

## The impact of macroprudential supervision tools on financial soundness in the Southern Mediterranean countries

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### ABSTRACT

This paper presents a macroprudential approach to supervision the soundness of the financial system in the southern Mediterranean countries by using a panel data. The objective of this research is to estimate the impact of the macroprudential instruments on the banking system solidity of the southern Mediterranean countries between 2000 and 2013. The empirical results suggest the importance of macroprudential tool in the financial system.

### Contribution/ Originality

The contribution of this paper is to employ two macroprudentials tools (capital adequacy ratio and Loans to deposits ratio) to investigate the financial soundness in the Southern Mediterranean countries

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## 1. INTRODUCTION

The need to strengthen the macro-prudential orientation frameworks of the regulation and financial supervision is widely accepted by the relevant authorities. Sami (2012) stipulates that the adoption of a macro-prudential framework would indeed integrate the systemic risk, the macroeconomic cyclicity and the weakening or the financial vulnerability scenarios in the microeconomic equity requirements.

The global financial crisis revealed the extent of externalities and the interdependence of the financial markets. It stressed the importance of going beyond the supervision and regulation of individual financial institutions and implement measures to limit the risks for the overall financial system. In addition, the pro-cyclicality of the financial system can generally lead to an excessive credit growth even if individual banks seem to behave responsibly. In other words, it is important to complete a microeconomic approach. In other words, it is important to complete a microeconomic approach of the financial regulation with what is now generally called macro-prudential policies which aim at limiting the systemic risk and adjust the regulation in response to the economic variables.

The practical use of the macro-prudential instruments varies depending on the countries' specific exposure to shocks and risks, and its market financial, institutional and structural characteristics that affect the amplification of the financial and real sector cycles as well as the political efficiency. On the one hand, the country's financial structure, which is the importance of banks compared to the capital markets in external funding, is probably an important factor in the political choice.

The extension of the scope of the macro-prudential regulation will be increasingly important in the MENA zone. As financial systems become more diversified and complex, the banking current regulatory and supervision approach is insufficient to deal with the systemic risk. Carvajal *et al.* (2009) state that, in most of the MENA countries, the banking supervision under the central bank; nonbanking financial supervisors are generally less independent and weaker.

In fact, the developing countries sought to improve the performance and efficiency of their financial sectors to ameliorate their overall economic performance. The authorities of several countries such as the southern Mediterranean countries and Middle East and North Africa (MENA) initiated a series of reforms to modernize their financial sectors. These reforms include the public banks' restructuring and privatization, the implementation of regulatory and management of the prudential, and the strengthening of the supervision responsibilities (Ayadi *et al.*, 2011).

The 2008 financial crisis spread the financial effects worldwide, which rapidly affected the functioning of the financial system and that economy, especially in the Mediterranean countries (Carvajal *et al.*, 2009). These countries, as in the rest of the world, are invited to strengthen the resilience of the financial system and introduce financial stability as an objective of macroprudential regulation.

Therefore, the main objective of this research is to analyze the relationship between the macroprudential surveillance and nonperforming loans (NPL), as an indicator of financial stability. The remaining part of this study is organized as follows. Section two explains the macroprudential supervision tools. Third section discusses the empirical literature overview. Section four presents the empirical analysis and includes the data and methodology, data, results and discussion, and the final section presents the conclusion and implications.

## 2. MACROPRUDENTIAL SUPERVISION TOOLS

The instruments of the macroprudential policy can be identified as the measures that enable, on the one hand, supervise, avoid and deal with systematic risk and, on the other hand, minimize the

systematic crisis costs. The southern Mediterranean countries already use a variety of macro-prudential tools recommended in the regulatory reform proposals, including the regulatory capital ratio and the loan deposits.

The adoption of macro-prudential instruments may enable the regulators in the region to mitigate the impact of external shocks. In the African economies, the macro-prudential tools can complement the monetary and fiscal policies by ensuring the stability and strength of the financial system (Paul, 2013). Many tools have been identified, nevertheless, not all of them are as targeted or effective, in addition, their use depends on the particular circumstances of a country as well as the structure of its economy. Actually, some macro-prudential tools can be identified as they are considered as key indicators;

### **2.1. The capital adequacy ratio (CAR)**

This is a macro-prudential tool that can mitigate the shocks when designed adequately. It is used to measure the amount of the bank's capital compared to the amount of its risk weighted credit. The capital adequacy ratio is one of the important concepts in the banking sector. It is applied to boost the soundness and the effectiveness of the monetary framework by reducing the likelihood of bank collapse. If a bank turns to be insolvent, there might be a loss of confidence in the financial system, which creates some financial problems for other banks and may put in danger the appropriate operating of the financial markets.

A number of studies used the regulatory capital to prevent credit growth Bank of England (2009) and Brunnermeier *et al.* (2009). The objective of this instrument is to promote the financial stability and protect the financial systems worldwide. Following the recommendations of international regulatory bodies, several countries in the MENA region adopted capital requirements for their banks. The implementation date of these regulations varies from one country to another.

Using the capital adequacy ratio, as a macroprudential regulation, Brahim (2014) stated that, despite the apparent regulation stringency of the banking capital in Tunisia, the banking supervision was poorly effective to limit the banking overall risk. Prior to 1988, a group of researchers, namely, Mohamed (2015), Marshall and Prescott (2000) and Kahane (1977) showed that there is a positive relationship between the banking risk and the capital ratio.

The significant credit growth is followed by the implementation of the capital regulation in some southern Mediterranean countries, such as Egypt, Jordan, Lebanon, Morocco (Naceur and Kandil, 2013). These authors also showed that Basel II implementation can establish a direct link between the regulatory capital ratios, the credit supply and the economic activity. Therefore, the policy examination of the banking supervision set up by the banking regulator, that is to say, the Tunisian central bank, is expected to provide the policymakers with more interesting policy implications.

The financial crisis brought about a broader support for a greater use of capital requirements as a tool of the macro-prudential policy. The policy makers aim at using these tools to improve the financial system resilience, and potentially impede the credit cycle (Yellen, 2010, Hanson *et al.*, 2011).

### **2.2. The loan to deposit ratio**

This tool is a very valuable tool to identify the banks' liquidity. It presents a relationship between the loans and deposits to assess the banking liquidity. If this ratio is high, it means that banks might not have sufficient liquidity to cover unpredicted fund requirements. The southern Mediterranean countries are more advanced than many other countries to impose the deposit to loan ratio in order to limit the credit growth (the average annual real credit growth in the private sector in the southern Mediterranean countries is between 29% in Egypt and 91% in Lebanon). A gradual tightening of the loan-to-deposit ratio limited the liquidity risk.

When loans exceed the deposit base, banks face a funding deficit for which they have access to financial markets. Therefore, a higher financing deficit implies a strong dependence on market funding which may be more volatile and expensive than retail funding (Jan, 2013). If a significant number of banks operate with a funding deficit, adverse shocks to market funding may affect the banking sector as a whole, which affects both the credit supply and economic growth.

The African banking systems are not only weak but also characterized by a weak intermediation. Thorsten and Harald (2011) defined the loan-to-deposit ratio as a simple method to measure the efficiency of intermediation. For the southern Mediterranean countries, there is a rising trend for the loan-to-deposit ratio during 2006-2010. Since the late 2010s, this ratio has dropped from 107% to 92% in 2011 for Tunisia.

According to Adrian *et al.* (2013), the European Central Bank shows that at the beginning of a crisis, several banking systems tend to be ready to have loans-to-deposit between 120 and 130 percent. When a crisis starts, the loan-to-deposit ratios drop, which means that there is a more deleveraging in the banking sector. If the financial system is close to the limit of 80 percent, there could be a credit crunch situation that the macroprudential authority and the central bank can prevent.

Other macroprudential tools such as loan to value ratio, debt to income ratio, reserve requirements on bank deposits and liquidity requirements were not used to the area.

### 3. EMPIRICAL LITERATURE

Nonperforming loans are the main source of the spread of systemic risk in the banking and financial sector. An increase of non-performing loans can be determined by a number of factors, including an increase in short-term interest rates, real interest rates, unemployment rates, inflation and exports....

According to Paul (2012), a major source of risk for the southern Mediterranean countries is the changes in the value of exports and the increase of the price level. Indeed, the macroeconomic instability on the Bank's balance sheet is also a major source of systemic risk to the banking sector. The common vulnerability to macroeconomic risk throughout banks is considered to be a systemic risk that affects the quality of the lending portfolio, which is defined as the ratio of impaired loans to total gross loans. In fact, if this ratio rises, this implies that the banking sector performance is declining. Theoretically, credit risk growth and the ratio of the impaired lending to total loans are expected to be procyclical in the economic cycle (Schinasi, 2005).

The deterioration of the quality of the loan portfolio is the main cause of problems in the banking systems, and asset qualities are often associated with the presence of bankruptcy risk and financial crisis in both developed and developing countries. Nonperforming loans are among the main causes of economic stagnation problems (Nkusu, 2011).

Peter (2012) used panel data to estimate the effect of the macroeconomic variable on the nonperforming loans to total gross loans and the ratio of assets of bank capital of the banking system from 27 countries of the European Union. The empirical analysis of banking systems in the EU reveals a strong correlation between economic trends and financial soundness indicators. This highlights the interdependence of the need for cooperation between financial supervision and economic policy that can lead to a reduction of systemic risk.

Zibell *et al.* (2010) used the macroprudential indicators, namely capital to assets ratio, regulatory capital, return on equity, non-performing loans and return on assets, and macroeconomic variables (GDP per capita, real GDP growth rate, unemployment rate, Gross domestic savings ...) assembled from 41 emerging economies and 18 selected developed economies covering the period 1993–2008. The empirical analysis showed that macroprudential indicators in developing economies are important determinants of financial soundness. Regarding the importance of capital requirements and the return indicators, the empirical results showed that macroprudential policy instruments, including the

appropriate capital demands, more capital reserves for banks, control in relation to financial leveraging ratios, and a more sufficient cash management of financial institutions, are more suitable.

Nir (2013) examined the nonperforming loans over the period 1998- 2011 in Central Eastern and South Eastern Europe. The base includes four explanatory variables at the bank (ratio of equity to asset funds, equity returns, asset ratio of loans and loan growth rates) and specific variables for each country (inflation, exchange rate, the unemployment rate, GDP growth and the S & P 500). The results confirmed that nonperforming loans have a significant impact on economic growth, inflation and unemployment.

Abdelkader *et al.* (2009) studied the relationship of the non-performing loan and the macro-prudential tool Middle East and North Africa countries between 2002 and 2006 for a sample of 46 banks. The empirical analysis showed that the capital adequacy ratio have a negative and significant impact on nonperforming loans. This result shows that an increase in regulatory capital caused a reduction in non-performing loans.

#### 4. THE EMPIRICAL ANALYSIS

In this paper, we examine the impact of macroeconomic variables on the macroprudential instruments (regulatory capital and the ratio of deposits to loans) for southern Mediterranean countries.

To explain the indicators of financial stability, we used ordinary least square regression (OLS) in a general panel regression model. OLS is a linear modeling technique that can be used to model a single response variable. The technique can be applied to single or multiple variables.

The OLS estimate the statistical properties:

- ✓ The random sample of a population is well defined
- ✓ The population model is linear
- ✓ variables are linearly independent,
- ✓ And the error term is normally distributed and uncorrelated with the independent variables (homoscedasticity).

##### 4.1. The data and methodology

The data set, which consists of a group of six countries of the Southern Mediterranean, is based on the annual frequency for the 2000 -2013 period and collected from the World Bank. To evaluate the loan to deposit ratio and the capital adequacy ratio based on a series of macroeconomic variables, the model is given as:

$$NPL_{it} = \alpha_0 + \alpha_1 GDP_{it} + \alpha_2 INF_{it} + \alpha_3 UR_{it} + \alpha_4 EXP_{it} + \alpha_5 NER_{it} + \alpha_6 FDI_{it} + \alpha_7 RC_{it} + \alpha_8 LDR_{it} + \epsilon_{it}$$

Where

NPL: nonperforming *loans* to total gross *loans* (%)

GDP: Gross Domestic Production growth (%)

UR: Unemployment Rate

EXP: Exports (% of GDP)

NER: Nominal Exchange Rate

FDI: Foreign Direct Investment, a share of GDP (%)

RC: regulatory capital (adequacy capital ratio)

LDR: loans to deposit ratio

€it: stands for the estimation error

$\alpha_0, \alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6, \alpha_7, \alpha_8$  are the respective coefficient terms.

**Table 1: Definition of variables**

Variables	Definition	Relation with NPL	Literature
INF	Measured by the consumer price index.	(-)	Faward and Taqodus (2013), Dash and Kabra (2010)
UR	The unemployment rate is the ratio between the number of unemployed and the labor force.	(+)	Ouhibi and Hammami (2015), Jakubík (2007)
LTD	Loans to deposits ratio, is a macroprudential instrument to mitigate liquidity risk.	(+)	Mejra (2009)
FDI	Foreign direct investment (FDI) is an investment in a company by an investor from another country.	(-)	Calvo and Mendoza (2000); Festic <i>et al.</i> , (2011)
EXP	Exports of goods and services can affect the amount of nonperforming loans.	(-)	Festic <i>et al.</i> (2011), Faward and Taqodus (2013), Babouček and Jančar (2005)
GDP	Annual percentage growth rate of GDP is an instrument of economic activity.	(-)	Faward and Taqodus (2013), Beck <i>et al.</i> (2013)
NEE R	Nominal effective exchange rate is an instrument of foreign exchange market	(+)	Ali (2013); Tarron and Sukrishnalall (2012)
RC	The regulatory capital or capital adequacy ratio is a macroprudential instrument to control banks and assess systemic risk in the financial system	(-)	Abdelkader <i>et al.</i> (2009)

The review found positive or negative influence of these variables on NPL and availability of data. To explain the indicators of financial stability, we used the OLS regression in a general panel regression model. Thus, most of the existing studies have shown that OLS is an appropriate model to describe the determinants of non-performing loans (Faward and Taqodus, 2013; Balogh, 2012; Ali, 2013; Skarica, 2013; Andres and Bonilla, 2012).

The methods used in the various estimates that seek empirical evidence of a relationship between non-performing loans (source of systemic risk), and macroeconomic variables are: the analysis of co-integration, correlation and panel regression. Before applying the OLS (Table 4), we begin our analysis with a complete description of all variables (Table 2). Then, we use the correlation matrix (Table 3) to check multicollinearity.

The multicollinearity problem arises because of the high correlation between any explanatory variables. Two variables are positively correlated if their correlation coefficient is positive and vice versa.

#### 4.2. Empirical results and discussion

Descriptive statistics is used to present quantitative description of different variables (dependent and independent), such as the mean and standard deviation presented in the following table;

**Table 2: Descriptive statistics**

Variables	Mean	Standard Deviation	Minimum	Maximum
NPL	12.5189	6.8290	2.5	29.3
INF	6.8166	10.0027	-7	54.9
GDP	4.5961	2.8943	-5.7	9.4
UR	11.5906	2.6869	6.4	20
Ex Rate	0.86904	1.4032	-0.2006	5.73
Exp	32.4871	11.9128	14	57
FDI	9.05480	1.5615	0	10.3433
RC	24.1794	5.4979	15	38
Loans to deposits	-4.3555	3.8171	-15	2.5

The mean of the non-performing loan to total loans 12.51% and its standard deviation is of 6.82%. Concerning the mean of inflation is 6, 81%. Similarly, GDP is a measure of economic growth has a mean of 4.59% and a standard-type low 2.89%. The mean of regulatory capital is 24.17% and a standard deviation low 5.49%. It has a minimum value of 15% and a maximum of 38%. On Foreign Direct Investment is low since the minimum value is 0% and the maximum value is 10.34%. Our regression shows that the exchange rate is on mean 0.86% and a standard deviation of 1.40%. He is very weak because the maximum value in this period is equal to 5.73% and the minimum is -0.2%. In this table, it appears that exports (mean = 32.48, SD = 11.91) are the best determinants of non-performing loans since they have the highest mean compared to other determinants. In addition, we can see that the loans to deposits ratio has the lowest mean in all the variables of -4.35% and a standard deviation of 3.81%.

In order to detect a possible relationship between the variables, we will present the various correlation coefficients in the following table to test the correlation between these variables.

**Table 3: Correlation matrix**

Vrbs	NPL	INF	GDP	UR	RC	Export	Loan /Deposit	FDI	Ex rate
NPL	1.0000								
INF	0.0521	1.0000							
GDP	-0.4139	-0.0334	1.0000						
UR	0.5436*	-0.2431*	-0.2529*	1.0000					
RC	-0.3229*	-0.6563*	0.1222*	-0.8720	1.0000				
Export	0.0713	-0.1043	0.2638	0.8574*	0.2318*	1.0000			
Loan/Deposit	-0.0616	0.6218	0.9154	0.2165	0.4578*	0.3021*	1.0000		
FDI	-0.6328	0.9053	0.4170	-0.6023*	0.3112	0.3421	0.3267	1.0000	
Ex rate	-0.4611	-0.6032	0.0421	-0.2468*	0.1093	-0.4156*	-0.4936*	-0.0150	1.0000

According to the correlation matrix table, we see that the unemployment rate is positively correlated with the non-performing loans; this is also consistent with the findings of Nir (2013), Andres and Bonilla (2012), Tarron *et al.* (2013).

Table 3 also shows that the regulatory capital negatively correlated with the non-performing loans, while other macroeconomic variables (GDP, nominal exchange rate, and exports, FDI, loan to deposit and INF) are insignificant.

To identify the determinants of non-performing loans, we used the panel fixed effect model. The following table summarizes the results of the estimated regression model is estimated using Ordinary least Square.

**Table 4: OLS based results**

Variables	Coefficient	Standard Error	t-Statistic	Propability
INF	0.2923*	0.6714	-1.69	0.096
GDP	0.0806	0.4336	0.63	0.528
UR	0.9516	0.6435	0.86	0.734
RC	-0.9270***	0.0914	-5.03	0.000
Exportation	0.3513	0.9808	1.48	0.134
Loan /Deposit	0.6720	0.0320	1.00	0.432
FDI	-0.1286	1.3201	-0.85	0.399
Ex rate	0.4479*	0.15228	1.72	0.090
Constant	34.6570	12.474	2.73	0.008

$R$ -squared = 0.347 ;  $F$  statistic = 7.42 ; Prob ( $F$ -Statistic) = 0.0000

\*\*\* Significant at 1% ; \*\* significant at 5% ; \* significant at 10%

The table below shows that three macroeconomic variables (the consumer prices index, the exchange rate and adequacy capital ratio) are significant with non-performing loans, while the other variables in our model (GDP, FDI, exports, unemployment and loan to deposit ratio) are insignificant.

Table 4 showed that nonperforming loans are correlated with macroeconomic indicators, the coefficient of determination ( $R$ -squared =0.3473) shows that 34.73% of the variation in the dependent variable (non-performing loans) can be explained by the model regression.

This estimate indicates that in southern Mediterranean countries, inflation positively affects non-performing loans. According to Peter (2012), the effect of inflation on asset quality in developed countries is negative and statistically significant. However, in the emerging economies of Latin America, the impact of inflation on asset quality is positive and statistically significant.

Table 4 shows that if the consumer prices index grows by 1percent, non-performing loans decrease by 0.29%. The results of OLS for the growth of the consumer price index are consistent with the findings of the existing studies Peter (2012), GÜNGÖR and KOSKİJA (2014), ŠKARICA (2014) which justify the negative relationship between non-performing loans and the CPI. The high inflation associated with poor macroeconomic management causes an increase of the rate of non-performing loans, which leaves the banking system vulnerable, whereas low inflation reduces the banks' nominal income, which affects their liquidity (Evans *et al.*, 2000). On the other hand, a significant and rapid drop of inflation could, however, result in a lower nominal income and cash flow, which affects the liquidity and solvency of the financial institutions.

On the other hand, a significant positive relationship was found between the exchange rate and the non-performing loans, which suggests that whenever international competitiveness of the national economy falls, the level of the nonperforming loans rises, which seems to be in conformity with the results of Badar and Atiya (2013); Khemraj and Pasha (2009); Ali (2013); Tarron and Sukrishnalall (2009).

In addition, and in line with previous studies, a negative and significant relationship was found between the non-performing loans and the capital adequacy ratio (Keeley and Furlong, 1990; Fries *et al.*, 2002). Inspired by these studies, our result interpretation revealed that the increase of the regulatory capital may have a reduction of the non-performing loan portfolios.

Naceur and Kandil (2009) showed that a higher capital adequacy ratio led to the improvement of the banks' credit activities. Actually, higher levels of capital make banks more capable of coping with the unexpected losses and improving their performance (Fries *et al.*, 2002). However, Keeley and Furlong (1990) showed that strict capital regulation would reduce the exposure of the financial system to risk and improve the quality of the portfolio assets.



## 5. CONCLUSION AND IMPLICATIONS

To assessing systemic risk and refining the impact of macro-prudential instruments to ensure financial stability, it is essential to identify the variables that can affect and influence non performing loans the southern Mediterranean.

The empirical results suggest the importance of macropudential tool such as capital adequacy in the financial system. Nevertheless, using extra capital necessities for macroeconomic motivations, which are not specifically identified with individual budgetary foundations, may be not a clear methodology and might need reaction impacts on the enthusiasm rates and therefore, on the fiscal monetary policy.

The banking system of the southern Mediterranean countries faces many challenges, such as problems caused by the economic crisis, revolutions (Tunisia, Egypt) moreover; the fact that banks are not cautious about providing loans resulted in an increase in non-performing loans (NPLs). These are the most important source of systemic risk in the financial system and the spread of macroeconomic contagion. In this situation, the empirical results show that inflation, the exchange rate and the regulatory capital are significant with non-performing loans, but other variables are insignificant.

To conclude, we can say that the banking system of the southern Mediterranean countries reveals a correlation between economic trends and the indicator of financial soundness (Non performing loans). This high-lights the interdependence of the need for cooperation between financial supervision and monetary policy as a new space for reflection, which can lead to a reduction of systemic risk and there-fore to financial stability.

The main policy implications arising from our study can be presented as follows: first, evidence showed that the banking system of the southern Mediterranean countries reveals a correlation between macroprudential tools and the nonperforming loans. Therefore, it is necessary to look for other macroprudential tools to assess systemic risk in the financial system. The resolution of the source of the systemic risk in the southern Mediterranean countries represents a challenge since the financial system for these countries is complex and poorly developed. Secondly, based on the increased risk of the high proportion of the nonperforming loans in the banking sector, it is necessary to introduce reforms in the banking liberalization. Besides, it is important for policy makers to implement sound economic policies which can lead to the reduction of systemic risk and achieve financial stability. These reforms improve the efficiency of the economy and strengthen the aspects of supply in the economy.

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