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 Thai1and 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:

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

Y_i is the total operating income of the bank i

X_{ij} is the jth element of the ith bank

β is the coefficient to be estimated (parameter of the variable Xij)

V_i is a statistical error due to random factors and is assumed to have a normal distribution (iid), N (0, σv2) and is independent of Ui.

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, δu2).

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:

$$TE = Y_i/Y_i^* = f(x_{ij}; \beta)exp(V_i - U_i)/ f(x_{ij}; \beta)exp(V_i) = exp(-U_i) \quad (2)$$

In which Y_i; Y_i^* is the total actual income and the maximum income of the i bank; ij (x_{ij}; β) 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 β except the blocking coefficients are non-biased estimates.

(2)Use grid search to estimate γ

(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:

$$LnY_i = \beta_0 + \beta_1 lnX_{1i} + \beta_2 lnX_{2i} + \beta_3 lnX_{3i} + + (V_i - U_i) \quad (3)$$

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.

Table 1. Number of commercial banks for each ASEAN country in the sample.

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 2. Output and input variables of ASEAN Bank 2013 – 2017 (Thousand USD).

		Output TOI	**Input 1** EQT	**Input 2** DEP	**Input 3** BOR	**Input 4** 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	12,151,332	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	40,847	781,847	141,518	13,829
	Obs	50	50	50	50	50
Malaysia	Mean	912,826	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
Philipine	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	1,369,071	21,654,245	51,511	92,559
	Std	2,708,251	1.17e+07	8.51e+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 (η)	-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 η indicates the effective change over time, the estimated result η = -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 Thai1and 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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