper right corner of Fig.3a), while a shock to
the ROA results no longer affected the Zscore for the first stage and lasts for the next stage (in the under a corner of Fig.3a).

Fig.3b shows that a shock to the Zscore result in a strong decrease in the ROE for the first, second stage, then an increase for the 3rd stage and lasts the next stages (in the upper wrong corner of Fig.3b). While a shock to the ROE no longer affects the Zscore for the first stage, it lasts for the next stages (in the under left corner of Fig.3b).

The result in Table 6 (Model: ROA and Zscore) analysis of variance decomposition between profit (ROA) and risk ratio (Zscore) are shown as follows:

The change in profit (ROA) is explained by the risk ratio (Zscore) of 0.1% for the first stages and more than 13% for the next stages. Thus, the influence of risk on profit has a relatively large explanation in the subsequent stages. On the other hand, the change in risk ratio (Zscore) is explained by the profit of 0.79% for the first stages and a decrease of nearly 0.45% for the next stages.

Figure 3: (a) Impulse-responses functions for one lag VAR of ROA and Zscore, and (b) Impulse-responses functions for one lag VAR of ROE and Zscore

Table 6 (Model: ROE and Zscore) shows that the change in profit (ROE) is explained by the risk ratio (Zscore) of nearly 0.07% for the first stages and more than 12% for the next stages. Opposite, the shift in risk ratio is explained by the profit of just over 2%.
### Table 6. A Forecast variance decomposition for impulse variable: ROA and Zscore; ROE and Zscore.

| Response variable and Forecast horizon | Impulse variable |    |   | Model: ROA and Zscore |    |   | Response variable and Forecast horizon | Impulse variable |    |   | Model: ROE and Zscore |    |   |
|---------------------------------------|------------------|---|---|-----------------------|---|---|---------------------------------------|------------------|---|---|-----------------------|---|---|
| ROA                                   | ROA              | Zscore |    |                       | ROE | Zscore |    |                       | ROE  | Zscore |    |                       |    |   |
| 0                                     | 0                | 0      | 0  |                       | 0   | 0      | 0  |                       | 0    | 0      | 0  |                       |    |   |
| 1                                     | 1                | 0      | 0  | 2                     | 0.905 | 0.095 | 2  | 0.931                  | 0.069 | 0      | 0  |                       |    |   |
| 3                                     | 0.919            | 0.081  | 0  | 3                     | 0.906 | 0.094 | 3  |                       | 0.906 | 0.094 | 0  |                       |    |   |
| 4                                     | 0.891            | 0.109  | 0  | 4                     | 0.891 | 0.109 | 4  |                       | 0.891 | 0.109 | 0  |                       |    |   |
| 5                                     | 0.894            | 0.106  | 0  | 5                     | 0.883 | 0.117 | 5  |                       | 0.883 | 0.117 | 0  |                       |    |   |
| 6                                     | 0.880            | 0.120  | 0  | 6                     | 0.878 | 0.122 | 6  |                       | 0.878 | 0.122 | 0  |                       |    |   |
| 7                                     | 0.878            | 0.122  | 0  | 7                     | 0.876 | 0.124 | 7  |                       | 0.876 | 0.124 | 0  |                       |    |   |
| 8                                     | 0.871            | 0.129  | 0  | 8                     | 0.874 | 0.126 | 8  |                       | 0.874 | 0.126 | 0  |                       |    |   |
| 9                                     | 0.869            | 0.131  | 0  | 9                     | 0.873 | 0.127 | 9  |                       | 0.873 | 0.127 | 0  |                       |    |   |
| 10                                    | 0.864            | 0.136  | 0  | 10                    | 0.873 | 0.127 | 10 |                       | 0.873 | 0.127 | 0 |                       |    |   |
| Zscore                                | Zscore           |    |   |                       | Zscore |    |   |                       | Zscore |    |   |                       |    |   |
| 0                                     | 0                | 0      | 0  |                       | 0    | 0      | 0  |                       | 0    | 0      | 0  |                       |    |   |
| 1                                     | 0.792            | 0.208  | 1  |                       | 0.000 | 1.000  | 1  |                       | 0.000 | 1.000  | 0  |                       |    |   |
| 2                                     | 0.567            | 0.433  | 2  |                       | 0.016 | 0.984 | 2  |                       | 0.016 | 0.984 | 0  |                       |    |   |
| 3                                     | 0.579            | 0.421  | 3  |                       | 0.019 | 0.981 | 3  |                       | 0.019 | 0.981 | 0  |                       |    |   |
| 4                                     | 0.512            | 0.488  | 4  |                       | 0.020 | 0.980 | 4  |                       | 0.020 | 0.980 | 0  |                       |    |   |
| 5                                     | 0.505            | 0.495  | 5  |                       | 0.021 | 0.979 | 5  |                       | 0.021 | 0.979 | 0  |                       |    |   |
| 6                                     | 0.473            | 0.527  | 6  |                       | 0.021 | 0.979 | 6  |                       | 0.021 | 0.979 | 0  |                       |    |   |
| 7                                     | 0.465            | 0.535  | 7  |                       | 0.021 | 0.979 | 7  |                       | 0.021 | 0.979 | 0  |                       |    |   |
| 8                                     | 0.447            | 0.553  | 8  |                       | 0.021 | 0.979 | 8  |                       | 0.021 | 0.979 | 0  |                       |    |   |
| 9                                     | 0.441            | 0.559  | 9  |                       | 0.021 | 0.979 | 9  |                       | 0.021 | 0.979 | 0  |                       |    |   |
| 10                                    | 0.430            | 0.570  | 10 |                       | 0.021 | 0.979 | 10 |                       | 0.021 | 0.979 | 0 |                       |    |   |

Source: Authors synthesize themselves

### 5. CONCLUSION

This study used the PVAR estimation method and Granger causality test to regress the causal relationship between profit and risk for ASEAN commercial banks. Our research is to measure return and risk, in addition to analyzing the causal relationship between return and risk throughout the PVAR model.
An interesting result of the PVAR model is that both the impact (i) of risk on profit and (ii) of profit on risk is significant for the sample of ASEAN banks. Except for the impact of profit measure by equity per total asset ratio on risk.

IRF and VDC indicate that the causal relationship between profit and risk is rigid for ASEAN banks. There is a change in risk that shows close causality: (1) The decrease in risk leads to an increase in profit (ROA); (2) A decrease in risk, increase stability (Zscore) also leads to deduce in profit (ROE). Opposite, an increase in profit (ROA) also leads to a rise in risk. However, an increase or decrease in profit (ROE) no effect on the risk bank. In which the important role of management is focused.

Our results have some administrative implications. First, commercial banks need to consider and screen the profitability of risky assets, and then have appropriate lending policies to improve profits while ensuring safety. Second, the bank executives in their business need to improve the management of the bank’s costs and income, which requires consideration between traditional operations and diversification strategies. Third, our findings provide evidence for a causal relationship between return and risk, besides supporting both the “bad management”, “skimping” hypothesis, which suggests managers should focus on solving this problem by developing appropriate for banks and improving management capacity.

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