HOW CAN BANK REFORMS ASSUAGE SOCIOECONOMIC ORDEALS IN EMERGING ECONOMIES? LESSONS FOR EGYPT FROM THE TURKISH EXPERIENCE

Monal Abdel-Baki
Durban University of Technology, South Africa

ABSTRACT

This research utilises a three-stage Stochastic Frontier Analysis/Data Envelope Analysis to investigate the relationship between post-crisis banking reforms, bank efficiency and macroeconomic performance from 2000 till 2010. The study draws lessons for Egypt from the Turkish bank reforms which successfully addressed the popular economic aspirations of growth, employment and stable prices. Whilst Turkey ensured that economic and banking reforms trickle down to all income groups, soaring food prices and high youth unemployment exasperated living conditions in Egypt, which helped trigger the Revolution of January 2011. The contribution of this study is to measure bank efficiency in accomplishing popular macroeconomic aims, instead of fulfilling the bank-centric goals of enhancing bank profitability and cost efficiency. The results reveal that the average-sized banks and domestic private banks display highest efficiency. Public debt, inflation and concentrated markets have unfavourable influences on bank efficiency.

JEL Classifications: E240; G210; G280
Key words: youth unemployment; inflation; growth; bank efficiency; banking regulation
Corresponding Author’s Email Address: monala@dut.ac.za; monalbak@aucegypt.edu

INTRODUCTION

Whilst most emerging economies have adequately weathered the global financial crisis (GFC), the protracted impact on youth unemployment has proved quite detrimental. Soaring food prices are also exerting additional pressures on the lowermost socioeconomic groups of these nations, hence raising concerns of looming social hazards and political instability (Boorman, 2009). In actuality, these two factors have fed into deepening the apprehension of scholars and policymakers of the populous emerging world, especially in the wake of the Egyptian Revolution of 2011. Since the escalating anti-government demonstrations raised fears of contagion among other developing and emerging nations, governments were alerted to the dire need of utilising all accessible tools to enhance the living conditions of their people. Researchers have also started to realise that partial and segregated solutions to these entrenched problems do not suffice.

At the twilight of the elapsed millennium, most emerging market economies (EMEs) encountered home-grown banking crises. Bank reforms, financial innovation and stringent regulations have been the major forces advancing the performance of the banking sectors of these nations. Subsequently, an extensive literature evolved exploring methods of enhancing the efficiency of the banking sector and augmenting its financial intermediation role (Vittas, 1991). In this context, various parametric and non-parametric
approaches have been employed, but there has been no uniform consensus on the inputs and outputs (Berger and Mester, 1997). While earlier research was primarily bank-centric focusing on increasing profitability and reducing costs (Battese and Coelli, 1995; Altunbas et al., 2001), recent studies explored the combined roles of regulation and bank reforms in enhancing overall banking performance (Demirguc-Kunt et al., 2009).

Only lately have sparse studies started to broach the effect of bank efficiency on segregated macroeconomic variables. Lucchetti et al. (2001) studied the role of bank efficiency in boosting growth, while Ordine and Rose (2008) investigated its impact on employment. However, almost no concerted research has been conducted to relate the efficiently operating banking sectors to the overall national macroeconomic goals. This paper expands the literature by comparing the efficacy of bank reforms conducted in Egypt and Turkey and contrasting the underlying effects of the augmentation of bank cost and profit efficiency levels on addressing macroeconomic problems, sustaining human development and raising living standards in emerging economies. Secondly, the paper attempts to draw lessons for EMEs, to enable the banking sector to fulfil the broad aspirations of the society. Hence, while the analysis draws heavily on the Egyptian and Turkish experiences, the implications may prove useful to other emerging economies that are currently facing similar calamities.

Turkey and Egypt are selected as case studies since they represent two emerging nations that introduced highly comparable versions of banking reforms and were encountering quite similar macroeconomic challenges at the turn of the millennium. Moreover, Egypt’s societal makeup bears significant resemblance to that of Turkey, where both nations comprise of a predominantly young population with a secular-religious divide. Hirschl (2004) explains that in spite of the fact that both national characters may differ in some ways, with Turkey adhering more to the European paradigm, the openness of the majority of the young Egyptian population to western media and social networking in addition to the strict constitutional division between the state and religion renders both collective identities rather similar. To ensure cohesion of all societal factions, both governments have taken strides in harmonising Islamic traditions with a market economy (Acar, 2009). Another similarity between Egypt and Turkey is the selection of both nations among the “Next-11” EMEs that are apt to catch up with the rapid and robust macroeconomic growth of the so-called “newly industrialized nations” (Wilson and Stupnyska, 2007).

Yet, while Egypt has orchestrated economic reform that liberalized the economy during the last two decades, the poorest members of its population failed to reap the benefits of economic growth. As a result, the indefatigably Egyptian youth uprising took policymakers and economic analysts by surprise. But the monumental political gains, national pride and self-empowerment of the long-repressed Egyptians were earned at the cost of interrupting the formerly rigorous economic growth. Tourism and construction industries have been pounded, national savings have leaked out of the financial sector, the nationwide labour strikes that voiced long-held grievances paralysed production, and private investment substantially declined. As much as this might lead to an economic meltdown in the short-term, the newly acquired democracy and the redesign of economic policies towards egalitarianism will expectantly set the stage for a stable investment and socio-political environment in the long-run. But the road to exhuming the accomplishments realized during the previous decade and to overturn the monotonic
pattern of downward sovereign credit revisions is fraught with difficulties. The banking sector is one of the prime catalysts that could help expedite the recovery process. Accordingly, the Central Bank of Egypt (CBE) needs to attune bank activities towards the recently defined national goals of income redistribution and generating jobs for the youth, in addition to the dire need to resume economic growth and to manage inflation. The results of the paper will confidently shed some new insights for emerging economies about the need to design bank reforms that explicitly address their inherent societal and economic predicaments instead of blindly copying bank reform paradigms that were tailor-made to suit advanced economies.

The rest of the paper is designed as follows. The second section provides an analysis of the root causes of the socioeconomic problems shouldered by both Egypt and Turkey. The third section outlines the DEA/SFA econometric model. The fourth section reports the results and the last section concludes with policy implications.

THE ANTECEDENTS OF SOCIOECONOMIC PROBLEMS IN EMES

Labour markets in populous emerging economies are under immense pressures to absorb the scores of the unemployed, the rising numbers of the youthful new entrants and the increasing numbers of women seeking work. In addition, EMEs that are over dependent on imported food like Egypt, are exposed to the risk of skyrocketing inflation, which is asserted to be among the prime factors that have triggered the recent popular uprising (Krugman, 2011). In addition to shouldering the inherent problems of population explosion and rapid urbanization, structural imbalances have posed more challenges to EMEs and deprived the very poor from sharing the fruits of macroeconomic growth.

Many of these structural weaknesses date back to the implementation of disparaging economic policies, many of which were imposed by intra-governmental donor institutions. Bordering on many other developing nations, both Turkey and Egypt adopted the Structural Adjustment Programs (SAPs) in the eighties and nineties in order to access the conditional loans of the World Bank and the International Monetary Fund (IMF). The SAPs might have provided short-term solutions to the monumental outstanding public and national debts, but this was achieved at the expense of the poor (Akyurek, 2006). Aside from the venomous post-privatisation unemployment, another serious drawback of the one-size-fit-all SAPs was the premature liberalization of financial markets prior to the introduction of adequate banking supervision (Freedman, 1989). More maliciously, the Bretton Woods programs focused on the modernisation of the banking sector, whilst ignoring its role in enhancing macroeconomic performance (Goldstein and Turner, 1996).

Bank Regulatory Reforms in the Wake of Home-grown Financial Crises

The premature liberalisation of the financial sector lead to the birth of fragile banking sectors, and exposed the Turkish and Egyptian economies to home-grown financial crises and severe contagion from the series of financial calamities that infested emerging economies during the nineties. The consequential banking crises caused capital outflows of $10.5 billion from the Turkish banking sector (Conkar et al., 2009) and $40 billion from its Egyptian counterpart (Mohieldin and Nasr, 2003). Moreover, the weakly
supervised financial institutions resulted in huge amounts of non-performing loans (NPLs) due to corruption and the covert subsidization of the public sector by state-owned banks (Sayilgan and Yildirim, 2009).

More deplorably, the delay in introducing regulatory reforms culminated in the eruption of the 2000/2001 Turkish banking and foreign exchange crises. The subsequent liquidity crunches lead to the failure of many undercapitalized banks (Ozatay and Sak, 2003). The costs to the Turkish economy exceeded US$50 billion due to the bankruptcy of thousands of businesses, losses of hundreds of thousands of jobs and the general economic meltdown. Further austerity measures were enacted, which enraged the low-paid workers, leading to the one million person strike of 2001. Ten years later, Egypt found itself encountering a largely analogous situation, shouldering a high public debt, an unmanageable fiscal budget deficit and plummeting national savings. Hence a comparison is very much in order. In reaction, the Central Bank of the Republic of Turkey (CBRT) implemented a twofold market-oriented strategy namely Transition to a Strong Economy and Banking Sector Restructuring and Rehabilitation Program. The combined effects of the enhanced regulatory framework and the restructured banks helped Turkish banks to adopt cost-effective techniques and to restructure their portfolios away from government securities (Sayilgan and Yildirim, 2007). Since a more egalitarian income distribution was among the prime objectives of the CBRT, it gave banks access to subsidised loans in order to channel them to low income borrowers (IMF, 2005).

Similarly, the banking crisis and the huge outstanding debts urged the Central Bank of Egypt to embark on its Banking Reform Plan (BRP) in 2004, which aimed at enforcing regulatory capital requirements; restructuring and privatizing state-owned banks; addressing the NPL problem; and enhancing banking regulation. Table 1 elucidates that the reform policies culminated in bank consolidation, where the number of banks declined by 37% for both nations since the dawn of the new millennium. One worthy observation is the apparent decline in the number of private and foreign banks, which were forced to fulfil regulatory capital requirements. However, unlike the introduction of outright deposit insurance in Turkey, the CBE merely provides implicit insurance to its depositors.

### TABLE 1. STRUCTURE OF BANKING SECTORS IN EGYPT AND TURKEY

<table>
<thead>
<tr>
<th></th>
<th># of Banks (December 2000)</th>
<th># of Banks (December 2004)</th>
<th># of Banks (December 2010)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Egypt</td>
<td>Turkey•</td>
<td>Egypt</td>
</tr>
<tr>
<td>State-owned Banks</td>
<td>7</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Private Banks</td>
<td>35</td>
<td>43</td>
<td>33</td>
</tr>
<tr>
<td>Foreign Banks</td>
<td>20</td>
<td>18</td>
<td>17</td>
</tr>
<tr>
<td>TOTAL</td>
<td>62</td>
<td>79</td>
<td>57</td>
</tr>
</tbody>
</table>

*In addition to these banks, the Turkish Saving Deposit Insurance Fund (SDIF) took over and restructured 11 insolvent banks.

The Banks Association of Turkey. Statistical Report, various issues.
Outcome of Reforms: Higher Levels of Youth Unemployment and Inflation

Notwithstanding the scope of the aforementioned bank reforms, NPLs accounted for 14.7% of total domestic credit in Egypt (IMF, 2010) compared to only 5.2% in Turkey (BAT, 2010) as at December 2010. More deplorably, Egyptian savings slid from 16.3% of GDP in 2007 to the execrable level of 12% in 2010, and the loan-deposit ratio declined from 54.4% to 51% for the same period (CBE, 2011). Whilst the savings rate has also decreased in Turkey from 16.8% in 2007 to 12.4% in 2010, the Turkish loan-deposit ratio stands at 76% for the same period (BAT, 2010).

Among the prime reasons behind the decline in the ability to mobilize savings are the isolation of the Egyptian and Turkish central banks from the national economic planning process and their overdependence on monetary experts who may lack adequate familiarity with the internal social problems (Franck and Krausz, 2008). It might suit the affluent industrial nations to limit the role of their central banks to inflation targeting, but countries suffering from low purchasing power and social unrest need to engage their central banks in alleviating the socioeconomic ordeal of their people (Thronton, 2011).

FIGURE 1. INFLATION AND UNEMPLOYMENT IN EGYPT AND TURKEY

Sources: Turkish Statistical Institute (TURKSTAT) Database
Central Agency for Public Mobilisation and Statistics (CAPMAS) Database

It is apparent from Figure 1 that the comprehensive restructuring and stabilisation policies adopted by Turkey since the 2000-01 crisis have commendably cooled down the inflationary pressures. Undoubtedly, lowering the intermediation costs
of Turkish banks has been of substantial help in this respect (Ersel and Özatay, 2008). The Turkish government has successfully bridged socio-economic disparities through enhancing public investment in education, health, social protection and human development. The ultimate result was a relatively acceptable level of youth unemployment, yet the problem started to resurface again after the eruption of the GFC. Given that both nations have a predominantly young population of a median age of 23.9 years in Egypt and 28.3 years in Turkey (UNDP, 2010) youth employment has become the prime goal of fiscal and monetary agents. Moreover, the Gini Index has deteriorated for both nations, and currently stands at 0.31 for Egypt and 0.38 for Turkey (UNDP, 2010). To address the macroeconomic challenges facing EMEs, they have to rely on a permutation of fiscal and monetary policies, and a congregation of restructuring schemes.

THE EMPIRICAL MODEL

Literature Review

It is generally alleged that central bank tools in many emerging economies require more time to gain efficiency and credibility (Freedman, 1989), which might increase the overall costs to the economy either in terms of loss in employment and output or in the form of price hikes (Bernanke et al., 1999; Cecchetti and Ehrmann, 1999; Durhan, 2001). Once trustworthiness is built, supply and demand shocks exert less inflationary pressures (Laxton and N'Diaye, 2002) and improve the trade-off faced by the monetary authority (Céspedes and Soto, 2005). The role of the banking sector and monetary policy in managing imported inflation is generally overlooked by researchers beyond devaluing the domestic currency (Yeldan and Erugrul, 2003), yet research efforts have been undertaken to develop methods of enhancing bank efficiency and reducing intermediation costs in order to manage inflation (Andrade et al., 2001). In a study covering the banking sector in the Gulf Cooperation Countries, Srarir (2010) finds that banks in oil-rich Arab nations have high profit efficiency but low cost efficiency, which contributes to inflationary pressures in these emerging economies. In such cases it becomes absolutely imperative for regulatory agents to intervene to help boost cost efficiency of banks (Paiouras et al., 2009).

However, there has been no consensus as to whether societal gains have been reaped in response to an enhanced financial and monetary system (DeLong and DeYoung, 2007). Undoubtedly, banking efficiency increases with consolidation, recapitalisation and regulation, hence reducing costs, taming inflation and generating jobs. In addition to capitalizing on economies of scale and scope, a consolidated banking sector enhances its geographical reach, expands the range of its products and attracts more deposits (Focarelli et al., 2002). Larger banks can significantly improve returns by diversifying activities into a wide range of financial and non-financial products (Yildirim and Philippatos, 2007) as well as consolidate risks (Group of Ten, 2001). Even if smaller banks exert all efforts to enhance their efficiency and recapitalisation, larger banks are able to access cheaper deposits and attract customers of higher creditworthiness (Demirguc-Kunt et al., 2008). As for their role in creating jobs, larger banks’ easy access to funds obliges them to seek alternative outlets for lending, including small and medium enterprises (SMEs) (Berger et al., 1998).
On the other hand, there is an opposing viewpoint asserting that banking reforms and recapitalization are ineffective if lending to small businesses is elbowed out by larger borrowers (Koutsomanoli-Filippaki et al., 2009). Moreover, excessive diversification of bank lending and investment must be avoided since it might increase systematic market risk (Stiroh and Rumble, 2006). Since the eruption of the global meltdown, researchers accentuate that banking reforms should no longer solely focus on enhancing bank safety, profitability and efficiency, but are required to provide lower costs for borrowers, more predictable returns for investors and a highly efficient allocation of resources (Brissimis et al., 2008). In the same vein, post-GFC research reveals that it is imperative to reduce systemic risks and to gear corporate governance (Black et al., 2003) and regulation (Beck et al., 2006; Institute of International Finance, 2010) towards attaining national macroeconomic goals (Pasiouras, 2008).

Banking sectors of emerging economies were hailed for their immunity against contagion from severe illiquidity and toxic assets amidst the GFC (Boorman, 2009). Studies applying the stochastic frontier approach (SFA) and the data envelopment approach (DEA) to the Egyptian and Turkish cases conclude that this is mainly attributed to the previously enacted banking reforms in these nations (El Shazly, 2009; Aysan and Ceyhan, 2008). Using the SFA model Chan and Abd Karim (2010) show that the protection from contagion hinges on the volume of credit extended to domestic private producers and the level of foreign ownership in the banking sector. As much as this may be true, the relatively shallow financial sectors of Egypt and Turkey, which prohibit dealings in sophisticated financial instruments, have isolated them from the toxicity of the global turbulence (Loser, 2009).

This explains why measuring efficiency of the Turkish and Egyptian banking sectors is being linked to achieving national macroeconomic objectives (Ihsan and Darrat, 2009). Ozkan-Gunay and Tektas (2006) utilise the DEA method to examine how bank efficiency in Turkey can contribute to enhancing economic growth. Focusing on the case of the Middle East and North Africa (MENA) Region, Aysan et al. (2008) emphasise that banking efficiency needs to be supported by an all-inclusive amalgamation of sound economic policies, supervisory controls, political stability and internal governance. But the main contribution of this study is that, unlike previous research, bank efficiency is measured in accordance with its ability to fulfil popular macroeconomic goals.

The DEA/SFA Methodology and Data Collection

This study uses a three-stage integrated DEA-SFA approach, à la Avkiran and Rowlands (2008), to compare the effect of a number of bank inputs on macroeconomic outputs in Turkey and Egypt from 2001 to 2010. In response to the 2001 banking crisis, the Central Bank of the Republic of Turkey provided emergency responses, granting stabilising funding and bailout funds to depositors and creditors.

The main advantage of the linear programming DEA approach is that it works on the principle of capturing the interaction amongst multiple inputs and outputs. Also, it is an efficient frontier technique that relies on relative evaluation by comparing the position of the inefficient decision making unit (DMU), or banking unit, to the frontier. As such, the management can select the efficient or best-practice DMU to be emulated. Both the BCC model, i.e. Banker, Charnes and Cooper (1984), and the CCR model i.e.
Charnes, Cooper and Rhodes (1978) do not generate units-invariant estimates of non-radial inefficiency. The DEA method stipulates that there is no noise in constructing the frontier indicating that any error in the data of a DMU might be reflected as a change in its measured efficiency. Thus, for a consistent interpretation of DEA estimates, the non-oriented slacks-based measure (SBM) of efficiency is employed (Cooper et al., 2006). Then, a second stage SFA technique is used to decompose the slacks into other effects that are beyond the control of the bank management. This is mainly due to the fact that SFA takes into account the exogenous events in the residue or the distance from the efficiency frontier, hence unravelling statistic noise (Berger and Mester, 1997).

Another rationale behind using both approaches is the randomness of internal macroeconomic conditions and external shocks. Hence, the intrinsic difficulty of predicting depositors’ and borrowers’ demand renders customer behaviour unpredictable and accordingly the input-output relationship becomes stochastic. This was especially evident during the massive wave of capital flight and deposit run witnessed by both nations in the wake of banking crises of the nineties and the recent Egyptian socio-political turmoil of January 2011. Moreover, various studies show bias in some of the results of the DEA methodology (Hughes and Yaisawarng, 2004) and imprecision of the SFA technique (Cooper and Tone, 1997). For this reason several researchers are increasingly employing comparative analyses of parametric and non-parametric approaches to ensure accuracy of results (Resti, 1997; Kohers et al., 2000; Chen, 2002). One of the latest studies applying both the DEA and SFA methodologies to a number of post-crisis Asian banking sectors concludes that the level of bank efficiency is highly affected by country-specific conditions, namely interest rates, competition levels and the degree of economic development (Thoraneenitiyan and Avkiran, 2009).

The data for Egyptian banks is collected from the individual financial statements of the 39 Egyptian banks and the CBE database. As for Turkey, the data is accessed from the databases of the Banks Association of Turkey (BAT) and the Central Bank of the Republic of Turkey. The study covers the entire 87 banks operating in Egypt and Turkey and yields 4187 observations. Macroeconomic data for both nations is collected from the database of the World Bank and the International Financial Statistics published by IMF. Values are converted to US dollars at market exchange rates to ensure comparability of cross-country data. Figures are adjusted for inflation, with 2000 being the base year.

### Input and Output Variables

The three-stage model starts with the DEA to measure bank efficiency, and then uses stochastic frontier analysis to exclude the effects of external macroeconomic environmental factors and statistical noise. Banks are assumed to minimize inputs. The fractional program for the non-oriented variable returns to scale SBM is shown in Equation 1, where $\rho$ is the scalar that captures radial and non-radial slacks.

$$
\begin{align*}
\min \rho &= \frac{1 - (1/n) \sum_{i=1}^{n} x_i^0}{1 + (1/m) \sum_{j=1}^{m} y_j^0} \\
&= \frac{1 - (1/n) \sum_{i=1}^{n} x_i^0}{1 + (1/m) \sum_{j=1}^{m} y_j^0} 
\end{align*}
$$

(1)
where, $x^0 \geq 0$ is the vector of inputs of the DMU, and $y^0 \geq 0$ is the vector of the outputs. $X\lambda$ and $Y\lambda$ are the levels of input usage and output production. $s^-$ and $s^+$ are the input and output slacks.

Imposing the following constraint in equation (3) introduces variable returns to scale. A bank is rated as efficient if the optimal value for the objective function equals one, i.e. if the efficient DMU or bank has zero input and output slacks.

$$\sum_{k=1}^{n} \lambda_k = 1$$

where, $\lambda \geq 0$

In this first-stage productivity model, four inputs and four outputs are specified under the intermediation approach. Inputs are chosen to assess the ability of the banking sector to fulfil its main role of mobilizing savings and channelling them to investors at the lowest possible price. To this avail, the first three inputs measure the costs of borrowed funds (BFE), physical capital expenses (PCE) and the costs of human capital (HCE). Another important factor that indirectly helps with reducing risks is the fulfilment of the 8% regulatory capital adequacy (CA) requirement as per Basel II (BIS, 2010).

To gauge the ability of the banking sector to achieve social stability, a few proxies are used to measure how efficiently banks fulfil the targets of job creation, GDP growth and managing inflation. The following four outputs are selected: the loan-deposit ratio (L/D), the proportion of funds lent to small and medium enterprises (SME), the proportion of funds lent to growth enhancing sectors (G) and the spread between borrowing and lending rates (B/L). The loan/deposit ratio is important since the Egyptian banking sector has recorded a notoriously low rate that reached 50.2% on December 2010 (CBE, 2010). Also, whereas the reform plan of the CBRT gave instructions and incentives to banks to direct their funds towards job-generating SMEs and growth enhancing sectors, namely agriculture, construction and manufacturing, the CBE instigated such actions as late as 2008 (Hassan and Sassanpour, 2008). An equally important output is the cost of lending, which impacts the consumer price index.

External macroeconomic environmental factors have a significant impact on the banking industry and affect the sample homogeneity assumption (Dietsch and Lozano-Vivas, 2000). Thus, the second stage of the model decomposes the input and output slacks or inefficiencies that are obtained from the first stage into environmental impacts, statistical noise, and managerial inefficiency. Examples of these environmental impacts are the inadvertent measurement errors, labour strikes, closures due to socio-political unrest, equipment failure, external shocks and deposit runs, which are compliant with the episodes of social unrest that infested both nations during their financial crises. The factors that contribute to managerial inefficiency are inconformity with regulatory capital and other central bank requirements, inadequate staffing, and insufficient inputs.
TABLE 2. ENVIRONMENTAL FACTORS (z)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macroeconomic factors (ME)</td>
<td>Public debt as a percentage of GDP (PD)</td>
</tr>
<tr>
<td></td>
<td>Growth of GDP per capita (GDP)</td>
</tr>
<tr>
<td></td>
<td>Inflationary shocks (CPI)</td>
</tr>
<tr>
<td>Banking Industry Variables (BI)</td>
<td>Bank concentration using Herfindahl-Hirschman Index (HHI)</td>
</tr>
<tr>
<td></td>
<td>Volume of NPL/Total loan portfolio (NPL/TL)</td>
</tr>
<tr>
<td>Regulations (R)</td>
<td>Costs of compliance with 3 pillars of Basel II capital (RC)</td>
</tr>
<tr>
<td></td>
<td>Costs &amp; benefits of corporate governance of banks*(CG)</td>
</tr>
<tr>
<td>External Global Variables (BS)</td>
<td>GDP change due to external the global shocks (GS)</td>
</tr>
<tr>
<td></td>
<td>Imported inflationary pressures (II)</td>
</tr>
</tbody>
</table>

* HHI is the sum of the squares of banking firms within each banking industry. It ranges from 0, indicating low market power, to 1, indicating more concentration.
* Battese and Coelli (1995) assert that inclusion of some variables in stochastic frontier supports the independence assumption when equations are estimated simultaneously.

Defining the Environmental Factors

In the second stage, the SFA method is used to minimize the chances of distorting the validity of the previous efficiency analysis. Since even the healthiest banking unit could be harshly affected by adverse conditions, the overall environment of the banking industry has to be examined. For example, lower GDP per capita will surely translate into lower savings and less employment opportunities (de Mendonca, 2009). Input and output slacks from the first stage across the ten-year period are first pooled and then separately regressed on the environmental exogenous variables (z). There is little consensus in the literature on the environmental variables that impact bank efficiency. Table 2 divides environmental features into country-specific macroeconomic, regulatory, banking and global external factors.

The legitimacy of selecting macroeconomic factors is that as of 2009 the outstanding public debt accounted for 72.1% of GDP in Egypt and 46.3% in Turkey, and the fiscal stimulus packages are likely to prompt future public borrowing (Boorman, 2009). Moreover, amidst the current slowdown in GDP and the looming inflationary risks, bank efficiency is apt to be adversely affected (Kasman and Yildirim, 2006). Also, if not properly addressed, bad debts are likely to have detrimental effects on the economy. But higher concentration could either be cost effective or lead to diseconomies of scale (Yildirim and Philippatos, 2007). The third group of variables is inherent in global shocks. Highly relevant to Egypt is imported inflation, which was evident during the severity of the Global Food Crisis of 2006/07. Finally, the regulatory environment, and the enhanced corporate governance of banks help in reducing fraudulent transactions and enhancing the overall functioning of banks (Beck et al., 2006).

The above specifications are intended to separate and highlight the role of banking units in efficiently attaining the macroeconomic goals of the nation after segregating the four aspects of environmental influences.

\[
s_p^r = f (z_p; \beta_i) + \varepsilon_p
\]  

(5)

where, \( \beta_i \) is the parameter vector for the feasible slack frontier.
\[ \varepsilon_{ip} = v_{ip} + u_{ip} \]

\[ s'_{jq} = f(z_q; \beta_j) + \varepsilon_{jq} \]  

where, \( \varepsilon_{jq} = v_{jq} + u_{jq} \)

The composite error terms \( \varepsilon_{ip} \) and \( \varepsilon_{jq} \) comprise a random stochastic term \( v_{ip} \) representing statistical noise, and \( u_{ip} \) denoting managerial inefficiency. After obtaining the parameters from the SFA regressions, the observed inputs \( (x) \) are adjusted for environment and statistical noise. Therefore, banks enjoying a favourable environment and/or statistical noise will find their efficiency scores decreased as inputs are adjusted upwards. Conversely, banks operating under less attractive environments and/or statistical noise have their efficiency scores increased as outputs are adjusted upwards.

Equation 7 shows how inputs are adjusted for environment and statistical noise \((x')\).

\[ x'_{ir} = x_{ir} + \left[ \max \left\{ z_r \hat{\beta}_i \right\} - z_r \hat{\beta}_i \right] + \left[ \max \left\{ \hat{v}_r \right\} - \hat{v}_r \right] \]  

where, \( x'_{ir} \) is the adjusted value of \( i^{th} \) bank input in \( j^{th} \) bank unit

\( x_{ir} \) is the observed value of \( i^{th} \) bank input in \( j^{th} \) bank unit

\( z_r \hat{\beta}_i \) is the \( i^{th} \) input slack in \( r^{th} \) unit due to environmental factors

\( \hat{v}_r \) is the \( i^{th} \) input slack in \( r^{th} \) unit due to statistical noise

Equations 8 through 10 display the adjustments attributable to the operating environment and statistical noise, which is best done by using ratios comprising of adjustment factors. The first adjustment variable \( (\mu) \) represents the percent upward adjustment of the observed input attributable to the operating environment, and the second \( (\eta) \) represents the percent upward adjustment of the observed input attributable to the statistical noise.

\[ x'_{ir} = 1 + \mu_s + \eta_s \]  

\[ \mu_s = \left( \frac{\max \left\{ z_r \hat{\beta}_i \right\}}{x_{ir}} \right) \left( 1 - \frac{z_{ir}}{\max \left\{ z_r \hat{\beta}_i \right\}} \right) \]  

\[ \eta_s = \left( \frac{\max \left\{ \hat{v}_r \right\}}{x_{ir}} \right) \left( 1 - \frac{\hat{v}_r}{\max \left\{ \hat{v}_r \right\}} \right) \]  

The outputs of the units suffering from unfavourable operating environments and statistical noise are adjusted upwards as shown in equations 11 through 14. This is done by comparing the slacks of these units to the ones generated by the best performers.
While \((\mu_y)\) captures the percent upward adjustment of the observed output due to environmental influence, \((\eta_y)\) represents the percent upward adjustment attributed to statistical noise.

\[
y_{sr}^\sigma = y_{sr} + \left[ z_r \beta_s - \min \left\{ z_r \beta_s \right\} \right] + \left[ v_{sr} - \min \left\{ v_{sr} \right\} \right] \tag{11}
\]

\[
y_{sr}^\sigma = 1 + \mu_y + \eta_y \tag{12}
\]

\[
\mu_y = \left( \frac{z_r \beta_s}{y_{sr}} \right) \left( 1 - \frac{\min \left\{ z_r \beta_s \right\}}{z_r \beta_s} \right) \tag{13}
\]

\[
\eta_y = \left( \frac{v_{sr}}{y_{sr}} \right) \left( 1 - \frac{\min \left\{ v_{sr} \right\}}{v_{sr}} \right) \tag{14}
\]

It is essential to distinguish between input-sourced statistical noise \((v)\) from the managerial inefficiency \((u)\) in the composite error term \((\varepsilon)\) of the SFA regressions. When \((v)\) is estimated for each unit, the observed input usage can be adjusted à la Jondrow et al. (1982) to separate the composed error term into its components. Then, the input-sourced statistical noise, which is conditional on the composed error structure, is residually estimated by subtracting from the first stage input slack the estimate of that input’s slack for a given unit as follows.

\[
\hat{E}[u|v+u] \text{ depending on } \hat{\beta}, \sigma_u^2 \text{ and } \sigma_v^2
\]

\[
\hat{E}[v_{sr}|v_{sr}+u_{sr}] = s^r - z_r \hat{\beta}_s - \hat{E}[u_{sr}|v_{sr}+u_{sr}] \tag{15}
\]

The same method is reused by estimating statistical noise in output generation as follows.

\[
\hat{E}[v_{sr}|v_{sr}+u_{sr}] = s^r - z_r \hat{\beta}_s - \hat{E}[u_{sr}|v_{sr}+u_{sr}] \tag{16}
\]

The third stage repeats the non-oriented SBM data envelopment analysis of bank efficiency that was performed in the first stage after using the adjusted input and output data obtained from the second stage. Since the operating environment and statistical noise influences have been removed, banking units will neither be blamed for external environmental conditions, nor unduly rewarded for operating in a favourable environment to which they did not contribute.

**Interpretation of the Results**

**Results of the First Stage DEA**

The results of the first stage DEA are estimated and presented in Table 3 against a common efficient frontier referred to as an “inter temporal production set”. This method is used since bank reforms in both Egypt and Turkey were enacted at virtually the same period and the level of technology and banking knowhow was almost analogous in both...
nations. Moreover, comparing bank efficiency over a ten-year period necessitates measuring efficiency relative to a common frontier (Tulkens and Eeckaut, 1995).

**TABLE 3. FIRST STAGE AGGREGATE WEIGHTED AVERAGE EFFICIENCY SCORES BY BANK CATEGORY**

<table>
<thead>
<tr>
<th>Bank Category</th>
<th>Mean</th>
<th>Median</th>
<th>Min</th>
<th>Max</th>
<th>CV*</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public commercial banks</td>
<td>0.507</td>
<td>0.517</td>
<td>0.337</td>
<td>0.891</td>
<td>0.192</td>
<td>6</td>
</tr>
<tr>
<td>Public specialized banks</td>
<td>0.503</td>
<td>0.516</td>
<td>0.311</td>
<td>0.8</td>
<td>0.189</td>
<td>6</td>
</tr>
<tr>
<td>Private domestic banks</td>
<td>0.528</td>
<td>0.598</td>
<td>0.634</td>
<td>0.969</td>
<td>0.221</td>
<td>51</td>
</tr>
<tr>
<td>Foreign banks</td>
<td>0.511</td>
<td>0.585</td>
<td>0.681</td>
<td>0.791</td>
<td>0.348</td>
<td>24</td>
</tr>
<tr>
<td>Total</td>
<td>0.518</td>
<td>0.534</td>
<td>0.494</td>
<td>0.714</td>
<td>0.292</td>
<td>87</td>
</tr>
</tbody>
</table>

* Coefficient of variation

Source: Author’s calculations

**FIGURE 2. BOX- PLOT OF EFFICIENCY SCORES BY BANK CATEGORY**

Source: Author’s calculations of median, 25th percentile, 75th percentile and lower and upper adjacent values

The results displayed by Table 3 and Figure 2 suggest low mean efficiencies and evident variability. The best performers are private and foreign banks. The lowest average cost efficiency is scored by public specialized banks, which also display the highest variability in efficiency scores. Inter-quartile ranges are confined to the central 50% of the sample in each category, bounded by the 25th and 75th percentile. Public banks show wide inter-quartile ranges and longer whiskers.
Results of the Second Stage SFA

The possible explanation of the low efficiency levels is that input and output inefficiencies are simultaneously captured. More importantly, at this initial stage, efficiency estimates might have been influenced by the aforementioned environmental factors and statistical noise. To rule out environmental and random error effects, input and output slacks obtained from the previous stage are pooled, and then separately regressed on input and output slacks to allow for variation. Most of the results in Table 4 are in line with the existing literature and the overall verdict is that the operating environment exerts a statistically significant influence on bank inefficiency. Most of the observations are significant in the regressions; most of the coefficients are statistically significant at 5% or less, which confirms that differences in economic conditions are beyond the control of the bank management influence.

Of great interest are the coefficients of macroeconomic variables. There is a direct relationship between public debt (PD) and most bank input and output slacks. In other words, the high level of public debt is in no way intuitive of a good management of resources to produce outputs. On the other hand, the fact that the coefficients for GDP have negative signs and are statistically significant confirms that a consistently high GDP growth is apt to reduce incidences of bank inefficiencies (Brissimis et al., 2008). While a positive relationship exists between the CPI and bank inefficiencies, it is counter-intuitive and is found to be statistically insignificant for fulfilling the goals of lending to SMEs and growth-enhancing sectors. This might be attributed to the fact that state-owned banks tend to take up this role during episodes of banking crises.

As for the general environment in the banking industry, the results reveal that the highly concentrated banking markets incur additional input and output slacks. The literature confirms this finding, reflecting the rise of inefficiency in the case of markets that are dominated by a small number of large banks (Bonin et al., 2005). Also, the result that more NPLs are associated with inefficiency confirms that outstanding bad debts cannot be disregarded in efficiency assessment. The result is insignificant for loans granted to growth enhancing sectors. Conversely, global shocks have a marked effect on efficiency except for SMEs. This may be explained by the fact that some incentives are extended to lend to these entities during crises. Another important observation is that regulatory bank capital is positively associated with bank inefficiency. A significantly negative coefficient for a dummy variable for CG reveals that an internally regulated bank is likely to have a more disciplined environment and may enjoy improved efficiency. Table 4 shows that the \( \gamma \) estimates, as explained in equation 17, range from 0.39 to 0.88 and are statistically significant.

\[
\gamma = \frac{\sigma_u^2}{\sigma_v^2 + \sigma_u^2}
\]

(17)
Results of Third Stage SBM on Adjusted Data

The third stage is a repetition of the non-oriented SBM analysis of the first stage, by using adjusted input and output data obtained from the second stage. The null hypothesis stipulating that the SBM scores from the first and third stages are independently drawn from the same population at 1% significance level is rejected after performing the parametric t-test and F-test and the non-parametric Wilcoxon signed-rank, Kruskal-Wallis and Kolmogorov-Smirnov tests. Figure 3 captures comparisons of the third stage SBM mean efficiency scores after introducing various adjustments. In the first step the impact of the statistical noise is removed and SBM scores are re-calculated. On average, bank efficiency shows some improvement, which indicates that the statistical noise has a negative impact on bank efficiency estimates. When removing the effect of global shocks, bank efficiency further improves, yet, its effect is not as substantial as the previous impact of internal conditions. The literature explains that this is due to the fact that in most post-crisis bank reforms, the reformed banking sector imposes immense restrictions on banking operations and prohibits trading on many sophisticated and multi-layered financial instruments, which keeps them relatively sheltered from global financial markets (BIS, 2010). These results support the private monitoring hypothesis, which states that the disclosure of accurate and timely information to the public allows private agents to overcome information and transactions costs and helps monitor banks more effectively (Pasiouras, 2008). However, Demirguc-Kunt et al. (2009) warn that excessive restrictions on bank activities impede some banking operations, hence increasing cost inefficiency. Bank efficiency scores rise even more when the data is adjusted for all three features of the internal operating environmental conditions. After removing all impacts in the third stage, it is observed that the bank mean efficiency scores are much higher than

<table>
<thead>
<tr>
<th>TABLE 4. SECOND STAGE SFA REGRESSIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input Slacks</strong></td>
</tr>
<tr>
<td><strong>Output Slacks</strong></td>
</tr>
<tr>
<td>Constant</td>
</tr>
<tr>
<td><strong>PD(+)</strong></td>
</tr>
<tr>
<td><strong>GDP(-)</strong></td>
</tr>
<tr>
<td><strong>CPI(+)</strong></td>
</tr>
<tr>
<td><strong>HHI (+)</strong></td>
</tr>
<tr>
<td><strong>NPL/TL (+)</strong></td>
</tr>
<tr>
<td><strong>GS (+)</strong></td>
</tr>
<tr>
<td><strong>H(+)</strong></td>
</tr>
<tr>
<td><strong>RC(-)</strong></td>
</tr>
<tr>
<td><strong>γ</strong></td>
</tr>
<tr>
<td>Log likelihood</td>
</tr>
<tr>
<td>LR test of one-sided error</td>
</tr>
<tr>
<td>Mean slacks</td>
</tr>
</tbody>
</table>

(γ) measures the variance in disturbance due to bank inefficiency
* and ** indicate 10% and 5% one-tailed significance levels
the first stage. Thus, the largest impact on bank efficiency is attributed to internal environmental conditions.

FIGURE 3. COMPARISON OF AGGREGATE MEAN EFFICIENCY SCORES

Robustness and Sensitivity Analysis

Three procedures are followed to test the robustness of the results. First, the above process is repeated separately for each of Egypt and Turkey. Then, the exercise is repeated after dividing the banking sample according to ownership. Thirdly, the purged data is applied after dividing banks according to size.

FIGURE 4. COMPARISON OF AGGREGATE MEAN EFFICIENCY SCORES OF TURKEY AND EGYPT
Both the Turkish and Egyptian banking sectors show low efficiency during the post-crisis period. The results are consistent across each country’s sample and the country-specific factors retain their significance. Even though the results displayed by Figure 4 show some difference in terms of average efficiency, the magnitude of changes by the country-specific factors are still very much in line with those presented in the initial findings. After segregating the results for each country, it becomes evident that Turkish banks adequately serve the macroeconomic objectives. Egyptian banks showed a slight improvement in the wake of the GFC, which might be due to the fact that the CBE started encouraging lending to SMEs by exempting these funds from the legal reserve requirements (CBE, 2010).

FIGURE 5. EFFICIENCY SCORES BY BANK CATEGORY
Figure 5 uses data that was fully purged in the third stage, where the subsamples are re-casted by type of ownership. Bank efficiency showed considerable improvement after reforms were enacted for both countries, with more pronounced effects in Turkey. On the whole, the highest scores were achieved by private and foreign banks, which scored above 85%. Public banks lagged behind, where the lowest efficiency was scored by agricultural specialised banks and the highest by industrial specialised banks. The superiority of both types of private banks is attributable to the fact that state-owned banks are inclined to loaning funds to state-owned enterprises (Thornton, 2011). The last check of robustness is comparing banks by size. Table 5 shows that the highest scores are achieved by medium-sized banks and the lower efficiency is recorded by large banks, which indicates that bank size is indeed a determining factor of bank efficiency.

**TABLE 5. AVERAGE EFFICIENCY SCORES BY BANK SIZE***

<table>
<thead>
<tr>
<th>Bank Size</th>
<th>Mean</th>
<th>Median</th>
<th>Min</th>
<th>Max</th>
<th>Var</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small banks</td>
<td>0.713</td>
<td>0.693</td>
<td>0.698</td>
<td>0.885</td>
<td>&lt;0.001</td>
<td>28</td>
</tr>
<tr>
<td>Medium banks</td>
<td>0.933</td>
<td>0.893</td>
<td>0.745</td>
<td>0.973</td>
<td>0.015</td>
<td>44</td>
</tr>
<tr>
<td>Large banks</td>
<td>0.804</td>
<td>0.808</td>
<td>0.563</td>
<td>0.878</td>
<td>0.018</td>
<td>15</td>
</tr>
<tr>
<td>All banks</td>
<td>0.912</td>
<td>0.831</td>
<td>0.637</td>
<td>0.923</td>
<td>0.012</td>
<td>87</td>
</tr>
</tbody>
</table>

- Bank size is measured by assets and equity. Small banks have less than half the mean assets and equity and large banks possess more than 30% of the mean.
- Source: Author’s calculations

**CONCLUSIONS AND POLICY IMPLICATIONS**

This research uses the DEA/SFA three-stage methodology to estimate the efficiency of Turkish and Egyptian banks in addressing the problems of inflation, job creation and economic growth during 2000-2010. The period captures the ante-crisis and post-crisis reform periods. The main contribution of this study is that bank efficiency is measured in accordance with its ability to fulfil macroeconomic national goals and not in regard to the bank-centric goals of enhancing profitability or cost effectiveness. The research is vital because in spite of the evident improvement in the overall macroeconomic performance and banking sector efficiency in emerging market economies, very few of these nations have endeavoured to gear banking reforms towards enhancing the prosperity of the lowermost income groups (Ihsan and Darrat, 2009). The Egyptian Revolution alerted policymakers in many EMEs to the urgency of utilising all available resources to address the socioeconomic calamities of their people. The study focuses on drawing lessons for Egypt from the more successful Turkish experience in this regard.

In general, bank mean efficiency scores improve over time as restructuring unfolds. The results of the third stage DEA-SBM show that the mean efficiency scores slightly improve and exhibit faintly less dispersion once the statistical noise is separated. The fact that the most sweeping effects are realized once the impact of environmental factors is separated confirms that policymakers need to redirect their reforms beyond bank restructuring. The results also reveal that the effect of internal corporate governance on bank efficiency is relatively low compared to the influences of central bank regulation. Hence, stronger supervision is more urgent at this point in time in comparison to internal governance, which Basel III will not impose till January 2019.
On the macroeconomic front, Turkish reforms show higher efficacy since the CBRT urges banks to direct loans towards job-generating and growth-enhancing sectors. Public debt, high inflation rates and concentrated markets impose adverse influences on bank efficiency. Imported inflation has a far more pronounced impact in Egypt, which confirms that there is ample scope for the input of the banking sector in this regard. This begs the need for the CBE to follow the steps of its Turkish counterpart in specifying an explicit nominal anchor for inflation targeting.

When the study is repeated after separating banks according to ownership, private domestic banks score the highest average efficiency followed by foreign banks, while public banks score the lowest. As for size, average-sized banks display highest efficiency, with the smallest ones being the least efficient. Thus, the commonsensical policy implication is to encourage the expansion of domestic private banks, whilst discouraging mergers and acquisitions beyond the mean-sized banks. It might also be advisable for state-owned banks to consider going into joint ownership with private banks as a means of enhancing their efficiency (Acar, 2009).

Finally, a study extended to a larger sample of emerging economies can be a valuable extension of the current research. A qualitative exploration of the possible reasons behind the low effect of corporate governance on bank efficiency deserves more attention and would surely prove to be an invaluable addition to the existing literature. Moreover, the analysis could be extended to different aspects of environmental conditions in order to determine the catalysts needed for banking sector reforms to close the efficiency gap between various banking categories.

REFERENCES


International Monetary Fund, *Turkey, IMF Staff Country Reports*, No. 05/412, 2005.


Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.