

# **THE PERFORMANCE OF VIETNAMESE BANKING SYSTEM UNDER FINANCIAL LIBERALIZATION: MEASUREMENT USING DEA**

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## **ABSTRACT**

*Using time trend data from 1990 to 2010, the research applied the efficiency measurement and Data Envelopment Analysis approach to evaluate the performance changes of Vietnamese banking system under financial liberalization. The DEA time trend model is a fruitful approach to analyze the banking sector through macro level data while banking level data is unavailable, for example the case of Vietnamese banks before 2000. It showed that this performance is on a decreasing trend (although a slight recover was noticed in 2009-2010) and the banking system in Vietnam is currently running under three-fourth of its capacity. One important reason for this decline in performance can be explained by the increasing in the financial openness level of the economy and its banking sector toward regional and global market.*

**JEL Classification:** E50, G21, G28

**Keywords:** performance, banking system, data envelopment analysis, Vietnam

## **1. Introduction**

Since the late 1980s, most centrally planned economies (CPEs) have transitioned their economies into market oriented ones either under gradual process or shock therapy. Many failed; however, some successes, of which Vietnam “has made substantial progress” toward sustained economic growth and financial stability (Lipworth & Spittaller, 1993, p. iii). The restructuring or modernization of the Vietnamese financial system, along with the reform of state economic management, state-owned enterprises (SOEs) reform, and external economic reform, were later became the financial liberalization (more details are in Section 2). This financial liberalization resulted in a rigorous restructuring and reform in the banking sector (Waal, Duong, & Ton, 2009), which brought both positive and negative changes to Vietnamese banks.

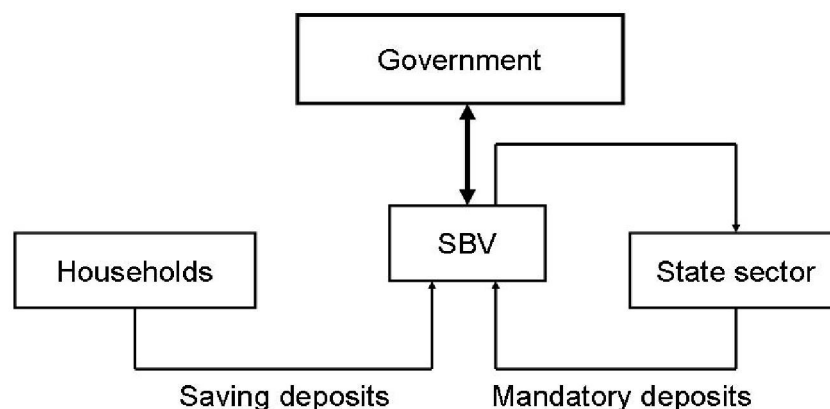
In order to understand the development of the Vietnamese banking system under the effects of financial liberalization, investigating its efficiencies is a requirement. Thus, it is important to analyze the performance of the banking system in Vietnam as well as the impact of liberalization policy to the system throughout the period 1990-2010. Along this timeline, there are few important years which can act as turning points for the liberalization process, such as 1990, 1997 and 2007. The 1990 was the time when the mono-tier banking system in Vietnam started to transform into two-tier ones, which allowed commercial banks developed and fulfilled their missions on providing capital to the economy. The second and third ones were times when the system had to restructure to deal with the regional and global financial crisis accordingly in 1997 and 2007. Hence, it is expected that the efficiency of the Vietnamese banking system would be changed at these turning points.

The remainder of this paper is organized as follows. Section 2 gives some overview on banking system development under the financial liberalization process in Vietnam. Section 3 reviews the literatures on efficiency/performance measurement in the banking industry. Section 4 explains the methodologies and technical procedures which will be applied in the research. Section 5 shows some empirical results for discussion and Section 6 concludes.

## 2. Financial liberalization and the current banking system in Vietnam

Before the ‘Doi Moi’ (revolution) in 1986, the Vietnamese economy in general and the banking system in particular, were not market-oriented. Thus, the only institution in the financial system at that time was the State Bank of Vietnam (SBV)<sup>1</sup>. After its foundation, SBV started issuing banknotes as well as other activities like currency revaluation, budget distribution, production lending, etc. to fulfill its missions of managing state funds, serving the state sector, and financing the state budget (N. T. Nguyen, 2001, p. 45).

**Figure 1. Role of the SBV before financial liberalization**



*Source: Adapted from Tran (2001, p. 7)*

<sup>1</sup> The SBV was established on 06/05/1951 under the Order 15/SL, signed by president Ho Chi Minh.

After some achievements helping the Government in controlling the financial aspect in war-time period, from 1975 to 1986, SBV started to face difficulties in its mission due to hyper-inflation<sup>2</sup>, lack of human resources in the banking sector, and collapses of people's credit unions, etc. This situation put decision makers under high pressure; hence, they had to try converting the SBV into two-tier system (July 1987 and then March 1988). After that, changes were made in the banking system's operations; new mechanism of banking operations was built up and later was improved by two important decrees which were announced in 1990 and applied in 1991.

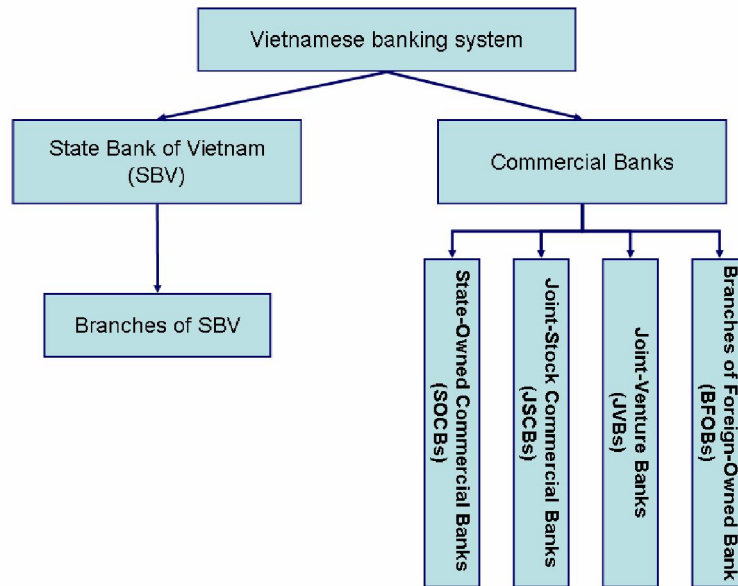
In May 1990, two important decrees were announced: one was the "Decree on the State Bank of Vietnam"; and the other was the "Decree on Banks, Credit cooperative and Financial companies". The two decrees transformed the Vietnamese financial system from an one-tier system into two-tier one, in which commercial banks exercised the monetary transactions and provided banking services; while the SBV exercised the state regulatory function of a central bank. This enabling legislation facilitated the establishment of commercial banks as well as paving the way for establishment of foreign bank branches and representative offices and joint venture banks. These measures not only helped recognizing and protecting business operations by the State-owned commercial banks (SOCBs), but also encouraged the development of Joint-stock commercial banks (JSCBs), Joint-venture banks (JVBs) and Branches of foreign-owned

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<sup>2</sup> The inflation reached its peak of 774 percent in 1986 (Abuza, 2002, p. 4).

banks (BFOBs)<sup>3</sup> on the basis of equal treatment to create a sound competitive environment, transparency, and publicity in banking operations.

**Figure 2. Structure of the two-tier banking system in Vietnam (after May 1990)**



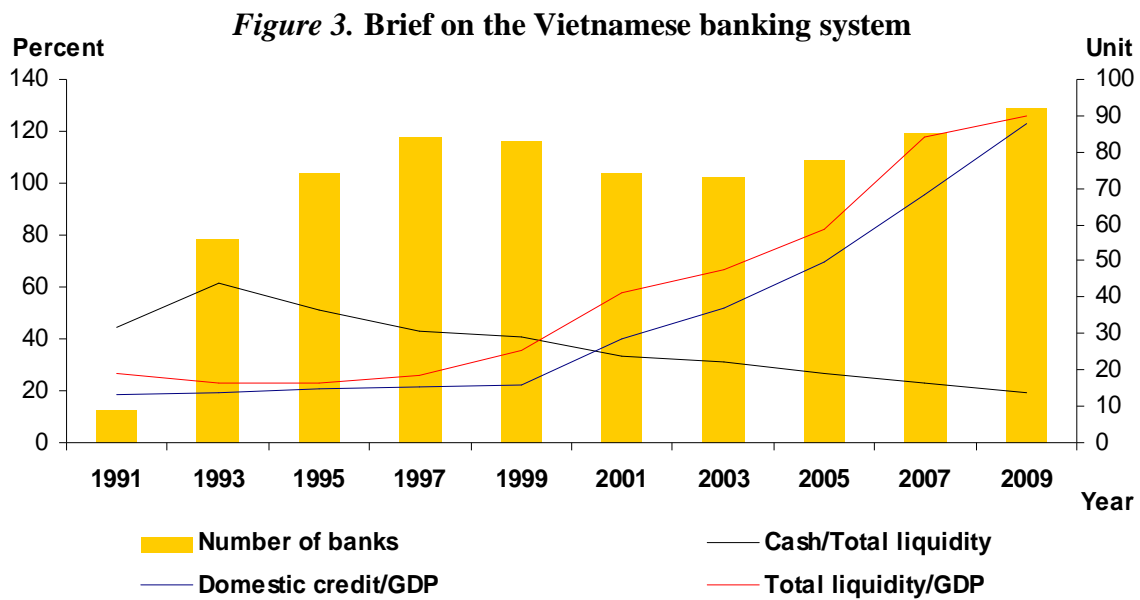
Particularly for commercial banks, in recent years, the autonomy and accountability of the commercial banks for their business have been institutionalized and enhanced in practice. They now have the right to decide on deposit and lending interest rates, and select the form of loan security. No (state) institution or individual can intervene illegally into the operation of the commercial banks. Directed credit or policy-oriented lending is gradually separated from the commercial credit. The international principles and standards for commercial banking (e.g. accounting and auditing, risk management, credit analysis, investment, foreign exchange, loan classification and provisioning, etc.) have been gradually introduced. Banking products and services become more diverse. By introducing modern technology, especially the information technology (IT), banks are

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<sup>3</sup> After 2007, BOFBs also included fully owned foreign bank as they were allowed to operate since then, according to WTO commitment from Vietnam.

providing more features to their customers, including the substantial improvement in the depth and quality of the banking payment system.

Over the two decades, the banking system in Vietnam gradually developed not only in number of banking institutions but in size of the banking sector in the economy, amount of credit for the economy, and proportion of total liquidity (broad money – M2) over GDP. As shown in Figure 3, after the two important decrees were applied, many banks were opened, mostly JSCBs and BOFBs. The number of JSCBs expanded 10 times from 04 in 1991 to 41 in 1993 while BOFBs increased from null to 08 institutions in the same period. At the end of 2010, the total number of banks in the system was 102 (besides two policy banks), including 5 SOCBs, 37 JSCBs, 5 JVBs, and 55 BOFBs. This resulted in the rapid raising of the domestic credit and total liquidity as proportion in GDP with both of them reached more than 120 percent of GDP in 2009. The black line of cash over total liquidity is in a decreasing trend shows that payment through banking system is replacing cash payment.



*Source: ADB (2012)*

Despite the above developments in quantity aspect, however, the quality or performance of the banking system has not been credited well. This is the motivation encourages the author in trying to examine the performance of the Vietnamese banking system in relate to financial liberalization at a long period (1990-2010).

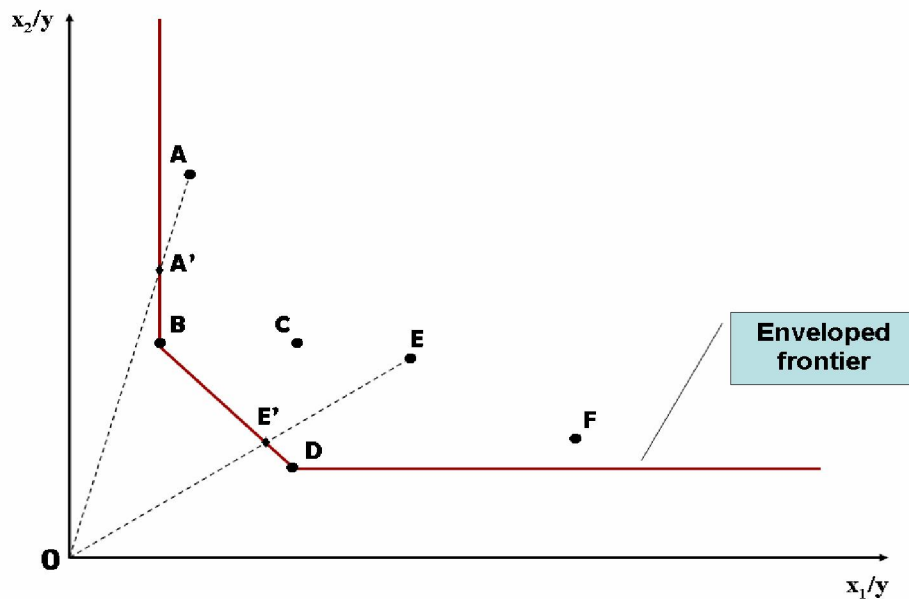
### **3. Literature reviews on performance measurement of banking system and motivation of the research**

Lovell (1995, p. 166) proposed that the techniques of the efficiency measurement can be adapted to be used in measuring the performance. In this sense, evaluating the efficiency of the banking system is therefore equivalent to evaluating its performance. One simple way to measure the efficiency of an economic unit is using the ratio between an output and an input which is used to produce it. When it comes to the case of multiple inputs and outputs, however, economists treats it as productive (technical) efficiency (Färe, Grosskopf, & Lovell, 1994; Siems & Barr, 1998).

In the literatures, various approaches have been used to measure the efficiency, in which two popular ones are parametric and nonparametric approaches. Each approach has its own advantages and shortcomings compare to the other, however, the nonparametric approach is more suitable for non-production institutions such as universities, hospitals, and banks. It is not because output of banks is considered to have multi-dimensional characteristics but also because it is difficult to measure cost, revenue or profit functions in order to apply the parametric approach (Bhattacharyya, Lovell, & Sahay, 1997). In the Data Envelopment Analysis (DEA), which belongs to the nonparametric approach, data collected from sampled institutions is enveloped in order to form the optimal frontier of the whole sample, and then each institution is evaluated by comparing its current level

with the optimal one. Discussion on DEA have been inspired by the work of Farrel (1957), Charnes, Cooper and Rhodes (1978), Färe, Grosskopf and Lovell (1994), and so on.

**Figure 4. Basic DEA frontier (2 inputs, 1 output)**



*Note: Efficient score of firm A can be defined by the ratio  $OA'/OA$ ; similarly for firm E with  $OE'/OE$ ; etc.*

*Source: Ngo (2011)*

In term of time trend analysis, most scholars use distance function (Shephard, 1970) to measure the productivity (or efficiency) changes in which efficiency is referred as total factor productivity. Caves, Christensen, and Diewert (1982) applied the Shephard's distance function to provide the theoretical framework for the measurement of productivity and its changing, which later became the Malmquist productivity index number approach. Since then, this approach has been popular in calculating the technological changes and productivity growth in the banking industry, including Berg, Forsund, & Jansen (1992), A.N Berger & Mester (1997), Grifell-Tatje & Lovell (1997), among others. As these papers all used institutional data for banks or bank branches,



however, the performance of the banking system at national level as a whole entity stays untouched.

At macro or national level, several studies on banking industries regarding cross-countries data were conducted. Berger and Humphrey (1997) reported that there were only 6 out of 130 studies on banking performance focused on cross-countries data. After 1997 few studies were developed following these researches, however, they still limit themselves on analyzing different banks from different countries but not the banking industry of each country as single entity. Although analyzing banks or bank branches is obviously meaningful in comparing the performance of each bank in the system, and from that one can get a bigger view on the banking system itself; it is also important to examine the banking system at aggregated level in order to have a different view of the picture. Among others, Hermes and Vu (2007) first used DEA to calculate the efficiency scores of each individual bank and then averaged them into the national performance. This approach, however, does not accurate because it treats individual bank equal (in term of calculating the national score), while in fact they have different impact on the national banking industry.

Theoretically, in contrast, we can analyze the efficiency of a banking system as a single entity by using macro level data. In this sense, a banking system is defined as a single decision making unit (DMU) which uses financial investments to create banking services to the whole economy. Hence, the performance of a banking system can be measured by comparing the banking services (outputs) with the finance consumed by the banking sector (inputs). By applying this idea, Ngo (2011) conducted a cross-country effectiveness analysis for the global banking system in 2010 under the effects of the

Global Financial Crisis 2008 and proposed that we can use DEA for macro data in the banking and financial sectors as well.

Regarding the Vietnamese banking system, unfortunately, studies about the efficiency and performance of this sector is limited. Due to the fact that data prior to 2000 at banking level is unavailable, no research is found regarding this period of time. This creates a big gap in the literatures which need to be fulfilled. For the period after 2000, following the development of IT as well as the development of the Vietnamese accounting system, more data is available for researchers. However, number of studies on the banking sector and its performance was still limited since these data were not required to be transparent, prior to 2009. After that, more works have been done but all of them regarding data at banking level. Among others, Hermes and Vu (2007), V. H. Nguyen (2007), X. Q. Nguyen & DeBorger (2008), and Vu & Turnel (2010) agreed that productivity of (some) Vietnamese commercial banks was on a decreasing trend, although they analyzed these banks in different periods, respectively from 2001 to 2003, from 2003 to 2006, and from 2000 to 2006. These facts motivate the author to expand the scope of research into a longer period (1990-2010) and for the whole Vietnamese banking system in order to answer the following questions:

- How did the Vietnamese banking system perform in the whole two decades (1990-2010), especially before 2000?
- Is there any different between analyzing the performance of the Vietnamese banking system at banking level and national level?
- Does financial liberalization have any effect on this performance?

## 4. Methodological issues

### 4.1. DEA time trend model

Basically, DEA uses linear programming method to minimizing the inputs while outputs are constrained (output-oriented DEA), or to maximizing the outputs while the inputs are constrained (input-oriented DEA), for every DMU in the data set. It helps enveloping an (optimal) piece-wise surface (or frontier) over the sample DMUs. Efficiency of each DMU then can be calculated by the distance from its current level to the frontier (see *Figure 4*). According to Charnes, Cooper and Rhodes (1978), we can measure the efficiency of a certain  $j_0$ -th DMU using the equation (1) under the assumption that there is no different in scale (Constant Returns to Scale – CRS) between DMUs.

$$\max_{u,v} \left( \sum_m u_m y_{mj_0} \right) \quad (1)$$

Subject to:

$$\sum_k v_k x_{kj_0} = 1$$

$$EF_j = \frac{\sum_m u_m y_{mj}}{\sum_k v_k x_{kj}} \quad 1, 1 \quad j \quad n$$

$$0 \leq u_m, v_k \leq 1$$

Where:

$u_m$ : weight of  $m$ -th output factor

$v_k$ : weight of  $k$ -th input factor

$x_{kj}$ :  $k$ -th input of  $j$ -th DMU

$y_{mj}$ :  $m$ -th output of  $j$ -th DMU

$n$ : number of DMU

According to Banker, Charnes, & Cooper (1984), to measure the scale efficiency issue, one can apply the Variable Returns to Scale (VRS) model of DEA in which the CRS technical efficiency score is decomposed into pure technical efficiency and scale efficiency. In this paper, we will mainly use the output-oriented CRS model of DEA for our research; while the VRS DEA model will also be used to test the scale effect.

Regarding time trend data, as we analyze the same Vietnamese banking system in the period of  $k$  years, if we treat them individually for each year then we will have  $k$  DMUs for the DEA time trend model. This technique, therefore, is similar to the window analysis model used by Asmild *et al.* (2004) or the “intertemporal production sets” definition used by Tulkens & Eeckaut (1995). The changes of the efficiency scores in our DEA time trend model will then show the performance changes in the examined banking system during that period.

It is important to notice that the nature of a bank is to attract deposits from savers and provides credits as well as liquidity liabilities and investments to boost up the economic development (Bencivenga & Smith, 1991). Hence, in our DEA time trend model, there is one input variable which is the value of total deposits that the banking system attracted in each year (named *Deposits*); while the value of credits (*Credits*), value of Gross domestic capital information (*Capitals*), and value of total liquidity (*Liquidities*) in the year will be treated as three outputs. Data for those variables was extracted from the Statistical

Database System of the Asian Development Bank (ADB) and has some descriptive information as below.

**Table 1. Descriptive statistics of variables for DEA model**

	<i>Unit: billion Dong</i>			
	<i>Deposits</i>	<i>Credits</i>	<i>Capitals</i>	<i>Liquidities</i>
<i>Mean</i>	350317.5	501257.5238	220567.0952	562801.2
<i>Standard Deviation</i>	529027.7	765144.9608	224476.2992	775275.5
<i>Minimum</i>	3943	9960	6025	11358
<i>Maximum</i>	1934593	2889525	770211	2789184

*Source: ADB (2012)*

#### **4.2. Analyze determinants of performance changes through Tobit model**

As efficiency or performance of the Vietnamese banking system changes through time trend, it is important to check whether financial liberalization or macroeconomic policy is the cause. Theoretically, bank's efficiency is expected to improve under financial liberalization (Berger & Humphrey, 1997). Our paper will apply a second stage study using a regression model to testify this issue. We will also analyze the effect of the important turning points in 1990, 1997 and 2007 by introducing a dummy variable into the model. Hence, our regression model will have the efficiency scores from DEA time trend model as dependent variable (*EF*); while the financial openness index (*KAOPEN*)<sup>4</sup> and crisis dummy variable (*CRISIS*) are independent variables. Since all efficiencies scores calculated from DEA time trend model fall between 0 to 1, we should avoid the

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<sup>4</sup> The KAOPEN index was developed by Chinn & Ito (2008) in order to measure the extensity of capital controls in an economy, hence, it shows the level of financial integration or liberalization of that country.

biased of non-censored OLS regression models (Fethi & Pasiouras, 2010) and use the two-sides censored Tobit regression.

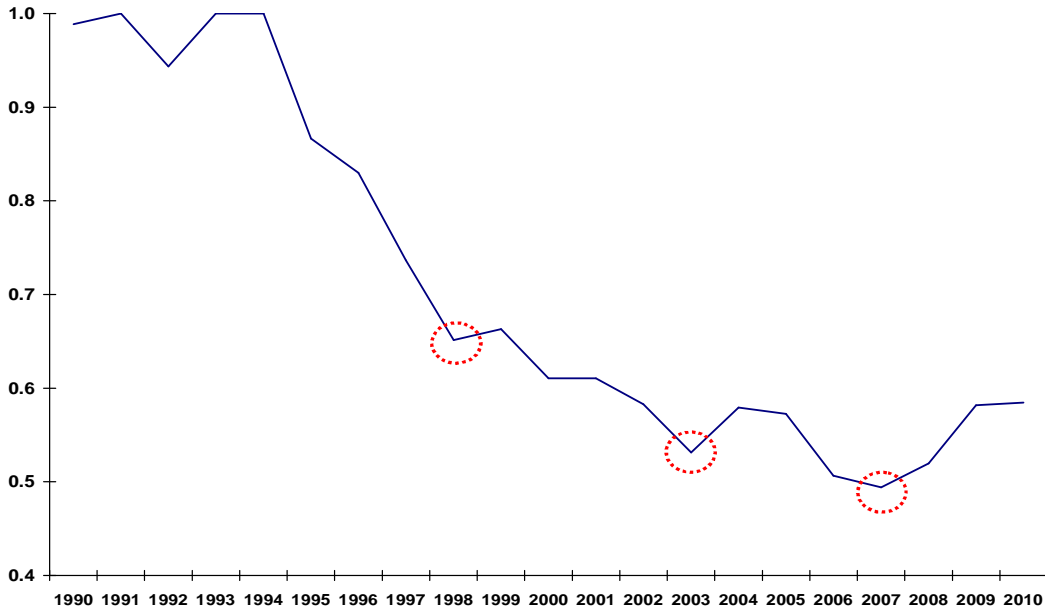
$$EF_t = \alpha + \beta_1 * KAOPEN_t + \beta_2 * CRISIS_t + \varepsilon \quad (2)$$

where  $EF_t$  is the efficiency score at time  $t$  extracted from the DEA model;  $KAOPEN_t$  is the financial openness index at time  $t$ ;  $CRISIS_t$  is dummy variable which equal to 1 if  $t$  is 1990, 1997 or 2007, otherwise equals to 0;  $\alpha$  is a constant;  $\beta_1$  and  $\beta_2$  are the variable coefficients;  $\varepsilon$  is the error term; and  $t$  runs from 1990 to 2010.

## 5. Results and discussions

**In the first step,** the DEA time trend model showed us the technical productivity of the Vietnamese banking system in the period of 1990-2010 (hereafter we call the banking system in year  $t$  under the name  $DMU_t$ , i.e.  $DMU_{1990}$ ,  $DMU_{1991}$ , and so on). Hence, we can see the efficiency (or performance) was higher at first as the economy in general and banking system in particular started to integrate into the global market and then sharply decreased under effects of the regional financial crisis 1997, the liquidity crisis of the Asia Commercial Bank (ACB) in 2003 (see Appendix for more details), and the global crisis 2007. A slight recovery was seen in the recent years, however, efficiency scores still remained under 60 percent. The mean of efficiency scores for the whole period is 0.707 suggests that the Vietnamese banking system is only running at under three-fourth of its capacity.

**Figure 5. Performance of Vietnamese banking system**



Along with CRS DEA model, we also run another VRS DEA model to define the scale efficiency issue. Following the relation in which CRS efficiency equals to VRS efficiency times with scale efficiency, one can easily figure out that the mean of scale efficiency is 0.708, as mean of VRS efficiency is 0.998. The Mann-Whitney test, however, shows that there is no different between efficiency scores generated from CRS and VRS model. This helps concluding that the scale effect in the Vietnamese banking system is insignificant.

As mentioned before in Figure 4, Section 3, the point A is an inefficient DMU while its target or optimal level is the point A'. In order to improve its position from A to A', it has to either decrease the inputs or increase outputs or doing both ways. The amount of saved or gained in inputs/outputs is the 'slacks' which show how much a DMU can be better-off from its current inefficient level. In term of the Vietnamese banking system, because we used an output-oriented DEA model, we can only gain slacks from the output

side. Impressively, if the banking sector can improve all of its performance in the 1990-2010 period to reach the efficient frontier, it can additionally accumulate up to nearly 360% of domestic capital and creates around 80% and 90% of the credits and liquidities, respectively.

**Table 2. Total slacks of inefficient DMUs**

<b>Year</b>	<b><i>Credits</i></b>	<b><i>Capitals</i></b>	<b><i>Liquidities</i></b>
<b>1990</b>	115	5959	131
<b>1991</b>	0	0	0
<b>1992</b>	4168	1165	1622
<b>1993</b>	0	0	0
<b>1994</b>	0	0	0
<b>1995</b>	10095	9581	15351
<b>1996</b>	18101	15682	22764
<b>1997</b>	29209	31726	32788
<b>1998</b>	49609	56125	54809
<b>1999</b>	73250	56139	72469
<b>2000</b>	100733	83460	142247
<b>2001</b>	127373	109759	178512
<b>2002</b>	171821	192203	235723
<b>2003</b>	279640	374329	362912
<b>2004</b>	315546	558948	386540
<b>2005</b>	437172	867807	515634
<b>2006</b>	711263	1133726	898583
<b>2007</b>	1123346	1899921	1380900
<b>2008</b>	1294700	2556439	1499380
<b>2009</b>	1466365	3569560	1880604
<b>2010</b>	2053899	5154317	2812695
<b><i>Total slacks</i></b>	8266404	16676847	10493665
<b><i>Total original values</i></b>	10526408	4631909	11818825
<b><i>Percentage</i></b>	78.53%	360.04%	88.79%

*Note: There is no slack for 1991, 1993 and 1994 as they are times when the banking system was efficient.*



***In the second step***, together with the basic Tobit regression as shown in equation (2), in order to strengthen the stability of the research, we also re-run it with 200 replications (re-samples) pooled randomly from original data with equal sample size. This technique, namely ‘bootstrapping’, allows us to reduce the distortions problem since our sample is small (21 observations). It is interesting to notice that, as shown in Table 3, the efficiency or performance of Vietnamese banking system is significantly correlated with the financial openness of the country; however, at negative relation. It means that as the banking system becomes more liberated and opened, its performance decreases. The reason of this problem may relate to the fact that it is easier to efficiently manage the banking system at the earlier state than in later one of development, as size of the banking system and its marginal growth are decreasing while competition and instability are increasing in long term. However, the affect of three turning points (in 1990, 1997 and 2007) on performance of Vietnamese banking system as not as expected since it has insignificant correlation with the efficiency scores.

**Table 3. Results from Tobit regressions**

<b>Tobit regression</b>				Number of observations	21
<i>Indicators</i>	<i>Coefficient</i>	<i>Standard error</i>	<i>P&gt; t </i>	LR chi2(2)	7.75
<i>Constant</i>	0.452	0.096	0.000	Prob > chi2	0.0208
<i>KAOPEN</i>	-0.250	0.083	0.007	Pseudo R2	4.0384
<i>CRISIS</i>	-0.061	0.110	0.590	Log likelihood	2.9139
<b>Bootstrapped Tobit regression</b>				Number of replications	200
<i>Indicators</i>	<i>Coefficient</i>	<i>Standard error</i>	<i>P&gt; t </i>	Wald chi2(2)	7.84
<i>Constant</i>	0.452	0.109	0.000	Prob > chi2	0.0198
<i>KAOPEN</i>	-0.250	0.091	0.006	Pseudo R2	4.0384
<i>CRISIS</i>	-0.061	0.112	0.587	Log likelihood	2.9139

## **6. Conclusions**

Using time trend data from 1990 to 2010, the research applied the efficiency measurement and Data Envelopment Analysis approach to evaluate the performance changes of Vietnamese banking system under financial liberalization. The DEA time trend model is a fruitful approach to analyze the banking sector through macro level data while banking level data is unavailable, for example the case of Vietnamese banks before 2000. It showed that this performance is on a decreasing trend (although a slight recover was noticed in 2009-2010) and the banking system in Vietnam is currently running under three-fourth of its capacity. This is consistent with findings from analysis with banking level data in the literatures. As a result, the slacks which can be additionally achieved when inefficient DMUs become efficient increase as well. One important reason for this decline in performance can be explained by the increasing in the financial openness level of the economy and its banking sector toward regional and global market.

As the DEA time trend model is new, it needs more experiments and studies to build a complete model. This can be done by expanding the research with more variables (such as labor, total bank assets, etc.) and at cross-country (regional or global) level. One can also takes inflation into account by using constant values but current ones. And by examining the changes of monetary and fiscal policy, it can help determining the effect of macro-economic policy on the performance of the banking system.

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