Performance of Vietnamese commercial banks in ASEAN Economic Community

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Abstract. In this study, the author assesses and compares the performance of commercial banks in Vietnam and ASEAN countries in the period of 2013-2017 by using parametric approach, using SFA method (Stochastic Frontier Analysis). The results showed that the average efficiency of ASEAN commercial banks in the study period was 0.77, the lowest efficiency was 0.11, the highest efficiency was 0.96. This result also shows that the efficiency of ASEAN commercial banks in the period of 2013 - 2017 is relatively low, with this result if the average output does not change, commercial banks can save as much as possible. 23% of the input. The results also show that the average efficiency of Brunie commercial banks is the highest at 0.87%, ranked second is Thailand with average technical efficiency of 0.83. Ranked last among the 9 ASEAN commercial banking systems in the research period is Singapore commercial banks with average technical efficiency of 0.72 above are Lao commercial banks with an efficiency of 0.73. Vietnam's commercial banking system with technical efficiency in the research period was 0.75, ranked 6th among 9 ASEAN countries.

1 Introduction

ASEAN Economic Community (AEC) was officially established on December 31, 2015, this event brought many opportunities and great challenges for Vietnamese enterprises. In order to penetrate the ASEAN market, Vietnamese enterprises must first have a foothold, exist and develop in the domestic market, become a partner instead of a competitor, increase their competitiveness, and step by step enter the ASEAN market, since then firmly entered the larger markets. According to experts, when joining AEC, enhancing the competitiveness of Vietnamese enterprises is indispensable if Vietnam wants to integrate successfully. Because in integration, the competition is not only about goods but also services, investment, and the movement of skilled labour resources of ASEAN countries.

The Vietnamese commercial banking system has experienced rapid developments in quantity, size and quality over the past 30 years. However, compared to other countries in the region and the world, Vietnam's commercial banking system is still young in terms of development history, asset size, distribution network, and efficiency, becoming a great

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awareness in international and regional integration process in the context of Vietnam joining the ASEAN Economic Community - AEC.

In the current competitive and integrated environment, the Vietnamese banking system not only maintains efficiency and must improve its competitiveness with non-bank main organizations, and compete with banks. Foreigners are penetrating into Vietnam market to compete for market share. ... The Vietnamese banking system needs to be competitive in order to penetrate into markets of regional countries and ASEAN member countries.

From practical demands and pressing needs in Vietnam, especially in the context of regional integration and globalization. In this study, the author uses the SFA (Stochastic Frontier Analysis) method to evaluate the performance of commercial banks in Vietnam and ASEAN countries, thereby assessing the performance of Vietnamese commercial banks compared with other commercial banks in ASEAN economic community.

2 Literature Review

In the field of banking, performance is defined by many different perspectives. According to [1] “Efficiency is a comparison between input and output or between profit and cost. With the same given input, the activity that produces the bigger output is the more efficient one.” Thus, it is possible to understand the performance of commercial banks can be understood in three directions: (1) minimizing costs, ie using the least input factors such as capital, facilities and labour, ... to generate income, (2) keep the same inputs but generate more outputs, (3) use more inputs but the amount of generated output increases faster than the rate of head increase to enter.

There are many researches on banking performance in the world. [2] used Data Enveloping Analysis (DEA) method to study the performance of 26 banks including domestic banks and foreign banks operating in South Africa. Or the study of [3] using DEA method to measure the performance of banks in Vietnam, Thailand, Malaysia, Philippines, , Indonesia 1998 - 2004.

[4] analyzed the effectiveness of 22 Vietnamese commercial banks in 2008 using data analysis methods of DEA, [5] studied the effectiveness of 29 Vietnamese commercial banks in the period of 2007-2012 by using data envelope method (DEA) and random boundary analysis (SFA) The results show that overall efficiency of commercial banks in Vietnam during the study period was about 70%, of which the highest efficiency was 98.55% and the lowest efficiency was 43.80%.

[6] use the DEA approach to estimate the effectiveness of the Indian banking system or [7] using the DEA and SFA method to assess the performance of Vietnamese commercial banks between 2000-2007 and 2008-2012.

In recent years, there have been many studies in many countries and territories studying the efficiency of banking industry. [8] uses DEA to estimate technical efficiency (TE), scale efficiency (SE), cost effectiveness (CE), mixed efficiency (ME) of commercial banks in 4 ASEAN countries. [9] use the DEA method to estimate the effectiveness of the system of 217 commercial banks in 10 countries MENA.

[10] studied the efficiency and competitiveness of the Mexican commercial banking system from 2002 to 2012, by non-parametric approach DEA to estimate the performance of the Mexican commercial banking system. [11] uses DEA method, studying the performance of commercial banks in Indonesia and commercial banks in 5 ASEAN countries, including: Vietnam, Malaysia, Thailand, Singapore, Philippines. [12], using SFA method to estimate the cost function, study the effectiveness of commercial banks of 15 commercial banks with large assets in 5 ASEAN countries, including: Indonesia, Malaysia, Thailand, Singapore, Philippines (each of 3 commercial banks with the largest total assets)
in the period of 2005 - 2016. Similar research were also conducted by [13, 14] for emerging markets.

3 Methodology

3.1 SFA approach

The SFA method is often used in models of production, cost or profit analysis. The boundary production function has the form:

\[ Y_i = f(x_{ij}; \beta) \exp(V_i - U_i) \]  
\[ (1) \]

\( Y_i \) is the total operating income of the bank \( i \)
\( X_{ij} \) is the \( j \)th element of the \( i \)th bank
\( \beta \) is the coefficient to be estimated (parameter of the variable \( X_{ij} \))
\( V_i \) is a statistical error due to random factors and is assumed to have a normal distribution (iid), \( N(0, \sigma v^2) \) and is independent of \( U_i \).
\( U_i \) is the technically ineffective part, which is assumed to be greater than or equal to 0 and has a half-normal distribution \( N(0, \delta u^2) \).

If \( U = 0 \) activities of banks on the boundary, the effectiveness of banks will be maximized based on existing factors and techniques. If \( U > 0 \) operation of banks is below the boundary, the actual efficiency \( (Y_i) \) is lower than the maximum efficiency \( (Y^*) \) and the difference \( (Y^* - Y_i) \) is the non-technical efficiency part. The higher the coefficient is, the lower the technical efficiency and vice versa.

The technical efficiency (TE) is calculated as follows:

\[ TE = \frac{Y_i}{Y_i^*} = \frac{f(x_{ij}; \beta) \exp(V_i - U_i)}{f(x_{ij}; \beta) \exp(V_i)} = \exp(-U_i) \]  
\[ (2) \]

In which \( Y_i \); \( Y_i^* \) is the total actual income and the maximum income of the \( i \) bank; \( ij (x_{ij}; \beta) \) is a frontier production function (Frontier Production Function). The estimates in the paper were calculated using Coelli's FRONTIER 4.1 software (1996). The coefficients were estimated using the maximum likelihood method through three steps:

1) The first OLS regression is performed, the coefficients \( \beta \) except the blocking coefficients are non-biased estimates.
2) Use grid search to estimate \( \gamma \)
3) The result obtained from step 2 is used as the initial value of the iterative algorithm according to the Davidon - Fletcher - Powell Quasi - Newton method to obtain maximum likelihood estimates.

Then the technical inefficiencies of each firm in each period will be calculated according to the formula of Battese and Coelli. The estimate of the average inefficiencies of each period is only the algebraic average of the individual values for each bank.

In SFA method, we need to estimate a production function, the boundary production function can be estimated by many different models such as: Leontief function, linear production function, homogeneous production function, production function CES format, neoclassical function, Cobb - Douglas function, translog function. In production economics, there are two commonly used models: Cobb - Douglas production function and translog production function, in this study, the Cobb - Douglas function is used.

Cobb - Douglas production function:

\[ \ln Y_i = \beta_0 + \beta_1 \ln X_{1i} + \beta_2 \ln X_{2i} + \beta_3 \ln X_{3i} + (V_i - U_i) \]  
\[ (3) \]
3.2 Input and Output Selection

According to [13] there is no perfect approach in determining the bank's inputs and outputs because there is no approach that can reflect all of the bank's activities and roles. Goods as an organization providing financial services. According to him, the intermediary approach is the most appropriate, considering banks as financial intermediaries between the savings and investment sectors. In this study, the author uses an intermediary and deposit approach as one of the input variables of the research model.

The variables of the model include 4 input variables: Equity (Input1-EQT), data taken from the equity of the commercial bank include: Capital of the banks (Charter capital, treasury shares), Fund of the banks and undistributed profits in the balance sheet of commercial banks. Deposits from customers (Input2 - DEP), data taken from customers' deposit in the balance sheet of commercial banks. Loans (deposits and borrowings from other credit institutions, issuance of valuable papers, debt securities, other borrowings. Input3 - BOR), data are taken from: Government debts and central bank; deposits and borrowings from other credit institutions; Issuing valuable papers, other debts ... in the section of Payables on the balance sheet of commercial banks. Operating expenses (Input4 - OPE), data are taken from Operating expenses in the report on business results of commercial banks. Output variable: Total operating income (Output - TOI), data taken from the report of business results of commercial banks include: Net interest income; Net gain / loss from service activities; Net gain / loss from foreign currency trading; Net gain / loss from securities trading; Net gain / loss from other activities

4 Data and Results

4.1 Data

Data sources include 130 commercial banks in 9 countries including: 31 Vietnamese commercial banks, 2 Brunei commercial banks, 12 Cambodian commercial banks, 26 Indonesian commercial banks, 10 Lao commercial banks, 15 Malaysian commercial banks, 14 Philippine commercial banks, 4 Singapore commercial banks, 16 Thailand commercial banks in period 2013-2017. The data is taken from the annual reports of commercial banks and official figures of the State Bank of Vietnam, the General Statistics Office of Vietnam, relevant ministries and statistics of national financial institutions. such as IMF, WB, ADB ... along with other official data sources.

| Nation      | Number of banks | Number of observations |
|-------------|-----------------|------------------------|
| Vietnam     | 31              | 155                    |
| Brunei      | 2               | 10                     |
| Cambodia    | 12              | 60                     |
| Indonesia   | 26              | 130                    |
| Laos        | 10              | 50                     |
| Malaysia    | 15              | 75                     |
| Philippine  | 14              | 70                     |
| Singapore   | 4               | 20                     |
| Thailand    | 16              | 80                     |
| Total       | 130             | 650                    |

Table 1. Number of commercial banks for each ASEAN country in the sample.
| Country | Output | Input 1 | Input 2 | Input 3 | Input 4 |
|---------|--------|---------|---------|---------|---------|
|         | TOI    | EQT     | DEP     | BOR     | OPE     |
| Viet Nam |        |         |         |         |         |
| Mean    | 288,849| 611,364 | 6,455,446| 1,427,725| 139,245 |
| Max     | 1,896,812| 2,813,381| 44,460,360| 11,318,852| 869,478 |
| Min     | 21,321 | 57,465  | 407,982 | 954     | 13,157  |
| Std     | 393,729 | 633,540 | 8,720,615| 1,941,938| 176,319 |
| Obs     | 155    | 155     | 155     | 155     | 155     |
| Brunei  |        |         |         |         |         |
| Mean    | 144,189| 518,029 | 2,875,561| 220,112 | 53,070  |
| Max     | 264,104| 994,245 | 5,573,019| 399,442 | 88,385  |
| Min     | 80,278 | 106,872 | 755,526 | 4,312   | 20,450  |
| Std     | 69,143 | 371,690 | 1,921,058| 137,491 | 24,376  |
| Obs     | 10     | 10      | 10      | 10      | 10      |
| Cambodia|        |         |         |         |         |
| Mean    | 67,257 | 165,649 | 746,128 | 123,208 | 26,537  |
| Max     | 494,809| 740,215 | 3,363,279| 1,118,833| 189,864 |
| Min     | 1,041  | 26,374  | 658     | 1       | 400     |
| Std     | 107,606| 171,303 | 807,544 | 225,201 | 39,906  |
| Obs     | 60     | 60      | 60      | 60      | 60      |
| Indonesia|       |         |         |         |         |
| Mean    | 888,771| 1,779,184| 8,566,924| 638,784 | 650,249 |
| Max     | 6,582,679| 12,151,322| 60,158,105| 6,036,119| 1,719,557|
| Min     | 271    | 14,367  | 29,830  | 65      | 4,252   |
| Std     | 1,467,116| 2,743,782| 1,34e+07| 1,105,831| 2,035,508|
| Obs     | 130    | 130     | 130     | 130     | 130     |
| Laos    |        |         |         |         |         |
| Mean    | 16,330 | 45,130  | 386,648 | 58,391  | 10,483  |
| Max     | 130,241| 214,458 | 3,358,547| 640,995 | 65,133  |
| Min     | 14     | 483     | 1,406   | 1       | 432     |
| Std     | 26,227 | 840,874 | 781,847 | 141,158 | 13,829  |
| Obs     | 50     | 50      | 50      | 50      | 50      |
| Malaysia|        |         |         |         |         |
| Mean    | 9,128,262| 3,340,617| 24,554,367| 2,739,896| 405,395 |
| Max     | 3,626,350| 15,484,308| 105,775,250| 14,155,905| 2,378,075|
| Min     | 16,347 | 98,161  | 100,232 | 29,037  | 7,761   |
| Std     | 875,317| 3,483,605| 2,40e+07| 3,235,839| 425,230 |
| Obs     | 75     | 75      | 75      | 75      | 75      |
| Philippine|       |         |         |         |         |
| Mean    | 413,399| 1,546,391| 7,452,284| 342,649 | 248,969 |
| Max     | 2,039,018| 34,042,520| 39,652,065| 2,354,984| 1,336,307|
| Min     | 32,823 | 79,815  | 579,605 | 8,436   | 38,235  |
| Std     | 433,140| 4,075,270| 8,420,676| 466,184 | 256,052 |
| Obs     | 70     | 70      | 70      | 70      | 70      |
| Singapore|       |         |         |         |         |
| Mean    | 4,958,955| 19,260,502| 139,342,216| 27,361,889| 1,990,051|
| Max     | 7,629,859| 37,289,492| 279,760,291| 56,256,951| 3,897,269|
| Min     | 156,948| 1,17e+07| 185,991 | 51,511  | 92,559  |
| Std     | 2,708,251| 3,644,567| 2,52e+07| 1,82e+07| 1,299,191|
| Obs     | 20     | 20      | 20      | 20      | 20      |
| Thailand|        |         |         |         |         |
| Mean    | 1,315,502| 3,500,667| 23,041,675| 2,504,739| 613,631 |
| Max     | 4,274,496| 12,329,850| 72,871,671| 11,595,984| 2,813,049|
| Min     | 78,438 | 116,541 | 185,992 | 36,444  | 21,854  |
| Std     | 1,419,776| 3,644,567| 2,52e+07| 2,303,948| 643,726 |
| Obs     | 80     | 80      | 80      | 80      | 80      |
| Mean    | 1,000,675| 3,418,615| 23,713,472| 3,935,266| 459,737 |
| Max     | 7,629,859| 37,289,492| 279,760,291| 56,256,951| 3,897,269|
| Min     | 14     | 483     | 1,406   | 1       | 400     |
| Std     | 1,333,351| 4,598,689| 3,13e+07| 5,829,161| 1,048,457|
| Obs     | 650    | 650     | 650     | 650     | 650     |
4.2 Descriptive statistics of inputs and output

Data are from annual reports of Vietnam and ASEAN countries in US dollar (USD). The commercial banks in the annual report that do not have a unit of USD are converted from the local currency to USD in the following ways: (1) Transfer to USD at the exchange rate stated in their annual reports; (2) At the cross-exchange rate of the State Bank of Vietnam at the reporting time.

Table 3. Model estimation results.

|        | Coefficient | Standard error | t-ratio |
|--------|-------------|----------------|---------|
| EQT    | 0.334877    | 0.287934       | 0.116303|
| DEP    | 0.205791    | 0.276589       | 0.744032|
| BOR    | 0.296858    | 0.130438       | 0.227585|
| OPE    | 0.438909    | 0.367298       | 0.119496|
| Constant | -0.546596  | 0.204498       | -0.267285|
| sigma-squared | 0.228555 | 0.334341 | 0.683599 |
| gamma(γ) | 0.921027 | 0.132540 | 0.694901 |
| mu (μ) | -0.290176 | 0.454160 | -0.638930 |
| Eta (ƞ) | -0.159038 | 0.170142 | -0.934741 |
| log likelihood function | -0.469605 | | |
| LR     | 0.453383    |                |         |

Observations: 650

5 Results and discussion

From the above data and research model, with the help of Frontier 4.1 software, the author estimates the effectiveness of 130 commercial banks of 9 Southeast Asian countries including: Vietnam, Brunei, Cambodia, Indonesia, Laos, Malaysia, Philippines, Singapore, Thailand in the period of 2013 - 2017.

The estimation results by MLE method in Table 3 show that, among the inputs, equity (EQT - β1) is the most important component for the total income of banks in the research period. This is consistent with the fact that commercial banks with large equity will have many advantages in proactively operating capital, less dependent on other capital sources, low capital costs. On the other hand, large equity means that banks can increase large assets, which are consistent with the results of performance analysis; the most efficient banks are mostly in the group of commercial banks with large scale.

In addition, operating costs, deposits, loans also have a positive relationship with the bank's total income, good management of costs, loans, maintaining a reasonable customer deposit balance will help the bank maintains and increases its income and performance.

The result of the coefficient of γ in the model is 0.92 ≠ 0, showing the component of the inefficiency in the error of the model, this result shows that it is necessary to include the random component in the estimation model and reliable. The coefficient ƞ indicates the effective change over time, the estimated result ƞ = -0.16 shows that the efficiency of banks tends to decrease during the research period.

The efficiency of banks by SFA method after estimating the random border production function in the previous step, using Frontier 4.1, the technical efficiency of banks is presented. In Table 4, the results showed that the average efficiency of the entire system in the study period was 0.77, the lowest efficiency was 0.11, the highest efficiency was 0.96. This result also shows that the efficiency of ASEAN commercial banks in the period of 2013 - 2017 is relatively low, with this result if the average output does not change, commercial banks can save as much as possible. 23% of the input.
Table 4. Efficiency of ASEAN commercial banks

|        | 2013    | 2014    | 2015    | 2016    | 2017    |
|--------|---------|---------|---------|---------|---------|
| Viet Nam | Mean 0.812 | 0.785 | 0.755 | 0.722 | 0.687 | Max 0.957 | 0.950 | 0.942 | 0.932 | 0.922 | Min 0.651 | 0.605 | 0.556 | 0.504 | 0.450 |
| Brunei  | Mean 0.902 | 0.886 | 0.869 | 0.849 | 0.827 | Max 0.948 | 0.939 | 0.929 | 0.918 | 0.905 | Min 0.855 | 0.832 | 0.808 | 0.780 | 0.749 |
| Cambodia | Mean 0.866 | 0.846 | 0.824 | 0.799 | 0.772 | Max 0.955 | 0.947 | 0.939 | 0.929 | 0.918 | Min 0.660 | 0.615 | 0.567 | 0.516 | 0.462 |
| Indonesia | Mean 0.836 | 0.810 | 0.784 | 0.775 | 0.736 | Max 0.962 | 0.956 | 0.949 | 0.941 | 0.931 | Min 0.382 | 0.218 | 0.113 | 0.356 | 0.213 |
| Laos    | Mean 0.784 | 0.736 | 0.694 | 0.657 | 0.767 | Max 0.960 | 0.953 | 0.946 | 0.937 | 0.959 | Min 0.286 | 0.231 | 0.180 | 0.134 | 0.611 |
| Malaysia | Mean 0.805 | 0.779 | 0.745 | 0.712 | 0.675 | Max 0.877 | 0.859 | 0.837 | 0.813 | 0.787 | Min 0.598 | 0.549 | 0.469 | 0.441 | 0.384 |
| Philippines | Mean 0.831 | 0.806 | 0.778 | 0.748 | 0.714 | Max 0.930 | 0.918 | 0.906 | 0.891 | 0.874 | Min 0.743 | 0.707 | 0.667 | 0.624 | 0.578 |
| Singapore | Mean 0.788 | 0.758 | 0.726 | 0.690 | 0.651 | Max 0.886 | 0.868 | 0.848 | 0.826 | 0.800 | Min 0.681 | 0.638 | 0.592 | 0.543 | 0.491 |
| Thailand | Mean 0.859 | 0.838 | 0.814 | 0.788 | 0.835 | Max 0.944 | 0.935 | 0.925 | 0.913 | 0.875 | Min 0.734 | 0.697 | 0.656 | 0.612 | 0.565 |
| Mean 0.820 | 0.796 | 0.770 | 0.741 | 0.709 |
| Max 0.962 | 0.956 | 0.949 | 0.941 | 0.959 |
| Min 0.286 | 0.218 | 0.113 | 0.134 | 0.213 |

Table 5. Ranking of effectiveness of ASEAN countries' commercial banks.

| Ranking | Nation   | Performance |
|---------|----------|-------------|
| 1       | Brunei   | 0.87        |
| 2       | Thailand | 0.83        |
| 3       | Cambodia | 0.82        |
| 4       | Indonesia| 0.79        |
| 5       | Philippines | 0.78      |
| 6       | Viet Nam | 0.75        |
| 7       | Malaysia | 0.74        |
| 8       | Laos     | 0.73        |
| 9       | Singapore| 0.72        |

During the study period, the model results also showed that the average efficiency of Brunei commercial banks was the highest at 0.87, ranked second was Thailand with average technical efficiency of 0.83. Ranked last among the 9 ASEAN commercial banking systems in the study period is Singapore commercial banks with an average technical efficiency of 0.72, above are Lao commercial banks with an efficiency of 0.73. Vietnam's commercial banking system with technical efficiency in the research period was 0.75, ranked 6th among 9 ASEAN countries.
6 Conclusions

With SFA method author evaluated the performance of ASEAN commercial banks in the period of 2013 - 2017, with a sample of 130 commercial banks from 9 ASEAN countries including: Vietnam, Brunei, Cambodia, Indonesia, Laos, Malaysia, Philippines, Singapore, Thailand.

The results from the model show that the average efficiency of the entire system during the study period was 0.77, the lowest efficiency was 0.11, the highest efficiency was 0.96. This result also shows that the efficiency of ASEAN commercial banks in the period of 2013 - 2017 is relatively low, with this result if the average output does not change, commercial banks can save as much as possible.

With the above results, we see that the overall operational efficiency of ASEAN banks in the period of 2013 - 2017 is very low, 0.77, so ASEAN commercial banks need to improve and enhance their performance by using efficiency.

Vietnam's commercial banking system in recent years has very low efficiency compared to the commercial banking system in the ASEAN commercial banking system.

The result from the SFA model is 0.75, ranking 6th among 9 ASEAN commercial banking systems.

From this result, the Vietnamese commercial banking system needs to reform more strongly to improve operational efficiency, enhance competitiveness with the system of commercial banks in the ASEAN economic community.

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