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Monetary policy and financial stability: empirical evidence from South Mediterranean countries

Saoussen Ouhibi
University of sfax , Tunisia
saoussenouhibi@yahoo.fr
Sami Hammami
University of sfax, Tunisia
sami _hammami2005@yahoo.fr

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 analyze the role of monetary policy to contribute to financial stability using a structural vector Auto-regressive model .our empirical results show that the effectiveness of short –term interest rates in affecting selected asset prices depends on the strategy of monetary policy . For countries that adopt a flexible exchange rate regime (Tunisia, Marocco, Egypt and Turkey), the interest rate is conducive to financial stability. But, countries that adopt a fixed exchange rate regime (Jordan and Lebanon), the interest rate is not an effective tool for promoting financial stability.

Keywords: monetary policy, financial stability, Structural Vector Autoregressive model.
JEL Code: E40, E44

I. **Introduction**

The global financial crisis, which began in summer 2007 and deepened following the collapse of Lehman Brothers in September 2008, led to a slowdown in economic activity and the increase of the global financial volatility. While the global economic crisis has led to recession and negative economic growth in many parts of the world, the emerging economies in the Mediterranean basin have also faced declining economic activity, although there seems to be considerable variation in the relative magnitudes and timing.

The global financial crisis that erupted is a sobering reminder of the critical role financial systems play in economic development. When financial systems perform their resource and productivity and contribute to higher growth of output and employment and to declining poverty and inequality.

In this context, the international economic and financial crisis has revealed the fundamental problems of economic policy which states should meet after the crisis and in particular the lessons of the crisis for monetary policies. There is a broad consensus about the financial crisis has led an overhaul of the monetary policy focused mainly on maintaining price stability, it is not a sufficient condition for financial stability. In addition, the crisis accelerated the introduction of a new field of rules called macro-prudential policy, inspired by the first contributions of Crockett (2000) was based on the finding to ensure the soundness and safety of individual financial institutions is not enough to guarantee the stability of the entire financial system and there is a need for a systemic approach to financial stability.

The central banks of the developed world have opted for a policy for setting short-term interest rates for the primary purpose of inflation targeting. Other objectives are supposedly but occupy the lowest place on the agenda. Among them is the goal of maintaining financial stability, the responsibility for what has long been a part of central banks.

The concept of financial stability is relatively new and there is no widely accepted definition or model or analytical framework to assess the stability of the financial system for example, one can define financial stability in terms of its opposite. Crockett (1997) defines financial instability as a situation in which economic performance is potentially affected by fluctuations in the price of financial assets. The link between monetary policy and asset price movements was of perennial interest to policy makers and academic researchers. In this document, financial stability is defined in terms of changes in stock prices, the nominal effective exchange rate, index of consumer prices.

More generally a concern for financial stability can lead to financial domination. To mitigate these risks, it is important that price stability remains the primary objective of monetary policy and a lexicographical order with financial stability is maintained. This will allow the central bank to lean against the wind, while maintaining its primary objective of price stability. (non de l'auteur science direct) . Central banks are no longer a part of the monetary transmission channel, but became the main subjects of many monetary policy interventions to maintain financial stability. In fact, the question of the role of central banks in the regulation of asset prices (generally in financial stability) was widely discussed from a dozen years.

In our paper, in the context of the evidence that monetary policy oriented towards price stability promotes financial stability over time, we look at the experience of the six countries of the southern Mediterranean between 2006M1-2013M12.

II. Literature Review

The importance of the stability of the financial sector was recently recognized by the monetary policy for the achievement of sustainable economic growth and there is a wave of empirical research on the importance of monetary stability and financial stability. These studies use proxy variables for financial stability and proxy variables for monetary policy. Examples of recent studies are Cocris Vasile Anca Elena Nucu (2013), Anca Elena Nucu (2013), Brigitte Granville, Sushanta Mallick (2009), Keray Raymond (2009), Christophe Blot et al (2014).

Cocris Vasile Anca Elena Nucu (2013) used the structural vector autoregressive models and the impulse response function to determine the implications of monetary policy on financial stability in the experience of Central and Eastern Europe (CEE) during 2003M01-2012M06. They analyzed the impact of short-term interest rates on industrial production, the loan to deposit ratio for the banking system, stock prices and exchange rates (proxies for financial stability). The empirical results show that the effectiveness of short-term interest rates affect asset prices depends on the strategy of 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.

With the same sample and econometric model, Nucu Anca Elena (2013), found that the money market interest rate is conducive to financial stability in the case of the Czech Republic and Poland. In the case of Bulgaria and Lithuania, countries wich lost their monetary policy autonomy, the changes in ECB refinancing interet rate are not in accordance with specifically domestic conditions. Hungary and Romania, the instrument of the interest rate used for inflation targeting, is not conducive to financial stability. Abdullah et al., (2013) study the determinants of money demand in case of Pakistan. They conclude inflation is an important determinants of money in case of Pakistan.

Brigitte Granville, Sushanta Mallick (2009) used a VAR-based approach -restriction sign in the experience of 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 down 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 is a crucial issue for monetary stability. Some authors have suggested introducing financial stability objective of the central bank. Dominique Pépin (2011), the European Central Bank reacts significantly to the financial asset prices increasing its key rate when the stock price is on - évalué.

Christophe Blot et al (2014), 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 a low-inflation environment. Ali (2015) mentioned that monetary policy is the keep factor of macroeconomic stability in an economy. This study further recommended that for macroeconomic stability a sound and stable monetary policy is necessary. Such As in Granville and Mallick (2009), we define financial stability in terms of changes in stock prices. the academic literature abounds in studies that examine the relationship between stock prices and monetary indicators in Jamaica (Keray Raymond (2009)), Germany and the United Kingdom (Elena Corallo (2006)), the developed and developing countries (Md. Mahmudul Alam Md. Gazi Salah Uddin (2OO9)), and emerging countries (Murudoglu et al (2001)).

Keray Raymond (2009), found a long-term relationship between stock prices and monetary variables (monetary aggregates M2 and M3, the interest rate, inflation and exchange rates) to using a vector erreur correction model (VECM) to experience Jamaica. Mehmet Eryigit (2014) used the vector autoregressive model (VAR) for Turkey with macroeconomic variables (stock index (ISE 100), interest rates, exchange rates and Crude Oil Price) showed a dynamic relationship between stock indices of istanbul (ISE10) and the money market interest rates. However, most research on the interaction between monetary policy and financial stability have been applied to developed economies. Similar to other economies, there is a lack of studies on the relationship between monetary policy and financial stability in the countries of the southern Mediterranean. 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.

III. Data Model and Methodology

To analyze the role of monetary policy to contribute to financial stability, we follow the standard literature and apply a structural vector autoregression 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.

III.I Model and Methodology

The SVAR (structural vector auto-regressive) was developed by Sims (1980) and Bernanke (1986). It has become a popular tool in recent years in the analysis of the mechanism and economic and monetary transmission fluctuations. VAR modeling the dynamic behavior of economic variables are not perceived as a technique based on economic theory. This criticism may be justified for VAR models reduced form VAR. However, the structural form based on a theoretical framework in -jacent and focuses on identifying constraints in the short and long terms. In this case, the shocks to the system are structural, they reflect the particularities of economic structures of the studied countries. Therefore, our empirical study is based on a SVAR. We follow Hamilton (1994), presenting the structural VAR model. The VAR (vector autoregressive) can be represented as follows:

$$\mathbf{Y_t = A_0 + A_1 Y_{t-1} + \ldots + A_p Y_{t-p} + U_t} \qquad \mathbf{(1)}$$

With $y_t = (y_{tt}, \ldots, y_{kt})$ vector of endogenous variables ; A_0 is the vector of parameters k×1 ; $A_1 \ldots A_P$ are matrices of dimension parameters K×K , and U_t is orthogonal vector with the following characteristics :
$U_t \sim N(0, S)$ et $E(U_t, U_s) = 0$ for all $t \neq s$.
The VAR model can be rewritten as follows:

$$\mathbf{A(I_K - A_1 L + A_2 L^2 - \ldots - A_p L^p) y_t = A\varepsilon_t = Be_t} \qquad \mathbf{(2)}$$

where L is the lag operator; εt is the vector of innovation with $\varepsilon t \sim (0, S)$ et $E(\varepsilon t \varepsilon'_s) = 0$ for all $t \neq s$; $u_t = Be_t$, with the following characteristics $e_t \sim N(0, I_k)$ et $E(\mathbf{ete}'_s) = 0$ for all ≠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 $\mathbf{\bar{A} = (I_k - A_1 L + A_2 L^2 - \ldots - A_p L^p)}$ its inverse is obtained as $\mathbf{\bar{A}^{-1}}$.
By pre-multiplying the equation (2) by the inverse matrix we have a long-term system as equation (3).

$$\mathbf{Y_t = \bar{A}^{-1} Be_t = Ce_t .} \qquad \mathbf{(3)}$$

Then C = Ā-1 B is the long-term matrix response to shocks. Then C = Ā-1 B is the long-term matrix response to shocks.
Since the goal of our empirical analysis is to evaluate the response of financial variables to a monetary policy shock, we explain the methodology of the analysis of the impulse response. The shock of monetary policy is the only shock. The correlation of the error term may indicate that a shock of a variable is succeptible to be accompanied by a shock of another variable. Therefore, we assume that the structural shocks are orthogonal, which means that covariance matrix of the VAR residuals transmits information on the coefficients of simultaneous relationships between endogenous variables (Jarocinski 2010). The relationship between the reduced form disturbances U_t and structural shocks εt is as follows:

$U_t = B^* \varepsilon t$,
Or B is a triangular matrix obtained from a Cholesky decomposition of the covariance matrix $\sum u$, as $BB' = \sum u$. ε_{ir} represent the shock of monetary policy.

III.II Data

At the end to test the link between monetary policy and financial stability, we identify the variable monetary and financial variables. Similarly, we intend to establish whether the link between monetary policy and financial stability is procyclical or not, and discover how empirical response of financial variables in the case of 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, the United States ......).
This variable has been extracted from the International Financial Statistics of the IMF.

- **NEER**: the nominal effective exchange rate: This rate expresses the US dollar units (USD) for a single unit of TND. 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: is an instrument that measures the stock market performance. It provides a measure of financial stability.

The frequency is monthly data covering the period 2006: 1 2013: 12. The data was compiled from the International Financial Statistics of the IMF.

IV. Results and Interpretations

IV.I Augmented Dickey Fuller test

In order to study the stationary data level, we have conducted unit root test on the variables in levels.
After to Table 1 in the appendix , results of Augmented Dickey -Fuller test showed that variables of 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. Thus there unit roots.

We will now proceed to the ADF test in first difference (table 2 in apprendix). The unit root analysis selon Augmented Dickey Fuller (ADF) indicate that variables are stationary. The ADF statistics computed on the variables are all lower than the critical value at the 5% level. Therefore the possibility of existence the cointégration relationship. 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 indicate one lagged difference for tunisia and Turkey, two lagged differences for Morocco, Egypt and Lebanon and three lagged difference .

IV.II Johansen Cointegration Test

The study of cointegration can test the existence of a stable long-term relationship between the number of variables. It can retain the variables of a same degree of integration. To test a cointegration, there are two choice test Engel (1987), Johansen (1988) (based on 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. The trace and the maximum value tests for the data in Tunisia, Egypt, and Turkey libanon (Appendix Table 2) suggests the absence of a cointegration relationship. We reject the null hypothesis of cointegration because trace and maximum tests are less than the critical value at the 5%. So we take 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 .Therefore we estimate a VECM (Vector Error Correction Model) and the results are presented in the appendix.

IV.III studies of causal

The existence of a cointegration relationship between the variables causes to the existence of a causal relationship. The study of the direction of causality between variables is very important. For this, we will make the classic causality test Granger (see annex). The results show the existence of a unidirectional causality of the price index to the stock indices and exchange rate to the TIMM in the Moroccan economy. For Tunisia, Turkey, Egypt and the lebanon, the absence of long-term relationship ,but the existence of a causality between sets allows us to estimate a VAR model . Interpretation of the results of the SVAR model is based on the response functions.

V. Analysis of the impact of Shock money market interest rate

V.I The impulse response function to an interest rate shock in the Tunisia

Analyzing the impact of a shock to money market interest rates (variable instrument of monetary policy) on macroeconomic variables (variables instrument of financial stability) will be done through impulse response functions. Money market interest rates shock generates a relatively small decrease in the index of consumer prices. The interest rate is a instrument used by the central bank in order to control inflation. Claudio Borio and Philip Lowe (2002), a monetary regime that ensures price stability ensures the stability of the financial system. With the monetary shock effect (an increase in interest rates), ongoing equity shares react negatively. This result is consistent with previous studies, such Keray R (2009), Humpe and Macmillan (2007), Brigitte G and Sushanta M (2009). Vasile Anca Elena C and N (2013). The nominal exchange rate responds to money market interest rates shock by a depreciation, but this effect is not significant statisquement. 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.

V.II The impulse response function to an interest rate shock in the Egypt

Figure 2 shows reponses of financial variables in the 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 significant statistiquements. The response of these indicators are similar to the case of Tunisia. The response functions to money market interest rates shocks showed a significant relationship between the money market interest rates and the exchange rate, this relationship is also confirmed by Anzuini and Levy (2007) find that increasing monetary policy rates led to the appreciation of local currencies. Exchange rate stability plays an important role in the development of foreign investment and minimizes the risk of the debtors. Kako Kviossi N (2002). The negative coevolution between the interest rate and the exchange rate is desirable in monetary policy. An exogenous increase in interest rates by the central bank that does not lead to an appreciation of the local currency means an imbalance in the financial system.

V.III The impulse response function to an interest rate shock in Lebanon

In Figure 3, responses of macroeconomic variables in the Lebanon to a 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, in the expected direction, shows that these economies react positively to the decisions of the monetary authorities. In addition, an interest rate shock raises the nominal exchange rate, then starts to decrease and finaly stabilizes. This result is consistent with the study Muazu I and M Alhassan (2014). On the response of the stock shares, we note that the interest rate positively influenced the growth of share price but this effect was not statistically significant.

V.IV The impulse response function to an interest rate shock in the Turkey

Figure 6 plots the responses of macroeconomic variables in turkey to a shock in the interest rate. We note that, nominal exchange rate responds counter–intuitively. According Domitrova (2005) in the short term, the depreciation of the currency led to a decline in share prices. The depreciation of the exchange rate suggests a higher inflation in the future, making 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 E study (2014) who found a significant relationship between the interest rate and stock index of Istanbul (ISE100).

V.V The impulse response function to an interest rate shock in Morocco

The responses of the macroeconomic variables in Morocco to a shock in the interest rate (Figure 4) 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 interest rates shock, stock indexes Marcaine shows a depreciation permanent.

V.VI The impulse response function to an interest rate shock in Jordan

The impulse response function shows, in the short term, and it marks a significant appreciation. Similarly, the response of the index of consumer prices varies from period to period positively. This effect is not consistent with other responses. The stock indexes depreciate under the effect of a monetary policy shock and this effect is statistically significant. Our empirical results on the relationship between monetary policy and Stock prices (variable instrument for financial stability) shows a significant relationship between these two variables in Tunisia, Morocco, Egypt, Turkey and Jordan, which means that monetary market interest rate is an effective instrument for financial stability. We can say that monetary policy in these countries should target prices of the stocks to combat accumulation of financial imbalance. Money market interest rates at a crucial importance for valorosation financial markets, we found a significant relationship between the prices of stock shares and money market rates in all these countries to the Jordan exception. 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 (2014) price stability not only contributes to the efficient allocation of resources in the real economy, but also the efficiency of financial markets, which promoting 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 transmission monetary policy. Our empirical results show that the effectiveness of money market rates by affecting the prices of stock shares depends on the strategy of monetary policy. We conclude that monetary stability generates to 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, Egypt and Morocco.

VI. Conclusions

During the nineties, a broad consensus about the objective of monetary policy. The Central banks have the objective of maintaining price stability. More generally, the financial crisis led to reconsider macroeconomic and financial stability. To mitigate the risks, it is important that price stability remains the primary objective of monetary policy with maintaining financial stability. This allows the central bank to "fight against the wind", while maintaining its primary objective of price stability. Our empirical results show that the effectiveness of money market rates by affecting the prices of prices stocks depends on the strategy of 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 for promote financial stability. Thus, there is a significant relationship between monetary policy and financial stability in the countries of the southern Mediterranean. To take financial stability as a permanent objective for the central bank, they will design and implement macro prudential instruments. This presents a policy debate on macro prudential policy and financial stability. The combination of the price stability and financial stability objectives for the central bank returns to explicitly integrate the issue of macro prudential regulations.

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Appendix 1: results of Augmented Dickey Fuller

Table 1: ADF test in first difference

Pays	**variables**	**Valeurs ADF**			**The stationarity**
		(1)	**(2)**	**(3)**	
Tunisia	MMIR	-1.593983	-1.622602	-0.344831	non-stationary
	ICP	-0.660891	-2.389149	2.305509	non-stationary
	NEER	-0.530760	-2.712697	0.812888	non-stationary
	SI	-2.712726	-1.141494	2.233028	non-stationary
Morocco	MMIR	-6.885316*	-6.885907*	-0.299525	stationary
	ICP	-2.012646	-1.950558	4.318622	non-stationary
	NEER	-3.122820	-3.172038	-0.625394	non-stationary
	SI	-2.680109	-2.767840	0.699763	non-stationary
Lebanon	MMIR	-1.010698	-1.977828	-1.088519	non-stationary
	ICP	-1.310897	-6.374682	2.011725	non-stationary
	NEER	-1.923621	-2.080015	0.055675	non-stationary
	SI	-2.370804	-2.703219	-0.306571	non-stationary
Turkey	MMIR	-0.791002	-2.205861	-1.364115	non-stationary
	ICP	-0.803281	-4.231292	7.681095	non-stationary
	NEER	-0.799763	-2.554779	1.001858	non-stationary
	SI	-3.021494*	-6.559770	0.244867	stationary

Tableau 2: ADF Test in first difference

Pays	Variables	Valeur ADF			the stationarity
		(1)	(2)	(3)	
Tunisie	**D(MMIR)**	-10.64969	-10.62989	-10.70478	stationary
	D(ICP)	-7.792294	-7.749966	-7.476135	stationary
	D(NEER)	-7.351286	-7.449143	-7.310680	stationary
	D(SI)	-8.455473	-8.882904	-8.117211	stationary
Maroc	**D(ICP)**	-9.118558	-9.315565	-4.617942	Stationary
	D(NEER)	-7.543490	-7.546324	-7.560775	Stationary
	D(SI)	-9.118827	-9.642992	-9.132676	stationary
Jordan	**D(ICP)**	-10.92029	-11.21757	-10.57132	Stationary
	D(SI)	-10.75734	-10.72262	-10.70872	stationary
Egypt	**D(MMIR)**	-8.933672	-8.905178	-8.981565	Stationary
	D(ICP)	-6.669266	-6.772082	-4.545968	Stationary
	D(NEER)	-5.530739	-10.15683	-10.27171	stationary
	D(SI)	-7.956377	-7.925504	-8.002275	
Lebanon	**D(MMIR)**	-9.695360	-9.642770	-9.643651	Stationary
	D(ICP)	-10.69335	-10.65678	-10.31490	Stationary
	D(NEER)	-7.854376	-7.820701	-7.896358	Stationary
	D(SI)	-7.751730	-7.673808	-7.799898	stationary
Turkey	**D(MMIR)**	-9.944984	-9.894060	-9.856978	stationary
	D(ICP)	-7.874140	-7.865779	-5.491800	stationary
	D(NEER)	-7.254502	-7.267605	-7.156987	stationary
	D(SI)	-10.86909	-8.859432	-8.954737	stationary

Appendix 2: Granger Causality test Tunisia

Null Hypothesis:	Obs	F-Statistic	Prob.
IPC does not Granger Cause IB	95	0.18566	0.6676
IB does not Granger Cause IPC		0.82348	0.3665
TC does not Granger Cause IB	95	0.52829	0.4692
IB does not Granger Cause TC		**4.04460**	0.0472
TIMM does not Granger Cause IB	95	**6.85441**	0.0103
IB does not Granger Cause TIMM		0.31478	0.5761
TC does not Granger Cause IPC	95	0.02513	0.8744
IPC does not Granger Cause TC		**7.52331**	0.0073
TIMM does not Granger Cause IPC	95	0.29267	0.5898
IPC does not Granger Cause TIMM		0.08206	0.7752
TIMM does not Granger Cause TC	95	**3.98252**	0.0489
TC does not Granger Cause TIMM		0.48319	0.4887

Morocco

Null Hypothesis:	Obs	F-Statistic	Prob.
IPC does not Granger Cause IB	94	**3.95787**	0.0226
IB does not Granger Cause IPC		1.11108	0.3337
TC does not Granger Cause IB	94	0.33157	0.7187
IB does not Granger Cause TC		2.87239	0.0618

TMM does not Granger Cause IB	94	2.00121	0.1412
IB does not Granger Cause TMM		3.01103	0.0543
TC does not Granger Cause IPC	94	0.50127	0.6075
IPC does not Granger Cause TC		0.43445	0.6490
TMM does not Granger Cause IPC	94	0.56227	0.5719
IPC does not Granger Cause TMM		1.99365	0.1422
TMM does not Granger Cause TC	94	1.59838	0.2080
TC does not Granger Cause TMM		**6.42084**	0.0025

Egypt

Null Hypothesis:	Obs	F-Statistic	Prob.
TC does not Granger Cause TMM	94	1.14214	0.3238
TMM does not Granger Cause TC		1.67634	0.1929
IPC does not Granger Cause TMM	94	0.00241	0.9976
TMM does not Granger Cause IPC		1.00570	0.3699
IB does not Granger Cause TMM	94	1.11383	0.3328
TMM does not Granger Cause IB		1.78831	0.1732
IPC does not Granger Cause TC	94	2.55837	0.0831
TC does not Granger Cause IPC		1.19209	0.3084
IB does not Granger Cause TC	94	0.40285	0.6696
TC does not Granger Cause IB		1.51845	0.2247
IB does not Granger Cause IPC	94	1.99507	0.1420
IPC does not Granger Cause IB		1.12486	0.3293

Jordan

Null Hypothesis:	Obs	F-Statistic	Prob.
IPC does not Granger Cause IB	93	1.69406	0.1743
IB does not Granger Cause IPC		1.61495	0.1918
TC does not Granger Cause IB	93	0.05436	0.9832
IB does not Granger Cause TC		0.93691	0.4265
TMM does not Granger Cause IB	93	1.02884	0.3840
IB does not Granger Cause TMM		1.50075	0.2201
TC does not Granger Cause IPC	93	0.45671	0.7132
IPC does not Granger Cause TC		0.06573	0.9779
TMM does not Granger Cause IPC	93	1.07086	0.3658
IPC does not Granger Cause TMM		0.98055	0.4058
TMM does not Granger Cause TC	93	1.06319	0.3691
TC does not Granger Cause TMM		0.10794	0.9552

Lebanon

Null Hypothesis:	Obs	F-Statistic	Prob.

IPC does not Granger Cause IB	94	1.13022	0.3276
IB does not Granger Cause IPC		0.94265	0.3934
TC does not Granger Cause IB	94	1.11409	0.3327
IB does not Granger Cause TC		0.64149	0.5289
TMM does not Granger Cause IB	94	0.74553	0.4774
IB does not Granger Cause TMM		0.40717	0.6668
TC does not Granger Cause IPC	94	0.09674	0.9079
IPC does not Granger Cause TC		0.85442	0.4290
TMM does not Granger Cause IPC	94	0.99148	0.3751
IPC does not Granger Cause TMM		0.82743	0.4405
TMM does not Granger Cause TC	94	0.80667	0.4496
TC does not Granger Cause TMM		0.94747	0.3916

Turkey

Null Hypothesis:	Obs	F-Statistic	Prob.
IPC does not Granger Cause IB	95	**13.0406**	0.0005
IB does not Granger Cause IPC		0.84325	0.3609
TMM does not Granger Cause IB	95	**13.8072**	0.0003
IB does not Granger Cause TMM		0.00087	0.9765
TC does not Granger Cause IB	95	**7.55399**	0.0072
IB does not Granger Cause TC		1.44090	0.2331
TMM does not Granger Cause IPC	95	0.15927	0.6908
IPC does not Granger Cause TMM		**4.20054**	0.0433
TC does not Granger Cause IPC	95	0.03909	0.8437
IPC does not Granger Cause TC		**4.01487**	0.0480
TC does not Granger Cause TMM	95	1.60012	0.2091
TMM does not Granger Cause TC		2.07279	0.1533

Appendix 3 : The impulse response function

Figure 1 :The impulse response function to an interest rate shock in the Tunisia

Model: Ae = Bu where E[uu']=I

Restriction Type: short-run text form

@e1 = C(1)*@u1

@e2 = C(2)*@e1 + C(3)*@u2

@e3 = C(4)*@e1 + C(5)*@e2 + C(6)*@u3

@e4 = C(7)*@e1 + C(8)*@e2 + C(9)*@e3 + C(10)*@u4

Where

@e1 represents IB residuals

@e2 represents IPC residuals

@e3 represents TC residuals

@e4 represents TIMM residuals

	Coefficient	Std. Error	z-Statistic	Prob.
C(2)	-0.005750	0.041117	-0.139832	0.8888
C(4)	-0.041343	0.151724	-0.272488	0.7852
C(5)	-0.319085	0.378549	-0.842915	0.3993
C(7)	-1.428778	1.097326	-1.302055	0.1929
C(8)	2.491531	2.746956	0.907015	0.3644

C(9)	-0.401316	0.741737	-0.541049	0.5885
C(1)	0.017105	0.001241	13.78405	0.0000
C(3)	0.006855	0.000497	13.78405	0.0000
C(6)	0.025293	0.001835	13.78405	0.0000
C(10)	0.182856	0.013266	13.78405	0.0000
Log likelihood	831.4085			

Estimated A matrix:

1.000000	0.000000	0.000000	0.000000
0.005750	1.000000	0.000000	0.000000
0.041343	0.319085	1.000000	0.000000
1.428778	-2.491531	0.401316	1.000000

Estimated B matrix:

0.017105	0.000000	0.000000	0.000000
0.000000	0.006855	0.000000	0.000000
0.000000	0.000000	0.025293	0.000000
0.000000	0.000000	0.000000	0.182856

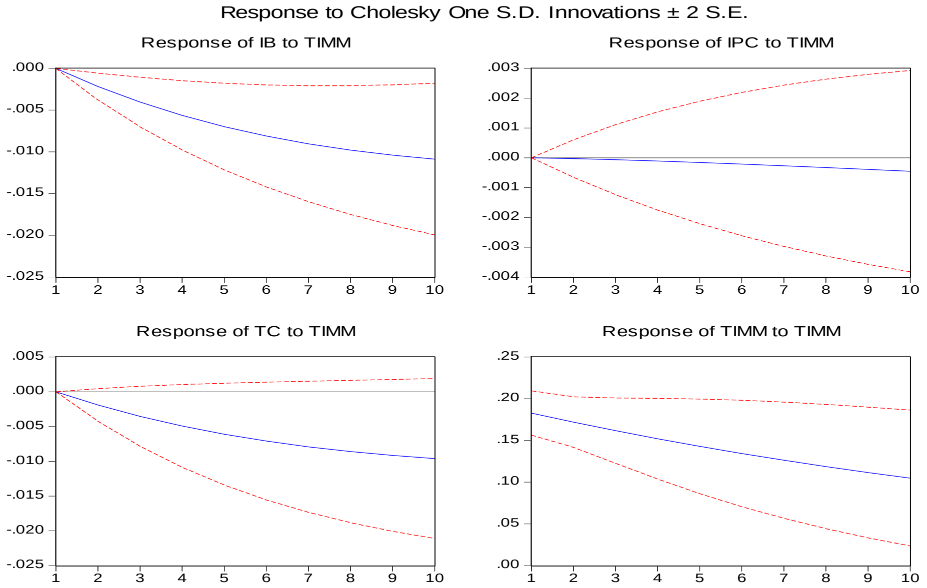

Figure 2 :The impulse response function to an interest rate shock in Egypt

Model: Ae = Bu where E[uu']=I
Restriction Type: short-run text form
@e1 = C(1)*@u1
@e2 = C(2)*@e1 + C(3)*@u2
@e3 = C(4)*@e1 + C(5)*@e2 + C(6)*@u3
@e4 = C(7)*@e1 + C(8)*@e2 + C(9)*@e3 + C(10)*@u4
Where
@e1 represents TMM residuals
@e2 represents TC residuals
@e3 represents IPC residuals
@e4 represents IB residuals

	Coefficient	Std. Error	z-Statistic	Prob.
C(2)	0.012615	0.015257	0.826868	0.4083
C(4)	0.000682	0.001213	0.562126	0.5740
C(5)	-0.003289	0.008170	-0.402528	0.6873
C(7)	-0.014596	0.013143	-1.110522	0.2668
C(8)	-0.063448	0.088460	-0.717247	0.4732

C(9)	1.159911	1.115800	1.039533	0.2986
C(1)	0.328226	0.023938	13.71131	0.0000
C(3)	0.048551	0.003541	13.71131	0.0000
C(6)	0.003846	0.000280	13.71131	0.0000
C(10)	0.041604	0.003034	13.71131	0.0000
Log likelihood	677.1556			

Estimated A matrix:

1.000000	0.000000	0.000000	0.000000
-0.012615	1.000000	0.000000	0.000000
-0.000682	0.003289	1.000000	0.000000
0.014596	0.063448	-1.159911	1.000000

Estimated B matrix:

0.328226	0.000000	0.000000	0.000000
0.000000	0.048551	0.000000	0.000000
0.000000	0.000000	0.003846	0.000000
0.000000	0.000000	0.000000	0.041604

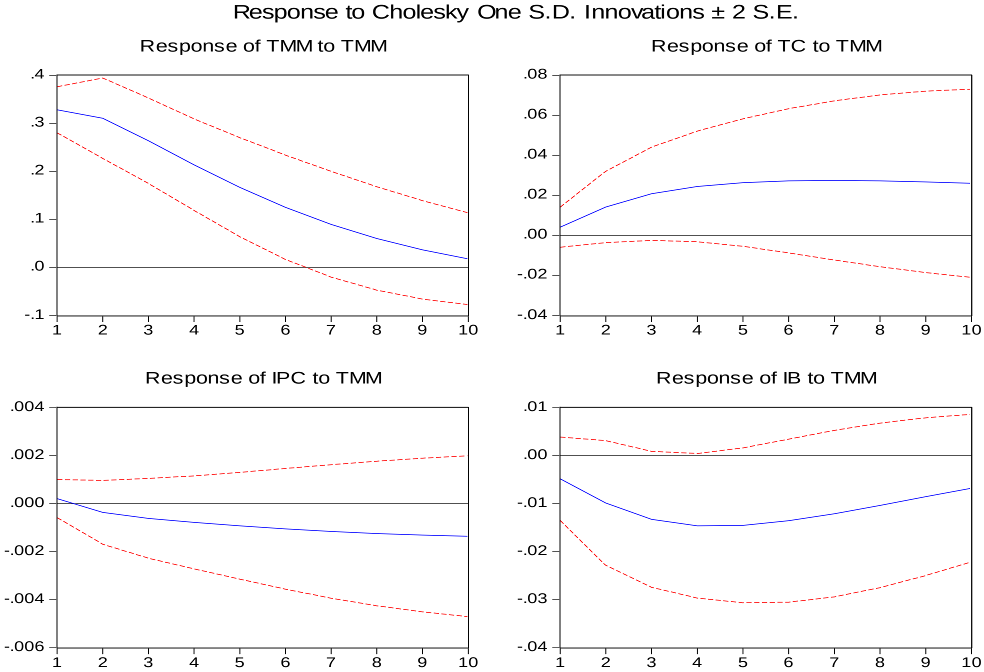

Figure 3 :The impulse response function to an interest rate shock in Lebanon

Model: Ae = Bu where E[uu']=I

Restriction Type: short-run text form

@e1 = C(1)*@u1

@e2 = C(2)*@e1 + C(3)*@u2

@e3 = C(4)*@e1 + C(5)*@e2 + C(6)*@u3

@e4 = C(7)*@e1 + C(8)*@e2 + C(9)*@e3 + C(10)*@u4

Where

@e1 represents IB residuals

@e2 represents TC residuals

@e3 represents IPC residuals

@e4 represents TMM residuals

	Coefficient	Std. Error	z-Statistic	Prob.
C(2)	-0.005449	0.007646	-0.712653	0.4761
C(4)	0.059949	0.082210	0.729220	0.4659
C(5)	-0.744837	1.105954	-0.673480	0.5006

C(7)	-0.739320	0.977517	-0.756325	0.4495
C(8)	-8.157280	13.14487	-0.620568	0.5349
C(9)	-0.589355	1.222954	-0.481911	0.6299
C(1)	0.021996	0.001604	13.71131	0.0000
C(3)	0.001631	0.000119	13.71131	0.0000
C(6)	0.017485	0.001275	13.71131	0.0000
C(10)	0.207319	0.015120	13.71131	0.0000
Log likelihood	956.9032			

Estimated A matrix:

1.000000	0.000000	0.000000	0.000000
0.005449	1.000000	0.000000	0.000000
-0.059949	0.744837	1.000000	0.000000
0.739320	8.157280	0.589355	1.000000

Estimated B matrix:

0.021996	0.000000	0.000000	0.000000
0.000000	0.001631	0.000000	0.000000
0.000000	0.000000	0.017485	0.000000
0.000000	0.000000	0.000000	0.207319

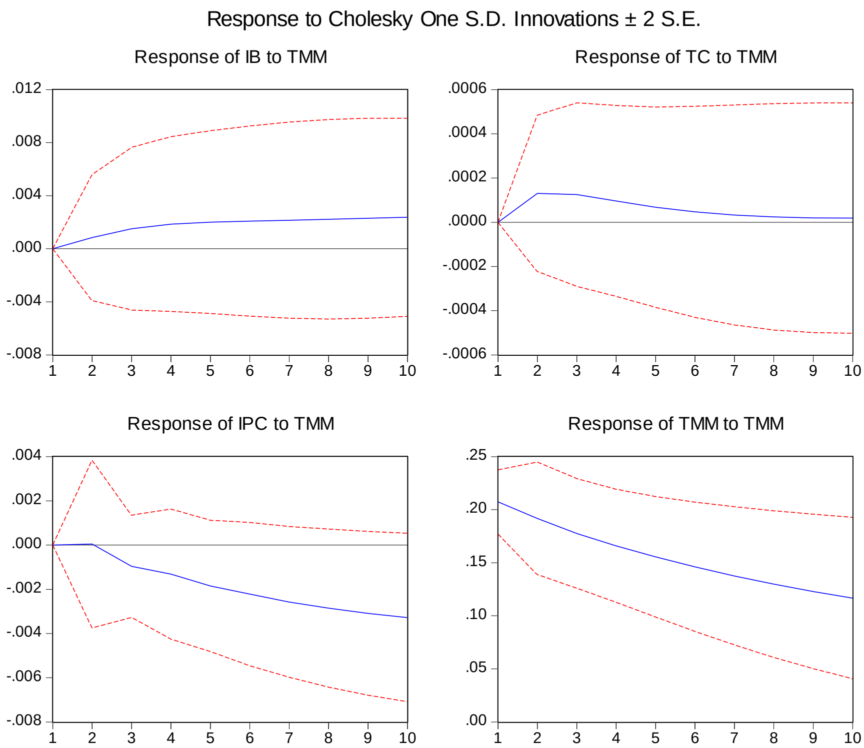

Figure 4 :The impulse response function to an interest rate shock in Turquie

Model: Ae = Bu where E[uu']=I
Restriction Type: short-run text form
@e1 = C(1)*@u1
@e2 = C(2)*@e1 + C(3)*@u2
@e3 = C(4)*@e1 + C(5)*@e2 + C(6)*@u3
@e4 = C(7)*@e1 + C(8)*@e2 + C(9)*@e3 + C(10)*@u4
Where
@e1 represents IPC residuals
@e2 represents IB residuals
@e3 represents TC residuals
@e4 represents TMM residuals

	Coefficient	Std. Error	z-Statistic	Prob.

C(2)	0.720579	3.612121	0.199489	0.8419
C(4)	1.518678	1.389677	1.092828	0.2745
C(5)	-0.119607	0.039464	-3.030810	0.0024
C(7)	9.897127	31.04597	0.318789	0.7499
C(8)	0.369252	0.917529	0.402442	0.6874
C(9)	1.548249	2.277806	0.679710	0.4967
C(1)	0.003602	0.000261	13.78405	0.0000
C(3)	0.126822	0.009201	13.78405	0.0000
C(6)	0.048782	0.003539	13.78405	0.0000
C(10)	1.083015	0.078570	13.78405	0.0000
Log likelihood	470.8267			
Estimated A matrix:				
1.000000	0.000000	0.000000	0.000000	
-0.720579	1.000000	0.000000	0.000000	
-1.518678	0.119607	1.000000	0.000000	
-9.897127	-0.369252	-1.548249	1.000000	
Estimated B matrix:				
0.003602	0.000000	0.000000	0.000000	
0.000000	0.126822	0.000000	0.000000	
0.000000	0.000000	0.048782	0.000000	
0.000000	0.000000	0.000000	1.083015	

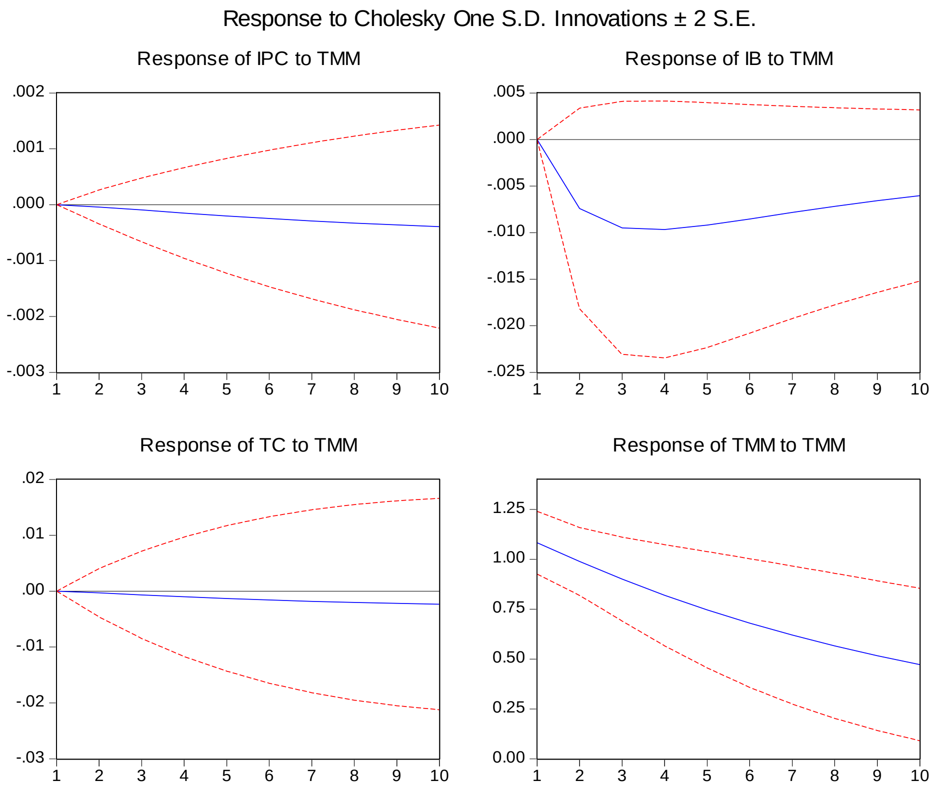

Figure 5 : The impulse response function to an interest rate shock in Marroco

Model: Ae = Bu where E[uu']=I

Restriction Type: short-run text form

@e1 = C(1)*@u1

@e2 = C(2)*@e1 + C(3)*@u2

@e3 = C(4)*@e1 + C(5)*@e2 + C(6)*@u3

@e4 = C(7)*@e1 + C(8)*@e2 + C(9)*@e3 + C(10)*@u4

Where

@e1 represents TMM residuals
@e2 represents TC residuals
@e3 represents IPC residuals
@e4 represents IB residuals

	Coefficient	Std. Error	z-Statistic	Prob.
C(2)	-0.055904	0.041419	-1.349720	0.1771
C(4)	0.000236	0.000796	0.296921	0.7665
C(5)	-0.002215	0.001963	-1.128453	0.2591
C(7)	0.000655	0.005128	0.127756	0.8983
C(8)	-0.003783	0.012728	-0.297251	0.7663
C(9)	0.376820	0.664260	0.567278	0.5705
C(1)	0.384878	0.028070	13.71131	0.0000
C(3)	0.154556	0.011272	13.71131	0.0000
C(6)	0.002942	0.000215	13.71131	0.0000
C(10)	0.018945	0.001382	13.71131	0.0000
Log likelihood	652.4803			

Estimated A matrix:

1.000000	0.000000	0.000000	0.000000
0.055904	1.000000	0.000000	0.000000
-0.000236	0.002215	1.000000	0.000000
-0.000655	0.003783	-0.376820	1.000000

Estimated B matrix:

0.384878	0.000000	0.000000	0.000000
0.000000	0.154556	0.000000	0.000000
0.000000	0.000000	0.002942	0.000000
0.000000	0.000000	0.000000	0.018945

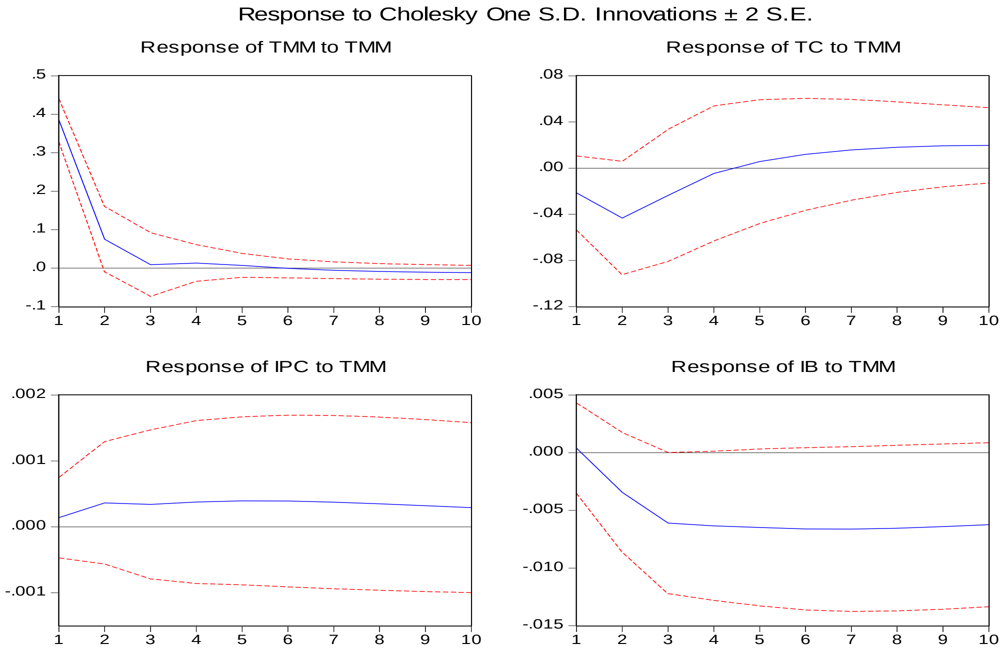

Figure 6:The impulse response function to an interest rate shock in Jordan

Model: Ae = Bu where E[uu']=I
Restriction Type: short-run text form
@e1 = C(1)*@u1
@e2 = C(2)*@e1 + C(3)*@u2
@e3 = C(4)*@e1 + C(5)*@e2 + C(6)*@u3
@e4 = C(7)*@e1 + C(8)*@e2 + C(9)*@e3 + C(10)*@u4

Where
@e1 represents IB residuals
@e2 represents IPC residuals
@e3 represents TC residuals
@e4 represents TMM residuals

	Coefficient	Std. Error	z-Statistic	Prob.
C(2)	-0.015819	0.065210	-0.242591	0.8083
C(4)	-0.000784	0.002068	-0.379119	0.7046
C(5)	0.003173	0.003287	0.965235	0.3344
C(7)	7.313517	2.235776	3.271131	0.0011
C(8)	-6.571571	3.569128	-1.841226	0.0656
C(9)	95.26973	112.0290	0.850402	0.3951
C(1)	0.029796	0.002185	13.63818	0.0000
C(3)	0.018738	0.001374	13.63818	0.0000
C(6)	0.000594	4.36E-05	13.63818	0.0000
C(10)	0.641736	0.047054	13.63818	0.0000
Log likelihood	900.8957			
Estimated A matrix:				
1.000000	0.000000	0.000000	0.000000	
0.015819	1.000000	0.000000	0.000000	
0.000784	-0.003173	1.000000	0.000000	
-7.313517	6.571571	-95.26973	1.000000	
Estimated B matrix:				
0.029796	0.000000	0.000000	0.000000	
0.000000	0.018738	0.000000	0.000000	
0.000000	0.000000	0.000594	0.000000	
0.000000	0.000000	0.000000	0.641736