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Examining the Impact of Governance, Macroeconomic and Political Risk Determinants on Banks' Efficiency

Rachel Saad *

Abstract: *The purpose of the paper is to examine the efficiency of the banking sector in the MENA region from 2006-2016. It considered both endogenous and exogenous factors, noting governance, macroeconomic, and political risk. A stochastic frontier analysis was initially applied without considering the exogenous factors. The macro-determinants factors were examined in the second stage by examining their impact on cost and profit efficiency. The findings of the investigation indicate that cost efficiency is negatively impacted by government effectiveness as reflected by bureaucratic quality, while inflation and government effectiveness positively affect cost efficiency. On the other hand, political stability and the absence of violence positively impacted profit efficiency. This reveals that total cost is a better proxy measure than net income to indicate how the level of banks' efficiency is affected by macroeconomic and political risk variables. The paper presents new empirical findings on the efficiency of banks while taking into account the impact of governance, macroeconomic, and political risk determinants in a single study.*

Keywords: Stochastic frontier analysis, banks' efficiency, Governance, Macroeconomic, Political Risk., MENA

Introduction

The banking sector is the main pillar contributing to the prosperity of the nation. It is the foundation of a strong financial market and the expansion of the economy. The growth or the downturn of the banking sector will heavily affect the stakeholders. That's why the latter are continuously interested in trying to assess the health of the banking sector (Andrieş & Căpraru, 2014). Five concepts stated in terms of competition, concentration, efficiency, productivity, and performance constitute the aspects of banks' performance. The necessity for banks to function efficiently is being reinforced by increased competition, new technology, and bank consolidation. Therefore, it is a necessity for banks to be aware of the issues that affect bank efficiency. Furthermore, calculating efficiency leads to the minimization of inputs and maximization of outputs by recognizing the appropriate amounts of inputs and outputs (Avkiran, 2011). The initial stage of assessing or testing efficiency is done by measuring cost efficiency. The second stage includes finding the determinants of governance, macroeconomic and political risks that influence efficiency. The

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same procedure is also adopted when examining profit efficiency. These criteria would enable banks to identify the primary causes of their level of efficiency. This might assist the bank in reapplying tactics and enhancing their strategies.

The rapid and ongoing drop in prices in MENA has significantly harmed growth prospects in oil-exporting countries since mid-2014. Even though the low oil price is a blessing for MENA oil importers, rising conflicts and security disruptions are the key obstacles to high-quality, long-term prosperity. Geopolitical challenges and oil prices are significantly determining the region's economic outlook. Conflicts in Iraq, for example, increase uncertainty and erode trust, posing considerable dangers to the region's economic outlook. On the other hand, inflation in the MENA region has been kept under control. Inflation in the region surged throughout the financial crisis of 2008, although it was brought under control by 2009. Lower energy prices, as well as currency appreciation versus China and the euro, the primary import partners of MENA countries, are the key drivers of the fall that began in mid-2014. Disputes in the region since the mid-twentieth century, the MENA region has seen more major and frequent conflicts than any other region on the planet, particularly following the Arab Spring. These disagreements have resulted in major recessions, raised inflation, deteriorated budgetary and financial situations, and harmed institutions from an economic standpoint. These conflicts have drastically altered the region's situation, which was considerably more promising at the start of the Arab Spring. Therefore, this paper focuses on studying commercial banks in the MENA region in order to identify their efficiencies while taking into consideration the impacts of three determinants from a macro perspective. The research is conducted in two steps for each of the methods tested in order to assess if they are efficient. Hence, in the first step, the internal factors are examined. In the second step, the external determinants are studied. The research adds value since few studies consider the stochastic frontier analysis when evaluating efficiency. Furthermore, the determinants adopted to assess if they can affect and predict efficiency were not all previously considered in a single study.

Literature Review

Intense competition, globalization, and incorporation into the financial system led to an increase in the profit margin. Thereafter, banks aim to overcome the impact of the three factors mentioned above in order to increase production and lower costs. In other words, it is crucial for banks to achieve economies of scale and scope by receiving deposits and providing loans and other banking services. Hence, banks must be efficient. Efficiency is attributed to the concept of producing more with fewer inputs. Therefore, it measures the value of output produced given a number of inputs. Efficiency is about making the best use of productivity while minimizing the waste of time, effort, and skills. Hence, efficiency measures how effectively the company utilizes its assets as well as how well it manages its liabilities.

Effectiveness is a performance level that describes a procedure that uses the fewest number of inputs to produce the greatest number of outputs. Productivity in financial aspects is defined as the most extreme expected proportion between the yield and the

inputs, or the contribution of the item advancement process. This shows the ideal dispersion of accessible assets that would permit accomplishing the greatest potential. Noting that efficiency, which is considered a general performance indicator for performance, indicates that a company is efficient when the output of an organization is equivalent to or greater than its inputs, it is pronounced effective (Cvilikas & Jurkonyte-Dumbliauskiene, 2016). Improving efficiency allows the bank to better serve the public interest and the economy. Being efficient is a critical contribution to the financial well-being of the community.

Measurement of Bank Efficiency

Bank efficiency can be estimated by three primary methodologies: intermediation, profitability and production. The intermediation approach is utilized to evaluate the efficiency of banks in intermediating capitals between specialists with surplus capital and other financial operators (Sealey Jr & Lindley, 1977).

Aikaeli (2008) argues that an efficient financial institution, noting banks, mirrors a sound intermediation process. Subsequently, the banks' expected commitment to monetary development will be traced. The intermediation approach perceives that the primary capacity of a bank is as a financial intermediary that takes in sources of income such as deposits and converts them into loans and other earning assets. Consequently, the sources of inputs will include deposits and borrowed funds alongside the conventional components of production such as employees and fixed assets. Credits in the form of loans and other purchasing resources will be the result.

The production approach examines the effectiveness of banks in giving financial services, for example, opening accounts, clearing checks, issuing reports, and others (Epure, Kerstens, & Prior, 2011). In fact, the production approach not only characterizes the kinds of services offered and delivered by the banks but also states and analyzes the best and most efficient method of producing the services. This method assumes that a bank offers a variety of financial services. These services are available to depositors and borrowers and include intermediation benefits as well as a variety of other financial services that would be charged to the non-interest-earning account. As a result, the inputs will include labor and fixed assets, while the output will include the number of deposit and loan accounts as well as the number of financial transactions logged over time. Total costs include operational costs but do not include interest costs (Ferrier, Grosskopf, Hayes, & Yaisawarng, 1993).

Below is a table representing some studies using different approaches to efficiency.

In 2013, Bokpin concluded that in the banking industry in Ghana, governance has a great impact on profit efficiency but slightly degrades banks' cost efficiency. He employed stochastic frontiers in this study. Another study, which examined the cost and profit efficiency of banking sectors in six transition countries in South-Eastern Europe from 1998 to 2008, emphasized the significance of corporate governance (Fang, Hasan, & Marton, 2011). Hence, corporate governance is a vital requirement for a stable and efficient banking sector (Qian & Yeung, 2015). The impacts of inflation, unemployment rate, and GDP per capita growth on bank efficiency were examined from 2007 to 2014 for the Gulf Coop-

Table 1
Approaches for Measuring Efficiency

Author(s)	Type of efficiency	Input used to measure efficiency	Output used to measure efficiency
Epure et al. (2011)	Production approach	Capital (such as real estate, equipment and machinery) and labor (measured by the cost or number of staff)	Deposits, provision of reports, opening accounts, payments, check clearing and others
Sathye (2005)		expense and non-interest expense	interest income and non-interest income
Gulati and Kumar (2017)	Intermediation approaches	fixed assets, employees and loanable funds (deposits plus borrowings)	Advances and investments
de Freitas Branco, Junior, Cava, Junior, and de Souza Junior (2017)		Number of employees, operating expenses (interest not included)	Total deposits, revenues not related to interest
Sukmana, Ajija, Salama, and Hudaifah (2020)		Interest/margin/profit sharing from third-party fund, Administrative and General Expenses, Expenses for Allowance for Earning Assets, Non-operational expenses, Other expenses	Receipt of interest/margin/profit sharing from loans disbursed, Other revenue
Kamau (2011)		deposits, capital and labour	set of financial services to depositors and borrowers.
Gulati and Kumar (2017)		Advances and investments	net-interest and non-interest incomes
de Freitas Branco et al. (2017)		Total Deposit, total employees	Total credit, revenue from credit operations, investments
Sukmana et al. (2020)		Capital, Savings, Time Deposits, Bank Loans	Loans/financings disbursed
de Freitas Branco et al. (2017)	Profitability approach	Total assets, operational expenses, financial liabilities	Net profit, ROA, ROE
Loong, Kamarudin, Sufian, and Naseem (2017)		Market power, liquidity and management quality	Revenue efficiency
Mohamed Shahwan and Mohammed Hassan (2013)		Total deposits, total operating expenses, leverage	ROE, ROA
Avkiran (2011)		interest expenses and non-interest expenses	interest income and non-interest income

eration Council countries. The findings of the study recommend that banks in countries with low country risk, and low concentration will, in general, be more efficient.

Models of Banks Efficiency

Banks play an important part in the role of monetary transmission and in the growth of the economy. In the new global economy, banks have become not only the core of the financial system but also the main source of banking services and financial activities. In recent years, there has been an increasing interest in studying banks' efficiency given the intense competition. Assessing a bank's efficiency gives substantial understanding and broadly affects both the microeconomic and macroeconomic levels. A variety of methods are used to assess efficiency. Therefore, several studies were conducted in order to measure efficiency using different models such as efficiency ratios, stochastic frontiers, and Data Envelopment Analysis (DEA) which is the most common measure of efficiency.

The non-parametric approaches are easy to process, and they can be actualized without knowing the arithmetical type of the input/output relationship. However, they don't give any information about the production procedure. They only measure or attempt to estimate efficiency by utilizing inputs and outputs. The creators' model additionally utilized input orientation and expected a constant return to scale. They extended Farrell's (1957) single input and single output productivity measure to include multiple inputs and outputs. In this manner, Banker, Charnes, and Cooper (1984) proposed a variable come back scale model. Consequently, these are the two fundamental DEA models that have been generally utilized in financial writing.

The structural approach is also known as the econometric approach or the parametric approach. This approach is also utilized to evaluate a relationship among inputs and outputs within a specified functional form by referring to econometric procedures to gauge unknown parameters within a certain model boundary in a decided model. In this paper, the stochastic frontier using the true-fixed-effect model is employed.

Exogenous Determinants and Banks Efficiency

Few studies covering variables of corporate governance and efficiency have been done. The following research tackles the relationship of some constituents of corporate governance to bank efficiency. Several studies were conducted to compare the efficiency of private and public banks. According to the findings of a study that covered 13 national-level commercial banks in China from 2008 to 2017, the efficiency of state-owned banks has been lower than that of joint stock banks since 2012. Based on the study's findings, the non-interest income ratio, net interest margin, and cost-to-income ratio all have a significant impact on bank efficiency. In terms of the macro influence factors, the rate of growth in total fixed investment and the consumer price index have a significant impact on bank efficiency. Another study aimed to explore the efficiency of local and foreign banks in the Central American region since 2002 till 2007. The study employed two main empirical approaches, DEA and Stochastic Frontier Analysis. The findings of the research show that foreign banks are not really more efficient than their local opponents. As per Otero, Razia,

Cunill, and Mulet-Forteza (2020), Aigner et al. developed the Stochastic Frontier Analysis in 1977 to estimate cost efficiency. The stochastic frontier has several advantages over the DEA model, since it permits us to distinguish between inefficiency and other stochastic shocks in the assessment of efficiency levels. Furthermore, by utilizing this model, it is simpler to include control factors in the equation than in a non-parametric model. Thus, this methodology permits us to analyze the efficiency among nations, and between various types of banks. Furthermore, the stochastic frontier, unlike the DEA, permits random errors, data problems, or other measurement errors.

H1: Governance determinants significantly impact banks' efficiency in the MENA region.

Other studies focused on examining cost efficiency. Goddard, Molyneux, and Wilson (2004) inspect the cost efficiency of the banking sector in Latin America and, more precisely, in Argentina, Brazil, Chile, and Mexico during the period 1985-2010. Their results propose that mistakenly defined cost capacities influence the exactness of inefficiency, while contrasted with fixed or random effects; the haphazard parameters stochastic frontier models yield higher mean cost efficiencies. They presumed that in Latin America's banking sector, efficiency was enhanced during the 2000s before switching after the 2007 financial crisis. The general cost productivity of an Indian sizeable PSB's system of workplaces inside Calcutta city was assessed by Ray (2016) to recognize the ideal number of branches with the least working expense.

Several studies concluded that banks operated efficiently in countries experiencing GDP growth. Hou, Wang, and Zhang (2014) used a two-stage semi-parametric data envelopment analysis model to evaluate the effects of market structure and bank risk taking on the efficiency of 44 major Chinese commercial banks from 2007 to 2011. The data suggested that banks based in nations with high GDP growth performed efficiently.

H2: Macroeconomic determinants significantly impact banks' efficiency in the MENA region.

Researchers have not studied risk from a political or macro perspective in the studies that have been conducted as to my knowledge. The study of banking efficiency can be beneficial to policymakers, shareholders, market analysts, clients, investors, managers and government regulators (Andrieş & Căpraru, 2014). Several studies have analyzed the performance of the banking industry in developed and developing countries. Another study for measuring bank efficiency in Malaysia using the DEA approach was employed in an attempt to investigate the bank specific and macroeconomic determinants that affect revenue efficiency within the period of 2006-2015. According to their findings, Malaysian Islamic banks have lower revenue efficiency than their foreign counterparts. They also discovered that bank market power, liquidity, and management quality all have a significant impact on revenue efficiency.

Chortareas, Girardone, and Ventouri (2012) utilize the Data Envelopment Analysis (DEA) strategy to assess the efficiency of banks within the twenty-two European Union countries from 2000 to 2008. The findings of this study are consistent with the abovementioned one. Hence, it entails that reinforcing capital limitations and official supervi-

sory powers can enhance bank productivity, while the level of bank efficiency can likewise be improved by upgrading private sector observation and confinement of bank operations.

The two-phase network DEA approach, whereby variable return to scale and constant return to scale are used for the estimation of efficiency in the Indian banking sector, is widely used. A comparative study between public sector banks and private sector banks demonstrated that banks within the private sector are more productive than the former.

H3: Political risk's determinants significantly impact banks' efficiency in the MENA region.

Data and Methodology

The Bankfocus Database was used to obtain secondary data. Over an eleven-year period (2006-2016), a total of 89 banks in the MENA region were included. Bahrain, Egypt, Iraq, Jordan, Kuwait, Lebanon, Qatar, Saudi Arabia, Tunisia, and the United Arab Emirates are among the ten countries covered. Due to a lack of data, omitted banks were not comprised in the study. The accessible population includes only the banks that can be investigated given the time frame. Therefore, they are the outcome of the filtered target population as they fulfill the specification or requirement needed to conduct the study.

This research aims to examine several models that integrate governance, economic, and political determinants in order to investigate their relationship with bank efficiency. Prior to conducting the test that will reveal the type of relationship between the exogenous determinants and efficiency, the endogenous factors are first tested.

The stochastic frontier approach is used to test efficiency. The parameters are estimated with the maximum likelihood method is applied in order to test efficiency along with specifying the combinations of inputs and output. Otero et al. (2020) model is adopted and modified to include the determinants to be tested. The model enable us to include multiple outputs or quasi-fixed inputs. The two stochastic models used to test the efficiency are cost stochastic frontier analysis and profit stochastic frontier analysis.

The data in this study was retrieved from four main sources: BankFocus to study bank specific factors and the World Bank database, International Country Risk Guide and Worldwide Governance Indicators to study the macro-determinants.

Bank Efficiency's Model

As mentioned earlier, there are different methods adopted to measure cost efficiency. The stochastic frontier using the true-fixed-effect model as proposed by Battese and Coelli (1995); Mohanty, Lin, Aljuhani, and Bardesi (2016) is applied with some modifications:

Efficiency

Definitions of variables and cross-product terms.

Variable Description

Dependent variables

TC Total costs = the sum of interest expenses, cost of labor, and other operating expenses in million US dollars.
NI Net income = total revenues - total operating costs (i.e., TC) - realized loan loss in million US dollars.

Output variables

Y1 = Total amount of net loans million US dollars.
Y2 = Total amount of security investments (equities and/or bonds in million US dollars.

Input Prices

P1= Price of borrowed funds is the ratio total interest expenses to borrowed funds.
P2 = Price of labor is the ratio of personnel expenses to total assets

Other variables

E = Total amount of equities in million US dollars = Common Stocks + paid-in capital + retained earnings + non-controlling interest + other accumulate comprehensive income (OIC) NPLR= Non-performing loans/total gross loans.
Z = Z-score-a proxy for bank insolvency risk defined as (EA + ROA)/Std. deviation of ROA

The cost stochastic frontier function based on Mohanty et al. (2016).

$$lnTC = \beta_0 + \sum_{k=1}^{2} \beta_1 lnp_{kit} + \sum_{s=1}^{2} \beta_2 slny_{sit} + \frac{1}{2}\sum_{k=1}^{2} 0 \sum_{k'=1}^{2} \beta_{3kk'} lnp_{kit} lnp_{k'it} \frac{1}{2}\sum_{s=1}^{2} 0 \sum_{s'=1}^{2}$$
$$\beta_{4ss'} lny_{s'it} + \sum_{k=1}^{2} 0\beta_{5ks} lnp_{kit} lny_{sit} + \Phi lnE + \frac{1}{2}\Phi lnE_1^2 + \sum_{k=1}^{2} \Phi lnE_5 lnp_{kit} + \sum_{s=1}^{2} \Phi lnE_0$$
$$lny_{sit} + \Phi_2 NPLR_{it} + \Phi_3 lnZ_{it} + \Phi_4 lnp_{1it} NPLR_{it} + \sum_{s=1}^{2} \Phi_{5s} lny_{sit} NPLR_{it} + \Phi_6 lnp_{1it}$$
$$lnZ_{it} + \sum_{s=1}^{2} \Phi_{7s} lny_{sit} lnZ_{it} + \Phi_8 lnE_{it} lnZ_{it} + \Phi_9 lnE_{it} NPLR_{it} + u_{it} + v_t \quad (1)$$

Bank cost efficiency is calculated by comparing actual costs to minimum costs based on the output vector, the input price vector, and other arguments of the cost function. The cost inefficiency index, uit, calculates a bank's distance from the best-practice frontier based on outputs, input prices, and external conditions. It is computed in the following way:

$$E[u_{it}|lny_{it}, lnp_{it}, lnE_{it}, q_{it}] = lnC_{it} - f(lny_{it}, lnp_{it}, lnE_{it}, q_{it}, \beta)$$

The profit stochastic frontier function based on Mohanty et al. (2016):

$$lnTC = \beta_0 + \sum_{k=1}^{2} \beta_1 lnp_{kit} + \sum_{s=1}^{2} \beta_2 slny_{sit} + \frac{1}{2}\sum_{k=1}^{2} 0 \sum_{k'=1}^{2} \beta_{3kk'} lnp_{kit} lnp_{k'it} \frac{1}{2}\sum_{s=1}^{2} 0 \sum_{s'=1}^{2}$$
$$\beta_{4ss'} lny_{s'it} + \sum_{k=1}^{2} 0\beta_{5ks} lnp_{kit} lny_{sit} + \Phi lnE + \frac{1}{2}\Phi lnE_1^2 + \sum_{k=1}^{2} \Phi lnE_5 lnp_{kit} + \sum_{s=1}^{2} \Phi lnE_0$$
$$lny_{sit} + \Phi_2 NPLR_{it} + \Phi_3 lnZ_{it} + \Phi_4 lnp_{1it} NPLR_{it} + \sum_{s=1}^{2} \Phi_{5s} lny_{sit} NPLR_{it} + \Phi_6 lnp_{1it}$$
$$lnZ_{it} + \sum_{s=1}^{2} \Phi_{7s} lny_{sit} lnZ_{it} + \Phi_8 lnE_{it} lnZ_{it} + \Phi_9 lnE_{it} NPLR_{it} + e_{it} + m_{it} \quad (2)$$

The ratio of a bank's actual profit to the maximum possible profit achievable given the output vector, input price vector, and other profit function arguments is defined as profit efficiency. Profit inefficiency is the distance between a bank's outputs, input prices, and external conditions and the best-practice profit frontier. The following is how Mit's profit inefficiency is calculated:

$$E[m_{it}|y_{it}, p_{it}, E_{it}, q_{it}] = ln\Pi_{it} - h(y_{it}, p_{it}, E_{it}, q_{it}, \beta^*)$$

Noting that the impact of the external determinants are also tested to check if they affect efficiency.

After testing the impact of the bank's specifications, the second step examines the impact of the external factors that represent the economic, governance, and political risks on efficiency as measured by total cost and net income, which reflect profitability and efficiency, respectively.

The variables used to examine the economic indicators are:
GDP = Real GDP growth
RIR= Real interest rate (%)
INF = Inflation (%)
Political risk indicators cover: PVA = Voice and Accountability measured by military in politics and democratic accountability,
PSAV = Political Stability and Absence of Violence measured by government stability, internal conflict, external conflict and ethnic tensions;
PGE = Government Effectiveness reflected by bureaucratic quality;
PRQ = Regulatory quality as to investment profile;
PRL = Rule of Law as to law and order
PCC = Control of Corruption
Governance components' include

GPVA= Voice and Accountability,
GPSAV = Political Stability and Absence of Violence/Terrorism,
GGE= Government Effectiveness,
GRQ =Regulatory Quality,
GRL = Rule of Law
GCC =Control of Corruption
PCC = Control of Corruption

The study includes four control variables: bank size, leverage, time effect or year and country effect. Bank size is characterized by the extent to which banks own assets. The higher the asset ownership, the greater the potential for banks to provide financial services at a lower cost. Also, bigger banks are less exposed to failure than smaller banks (Gunsel, 2012). Varotto and Zhao (2018) concluded in their study conducted in US and European banks from 2004 to 2012 that size impacts failure more than what is reflected in non-standardized and standardized systemic risk measures, which are definitely useful in foreseeing banks' failure. In another study, size was measured by return on assets.

The findings of most empirical studies on the effect of bank size on financial stability, including (Obamuyi et al., 2013; Curak, Poposki, & Pepur, 2012; Onuonga, 2014), are mixed at best. The researcher discovered that the size of a bank has a significant negative impact on its stability. Obamuyi et al. (2013) demonstrated the same finding when he questioned the impact of bank capital, bank size, expense management, interest income, and the economic condition on bank profitability in Nigeria as measured by return on assets (ROA).

On the other hand, another study found that there is an insignificant negative effect of bank size and loan-to-asset ratio on bank profitability (Curak et al., 2012). In a study covering the period from 1996 to 2000 in eleven transition countries, including two hundred fifty-five banks, Bonin, Hasan, and Wachtel (2005) concluded that return on assets is attributable to country and year effects. They additionally added that the country effect, along with the year effect, played a significant role in the justification of variation in the measurement of efficiency.

Empirical Results and Discussion

Correlation Coefficients

Table 2 displays that the banks incorporated in this study have a different total cost and net income, but the range in the net income is wider than that of the total cost. The two variables that are taken as proxies for the total are Y1 and Y2, which stand for the total amount of net loans and the total amount of security investments, respectively. These two indicators have different statistical features where the mean of Y1 is equal to 7053 while the mean of Y2 is equal to 3032, which is almost double Y1. That means that half of the sample is more concerned with loans than with security investment. P1 represents the cost of borrowed funds, while P2 represents the cost of labor. Both of them are proxies

for input variables. The table reveals that these banks pay more in interest on borrowed funds than in wages, which is the normal case since the bank's primary function is that of an intermediary. The banks incorporated in this study have different sizes, and this is reflected in the wide range between the minimum and maximum of total equity (E). Non-performing loans/total gross loans (NPLR) have a mean of 0.325, which is a low value.

Table 2
Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
TC	878	276.831	365.70	0.000	2394.51
NI	977	376.208	1886.3	0.000	22505.1
Y1	1062	7053.6	10613.7	0.113	79071.0
Y2	1061	3032.66	4747.3	0.035	40853.4
P1	737	127411	30322	0.000	817000
P2	911	10746.4	32435	0.000	979000
E	1077	1807.4	2844.7	12.415	25588.9
NPLR	943	0.325	1.147	0.000	20.8220

Correlation Matrix

The first dependent variable (lnTC) in Table 3 showed a strong positive relationship with lnY1, lnY2 and lnE where the values recorded are higher than 0.7. Also, it has a positive relationship with lnP1 and lnZ. The negative relationship occurred with lnP2 and NPLR. The second dependent variable (lnNI) has an inverse relationship with lnP1, lnP2, NPLR and lnZ and a positive relationship with lnY1, lnY2 and lnE. NPLR and lnZ showed a small value of correlation with the dependent variables, which, in fact, affect the efficiency with which inputs are converted into outputs. As Zoghbi, Rocha, and Mattos (2013) pointed out, "these variables are considered exogenous in the sense that they influence the production process but are not themselves either inputs or outputs".

Table 3
Matrix of Correlations

Variables	-1	-2	-3	-4	-5	-6	-7	-8	-9
(1) lnTC	1.000								
(2) lnNI	0.347	1.000							
(3) lnP1	0.403	-0.233	1.000						
(4) lnP2	-0.300	-0.273	-0.077	1.000					
(5) lnY1	0.793	0.216	0.188	-0.272	1.000				
(6) lnY2	0.814	0.245	0.281	-0.287	0.706	1.000			
(7) lnE	0.784	0.136	0.323	-0.332	0.724	0.693	1.000		
(8) NPLR	-0.065	-0.144	-0.021	-0.007	-0.007	-0.045	-0.029	1.000	
(9) lnZ	0.128	-0.026	-0.083	-0.005	0.133	0.190	0.196	0.010	1.000

Empirical Results

The stochastic frontier analysis methodology is used in this section of the study. The functional form of the model as defined is the output of a company is a function of inputs, predefined inefficient and random errors, and the error term distribution. By normalizing total costs and input prices by one input price, the assumption of linear homogeneity in

input prices is imposed. This is accomplished by including a random error term in the specification of the frontier efficiency model. Based on the literature, the best econometric technique to apply when measuring efficiency is the SFA technique. This subsection shows the outcome regression of several models while using SFA. The first two tables are based on the research done by Mohanty et al. (2016). The first table has the TC as the first dependent variable in order to use the Stochastic Cost Frontier model, while the second table shows the result of the Stochastic Profit Frontier model. In this model, NI is the dependent variable.

As mentioned earlier, the OLS regression has a biased intercept based on this the Time-invariant fixed-effects model be applied to the two models. Table 4 shows the SFA outcomes of model cost stochastic frontier. The only negatively significant variable is lnP1 at a significant value of 5% of a coefficient value of 1.155369, which implies that the borrowed fund cost decreases the bank's total cost. The remaining significant variables are lnE and NPLR at 5% significance level with almost the same coefficient that is equal to 1.408. These two variables increase the bank's cost. If the financial risk to shareholders rises, they demand a higher return to compensate for the increased risk, raising the cost of equity. Nonperforming loans are loans, particularly mortgages that organizations make to borrowers but do not recoup. In other words, the borrower is unable to repay the loan in full, or even sufficiently to allow the bank to make a profit. When this occurs, the bank can either work out a new payment plan with the borrower or foreclose on the collateral the borrower has provided. Because both options cost the bank money, lenders try to avoid nonperforming loans as much as possible.

The Half-Normal Distribution applies these restrictions on the error term:

$$v_i = iid(0, 2)$$

$$u_i = iidN + (0, \sigma u2)$$

v_i and u_i are distributed independently of each other and of the regressors.

The most interesting finding are sigma u and sigma v in order to calculate the lambda where $\lambda = \sigma_u/\sigma_u$. In this model λ= 0.607/0.152= 4.85. The value of lambda is greater than one, which means that the variance in inefficiency than in the random noise variable, so the composed error term change more as the inefficiency level changes.

In the Stochastic Profit Frontier model, the only significant variable is NPLR which is negatively signed with a value of 6.394 at 5% level of significance, as number of defaulters increase there is a decrease in the profit. In this model the lambda value is equal to 0.1.867 ÷ 0.8507 = 2.19, this means that change in inefficiency is greater than in the random noise variable.

The SFA method allows for the modeling of factors that may affect an organization but are beyond its control. Because of its multi-criteria nature, the Tran slog function is more suitable for the evaluation of the banking system.

To take a deeper look at the impact of the efficiency scores, Battese and Coelli (1995) model (BC95) is applied now using the time- varying stochastic frontier approach for panel data with firm effects. For the inefficiency term, a transcendental logarithmic (Trans

log) function is combined with a truncated-normal function. First, when a functional form of the translog type functions is used instead of the Cobb - Douglas functions, this Translog cost function is more flexible than the stochastic frontier method. Furthermore, it allows data to indicate the true value of the function's curvature rather than imposing prior hypotheses about its value. Second, the truncated-normal distribution for inefficiency may be more appropriate than the half-normal distribution used in the preceding section.

Imposing the below restrictions on the error term under the Truncated-Normal distribution:

$$v_i = (0, \sigma v2)$$

$$u_i = iidN + (\mu, \sigma u2)$$

v_i and u_i are distributed independently of each other and of the regressors, and μ is nonzero mean for u_i.

To avoid spurious results, it is critical that the econometrics results adhere to certain a priori expectations. Correlation coefficients are calculated in the study to determine the levels of correlation among variables.

Tables 6 and 7 are based on the Battese and Coelli (1995) model, which is dependent on the banks' fixed effects. Table 6 depicts the outcome regression of the TC as the first dependent variable when the Stochastic Cost Frontier model is used (BC-95) and Table 18 shows the result of the Stochastic Profit Frontier model in this model, NI is the dependent variable (NI-95).

Table 6 shows the outcomes of Battese and Coelli (1995) applied to the cost stochastic frontier (TC-BC95). The table reveals that as the Z score increase it increases the total cost since it is significantly related at a 10% level. In other words, as Z increases, the probability of a bank going bankrupt increases. The model showed a high fit probability since Prob > χ^2 = 0. Because the overall model's prob > χ^2 statistic is a test of the joint null hypothesis of all of the regression coefficients. In this model u is not significant nor σ_u that means the inefficiency has no impact on the TC under the BC95 model. Yet, the error term that is due to the noise random variable v since it is significant at 1% level and it affects the total cost in a negative way. These external variables decrease the total cost. Even though, the lambda value is less than 1 but is not considered since it is insignificant.

Table 7 shows the profit stochastic frontier based on the BC-95 technique. The table shows both P2 and Y2 both negatively affect NI at 10% significance level and at 5% significance level, respectively. For P2, as the price of labor increases, this is deducted from profit to pay for this increase. For Y2, any investment may lead to a loss or gain. Displaying a negative sign in this regression reflects that most banks are suffering from a loss. This loss led to a decrease in net profit.

In this model, the inefficiency term is significant at a 10% level and showed a value of-43.464. This means that as the inefficacy u increases by 1% the net profit decreases by 43%. The inefficiency truncated normal distribution is N+(-44, 42).

Furthermore, the variance parameter $2\sigma 2$ indicates whether or not the NI-BC95 function is a satisfactory representation of the data used. The standard error ratioλ is a measure of the relative variability of inefficiency and statistical noise sources. The value λ is 10.26 and is significant at a 5% level of significance. This value is less than one, indicating that the variability caused by technical inefficiency dominates the difference between observed and maximum attainable output levels.

Table 8 displays the Descriptive Statistics of Efficiency Scores. According to the table, the TC-BC95 model has a minimum efficient score for the sample of 0.992 percent and a maximum efficient score of 0.993 percent. The fixed effect model, on the other hand, shows that the minimum score was 0.058 percent and the maximum score was 1. The results show that the fixed effect model has a wider range but fewer efficient score values than the TC-BC95 model. Furthermore, the fixed effect model revealed that the majority of the scores are greater than 0.276, with 0.993 compared to TC-BC95.

Concerning the two profit stochastic models, they almost had the same minimum efficiency score, which is equal to 0, but NI-BC95 had a maximum value equal to 0.867 which is lower than the maximum value of efficiency registered under fixed effect (1).

When the mean value of the efficiency scores for the four models is compared, it is discovered that the efficiency score has a higher value under fixed effect and BC95 when the cost stochastic frontier is used than when the profit stochastic frontier is used.

The profit stochastic model is more statically reliable since lambda was only significant as well as inefficiency and noise terms under NI-BC95.

Table 8
Descriptive Statistics of Efficiency Scores

	Mean	Median	Max	Min	Std. Dev.	Probability
TC- BC95 Model (Cost)	0.993	0.993	0.993	0.992	0.000	0.000
Fixed Effect (Cost)	0.327	0.276	1.000	0.058	0.198	0.000
NI-BC95 Model (Profit)	0.522	0.579	0.867	0.001	0.206	0.000
Fixed Effect (Profit)	0.024	0.002	1.000	0.000	0.115	0.000

This part shows the output of four models, where Table 9 presents the regression outcome of the impact of governance, macroeconomics and political risk on TC as the dependent variable, while Table 10 presents the regression outcome on NI as the dependent variable. In both tables, OLS and FE estimation techniques are used.

The output of testing the impact of the economic situation, political risk, and governance on efficiency is presented in Table 9, the regression output of using OLS is in column OLS-TC, and the regression output of using FE in column FE-TC. The estimation coefficients are shown in the first row of each variable, while the standard errors are shown in brackets in the second row. The standard errors of the OLS and FE estimators are based on robust standard errors corrected for potential heteroscedasticity and time-series autocorrelation within each country.

Only the inflation variable, out of the variables representing the economic situation, showed a significant relationship. Under OLS, this relationship is positive and significant at a 10% level of significance, while it becomes strongly significant when FE is applied (1% significance level). Yet, the coefficient value of INF remained unchanged under both estimators.

Table 9
OLS and FE Regression Outcomes on Cost Efficiency

	OLS-TC	**FE-TC**
	TC	**TC**
GDP	0.00122	-0.0079
	-0.01495	-0.00532
RIR	0.0021	0.00106
	-0.0045	-0.00161
INF	-.02497*	.02034***
	-0.01392	-0.00699
PVA	0.65298	0.45179
	-1.54746	-0.7428
PSAV	-0.03922	-0.47035
	-1.1311	-0.6062
PGE	-2.94645	-2.55157*
	-2.53857	-1.28218
PRQ	-0.03524	0.07739
	-1.07036	-0.27775
PRL	-0.22541	0.3962
	-3.23375	-1.18367
PCC	-0.42617	-0.39347
	-1.28137	-0.56975
GPVA	-0.29366	-0.23541
	-0.37434	-0.19443
GPSAV	0.14652	0.109
	-0.21459	-0.1017
GGE	0.17253	.23412*
	-0.48351	-0.12629
GRQ	-0.09213	-0.17406
	-0.46681	-0.12118
GRL	-0.13619	-0.22108
	-0.41001	-0.13733
GCC	0.20289	0.08635
	-0.55809	-0.21115
SIZE	2.00741***	1.45945***
	-0.06042	-0.18137
LEV	-1.07042**	-1.89056***
	-0.44367	-0.6128
_cons	-0.84539	0.78432
	-2.94848	-1.3415
Bank fixed-effects	No	Yes
Year dummies	Yes	Yes
Country fixed-effects	Yes	Yes
Observations	340	340
R-squared	86.02%	80.96%

When analyzing the relationship of the variables representing political risk under OLS, it showed that none of these variables is significant. When employing the FE estimator, only PGE showed an inverse significant relationship at a 10% significance level with TC. Similarly, none of the variables representing governance showed a significant relationship with TC. Under the FE estimator, only GGE showed a significant impact on TC at a 10% significance level.

The control variables are significant under OLS and FE estimators, which have different coefficients and different significance values. SIZE has a strong positive impact on TC, which is shown with a significance level that is equal to 1% under both OLS and FE. It has a coefficient value that is equal to 2.00741 and 1.45945 under OLS and FE, respectively.

LEV has a coefficient of value -1.07042 and is significant at a 5% under OLS, while

under FE the coefficient kept the negative sign with a different value that is equal to -1.89056 and is significant at a 1%.

R-Squared is calculated in order to evaluate the overall explanatory power of the exogenous variables on bank efficiency measured by TC. The R-squared showed a value of 86% under OLS, then it decreased when the FE estimator was applied to record a value of 80%. The F-test is highly significant for both estimators which reflects the overall regression F-statistic since the Prob (F-statistic) value is less than 0.05.

Table 10
OLS and FE Regression Outcomes on Net Income

	OLS-NI	**FE-NI**
	Profit	**Profit**
GDP	-0.03981	-0.02176
	-0.02781	-0.02151
RIR	0.00167	0.00063
	-0.00905	-0.00566
INF	0.00054	-0.00312
	-0.01894	-0.01037
PVA	-1.06547	-0.33295
	-2.76314	-1.97579
PSAV	5.04611**	5.95261*
	-2.48955	-3.39527
PGE	-1.88099	-2.05499
	-2.97267	-2.05353
PRQ	-0.56536	-0.91883
	-2.19458	-2.88005
PRL	-7.45084*	-8.19457
	-4.46376	-5.37431
PCC	-1.38039	-0.91812
	-2.32392	-1.9362
GPVA	0.94801	0.76178
	-0.81407	-0.58585
GPSAV	0.4867	0.53964
	-0.48184	-0.45214
GGE	1.02867	0.70859
	-1.07051	-0.60912
GRQ	-0.49858	-0.39714
	-0.95788	-0.87059
GRL	-0.98588	-1.00166
	-0.95081	-0.73328
GCC	0.17705	0.36386
	-1.2006	-0.97807
SIZE	1.23739***	1.77184*
	-0.13648	-0.92708
LEV	-0.28291	2.90395**
	-0.98907	-1.41925
_cons	6.71269	1.50544
	-4.73593	-5.55756
Bank fixed-effects	No	Yes
Year dummies	Yes	Yes
Country fixed-effects	Yes	Yes
Observations	385	385
R-squared	36.42%	23.00%

The regression results of testing the impact of economic situation, political risk and governance on efficiency measured by total profit is presented in Table 10, the regression output of OLS estimators is presented in column OLS-NI, the regression output of FE esti-

mators are in column FE-NI. The estimation coefficients are shown in the first row of each variable, while the standard errors are shown in brackets in the second row. The standard errors of the OLS and FE estimators are based on robust standard errors corrected for potential heteroskedasticity and time-series autocorrelation within each country.

The variables that stand for economic growth and governance showed a none significant relationship with NI under both estimators. PSAV and PRL have a significant relationship with NI under OLS, in details, PSAV has a positive significant relationship with NI at 5% level while PRL has a negative significant impact at 10% significance level. Under FE, only PSAV remained significant having almost same positive coefficient at 10% level of significance.

The first control variable, SIZE has a positive significant impact at 1% level and 10% of significance under OLS and FE, respectively. However, the second control variable LEV is only significant when FE is employed at 5% level with a positive impact.

Both models required a low value of R-Squared which is equal to 36% and 23% under OLS and FE. The model fits significantly since the Prob (F-statistic) is less than 0.05.

Conclusion, Limitation and Recommendation

As per the results obtained, there is no significant impact on total cost in terms of inefficiency, yet it affects profitability noting that lambda is greater than one. That ascertain that a decrease in profit within the banking sector is not related to random errors, which is noise, but it is more related to inefficiency. Therefore, any decrease in profit is due to inefficiency. This can be justified by referring to the indicators of labor cost. The findings indicate that the MENA banking industry has a low level of cost inefficiency. The significantly higher profit efficiency of banks emphasizes the importance of the revenue side and, as a result, the potential superiority of profit efficiency techniques. It should be noted that a comprehensive approach to measuring bank efficiency necessitates cross-referencing the various techniques available. The current study was conducted in two stages to accomplish this task by referring to two (Mohanty et al., 2016) and BC95. It used the Stochastic Frontier Approach to examine the cost and alternative profit efficiency of the banking system in the MENA from 2006 to 2016. The intermediation approach was used to estimate the translog cost and profit functions. Our findings revealed that, as expected, cost efficiency was lower than profit efficiency, with both measures improving over the sample period. However, the difference in cost and profit efficiency is quite significant. Regarding the exogenous determinants, cost efficiency is negatively impacted by PGE while inflation and GGE positively affect the cost efficient. On the other hand, PSAV positively impacted profit efficiency. Similarly to the study conducted by Mohanty et al. (2016), measures of bank cost and profit efficiencies vary greatly across the examined countries over the study period. However, the findings of this study contradict those of Maudos, Pastor, Perez, and Quesada (2002), who discovered in their study of ten European Union countries that profit efficiency levels are lower than cost efficiency levels.

Due to the limited number of studies in the field of governance and political risk in the MENA banking sector, this research fill a gap in the literature by looking into and as-

sessing the relationship between the above mentioned constructs and the economic determinant, as well as offering new empirical evidence from the MENA region. Additionally. This research demonstrates that the independent factors of governance, macroeconomic, and political risk have varying effects on MENA banks' efficiency. Although this paper uncovers some noteworthy relationships between a variety of parameters and bank efficiency, it has some limitations. To start with, the period of study only spans eleven years, from 2006 to 2016 due to lack of data availability. Second, the sample utilized did not include all of the nations in the MENA region, and there were even variations in the number of banks considered per country investigated.

When replicating the empirical analysis, future research should take the limitations of this research into account. Future research may find it interesting to determine how Islamic banks and commercial banks performed following the recent financial crisis. Second, another type of comparative study can be examined alongside the one based on the type of bank. In other words, comparison can take into account whether banks are private sector, public sector, foreign, or Regional Rural Banks. Third, future research could take a micro-level look at the impact of each bank's governance on its efficiency.

References

Aikaeli, J. (2008). Commercial banks efficiency in Tanzania. A paper presented at a CSAE Conference on Economic Development in Africa, held at St. Catherine's College. *Oxford, 16th–18th. Banking Finance*, *20*(3), 495–509.

Andrieş, A. M., & Căpraru, B. (2014). The nexus between competition and efficiency: The European banking industries experience. *International Business Review*, *23*(3), 566–579.

Avkiran, N. K. (2011). Association of DEA super-efficiency estimates with financial ratios: Investigating the case for Chinese banks. *Omega*, *39*(3), 323–334.

Banker, R. D., Charnes, A., & Cooper, W. W. (1984). Some models for estimating technical and scale inefficiencies in data envelopment analysis. *Management Science*, *30*(9), 1078–1092.

Battese, G. E., & Coelli, T. J. (1995). A model for technical inefficiency effects in a stochastic frontier production function for panel data. *Empirical Economics*, *20*, 325–332.

Bonin, J. P., Hasan, I., & Wachtel, P. (2005). Bank performance, efficiency and ownership in transition countries. *Journal of Banking & Finance*, *29*(1), 31–53.

Chortareas, G. E., Girardone, C., & Ventouri, A. (2012). Bank supervision, regulation, and efficiency: Evidence from the European Union. *Journal of Financial Stability*, *8*(4), 292–302.

Curak, M., Poposki, K., & Pepur, S. (2012). Profitability determinants of the Macedonian banking sector in changing environment. *Procedia-Social and Behavioral Sciences*, *44*, 406–416.

Cvilikas, A., & Jurkonyte-Dumbliauskiene, E. (2016). Assessment of risk management economic efficiency applying economic logistic theory. *Transformations in Business & Economics*, *15*(3/39), 207–219.

de Freitas Branco, A. M., Junior, A. P. S., Cava, P. B., Junior, E. F., & de Souza Junior, M. A. A. (2017). Efficiency of the Brazilian banking system in 2014: a DEA-SBM analysis. *Journal of Applied Finance and Banking*, *7*(5), 29-47.

Epure, M., Kerstens, K., & Prior, D. (2011). Bank productivity and performance groups: A decomposition approach based upon the Luenberger productivity indicator. *European Journal of Operational Research*, *211*(3), 630–641.

Fang, Y., Hasan, I., & Marton, K. (2011). Bank efficiency in South-Eastern Europe. *Economics of Transition*, *19*(3), 495–520.

Ferrier, G. D., Grosskopf, S., Hayes, K. J., & Yaisawarng, S. (1993). Economies of diversification in the banking industry: A frontier approach. *Journal of Monetary Economics*, *31*(2), 229–249.

Goddard, J., Molyneux, P., & Wilson, J. O. (2004). The profitability of European banks: a cross-sectional and dynamic panel analysis. *The Manchester School*, *72*(3), 363–381.

Gulati, R., & Kumar, S. (2017). Analysing banks' intermediation and operating efficiencies using the two-stage network DEA model: The case of India. *International Journal of Productivity and Performance Management*, *66*(4), 500–516.

Gunsel, N. (2012). Micro and macro determinants of bank fragility in North Cyprus economy. *African Journal of Business Management*, *6*(4), 1323-1329.

Hou, X., Wang, Q., & Zhang, Q. (2014). Market structure, risk taking, and the efficiency of Chinese commercial banks. *Emerging Markets Review*, *20*, 75–88.

Kamau, A. W. (2011). Intermediation efficiency and productivity of the banking sector in kenya. *Interdisciplinary Journal of Research in Business*, *1*(9), 12–26.

Loong, F., Kamarudin, F., Sufian, F., & Naseem, N. (2017). Estimating efficiency in domestic and foreign islamic banking and its determinants among three neighboring countries-Malaysia, Indonesia and Brunei. *International Journal of Economics & Management*, *11*(1), 237-258.

Maudos, J., Pastor, J. M., Perez, F., & Quesada, J. (2002). Cost and profit efficiency in European banks. *Journal of International Financial Markets, Institutions and Money*, *12*(1), 33–58.

Mohamed Shahwan, T., & Mohammed Hassan, Y. (2013). Efficiency analysis of uae banks using data envelopment analysis. *Journal of Economic and Administrative Sciences*, *29*(1), 4–20.

Mohanty, S. K., Lin, H.-J., Aljuhani, E. A., & Bardesi, H. J. (2016). Banking efficiency in Gulf Cooperation Council (GCC) countries: A comparative study. *Review of Financial Economics*, *31*, 99–107.

Obamuyi, T. M., et al. (2013). Determinants of banks'profitability in a developing economy: Evidence from Nigeria. *Organizations and Markets in Emerging Economies*, *4*(08), 97–111.

Onuonga, S. M. (2014). The analysis of profitability of kenyas top six commercial banks: Internal factor analysis. *American International Journal of Social Science*, *3*(5), 94–103.

Otero, L., Razia, A., Cunill, O. M., & Mulet-Forteza, C. (2020). What determines efficiency in MENA banks? *Journal of Business Research*, *112*, 331–341.

Qian, M., & Yeung, B. Y. (2015). Bank financing and corporate governance. *Journal of Corporate Finance*, *32*, 258–270.

Ray, S. (2016). Cost efficiency in an Indian bank branch network: A centralized resource allocation model. *Omega*, *65*, 69–81.

Sathye, M. (2005). Privatization, performance, and efficiency: A study of Indian banks. *Vikalpa*, *30*(1), 7–16.

Sealey Jr, C. W., & Lindley, J. T. (1977). Inputs, outputs, and a theory of production and cost at depository financial institutions. *The Journal of Finance*, *32*(4), 1251–1266.

Sukmana, R., Ajija, S. R., Salama, S. C. U., & Hudaifah, A. (2020). Financial performance of rural banks in Indonesia: A two-stage DEA approach. *Heliyon*, *6*(7). doi: https://doi.org/10.1016/j.heliyon.2020.e04390

Varotto, S., & Zhao, L. (2018). Systemic risk and bank size. *Journal of International Money and Finance*, *82*, 45–70.

Zoghbi, A. C., Rocha, F., & Mattos, E. (2013). Education production efficiency: Evidence from Brazilian universities. *Economic Modelling*, *31*, 94–103.