

## Monetary Policy and Financial Stability: Empirical Evidence from South Mediterranean Countries

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### Abstract

This article examines the relationship between monetary policy and financial stability, in the experience of six south Mediterranean countries (Tunisia, Morocco, Egypt, Lebanon, Jordan and Turkey) over the period 2006M1-2013M12. This research analyzes the monetary policy contribution to financial stability using a structural vector Auto-regressive model. Our empirical results show that the short term interest rates is affect the selected asset prices depends on the strategy of the monetary policy. For countries that adopt a flexible exchange rate regime such as Tunisia, Morocco, Egypt and Turkey, the interest rate is conducive to financial stability. However in countries that adopt a fixed exchange rate regime such as Jordan and Lebanon, the interest rate is not an effective tool for promoting financial stability.

**Keywords:** Monetary policy; Financial stability, Structural Vector Autoregressive model; Exchange rate

### Introduction

The 2007 financial crisis revealed fundamental problems led to the slowdown of economic activity and the rise of the global financial volatility. Emerging economies of the Southern Mediterranean countries had a decline of their economic activity, due to the instability caused by the Arab Spring.

Before the crisis, economists reached a wide consensus regarding the justification of the frame of the political frame of the central bank; its goals, its assessments of economic prospects, and its main role of price stability. Price stability is the main aim monetary policy and it is independent of financial stability. It do have limitations which are balance sheet of the central bank, interest rate and independence of central bank to arrest inflation.

The concern of the central bank about financial stability remains a center of debate for economists and universities and can lead to what is called "the financial domination".

Mishkin [1], defines financial stability in terms of its opposite which occurs when shocks to the financial system interfere with information flows so that the financial system can no longer do its job of channeling funds to those with productive investment opportunities.

To limit the risks of the financial system, it is important that the price stability remains the main objective of the monetary policy and with the preservation of the financial stability. Okina et al. [2] stress the importance of conducting a monetary policy with the emphasis on maintaining an environment conducive to the sustainable economic growth that is the ultimate goal of price stability. However for sustainable economic growth proper functioning of financial system is an indispensable variable.

In this article, financial stability is defined in terms of changes in the stock index, interest rate, the nominal exchange rate and inflation. Crockett [3] defines the financial instability as the situation in which economic performance is affected by the fluctuations in the price of financial assets.

In the context that the monetary policy oriented to the price stability favors the financial stability over time, we examine the experience of six countries of the southern Mediterranean zone between 2006M1-2013M12.

### Literature Review

The importance of the financial stability was recently recognized by the monetary policy for the achievement of sustainable economic growth, moreover, there is a wave of empirical research on the importance of monetary stability and financial stability. These studies use proxies for financial stability and proxy for monetary policy. Examples of recent studies are Cocris Vasile and Anca Elena Nucu [4], Brigitte Granville and Sushanta Mallick [5], Keray Raymond [6], Christophe et al. [7].

Cocris Vasile and Anca Elena Nucu [4] used the structural vector autoregressive models and the impulse response function to determine the implications of the monetary policy on financial stability in the experience of Central and Eastern Europe (CEE) during 2003M01-2012M06. They analyzed the impact of the short-term interest rates on industrial production, the loan to deposit ratio for the banking system, the stock prices and the exchange rates (proxies for financial stability). The empirical results show that the effectiveness of the short-term interest rates which affect asset prices depends on the strategy of the monetary policy. In the case of the Czech Republic, Hungary, Poland and Romania, the instrument of the interest rate used for inflation targeting is conducive to financial stability.

Using the same sample and the same econometric model, Nucu Anca Elena [4], found that the money market interest rate is conducive to financial stability in the case of the Czech Republic and Poland. In the Bulgaria and the Lithuania, which lost their autonomy in monetary policy, the fluctuations of the interest rates of the central bank are not in accordance with the specific national conditions. In Hungary and Romania, the instrument of the interest rate used for targeting is not appropriate to financial stability.

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Received July 29, 2015; Accepted August 13, 2015; Published August 20, 2015

Citation: Ouhibi S, Hammami S (2015) Monetary Policy and Financial Stability: Empirical Evidence from South Mediterranean Countries. Arabian J Bus Manag Review 5: 164.

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Brigitte Granville and Sushanta Mallick [5] used a VAR-based approach -restriction sign in the experience of the EMU between 1994 and 2008 with variables for monetary stability (index of consumer prices and central bank rate ) and variables for financial stability (stock prices, exchange rates, the real estate prices and loan to deposit ratio of the banking sector). Their results indicate a pro-cyclical relationship between monetary and financial stability in the long term. With a positive inflation shock, stock prices fell by 2%, this suggests that the instrument of the interest rate used for inflation targeting is conducive to financial stability.

The relationship between price stability and financial stability became a crucial issue for the monetary stability. Some authors suggested introducing financial stability as an objective of the central bank. Dominique Pépin [8] states the European Central Bank reacts significantly to the financial asset prices by increasing its main rate when the stock price is over-estimated.

Christophe Blot et al. [7] explored the link between financial stability and monetary stability through three empirical models (simple correlations, VAR and dynamic conditional correlation models). They found that none of these three empirical methods show a positive relationship between financial stability and price stability. This result suggests that financial instability can develop in an environment of low inflation. Such As in Granville and Mallick [9], we define financial stability in terms of changes in the stock prices.

The academic literature abounds in studies that examine the relationship between the stock prices and the monetary indicators in Jamaica [6], Germany and the United Kingdom [10], the developed and developing countries [11], and the emerging countries [12]. Keray Raymond [6], found a long-term relationship between the stock prices and the monetary variables (monetary aggregates M2 and M3, the interest rate, inflation and exchange rates) using a vector error correction model (VECM) for experience Jamaica.

Mehmet Eryigit used the vector autoregressive model (VAR) with macroeconomic variables for Turkey (stock index (ISE 100), interest rates, exchange rates and Crude Oil Price) showed a dynamic relationship between the stock indices of Istanbul (ISE10) and the money market interest rates.

However, most studies on the interaction between the monetary policy and the financial stability have been applied to the developed economies. With the other economies, there are a few studies on the relationship between the monetary policy and financial stability in the southern Mediterranean countries. Possible causes can be explained by the lack of data for some countries. Indeed, the execution of an empirical analysis requires a large number of observations.

## Research Methodology

To analyze the role of the monetary policy contributing to financial stability, we apply a structural vector auto regression model the experience of some countries of the southern Mediterranean. Tunisia, Egypt, Morocco, Turkey, Lebanon and Jordan. Therefore, we chose these countries from the data availability.

## Model and methodology

The SVAR (structural vector auto-regressive) was developed by Sims and Bernanke [13,14]. It has become a popular tool in recent years in the analysis of the mechanism and economic and monetary transmission fluctuations.

The VAR modeling of the dynamic behavior of economic variables

is not perceived as a technique based on the economic theory. This criticism may be justified by the reduced form of VAR model. However, the structural form is based an underlying a theoretical framework and centered on short and long term.

In this case, the shocks affecting the system are structural, this means that they reflect the particularities of the economic structures of the studied countries. For this reason, our empirical study is based on a SVAR.

As per Hamilton VAR model been represented as:

$$Y_t = A_0 + A_1 Y_{t-1} + \dots + A_p Y_{t-p} + U_t \quad (1)$$

With  $y_t = (y_{1t}, \dots, y_{kt})$  vector of endogenous variables;  $A_0$  is the vector of parameters  $k \times 1$ ;  $A_1, \dots, A_p$  are matrices of dimension parameters  $K \times K$ , and  $U_t$  is orthogonal vector with the following characteristics :

$$U_t \sim N(0, S) \text{ et } E(U_t, U_s) = 0 \text{ for all } t \neq s.$$

The VAR model can be rewritten as follows:

$$A(I_k - A_1 L + A_2 L^2 - \dots - A_p L^p) y_t = A \varepsilon_t = B \varepsilon_t \quad (2)$$

where  $L$  is the lag operator;  $\varepsilon_t$  is the vector of innovation with  $\varepsilon_t \sim (0, S)$  et  $E(\varepsilon_t \varepsilon_s') = 0$  for all  $t \neq s$ ;  $u_t = B \varepsilon_t$ , with the following characteristics  $\varepsilon_t \sim N(0, I_k)$  et  $E(\varepsilon_t \varepsilon_s') = 0$  for all  $t \neq s$ .

The matrices  $A$  and  $B$  represent a short-term system. Long-term analysis of this system requires the VAR model or  $y_t$  to fluctuate around its mean and matrices  $A$  and  $B$  are not singular.

Therefore, by  $\bar{A} = (I_k - A_1 L + A_2 L^2 - \dots - A_p L^p)$  its inverse is obtained as  $\bar{A}^{-1}$ .

By pre-multiplying the equation (2) by the inverse matrix we have a long-term system as equation (3).

$$Y_t = \bar{A}^{-1} B \varepsilon_t = C \varepsilon_t \quad (3)$$

Then  $C = \bar{A}^{-1} B$  is the long-term matrix response to shocks. Then  $C = \bar{A}^{-1} B$  is the long-term matrix response to shocks.

Since the goal of our empirical analysis is to evaluate the response of the financial variables to the monetary policy shock, the methodology of the analysis of the impulse response is explained by the monetary policy shock. The correlation of the error term may indicate that a shock of a variable is likely by a shock of another variable.

Therefore, we assume that the structural shocks are orthogonal, which means that the covariance matrix of the VAR residuals transmits information on the coefficients of the simultaneous relationships between endogenous variables [15]. The relationship between the reduced form of disturbances  $U_t$  and structural shocks  $\varepsilon_t$  is as follows:

$$U_t = B^* \varepsilon_t,$$

Or  $B$  is a triangular matrix obtained from a Cholesky decomposition of the covariance matrix  $\Sigma_u$ , as  $BB' = \Sigma_u$ .  $\varepsilon_t$  represent the shock of monetary policy.

## Data

It the end, to test the link between the monetary policy and financial stability, we identify the monetary and financial variables.

Similarly, we intend to find out establish whether the link between the monetary policy and financial stability is procyclical, and empirically discover of the financial variables respond in the case of an interest rate shock. To answer the question, we consider the following

four variables:

➤ **MMIR:** The Money Market Interest Rates: It is an instrument for monetary policy in our empirical research. We used the discount rate for Egypt and Lebanon.

The discount rate is the interest rate used in the money market for short-term loans. It is the name given to a policy rates by several central banks (Japan, Canada and the United States).

This variable has been extracted from the International Financial Statistics of the IMF.

➤ **NEER:** Nominal Effective Exchange Rate: This rate expresses the units currency local against the US dollar (USD). The stability of the exchange rate is important in the development of foreign investment.

➤ **ICP:** index of consumer prices: It is an indicator of economic growth can track the financial and economic health of a country.

➤ **SI:** Stock Index: It is an instrument that measures the stock market performance. It provides a measure of financial stability.

The data are collected covering the period 2006: 1 2013: 12. The data was compiled from the International Financial Statistics of the IMF.

## Results and Interpretations

### Augmented dickey fuller test

In order to study the stationary data level, we have conducted unit root test on the variables in levels. According to Table 1 in the Appendix 1, the results of the Augmented Dickey -Fuller test showed that variables of the money market interest rate ( MMIR ), the index of consumer prices (ICP) the nominal effective exchange rate (NEER) and stock index ( SI ) for these six countries have not stationary, therefore, are unit roots.

We will now proceed to the ADF test in first difference (Table 2 in Appendix 1). The unit root analysis using the Augmented Dickey Fuller (ADF) indicates that the variables are stationary. The ADF statistics computed on the variables are all lower than the critical value at 5% level. Therefore, the cointegration relationship is likely to exist.

Determining the number of lagged differences of a structural vector Auto-regressive model is an important step in our empirical study. The AIC and SC tests indicate one lagged difference for Tunisia and Turkey, two lagged differences for Morocco, Egypt and Lebanon and three lagged difference for Jordan.

### Johansen cointegration test

The study of cointegration can test the existence of a long-term stable relationship between the number of variables. It can retain the variables of a same degree of integration. To test cointegration, we choose between the test of Engel, and that Johansen. The latter is based on the statistics of the trace and the maximum eigenvalue. We accept the existence of a cointegration relationship if the statistics of the trace and the maximum value exceeds the critical value. Therefore we estimate a VECM (Vector Error Correction Model) of which the results are presented in the Appendix. The trace and the maximum value tests for the data about Tunisia, Egypt, and Turkey and Lebanon (Appendix 1, Table 2) suggest the absence of a cointegration relationship. Therefore, we reject the null hypothesis of cointegration because the trace and maximum tests are less than the critical value at 5%. As a consequence, we apply the estimated VAR model.

Based on the trace and the maximum eigenvalue, the Johansen cointegration test shows at the 5% level, there is a cointegration relationship ( $r=1$ ) for Morocco and two cointegrating relationships ( $r=2$ ) for Jordan between variables.

### Studies of causal

The existence of a cointegration relationship between the variables causes the existence of a causal relationship. The study of the direction of causality between the variables is very important. For this reason, we will carry out the classic causality test in the Granger (Appendix 2). The results show the existence of a unidirectional causality of the price index to the stock indices and of the exchange rate to the TIMM in the Moroccan economy.

For Tunisia, Turkey, Egypt and Lebanon, it is not long-term relationship, but the causality between the series enables us to estimate a VAR model. The Interpretation of the results of the SVAR model is based on the response functions.

### Analysis impact of shock money market interest rate

**The impulse response function to an interest rate shock in Tunisia:** Figure 1 in Appendix 3 shows the responses of the financial variables for Tunisia to an interest rate shock. The analysis of the impact of a shock on the money market interest rates (variable instrument of monetary policy) on macroeconomic variables (variables instrument of financial stability) will be performed through impulse response functions. The money market interest rates shock generates a relatively small decrease in the index of consumer prices. The interest rate is an instrument used by the central bank to control inflation. Claudio Borio and Philip Lowe state what a monetary regime that ensures price stability ensures the stability of the financial system.

With the monetary shock effect (an increase of the interest rates), ongoing equity shares react negatively. This result is consistent with previous studies, of Keray [6], Humpe and Macmillan [16], Brigitte and Sushanta [5]. Vasile et al. [17]. The nominal exchange rate responds to the money market interest rates shock by depreciation, but this effect is not statistically significant. The lack of reactivity of the nominal exchange rate to monetary shock implies that it does not contribute to the stability of the financial system.

**The impulse response function to an interest rate shock in Egypt:** Figure 2 in Appendix 3 shows the responses of the financial variables for Egypt to an interest rate shock. Our empirical results show that after a monetary policy shock by the interest rate, all variables react in accordance with economic theory: A decrease in the index of consumer prices and prices of stocks. All these effects are statistically significant. The response of these indicators is similar to those of Tunisia.

The response functions to money market interest rate shocks showed a significant relationship between the money market interest rates and the exchange rate. This relationship is also confirmed by Anzuini and Levy who found out that increasing monetary policy rates led to the appreciation of local currencies. The exchange rate stability plays an important role in the development of foreign investment and the minimization the risk of the debtors. Kako Kviossi [18] the negative coevolution between the interest rate and the exchange rate is desirable in the monetary policy. An exogenous increase in the interest rates by the central bank that does not lead to an appreciation of the local currency shows that there is an imbalance in the financial system.

**The impulse response function to an interest rate shock in Lebanon:** Figure 3 in Appendix 3 shows the responses the

macroeconomic variables in Lebanon to an interest rate shock. As in the case of Tunisia and Egypt, the index of consumer prices followed a downward trend, the effect is statistically significant. This result, which is expected, shows that these economies react positively to the decisions of the monetary authorities. In addition, an interest rate shock raises the nominal exchange rate which then starts to decrease and finally stabilizes. This result is consistent with the study of Muazu and Alhassan. Regarding on the response of the stock shares, its can be noticed that the interest rate positively influenced the growth of the share price, however this effect was not statistically significant.

#### **The impulse response function to an interest rate shock in Turkey:**

Figure 4 in Appendix 3 shows the responses of the macroeconomic variables to a shock of the interest rate in Turkey. We note that the nominal exchange rate responds counter-intuitively. According to Domitrova, in the short term, the depreciation of the currency leads to a decline of the share prices. On the other hand, the depreciation of the exchange rate suggests a higher inflation in the future, which makes investors suspicious about business performance.

In response to a interest rate shock, index of consumer prices decreased slightly, but this decrease is significant and persistent, and the stock price drop, the type of response is similar to Tunisia and Egypt. This result is supported by Mehmet study, who found a significant relationship between the interest rate and stock index of Istanbul (ISE100).

**The impulse response function to an interest rate shock in Morocco:** The responses of the macroeconomic variables to a shock in the interest rate of Morocco (Figure 5, Appendix 3) show a depreciation of the local currency against the US dollar and an increase (light) of the index of consumer prices. These results are not statistically significant.

In response to a shock to the interest rates shock, the Moroccan stock indexes show a permanent depreciation.

**The impulse response function to an interest rate shock in Jordan:** The impulse response function for Jordan (Figure 6 Appendix 3) shows that the share prices depreciate in the short term and then show a significant appreciation. Similarly, the response of the consumer prices positively varies from period to period positively. This effect is not consistent with other responses, since the stock indexes depreciate under the effect of the monetary policy shock and this effect is statistically significant.

Our empirical results on the relationship between the monetary policy and the Stock prices (variable instrument for financial stability) show a significant relationship between these two variables in Tunisia, Morocco, Egypt, Turkey and Jordan, which means that the monetary market interest rate is an effective instrument of financial stability. We can say that the monetary policy in these countries should target the stock prices to combat the accumulation of financial imbalance.

Money market interest rates have a crucial importance for the financial markets valuation, there is a significant relationship between the stock share prices and the money market rates in all these countries excepting Jordan. The exchange rate shock impact on prices is significant for Tunisia, Egypt, Lebanon and Turkey. Hence, the interest rate is conducive to financial stability. Janet L Yellen states that price stability contribute not only to the efficient allocation of resources in the real economy, but also to the efficiency of financial markets, which promotes financial stability.

In the currency market, there is a significant relationship between the nominal exchange rate and the monetary interest rate for Egypt

and Lebanon. Therefore, this result shows that the nominal exchange rate may be an effective channel of the monetary policy transmission.

Our empirical results show that the effectiveness of the money market rates affecting the stock share prices depends on the strategy of the monetary policy. We conclude that monetary stability generates financial stability (represented by the stock price) suggesting that monetary stability from the interest rate adjustment presents a prerequisite for financial stability for Tunisia, Turkey, the Egypt and Morocco.

## **Conclusion**

During the nineties, a broad consensus regarding the objective of the monetary policy. The aim of central banks is to maintain the price stability. In general, the financial crisis leads to the reexamination of the macroeconomic and financial stability. To mitigate the risks, it is important that price stability remain the primary objective of the monetary policy while maintaining financial stability. This helps at the central bank "fight against the wind", while maintaining its primary objective of price stability.

Our empirical results show that the effectiveness of the money market rates affecting the stock prices depends on the strategy of the monetary policy. In countries that adopt a flexible exchange rate regime (Tunisia, Morocco, Egypt and Turkey), the interest rate is conducive to financial stability. Any time, countries that adopt a fixed exchange rate regime (Jordan and Lebanon), the interest rate is not an effective tool to promote financial stability.

Therefore, there is a significant relationship between the monetary policy and financial stability in the southern Mediterranean countries. To take financial stability as a permanent objective for the central bank, banks have to understand and implement macroprudential instruments. This can raise a policy debate on the macroprudential policy and financial stability.

The combination of the price stability and financial stability objectives for the central bank returns explicitly integrates the issue of macroprudential regulations.

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