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Measuring the Performance of the Banking System Case of Vietnam (1990-2010)

Dang-Thanh NGO[1]

Abstract

Banking is the core of the financial system which has important role in attracting deposits to provide credits to borrowers, services to customers and booting the economic development. This paper applied a modified DEA window analysis to analyze the performance changes through time of the Vietnamese banking system in the 1990-2010 periods. The research suggests that this performance is decreasing through the time as the size of the banking sector increases; financial market is more liberate, and when the World and regional economies are problematic. While the banking system is running at two-third of its capacity, it has limited contribution to the economy. Therefore, continuing to develop and restructuring the banking system in Vietnam is important now and then. Using tighten monetary and/or loosen fiscal policy can be seen as a solution for improving the performance of the Vietnamese banking system.

JEL classification numbers: E50, G21, G28

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

1 Introduction

From the financial liberalization in the early of the nineteen nineties, the banking system in Vietnam particularly and the financial system generally has achieved a lot of improvements (Ngo, 2004). Over these last twenty years, the banking system has been transferring from a one-tier system into a two-tier system which allowed all participants to compete fairly and effectively. More banks were established (including foreign owned banks and branches), and more banking services were provided to satisfy the needs of the customers.

The improvements in the banking sector include increasing freedom for banks in their decisions and activities, the increasing of (domestic) deposits over Gross Domestic Products (GDP), the

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increasing in number of foreign financial and banking institutions, and so on. At the same time, however, there were several negative ones as well. The negative side may include the number of closed or merged banking institutions, the unstable of the system (through the liquidation crisis at the end of 2008 or the high non-performance loans ratio, etc.) These are the results of the operation of the banking sector itself as well as macroeconomic policy of the Government, especially the monetary and fiscal policy. Thus, it is important to analyze the performance of the banking system in Vietnam and how it was affected from macroeconomic policy through the 1990-2010 period.

To the limited knowledge of the author, so far, there is still a lack of research on the efficiency/performance of the banking sector in Vietnam over the decades. It includes the lack of research from foreign researchers, which of course feel difficult in accessing the data of Vietnamese banks (it is always difficult to get any data from any financial institutions because these data are confidential – except things from the Annual reports). It also includes the lack of research from Vietnamese ones as well as methodologies for analyzing the performance of banks individually and banking system as a whole is still limited. Therefore, the aim of the paper is to provide an empirical research on the performance of the Vietnamese banking system (as a whole) over twenty years (1990-2010) in order to see how efficient the banking system is, and how it change during the above period. Within this scope of research, the author will try to prove if there is any relation between banking performance and macroeconomic policy. This relation, if significant, will be a good guidance for policy makers in Vietnam and also in other developing countries.

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

2 Overview of the Vietnamese banking system

Basically before the Doi Moi (revolution) in 1986, the Vietnamese economy in general and the banking system in particular were not market–oriented. There was only the State Bank of Vietnam (SBV) in the banking system acting as a government's budget tool. However, changes were made in the country after the Sixth National Congress of the Communist Party in 1986,

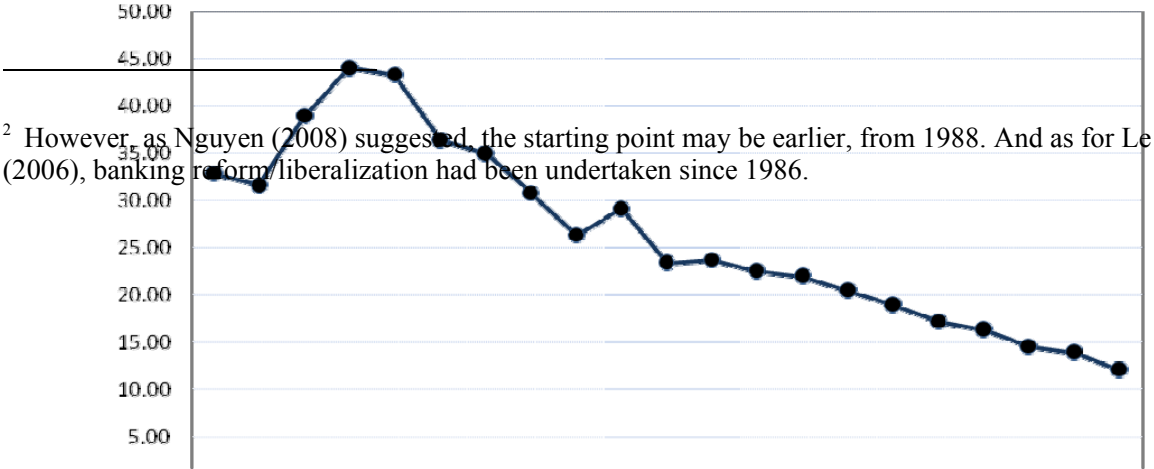
transformed the economy from a closed command economy into a market-oriented one (Siregar, 1999). This led to the transformation of the banking system as well.

Almost economists agreed that the reform of the Vietnamese banking system was started from May 1990, when the 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[2]. These two decrees transformed the Vietnamese banking system from one-tier into two-tier, in which SBV now mainly acted as a central bank, while other banks and financial companies can operate independently commercial activities. Since then, the banking system in Vietnam had developed very fast, resulting in the number of banking institutions reached 93 at the end of 2009 (beside 5 State-owned Commercial Banks and 1 Social Bank, 87 were private commercial banks in which 5 were foreign fully owned and 40 were foreign branches) (*see Table 1*).

Within these past years, the banking system in Vietnam did gradually developed not only in number of banking institutions but size of the banking sector in the economy, amount of credits for the economy, and amount of other banking services as well. Results of this are, the amount of capital mobilized through the banking sector was around 1,800 trillion VND, nearly 30% up compares to 2008 (SBV, 2009); hence, the amount of domestic credits that banking sector provided to the economy was more than 135% of total GDP (ADB, 2011). Table 2 will show some of the development of the Vietnamese banking sector over this period.

According to Table 2, the increasing of total liquidity of the economy (as SBV mentioned), or broad money M2 (ADB definition) over total Gross Domestic Product showed that the financial deepening was raised rapidly, account for nearly 1.5 times of GDP itself in 31st December 2010. More important, ratio of cash over total liquidity was reduced rapidly in the mean time, suggested that financial activities regarding cash are now being replaced by activities regarding non-cash payments such as ATM/POS, checks, credit and debit cards, banking transactions, online payments, etc. (*see Figure 1*).

Figure 1: Cash/Total liquidity ratio (1990-2010, percent)



[2] However, as Nguyen (2008) suggested, the starting point may be earlier, from 1988. And as for Le (2006), banking reform/liberalization had been undertaken since 1986.

Source: *ADB (2011)*

Despite the above development, however, the performance of the banking system has not been credited well. While quantity is important, quality is even more vital. In this situation, this paper contributes to the literatures by researching the performance of the banking system in Vietnam throughout the transformation period, from 1990 to 2010.

Table 1: Numbers of banking institutions in Vietnam (1991-2009)

	1991	1993	1995	1997	1999	2001	2003	2005	2007	2009
State-owned commercial banks	4	4	4	5	5	5	5	5	5	5
Joint-stock commercial banks	4	41	48	51	48	39	37	37	34	37
Joint-venture banks	1	3	4	4	4	4	4	5	5	5
Foreign bank branches	0	8	18	24	26	26	27	31	41	45
Total	**9**	**56**	**74**	**84**	**83**	**74**	**73**	**78**	**85**	**92**

Source: *SBV, several years*

Table 2: Some developments of Vietnamese banking system (1990-2010, percent)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2006	2005	2006	2007	2008	2009	2010
Total liquidity growth rate	53.09	78.73	33.71	18.95	33.19	22.57	22.70	26.10	25.57	39.28	56.25	25.53	17.65	24.94	29.45	29.74	33.59	46.10	20.30	29.00	33.30
Domestic credit/GDP	23.74	18.40	15.49	19.33	21.26	20.56	20.34	21.30	22.44	22.39	35.15	39.73	44.78	51.65	60.75	69.78	74.96	95.90	94.32	122.99	135.77
Total liquidity/GDP	27.07	26.47	24.56	23.02	24.09	23.03	23.78	26.01	28.37	35.67	50.47	58.13	61.44	67.04	74.42	82.30	94.70	117.88	109.23	126.17	140.80
Finance/GDP	1.17	1.44	1.42	1.65	1.93	2.01	1.89	1.74	1.74	1.87	1.84	1.82	1.82	1.77	1.78	1.80	1.81	1.81	1.83	1.91	1.89
Deposit/GDP	9.14	7.20	7.29	5.36	8.08	7.42	8.36	9.59	11.17	15.45	20.25	22.62	24.47	32.99	38.48	44.85	53.46	71.70	67.15	77.97	89.35

Source: *ADB (2011)*

3 Review on measuring performance of banking system in literatures

Performance can be measured using efficiency, or, one can "adapt the techniques of the efficiency measurement literature to the problem at hand" (Lovell, 1995). Efficient or efficiency is a term which is used popularly in many aspects such as economics, technology, social science, etc. In economics, under broad meaning, efficiency can be viewed as productivity and is measured by the ratio between an output and an input which is used to produce it. However, when it comes to the case of multiple inputs and outputs, researchers tend to refer it as productive (technical) efficiency (Färe, Grosskopf and Lovell, 1994, Siems and Barr, 1998) or X-efficiency (Berger, Hunter and Timme, 1993).

At institutional (or micro) level, there are two approaches for measuring the efficiency of a bank: parametric and nonparametric. Each approach has its own advantages and shortcomings compare to the other. The parametric approach tends to focus on production function or cost function of banks, in which the estimated function through regression model can be viewed as an optimal function of the banking system and can be used as the benchmarking frontier (Banker and Maindiratta, 1988). Although this parametric estimation can provide information on confidence intervals and deviations, however, it faces the problem of misspecification in choosing the right functional form (Berger and Humphrey, 1997) and requires large sample. In contrast, the nonparametric approach tends to envelop data collected from sampled financial institutions in order to estimate the optimal frontier of the whole sample, and then scores each institution by comparing its current level with the optimal one. This approach, therefore, is more flexible compare to the parametric approach (Charnes, Cooper and Rhodes, 1978, Färe, Grosskopf and Lovell, 1994, Farrel, 1957) and suitable for non-production institutions.

In term of time trend analysis, most scholars tend to refer efficiency as total factor productivity (TFP) and use distance function (Shephard, 1970) to measure the productivity (or efficiency) changes. Caves, Christensen, & Diewert (1982)

applied the productivity indexes derived from 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. In the banking industry, this approach was popularly applied to calculate the technological changes and productivity growth, including Berg, Forsund, & Jansen (1992), A.N Berger & Mester (1997), Grifell-Tatje & Lovell (1997), etc. However, as they all used institutional data for banks or bank branches, their studies can analyze individual bank but not the system as a whole entity.

In fact, at macro level, we can analyze the efficiency of a banking system as a single entity by applying the X-efficiency definition. Thus, a banking system is defined as efficient if it can fulfill its missions of providing banking services and monitoring its stability. Therefore, its efficiency can be calculated by comparing the outputs (quantity and quality of banking services) and the inputs (financial investments to the banking system) through Data Envelopment Analysis (DEA), a popular and powerful tool of the nonparametric approach. By applying this idea, Ngo (2011) assumed that all researched countries use the same financial investment to provide ten outputs (including Assets of banking system, Credits provided by banking system, etc.) and conducted a cross-country effectiveness analysis for the global banking system. This fruitful study proposed that we can use DEA for macro data in the banking and financial sectors as well.

In term of analyzing the Vietnamese banking system, limited researches were conducted, both institutionally and individually.

For institutes, there are reviews and reports of international financial institutions such as the World Bank (WB), International Monetary Fund (IMF)[3], Asian Development Bank (ADB), but also reports from specialized organizations such as Business Monitor International (BMI)[4], Moody's Investor Service (MIS)[5] or Fitch

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[3] http://www.worldbank.org; http://www.imf.org; http://www.adb.org/Vietnam/

[4] http://store.businessmonitor.com/products/?action=show&product_id=921

Ratings (FR)[6]. Last but not least, the annual reports of the SBV are also important but nothing more than giving general information on the Vietnamese banking system and policy of the SBV. These publications share a common thing as they do not give any particular attention to the efficiency of the Vietnamese banking system.

For individuals, researchers tend to focus more on efficiency evaluation but mostly at micro level. V. H. Nguyen (2007) conducted research on 13 commercial banks in Vietnam for the period of 2001-2003 and found that these banks were inefficient in both allocative (regulatory) and technical (managerial capacity) aspects, with technical inefficiency is more serious[7]. X. Q. Nguyen & DeBorger (2008) enlarged the sample size to 15 commercial banks continuing to examine the technical efficiency of the Vietnamese banking system from 2003 to 2006. The authors showed that the productivity of these banks was on a decreasing trend. Recent studies of K.M. Nguyen, Giang, & Nguyen (2008, Nguyen, Giang and Nguyen, 2010) expanded their research to 32 commercial banks (in the period of 2001-2005) through the slacks-based model DEA, argued that there would be a room to improve the efficiency of those banks. This is consistent with Ngo (2010) and Vu & Turnel (2010), although the earlier applied DEA approach for the top-22 banks in Vietnam in 2008 and the latter applied a Bayesian SFA approach to investigate the Vietnamese banks in 2000-2006 period.

These results suggested that there is a decreasing trend in the efficiency (and productivity) of (each) commercial banks in Vietnam. However, without the analysis at macro level (the whole banking system as an entity), there is no significant proof for that suggestion. Hence, this paper attempts to show a need for further research on the Vietnamese banking system, especially relating to efficiency and performance. Only by improving efficiency can the banking sector

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[5] http://v3.moodys.com/viewresearchdoc.aspx?docid=PBC_119337

[6] http://www.fitchratings.com

[7] Berger & Humphrey (1991); Berger, Humphrey, & Hancock (1993) also concluded that

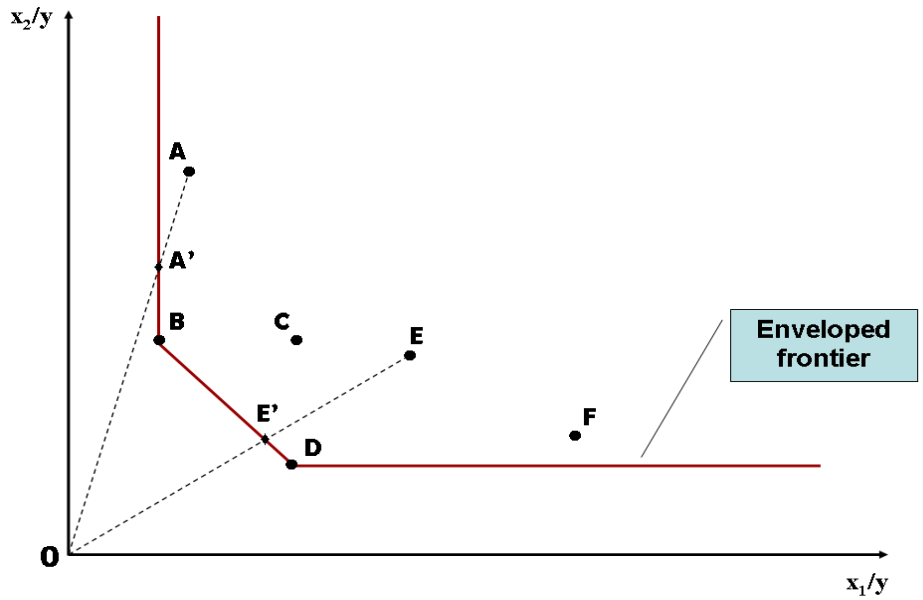
of Vietnam compete strongly and fairly with foreign banks in the integrated global financial system.

4 Methodological issues

4.1 (General) Data Envelopment Analysis model

The purpose of DEA is to maximizing the outputs while the inputs are constrained (input-oriented DEA); or minimizing the inputs while outputs are constrained (output-oriented DEA), for each and every firm in the observation set. By doing that, the most efficient firms will envelop an (optimal) frontier while remaining firms relatively are inefficient (*see Figure 2*).

Figure 2: Simple DEA frontier with 2 inputs and 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)*

Charnes, Cooper and Rhodes (1978) developed this model by converted the maximization (or minimization) problem into a linear program. In this case, a certain j0-th firm (or DMU – Decision Making Unit) can maximize its efficiency

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normally bank's inefficient was caused by technical rather than allocative reason.

by solving the following mathematical problem under the assumption that there is no different in scale between DMUs (CRS model of DEA):

$$\max_{u,v}\left(\sum_{m} u_m y_{mj_0}\right)$$

Subject to:

$$\sum_{k} v_k x_{kj_0} = 1$$

$$EF_j = \frac{\sum_{m} u_m y_{mj}}{\sum_{k} v_k x_{kj}} \leq 1,\ 1 \leq j \leq n$$

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

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

Later, Banker et al. (1984) improved the model by adding a variable returns to scale condition in order to analyze the scale effect in efficiency evaluation (VRS model of DEA). This technique allows researchers to determine whether a DMU is working at increasing, decreasing or constant returns to scale. As we analyze the same Vietnamese banking system through time trend, however, the scale effect is not so important; this paper will apply the CRS model of DEA.

4.2 First stage: DEA model for a single DMU through time trend

According to Asmild et al. (2004), the DEA window analysis model which was created by Charnes et al. (1985) is useful to analyze the efficiency of a single DMU over time. This is consistent with Tulkens & Eeckaut (1995) when they use the term '*k-specific intertemporal production sets*' to define the general mode for a (k-times) window analysis. In this sense, window analysis can be applied to a

single time series of various observations of a single firm (Tulkens and Eeckaut, 1995). Based on that, this paper will propose a modified window analysis DEA model by looking at the same banking system in different years as different DMUs. Hence, if we treat the banking system in the period of *k* years individually, we can have *k* observations (or *k* DMUs). The decreasing or increasing of the efficiency scores will then show us if there was any technical shift (which leads to technical efficiency changes) in the examined banking system during that period. In this situation, the DEA model in this stage is similar to the general DEA model stated in section 4.1 above.

Figure 3: DEA efficiencies of a single DMU through time trend

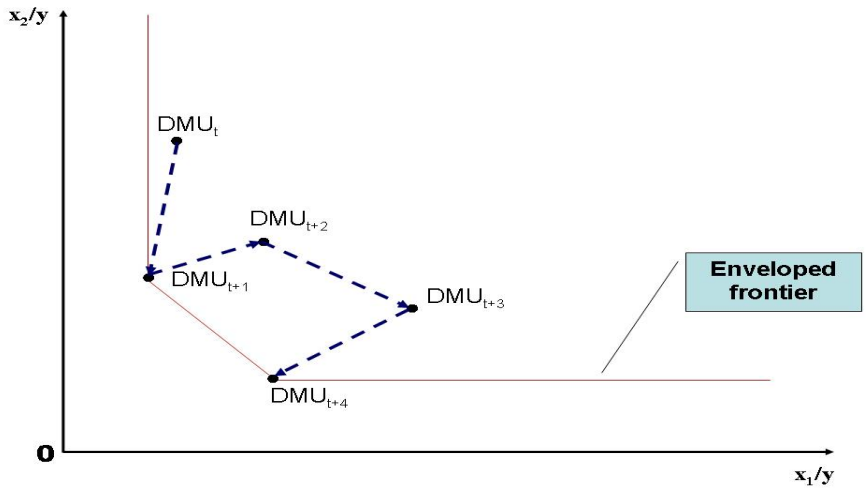

Figure 3 above explains the situation of efficiency change through time trend for a single DMU in 5 years (from the time *t* to *t+4*). Along this change, this DMU in time *t+1* and *t+4* form the enveloped frontier; showing that the efficiency is increasing from time *t* to *t+1*, decreasing from time *t+1* to *t+2* and staying almost the same in time *t+3*, and then increasing again in time *t+4*.

4.3 Second stage: Tobit regression

Another aim of the research is to find out the effects of macroeconomic policy on the efficiency of the Vietnamese banking system. This matter was analyzed several times in the literatures; however, the resulted were contradicted with each

other. According to Olugbenga & Olankunle (1998), in Nigeria from 1983 to 1993, the financial liberalization and deregulation significantly decreased the efficiency of the banking system during the years immediately after the reform and took long time to raised up. However, Laeven (2005) analyzed the banking industry of several East Asian countries and concluded that banking systems with less government interventions (meaning higher deregulated) performed better than ones that strongly affected by the state. In 2008, Aburime also conducted a research on the Nigerian banking industry and found that monetary policy was positively and significantly affected the profits of the banking sector (Aburime, 2008). And in 2009, Brissimis & Delis (2009) joined this discussion by identified that monetary policy had no significant impact on bank profits. Therefore, this paper will use a second stage to define the correlation between efficiency of the Vietnamese banking system with macroeconomic policy, especially the monetary and fiscal policies.

After the efficiencies of the Vietnamese banking system were calculated for each year, the second stage will be conducted using a Tobit regression analysis[8] in order to determine the factors affecting the banking efficiencies. Since the efficiencies scores above are bounded between 0 to 1, non-censored regression models could be biased (Fethi and Pasiouras, 2010), while Tobit regression is justify. Following the suggestion of Aburime (2008), the equation for Tobit model is defined as follow:

$$EF_t = \alpha_0 + \beta_1 * INTEREST_t + \beta_2 * SPENDING_t + \beta_3 * CONC_t + \beta_4 * FX_t + \beta_5 * INF_t + \varepsilon_6$$

where EF_t is the efficiency score at time t extracted from the 1st stage; $INTEREST_t$ is six months nominal interest rates at time t; $SPENDING_t$ is government expenditures at time t; $CONC_t$ is concentration level of the banking system at time t, defined by the assets proportion of three largest banks to all

[8] For more details, see Tobin (1958).

commercial banks; FX_t is nominal exchange rates (VND/USD) at time t; INF_t is inflation level at time t; α_0 is a constant; $\beta_{1...4}$ are variable coefficients; ε_6 is error term; and t runs from 1990 to 2010[9].

5 Empirical results

In the first stage, the paper develops an output-oriented CRS DEA model for analyzing the efficiency changes in the Vietnamese banking system from 1990 to 2009. The reason for choosing this model is due to the fact that Vietnamese banking system is young (compare to other systems in the region and the World) and still strongly affected by the central banks (SBV); hence, it is possible for the SBV to control the output of the system in order to contribute to the economic development of the country. In this situation, the SBV tends to maximize the outputs using limited inputs (at younger state of development, the nation prefers investing in industry than service and financial sectors).

According to Ngo (2011), because the banking system acts as an intermediary for attracting deposits to provide credits to borrowers, services to customers and booting the financial market (as well as the economy); one input and three outputs are used in our model. The input variable 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 Product of the nation (GDP), and value of money supply to the financial market (M2) in the year will be treated as outputs. In this sense, the model has a total of 4 variables while the sample size is 21 (DMUs) which making the analysis justified[10]. Data on these variables was extracted from the Statistical Database System (SDBS) of the Asian Development Bank. Below is some descriptive information on these variables.

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[9] Data for the five independent variables *INTEREST, SPENDING, CONC, FX* and *INF* are annual averaged, extracted from databases of the ADB (*INTEREST* and *SPENDING*); the World Bank (*CONC* and *FX*); and the IMF (*INF*).

[10] Dyson et al. (2001) suggested that the number of observations needs to be at least 3 times larger than the number of total variables in order to overcome the discrimination problem of DEA.

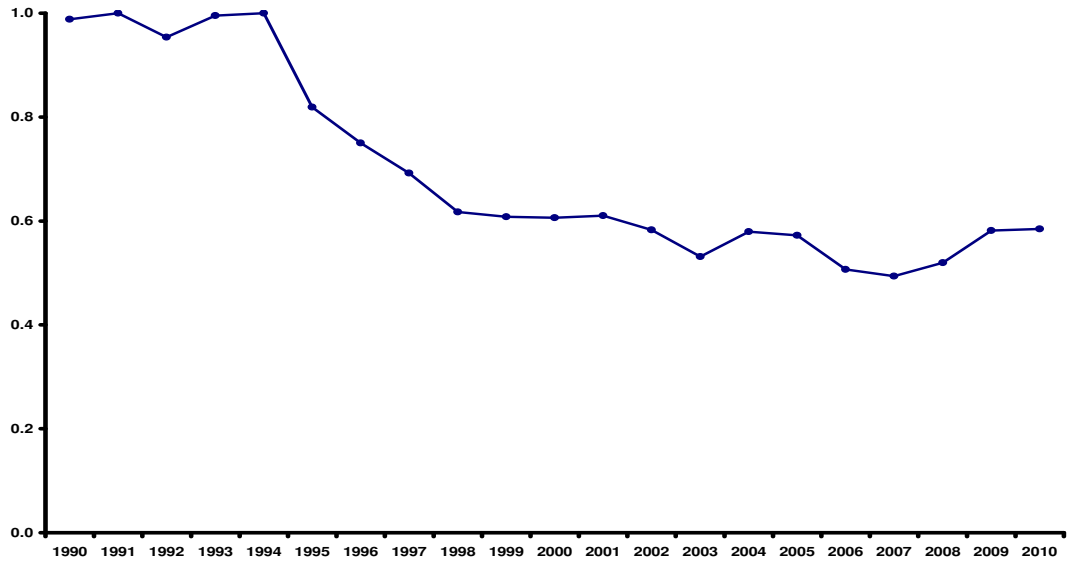
Table 3: Descriptive statistics of input and output variables

	Deposits	*Credits*	*GDP*	*M2*
Mean	350317.52	501257.52	618689.48	562801.19
Standard Deviation	529027.73	765144.96	547312.25	775275.51
Minimum	3943	9960	41955	11358
Maximum	1934593	2889525	1980914	2789184

Source: *ADB (2012)*

The DEA model conducted from these variables will then show us the technical productivity (or efficiency) 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*, etc.). The empirical results include efficiency scores in each year, the reference years (which form the frontier), and the targeted outputs need to be achieved in each year to optimal the activities of Vietnamese banks.

Figure 4: Efficiencies of Vietnamese banking system (1990-2010)



At first**,** the efficiency scores as shown in Figure 4 provide a general view on (technical) productivity changes throughout the period, in which the efficiency was higher at the beginning of 1990s and then decreased sharply afterward. A

slight recovery was seen in the 2009-2010 periods but the efficiency scores were still low, settled under 0.6. The lowest score is 0.494 in 2007 could be explained by the "boom and burst" of the Vietnamese securities market in 2006; while the second lowest is in 2003 when the economy started to get out of the effects of the regional financial crisis in 1997. This result consistent with the literatures mentioned in section 3 above suggesting that at the earlier state of development, the banking system in Vietnam was more efficient in controlling the limited input (deposits) to provide maximal outputs (credits, GDP, and M2) than in the later state. This may related to the size of the financial market (and banking system), while monitoring the system at small size is easier than at larger size. In average, the efficiency score of the whole banking system during 1990-2010 period is 0.695, which means the system is only running at about two-third of its capacity.

***Then*,** the peers (or reference DMUs) which focused on only two years, 1991 and 1994, propose that these two year were times when the Vietnamese banking system reached its optimal level, regarding using deposits to create credits, GDP, and money supply. For 19 years in which the system were less efficient (1990, 1992-1993, and 1995-2010), the system in 1991 (DMU*1991*) was used to be the reference 17 times, while the DMU*1994* was equally used in 16 times. When comparing the lambda weights, however, the DMU*1994* had higher value than DMU*1991 (see Table 4)*. The fact that the SBV normalized its credit relations with international monetary institutes (IMF, WB, and ADB) in 1993[11] was one important factor made DMU*1994* became the most efficient year in the whole period as such.

Table 4: Peers and Lambda weights for Vietnamese banking system

Year	Lambda weight		Year	Lambda weight	
	1991	*1992*		*1991*	*1992*
1990	0.017	0.259	**2002**	22.808	2.368
1992	1.511	n.a	**2003**	22.783	7.246

[11] History of State Bank of Vietnam, available online at http://www.sbv.gov.vn

1993	1.238	0.257	**2004**	15.978	13.824
1995	0.891	1.182	**2005**	10.983	22.865
1996	1.522	1.378	**2006**	43.544	21.794
1997	1.961	1.813	**2007**	49.498	40.094
1998	3.982	1.977	**2008**	15.57	65.233
1999	11.559	n.a	**2009**	n.a	92.384
2000	17.976	0.062	**2010**	n.a	130.258
2001	22.575	n.a	**TOTAL**	**244.396**	**402.994**

The third point that DEA model tells us is about objective (or targeted) value of outputs, which should be achieved if the banking system can optimize its efficiency. According to this result, as the efficiency scores decreasing through the time, differences between objective and original value became bigger; that made total difference of the whole period reach 96,763,482 billion Dong, account for more than 7.4% of total GDP from 1990-2010. Within this difference (or so-called *waste*), the most wasted factor is GDP (around 81%) while Credits and M2 are 8% and 11% wasted accordingly. It suggests that the contribution of banking system into economic development in Vietnam has been very limited.

Table 5: Targeted value for output variables when reach efficient frontier

Year	Credits		GDP		M2		Total differences
	Original	*Objective*	*Original*	*Objective*	*Original*	*Objective*	
1990	9960	10075	41955	47570	11358	11489	5862
1991	14112	14112	76707	76707	20301	20301	0
1992	17122	21321	110532	115893	27144	30672	13088
1993	27112	27233	140258	140882	32288	36193	4650
1994	37951	37951	178534	178534	43006	43006	0
1995	47055	57428	228892	279350	52710	68915	77036
1996	55323	73776	272036	362773	64678	90162	134673
1997	66807	96476	313623	474094	81558	117778	226360
1998	81028	131218	361016	658382	102416	165854	410995
1999	89559	163125	399942	886682	142646	234666	652326
2000	155236	256022	441646	1389914	222882	367587	1193759
2001	191204	318577	481295	1731652	279781	458293	1556242
2002	239921	411742	535762	2172338	329150	564873	2044119
2003	316872	596512	613443	3041296	411232	774144	3070405
2004	434572	750118	715307	3693685	532346	918886	3680464
2005	585559	1022731	839211	4924603	690652	1206286	5038199
2006	730330	1441593	974264	7231080	922672	1821255	7866662
2007	1096780	2220126	1143715	10954997	1348244	2729144	12315529

2008	1400693	2695393	1485038	12840692	1622130	3121510	14149734
2009	2039687	3506052	1658389	16493623	2092447	3973051	18182203
2010	2889525	4943424	1980914	23255496	2789184	5601879	26141176

In the second stage, first we ran a basic Tobit regression to define if there is any correlation between efficiency of the banking system and the independent variables of *INTEREST, SPENDING, CONC, FX*, and *INF*. The result is shown in Figure 5. However, as our sample is small (18 observations, as we do not have the data of *INTEREST* for two years 1990 and 1991), we ran another bootstrapped Tobit regression to see the changes (Figure 6). It is worth to notice that under normal Tobit model, all independent variables are significantly correlated with the banking system's efficiency (while the first three variables have positive correlations, *FX* and *INF* is negatively correlated to efficiency). Under bootstrap, exchange rates and inflation are no longer correlated; however, banking concentration, short term interest rates and government expenditures are still have big impact to the efficiency of the Vietnamese banks. This suggest that under a tighten regime of monetary policy and/or loosen regime of fiscal policy, the Vietnamese banking system can work more efficient than in other situations.

Figure 5: Non-bootstraped Tobit resression results

```
Tobit regression                                  Number of obs   =         18
                                                  LR chi2(5)      =      50.07
                                                  Prob > chi2     =     0.0000
Log likelihood =   29.39442                       Pseudo R2       =    -5.7406
```

EF	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
INTEREST	.046266	.0121567	3.81	0.002	.020003	.0725289
SPENDING	.0218723	.0063421	3.45	0.004	.0081711	.0355735
CONC	.6432004	.144944	4.44	0.001	.3300679	.9563329
FX	-.0000294	.0000122	-2.40	0.032	-.0000559	-2.96e-06
INF	-.0074396	.0036031	-2.06	0.059	-.0152237	.0003445
_cons	-.337579	.340679	-0.99	0.340	-1.073571	.3984132
/sigma	.0402238	.0069962			.0251095	.0553381

```
Obs. summary:          0  left-censored observations
                      17     uncensored observations
                       1 right-censored observation  at EF>=1
```

Figure 6: Bootstraped Tobit resression results

Tobit regression

Number of obs	=	18
Replications	=	1000
Wald chi2(5)	=	71.81
Prob > chi2	=	0.0000
Log likelihood = 29.39442	Pseudo R2	=	-5.7406

EF	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf.	Interval]
INTEREST	.046266	.022565	2.05	0.040	.0020393	.0904926
SPENDING	.0218723	.0126574	1.73	0.084	-.0029357	.0466803
CONC	.6432004	.2427497	2.65	0.008	.1674198	1.118981
FX	-.0000294	.0000219	-1.35	0.178	-.0000723	.0000134
INF	-.0074396	.0058942	-1.26	0.207	-.018992	.0041128
_cons	-.337579	.5486204	-0.62	0.538	-1.412855	.7376971
/sigma	.0402238	.0075467			.0254325	.0550152

Obs. summary: 0 left-censored observations
17 uncensored observations
1 right-censored observation at EF>=1

6 Conclusions

The research provides a different view on the performance of the banking system in Vietnam in the last two decades of development (and financial liberalization) under the view point of efficiency measurement. It appends to the literatures in concluding that the efficiency (and thus, performance) of the Vietnamese banking sector is decreasing through the time as the size of the sector increases, financial market is more liberate, and when the World and regional economies are problematic. While the banking system is running at two-third of its capacity (the other one-third is a waste accordingly), its role on boosting the economic development is very limited. Therefore, continuing to develop and restructuring the banking system in Vietnam is important to finance the capital needs of the economy now and in the near future. Regarding macroeconomic policy such as monetary and fiscal policy, the research suggests that Vietnamese banking system may work better under tighten monetary and/or loosen fiscal policy regimes.

The research also provides a new function for the DEA approach in evaluating banking efficiency and performance in various ways. First, it suggests that we can use macro data for analyzing the whole banking system as a single entity. Second, it shows that by applying a modified window analysis, we can use DEA model for examine the efficiency changes through time trend other than Malmquist index (especially when we data is unbalanced). However, further researches are still needed to make this fruitful results become real contribution to the literatures.

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