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Banking Interaction and Financial Stability: MENA Countries

Dr. Nadia MANSOUR [α] & Pr. Ezzeddine ZOUARI [σ]

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I. Introduction

During the past decades, the progress of the financial system has created different types of activities and financial instruments increasingly diverse and complex. In this context, developments in the financial sector seem to have played a growing role in the configuration and sometimes the amplification of macroeconomic fluctuations.

Consequential concerns an "excessive" variability in the financial system has highlighted the need to put in place measures for prudential regulation, accounting, and risk measurement or monetary policy with the goal of consolidating the financial system and macroeconomic stability.

However, even though the various regulations accompanied by strong supervision aim to guarantee the risk management functions of banks as well as the liquidity management that continuously contribute to financial stability, the risks of instability can't be solved. In these cases, only the central banks can provide liquidity when necessary. Also, financial stability is a source of preoccupation internationally, because of financial crisis since the middle of the Second World War.

The application of prudential regulation standards requires a lot of effort on the part of banks, which must have sophisticated means for measuring credit, operational and Market risks, as well as owning the necessary capital to apply these standards. Hence poor risk management may be causing a problem of financial stability.

The latter corresponds to a reality bringing together both economic and financial issues. Each of these two aspects refers to the consideration of destabilizing events and their influence on the entire financial system.

Initially, financial stability had always been considered as a concept indicating an important function within central banks as well as in public institutions. Indeed, it was only in 1994 that the Bank of England began to use this concept to designate the objectives to attain and which were destabilized by price stability or the efficiency of the Banking system's operation, Weller, (1999).

During the 1990s, the formulation of economic policy was based for the most part on the pursuit of maintaining financial solidity. Thus, a financial system is part of a zone of stability when it can facilitate without hindrance the performance of the economy while having the possibility to reduce problems, Schinasi, (2006). In other words, financial stability is the maintenance of confidence in the financial system.

Thus, to ensure the financial stability, the different actors of the system have a solid accompanied by proper operation and an exchange rate regime and performance concerning other economic actors, in particular, the state, households and non-financial enterprises. In this balance, credit institutions, alongside their traditional intermediation function and their growing involvement in capital markets, play an important role. There are also other financial institutions such as insurance companies, investment companies, and pension funds.

Also, it is still essential to take into account the behavior of the financial markets, especially the equity, and foreign exchange markets. The opening of the financial markets, which are at the origin of large international capital movements as well as significant volatility of the prices of the assets, is considered as a risk taking.

This situation brings us to the following questions: *What is the relationship between bank risk and financial stability? What is the impact of prudential regulation on financial stability?*

The problem developed is *the evaluation, firstly, of the relationship between banking risk and financial stability and, secondly, the impact of banking regulation on financial stability.*

II. Literature Foundations

"Financial stability refers to a bank's ability to withstand significant shocks and the resolution of macroeconomic imbalances, thereby reducing the probability of a break in the financial intermediation between savings and investment." BCEAO, (2006).

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Financial stability is an important factor in the proper functioning of the economy. The main aims of this notion are towards economic development, and the assurance of high-quality intermediation between economic agents, through the channeling of financing flows efficiently towards the most growth-enhancing sectors. Indeed, the stability of financial institutions was the absence of tension that can lead to many economic crises whose effects are not limited to economic agents alone. In this context, financial stability requires two main conditions, Salameh (2013):

The institutions of the financial system are stable so that there is sufficient confidence to continue to fulfill their contractual obligations without necessarily having external assistance or interruption.

The main markets must be stable so that each actor can trade with confidence at prices reflecting the fundamental data on the market.

All of this shows that the definition of financial stability is not limited to banking stability alone, but affects the entire financial system since the financial stability of the banking sector is a factor in the soundness of all financial corporations.

In maintaining this stability, central banks provide not only identifying threats to the financial system while trying to reduce, but also protecting the system while recognizing that the instability of markets institutions can cause systemic risks. Central banks have the right to detect these risks.

a) Determinants of Financial Stability

There are many factors and can be classified into three categories:

- *Macro-economic conditions*: to maintain or restore financial stability, it is essential that macro-economic policies be enhanced with appropriate structures. When the economic environment is affected by difficulties, the banks suffer the consequences.

Indeed, stability depends on the specificities of a country's relationship with the outside world. When a state is highly dependent on foreign aid, it is exposed to significant risks, particularly as regards public finances, external financing or the performance of the private sector. However, this situation mainly affects developing countries or countries with fragile economic conditions.

- *Internal Financial Institutions and Markets Management Systems*: A stable financial system is always accompanied by an adequate institutional and regulatory framework whose components and functioning determine the potential risks that financial institutions face,
- *The effectiveness of the regulatory system and supervision of financial institutions:* When the institutional framework is efficient and, the financial system can adapt to different innovations and changes in the environment, there will automatically be financial stability.

Thus, a financial system was considered stable when it can facilitate the efficient allocation of economic resource and financial processes; evaluates, and manages financial risks (Icard, 2007).

Also, one of the main channels of transmission of a financial crisis in the real economy is mainly the seizure of the intermediation activity. In this case, the banks stop granting new financing and no longer proceed to the renewal of credits that are maturing, a situation called by the economists "Credit Crunch."

In a "Credit Crunch," it is possible to highlight two types of mechanisms: it could be caused by a lack of banks' funds. When there is an economic and financial turnaround, the banks' capital level can be reduced by the losses. Prudential rules do not allow banks to expose themselves to risk if they do not have sufficient capital. Also, the "credit crunch" may be the consequence of a low level of liquidity.

In general terms, the financial system and the banking system represent, through their roles and their vocations, reliable indications of the health of an economy, while allowing investors and the various economic players to plan their actions in advance and effectively manage their capital flows. This situation reflects the importance of banking institutions in the economy as well as the interest granted by public authorities to these institutions.

Banking is a fundamental element of any economy, particularly in linking providers and investors. However, even in performing the role of financial intermediation, the activities of banks depend to the stability of all financial mechanisms. It is for this reason; the latter constitutes one of the highest priorities of the public authorities. Indeed, these authorities are in a position where they are forced to organize the banking sector through specific regulations, including "prudential banking regulations."

In case of a crisis, the financial markets are no longer able to function normally and, as a result, the banks can no longer refinance and stop providing loans. Therefore, the latter will be unable to finance productive activities; consumption will decline and subsequently curb economic growth.

Indeed, for a long time, the monetary authorities have sought ways to impose prudential constraints on banking activities to formulate not only the security but also the soundness of the banking system which is at the heart of the financial system.

b) Financial stability and banking regulation

Prudential regulation has continued to evolve through various provisions aimed at improving or eliminating old rules or introducing new standards. The financial system is experiencing developments posing

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as many challenges for both credit institutions and regulators.

The various financial crises that have followed one another, as well as the recent global financial crisis, have led regulators, notably the Basel Committee, to review the Basel agreements. For example, the Basel III agreement which is intended to enhance the Basel II brought new regulations to strengthen the requirement for capital and liquidity of banks while aiming to weaken the leverage. However, financial instability, regardless of the level of policies, strongly impacts the smooth running of banking activities, including exposure to different banking risks.

But after more than 30 years of deregulation, the financial crisis of 2007 to 2009 completely changed the role of government and regulators. Knowing that during the 1960s, the theory of financial market is used to explain the range of government intervention. As a result, the weakness of a banking system can threaten financial stability at both the national and global levels. Then to ensure that solidity, several official bodies, the main ones being the Basel Committee on Banking Supervision, Bank of International Settlements, the International Monetary Fund and the World Bank have attempted to examine ways to strengthen financial stability world.

In this case, "financial regulation" is the set of public provisions intended to ensure the smooth running of the banking sector. Most of it is similar to regulations in other industries and relates to consumer protection through.

However, the financial system has some features such as a procyclical trend that triggers regular crises while seeking to reduce industry-specific regulations. In other words, financial instruction always tends to balance performance with risk.

The majority of financial markets were governed by a certain level of regulation put in place for various reasons (Heffernan, 2005) :

- *It's important to protect investors*: It is essential that investors know how to shoulder some of this responsibility. However, government guidelines are essential to ensure the capacities of financial companies to provide adequate financial information.
- *The high concentration of financial institutions in the market*: The financial system consists of several markets that have different characteristics: from the retail bank market to the global bond market. Thus, the competitive structure of each type varies considerably depending on its specificities.
- *The fight against illegal activities*: Actors who carry out fraudulent activities, tax evasion or money laundering.
- *The externalities*: These are the various measures implemented by the actors who feel undermined financial stability. In the financial markets, crises often result in negative externalities.

c) *Financial stability and Business Model*

Business model analysis is essential for investors and supervisors.

Previously, supervisors focused on capital, liquidity and risk management. However, the recent financial crisis has shown the value of analyzing the "Business Model" of banks. This model generally describes how banks generate their profits and what are their channels of transmission. It thus goes beyond traditional risk and banking income indicators, allowing supervisors a better understanding of the sustainability of bank profits and stability (Calomiris and Kahn 1991, Huang and Ratnovski 2011).

Most recent studies that have taken into account the period of financial crisis provide mixed results regarding the impact of income diversification on risks and bank profits. Also, these studies analyze how the diversification of funding sources can affect the level of these two criteria.

Demirgüc-Kunt and Huizinga (2010) found a decrease in risk, associated with low levels of non-interest income and non-deposit funding. However, for most banks, an increase in interest-free income and non-deposit financing is related with strong banking instability.

Also, De Young and Torna (2013) showed that banks with high levels of interest-free income are more likely to go bankrupt during periods of crises.

According to Altunbas and al. (2011), the banks most dependent on wholesale financing were more exposed to the risk of bankruptcy during the crisis. In contrast, banks with a more diversified income structure have been more stable.

For Calomiris and Kahn (1991), wholesale financing can reduce bank risk through better monitoring of banks by sophisticated fund providers and better diversification of financing resources. In contrast, client deposits were revalued more slowly and, as a result, are relatively more stable, Shleifer and Vishny, (2010).

The results of the various theoretical studies suggest that the best-capitalized banks are more stable than other banks. Regarding economic importance, the capitalization of banks is one of the main determinants of bank stability. Indeed, a higher rate of asset growth makes banks significantly riskier; this corroborates with the results of Altunbas and al. (2011) and Demirgüc-Kunt and Huizinga (2010).

For the ratio of net credits / total assets, is an indicator to control the composition of bank assets. Freixas (2005) has argued that specialization in credit activities offers informational benefits, which can reduce the risk of bank failure.

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Regarding the "net interest margin" variable, it provides a test of how incentives to engage in traditional banking activities could be a deterrent to the crisis (Ghosh, 2016). A lower net interest margin implies stronger incentives for traditional banks to look for alternative sources of revenue ("yield-seeking") and move to new business models. (Beck and al. (2010), Gambacorta and Marques-Ibanez, (2011). As a result, an increase in this margin and the loan portfolio may reduce the level of bank risk.

In the study by Ghosh (2016), the size coefficient has a positive and statistically significant effect on Z-score, which is consistent with research on other banking financial systems, Beck and al. (2009) and suggests that large banks are more stable thanks to the low volatility of their returns. This positive relationship has an important implication for the current debate about the need to restrict the size of banks to protect the financial system from future crises, Adusei (2015). Indeed, the big banks were the source of the problems that caused significant damage to many economies around the world.

Köhler (2015) also showed that a large number of countries of characteristics likely to have an impact on the risk and return of the banks, as the overall macroeconomic environment.

III. Methodology

With the succession of financial crises, it is necessary to study the relationship between financial stability and banking risks by taking into account the effect of prudential regulations in macro terms, in the context of Business Model in the conventional banks in the MENA zone between 2003 and 2014. Also, it is important to study the relationship between the size of banks and financial stability. This relation represents the object of this study.

The study would be based on three models to detect the relationship between Z-score and financial stability and the relationship between the level of capitalization and bank profitability and financial stability.

a) Presentation of the model and definition of the variables

With the succession of crises, the question arises about the relationship between banking risks and financial stability in this region.

Also, we will represent the following models inspired by Köhler's study (2015) and which take the following forms:

$$Y_{it} = \alpha + \beta_1 * NNINC_{it} + \beta_2 * NONDEPOSIT_{it} + \beta_3 * B_{it} + \beta_4 * C_{it} + \varepsilon_{it} \quad (1)$$

With

NNINC: Interest-free income

NONDEPOSIT: Funds other than deposits

B: The matrix of control banking variables

C: The matrix of control variables by country

Table 1: Definition of variables

variables	Measures	Sources
NONDEPOSIT	Deposits and short-term funding / Total liabilities	Bankscope
NNINC	(1-abs (net interest income)) / (abs gross revenue)	Bankscope
CAR	Total equity / total assets	Bankscope
The OANS	Net loans / total assets	Bankscope
NIM	Net interest income / average earnings asset	Bankscope
GDPGR	Real GDP Growth	World Bank
GDPPPC	Real GDP per Capita	World Bank

We will use the Z-score to measure the banking risk and to overcome the shortcomings of the ratio method, Stiroh and Rumble, (2006), and Demirgüc-Kunt and Huizinga, (2010). The Z-score can be estimated by the probability of default represented by Roy (1952) and developed by Goyeau and Tarazi (1992). This last is the probability that losses exceed equity (Roy, 1952, Boyd and Graham, 1988).

This ratio could be written as:

$$Probability\ of\ default = prob\ (\pi < -E)$$

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In this study, we will present "z-score" following the literature studies conducted by Stiroh (2004a, b), and Stiroh and Rumble (2006):

$$Z - score_{it} = \left(\frac{(ROA_{it}+CAR_{it})}{SDROA_{ip}}\right) \quad (2)$$

With:

ROA_{it}: Economic profitability

CAR_{it}: The ratio of total assets / Equity

$SDROA_{ip}$: Standard deviation of ROA.

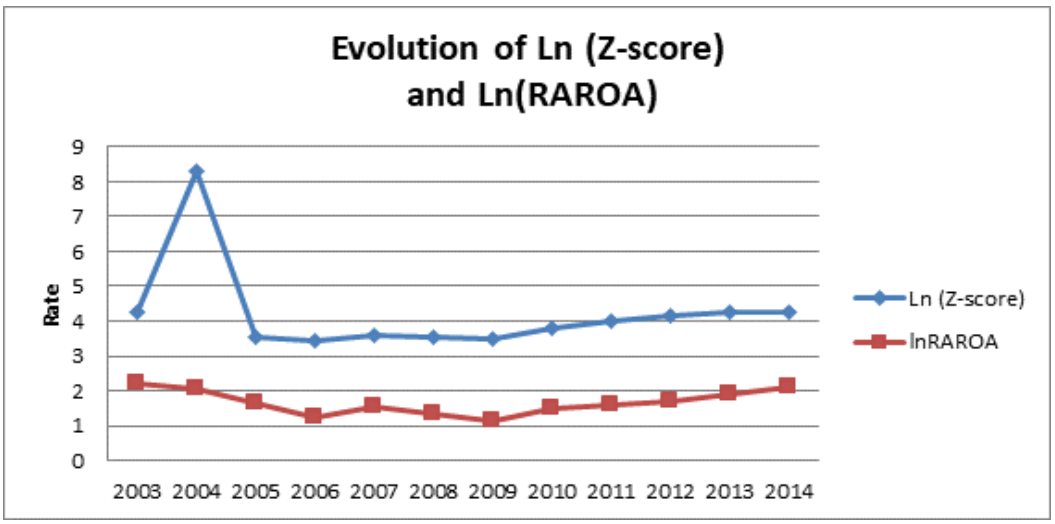
In this same context, and to get a better idea about the components of Z-score and their relationships with dangling dice variables, we use the following ratios:

$$RAROA_{it} = \frac{ROA_{it}}{SDROA_{ip}} \quad (3)$$

$$RACAR_{it} = \frac{CAR_{it}}{SDROA_{ip}} \quad (4)$$

At this level, we would like to mention that a Skewness-Kurtosis normality test had performed on the Z-score, RAROA and RACAR variables and that the latter do not follow the normal distribution, hence the integration of natural logarithms. For these three variables in the suite of econometric applications, Laeven and Levine, (2009) and Houston et al., (2010).

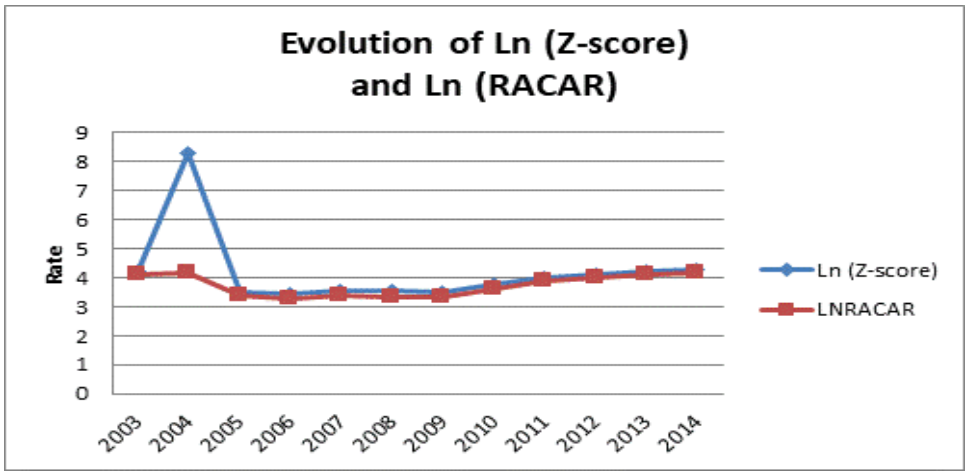
To get a better idea about the relationship between Ln (Z-score) and its two components, we will draw the following two graphs:



Source: The author

Figure 1: Evolution of Ln (Z-score) and lnRAROA in the MENA zone between 2003 and 2014

According to this graph, we can notice that the variable Ln (Z-score) progressed between 2003 and 2004 before falling from 2005 from 8.29731255 to 3.5212993. This peak was strongly correlated with the Iraq War, which began in 2002, and particularly affected the countries of the Middle East. Also, the risk of bank failure has experienced a second increase from 2009, which is related, on the one hand, with the subprime crisis and, on the other hand, with the geopolitical troubles in the MENA zone. Concerning the variable Ln (RAROA), it began to progress since 2009 following the same direction of evolution of Ln (Z-score).



Source: The author

Figure 2: Evolution of Ln (Z-score) and LNRACAR in the in the MENA zone between 2003 and 2014

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From this graph, we can notice that, apart from the peak of 2004, the variable Ln (RACAR) followed the same direction of evolution of Ln (Z-score). In fact, since 2005, both variables have achieved almost the same values. This result means that in recent years, the level of capitalization is stable in banks in the MENA zone.

b) The hypotheses

The purpose is to determine the effect of financial stability on bank risks. Therefore, we will rely on the calculation of "z-score" as an indicator of bank failure in the framework of "Business Model."

The selection is focused exclusively on conventional banks in the MENA region. We have a sample of 146 banks for which we hold all the financial information necessary to conduct the empirical analysis.

Our sample will cover 146 conventional banks in 17 MENA countries (Algeria, Saudi Arabia, Bahrain, Djibouti, Egypt, United Arab Emirates, Jordan, Kuwait, Lebanon, Malta, Morocco, Oman, Palestine, Qatar, Syria, Tunisia, Yemen) over the period 2003-2014.

- The relationship between size and financial stability

Kôhler (2015): He finds a negative rapport between "Z-Score" and the size of the bank. This situation means that big banks are less stable. This observation was based on the results of the subprime crisis, for which the big banks were the least stable.

H1: An increase in the size of the bank is causing a risk of bank insolvency.

- The relationship between capital ratio and financial stability

Zhong (2007): The level of capital is a determining factor in the bank's ability to withstand operational losses. Adequate bank capital can be used to reduce bank risk by acting as a buffer against losses, providing easier access to financial markets and limiting risk-taking. So, the second hypothesis of the research is this:

H2: An increase in the capital ratio will decrease the probability of the risk of bank failure.

IV. Empirical Results

We present the significant statistics followed by the models constructed concerning the regression of the variables defined above on conventional banks of the MENA zone with the empirical results obtained and their interpretations.

a) Descriptive analysis of variables and econometric tests

i. *Descriptive analysis*

This study will expose the descriptive analysis of the different variables. The table below gives the mean, the standard deviation, the maximum and the minimum of the variables studied during the study of the previously defined models (see appendix 1).

Indeed, we note from the table below, the disparity of the average values of the explanatory variables and their standard deviations. These two variables suggest that the sample structure is not homogeneous and that additional tests are required to select the appropriate estimator.

ii. *Econometric tests*

We would been based on econometric tests following: the multicollinearity, the stationarity, the heteroscedasticity, the homogeneity and, the Hausman test.

a. Multicollinearity tests

According to Bourbonnais (2009), to decide on a problem of collinearity between the independent variables included in a regression model, it is necessary that the correlation coefficient exceeds the order of 0.7. Examination of the correlation matrix and the VIF test (see appendix 2) highlights the absence of a multicollinearity problem.

b. Stationarity test

To do this, we would be based on the tests of Dickey- Augmented Float (ADF) and Phillips-Perron (PP).

Table 2: ADF & PP Tests

variables	ADF		PP	
	In level	In difference	In level	In difference
Ln (Z-score)	0.0295 **		0.0295 **	
GDPGR	0.0127 ** (With trend)		0.0127 ** (With trend)	
NNINC	0.0538 * (With trend)		0.0529 * (With trend)	
Ln (RAROA)	0.0718 *			0033 **
Ln (RACAR)		0.0592 *		0017 **
GDPPC	0.02163 **		0.02163 **	
NONDEPOSIT		0.0284 ** (With trend)		0.0703 * (With trend)
Size		0.0763 *		0.08099 *
CAR	0.0244 **		0.0220 **	
LOANS		0.0674 *		0.0990 * (With trend)
NIM	0.0293 ** (With variation)			0.0888 * (With trend)

**** Significant at 1%, ** significant at 5%, * significant at 10%*

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The results show the stationarity of the variables in level for the ADF & PP tests and other were difference stationery.

c. Testing for heteroscedasticity

This test is to examine the variance of the standardized residuals is constant or homoscedasticity, Evrard and al. (2003).

Table 3: Heterosedasticity test

Model 1 (Ln Z-score)	Model 2 (Ln RAROA)	Model 3 (Ln RACAR)
Chi2 = 4.13 Prob > chi2 = 0.0420	Chi 2 = 46.83 Prob > chi2 = 0.000	Chi2 = 0.04 Prob > chi2 = 0.840
Presence of a problem of heteroscedasticity	Presence of a problem of heteroscedasticity	Absence of heteroscedasticity problem

d. Specification and homogeneity tests

It is a question of checking whether the specification is homogeneous or heterogeneous of the data generating process.

Table 4: Homogeneity test

Model 1 (Ln Z-score)	Model 2 (Ln RAROA)	Model 3 (Ln RACAR)
F = 4.72 P value = 0.0 00 0	F = 4.01 P value = 0.000	F = 5.24 P value = 0. 000

e. Hausman test

The Hausman test is a specification test that determines whether the coefficients of the two estimates (fixed and random) are statistically different.

Table 5: Hausman test

		Model 1 (Ln Z-score)	Model 2 (Ln RAOA)	Model 3 (Ln RACAR)
Effect test	**value**	57.33	15.51	64.76
Cross section Khi-two	**P-value**	0.0000	0.03	0.0000
		To hold the model in effect fixed s with the control Robust	To hold the model in effect fixed s with the control Robust	To remember the fixed effect model

f. Analysis of results and interpretation

The estimation results of the fixed effects model using the Ordinary Least Squares method are in the following table:

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Table 6: Results of estimates

	Model 1 : Ln Z-score			Model 2 : Ln RAROA			Model 3 : Ln RACAR		
Variables	Coefficient	T-Statistic	P-Value	Coefficient	T-Statistic	P-Value	Coefficient	T-Statistic	P-Value
NONDEPOSIT	1.600113	1.94	0.055*	0.6740837	0.60	0.546	1.603194	2.55	0.011**
NNINC	-0.001328	-0.48	0.633	-0.0005733	-0.16	0.874	0.0002497	0.13	0.896
CAR	0.0213014	2.78	0.006***	0.0026515	0.26	0.792	0.0264377	4.60	0.000***
SIZE	0.3691307	2.78	0.006***	0.4325939	2.64	0.009***	0.4459224	5.02	0.000***
LOANS	1.970601	2.26	0.025**	0.4918528	0.47	0.637	1.992006	3.99	0.000***
NIM	-0.026526	-0.35	0.726	0.1871667	1.77	0.079*	-0.0355441	-0.69	0.487
GDPGR	0.0125505	1.16	0.248	0.0360702	2.49	0.014**	0.0113722	1.30	0.194
GDPPC	-5.99e-07	-0.07	0.942	-5.12e-06	-0.58	0.560	-4.96e-06	-0.77	0.439
Constante	-1.971046	-1.48	0.140	-3.516106	-2.16	0.033**	-2.652607	-2.88	0.004***
F(8,141) = 3.64				F(8,141) =2.72			F (8,1048) =8.86		
P value = 0.0007				P value =0.0082			P value =0.0000		
Model of OLS (fixed effect) With command Robust				Model of OLS (fixed effect) With command Robust			Model of OLS (fixed effect)		

**** Significant at 1%, ** significant at 5%, * significant at 10%*

- Model 1 (Ln Z-score)

We note a significantly positive relationship between the NONDEPOSIT ratio and "Ln Z-score". Indeed, this result reflects a high volatility of income in banks in the MENA zone, contrary to the findings of Calomiris and Kahn (1991). This situation calls for better monitoring of banks by financiers as well as better diversification of funding sources.

Also, the capital ratio had positively related to the "Ln Z-score." This result means that this variable is among the most important determinants of banks' financial stability in our sample. Any increase in this ratio will improve the level of solidity of the bank. This result corroborates with the work of Köhler (2015).

For the variable Size, it had positively related with "Ln Z-score." This result means that big banks are generally more stable. They have more diversified portfolios than small banks.

The variable "Loans" had positively related in the regression with "Ln Z-score," which indicates that banks that are more focused on lending activities are more stable. Freixas (2005) argues that specialization in a specific type of credit offers informational benefits, which can reduce the risk of bank default.

- Model 2 (Ln RAROA)

At the level of this study, we included the variable "NIM" because banks tend to take excessive risks to restore their returns if their interest margin is low. This variable is positively related to the dependent variable. Banks, whose net interest margin is higher, are also more stable and more profitable.

Also, by introducing the macroeconomic environment control variable "GDPGR" which reflects the growth rate by country, we noticed that it is positively related to "Ln RAROA." This result confirms Kohler's (2015) findings that banks in countries with higher levels of economic development are more profitable than other banks.

Regarding the size variable, it was positively related to the variable "Ln RAROA," which means that large banks are generally more profitable.

- For model 3 (Ln RACAR)

The capital ratio is positively related to "Ln RACAR." Riskier banks tend to decrease the level of this ratio. This result corroborates with the findings of Köhler (2015).

Also, we note a significantly positive relationship between the NONDEPOSIT ratio and "Ln RACAR." Indeed, this result reflects significant volatility of incomes in banks in the MENA zone, contrary to the findings of Köhler (2015). This situation requires a better monitoring of the level of capitalization of banks by the financial managers as well as a better diversification of the sources of financing.

Moreover, the variable "LOANS" was positively related to the dependent variable at the level of this regression. This result means that banks with a higher ratio are better capitalized than other banks.

Regarding the size variable, it had positively related to the variable "Ln RACAR." Indeed, large banks rely on high capital ratios to reduce the risk of bank failure. This finding invalidates the results of Köhler (2015). This result was explained by the difference between the MENA and German banking systems, in which the big banks are less stable.

In the three previous models, we found the significance of the variable size, from which it is essential to test the evolution of the variables "Ln Z-score," "Ln RAROA," and "Ln RACAR" for small and large banks. To do this, we will use the variable "Ln (total assets)" by the work of Bourgain and al. (2012) that a bank was considered big if its total assets are superior to $ 10 thousand. Otherwise, it is a small bank. As a result, 40 banks in the sample are considered large and, 106 banks are considered small banks.

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The results of the estimate are presented in the following table:

Table 7: Results of the estimates of the 3 models for large and small banks

The variables	Big Banks			Small Banks		
	"Ln Z-score"	"Ln RAROA"	"Ln RACAR"	"Ln Z-score"	"Ln RAROA"	"Ln RACAR"
NONDEPOSIT	0331 (1.212228)	0986 (-0.0375224)	0215 (1.592371)	0.08 0 * (1.795376)	0603 (-0.311907)	0096 * (1.745977)
NNINC	0116 (-0.0123064)	0796 (0.0033991)	0592 (0.0037031)	0554 (-0.0017267)	0086 * (-0.0050844)	0.656 (-0.0011611)
CAR	0019 ** (0.0343446)	0863 (0.0044145)	0000 *** (0.0539345)	0.06 0 * (0.12962)	0340 (-0.0065317)	0031 ** (0.0150175)
LOANS	0659 (0.461685)	0990 (0.018307)	0412 (0.8822956)	0004 *** (2.962416)	0144 (0.7210746)	0004 *** (2.970298)
NIM	0.620 (-0.0659144)	0284 (0.287042)	0.866 (-0.0228532)	0332 (-0.080774)	0003 *** (0.1693388)	0245 (-0.0899614)
GDPGR	0508 (0.0084499)	0.03 0 ** (0.0284865)	0.701 (0.0050372)	0999 (0.0000176)	0140 (0.0202857)	0899 (-0.0023805)
GDPPC	0002 *** (0.0000223)	0051 * (0.0000189)	0001 *** (0.0000239)	0456 (6.35e-06)	0439 (4.71e-06)	0.650 (4.36e-06)
Constant	0529 (0.8514391)	0811 (0.6279075)	0642 (0.6475084)	0482 (0.7608145)	0350 (0.5747028)	0474 (0.756912)
	F (7.384) = 2.72	F (7.39) = 2.68	F (7.385) = 3.10	F (7.101) = 2.71	Khi2 (7) = 29.67	F (7.101) = 2.81
P value	0.0092	0.0161	0.0035	0.0128	0.0001	0.0102
The estimation method	MCO (Fixed effects)	MCO (Fixed effects with Robust command)	MCO (Fixed effects)	MCO (Fixed effects with Robust command)	MCG	MCO (Fixed effects with Robust command)

**** Significant at 1%, ** significant at 5%, * significant at 10%*

Based on the above estimates, we note a significantly positive relationship between the NONDEPOSIT ratio and the "Ln Z-SCORE" and "Ln RACAR" variables for small banks. This result reflects significant volatility of income in small banks in MENA. This is explained by the difficulties encountered by these banks to access large and less risky projects, which invalidates the findings of Köhler (2015). This situation requires a better monitoring of the level of capitalization of these banks as well as a better diversification of the sources of financing.

Concerning the variable NNINC, it was negatively associated with "Ln RAROA" in the small banks of the MENA zone. This result shows that the structure of banks' income is decisive in banking stability. Indeed, the negative coefficient for this variable means those smaller banks are riskier with a less diversified income structure.

In this context, several studies have analyzed the impact of the income structure on banking stability during a financial crisis. Altunbas and al. (2011) have confirmed that banks with good income diversification are less likely to encounter difficulties during periods of crisis. As a result, small banks in the MENA zone must try to diversify their revenue structure to minimize the likelihood of bank failure risks in times of crisis.

For the capital ratio, it was positively related to "Ln Z-SCORE" and "Ln RACAR" for small and large banks in MENA. This result confirms the findings of Köhler (2015) in hisStudy on German banks. This result means that banks in the MENA region use capital ratios that are high enough to cope with the risks.

Also, the LOANS variable (Net Credits / Total Assets) was positively related to "Ln Z-SCORE" and "Ln RACAR" in small banks. This result means that small banks in the MENA zone generally focus on granting credit to improve their stability. This result confirms the findings of Köhler (2015). Freixas (2005) has ensured that the focus on credit agreement can be a source of informational advantage and, therefore, it can reduce the probability of the risk of bank failure.

The variable NIM (net interest margin) is positively related to "Ln RAROA" of small banks. By Köhler's (2015) results, they try to increase their net interest margin to improve their stability.

Also, by introducing the GDPGR macroeconomic environment variable that reflects the growth rate by country, we have noticed that it is positively related to the "Ln RAROA" of the big banks. This result means that an increase in this ratio was reflected in an improvement in the profitability of the large banks in the MENA zone.

Also, the "GDPPC" rate was positively related to the three dependent variables for the large banks in the MENA zone. This result confirms the findings of Köhler (2015). This means that the major banks of the most economically developed countries are more profitable and more capitalized since real GDP per capita is an indicator of the wealth of countries.

b) Cross-sectional regression

To better refine the results, under a technical analysis of the cross-section was carried out as above presented the following model based on the work of Köhler (2015) takes shape following:

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$$Y_i = \alpha + \beta_1 * \overline{NNINC_i} + \beta_2 * \overline{NONDEPOSIT_i} + \beta_3 * \overline{B_i} + \beta_4 * \overline{C_i} + \gamma_t + \varepsilon_i$$

With:

Yi: The standard deviation of ROA (SDROA) of banki between 2003-2014

$\overline{\text{NNINC}_i}$: NNINC average

$\overline{\text{NONDEPOSIT}_i}$: NONDEPOSIT average

$\overline{B_i}$: The average matrix of control banking variables

$\overline{C_i}$: The average matrix of control variables by country

i. *Descriptive analysis of the variables*

The table below gives the average, the standard deviation, the maximum and the minimum of the variables studied during the study of the previously defined model.

Table 8: Descriptive statistics of variables

variables	Average	standard deviation	Minimum	Maximum
SDROA	1.215933	4.125733	0.048211	45.95497
NONDEPOSIT	0.8994124	0.1440236	0.0092897	1.093904
NNINC	-60.50845	17.88776	-97.96267	7.604923
NIM	3.375774	5.005361	-2.18	61.06
LOANS	1.537404	13.37402	0.0083532	160.8953
CAR	21.71052	10.79891	7.943333	78.08
SIZE	7.939817	1.803596	2.193664	14.62996
GDPPC	16672.43	17341.39	1099.824	71053.23
GDPGR	4.915289	1.859248	1.679477	12.55121

ii. *Multicollinearity and heteroscedasticity tests (Appendix 3)*

We performed the VIF test, which allowed us to confirm the result since the average value of VIF is 1.57 <3.

The Chi-Square value of the heteroscedasticity test is 132.09 with a significance level of 0.000 below the critical threshold of 5%. In this case, use the Ordinary Least Squares (OLS) method with the Robust command to correct this problem.

iii. *Analysis of results and interpretation of model estimation*

The results of the estimation of the model in the following table:

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Table 9: Results of the model estimate

Variables	Coefficient	T- Statistic	P-Value
NONDEPOSIT	-1.150602	-0.93	0. 353
NNINC	0.0386216	2.88	0.00 5 ***
CAR	0.04809112	2.80	0.0 06 ***
SIZE	-0.073868	-0.88	0378
NIM	-0.0132922	- 0.17	0. 865
LOANS	0. 4799516	1.09	0. 279
GDPGR	-0.0056509	-0.12	0906
GDPPC	4.02e -06	0.62	0538
Constant	4.730183	1.96	0052
F (8.132) = 2.79			
P-value = 0.041			

**** Significant at 1%, ** significant at 5%, * significant at 10%*

The positive relationship between SDROA and NNINC shows the importance of the income structure as a determinant of bank stability. This result means that an increase in the volatility of banking income will increase the level of risk. This result is in line with the findings of Stiroh (2004 a,b) and DeYoung and Roland (2001). Indeed, the enrichment of product and an increase in the share of interest-free income will permit banks to reduce their insolvency risk (Stiroh, 2004b). This result corroborates with recent studies (Altunbas and al. 2011; De Young and Torna, 2013). These authors showed that banks with a diversified income structure were significantly less likely to be distressed during the crisis.

Also, the positive relationship between the ratio of capital and SDROA indicates that an increase in capitalization was associated with a lower level of risk. This result confirms the findings of Blum (1999).

The MENA region have partially weathered the global crisis, but with rhythms different growth and a level of recovery which varies from one country to another, depending on the initial conditions and the intensity of the impacts on which the global financial crisis has affected this region.

However, the area still faces a climate of uncertainty, because of the "Arab Spring" which weighs on the short-term macroeconomic prospects of some countries such as Tunisia and Egypt (World Bank, 2016).

As a result, the results show the contagion effect of financial crises around the world and justify the overriding importance given by the monetary authorities to introduce early warnings to avoid problems of instability.

V. Conclusion

From a macro-prudential point of view, financial stability depends on the situation of the banks, as a failure in financial institutions poses a significant threat to financial solidity.

In this context, we have tried throughout to analyze the impact of the "Business Model" on financial stability in a sample of 146 conventional banks in MENA countries between 2003-2014.

The previous results showed that banks with a poorly diversified income structure were significantly more likely to be distressed during a period of crisis and small banks will try to increase this margin to improve their stability.

For the macroeconomic environment control variables there are important of economic development of MENA countries on banking stability.

The cross-sectional regression over the entire sample shows that an increase in the volatility of banking income will increase the level of risk.

To conclude, capitalization is the most determining factor in the Z-score variable at the banks of the MENA zone.

This empirical analysis allows us to show that the major banks of the most economically developed countries are more stable. And for smaller banks, the significant volatility of revenues with a little diversified structure of these, make these banks less stable.

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Appendix

Appendix 1: Descriptive statistics

Table 1: Descriptive statistics

Variables	Moyenne	Écart type	Minimum	Maximum
Ln (Z-score)	3.297863	1.254814	-1.482556	10.33783
Ln(RAROA)	0.9760647	1.545632	-6.579973	8.443391
Ln (RACAR)	3.077297	1.40935	-3.131126	10.1748
NONDEPOSIT	0.8983817	0.1589657	0	1.289135
NNINC	-61.16963	25.77364	-296.2408	239.65
NIM	3.169965	4.944557	-3.88	156.06
LOANS	0.9717784	12.55295	0	419.301
CAR	20.75376	14.50058	-13.1	285.4
SIZE	8.003754	1.764696	1.8453	14.97227
GDPPC	16699.14	18100.23	607.9158	96732.41
GDPGR	4.920161	3.860769	-15.08839	26.17025

Appendix 2: Matrix correlate

```
. correlate CAR NNINC NONDeposit Loans NIM Size GDPpergrowth GDPpercapita   (obs=1205)

             |      CAR    NNINC  NONDeposit    Loans      NIM     Size  GDPper~h  GDPper~a
-------------+------------------------------------------------------------------------------
         CAR |   1.0000
      NNINC  |   0.0254   1.0000
  NONDeposit |   0.0329  -0.1851   1.0000
       Loans |  -0.2139  -0.2260   0.1790   1.0000
         NIM |   0.0967  -0.2994   0.1518   0.3137   1.0000
        Size |  -0.3416  -0.1930   0.0120   0.3374   0.0395   1.0000
GDPpergrowth |  -0.0276   0.0236   0.0027   0.0480  -0.0462   0.0461   1.0000
GDPpercapita |  -0.0252  -0.0078  -0.0148   0.4088  -0.0532   0.3160   0.2549   1.0000
```

Appendix 3: Model of cross-section

- Multicolinearite test

```
. correlate NNINC NONDeposit CARTotalregulatorycapitalrat SizeIntotalassets NIM Loans GDPpergrowth
GDPpercapita(obs=141)

             |    NNINC NONDep~t CARTot~t SizeIn~s      NIM    Loans GDPper~h GDPpercapita
-------------+---------------------------------------------------------------------------
       NNINC |   1.0000
  NONDeposit |  -0.2755   1.0000
CARTotalre~t |   0.3051  -0.0197   1.0000
SizeIntota~s |  -0.3483   0.0164  -0.4803   1.0000
         NIM |  -0.4105   0.1532   0.0213   0.0527   1.0000
       Loans |  -0.3912   0.2022  -0.1943   0.3410   0.3269   1.0000
GDPpergrowth |  -0.1017   0.0413  -0.2487   0.2750  -0.0472   0.2061   1.0000
GDPpercapita |  -0.0630  -0.0186  -0.0087   0.2639   0.0167   0.4243   0.5906 1.0000
```


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