

# Financial and Production Performance of Domestic and Foreign Banks in Indonesia in Pre- and Post-Financial Crisis

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## Abstract

Paper ini bertujuan mengevaluasi kinerja keuangan dan kinerja produksi bank swasta dan bank asing periode 1991 hingga 2003. Kinerja keuangan diukur dengan metode CAEL. CAEL adalah bagian dari CAMELS yang merupakan alat ukur kinerja perbankan di Indonesia. Sedangkan, kinerja produksi diukur dengan model Data Envelopment Analysis (DEA) Malmquist. Hasil penelitian menunjukkan bahwa kinerja keuangan bank asing lebih baik dibandingkan bank swasta. Bank umum di Indonesia rata-rata per tahun mengalami penurunan produktivitas sebesar 2 % untuk periode 1991 hingga 2003. Hasil penelitian juga menunjukkan terdapat hubungan signifikan antara kinerja keuangan dan kinerja produksi.

**Keywords:** CAEL; DEA - Malmquist index; domestic banks; foreign banks

The multilateral trade liberalization has progressed rapidly since the first round of trade negotiations under the General Agreement on Tariffs and Trade (GATT) after World War II and World Trade Organization (WTO) since 1995. Reductions in trade barriers, declines in transportation costs, advancements in communications technology, and formation of political allies among members strengthened and fastened the mobility of people, goods, services, and capital in recent years that led to an acceleration of international economic integration. Consequently, the recent increase in international commerce has

created a massive demand for international financial services.

Financial institutions nowadays have different ways to deliver financial services to their customers in a foreign country. With the advancement of technology, the corporate body of an establishment can offer services directly to the foreign business from its home country headquarters. Along with the expanded participation in the general Agreement on Trade in Services (GATS) of WTO and ASEAN Free Trade Area (AFTA), policymakers became aware of the presence of foreign financial service, which enhances banking efficiency.

Among the financial institutions, banks are considered to be the most important. Bank serves as the principle source of credit for some multinational corporations, small firms, government sector, and household sector. Their increasing role was manifested in the recent survey of 2004 World Development Indicator. Accordingly,

credits provided by banks have increased from 121 percent of GDP in 1990 to 151 percent of GDP in 2002. Miskhin (2003) noted that the primary sources of external funds for most of the business transactions in the world are bank loans. As a matter of fact, 61.9 percent of the business transactions in the United States of America are financed through this.

The financial equilibrium among Asian countries has been controlled by commercial banks, which usually control the domestic banking having large branch networks. The foreign banks generally offer trade finance to big firms. Foreign banks, operations in Asia, Africa, the Middle East, and the former Soviet Union have increased in the past decades as it promotes competition, improves economic and financial stability, and encourages sectors efficiency.

Determining the efficiency of the financial service industry has been a popular area in banking research. Different findings about bank's safety and soundness have found to be useful especially for bank manager, who seeks to improve the operation performance of his bank and policymakers, who are very much concern with public welfare. Some of the studies reviewed have revealed a positive relation between financial performance and efficiency (Li et al., 2001; Karim, 2001; Barr, et al., 2002). PLS. On the other hand, some studies focused on comparing the performance of foreign and domestic banks (Claessens et al., 1998; Hermes and Lensink, 2003; Jeon and Miller, 2002).

In the conduct of the study of Asian banks, performance especially in Indonesia, lack of data for non-publicly financial institutions remains to be the impediment for a better and deeper analysis. Although,

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there are some studies about bank's performance, their focus is more on the profit side rather than the operations side of financial institutions.

The aim of this study is to comparing financial and production performances of the foreign and domestic banks in Indonesia using the financial accounting ratio model and DEA - Malmquist model. These research models are all consistent with those previous studies on financial and production banks' performance. The combination of these two models in the Indonesian banking industry would fill the gap of the limitations of one model found in the existing literature. This study, then, would offer more valuable information for policy formulation and improvement of bank's management performance.

The paper is organized as follows: Section II briefly discusses the existing banking literature review and the empirical model, Section III discusses the methodology and data, and Section IV presents the findings and followed by conclusions in Section V.

## LITERATURE REVIEW

This section presents the previous studies about the comparative performance of foreign and domestic banks. There are two ways of presenting the literature of comparative performance between foreign and domestic banks. First, it compares of foreign-owned and domestic banks in one country and second, it gives attention to cross-country analysis within developing country or/and among nations. Environment factors such as bank regulation industry and culture barrier are ignored in the former type, because banks compete in the same market within the country (Vivas et. al., 2001).

Using accounting method, a study of Jeon and Miller (2001) found out that during the period of financial crisis (1997-1999), domestic banks in Korea had negative return on asset (ROA) and return on equity (ROE) while foreign banks maintained positive profits. This is attributed to the won, which depreciated as an effect of the financial crisis. It was also found out that ROA and ROE have positive associations with the bank's performance, and negative correlations between the non-performing loans.

Li et. al. (2001) also conducted a study on the financial performance between stated- owned bank and joint-equity bank in China using financial ratio analysis. Findings showed that state-owned banks are lower in terms of profitability (ROA and ROE) as compared with joint-equity banks. The low profit registered was obtained because of high non- interest expenses and low interest margin. Likewise, Chinese banks generated lower returns than their Western counterparts because of higher financial risks.

By using DEA, Jemric and Vujcic (2002) examined the bank's efficiency among countries in transitional period 1995-2000. Their study showed that foreign owned banks are more efficient than private and state-owned banks, and that new banks are more efficient than old ones due to non-performing loans at old banks as well as in state banks. In terms of size, it was noted that smaller banks are more efficient than large banks.

On the other hand, based on two main hypotheses, the home field advantage hypothesis and the global advantage hypothesis, Berger et al. (1999) examined the performance of foreign and domestic banks in five different home countries during 1990's. In general, foreign banks are less efficient than domestic banks. Their finding was in consonance with the hypothesis of the home field advantage. Domestic banks were found to have several advantages over foreign banks in terms of their language, culture, and regulatory system. Foreign banks, on the other hand, have the advantage on the global environments by spreading their superior managerial skill. The cost efficiency for country was the following: France (70.9 percent), Germany (79.3 percent), Spain (91.5 percent), U.K. (79.2 percent), and the United States (77.4 percent). However, they noted that the efficiency of one country is incomparable to the efficiency of the other four home countries. Their differences in terms of across home countries are influenced by market structure such as the degree of competition and regulatory / supervisory factors. Finally, they concluded that banks with the best domestic performance also perform well abroad, and

banks with the weakest performance abroad also perform poorly at home.

Levine (1996) stated that foreign banks may improve the quality and increase the availability of financial services in the domestic financial market by increasing bank's competition and allowing the application of more sophisticated banking know-how technology. Moreover, these banks could enhance country's access to international capital.

In this paper, we investigate the performance between foreign and domestic banks in pre and post financial crisis in Indonesia. The main hypothesis is that there is no significant different in financial and production performance between domestic and foreign banks in pre and post financial crisis.

## METHODOLOGY AND DATA

### Financial Ratios

Bank industry's performance is often evaluated with the simple ratios taken from balance sheet and income statements. Financial ratios are proven to be useful because these allow analysts to test and measure the profitability and production efficiency of banks relative to their underlying risk taken. Almost all studies investigating the financial performance of banks rely on such financial and accounting measures. Measuring financial performance using financial ratio (CAMEL) started to become popular since 1990's. This is because the financial ratios provide accurate measures of profitability and efficiency (Kwan, 2003; Allen et al., 2000; Scholtens, 2002). Starting 1980's, US supervisory authorities used CAMEL rating system for on-site examinations of banking institutions. This concept introduced a uniform system of rating a banking institution in the United States. CAMELS system has developed in the U.S. but similar methodology has been developed by various central banks all over the world, including Indonesia.

The FDIC, a US supervisory authority, developed and adopted quarterly off-site supervisory rating system, CAEL in the mid-1980s. The acronym CAEL refers to four of the six letters from CAMELS. These are Capital, Assets, Earnings, and Liquidity. Calculation of CAEL ratings involved

some financial ratios representing these four main components.

This study employs the CAEL method; it provides the financial performance of relevant variables to assess Indonesian bank's performance. Each of the four CAEL variables are computed over the period 1991-2003, except ratios of CAR and NPL, which are given 1998 onwards. Data were obtained from annual publication of banks' financial statements. The CAEL variables are defined as follows:

1. Capital ratio
  - a. Ratio of total equity to total assets
  - b. Ratio of CAR version Bank for International Settlement (BIS)
2. Asset quality ratio
  - a. Allowance earning assets to total earning assets
  - b. Non-performing loans
3. Earning ratio
  - a. Earning after tax to total assets
  - b. Net Interest income to total assets
  - c. Non interest income to total assets
4. Liquidity ratio
 

Ratio of Loans to Deposit ratio (LDR):  
Total loans to total deposit

#### DEA - Malmquist Index

Some scholars have argued that these measures are very simple estimates of cost efficiency and productivity (Oral and Yolalan, 1990; Berger and Humphrey, 1992). They stated that accounting ratios might be inappropriate for describing the actual efficiency. In the light of criticisms against the inadequacy of financial ratios as a measure of performance, the Data Envelopment Analysis (DEA) model has been adopted as a general measurement of production efficiency.

DEA is a mathematical programming technique used to define a set of best practice observations and form a piecewise linear frontier that all institutions can be evaluated against (Barr et al., 2002). This study uses DEA - Malmquist index. This method is used to calculate indices of total factor productivity (TFP) change, technological change (TECHCH), and efficiency change (EFFCH) (Tim Coelli, 1996). Particularly, Fare et al. (1994) developed the Malmquist productivity change index as shown in equation 1:

$$m_0^t(y_t, x_t, y_{t+1}, x_{t+1}) = \frac{d_0^{t+1}(y_{t+1}, x_{t+1})}{d_0^t(y_t, x_t)} \left[ \frac{d_0^t(y_{t+1}, x_{t+1})}{d_0^{t+1}(y_{t+1}, x_{t+1})} \times \frac{d_0^t(y_t, x_t)}{d_0^t(y_t, x_t)} \right]^{1/2} \quad (1)$$

where, y and x represent outputs and inputs, respectively across time period t to t+1. All the indices are geometric means and are relative to the previous year; therefore, the values derived are interpreted as:

- index > 1 indicates a positive TFP growth,
- index < 1 indicates a decrease in TFP growth.
- index = 1 indicates no change or constant.

The first equation (1) to the right represents the efficiency change and the next equation represents the technological change from distance t to t+1. The product of the two components (EFFCH and TECHCH) on the left of Equation 1 is the Malmquist productivity change (TFPCH).

In this paper, DEA - Malmquist index was used to measure the production performance. To examine production performance, three outputs and four inputs variables taken from bank's financial statement period 1991 up to 2003 were considered. The outputs used here include: bank's loans, interest income, and non-interest income, while four inputs used are: bank's deposit, interest cost, personnel expenses, and administration cost. The Data Envelopment Analysis Program (DEAP) version 2.1 which was developed by Tim Coelli (Coelli, 1996) is employed to obtain the empirical results.

#### Data and Sample

The data for this paper are mostly taken from Ekofin Konsufindo, Indonesia, and some data are also gathered from Bank Indonesia. Data for the time period 1991 to 1996 is categorized as before the Asian financial crisis while data obtained for the time period of 1998 up to 2003 are classified as after financial crisis. The year 1997 is considered as the period of transition from the years of pre crisis to the post crisis.

The total Indonesian commercial banks are 138 banks; however, there are 60 banks only with a foreign exchange status. This study covers 31 banks, composed of 22 domestic banks and 9 foreign

banks. Domestic banks are defined as private banks, which have a foreign exchange status while foreign bank refers to corporation formed, organized and existing under any foreign law (Indonesian Republic Act No. 24, 1999).

#### FINDINGS

##### Result I: Financial Performance

CAEL is a tool for examining the financial performance of domestic and foreign banks for the test period of 1991 to 2003. Based on Table 1,1A and 1B, the Mann-Whitney rank sum test shows that for the entire period covered (including the pre-financial crisis and post financial crisis), the financial ratio is significantly different between domestic and foreign banks. The asset quality and capital ratio (except CAR version BIS) of domestic banks are better than that of foreign banks while earning ratio and liquidity of foreign banks are better than that of its counterpart. The equity divided by foreign bank's total asset is lower than domestic banks but in terms of calculated CAR version BIS, foreign banks are higher than that of domestic banks. This can be attributed to the foreign banks' readily available additional funds.

The earning ratio of foreign banks revealed that these banks are more productive and efficient than domestic banks. The lower interest rate that these foreign banks charge to their borrowers and higher interest rate for their depositors make them more profitable. This is possible because of their large pool of capital. This finding is consistent with the theory that foreign banks have global advantage over domestic banks. This is because countries, like Indonesia, have not yet developed fully its financial market unlike in the U.S., for instance, where sophistication is visible already (Berger et al., 2001). The result is also consistent with the findings of Claessens et al. (2001). They concluded that foreign banks which operate in developing countries generally achieve higher profitability than domestic banks.

In terms of liquidity ratio, foreign banks are more aggressive than domestic banks to provide loans. This can be inferred from the foreign banks' loan to deposit ratio, which is higher than domestic banks. This also validates the hypothesis that higher LDR has better chance to profitability but needs to face higher risk-consequently, foreign banks having LDR have high non-performing loans and poor in terms of quality of assets.

#### Period Pre and Post Financial Crisis:

Based on Table 2, 2A, and 2B, Wilcoxon test revealed that commercial banks in Indonesia showed unfavorable performance during the post-financial crisis. Except in non-interest income, the financial ratios of commercial banks during the pre-financial crisis are better as compared the post-financial crisis. This result implies that domestic banks suffered more than the foreign banks during the financial crisis. Due to the latter's global advantage and capacity to manage financial risk, foreign banks performed better. On the other hand, domestic banks' performance worsened due to moral hazard and crony capitalism problem. Consequently, some domestic banks collapsed after the financial crisis.

Table 2A and 2B show that the financial performance of domestic banks in pre and post financial crisis is significantly different to each other while foreign banks' performance did not register significant difference. This implies that the former type of banks was hit more during the financial crisis while the latter type of bank was able to successfully recover from it. Interestingly, both types of banks become aggressive to collect non-interest income such as fee on commission and trading foreign exchange after the financial crisis. Consequently, non-interest income in both types of banks significantly increased, although, domestic banks managed to earn more from this item.

#### Result II: Production Performance

This section investigates the production performance, which is also known as productive-efficiency (Elyasiany, 1994). DEA-Malmquist index assigns productivity change, which is decomposed into efficiency and technological change. The

TABLE 1  
FINANCIAL PERFORMANCE  
DOMESTIC AND FOREIGN BANKS

PERIOD 1991-2003

Measure	MEAN		Test of Significant Mann-Whitney	Remark
	Domestic	Foreign		
Capital Equity/A	10.60%	6.33%	-2.949 (0.003)***	Domestic is better
Asset quality AA to EA	2.53%	6.19%	-2.182 (0.029)**	Domestic is better
Earning ROA	0.24%	2.16%	-4.134 (0.000)***	Foreign is better
NIM	3.98%	5.93%	-2.616 (0.009)***	Foreign is better
Non. Int.	1.06%	4.25%	-4.212 (0.000)***	Foreign is better
Liquidity LDR	69.31%	98.21%	-2.333 (0.020)**	Foreign is better

( ) Indicates p-Value

\*, \*\*, \*\*\* significant at .10, .05, .01 probability level respectively

TABLE 1A  
COMPARATIVE FINANCIAL PERFORMANCE  
DOMESTIC AND FOREIGN BANKS

PRE CRISIS (1991-1996)

Measure	MEAN		Test of Significant Mann-Whitney	Remark
	Domestic	Foreign		
Capital Equity/A	11.69%	8.70%	-1.444 (0.149)	Domestic is better
Asset quality AA to EA	1.00%	2.05%	-2.913 (0.004)***	Domestic is better
Earning ROA	1.10%	2.16%	-2.732 (0.006)***	Foreign is better
NIM	4.62%	5.89%	-2.722 (0.006)***	Foreign is better
Non. Int.	0.67%	3.30%	-2.908 (0.004)***	Foreign is better
Liquidity LDR	85.54%	127.40%	-2.882 (0.004)***	Foreign is better

( ) Indicates p-Value

\*, \*\*, \*\*\* significant at .10, .05, .01 probability level respectively

TABLE 1B  
COMPARATIVE FINANCIAL PERFORMANCE  
DOMESTIC AND FOREIGN BANKS

POST CRISIS (1996-2003)

Measure	MEAN		Test of Significant Mann-Whitney	Remark
	Domestic	Foreign		
Capital Equity/A	8.88%	4.28%	-2.562 (0.010)***	Domestic is better
CAR	22.77%	30.29%	-2.402 (0.016)**	Foreign is better
Asset quality AA to EA	4.21%	10.94%	-2.647 (0.008)***	Domestic is better
NPL	18.57%	29.62%	-1.121 (0.262)	Domestic is better
Earning ROA	-0.79%	2.21%	-2.892 (0.004)***	Foreign is better
NIM	3.12%	6.25%	-2.647 (0.008)***	Foreign is better
Non. Int.	1.40%	5.20%	-2.732 (0.006)***	Foreign is better
Liquidity LDR	48.51%	70.00%	-2.882 (0.004)***	Foreign is better

( ) Indicates p-Value

\*, \*\*, \*\*\* significant at .10, .05, .01 probability level respectively

indices are related to the previous years, so no data are available for 1991. Findings reveal that the productivity of all banks declined during the sample period covered. Geometric means indicate the productivity index decline by 2 percent. The result can be attributed to the decline in technological change by 1.4 percent and efficiency change by - 0.4 percent. The sign reveals that its productivity did not grow up to frontier level during the period covered. This implies that Indonesia was badly hit by the Asian financial crisis and suffered the most. This result is consistent with that of Batunanggar (2002).

Indonesian commercial banks experienced 21 percent and 33 percent productivity growth in 1997 and 1998, respectively. At the same time, its technological growth grew from 16 percent to 37 percent for the said two years. However, TFP dropped by 44 percent in the period 1999/1998. This decline could be attributed to the cost of investment technology, which was more expensive during that period as a result of more than the depreciation of its currency for almost 60 percent. It is also worth to note that there were more than 50 banks that either closed or acquired by bigger banks during the period of financial crisis. Surprisingly, there was 2.8 percent efficiency growth that was registered. This shows that Indonesian commercial banks tried to cope up with the crisis by improving their inputs to become more efficient in the midst of the crisis.

Among nine (9) commercial banks, which posted the highest productivity, five (5) of which are foreign banks and four (4) are domestic banks. Interestingly, among nine foreign banks being considered in this study, five of which entered into the top nine. On the other hand, only four among twenty-two (22) domestic banks managed to complete in ranking where its highest ranked third only while the first two ranks were garnered by foreign banks (Table: 4 A).

Foreign banks also dominate in terms of technological change. Six (6) of the ten (10) banks are foreign banks, wherein, they got the first two positions as well. These positions belong to Deutsche Bank and Tokyo-Mitsubishi Bank, respectively. These findings are consistent with the theory that foreign banks are more glo-

TABLE 2  
COMPARATIVE FINANCIAL PERFORMANCE  
PRE AND POST FINANCIAL CRISIS

ALL SAMPLE BANKS

Measure	MEAN		Test of Significant WILCOXON	Remark
	Pre - C	Post - C		
Capital				
Equity/A	10.83%	7.55%	-1.992 (0.046)**	Pre crisis is better
Asset quality				
AA to EA	1.30%	6.16%	-2.201 (0.028)**	Pre crisis is better
Earning				
ROA	1.41%	0.08%	-2.032 (0.042)**	Pre crisis is better
NIM	4.99%	4.05%	-1.572 (0.116)	Pre crisis is better
Non. Int.	1.44%	2.50%	-2.023 (0.043)**	Post crisis is better
Liquidity				
LDR	97.69%	54.75%	-2.201 (0.028)**	Pre crisis is better

( ) Indicates p-Value

\*, \*\*, \*\*\* significant at .10, .05, .01 probability level respectively

TABLE 2A  
COMPARATIVE FINANCIAL PERFORMANCE  
PRE AND POST FINANCIAL CRISIS

DOMESTIC BANKS

Measure	MEAN		Test of Significant WILCOXON	Remark
	Pre - C	Post - C		
Capital				
Equity/A	11.69%	8.88%	-2.201 (0.028)**	Pre crisis is better
Asset quality				
AA to EA	1.00%	4.21%	-2.207 (0.027)**	Pre crisis is better
Earning				
ROA	1.10%	-0.79%	-2.201 (0.028)**	Pre crisis is better
NIM	4.62%	3.12%	-2.201 (0.028)**	Pre crisis is better
Non. Int.	0.67%	1.40%	-2.207 (0.027)**	Post crisis is better
Liquidity				
LDR	85.54%	48.51%	-2.201 (0.028)**	Pre crisis is better

( ) Indicates p-Value

\*, \*\*, \*\*\* significant at .10, .05, .01 probability level respectively

TABLE 2B  
COMPARATIVE FINANCIAL PERFORMANCE  
PRE AND POST FINANCIAL CRISIS

FOREIGN BANKS

Measure	MEAN		Test of Significant WILCOXON	Remark
	Pre - C	Post - C		
Capital				
Equity/A	8.70%	4.28%	-1.363 (0.173)	Pre crisis is better
Asset quality				
AA to EA	2.05%	10.94%	-2.201 (0.028)**	Pre crisis is better
Earning				
ROA	2.19%	2.21%	-0.315 (0.752)	Post crisis is better
NIM	5.89%	6.25%	-0.734 (0.463)	Post crisis is better
Non. Int.	3.30%	5.20%	-1.156 (0.248)	Post crisis is better
Liquidity				
LDR	127.40%	70.00%	-2.201 (0.028)**	Pre crisis is better

( ) Indicates p-Value

\*, \*\*, \*\*\* significant at .10, .05, .01 probability level respectively



bally competitive and have an advantage than domestic banks. Likewise, the result confirms that domestic banks need to develop more its financial system. (Table: 4 B).

On the contrary, domestic banks dominate in terms of efficiency. Out of ten, only one (1) foreign bank managed to land on the 10th place ( Deutsche Bank ). This means that foreign banks are in less advantage position. This finding also confirms the home field advantage theory for Indonesian domestic banks. Findings also imply that domestic banks in Indonesia were able to survive despite the fact that financial crisis badly hit its financial system. Foreign banks, on one hand, have to adapt to different banking regulations since Indonesia has changed its president thrice during the period of financial crisis. This necessitates them to face higher overhead cost because of the cultural and language barriers as well. (Table: 4 C).

### Result III: Linkage between Financial Performance and Production Performance

In terms of financial performance, it shows that foreign banks are more profitable because of their aggressiveness to face risks. On the other hand, in terms of production performance, foreign banks are more productive and innovative than domestic banks but less on catching up to the best-practice frontier (EFFCH). This follows to the conclusion that those banks that are more productive and advance in terms of technology tend to be more profitable but at the same time face higher risks.

In this section, the linkage between financial performance and production performance using DEA-Mammquist index is examined specifically the stepwise regression is used to test the association between Malmquist index as dependent variable and all financial ratios (CAEL) as independent variables.

Scholars attested that stepwise model is appropriate and best method Field (2002). This is because it maximizes the squared partial correlation coefficient with the variable chosen. Table 5 summarizes the comparative association between financial and production performances.

**Table 3: MALMQUIST-INDEX SUMMARY OF ANNUAL MEANS**  
All sample banks

Year	EFFch	TECHch	TFPch
1992	1.010	0.984	0.994
1993	1.006	0.906	0.911
1994	0.966	1.066	1.019
1995	0.926	1.117	1.035
1996	1.018	0.989	1.007
1997	1.044	0.956	1.207
1998	0.972	1.369	1.331
1999	1.028	0.559	0.557
2000	1.034	0.862	0.891
2001	0.984	1.100	1.082
2002	0.932	0.065	0.993
2003	1.047	0.881	0.922
<b>GEOMETRIC MEANS</b>	<b>0.996</b>	<b>0.984</b>	<b>0.980</b>

Table 5 shows the existence of linkage between financial and production performances. Results affirm that there is an association between TECHCH and TFPCH, and with financial ratios except EFFCH. Results from stepwise regression indicate that two out of six variables showed strong association between technological change and total factor productive change. These two variables are allowance of earning assets and profit on non-interest income.

The association between banks' efficiency and productivity as indicated by the ratio of allowance assets to earning assets is strong and statistically significant at 5 and 1 percent probability levels. The negative sign indicates that an increase in allowance on earning assets in bank decreases the technological change and productivity-efficiency as a whole. This is consistent with the proposition that higher allowance on earning assets is accompanied by higher risks. Likewise,

**Table: 4 B**  
Rank Bank based on TECH which greater than 1

Rank	Bank	TECH
1	Deutsche Bank (F)	1.075
2	Tokyo - Mitsubishi Bank (F)	1.056
3	Bank Internasional Indonesia (D)	1.033
4	Citibank (F)	1.027
5	Bank Panin (D)	1.025
6	Hongkong Shanghai Bank (F)	1.024
7	Bank CIC Internasional (D)	1.017
8	Bank Mega (D)	1.009
9	Bangkok Bank (F)	1.009
10	Standard Chartered Bank (F)	1.001

Note: (F) foreign bank and (D) domestic bank

**Table: 4 A**  
Rank Bank based on TFP which greater than 1

Rank	Bank	TFP
1	Deutsche Bank (F)	1.075
2	Tokyo - Mitsubishi Bank (F)	1.056
3	Bank Panin (D)	1.034
4	Citibank (F)	1.027
5	Bank Mega (D)	1.019
6	Bank CIC Internasional (D)	1.011
7	Bangkok Bank (F)	1.009
8	Hongkong Shanghai Bank (F)	1.007
9	Bank NISP (D)	1.003

Note: (F) foreign bank and (D) domestic bank

the positive and significant association of profit on non-interest income with TECHCH and TFPCH is consistent with the theory that banks' productivity increases as profit grows. This consequently led to better access to technology. Thus, profitability has something to do with the banks' technology.

## CONCLUSION

This study affirms that foreign banks have higher overhead cost when their operation is found in developing countries like Indonesia. Nevertheless, they are still more profitable than domestic banks because of their larger pool of available funds. This helps them to entice more borrowers and depositors towards increasing the mobility of their capital for a faster realization of profit. When the country faced social and political crisis (where foreign bank is operating), domestic banks enjoy the so-called home advantage. However, because of the foreign banks' global advantage, they still manage to cope up with the crisis.

Our findings also showed that the DEA model analysis was not only complement of the analysis of banks' performance but can even provide robust results. The combination of two performance models - financial ratio and DEA-offers significant contribution to the banking study and consequently, establishing a linkage between the two models. This study affirms the existence of a significant association between financial ratio and production-efficiency, which is also an original contribution of the study. Future studies will adopt the stochastic frontier method to capture other factors for evaluating the performance of Indonesian banking industry, which is the limitation of the present study. □

**Table 4 C**  
Rank Bank based on EFF which greater than 1

Rank	Bank	EFF
1	Bank Bukopin (D)	1.025
2	Bank Antar Daerah (D)	1.020
3	Bank NISP (D)	1.018
4	Bank Nusantara P. (D)	1.012
5	Bank Artha Graha (D)	1.011
6	Bank Mega (D)	1.010
7	Bank Panin (D)	1.009
8	Bank Mayapada (D)	1.008
9	Bank Buana Indonesia (D)	1.005
10	<b>Deutsche Bank (F)</b>	1.001

Note: (F) foreign bank and (D) domestic bank

**Table 5**  
Linkage between Financial and Operational

CAEL	Stepwise method		
	EFFch	TECHch	TFPch
Capital Equity/A	-	-	-
Asset quality A/AtoEA	-	-5.341 (-3.011)**	-5.229 (-3.221)**
Earning ROA	-	-	-
NIM Non. Int.	-	19.168 (4.470)**	18.367 (4.679)**
Liquidity LDR	-	-	-
R-squared F	-	69.10% 10.063 (11.776)**	70.90% 10.989 (12.917)**

\*\* and \*\*\* significant at 0.05 and 0.01 probability level.

- Stepwise regression did not pick up these variables

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