

## **Determinants of Banking distress and Merger as Strategic Policy to Resolve Distress**

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**Abstract.** This paper studies bank distress in MENA countries and addresses the question of whether mergers are commonly considered as a solution for resolving individual bank distress. Both specific bank levels and macro variables are deployed to predict banking distress. In line with other recent papers, we challenge the view that specific bank indicators such as CAMEL category and bank size are significant determinants of bank distress. Our findings indicate that monetary policy indicators do not really affect bank distress in MENA countries. Overall, we suggest that bank capitalization and regulatory supervision needs to be given enough consideration to avoid individual distress in the banking sector. Our empirical study shows that 67% of the distressed banks in our sample are involved in merger transactions and that poor financial status systematically increases the likelihood of a bank being involved in a merger. Distressed state-owned banks and large-sized banks are less likely to be a target in a merger transaction. However, global economic conditions do not affect the decision of distressed banks to initiate a merger policy.

**JEL:** G21, G33, G35, G38.

**Keywords:** banking distress, bank mergers, CAMEL rating, financial stability, MENA.

## 1. Introduction

Financial systems in MENA countries are dominated by banks and, in some economies, by state-owned banks. The banking system is one of the most closely supervised industries in the MENA region, reflecting the view that bank distress has a greater adverse impact on economic activity than other business failures.

In some countries, such as those belonging to the Gulf Corporation Council-*GCC*, the banking sector is well-developed, profitable and efficient. But in almost half the MENA region, the banking sector is poorly developed and is dominated by state-owned banks. Public sector banks are characterized by government intervention in credit allocation, losses and liquidity problems, and wide interest rate spreads. In more than half the countries in the region, the banking sector is highly concentrated, with the assets of the three largest banks accounting for over 65% of total bank assets, making it difficult for new banks to enter the sector. In many areas, there is also a lack of modern banking and financial skills.

Conscious of the impact of the banking system panic on the economy, the International Monetary Fund identified four sources of weakness in the MENA region banking system.

*Monopoly of Public Sector Banks:* Public sector banks reduce the need to increase efficiency due to the absence of competition. This has led to many of the region's banks being cut off from the developments and innovations taking place in the international banking industry. In addition, in order to create more jobs, most of these banks are overstaffed, creating redundant employment. In many cases (e.g. Egypt and Syria), credit is allocated by direct order from government authorities, regardless of sound credit principles and practices or the viability of the activity and the borrower's creditworthiness.

*Distorted Macroeconomic Framework:* The banking system in most MENA countries (e.g. Egypt, Morocco, Iraq, Iran, Syria and Yemen) has historically functioned in a distorted macroeconomic framework. This was mainly reflected in negative real interest rates and a continuously depreciating exchange rate. This in turn encouraged many corrupt and profiteering institutions to develop, including the so-called "Islamic Private Financing Companies" which offered a much higher interest rate than commercial banks, and resulted in the misallocation of resources, various forms of speculation and flight of capital. It also deprived the formal banking system from receiving a sizable portion of potential deposits.

*Direct Administrative Determination of Service Charges and Tariffs:* the tariffs and service charges in most Arab banks were administratively determined by the central banks and were unified for all banks. This contributed to a deterioration in the quality of services offered to the customers.

*Administrative Inefficiency:* this is reflected in the lack of skilled staff, over-staffing and low salaries.

Studies on the health of the banking sector in MENA countries have been a major concern for both bankers and international organisations, including the IMF and the World Bank. The fact that the MENA banking sector is dominated by state-owned banks and characterized by a high degree of government intervention and a lack of independence of the central banks in most countries means that banks are well-protected against failure and closure. This paper focuses on the cases of distressed banks in order to identify specific banking factors and macroeconomic indicators that impact on the probability of bank distress in MENA countries. Bank distress is related to the present weak level of capitalisation, solvency and liquidity. We also look at whether bank mergers in this area may be considered as a solution for distressed banks.

Most studies that analyze bank distress at micro and macro level, such as those developed by Altman (1977), Cole and Gunther (1995), Meyer and Pifer (1970), Calomiris and Mason. 2000, Oshinsky and Olin (2006), Koetter, de Graeve and Kick (2008), focus on the developed countries,

especially the U.S. banking industry. However, bank failures are not unique to developed countries. Laeven (1999), Bongini, Classens and Ferri (2001), and Arena (2005), among others, studied bank distress in East Asia following the severe financial crisis experienced in 1997 that led to a number of bank failures. This paper contributes to the literature in this context by developing the first comparative empirical study using micro and macro data that take into account the troubled economic period between 2000-2007 in MENA countries, in order to address the following three questions: (i) To what extent do individual bank conditions explain bank distress? (ii) Is it mainly the macro economic fundamentals that explain bank distress? (iii) Are mergers the commonest solution for distressed banks in the MENA region? As far as we know, no studies have conducted a detailed investigation of individual banking distress in the MENA region to date.

In this paper we examine the determinants of individual bank distress in MENA countries, together with bank merger operations as a solution for troubled banks. We use bank-specific information suggested by the CAMEL rating technique to estimate individual probability of bank distress.<sup>1</sup> The CAMEL method encompasses some useful measures of financial performance and includes the five components of a bank's condition in its assessment: Capital adequacy, Asset quality, Management, Earnings, and Liquidity. We apply a cross-sectional multivariate logit model to assess whether specific bank fundamentals are important in explaining bank failures. We find that traditional, CAMEL-type variables, capital to loan loss reserves, loan growth, net interest income to total revenue, return on assets, and loan loss provision can help predict subsequent bank distress.

In the next step, we estimate the individual probabilities of bank failure as a function of both micro and macro variables. We show that economic country fundamentals, such as real interest rate and exchange rate do not significantly impact on the probability of bank distress. This paper assembles a rich disaggregated dataset capable of linking fundamental sources of banking weakness – individual bank portfolios and liability structure and condition, and Macro economic fundamentals – to the process of bank distress. We then look at strategies adopted by distressed banks to resolve distress. We address the issue as to whether mergers are commonly considered as a solution for troubled banks in MENA countries to resolve distress. We show that a distressed bank's likelihood of being involved in a merger is systematically related to its financial status.

The rest of the paper is organized as follows: section 2 sets out our motivation and reviews the literature on banking distress. Section 3 presents the methodology, describes the data used and provides selection criteria of distressed banks. The following section analyzes the contribution of bank specific factors and macro variables in explaining the probability of individual bank distress through logit models. Section 5 tests the hypothesis that mergers are a solution adopted by troubled banks to resolve distress. Section 6 sets out our conclusions.

## **2. Motivation and empirical review**

In this section, we present a brief review of the financial literature dedicated to explaining bank distress and we investigate to what extent the literature has explored the adoption of banking merger as a solution to resolve banking distress.

### **2.1. Bank distress literature**

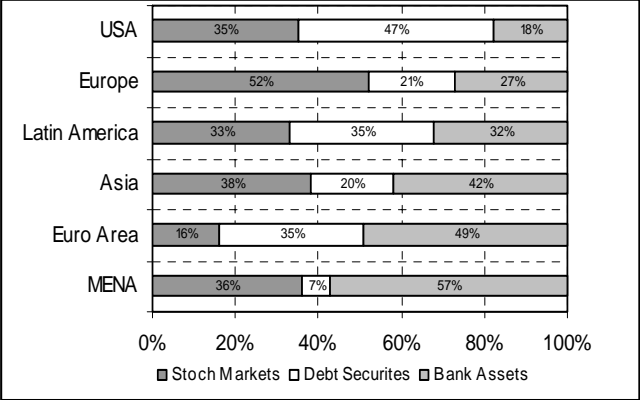
Further to the wave of bank failures since 1990 which have affected many financial centres worldwide, banking distress has been of major interest in the field of economics. Certainly, the interest in banking distress is greater in regions where the banking sector dominates the financial

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<sup>1</sup> The CAMEL rating system is a method of evaluating the health of credit unions by the National Credit Union Administration.

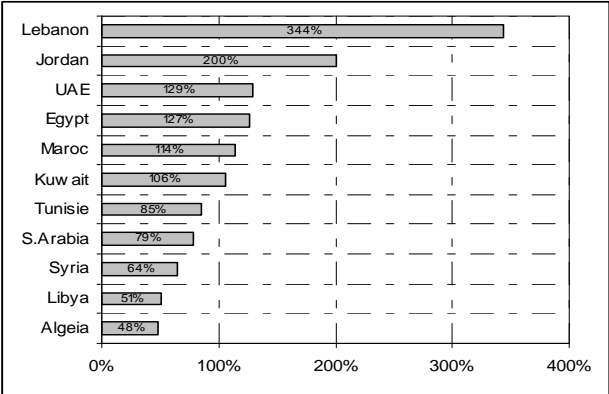
system. In such cases, the banking sector constitutes the prime source of financing economic growth in these regions. In this paper we attempt to characterise the fundamental factors that determine banking distress in MENA countries. We also focus on mergers of troubled banks as a solution for distress. Figures 1 and 2 illustrate the major role played by the banking systems in MENA countries in funding the economy, and indicate key disparities across countries.

Figure 1. Structure of financial markets



(Sources: IMF)

Figure 2. Total banking assets (% of GDP)



(Sources: IMF)

We began our study by exploring the literature on predicting individual financial institutions' distress and closures. Models have been developed to try to predict the failure of individual financial institution (early warning systems) since the 1970s. Mainly applied to banking systems in developed countries, these studies focus on the early identification of financial institutions developing financial difficulties. From the viewpoint of banking regulators and supervisory agencies, early warning systems can help minimize the use of relatively scarce examination resources, while at the same time introducing as much failure-prevention as possible. Indeed, failure prediction models and early warning systems have proven important tools for supervisory agencies to schedule individual on-site bank examinations and initiate remedial action.

The first generation of financial early warning systems aimed to build screening devices to help schedule bank examinations by flagging institutions in financial distress as early as possible. These studies share a similar approach (Meyer and Pifer 1970; Sinkey 1975; Altman 1977; Martin 1977; Pettaway and Sinkey 1980; see Altman 1981 for a comprehensive survey of the early wave of the literature): on the basis of a set of financial ratios which reflect the different dimensions of a CAMEL rating system, the statistically best subset of variables is chosen to distinguish between potentially financially-troubled and sound financial institutions, within a certain prediction horizon. As their goal is early warning, these models aim to predict the economic insolvency of a bank rather than the narrow notion of *de jure* failure. In other words, these studies aim to identify situations in which a bank might become unable to meet its contractual liabilities from its own resources due to the negative value of its net worth at market-value even if this is not followed up by a formal declaration of insolvency (and subsequent closure) by the chartering authority. In fact, bank merger is only one of the various options available for dealing with distress.

A certain number of studies that attempt to empirically identify the causes and origins of banking system<sup>2</sup> weakness have mainly focused on the macro-economic factors that can help predict banking crises. Macro-economic variables through factors such as inflation and changes in

<sup>2</sup> See Lee Jong-Kun (2002) for study explaining MENA banking system weakness using macroeconomic fundamentals. See also Corsetti, Pesenti, and Roubini (1998), Kaminsky and Reinhart (1999), Radelet and Sachs (1998), Demirgüç-Kunt and Detragiache (1999) for details about developed banking system with macro-economic variables.

interest rates may either enhance or distress the financial performance of banks. Cordella and Levy Yeyati (1998) point out that if there are widespread shocks to the economy and banks cannot control their asset portfolio risks, then full transparency of the bank's risk positions may destabilize the banking system. A country's macro economic environment may also affect transparency levels, making it difficult to relate to the financial performance of commercial banks.

Early warning systems based on macro variables are important tools for the timely detection of systemic bank distress. However, they do not analyse the impact of individual bank factor weaknesses which contribute to the occurrence of the distress. In particular, they are unlikely to be able to discriminate between the view that distressed banks have been hit by exogenous shocks, or the view that many specific weakness factors may have led to the systemic financial distress.

Wheelock and Wilson (1995), Natalia (2006) and Koetter, de Graeve and Kick (2008), among others, suggest that studies that focus on bank distress from a macro-economic perspective have several limitations. In particular, macro-economic studies leave policymakers with insufficient information as to which banks are the most fragile and vulnerable within the system. This may lead to policymakers dealing with financial sector problems at aggregate level, introducing policies that might affect both weak and healthy banks in less than optimal ways. Natalia (2006) argues that using individual institutional data, we can investigate, for example, why, despite the fact that all banks may have faced similar macroeconomic shocks, not all of them experience distress and/or eventually fail. We can thus identify the specific characteristics of distressed banks compared to non-distressed banks and these characteristics can be used to develop systems to monitor the distress risk for banks in the future. By studying the resolution and restructuring processes, we can try to identify the best processes to implement in order to resolve the situation of distressed banks, and which will lead to the least loss of confidence.

Our study contributes to the existing literature by explaining the reasons for bank distress in MENA countries using both macroeconomic fundamentals and specific bank factors.

Studies that have explored the micro-level and specific factors, looked at bank distress in specific countries or even regions, using cross-section, micro-level data. Wheelock and Wilson (1995) adopted proportional hazard models to study the state-chartered Kansas banks between 1910 and 1928. Together with micro variables, critical for a bank's stability, they include dummy variables for deposit insurance membership and technical efficiency estimates as a proxy for managerial quality. Their findings indicated that insured banks were more likely to fail, supporting the moral hazard hypothesis, while more efficient banks were more likely to stay in business. Molina (2002) used the same methodology to study a banking crisis in a developing country - Venezuela. He found that the surviving banks were more profitable and, unlike the case of the Russian crisis of 1998, held a greater share of their assets in government bonds.

Gonzalez, Pazarbasioglu and Billings (1997) suggest that not only bank-specific factors, but also macroeconomic conditions and potential contagion effects determine bank fragility. Following Cole and Gunther (1995), they recognised that likelihood and timing of a failure are influenced by different factors. By applying a multivariate logit and survival analysis, they concluded that macroeconomic factors played a pivotal role in explaining the timing of failure during the Mexican crisis of 1994, with likelihood of failure being influenced more by bank-specific factors, although the contagion effect was important in assessing both.

Gonzales (1999) continued the search by considering an integrated approach to the micro and macro aspect. She considered that a framework for the probability of a bank becoming unsound should include liquidity risk, market risk and credit risk, and suggested indicators for these variables along with certain efficiency measures. She concluded that "sound and unsound banks show different characteristics, largely as the result of different risk-taking behaviour." This claim is supported by the estimation of Cox's proportional hazard model for three episodes of banking crises in the US, as well as in Mexico and Columbia.

Among the contributions, Thomson (1991) and Whalen (1991) developed empirical analyses of the contribution of bank fundamentals and systemic and macroeconomic factors in different episodes of banking system problems in the United States. The common methodologies used by these authors are multivariate logit analysis and proportional hazard models. Their main findings are that measures of bank solvency and risk, *proxied* by CAMEL-rating variables, explain the incidence of bank failures after controlling for aggregate factors.

Kolari *et al.* (2002) developed models and predicted bank failure where the models initially included three measures of loan default disclosure along with 25 other financial measures. The loan default measures included allowance for loan losses to total assets, net loan charge-offs to total assets and provision for loan losses to total assets. In the final analysis, the allowance for loan losses to total assets was significant in two of the six predictions. As with many other studies, there was a lack of theory for the choice of variables, as stepwise logit was utilized for the inclusion or elimination decision.

## **2.2. Banking distress and merger**

Banking distress is generally the result of banking insolvency and undercapitalization. A strategic decision often needs to be taken by the troubled bank's government in order to resolve the distress. Financial distress will, for example, often be resolved via mergers that are supervised, encouraged and supported. Mergers are seen as an administrative option that owners may or may not choose to exercise, even when the bank is economically insolvent. Merger and acquisition of distressed banks is a strategic decision largely evoked in the literature as a solution for distress. Berger and Humphrey (1992), Peristiani (1993), and DeYoung (1997) among others indicate that merger and acquisitions tend to be successful in improving the profitability and efficiency of banks.

Banks have different reasons as to why they engage in mergers. Hadlock *et al.*, (1999) and Bliss and Rosen (2001) suggest that business motives play an important role in bank merger transactions. With regard to mergers driven by business motives, Berger (1998) distinguishes between the relative efficiency hypothesis and the low efficiency hypothesis. Under the relative efficiency hypothesis, the acquiring bank tries to bring the target bank back to its own higher level of efficiency by transferring its superior management capacities or its business procedures. Under the low efficiency hypothesis, one or both of the merging banks are inefficient relative to their peers. The merger may therefore serve as a disciplinary device for the banks' management to improve the banks' performance or as a means of implementing unpleasant business measures.

Hoggarth and Reidhill and Sinclair (2003) note that there is a range of options for resolving insolvent banks. At one extreme, a bank can be kept open through an injection of capital. At the other extreme, a bank can be closed with its assets sold and depositors and possibly other creditors paid off. Between these extremes, a bank's licence may be removed but with the bank sold off to another bank, in full or in part, to preserve the bank's activities. The extent of involvement by the authorities may also vary. It may be limited to promoting or organising private sector support, or extended to official financial support, and as a final resort it may extend to a partial or total government takeover.

Arguably, the decision to merge a distressed bank with a healthier bank rather than leave it in business, is probably necessary and can be a good policy during a global banking crisis or in the case of a weak banking system as it will be difficult to support economic development with a weak banking system, even if many financial institutions are technically insolvent. However, the solutions left to distressed financial institutions are also likely to be more discretionary when there is a systemic crisis. At such a time, not only is it difficult to differentiate problems of illiquidity from problems of insolvency, but the monetary authority is also likely to be more limited in its ability to take on a large number of insolvent banks in both its financial and institutional capacity .

In our analysis of the literature on bank mergers we focused on bank merger as a solution to resolving bank distress. We attempted to identify key factors that characterise the distressed banks most likely to be subject to a merger. We considered both bank-specific factors and macro variables to detect which factors affect the merger decisions of distressed banks.

### 3. Methodology, data and identification of distressed banks

In this paper we estimate two logit models. The first predict the probability of bank distress and the second predict the probability that the distressed banks will be involved in a merger.

#### 3.1. Methodology

Empirical work on bank distress prediction shares the following approach. First, the dependent variable is constructed on the basis of ex-post information on bank distress. Typically, the dependent variable is a dummy variable that distinguishes between failure and non failure. Second, the explicative variables are a subset of bank-specific indicators that generally refer to the five CAMEL categories and country-specific indicators reflecting the macroeconomic situation of banks.

We use a qualitative response logit model to estimate the probability of the occurrence of distress as a function of a vector of independent variables,  $X$ , and a vector of unknown parameters,  $\theta$ . The specific model we use is:

$$\Pr(Y_i = 1) = F[H(X, \theta)] \quad (1)$$

Where  $Y_i$  is the dependent variable which takes the value of one if the bank has experienced distress and zero otherwise;  $F$  is the probability function, which has a logistic functional form, giving rise to the logit model;

$$H_i = \theta_0 + \sum_{j=1}^M \theta_j X_{ij} \quad (2)$$

$X_i$  is the vector of explanatory variables for the  $i$ -th individual bank; and  $\theta$  is the vector of parameters to be estimated.

The basic equation of the logit model to be estimated can be written as:

$$\Pr(Y_i = 1) = F[H(X_i, \theta)] = \frac{1}{1 + e^{-H_i}} \quad (3)$$

We estimate two different logit models using maximum likelihood techniques. In the first model, the dependent variable takes the value of one when a financial intermediary experiences distress and zero otherwise. Here, we have 330 observations, which include 275 non-distressed and 55 distressed banks. In the second model, we only study the strategic decision of distressed institutions. Here we have 55 observations, which include 37 merged and 18 non-merged banks. This model enabled us to estimate the probability of merger with respect to distress. We consider both bank specific indicators and macro variables to investigate which characteristics make a bank more attractive as an acquisition target.

#### 3.2. Data sources and identification of distressed banks

We investigated the distress and subsequent merger decisions for 330 banks from the MENA region during the period 2000-2007. During this period, the MENA region was marked by a

highly turbulent political, economic and financial climate, including the Iraq war in 2001 and the Iranian nuclear crises in 2007. These events had both direct and indirect impacts on the banking industry in some countries. We did not exclude countries affected by wars, embargo or political crisis (e.g. Iraq, Iran, etc.) since bank distress is explained in this paper by economic variables.

The micro-data of distressed and non-distressed banks used in our sample comes from the Bankscope database, published by the Bureau van Dijk. Macroeconomic data used for each country are collected from the International monetary fund database.

A bank is identified as being in distress when at least one of the following criteria is met according to the information from the BankScope database:

1. bankruptcy,
2. dissolved merger,
3. in liquidation,
4. the fourth quartile of loan loss provision (for two successive years).

To identify distressed banks through the fourth criteria, we constructed quartiles of loan loss provisions in the cross-section of banks on a yearly basis. We define a distressed bank as one which finds itself in the highest quartile of loan loss provisions over two successive years.

#### **4. Prediction of bank distress probabilities**

We have tried to analyse both the bank-specific and the macroeconomic conditions that contribute to bank distress. In our bank-specific variables selection we use the financial ratios found extensively in the empirical literature on banking industry and related to the CAMEL rating system.

In this section we develop and estimate a bank distress prediction model for the MENA countries' banking sector. We use a multivariate logit model to estimate the probability of bank distress and to identify key explanatory factors that influence it. We include a set of micro and macro-level variables in our estimation. The micro-level variables refer to the five CAMEL categories: Capital adequacy, Asset quality, Management quality, Earnings and Liquidity which are now used extensively by regulators to evaluate a bank's financial health.

Capital Adequacy: ultimately determines how well banks can cope with shocks to their balance sheets. Capital adequacy in banks is measured in relation to the relative risk weights assigned to the different category of assets held both on and off the balance sheet items. We use three ratios to evaluate capital adequacy:  $Equity/Total Asset$ ,  $Equity/Total loans$ ,  $Equity+Loan Loss Reserve/Loans$  and hypothesize that better capitalised banks are less exposed to distress.

Asset Quality: The solvency of financial institutions is typically at risk when their assets become impaired, so it is important to monitor their asset quality indicators in terms of overexposure to specific risk trends in non-performing loans, and the health and profitability of bank borrowers, especially in the corporate sector. Of course, credit risk is inherent to lending, which is the major banking business, arising when a borrower defaults on the loan repayment agreement. A financial institution whose borrowers default on their repayments may face cash flow problems, which eventually affect its liquidity position. Ultimately, this negatively impacts on profitability and capital through extra specific provisions for bad debts. We use two indicators to evaluate Asset Quality, namely,  $Loan Loss Reserve / Gross Loans$  ratio, which evaluates the proportion of bad loans over total loans (a high ratio is supposed to mean poor asset quality, but in fact it depends on whether the information on 'bad loans' is correctly revealed), and secondly,  $Loans Growth$ , which indicates an increase in the misallocation risk of banking asset caused by the growth in loans. This leads us to predict a positive impact of loan growth on the probability of bank distress.



Managerial quality: we use an *Efficiency score* to assess management quality. We expect *more efficient banks to be less likely to be distressed*. Following Wheelock and Wilson (1995), we use the non-parametric linear programming approach (DEA) to estimate the *individual efficiency* of each bank to later be included in a logit model as proxies for *managerial quality*.

To briefly but formally outline the estimation method, assume we have  $K$  banking firms each employing  $N$  variable inputs  $x$ , with  $x \in \mathfrak{R}_+^M$ , and producing  $M$  outputs  $y$ , with  $y \in \mathfrak{R}_+^N$ . In addition, there are  $R$  quasi-fixed inputs  $e$ ,  $e \in \mathfrak{R}_+^R$ , in a sense that they cannot be altered in the short term (here, we use it for the *equity capital* variable to reflect that banks cannot voluntarily reduce it due to Central Bank regulations; equity capital also serves to reflect a bank manager's risk preferences). The proxy of each bank's managerial quality is then obtained by applying the *Farrell Input-Saving Measure of Technical Efficiency*, defined as

$$F_i(y, x, e) = \min\{\lambda \in (0,1] : (\lambda x, e, y) \in T\}, \quad (4)$$

where  $T$  is the hypothetical banking *technology set*. In DEA,  $T$  can be approximated as the smallest convex, free disposal hull via the following activity analysis model formulation (see Fare and Grosskopf, 1996):

$$\hat{T} = \left\{ (x, e, y) : \sum_{k=1}^K z_k y_{km} \geq y_m, m = 1, \dots, M; \sum_{k=1}^K z_k x_{kn} \leq x_n, n = 1, \dots, N; \sum_{k=1}^K z_k e_{kr} \leq e_r, r = 1, \dots, R; z_k \geq 0, k = 1, \dots, K \right\} \quad (5)$$

The variables used in the estimation are presented in Table 1. Note that in choosing inputs and outputs, we follow the *intermediation* approach,<sup>3</sup> according to which banks are viewed as intermediaries whose primary objective is to transform deposits into loans. This approach accepts monetary balances rather than physical units as a measure of inputs and outputs.

**Table 1. Variables used for DEA model**

	<b>Variable definition</b>
$X_1$	Personnel Expenses
$X_2$	Total Fixed Assets
$X_3$	Deposits
$X_4$	Other expenses
$Y_1$	Total loans
$Y_2$	Non interest income

First, we computed the efficiency scores for each bank in the sample with the help of a Data Envelopment Analysis. We constructed a frontier for each year separately and the resulting scores were then added to the data sets.

<sup>3</sup> There are two widely used approaches to examine a bank's input-output process. In the first, the so-called production approach, banks are treated as firms which employ capital and labour to produce different types of deposit and loan accounts. Output is measured by the number of deposit and loan accounts or the number of transactions performed on each type of product, while total costs are the operating costs used to produce these products. The bank is viewed as a producer of two types of services: an acquirer of funds and a user of funds. In the second, the so-called intermediation approach, banks are viewed as intermediaries of financial services rather than producers of loan and deposit account services. Banks produce intermediation services through the collection of deposits and other liabilities and the transfer of these funds to interest-earning assets. Deposits are included as a third input along with capital and labour. Consequently, both operating costs and interest costs are taken into account in the production process. In this study we use the intermediation approach and we also use the intermediation approach to estimate efficiency score for each bank in this paper.

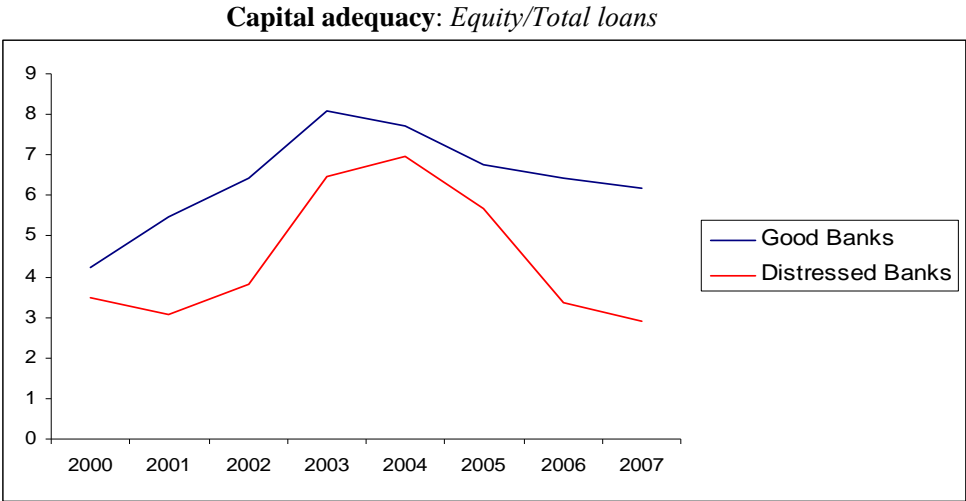
Two other indicators are also used to evaluate a bank’s managerial quality. A governance indicator indicates if a bank is state owned or non-state owned. Nakane and Weintraud (2005) suggested that state-owned banks face severe agency problems due to their inherent political and social purposes. State-owned financial institutions tend to be less efficient than private institutions, taking more risks and suffering more from political motivated lending. We consider Total Expenses to Total Revenue ratio as a managerial quality indicator. A higher ratio indicates inefficient bank management and increase the probability of bank distress.

Earnings: The continued viability of a bank depends on its ability to gain an adequate return on its assets and capital. Good earnings performance enables a bank to fund its expansion, remain competitive in the market and replenish and /or increase its capital. We use five Earning indicators for banks: Return on Assets (ROA), Return on Equity (ROE), Net Interest Income/Total Revenue, Loan Loss Provision and Personnel Expenses. A number of authors have argued that healthier banks have: higher return on assets (ROA), better return on equity (ROE) and higher net interest income to total revenue.

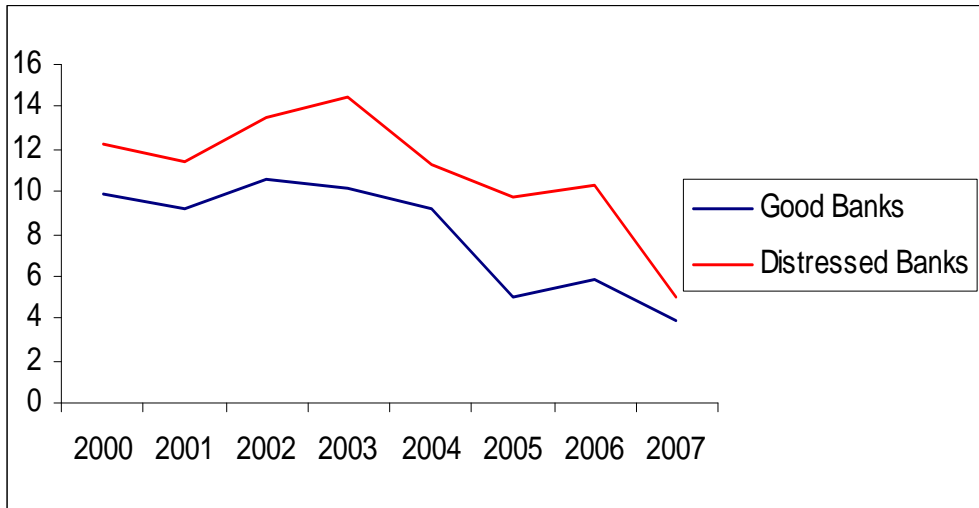
Liquidity: Initially solvent financial institutions may be driven to closure by poor management of short-term liquidity. Indicators should cover funding sources and capture large maturity mismatches. An unmatched position potentially enhances profitability but also increases the risk of losses. We use the *Deposit/Total Assets* ratio as an indicator of bank liquidity. Perfect liquidity implies that liabilities ranked by maturity be matched by corresponding assets. The size of deposits (short term liabilities) over total assets gives a rough estimate of liquidity risk, associated with deposit withdrawal.

Figure 1 depicts the evolution of some selected CAMEL rating variables for distressed and non distressed banks.

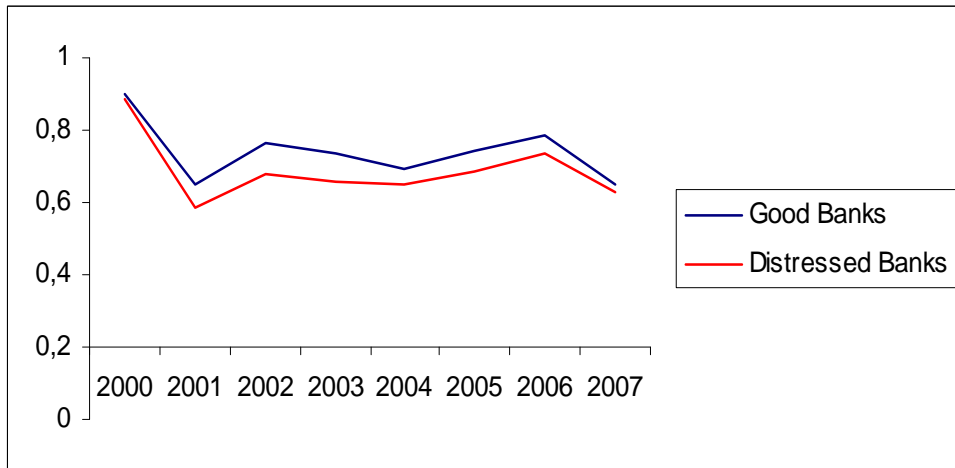
**Figure 3. Evolution of CAMEL rating for distressed and non distressed banks**



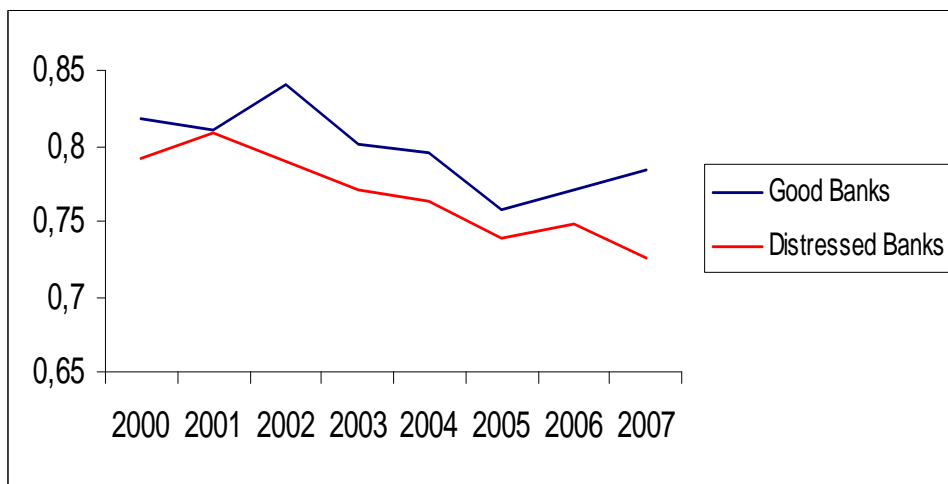
**Asset quality: Loan loss provisions/total loans**



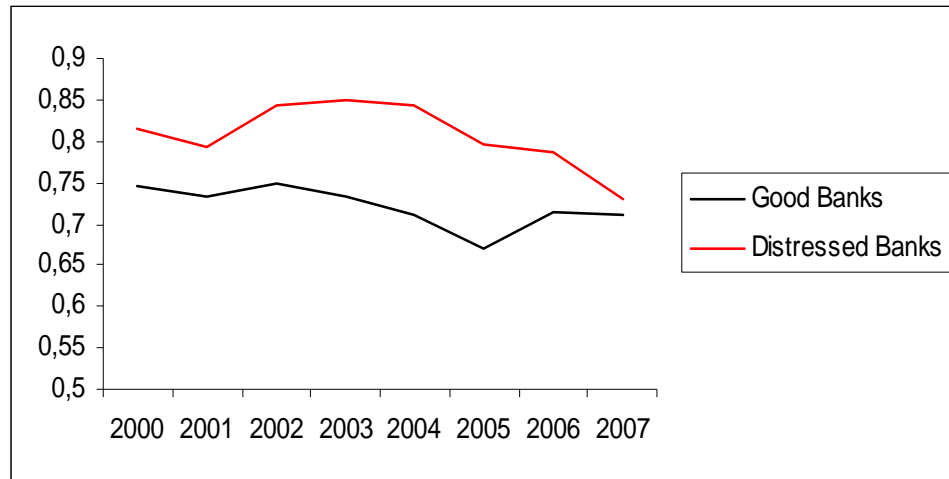
**Management quality: Technical efficiency**



**Earnings ability: Return on assets (ROA)**



**Liquidity position: Deposits/total assets**



We consider size among bank specific explanatory variables other than the non-CAMEL-type. Bongini Claessens and Ferri (2001) argue that in terms of probability of distress, a larger financial institution might have a lower chance of becoming distressed if it is more diversified and less exposed to liquidity shocks. On the other hand, the likelihood of distress probably increases if the bank has been more subject to distortionary effects, including political intervention. As regards closure, we imagine that the authorities would consider large intermediaries “too big to fail.”

With regard to the macroeconomic variables used in our model to predict bank distress, we consider *Real interest rate growth* (RINT) which could signal that the economy is overheating and there is a possibility of a worsening economic environment in the near future. In this context, the more bad loans there are, the more funds are needed to write them off, in turn making the banks more vulnerable. So we assume that a coefficient in this variable would be a positive sign.

We also include GDP (Gross Domestic Product), CPI (Consumer Price Index) and EXRT (Exchange rate). Rising GDP usually signals a healthy economy and should reduce the probability of distress. GDP growth may, in fact, be the most important factor affecting banking soundness. Studies have observed that the quality of bank loans deteriorates when the business cycle is in a downward trend. Kaminsky and Reinhart (1999) find that slowdown in output is one of the best indicators of banking crises. They argue that adverse shocks affecting the whole economy will increase the non-performing loans of banks and cause systemic banking crises. This happens because negative shocks to the whole economy affect the solvency of bank borrowers. Since banks cannot diversify their lending risk effectively in an economy that is in general distress, their balance sheet subsequently worsens. This is also consistent with the observation that systematic banking crises are associated with fluctuations in the business cycle (Gorton, 1988).

Rising CPI indicates inflation, which often works in a bank's favour - their assets are re-priced faster than their liabilities, and inflation reduces the real value of nonperforming loans. So, we would expect CPI to have a *negative effect* on distress. Depreciation of domestic currency increases risk exposure, which has a *positive impact* on the banks' fragility. Kaminsky and Reinhart (1999) reported that a devaluation of the local currency increases the probability of banking crisis. Thus, the exchange rate coefficient is expected to be positive. Table 2 summarizes both CAMEL and macroeconomic variables, along with the expected signs of their impact on the likelihood of a bank's distress.

**Table 2. Explanatory variables and expected signs for predicting probability of distress**

	<b>CAMEL category</b>	<b>Definition</b>	<b>Expected impact on distress</b>
<b>Bank specific factors</b>			
Eq_TAssets	<b>C</b>	Equity/Total assets	(-)
Eq_Loans	<b>C</b>	Equity/Total loans	(-)
EqLLR_Loans	<b>C</b>	Equity+Loan Loss Reserve/Loans	(+/-)
LLR_Loans	<b>A</b>	Loan Loss Reserve / Gross Loans	
LoanGrowth	<b>A</b>	Loans Growth	(+)
DEA_SE	<b>M</b>	DEA Score Efficiency	(-)
Exp_Rev	<b>M</b>	Total Expenses/Total Revenue	(+)
CORGOV	<b>M</b>	Dummy variable which takes the value of 1 if the bank is private-owned, and 0 if the bank is state-owned	(+/-) Inefficiency/ Safety
ROAA	<b>E</b>	Return on Average Assets (ROAA)	(-) Profitability
ROAE	<b>E</b>	Return on Average Equity (ROAE)	
NIInc_Rev	<b>E</b>	Net Interest Income/Total Revenue	(+/-) less volatility/More volatility of income
LLProv	<b>E</b>	Loan Loss Provision	(-)
PerExp	<b>E</b>	Personnel Expenses	(-)
Dep_Asset	<b>L</b>	Deposit/Total Assets	(+)
<b>Non CAMEL Variable</b>			
Size		Ln (Total Assets)	(-)
<b>Macro-economic factors</b>			
RINT		Real Interest rate	(+)
TBLOANS_GDP		Total Banking Loans / GDP	(+)
Exchg		Exchange Rate	(+)
CPI		Consumer Price Index	(-)
GDP		GDP	(-)

Table 3 reports summary statistics of bank specific indicators for all banks in MENA countries. In order to deduce some preliminary results about the banks' characteristics, we also report descriptive statistics for distressed and non distressed banks. The table suggests that distressed banks showed early signs of vulnerability. Regarding asset risk, distressed banks have lower capitalization while non distressed banks showed a higher ratio of loan loss reserves + equity to total loans, and a higher ratio of equity to total loans, than distressed banks. So, distressed banks are less able to absorb negative shocks given their higher leverage. This preliminary result shows that not only high lending but also bad lending characterizes troubled banks. Non distressed banks are found to have higher personnel expenses and are smaller in size. In contrast with our hypotheses, distressed banks show lower loan growth.

Non distressed banks have a higher efficiency score, which leads us to suggest that management quality is determinant with respect to the probability of bank distress. In addition, distressed banks showed lower profitability (return on assets and return on equity), which makes it more difficult for them to increase their capital base and improve their viability.

**Table 3: Summary statistics of all banks, Non-distressed banks and distressed banks**

	All Banks		Non Distressed Banks		Distressed Banks	
	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev
Equity/ Total assets	14,046	59,991	16,841	56,087	11,386	83,975
Equity/Total loans	5,618	76,823	7,622	39,877	3,451	16,512
Equity+Loan Loss Reserve/Loans	19,015	28,579	20,759	30,017	14,257	87,679
Loan Loss Reserve / Loans	8,916	11,156	8,456	10,862	11,345	12,345
Loan Growth	23,771	204,869	25,598	218,332	13,933	106,126
Total Assets	13,172	1,915	13,460	1,932	13,817	1,781
DEA Score Efficiency	0,736	0,153	0,743	0,153	0,697	0,143
Total Expenses/Total Revenue	2,999	30,472	60,139	97,801	44,672	43,336
Return on Average Assets (ROAA)	2,784	4,492	3,058	4,808	1,357	1,586
Return on Average Equity (ROE)	15,668	31,134	18,126	27,971	15,469	46,683
Net Interest Income/Total Revenues	0,795	0,366	0,800	0,394	0,772	0,157
Loan Loss Provision	12,943	1,961	13,013	1,935	12,569	2,057
Personnel Expenses	5720,109	15,734	6026,516	15,691	3934,101	15,535
Deposit/Total Assets	0,723	0,352	0,706	0,377	0,804	0,159

Regarding liquidity, distressed banks appear less liquid as they have a higher deposit to total assets ratio, which makes them less able to withstand unexpected deposit withdrawals.

Table 4 summarizes the results of the model used to estimate probability of bank distress in MENA countries. The dependent variable takes the value of 1 if the bank is identified with any of the categories of distress during the periods of study.

Model (1) of Table 2 contains the results of the logit model estimation explaining the probability of bank distress using only bank-specific indicators. The model shows good predictive power, and thus 78% of banks were correctly classified. The results confirm that bank-level fundamentals not only significantly affect the likelihood of bank failure, but also explain a high proportion of the likelihood of distress for distressed banks (over 50%).

All Capital adequacy variables are correctly signed. Eq\_TAsset and Eq\_Loans variables appear significantly negative, implying that higher capitalization has a negative impact on the probability of distress as the bank will be better able to absorb losses. According to these results, higher capital relative to assets or liabilities is negatively associated with the probability of distress.

The LLR\_Loans variable is insignificantly positive, which implies that a higher share of loan loss reserves in overall capitalization has a positive impact on distress. This result confirms those of Bongini Claessens and Ferri (2001) who suggest that as financial institutions made (albeit inadequate) provisions for loan-losses in response to the riskiness of their loans, the share is a useful predictor of institutions which may run into distress.

Regarding Assets and Management qualities, Model (1) also shows that higher loan growth tends to increase the probability of distress significantly, while a higher ROA, a higher ROE and a higher share of net interest income in total income tends to reduce it. These variables, however, do not impact significantly on the probability of distress.

The governance variable of bank ownership appears significantly positive. We deduce that privately owned banks are more likely to become distressed, suggesting that flight to safety and access to financing by state-owned banks are mitigating factors. State-owned banks may benefit from depositors' flight to safety-domestic deposits, shifting from non-state-owned to state-owned financial institutions, and may have easier access to financing during a crisis as they are perceived

as more likely to receive support in case of distress. Our results confirm those reported by Natalia (2006) for the Russian banking system. He found that higher government securities holdings together with greater profitability were significant determinants of soundness.

**Table 4: Results of Logit model regression of distress determinants for MENA Banks**

	Model (1)			Model (2)		
	Coef.	Std. Dev.	P-Value	Coef.	Std. Dev.	P-Value
Eq_Asset	-0.017	0.003	0.021	-0.019	0.015	0.015
Eq_Loans	-0.002	0.763	0.048	-0.001	0.470	0.031
EqLLR_Loans	-0.029	0.161	0.041	-0.001	4.310	0.018
LLR_Loans	0.010	2.763	0.000	0.270	0.470	0.022
Loan_Growth	0.051	0.001	0.009	0.072	0.201	0.017
DEA_SE	-1.107	0.911	0.04	-1.660	1.099	0.01
Exp_Rev	-0.156	0.577	0.788	-0.656	0.731	0.369
CORGOV	0.115	0.244	0.008	-0.346	0.308	0.262
ROAA	-0.239	0.122	0.050	-0.323	0.157	0.040
ROAE	-0.009	0.005	0.085	-0.007	0.005	0.171
NIInc_Rev	-2.538	1.089	0.240	-1.460	1.327	0.271
LLProv	0.130	0.000	0.020	2.070	0.000	0.793
PerExp	0.095	0.000	0.260	0.955	0.000	0.238
Dep_Asset	4.825	1.836	0.009	2.660	2.136	0.213
Constant	-2.474	1.745	0.156	-9.196	2.799	0.001
Size	-0.591	0.089	0.020	-0.130	1.337	0.001
RINT				0.064	0.019	0.121
TBLOANS_GDP				0.159	0.060	0.098
Exchg				0.001	0.000	0.313
CPI				-0.076	0.013	0.875
GDP				-6.350	0.000	0.342
Overall predictive power	78.00%			82.8%		
R <sup>2</sup> -of Nagelkerke <sup>4</sup>	0.5632			0.5977		
-2Log L				429,177		

The logarithm of total assets, a measure of size, is significant and has a negative sign. The negative significant coefficient probably reflects an actual or perceived size-related diversification benefit. Larger banks are associated with longer survival, which could be consistent with the “too-big-to-fail” hypothesis.

Quality of management is also associated with a lower probability of distress. As we can see, the efficiency coefficient is negatively significant, proving our hypothesis that quality of management is very important in characterizing bank distress.

<sup>4</sup> Nagelkerke R<sup>2</sup> are attempts to provide a logistic analogy to R<sup>2</sup> in OLS regression.

Our results show that interest income to total revenue, personnel expenses and loan loss provision do not significantly impact on the probability of bank distress in MENA countries. Therefore, our results are not exactly the same as those reported by Bongini Claessens and Ferri (2001) who found that Net Interest income to total income were significant determining factors of bank distress, which is not true for our model.

As we can see, deposit to total assets is significantly positive, so liquidity appears to be a significant factor in influencing distress.

In model (2), both bank specific level and macro variables are deployed to predict bank distress. The estimation results reveal that adding macroeconomic variables to the model do not significantly improve it since none of them are statistically significant in the model apart from GDP growth. The predictive power of the model increases by just 4% compared to the model (1).

CPI variables, interest rate and exchange are correctly signed but appear insignificant. Our findings are contrary to those of Goldstein, Kaminsky and Reinhart (2000) who found appreciation of real exchange rate to be the best leading indicator of bank distress. However, the sign of total bank loans to the GDP variable is contrary to expectations and tends to have positive, insignificant effects on the probability of distress. As expected, increases in economic activity are associated with a lower probability of distress. This implies that rising GDP signals a healthy economy and reduces the probability of distress. Since any macro analysis of monetary policy issues typically includes at least GDP growth, interest rate and inflation, we deduce that monetary policy do not really impact on bank distress.

Our results are not exactly the same as de Graeve, Kick and Koetter (2008) who confirm the existence of a relationship between monetary policy and bank distress. They argue that a monetary contraction increases the mean probability of distress.

Our findings indicate that a strong banking system is crucial for financial stability and development in MENA countries. This means that the regulatory supervisor, namely central banks, should exercise prudential oversight, ensuring the financial soundness and solvency of individual banks. To this end, the monetary authorities should accelerate the adoption of the Basel II revised capital accord that establishes a spectrum of more risk-sensitive capital allocation and incentives for improving the quality of risk management in banks. In order to reduce the likelihood of individual banking distress, the adoption of Basel II and its three pillars strengthens the security and soundness of the financial system by reinforcing the emphasis on risk-based calculation of capital, the supervisory review process and market discipline. This is achieved by adjusting capital requirements to credit risk and operational risk, and introducing changes in the calculation of capital to cover exposure to risks of losses caused by operational failures.

## **5. Merger as a solution for distressed banks**

In this section we test whether distressed banks in MENA countries adopt merger as a preferred solution to resolving distress. From the 55 distressed banks identified, 37 were involved in mergers (67% of distressed banks). We suggest that distress mergers are observable in MENA countries and that most distressed banks look to bank mergers as a strategy to resolve the financial distress of banks pre-emptively.

We use the same set of specific bank indicators and macro variables to detect the fundamental characteristics of banks most likely to be involved in mergers. In this section, our sample contains only the 55 distressed banks. We estimate a second logit model where the dependent variable equals zero if the distressed bank was not involved in a merger over the observed period, and one if the distressed bank was involved in a merger.

Table 5 reports the results of the logit estimation. Model (1) only considers bank specific variables, while model (2) incorporate both micro and macro variables. Let us begin with the



specific bank conditions that precipitate distressed bank merger. Model (1) shows that measures related to bank-specific performances significantly affect the probability of being involved in a merger, apart from loans growth, net interest income to total revenue and personal expenses.

*Table 5. Results of Logit Regressions of Determinants of Bank Merger for MENA banks*

	Model (1)			Model (2)		
	Coef.	Std. Dev.	P-Value	Coef.	Std.Dev.	P-Value
Eq_Asset	-0.024	0.846	0.001	-0.599	0.035	0.005
Eq_Loans	-0.065	0.090	0.014	-0.164	0.212	0.438
EqLLR_Loans	0.059	0.089	0.029	0.133	0.205	0.517
LLR_Loans	-0.001	0.004	0.004	0.015	0.010	0.139
Loan_Growth	0.088	3.529	0.081	-2.631	5.347	0.623
DEA_SE	-0.003	0.085	0.003	-0.315	0.248	0.203
Exp_Rev	1.917	1.350	0.000	3.212	3.437	0.350
CORGOV	1.001	1.535	0.003	0.543	3.290	0.869
ROAA	-2.493	2.393	0.000	-6.730	7.963	0.009
ROAE	-0.007	0.032	0.000	-0.054	0.158	0.730
NIInc_Rev	19.909	9.887	0.581	57.191	25.339	0.024
LLProv	0.000	0.000	0.008	0.000	0.000	0.010
PerExp	-0.001	0.003	0.536	-0.013	0.011	0.227
Dep_Asset	-12.471	9.355	0.000	-60.700	27.727	0.029
Constant	-10.362	10.881	0.341	15.733	24.427	0.520
Size	1.237	0.390	0.000	2.212	3.087	0.030
RINT				-0.370	0.215	0.085
TBLOANS_GDP				-1.445	0.809	0.074
Exchg				0.008	0.004	0.268
CPI				0.114	0.057	0.937
GDP				2.660	0.437	0.380
Overall predictive power	78.00%			82.8%		
R2-of Nagelkerke5	0.5632			0.5977		
-2Log L				429,177		

Equity to asset appears significantly negative, implying that under-capitalized banks are more likely to be involved in merger. The attraction of under-capitalised banks may be low acquisition prices because one basis for determining prices is book value, and capital is a major component of book value.

Lower profitability in terms of return on assets (ROA) and return on equity (ROE) increases the probability of becoming a target. These results can be interpreted as evidence of a market for corporate control in which poorly performing firms are acquired. These findings conflict with the evidence of other studies<sup>6</sup> examining merger activity in banking as well as the industrial sector.

<sup>5</sup> Nagelkerke R<sup>2</sup> are attempts to provide a logistic analogy to R<sup>2</sup> in OLS regression.

<sup>6</sup> Koetter, M., J. W. B. Bos, F. Heid, J. W. Kolari, C. J. M. Kool, and D. Porath, (2007).

Taken together, these results suggest that a weak financial situation systematically affects the probability of merger involvement for banks, which is the necessary condition for the distress merger conjecture. The more distressed banks are, the more likely they are to be a target in a merger transaction.

The corporate governance ownership variable appears significantly positive. This implies that state-owned banks are less likely to be involved in merger operations. Distressed state-owned banks have a lower probability of being targeted for merger or acquisition by healthier banks due to the possibility of government recapitalization and direct central bank intervention to reinforce their financial structure and clean up their asset accounts.

While there is weak evidence that the probability of being acquired is related to both Var1 and Var2, in both models these variables have insignificant coefficients.

So remaining in business without a merger is largely defined by bank-specific factors such as large value of assets and CAMEL performance indicators.

Model (2) demonstrates that macroeconomic variables do not significantly affect the probability of an evolving bank merger. Thus, the global economic conjuncture does not appear to affect the decision of distressed banks to trigger a merger policy.

## **6. Conclusion:**

Rapidly growing empirical literature continues to study the causes and consequences of bank distress in diverse economies. The present study developed a logit econometric model to identify a set of specific indicators and macroeconomic factors pertaining to individual bank distress and assessed the likelihood of bank distress in the MENA region. To rationally select bank-specific variables, we extensively adopted financial ratios from the empirical literature on the banking industry and related to the CAMEL rating system.

The results of the logit models show that bank specific factors have a significant impact on the probability of bank distress. However from the macro factors used, only GDP growth significantly increased individual bank distress. Yet, other monetary policy indicators such as real interest rates and CPI as shown do not appear to significantly increase banking distress in MENA countries. Given that global economic development affects the probability and timing of bank failure, banking regulations and supervision should also take into account the influence of macroeconomic developments on individual banks (i.e., assess the financial institution's exposure to systemic shocks) in order to make the banking system more robust.

In this paper we also tested whether distressed banks in MENA countries looked to mergers as a solution to distress. We tested whether both micro and macro factors accounted for merger in distressed banks and found that 67% of the distressed banks in our sample were involved in merger transactions. The results indicate that a weak financial status significantly increases the likelihood of a bank being involved in a merger. Private distressed banks were found to have a higher likelihood of being involved in a merger. With respect to macroeconomic factors, we deduced that the global economic conjuncture does not affect the decision of distressed banks to initiate a merger policy.

Since the financial status of banks is the fundamental determinant of bank distress, we suggest that the supervisory authorities in MENA countries should accelerate the implementation of Basel II recommendations to improve internal control and preserve high capitalization of their banking system. The ongoing implementation of Basel II is likely to help in the management of operational risks directly related to the managerial quality of banks. Thus, the capital charge for operational risk is explicitly recognized within this framework.

The challenge for central banks in MENA countries through Basel II is to introduce a more comprehensive, sophisticated and risk-sensitive approach for banks to calculate regulatory capital. The proposals will enable banks to align regulatory requirements more closely with their internal risk measurement and to improve operational processes in order to avoid individual bank distress and ensure banking stability.

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