

## Operational Efficiency of Bank Loans and Deposits

### A Case Study of Vietnamese Banking System

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#### Abstract

*This paper examines whether there is a causal relationship between bank loans and deposits in the Vietnamese banking system and how efficient the use of loans and deposits by the Vietnamese banks is. In a country such as Vietnam, where inter-bank money markets are relatively underdeveloped, one would expect a reasonably strong relationship between deposits and loans. A pooled cross-sectional sample of certain financial ratios is collected from annual reports of 44 Vietnamese banks over the period from 2008 to 2015. The explanatory power of certain instrumental variables in relation to the endogenous variables is tested. The deterministic frontier model based on corrected ordinary least squares, estimated by three-stage least squares on a simultaneous equations model, is employed to derive the frontiers for the sampled banks as well as to estimate the causality between bank loans and deposits. Our findings suggest that in an underdevelopment banking system such as Vietnam, bank deposits have positive and significant impact on bank loans, but the reversal relationship is not significant. It is further suggested that Vietnamese banks performed moderately well in the examined period, but in the near future, they should start to focus more on deposits-taking activities.*

**Keywords:** simultaneous equations model (SEM); corrected ordinary least squares (COLS); three-stage least squares (3SLS); causality; loans; deposits; Vietnamese banks.

## 1. Introduction

In a market economy, the activities of an intermediary credit institution such as a commercial bank primarily focus on receiving deposits and providing loans, which are two aspects of credit operations. Among other things, receiving deposits (or fund mobilisation) is considered as an 'input' activity of the bank<sup>1</sup> while lending (or fund utilisation) is considered an 'output' activity. On one hand, since more deposits allow for more loans, banks would like to mobilise more funds but also trying to keep their interest payments minimized. On the other hand, since more loans contribute to economic development and create more (potential) deposits, banks would also like to utilise more funds while maintaining low leverage and low risks. Concurrently, the efficiency of funds mobilization and utilization at banks should have some causality impacts on each other.

The interdependent relationship between bank loans and deposits has been long acknowledged in the banking literature. Revisiting the argument of Klein (1971) and Monti (1972) that the decisions about loans and deposits are independent, Dermine (1986) found that the two decisions are interdependent if the bank faces some very plausible situations such as a positive probability of default. Using data from Italian banks, Corradi, Galeotti, and Rovelli (1990) empirically showed that there is cointegration among bank free reserves, loans and deposits and thus provided evidence in favour of the hypothesis that there is a causal nexus running from bank deposits to loans. Kashyap, Rajan, and Stein (2002) also found the synergies between the two activities of deposit-taking and lending and further argued that they are the two manifestations of one primitive function of the bank, that is the provision of liquidity on demand or the intermediary role of the banks.

Bank efficiency studies mainly treat banks as intermediaries<sup>2</sup> between savers and borrowers. In this sense, according to Sealey and Lindley (1977), loans and other assets serve as outputs while deposits and other liabilities are considered inputs of the banks. Consequently, bank efficiency studies will focus on minimize the deposits used (input oriented), or maximize the loans provided (output oriented), or both (non-oriented). For example, Allen N. Berger, Hancock, and Humphrey (1993) examined the input technical efficiency of US banks over the

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<sup>1</sup> It is arguable that deposits can also be seen as an output of the bank (A. N. Berger & Humphrey, 1997); however the more common sense is to see it as input as opposed to loans, which is an output.

<sup>2</sup> There is also a 'production approach' where banks are seen as a production unit which primarily producing services for account holders (A. N. Berger & Humphrey, 1997), but is less common to the 'intermediation approach' addressed in this paper, since banks are commonly seen as the intermediaries of the process by which the economy chooses its activities and the way those activities are financed (Fama, 1980). Readers interested in alternative approaches are encouraged to check for the study of Favero and Papi (1995), among others.

1984 – 1989 period using the funds (both deposits and non-deposit funds) and number of employees as input variables; while R. (2017) used total deposits (alongside labour and fixed assets) to evaluate the input efficiency of Islamic banks in the Middle East and North Africa region during the period 2007-2012. In contrast, Fujii, Managi, and Matousek (2014) studied the output-oriented efficiency of Indian banks in producing customer loans (alongside other earning assets as well as bad loans); while P. A. Nguyen and Simioni (2015) used total loans (alongside securities and total operating income) to analyse the output-oriented total factor productivity changes over time of Vietnamese banks from 2008 to 2012.

Consequently, we found out that traditional banking studies acknowledge the causal relationship between bank loans and deposits but do not examine it under the efficiency aspect. In contrast, the bank efficiency literature examines the efficiency of either funds mobilization or funds utilization activities and thus could not reflect this causality issue. In this paper, we further develop the efficiency analysis of deposit-taking and loans-making in a simultaneous framework in order to determine the causality between operational efficiency of bank loans and deposits. Specifically, we apply the Corrected Ordinary Least Squared (COLS) to estimate the deterministic frontier of Vietnamese banks for the period of 2008-2015 in funds mobilizing and utilizing. More importantly, the efficiency of deposit-taking and loans-making activities will be simultaneously examined under a Simultaneous Equations Model (SEM) using three-stage least squares (3SLS). In this sense, we combine the two approaches above of traditional banking studies and banking efficiency studies into one novel approach. We expect that the proposed approach can provide an overall view on the operational efficiency of the two basic activities of commercial banks without the problem of simultaneous bias (Wooldridge, 2016).

Empirically, we found that for Vietnamese banks, deposits have a positive and significant impact on loans, whereas loans have a positive but insignificant impact on deposits. Moreover, the (median) operational efficiency of deposit-taking activities is higher than that of loans-making activities further suggests that Vietnamese banks will need to focus more on their output side. One can see that in the past years, Vietnamese banks were not only having problems of creating more loans but also the problem of the quality of the loans, as the nonperforming loans kept increased over time (Ngo & Tripe, 2017).

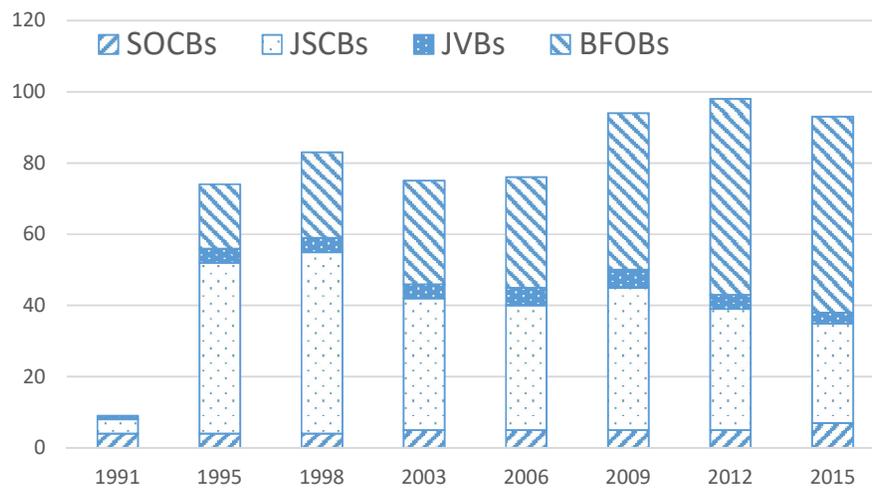
The remainder of this paper is as follows. Section 2 provides some background information regarding the Vietnamese banking system and its efficiency. Section 3 clarifies the methodology aspect of the research as well as the sample data. Section 4 reveals the results and discussions whereas Section 5 concludes.

## 2. The Vietnamese banking system and its efficiency

Since the transformation from a one-tier into two-tier system in 1990, the Vietnamese banking system has developed rapidly in terms of number of banks, size of the banking sector, amount of banking activities and transactions (Ngo, 2012). However, impacts of the Asian Financial Crisis (AFC) 1997 and Global Financial Crisis (GFC) 2008 put pressures on the Vietnamese banking system and thus required further renewals of banking operations.

From 2011 up to the present, the State Bank of Vietnam (SBV) has introduced many policies that have brought about fundamental changes and achieved positive results. In particular, the Credit Institution System Restructuring Plan was approved in March 2012 (Vietnamese Government, 2012) to deal with bad debt and weak performance of the banking system. One important impact of this Decision was the merger and acquisition of some joint stock commercial banks in the recent years, which caused concern about the efficiency of the operation of the banking system in Vietnam.

**Figure 1. Number of Vietnamese banks over time**



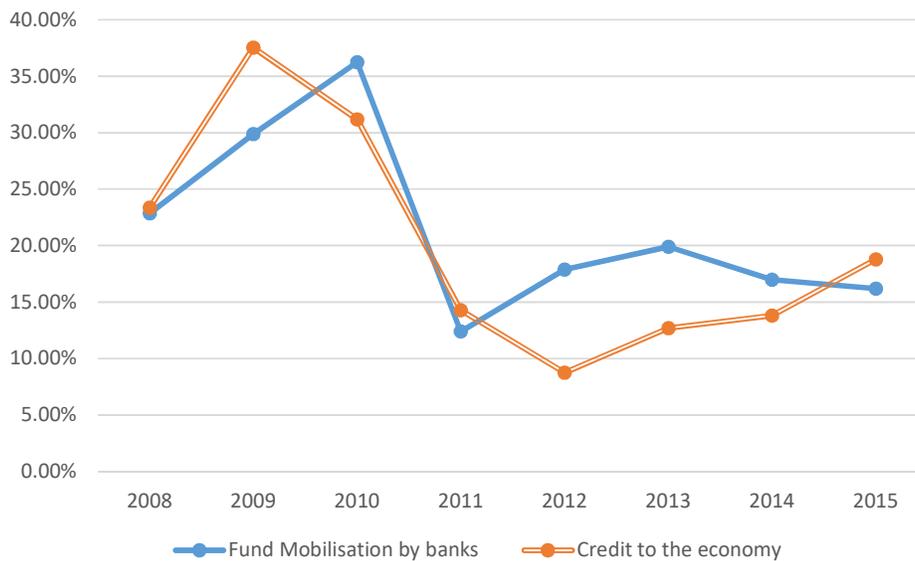
**Notes:** SOCBs stand for State-Owned Commercial Banks; JSCBs stand for Joint Stock Commercial Banks; JVBs stand for Joint Venture Banks; and BFOBs stand for Branches of Foreign-Owned Banks (also include Fully Owned Foreign Banks after 2007).

*Source: SBV*

Figure 1 presents the changes in the number of commercial banks in Vietnam over the past 25 years. One can easily observe that many banks were established in the first decade<sup>3</sup>, the restructure of the banking system after the AFC 1997 and GFC 2008.<sup>4</sup>

Figure 2 below presents both fund mobilisation and utilisation (as percentage of GDP), two basic activities of Vietnamese banks during the period of 2008 to 2015. Both activities show downward trends overall, although there was a gradual increase at the end of the period with respect to credit activity. The fund mobilisation rates in Vietnamese banks rose from 22.84% in 2008 to 36.24% in 2010. This then plunged to a low of 12.4% in 2011, followed by moderate growth to 19.9% in 2013. Later, the rate of fund mobilisation declined progressively to 16.2% during the last two years of the 2008 to 2015 period. Meanwhile, the rate of bank credit for the industry was almost equal to that of fund mobilisation in 2008 (23.38%). The figure hit a peak of 37.53% in 2009, followed by a sequential decrease, reaching its lowest point, at 8.75%, in 2012. The following three years saw a moderate recovery, reaching 18.8% in 2015.

**Figure 2. Funds mobilisation and utilisation of Vietnamese banks, 2008 - 2015**



*Source: SBV*

<sup>3</sup> Notice that after the Vietnam War, Vietnam re-joined IMF, WB and ADB in October 1993. And in February 1994, the US also removed its sanctions on Vietnam.

<sup>4</sup> It is argued that effects of regional and global crisis on the Vietnamese banks were lagged due to the lack of cross-border linkages between the domestic banking system and the regional/global counterpart (Ngo, 2015), which is also found in other developing countries (IMF, 2009).

The development of the Vietnamese banking industry and its performance has been examined by many studies, including market reports from international financial institutions (e.g. WB or IMF) as well as individual researchers (Ngo, 2012; Ngo & Tripe, 2017; P. A. Nguyen & Simioni, 2015; T. P. T. Nguyen, Nghiem, Roca, & Sharma, 2016; Stewart, Matousek, & Nguyen, 2016). In particular, Stewart et al. (2016) revealed that in Vietnam, small and medium-sized banks were less efficient than large and very large banks, and the small banks had the lowest efficiency ratings. This was supported by Ngo and Tripe (2017) and T. P. T. Nguyen et al. (2016) where they both found that SOCBs (which are large in size) were more (cost) efficient than JSCBs (which are generally smaller). In terms of profit efficiency, findings from Vu and Nahm (2013) further argued that Vietnamese banks operated well below the frontier in the 2000-2006 period due to a low quality of assets, which include deposits. However, none of these studies has focused on the banks' efficiency under the causal relationship between loans and deposits. Our study is therefore expected to be the very first empirical study on the particular relationship between the operational efficiency of bank loans and deposits, especially in the Vietnamese context.

### **3. Technical aspects of the study**

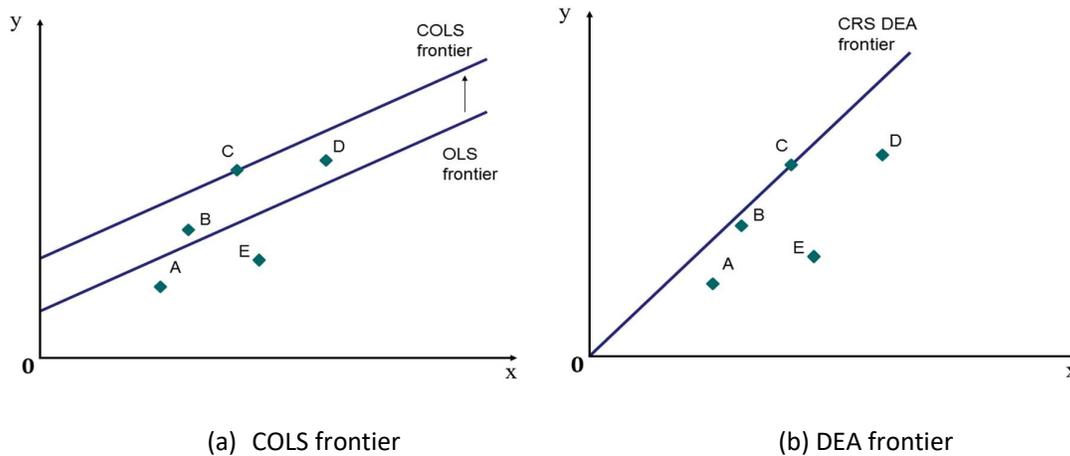
#### **3.1. Methodology**

According to A. N. Berger and Mester (1997) and Liu, Lu, Lu, and Lin (2013), data envelopment analysis (DEA), which belongs to the nonparametric approach, and stochastic frontier analysis (SFA), which belongs to the parametric approach, are the two most popular approaches for efficiency evaluation in the banking sector. The basic difference between DEA and SFA is that the former does not distinguish noise or errors from efficiency. In this sense, DEA is similar to the deterministic frontier model (DFM) of the parametric approach (Forsund & Hjalmarsson, 1987; Winsten, 1957), where one can use Corrected Ordinary Least Squares (COLS) to estimate the frontier and all deviances from the frontier will be accounted as inefficiency.

According to Kumbhakar, Wang, and Horncastle (2015), the output-oriented efficiency estimation of COLS starts by first obtaining the OLS frontier, and then shifts this frontier upward (or inward if input-oriented) to the extent that the function after the adjustment bounds all the observations below (or above, if input-oriented). Adapted from Greene (2008), Figure 3 below shows the difference between OLS and COLS frontiers for the output-oriented situation, whereas the COLS frontier envelops the sample at the best-practice observation (i.e.

point C), similar to DEA (under the constant-returns-to-scale (CRS) assumption). The only different between CRS DEA and COLS is the intercepts (and thus the slope of the frontiers), which usually reveal nothing more than the units of measurement (as in COLS, Greene, 2008).

**Figure 3. Similarity between COLS and CRS DEA**



*Source: Adapt from Greene (2008, Figure 2.3, p. 106).*

Amsler, Prokhorov, and Schmidt (2016) suggested that one needs to consider the endogeneity issue when estimating the (OLS) frontier. This is in line with our discussion so far, as we expect to see a causal relationship between banks activities of fund mobilization and utilization. Consequently, we use a Simultaneous Equations Model (SEM) to examine this issue in the Vietnamese banking context, because SEM is able to provide a set of interrelated questions in a single, systematic, and comprehensive analysis (Gefen, Straub, & Boudreau, 2000) by modelling the relationship between operational efficiency of bank loans and deposits simultaneously. To date, SEM has been applied in a great number of economic fields, particularly marketing and management, but not with efficiency analysis. Therefore, with the application of SEM to banking data, the author would like to develop a new approach to banking research.

Specifically, our SEM is constituted by the two following equations, each has a *ceteris paribus* interpretation.<sup>5</sup> It is important to note that the Three-Stage Least Square (3SLS) will be used to solve that SEM, as it can be more efficient than the Two-Stage least Square (2SLS) in terms of explaining interrelations among the error terms (Belsley, 1988).

<sup>5</sup> For simplicity, we omit the subscript “i” for bank and “t” for year.

$$LOAN = \alpha_0 + \alpha_1 DEPOSIT + \beta_1 Z_1 + \varepsilon_1 \quad (1)$$

$$DEPOSIT = \alpha_2 + \alpha_3 LOAN + \beta_2 Z_2 + \varepsilon_2 \quad (2)$$

where:

*LOAN*: the logarithmic value of the loans utilised by the bank;

*DEPOSIT*: the logarithmic value of the deposits mobilised by the bank;

$Z_1$ : a set of exogenous instrumental variables in equation (1);

$Z_2$ : a set of exogenous instrumental variables in equation (2); and

$\varepsilon_1$  and  $\varepsilon_2$  are the residuals, which then will be used to estimate the inefficiency of the two activities in the next step.

At this stage, we can obtain the zero-mean OLS residuals as

$$\hat{\varepsilon}_1 = LOAN - [\alpha_0 + \alpha_1 DEPOSIT + \beta_1 Z_1] \quad (3)$$

$$\hat{\varepsilon}_2 = DEPOSIT - [\alpha_2 + \alpha_3 LOAN + \beta_2 Z_2] \quad (4)$$

Here, the value of  $\hat{\varepsilon}_1$  and  $\hat{\varepsilon}_2$  can be less than, equal to, or greater than zero.

After the efficient frontiers for the two activities are estimated, COLS will adjust them upward (as we follow the output-oriented).<sup>6</sup> Accordingly, the residuals are also adjusted to be

$$u_1 = \hat{\varepsilon}_1 - \max\{\hat{\varepsilon}_1\} \leq 0 \quad (5)$$

$$u_2 = \hat{\varepsilon}_2 - \max\{\hat{\varepsilon}_2\} \leq 0 \quad (6)$$

and

$$EF_1 = \exp(u_1) \quad (7)$$

$$EF_2 = \exp(u_2) \quad (8)$$

where  $EF_1$  is the technical efficiency of funds utilization activities and  $EF_2$  is the technical efficiency of funds mobilization activities.

### 3.2. Data

Our research employs the pooled cross-section sample data of 44 banks domiciled and operated in Vietnam (please see Appendix for the specific names those banks) during the 2008-

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<sup>6</sup> In this sense, we argue that the aim of Vietnamese banks is to maximize the amount of funds mobilized from savers as well as the amount of funds utilized for borrowers.

2015 period, totalling 297 observations. The data is collected from annual reports and financial statements published by those banks. All data is calculated in VND and deflated using the Consumer Price Index (CPI) extracted from the World Bank Database, where 2010 is chosen as the base year. There might be differences between the accounting principles and standards of the banks, namely the Vietnamese Accounting Standards (VAS) and the International Financial Reporting Standards (IFRS), but those differences are not important to our analysis, especially as VAS had begun to adopt IFRS since 2001 (Ngo & Tripe, 2017). A summary on the number and types of banks covered in this research is presented in Table 1 below, where the number of banks varied from 29 to 43 each year, supporting the idea of a pooled cross-section analysis. Overall, our sample covers a set of up to seven SOCBs and up to another 33 JSCBs.<sup>7</sup>

**Table 1. Number of banks tested every year during the period 2008-2015**

Year	Number of Banks	SOCBs	SPB	JSCBs	JVBs	BFOBs
2008	40	6	1	32	1	0
2009	43	7	1	33	1	1
2010	43	7	1	33	1	1
2011	38	6	0	30	1	1
2012	36	5	0	29	1	1
2013	35	5	0	28	1	1
2014	33	4	0	27	1	1
2015	29	3	0	24	1	1

**Notes:** SOCBs stand for State-Owned Commercial Banks; SPB stands for State Policy Bank; JSCBs stand for Joint Stock Commercial Banks; JVBs stand for Joint Venture Banks; and BFOBs stand for Branches of Foreign-Owned Banks (also include Fully Owned Foreign Banks after 2007).

*Source: Authors' calculation*

As discussed in the previous section, beside the two variables LOAN and DEPOSIT, we also examine the effect of some instrumental variables (IVs) on the efficiency of the two basic activities as  $Z_1$  and  $Z_2$  in our SEM. Accordingly, we control for the total assets (TA), the ratio of loans to customers over total assets (LOA), the ratio of deposits from customers over total liabilities (DOL), the number of bank's branches (BRANCH), the ratio of deposits and borrowings from other credit institutions over total liabilities (ILL), the lending rate (LR), the unemployment rate (UNEMP), and the type of the bank (TYPE, a dummy variable which

<sup>7</sup> The total assets owned by the 7 State-owned commercial banks, as of September 2016, were VND 3,690,463 billion, accounted for 45% of the total assets of the Vietnamese banking sector (SBV, 2017).

equals to 1 if the bank is a SOCB; otherwise is zero). The descriptive statistics of those variables are presented in Table 2 below. It is worth to mention that the correlation between those variables are low, except for LOAN, DEPOSIT and TA. This is common in the banking literature and further emphasizes the endogeneity issue that needs to be avoided using SEM.

**Table 2. Descriptive statistics of the variables**

Variable	Obs	Mean	Median	Maximum	Minimum	Std. Dev.
LOAN	297	12.3388	12.1801	15.7777	8.0742	1.3631
DEPOSIT	297	12.3889	12.4489	15.5139	8.6800	1.4466
TA	297	13.0661	13.1061	16.2169	9.7549	1.2915
LR	297	12.1845	13.1353	16.9538	7.1175	3.1409
DOL	297	0.6410	0.6701	0.9829	0.0138	0.1835
UNEMP	297	2.2739	2.3000	2.6000	1.8000	0.2704
ILL	297	0.2193	0.2113	0.7608	0.0000	0.1409
BRANCH	297	1639	88	199689	0	16258
LOA	297	0.5172	0.5110	0.9773	0.0116	0.1605
TYPE	297	0.1246	0	1	0	0.3308

*Source: Authors' calculation*

## 4. Results and Discussions

### 4.1. SEM analysis

The estimation of the SEM in equations (1) and (2) above required some endogenous variables. We argue that DOL can have some relationship with DEPOSIT while LOA is associated with LOAN and thus use the two as endogenous variables in our SEM. The rest of the variables in  $Z_1$  and  $Z_2$  can be used as control variables. We first report OLS results for the reduced forms of the above equations in detecting strong IVs for the two endogenous variables LOAN and DEPOSIT. In particular, we used the Cragg-Donald test to check if DOL is an endogenous variable of DEPOSIT, and if LOA is an endogenous variable of LOAN. Both tests resulted with the F-statistics of 563.301 and 635.596, respectively. Since those results are greater than 10, we can argue that they are justified as endogenous variables of our SEM.

In addition, we also employed the Durbin-Wu-Hausman test for the exogenous characteristics of the other IVs (e.g. TA, BRANCH or UNEMP). All tests ended up with J-statistics smaller than zero, thus we cannot reject the null hypothesis that those variables are

exogenous to the dependent ones, i.e. LOAN and DEPOSIT. Consequently, we argue that our SEM is justified, and its results are thus consistent and unbiased.

Our SEM in equations (7) and (8) are consequently estimated by 3SLS and the results are presented in Table 4. As discussed, we argue that our SEM results are have accounted for the causal relationship between bank loans and deposits, and the findings can reveal the operational efficiency of Vietnamese banks' funds mobilization and utilization activities simultaneously.

**Table 4. Results of SEM analysis**

<b>Part 1. Results of Equation (9) – Dependent variable: LOAN</b>			
<i>Variable</i>	<i>Coefficient</i>	<i>Standard Error</i>	<i>t-Statistic</i>
DEPOSIT	0.208	0.022	9.294 ***
LOA	2.440	0.073	33.480 ***
TA	0.765	0.025	30.462 **
LR	0.008	0.005	1.797 ***
BRANCH	0.000	0.000	2.543 ***
TYPE	-0.022	0.041	-0.535
UNEMP	0.063	0.199	0.315
Constant	-1.466	0.191	-7.678 ***
<b>Part 2. Results of Equation (10) – Dependent variable: DEPOSIT</b>			
<i>Variable</i>	<i>Coefficient</i>	<i>Standard Error</i>	<i>t-Statistic</i>
LOAN	-0.029	0.048	-0.614
DOL	2.686	0.108	24.893 ***
TA	1.072	0.046	23.362 ***
LR	0.037	0.007	5.042 ***
BRANCH	0.000	0.000	-9.220 ***
TYPE	-0.136	0.064	-2.121 **
UNEMP	-1.071	0.319	-3.357 ***
Constant	-3.532	0.286	-12.328 ***

In particular, by examining this causality, we can identify a positive and significant impact that DEPOSIT has on LOAN (see the first part of Table 4), whereas the impact of LOAN on DEPOSIT is negative (and small) but insignificant (the second part of Table 4). Theoretically, one can argue that on a system wide basis, loans would come back to the banking system as deposits. What we do not know, however, is how this affects the loans and deposits of individual banks. In the Vietnamese context, we assume that the flow of loans back to the

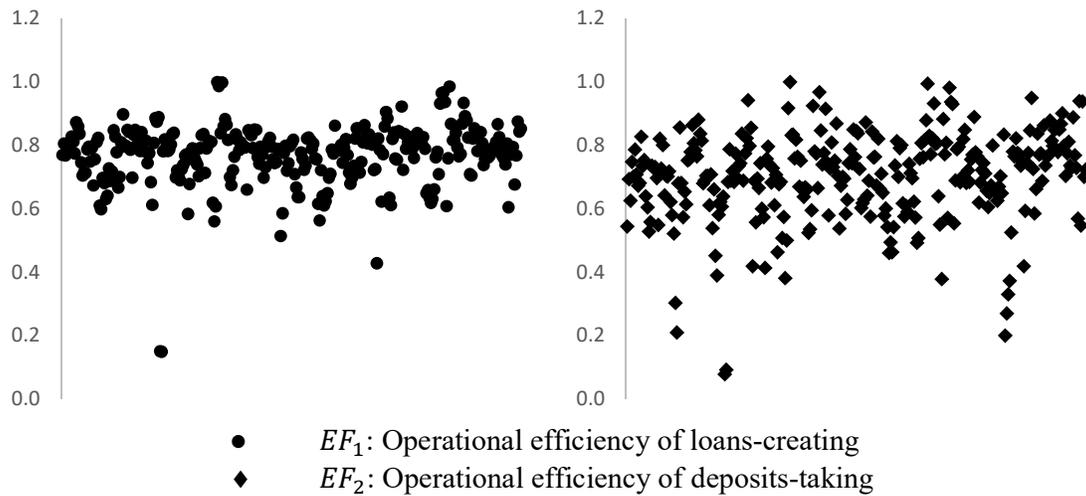
banks is asymmetric between individual banks (i.e. big banks may get more of the loans back in as deposits, compared to smaller banks) – as can be seen with the variable TA in Table 4. Additionally, since in Vietnam the SOCBs can attract more deposits than the JSCBs, we further argue that savers put money in the banks not because the banks are efficient but due to other factors such as safety or belief (e.g. the SOCBs will not be merged or bankrupted). It thus suggests that further studies with bigger dataset or with different datasets (e.g. for other advance economies) are needed to confirm this finding.

In terms of the impacts of IVs on funds utilization activities of the banks, i.e. part 1 of Table 4, we can see that except for TYPE and UNEMP, other independent variables of this equation are positively and statistically significant. It suggests that increasing in those factors can help Vietnamese banks to provide more loans to the market. For example, adding one more point of deposit or one more point of assets can increase the amount of loans by 0.208 and 0.765 percentage points, respectively. In contrast, the second part of Table 4 suggests that all independent variables have significant impact on bank deposits, except for bank loans. Interestingly, in this part, TYPE and UNEMP negatively affect deposits, indicating a different story about the funds mobilization activities of Vietnamese banks. In particular, SOCBs tend to attract less deposits compares to other types of banks, which confirm the argument that private banks are more flexible and more competitive than state-owned banks (Ariff & Can, 2008; Bonin, Hasan, & Wachtel, 2005a, 2005b), therefore they can be more attractive to savers. In addition, the unemployment rate has an explanatory power for deposits, but not for loans, because an individual who has lost his job would reduce his/her deposits into a bank.

#### *4.2. Efficiency analysis using COLS*

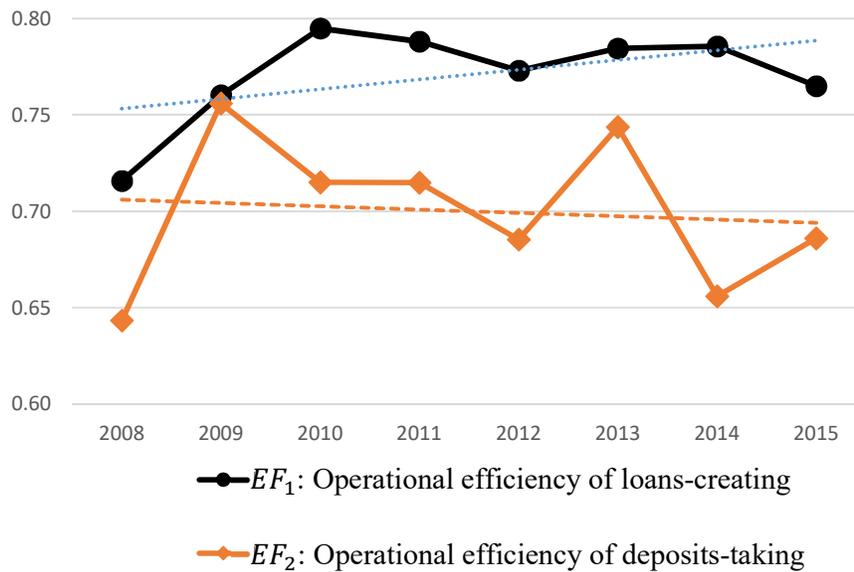
In this section, we first report the overall view on operational efficiency of Vietnamese banks in terms of funds mobilizing and utilizing. Figure 4 suggests that Vietnamese banks are more competitive in lending activities than in deposits-taking activities, as observations on  $EF_1$  are more concentrated than those of  $EF_2$ . Additionally, the median score for  $EF_1$  is 0.789, higher than that of  $EF_2$  (0.720). Accordingly, we conclude that over the 2008-2015 period, Vietnamese banks performed moderately well in terms of the two activities, of which the lending activities were focused more than deposits-taking activities. We then argue that this might be resulted from the Credit Institution System Restructuring Plan and the establishment of VAMC, since banks were required to manage their credit risks. Nevertheless, there are still rooms for those banks to improve their efficiency.

Figure 4. Results of SEM: overview



When examining over time, the picture on operational efficiency of Vietnamese banks is clearer. Particularly, we can see that the efficiency of loans-creating activities of Vietnamese banks increased during the examined period (the dotted line in Figure 5); whereas the efficiency of deposits-taking activities decreased (the dashed line in Figure 5). While the former shows a good signal, the latter reveals an issue of the Vietnamese banking system. Specifically, as discussed in the previous section, in the Vietnamese banking system, deposits have positive impact on loans, while the impact of loans on deposits is not significant. In other words, the contribution of higher efficiency of loans-creating activities to the banks is not clear, but the decrease in efficiency of deposits-taking activities will definitely hinder the banks' lendings and thus negatively impacts the whole banking system. Therefore, we suggest that while trying to keep the good trend on loans-creating activities, in the near future, Vietnamese banks should start to focus more on deposits-taking activities.

**Figure 5. Results of SEM: operational efficiency over time**



## 5. Conclusions

In this paper, we examine the causal relationship between bank loans and deposits in the context of the Vietnamese banking system. A sample consisting of secondary data collected from the annual reports of 44 Vietnamese banks over an eight-year period from 2008 to 2015 is utilised to examine the hypotheses developed in the study. The relationship between bank loans and deposits is significant in the one-way relationship, indicating that deposits have an impact on loans. This also points out that, in case of limited numbers of funding sources for loans as in Vietnam, banks deposits are crucial. The reversal effect of loans on deposits is not significant could be explained as deposits being made by customers to a bank in Vietnam is not because the bank is efficient but due to other factors such as safety or belief (e.g. the SOCBs will not be merged or bankrupted). It thus suggests that further studies with bigger dataset or with different datasets (e.g. for other advance economies) are needed to confirm this finding.

We also investigate the efficiency in the use of loans and deposits by those Vietnamese banks. Employing the COLS approach, we found Vietnamese banks performed moderately well in terms of deposits-taking and loans-creating activities, although there are still rooms for those banks to improve. Combine with an assessment of efficiency changes over time, we suggest that while trying to keep the good trend on loans-creating activities, in the near future, Vietnamese banks should start to focus more on deposits-taking activities.

As a very first study on the relationship between loans and deposits, as well as on the efficiency of using loans and deposits in the context of the Vietnamese banking system, this study, however, still experienced certain difficulties that limit its research scope. These limitations include the challenges in collecting the data from banks with foreign ownership, which led to the small data sample (only 297 observations). The sample period was short, at only eight years from 2008 to 2015, thus it does not allow us to examine the impact of the recent global financial crisis on Vietnamese banks. Future research on this topic, specifically through increasing the sample data in respect to both size and time period covered is, therefore, recommended. In addition, more in-depth study on the efficiency of using loans and deposits based upon other factors such as customer behaviour is also suggested.

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## Appendix

### Vietnamese banks included in the study

No.	Bank's Name	No.	Bank's Name
1	An Binh Commercial Joint Stock Bank	23	Orient Commercial Joint Stock Bank
2	Asia Commercial Joint Stock Bank	24	Petrolimex Group Commercial Joint Stock Bank
3	Bao Viet Joint Stock Commercial Bank	25	Saigon – Hanoi Commercial Joint Stock Bank
4	Construction Bank (former name: Trustbank)	26	Saigon Bank for Industry & Trade
5	DongA Joint Stock Commercial Bank	27	Saigon Commercial Bank
6	First Joint Stock Commercial Bank	28	Saigon Thuong Tin Commercial Joint Stock Bank
7	Global Petro Commercial Joint Stock Bank	29	South East Asia Joint Stock Commercial Bank
8	Great Asia Commercial Joint Stock Bank	30	Southern Commercial Joint Stock Bank
9	Hanoi Building Commercial Joint Stock Bank	31	TienPhong Commercial Joint Stock Bank
10	Ho Chi Minh City Development Joint Stock Commercial Bank	32	Viet A Joint Stock Commercial Bank
11	HSBC Bank (Vietnam) Limited	33	Viet Capital Commercial Joint Stock Bank
12	Indovina Bank Ltd.	34	Viet Nam Technological and Commercial Joint Stock Bank
13	Joint Stock Commercial Bank for Foreign Trade of Vietnam	35	Vietnam Bank for Agriculture and Rural Development
14	Joint Stock Commercial Bank for Investment and Development of Vietnam	36	Vietnam Bank for Social Policies
15	Kienlong Commercial Joint Stock Bank	37	Vietnam Commercial Joint Stock Bank for Private Enterprise
16	Lien Viet Post Joint Stock Commercial Bank	38	Vietnam Export Import Commercial Joint Stock Bank
17	Mekong Development Joint Stock Commercial Bank	39	Vietnam International Commercial Joint Stock Bank
18	Mekong Housing Bank	40	Vietnam Joint Stock Commercial Bank of Industry and Trade
19	Military Commercial Joint Stock Bank	41	Vietnam Maritime Commercial Joint Stock Bank
20	Nam A Commercial Joint Stock Bank	42	VietNam Tin Nghia Commercial Joint Stock Bank
21	National Citizen Bank	43	Western Commercial Joint Stock Bank
22	Ocean Commercial One Member Limited Liability Bank	44	Vietnam Public Joint Stock Commercial Bank