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DETERMINANTS OF OPERATIONAL EFFICIENCY: THE CASE OF SAUDI BANKS

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Abstract

The study determines the factors that can affect the operational efficiency of Saudi commercial banks. It uses the data of listed banks from the period 2010 to 2017. The panel data estimation technique of pooled ordinary least squares is used with random and fixed effects estimations to find the significant factors. Based on the Hausman test (1978) fixed effects estimation results are used for discussion. The operational efficiency of Saudi banks is influenced by the same factors highlighted for different economies, with a certain exception. Capital adequacy, profitability, and bank size have an adverse influence on operational efficiency. Contrary to this it is positively related to liquidity and asset quality. The results of the study will be useful for policymakers and bank managers to support the effective role of banks in the improvement of the financial sector which is also part of the Kingdom's vision 2030 development plan.

JEL classification: G21, D02, E50

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Introduction

The role of financial institutions, especially banks, is inevitable in the socio-economic development of an economy whether developing or developed. As depository institutions, banks play an important role as financial intermediaries (Levin, 1997). By taking household deposits, they are the primary suppliers of capital to firms. Therefore, banks match the financing supply and demand in the market. The role of banks is essential in the capital allocation between all productive sectors of the economy (Ching et al., 2016). This role of capital allocation becomes more significant in emerging and developing economies. The efficient allocation of capital by banks is dependent on their operational efficiency. As quoted by Barr et al. (1994) "since Secrist (1938) bank failure prediction studies have continually concluded that the quality and the efficiency of the bank management are the leading cause of failure." In the current era of information communication technology, where the information reaches from one corner of the globe to another in a few seconds, a bank run caused by bank failure could be disastrous for any economy. And it could bring the whole financial system of the country to great scrutiny.

However, existing literature has pointed out several factors that affect the efficiency of banks. These factors include bank size, ownership, market share, privatization, and so forth. Tecles and Tabak (2010) reported that Brazilian larger banks are highly efficient in terms of cost and profit. They also stated that privatization and foreign ownership have improved the efficiency of local banks. According to Suzuki (2011) banking is an information-intensive industry. Therefore, to measure bank efficiency the existing literature used either information about cost-effectiveness or profit effectiveness. The existing studies have either measured the cost inefficiencies or profit inefficiencies (Tecles & Tabak, 2010). Maudos et al., (2002) stated that profit maximization not only focuses on cost reduction but also on increase in the revenue. Therefore, profit efficiency provides important information to the bank management as compared to the partial information provided by cost-efficiency. According to Berger and Mester (1997), profit efficiency and cost efficiency of banks are not positively associated, which suggests that profit cannot be increased only by reducing costs.

Several studies have been conducted on emerging economies to find the elements that affect the operational efficiency of the banks. It is assumed that banks with effective operations could meet the capital requirement of the various sectors in the economy. According to Beck et al. (2010) in the case of Kenya, the size of the private banks and efficiency are positively associated. Lotto (2019) explored the operational efficiency of Tunisian banks and concluded that capital adequacy and liquidity have a positive association with bank operational efficiency. The study on banks in Mexico by Garza-García (2012) reported that foreign ownership, GDP growth, and loan intensity contribute to the bank operational efficiency. According to Tecles and Tabak (2010), inefficiency levels in the emerging markets are very high, which hinders financial development and stability. They further argued that the banking sector in developed economies is highly efficient as compared to the developing economies. Moreover, Ghimire et al. (2015), concluded that banks have a vital role in the development of stock and capital markets.

According to the Federal Reserve Economic Data, bank deposits to GDP of Saudi Arabia have increased from 14.51% in 1996 to 38.35% in the year 2017, this shows that the deposits to GDP ratio is still very low compared to developed economies. Secondly, bank concentration (percentage of assets held by the 3 largest banks) has been a constant percentage of 54% from 1996 to 2017. These two factors point out that the Saudi financial sector, especially the banks, are highly concentrated and there is significant potential for the banking sector to grow by improving its operational efficiency which will contribute to the country's economic growth. Moreover, as per the financial stability report by the International Monetary Fund (2017), the interbank market is not well developed therefore domestic banks heavily rely on the Saudi Central Bank (SCB) previously known as (Saudi Arabian Monetary Authority, SAMA) for funding. The same report highlights that commercial banks comprise 51% of the Saudi financial sector while the remaining 49% comprises of pension funds, specialized credit institutions, investment funds, and other financial institutions.

Therefore, considering the importance of banks' role in an economy, this study intends to find the factors affecting the operating efficiency of banks operating in Saudi Arabia. According to Khan et al. (2021) banks are the main source of capital for firms as securities markets are in the development phase. Therefore, it is assumed that the findings of the study will help the managers to improve the operational efficiency of the banks which will contribute to the availability of an additional capital cushion that could be used for the financing of non-oil industrial sectors. In addition, im-

proving the operational efficiency a bank can also increase the deposit to GDP ratio of the country which is quite low compared to other high income economies. Moreover, it will lend a hand to the regulatory bodies to formulate an effective regulatory framework for banks to achieve competitiveness among the regional and emerging economies.

Literature review

According to Berger et al. (1997), the inefficiencies in US banks are quite large, however, the bigger banks are more efficient compared to small banks. Several studies explored the factors affecting the banks' efficiency either by focusing on cost functions or profit functions. Hsiao et al. (2010) stated that in the current competitive environment due to financial globalization banks need to operate efficiently by reducing costs and adapting to new technologies. This competition intensifies with the technological and product innovation in the banking industry. This growing competition can enhance economic progress by increasing the disposal of credit to various economic players, but, financial sector regulators discourage the competition (see: Vives, 2001). This assumption could be held true in the case of developing economies that have liberalized financial policies and strict regulations. Existing literature highlights various factors that affect the banks' efficiency such as non-performing loans (Berger & Mester, 2003), capital adequacy (Das & Ghosh, 2006), financial liberalization, and restructuring (Hsiao et al., 2010), liquidity and capital adequacy (Lotto, 2019). Like other industries, it is assumed that competition can also contribute to the efficiency of the banking industry. According to William and Cabro (2012) financial restructuring can enhance competition, which ultimately affects the bank efficiency. In contrast, it is assumed that an increase in market share can enhance bank efficiency. Some studies suggested the competition between domestic and foreign banks improves the operational efficiency of banks. For instance, the Zhu et al. (2021) study on Pakistan reported that foreign banks have higher operational efficiency than domestic banks; to the contrary, Kamarudin et al. (2017) found that domestic commercial banks have higher efficiency than foreign banks operating in Southeast Asia. In addition, the study by Khan (2022) reported that capital structure also influences the performance and operational efficiency of banks.

Banks as a provider of capital take deposits and pay costs in the form of interest, and lend that money to borrowers to earn income in the form of interest. The interest spread contributes to the bank income, but banks cannot control the interest rates. But, improving the operational efficiency and saving unnecessary costs can contribute to the bank capital and revenue at minimum. Hence, there are internal and external determinants of bank efficiency. The external determinants are legal and economic environment, and internal determinants are size, capital, asset quality, and risk management (see: Delis & Papanikolaou, 2009). In the existing literature, the internal aspects that affect the operating efficiency of the banks are capital adequacy ratio, liquidity, assets quality, profitability, and bank size. In addition to this the external elements that effects the operational efficiency of the banks are inflation and GDP growth.

Capital adequacy ratio

One of the prudential regulations that differentiates banks from non-financial firms is the capital adequacy ratio (CAR). It is implemented by the central banks all over the world as per the recommendations of the Bank for International Settlements (BIS) BASEL accord i.e. An International Regulatory Framework for Banks. Moreover, this ratio is also part of CAMELS ratios used to perform various analysis on banks. It is assumed that banks with higher CAR are considered technically more efficient (see: Das & Ghosh, 2006). In contrast, higher CAR could result in an opportunity cost for banks giving up their income on reserved capital as well.

According to Das and Ghosh (2006) CAR is positively associated with technical efficiency, and banks with higher CAR are well-capitalized and are considered safe. Several studies used CAR to evaluate bank performance in terms of efficiency, lower cost of borrowings (Bernauer & Koubi, 2002), credit risk management practices (Caprio & Klingebiel, 1996), and bank operational efficiency, (Das & Ghosh, 2006; Lotto, 2019). Empirically, the study on Tanzanian banks by Lotto (2019) reported a positive association between CAR and bank operating efficiency. Likewise, Bandaranayake and Jayasinghe, (2014) found a positive effect of CAR on the Net Interest Margin (NIM) of Sri Lankan banks. The study by Das and Gosh (2006) explored the negative effect of CAR on bank inefficiency in Indian banks.

Liquidity

In recent years in addition to CAR, liquidity has also been a primary concern for regulators. The liquidity contributes to the availability of the funds that banks can lend to earn income and it can also contribute to

the safety and soundness of the banks. According to Diamond and Dybvig, (1983) banks as financial intermediaries provide liquidity, though the liquidity of the banks itself depends on the deposits and their earnings on loans. They further argued that banks' own efforts to achieve liquidity may expose banks to risk and ultimately result in bank runs. According to Vodova (2013), interbank bank borrowings and size of the banks are the significant factors that contribute to liquidity. Theoretically, there is a short-run trade-off between liquidity and bank profitability. Taiwo et al. (2017) reported a positive but insignificant association between liquidity and bank profitability for Nigerian banks. Lotto (2019) reported that in the case of Tanzania liquidity has a positive effect on bank operating efficiency. The availability of the most liquid assets not only provides an extra capital cushion to the banks but also improves their operational efficiency which ultimately contributes to financial stability.

Asset quality

The primary assets and source of income for banks are loans, hence the quality of loans represents the quality of the banks' assets and it ultimately affects their bottom line. Poor asset quality contributes to the banks' non-performing loans that dry the banks' capital. Therefore, it is also an important variable for the performance analysis of banks under the CAMELs ratio-based approach. The study on Indian commercial banks by Das and Gosh (2006), reported that there is a difference in bank operational efficiency with different levels of asset quality. Similarly, Demirgüç-Kunt (1989) reported that assets quality was one of several factors that contributes to the insolvency of banks. According to Hsiao et al. (2010), the financial restructuring in Taiwan resulted in the improvement of banks' asset quality which decreases their financial risk, and improves their performance. Likewise, Lotto (2019), reported a positive impact of assets quality on the operational efficiency of Tanzanian banks.

Profitability

Profitability is a primary indicator of performance for any profit-oriented organization. It has more significance in the case of banks. It is assumed that profitable banks are more efficient in their operations. Moreover, more profit means the availability of more capital that banks can lend to generate further profit. The relationship between profitability and operational efficiency of banks in the existing literature is inconclusive. The study by Das and Gosh (2006), on Indian commercial banks reported that more profitable banks manage to reduce their operation inefficiencies. In contrast, Berger and Mester (1997) reported that banks with higher inefficiencies in terms of cost may earn higher profits as compared to their competitors. However, the majority of the studies reported a positive association between profitability and banks' operation efficiency (see: Lotto, 2019; Sanchez et al., 2013; Kalluru & Bhat, 2009).

Bank size

Theoretically, it is assumed that larger banks are more efficient in their operations as compared to smaller banks. However, existing literature on efficiency and bank size provides mixed findings. According to Hughes et al. (2001), larger banks can improve their operational efficiency by mobilizing various pools of resources such as technology, human resources, material, and so forth. In contrast study by Das and Gosh (2006), reported a U-shaped relationship between bank size and operational efficiency. They reported that smaller and larger banks tend to be efficient but medium-size banks are not especially efficient in the case of India. They further argued that different regulations may have a different impact on different size banks, hence their efficiency as well. However, the Maudos et al. (2002) study on European banks reported that medium-size banks achieved the highest level of cost and profit efficiencies. According to Mester (1992), larger banks are less efficient in developing economies. Several studies reported that bank size contributes more to their efficiency in relation to the market share of the banks. Likewise, Lotto (2019) reported that in the context of Tanzania, banks put efforts to increase their market share by growing their customer base to enhance the bank's operational efficiency.

Several studies (see: Khan, 2022; Khan et al., 2021; Bashir et al., 2021) on banks have incorporated GDP growth and inflation as external factors that can have an impact on bank performance. These macroeconomic indicators have a direct impact on fiscal and monetary policy. Hence, to control the effect of macroeconomic indicators on banks' operational efficiency this study uses inflation and GDP growth as control variables

Research design

To evaluate the factors that affect the operational efficiency of the listed Saudi banks, the study uses 2010 -2017 data of 11 domestic commercial banks. The sample of domestic banks have the majority of the market share, out of 11 banks 3 banks hold 54% of the total assets of the banking sector. The study uses the sec-

ondary data that has been collected from the published annual statements of the banks. The macroeconomic data of annual inflation and GDP growth has been taken from the SCB. The final sample is balanced panel data (banks over time) that comprises 11 banks data for 8 years with total observations of 88 bank years.

Variables

To have a comparison with existing studies, this study adopted the variables from the existing literature. The dependent and explanatory variables have been computed in a similar way that has been used by Lotto (2019). The list of the variables used in the study along with their definitions is presented in Table 1.

Table 1: List of variables

Variables	Definition
Dependent variable	
Operating efficiency (OPE_{it})	Proportion of bank operating expenses$_t$ to total operating income$_t$
Explanatory variables	
Capital Adequacy Ratio (CAR_{it})	Proportion of bank total capital$_t$ to total assets$_t$
Liquidity (LIQ_{it})	Proportion of loan $_t$ to deposits$_t$
Asset Quality (AQ_{it})	Proportion of liquid assets$_t$ to bank deposits$_t$
Profitability (PRO_{it})	Proportion of net income$_t$ to total assets$_t$
Bank Size (SZ_{it})	Natural logarithm of bank total assets$_t$
Control variables	
Inflation (INF_{it})	Annual rate of inflation
GDP growth ($GDPG_{it}$)	Annual growth rate of GDP

Source: Author's calculation based on Lotto (2019).

Methodology

As the final sample is panel data, hence, to explore the factors that affect the operational efficiency of the Saudi banks, pooled OLS (ordinary least squares), a panel data estimation technique has been employed. Furthermore, random effects and fixed effects estimations have been employed to explore the relationship between dependent and explanatory variables. After the estimations, Hausman's (1978) test has been used to select the result of the fixed or random effects. Below is the regression equation,

$$y_{it} = \alpha + X_{it} + \mu_{it} \quad (1)$$

The dependent variables are represented by yit, the i denote the cross-sectional term & t represents the time series. α stands for the y-intercept. B stands for the parameters of 1xK vector, the disturbance term is denoted by μ_{it}. The following equations (i), (ii) and (iii) are used to estimate pooled OLS, fixed and random effects respectively.

$$OPE_{it} = \beta_0 + \beta_1 CAR_{it} + \beta_2 LIQ_{it} + \beta_3 AQ + \beta_4 PRO_{it} + \beta_5 SZ_{it} + \beta_6 GDPG_{it} + \beta_7 INF_{it} + \varepsilon_{it} \quad (2)$$

$$OPE_{it} = \beta_0 + \beta_1 CAR_{it} + \beta_2 LIQ_{it} + \beta_3 AQ_{it} + \beta_4 PRO_{it} + \beta_5 SZ_{it} + \beta_6 GDPG_{it} + \beta_7 INF_{it} + \mu_{it} \quad (3)$$

$$OPE_{it} = \beta_0 + \beta_1 CAR_{it} + \beta_2 LIQ_{it} + \beta_3 AQ_{it} + \beta_4 PRO_{it} + \beta_5 SZ_{it} + \beta_6 GDPG_{it} + \beta_7 INF_{it} + \varepsilon_i + \mu_{it} \quad (4)$$

Based on the existing literature, anticipated signs of the relationship between dependent and explanatory variables are given in Table 2. Moreover, the actual outcome signs explored by this study are also given.

Table 2: Expected and outcome signs

Factor	Expected signs	Outcome signs
Capital Adequacy Ratio (CAR_{it})	Positive	Positive & Negative
Liquidity (LIQ_{it})	Positive	Positive & Negative
Asset Quality (AQ_{it})	Positive	Positive
Profitability (PRO_{it})	Positive	Negative
Bank Size (SZ_{it})	Positive	Negative

Source: Author's compilation based on existing literature.

Results and discussion

Descriptive statistics

The descriptive statistics (summary) of the dependent and explanatory variables used in the study are given in Table 3. The average operating efficiency of the sample banks is 53%, while the minimum and maximum efficiency is 32% and 97% respectively. This shows that on average 53% are the operating expenses of banks' total income. The mean of CAR is 16% for Saudi banks, which is higher than the regulatory requirement. The minimum CAR is 6% and the maximum quirement. The minimum CAR is 6% and the maximum of banks' total income. The mean of CAR is 16% for Saudi banks, which is higher than the regulatory requirementquirement. The minimum CAR is 6% and the maximum is 59% which suggests that the majority of the funding for banks is coming from long-term liabilities. The mean of liquidity is 75%. The asset quality mean is 23%. The average profitability is 1.7% with a minimum and maximum of 0.05% and 3.6% respectively. The banks' size has a minimum value of 16% and a maximum of 19% with an average of 18%.

Table 3: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
OPE_{it}	88	0.5302	0.1378	0.3222	0.9770
CAR_{it}	88	0.1676	0.0638	0.1026	0.5986
LIQ_{it}	88	0.7545	0.2588	0.0010	1.4209
AQ_{it}	88	0.2399	0.1141	0.0958	0.7257
PRO_{it}	88	0.0177	0.0059	0.0005	0.0366
SZ_{it}	88	18.5450	0.6701	16.8650	19.6530
INF_{it}	8	2.7787	2.0329	-0.8300	5.8300
$GDPG_{it}$	8	3.9450	2.9378	-0.7400	10.0000

Source: Author's calculations.

Pairwise correlation matrix

To check for the multicollinearity among variables, a pairwise correlation matrix has been constructed. The results are presented in Table 4. Among independent variables, the highest level of correlation is 63% between bank size and profitability. Based on this, it is assumed that there is no issue of multicollinearity among the variables. According to Studenmund (2011) multicollinearity is a condition where explanatory variables are linear dependent virtually. However, an absolute value of higher than 80% is sufficient to cause multicollinearity. In our sample, this is not the case.

Table 4: Pairwise correlation matrix

Variables	OPEit	CARit	LIQit	AQit	PROit	SZit	INFit	GDPGit
OPEit	1.00							
CARit	0.24**	1.00						
LIQit	0.25***	0.31***	1.000					
AQit	0.52***	0.59***	0.100	1.00				
PROit	-0.75***	-0.21**	-0.570***	-0.27***	1.00			
SZit	-0.77***	-0.21**	-0.450***	-0.55***	0.63***	1.00		
INFit	0.22**	0.17	-0.010	0.36***	-0.09	-0.29***	1.00	
GDPGit	0.07	0.12	0.002	0.29***	0.01	-0.23**	0.80***	1.00

Source: Author's calculations.

Regression results

To evaluate the operational efficiency of the Saudi banks, the study employs three estimations on the variables. These estimations results are given in Table 5. Most of the explanatory variables show similar effects under each estimation. Based on Hausman's (1977) test values (Chi-square = 12.64 and p-value = 0.08) fixed effects findings are appropriate for the explanation.

Table 5: Regression results

Variables	M1	M2	M3
CAR_{it}	0.1396	-0.4024	-0.3271
	(0.1482)	(0.3608)	(0.1682)**
LIQ_{it}	-0.1785	0.2533	-0.1631
	(0.0357)***	(0.1740)	(0.0567)***
AQ_{it}	0.1090	0.1344	0.0301
	(0.0972)	(0.1366)	(0.1056)***
PRO_{it}	-13.4850	-12.9320	-12.8480
	(1.6371)***	(1.5855)***	(1.5458)***
SZ_{it}	-0.1040	-0.1866	-0.1151
	(0.0166)***	(0.0537)***	(0.0228)***
INF_{it}	0.0054	0.0035	0.0054
	(0.0058)	(0.0059)	(0.0051)
$GDPG_{it}$	-0.0063	-0.0086	-0.0065
	(0.0039)	(0.0032)***	(0.0033)**
C	2.7942	4.0902	2.9656
	(0.3145)***	(1.0343)***	(0.4519)***
R^2 Adjusted	0.8010	0.5918	0.8102
Prob. (F-stat)	0.0000	0.0000	0.0000
Hausman test Chi-Square		12.6400	
Hausman test Probability		0.0814	
Number of Obs.	88.0000	88.0000	88.0000
Number of groups	11.0000	11.0000	11.0000

Note: ***, **, and * indicate significance at p<0.01, p<0.05, & p<0.1. Standard errors are given in parentheses. Regression models: M1 is OLS, M2 is FE, and M3 is RE.

Source: Authors' calculations.

CAR is negatively related to the operation efficiency in both fixed and random effects regression but the association is insignificant. Liquidity is positively associated with the dependent variable in all regressions, however, the affiliation is significant in the OLS and random-effects model. Asset quality is positively related to operational efficiency but the nature of the association is only significant in random effects. The relationship between profitability and operational efficiency is negative and significant in all estimation models. Bank size has a negative relation with operational efficiency and it is significant in all their estimations. The control variable, inflation, is positively related to banks' operational efficiency but the relationship is insignificant. GDP growth is negatively related to operational efficiency and the association is significant in fixed and random effects.

Discussion

The expected nature of the relationship between dependent and explanatory variables based on existing literature and the findings of this study are summarized in Table 2. It is observed from the table that the nature of the relationship reported by the study has mixed similarities to the findings of existing studies. The effect of explanatory variables on the operation efficiency of banks under fixed effects estimation shows that CAR, profitability, and bank size are negatively related, while liquidity and asset quality are positively related to the operational efficiency in the case of Saudi banks. The CAR (the ratio of total capital to total asset) is negatively associated with operational efficiency but the association is insignificant. The findings are in contrast to Lotto (2019) and Bandaranayake and Jayasinghe (2014). It is assumed that a higher CAR could increase the opportunity cost of a bank's capital, and ultimately the operational efficiency. Liquidity is positively associated with the operating efficiency of banks which is in line with the findings of Lotto (2019), Taiwo et al. (2017), Gorton and Huang (2004). The banks with more liquid assets are assumed to be more efficient.

The asset quality is also positively related to operational efficiency but unlike Lotto (2019) the relationship is insignificant. The nature of assets, i.e. loans, for banks is an important factor in a bank's efficiency and its risk exposure. Profitability has a negative relationship to operational efficiency which contradicts earlier studies' findings. (see: Lotto, 2019; Sanchez et al., 2013). This might be due to the less competitive banking environment in the Kingdom for banks, where banks, whether efficient or not can earn sufficient profits. Bank size has a significant and negative affiliation with operational efficiency. The findings are inconsistent with the earlier studies' findings, such as Lotto 2019. However, these findings endorse the argument of Berger et al. (1997) which stated that larger banks in transition economies are less efficient. It is assumed that the operating cost decreases with the increase in bank size but it is held true up to a certain level. Hence, it can be argued that banks may become inefficient after a certain level of size, which could be true in the case of Saudi banks as well.

Conclusion

This study determines the elements that influence the operational efficiency of commercial banks listed in Saudi Arabia. The study used data from 2010-to 2017 of 11 listed commercial banks. The results of the study recommend that the operational efficiency of the Saudi banks is influenced mostly by the same factors highlighted by earlier studies on different economies, with a certain exception. The negative relationship between CAR and operational efficiency suggests that the opportunity cost of the capital is high, particularly in relation to the cost of deposits for banks. Liquidity and asset quality have a positive relationship with operational efficiency. Liquidity or availability of the liquid assets helps the banks to meet their urgent capital needs or liabilities, which ultimately improves their performance. Bank loans are their assets, hence asset quality refers to the nature of the quality of the loans. Good quality loans mean that banks will have sufficient interest income to meet their interest expenses on deposit liabilities. Contrary to this profitability and bank size negatively influence the operational efficiency.

These results point out that there is less competition among banks, which can be observed from the total number of domestic banks i.e. only 11 banks. It means the banks enjoy sufficient income even without severe competition. Secondly, it is assumed that banks may have a large number of current account deposits where customers do not require or accept interest on deposits due to their religious beliefs. Even though this is the first study to explore the operational efficiency of the banks, a more comprehensive study is recommended where the type and proportion of various types of banks should be considered as well. It is also suggested to include a higher number of bank year data including the pre-post Covid period and the other regional economies in a study as well.

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