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MONETARY POLICY TRANSMISSION AND TARGETING MECHANISMS IN THE MENA REGION

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Abstract

Since the early 1990s some industrialized economies have implemented a monetary policy regime shift known as inflation targeting. This shift was justified by the difficulties posed by targeting the nominal exchange rate, or in some instances money supply. Given the very encouraging experience of developed countries, a number of MENA countries decided to adopt price stability as an explicit monetary policy objective. Using sophisticated time series econometric techniques, this study aims to highlight the monetary transmission mechanism across the region, and to assess how successful the MENA countries have been in making a smooth transition to inflation targeting. The empirical results indicate that the recent success of Turkey and Egypt in adopting flexible exchange rates has helped those countries shift to an inflation targeting regime. It is also shown that Jordan, Lebanon, Morocco and Tunisia will have to introduce more flexibility into their exchange rates before they can shift to an inflation targeting monetary policy regime. Other empirical results indicate that for Egypt and Turkey, the exchange rate played a dominant role in the transmission mechanism of monetary policy, while for Jordan, Lebanon, Morocco, and Tunisia it was the interest rate that played the dominant role.

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1. Introduction

Since the early 1990s some industrialized economies have implemented a monetary policy regime shift known as inflation targeting. This shift was justified by the difficulties posed by targeting the nominal exchange rate, or in some instances money supply. At the same time, this move paved the way to enhance their record of controlling inflation, and to make their monetary policies more transparent and effective. Given the very encouraging experience of developed countries, a number of Middle East and North African (MENA) countries recently decided to adopt price stability and inflation targeting whether as an explicit, or implicit monetary policy objective. Two countries that explicitly adopted inflation targeting as their main monetary policy goal were Egypt and Turkey.

MENA economies have been able to contain the inflationary pressures of the last two decades by targeting the nominal exchange rate. By pegging their currencies to a relatively low-inflation currency such as the Euro or the United States (US) dollar, and relying on high interest rate policies to defend their exchange rates,[1] they have succeeded in containing inflation. Even though this policy helped them reduce inflation substantially, it generated persistent real exchange rate appreciations, losses in international competitiveness, large trade and budget deficits, the accumulation of sizeable debts, and in some instances serious currency crises. Some examples from the 1990s are Egypt, Jordan, Turkey, and Lebanon.[2]

Moreover, the unhappy experience of MENA and other developing countries in Latin America and East Asia with pegged exchange rate regimes pushed emerging policy makers to search for alternative nominal anchors. Targeting inflation, a monetary policy strategy which had been successfully used by a number of developed countries, became quite an attractive alternative for a growing number of emerging market countries, including Chile, Brazil, the Czech Republic, Poland, and more recently MENA countries, specifically Turkey and Egypt.

After a series of currency crisis, the Central Bank of Turkey began working on the inflation-targeting regime and has been doing so for a few years. Lately, the central bank has become, to some extent, independent from the government, with an explicit price stability objective and a floating exchange rate. While interest and exchange rates continue to be heavily influenced by fiscal policies – due to the large public sector borrowing requirements– the central bank has been successful in building up credibility over time, and is increasingly shaping inflation and interest rate expectations. Lebanon's experience is very much similar to Turkey's in the late 1990s. Lebanon is a highly indebted and dollarized economy, characterized by a high inflation history. Since 1993, the monetary authority focused on stabilizing the currency on one hand, and helping the government finance its deficit without restoring to seigniorage revenues, on the other. To some extent the monetary authority succeeded in building up credibility over time, and has been successful in stabilizing the local currency after the exchange rate crisis of 1991.

Other MENA countries such as Morocco and Tunisia are implicitly targeting inflation, and are slowly moving towards an inflation targeting regime. They are already targeting the real exchange rate rather than the nominal rate in order to maintain competitiveness and avoid currency overvaluation, while opening their capital markets to international capital flows. In 2002, Egypt shifted to a flexible exchange rate regime. By mid-October 2003, the Egyptian Pound (EP) had declined by 33 percent reaching EP 6.15 per US Dollar. One of the most important challenges facing Egypt today is shifting to a monetary policy framework that focuses on price stability with a flexible exchange rate regime. Monetary policy in Jordan is officially geared towards maintaining a fixed exchange-rate peg to the US Dollar. The

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[1] See Mansoorian and Neaime (2002, and 2003) and Neaime and Paschakis (2002).

[2] See also Neaime (2000 and 2001).

Central Bank of Jordan does not yet enjoy the status of an independent and autonomous entity.

On the other hand, following the signing of the Barcelona declaration between the European Union (EU) and the MENA region, MENA countries are aiming for increased regional and inter-regional monetary and financial economic integration. A significant part of economic integration is the liberalization of the capital account and the enhancement of cross borders capital flows. However, when capital becomes increasingly mobile across national borders, and nominal exchange rates are fixed, monetary policy becomes increasingly subordinated to defending the nominal exchange rate peg.[3] In the extreme case, free capital movements and pegged exchange rates render the independence of monetary policy obsolete, as interest rates will have to shadow the interest rate of the anchor currency to which national currencies are pegged, irrespective of whether this foreign interest rate level suits the economic situation of the country. Under these circumstances, shifting to inflation targeting in some MENA countries may become even more difficult to implement.

Against this backdrop, using sophisticated time series econometric techniques, mainly Vector Autoregression (VAR) and Impulse Response Functions (IRF), this study aims to assess how successful MENA countries have been in making a smooth transition to inflation targeting, given the respective monetary policy transmission mechanisms, the exchange rate regimes, and the current targets, instruments, and goals of monetary policy. It then identifies the transmission channels of these instruments, as well as their impact on the MENA economies, and the time necessary for the policy instruments to manifest their impact. The recent success of Turkey and Egypt in shifting to the inflation target should pave the way for the remaining countries to follow suit.

The rest of the study is divided as follows. Section 2 presents a summary of related literature on inflation targeting and the transmission mechanism of monetary policy. Section 3 lays down the empirical methodology for the empirical analysis. Section 4 presents the empirical results and section 5 concludes the study with policy implications.

2. Literature Review

Since the early 1990s, literature dealing with inflation as target of monetary policy has grown. While the literature on developed countries is significant, studies dealing with the MENA region are still very rare. It is well known that inflation-targeting regimes emphasize the need to make monetary policy transparent, and to render the central bank more independent. In fact, these features which have been central to the strategy's success in developed countries are still absent in many MENA countries. As illustrated in Mishkin and Posen (1997), and in Bernanke, et al. (1999), inflation-targeting central banks have frequent communications with the government, while preserving at the same time a great degree of independence.

The VAR approach to economic fluctuations which was pioneered by Sims (1980), has been widely used in the empirical literature to analyze the transmission mechanism of monetary policy in developed economies, and to assess the success of the conduct of monetary policy and the choice of instruments and targets. More recent studies have used the VAR model to assess the success of inflation targeting in developing countries (see for instance Schmidt-

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[3] The relationship between fixed exchange rates, perfect capital mobility and independence of monetary policy, usually referred to as the "impossible trinity" as the three cannot exist at the same point in time, is considered the main reason for the European Monetary System (EMS) crisis of 1992, as well as the breakdown of the Argentinean currency board, in addition to the 1998 Russian crisis and the 2001 Turkish crisis.

Hebbel and Tapia (2002), Qin et al (2005), Disyatat and Vongsinsirikul (2003), and Gottschalk and Moore (2001) among others).

Within the context of the new inflation targeting framework for monetary policy in Poland, Gottschalk and Moore (2001) study the linkages between monetary policy instruments and inflation targets. They employ VAR models to find such relations, in particular between the short-term interest rate as policy instrument, and inflation as target. Their paper finds that the exchange rate played a dominant role as a policy instrument in the 1990's. However, linkages between the short-term interest rate and inflation have been weak. Given this finding, widening the target range or lengthening the target horizon, would be optimal.

Beetsma and Bovenbergb (1996) explore how monetary policy set by the central bank interacts with public debt policy determined by fiscal authorities. They find that the need to establish the credibility of discretionary monetary policies restrains debt accumulation if policy-makers coordinate their policies. In the absence of coordination, the conflict between the central bank and the government about future monetary policy induces the government to use debt strategically. In the absence of political distortions (and in contrast to the case of coordination), a properly designed conservative independent central bank is sufficient to establish the second best. With an opportunistic or myopic government, however, monetary institutions need to be supplemented by an optimal debt target. Without such a debt target, a conservative central bank leads to excessive debt accumulation.

Erol and Van Wijnbergen (1997) empirically study the conflict among monetary policy targets under a real exchange rate policy, in specific between the trade balance and domestic inflation. This occurs when the nominal exchange rate is managed to achieve a certain level of the real exchange rate in order to maintain external competitiveness. The empirical analysis draws on the Turkish case, whereby the exchange rate has been the key policy instrument since the 1980s. The results from the simulation experiments with a well-defined macro model, point to moderate inflationary consequences of a real exchange rate policy based on the relative purchasing power parity (PPP) rule in Turkey. Moreover, a real exchange rate appreciation is found to be contractionary. Another major conclusion is that the exchange rate policy can provide an anchor for price stability only if it is credible. More recent papers, (see for instance, Kara (2006)) describe in detail Turkey's transition from implicit targeting to the recent explicit targeting of inflation. From a different perspective, Basci *et al* (2007) examines the transmission mechanism of monetary policy for a better understanding of Turkey's monetary policy targeting mechanism.

Mishkin (2000) discusses the advantages and disadvantages of inflation targeting for emerging countries as a monetary policy strategy. He argues that although inflation targeting is not a solution and may not be appropriate for many emerging market countries, it can be a highly useful monetary policy strategy in a number of them. Moreover, one characteristic shared by many emerging market countries, is their insistence on limiting exchange rate movements, partly because of the existence of a sizable stock of external debt and/or a high degree of dollarization. This creates the risk of transforming the exchange rate into a nominal anchor for monetary policy that takes precedence over the inflation target. Therefore, the author recommends inflation-targeting central banks in emerging countries to adopt a transparent policy of smoothing short-run exchange rate fluctuations, while making it clear to the public that they will allow exchange rates to reach their equilibrium level in the long run.

Disyatat and Vongsinsirikul (2003) study the monetary transmission mechanism in Thailand. They examine the transmission mechanism from money market rates to retail rates, to quantify the lags associated with monetary policy shocks, and investigate the channels through which these shocks are propagated. To that end, the authors use a restricted VAR model, the Vector Error Correction Model (VECM). The empirical results point to a

transmission mechanism in which investment is particularly sensitive to monetary shocks, and where banks act as an important conduit for monetary policy to real activity.

Qin, *et al.* (2005) investigates empirically how monetary policy has been transmitted into the macro economy of China. Econometric VAR modeling reveals that the interest rate, the required reserve ratio, and a direct quantity control rule of the base money supply are the most effective tools of monetary policy in China. Model simulations show that these instruments are most effective in affecting monetary aggregates and prices, but are least effective in affecting the real economy in the long run.

Since Bernanke and Blinder (1992) and Sims (1992), a considerable literature has emerged that employs vector autoregression (VAR) methods to attempt to identify and measure the effects of monetary policy shocks on macroeconomic variables. In a recent paper, Bernanke and Boivin (2003) argue that the sparse information-sets typically used in these empirical models lead to at least two potential problems with the results. First, if the central banks and the private sector have information which is not reflected in the VAR, the measurement of policy innovations is likely to be contaminated. The second is that impulse responses can be observed only for the included variables, which are generally a small subset of the variables that the researcher and policymaker care about.

With the exception of the literature on Turkey, this paper adds to the limited literature on developing countries in general, and the MENA region in particular by empirically examining for the first time: (1) the transmission mechanism of monetary policy within the region, drawing on the nature of monetary policy targets and instruments that should be adopted, and (2) the prospects and requirements for a smooth transition to an inflation targeting regime.

3. Empirical Methodology

The smooth implementation of an inflation targeting regime requires first and foremost an understanding of the monetary transmission mechanism in individual MENA countries. It also requires a rigorous assessment of the links between the instruments of monetary policy and the inflation target. However, understanding these links within MENA may be complicated by the high degree of structural adjustments that have occurred during the stabilization period of the early 1990s in Egypt, Jordan and Lebanon, and by major revisions to the monetary policy regime, with the exchange rate, GDP, money supply and short-term interest rate alternating as the monetary policy target. To shed light on these issues, this section uses VAR and IRF to understand MENA's monetary policy transmission and targeting mechanisms.

VAR models are widely used in the econometrics literature because they sidestep the need for structural modeling by modeling every endogenous variable in the system as a function of the lagged values of the remaining endogenous variables. Since only lagged values of the endogenous variables appear on the right hand side of each equation, there is no issue of simultaneity, and Ordinary Least Squares (OLS) is the appropriate estimation technique. In addition, the assumption that the error terms are not serially correlated is not restrictive, because any serial correlation could be absorbed by adding more lagged dependent variables.

The VAR approach has been recently widely used in the empirical literature because of its following advantages. First, being an explicit dynamic system renders it the most appropriate econometric model for studying the dynamics of monetary policy. Second, VAR treats all variables in the system as jointly endogenous, and does not distinguish between endogenous and exogenous variables. In particular, each individual variable in the monetary model depends on its lagged realization and on all other variables, suggesting a genuine simultaneity

among them. Third, VAR permits modeling both endogenous and exogenous shocks, which are indisputably the main sources of monetary dynamics in the small open economies of the MENA region. Fourth, VAR models are relatively easy to estimate for a single MENA country. Each equation separately can be estimated by OLS, which is consistent and asymptotically efficient. Finally, VAR has a clear practical value as an efficient tool for a robust analysis of the monetary performance of MENA countries.

As stated earlier, the transmission mechanisms of monetary policy in the MENA region, as well as inflation targeting, will both be modeled following the VAR model. For each individual MENA country (Egypt, Jordan, Lebanon, Morocco, Tunisia and Turkey) the econometric analysis starts with a monetary VAR model which includes the nominal exchange rate (ER) and the three-month Treasury Bills (TB) rate as policy variables in addition to the Gross Domestic Product (GDP) and the Consumer Price Index (CPI) as the output and price variables respectively. The four-equation VAR model with one lag for the individual MENA country is given by

$$Y_{i,t} = \alpha + \alpha_1 Y_{i,t-1} + \alpha_2 CPI_{i,t-1} + \alpha_3 ER_{i,t-1} + \alpha_4 TB_{i,t-1} + \varepsilon_{1,t}, \tag{1}$$

$$CPI_{i,t} = \beta + \beta_1 CPI_{i,t-1} + \beta_2 Y_{i,t-1} + \beta_3 ER_{i,t-1} + \beta_4 TB_{i,t-1} + \varepsilon_{2,t}, \tag{2}$$

$$ER_{i,t} = \delta + \delta_1 ER_{i,t-1} + \delta_2 Y_{i,t-1} + \delta_3 CPI_{i,t-1} + \delta_4 TB_{i,t-1} + \varepsilon_{3,t}, \tag{3}$$

$$TB_{i,t} = \lambda + \lambda_1 TB_{i,t-1} + \lambda_2 Y_{i,t-1} + \lambda_3 CPI_{i,t-1} + \lambda_4 ER_{i,t-1} + \varepsilon_{4,t}, \tag{4}$$

where $Y_{i,t}$ is real GDP of country i in period t; $CPI_{i,t}$ is the Consumer Price Index of country i in period t; $ER_{i,t}$ is the exchange rate of country i in period t; and $TB_{i,t}$ is the treasury bills rate of country i in period t. The ordering of the equations in the above VAR model is not ad hoc; it allows the interpretation of impulse response functions to be used in the following analysis. The model uses economic theory and intuition, as well as the concept of orthogonality of structural innovations. The interest and exchange rates are put last in the above VAR specification. It is assumed that GDP and inflation react only with a lag to shifts in monetary policy. Since the MENA economies are characterized by several nominal rigidities, this is a plausible restriction.

The VAR model (1)-(4) may be written in matrix form as follows
$$Z_t = \beta_0 + \beta_1 Z_{t-1} + ... + \beta_q Z_{t-q} + \eta_t, \tag{5}$$
where Z_t is a 4 by 1 vector of variables in the system at time t, β_j for $j = 0,...,q,$ are 4 by 4 matrix of coefficients, and η_t is a 4 by 1 vector of structural shocks with the variance-covariance matrix $E(\eta_t \eta_t') = \rho$.

The VAR estimates (5) in the reduced form
$$Z_t = \alpha_1 Z_{t-1} + ... + \alpha_q Z_{t-q} + \upsilon_t, \tag{6}$$
where υ_t is the 4 by 1 vector of residuals with variance-covariance matrix $E(\upsilon_t \upsilon_t') = \omega$.

Defining $\alpha_0 = \dfrac{1}{\rho - \beta_0}$, implies that $\alpha_i = \alpha_0 \beta_j$ for $j = 0,...,q.$

The structural innovations and the reduced-form residuals are thus related by
$$\upsilon_t = \alpha_0 \eta_t, \tag{7}$$
so that

$$\omega = \alpha_0 \alpha'_0. \tag{8}$$
To obtain the impulse response functions, we write equations (5) and (6) respectively as

$$Z_t = \frac{\eta_t}{\rho - \beta(L)},$$ (9)

and

$$Z_t = \frac{\nu_t}{\rho - \alpha(L)}.$$ (10)

From equation (7), the impulse response to structural shocks can be obtained from (9) and (10) using the relation

$$\rho - \alpha(L) = \rho - \beta(L).$$ (11)

Impulse response functions trace the effect of a one standard deviation shock to one of the innovations on current and future values of the endogenous variable. In other words, a shock to the j-th variable directly affects the j-variable, and is also transmitted to all of the endogenous variables through the dynamic structure of the VAR. The impulse response functions shed light on the dynamics of the variables included in the VAR system as a result of shocks to either one of these variables. The impulse response functions permit us to explore how the target (GDP and inflation) variables might respond to various shocks in the monetary policy instruments (exchange and interest rates).

The estimation is carried out using quarterly, seasonally adjusted data gathered from the International Monetary Fund's International Financial Statistics, from 1990Q1 to 2006Q4. All variables, except the interest rate, enter in natural logarithm. In addition, an intervention dummy variable is introduced to remove the effect of exchange rate turbulence of the early 1990s in Egypt, Jordan, Lebanon, and Turkey. The optimal lag length under various criteria is determined using the Akaike, Schwartz, and Hannan-Quinn criteria.[4]

4. Empirical Results

Figures 1-6 depict the dynamic responses of the macro econometric model to two monetary shocks: shocks to the interest rate and shocks to the exchange rate, with the respective 90 percent confidence interval. The interest rate shock corresponds to a one percent increase in interest rates, while the exchange rate shock corresponds to an appreciation of 1 percent.

Table 1 indicates that with the exception of the TB rate, all Egypt's series contain a unit root and are integrated of order 1, I (1). Egypt's VAR model is therefore estimated with the variables taken in first difference given the evidence of no co-integration between the four series (Table 2).

IRF are next deduced from Egypt's VAR model in first difference. Figure 1(a) indicates that after an exchange rate shock, prices decrease during the first 3 quarters. In fact, prices respond quite swiftly to an appreciation of the exchange rate. This is expected since in a small open economy like Egypt, prices of traded goods return rapidly to world levels following an exchange rate appreciation. The interest rate falls in response to the appreciation of the exchange rate (Figure 1(c)), suggesting that the central bank attempts to ease up the pressure of higher interest rates on GDP, and offset further exchange rate appreciation. By lowering the interest rate, the monetary authority hopes to revert any inflow of capital and decrease the pressure on the Egyptian Pound. In addition, GDP also declines as a result of an exchange rate appreciation, and that effect is persistent for about 5 quarters (Figure 1(b)).

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[4]Generally speaking, lag length criteria such as the Akaike and Schwartz statistic are not without shortcomings and should be used more as a guide than as hard-fast rules. Ramaswamy and Sloek (1997) used two lags in their cross-country comparison of monetary transmission in the EU, as did Bayoumi and Morsink (2001) in their analysis for Japan.

This shows the sensitivity of Egypt's economic activity to innovations in its trade balance. The empirical results suggest that Egypt's exchange rate is quite effective with respect to GDP and inflation. This is not surprising given the recent float of the pound, and the subsequent positive effects on exports and the rate of growth of GDP.

GDP decreases for four consecutive quarters as a result of a 1 percent increase in interest rates (Figure 1(e)). The decrease in GDP dies out after the fourth quarter. Investment in Egypt is crowded out by increases in interest rates, with a subsequent decline in GDP. This points to the fact that investment is particularly sensitive to monetary shocks. Similar dynamics are observed for prices which also decrease permanently, and the effect becomes more significant after quarter 6 (Figure 1(d)). While this effect is not clearly significant during the first 6 quarters, it is nevertheless robust thereafter. Comparing the price response observed under an interest rate shock, with the response to an exchange rate shock, prices respond more gradually in the short run to an exchange rate shock, however in the long run the effect becomes more significant under an interest rate shock. Moreover, an increase in interest rates triggers an exchange rate appreciation of the Egyptian pound (Figure 1(f)). This effect appears to be quite persistent. Recalling the significant negative effects of an appreciation on the price level above, this suggests that the transmission of the interest rate shock on prices took place, at least to some extent, via the exchange rate channel. The importance of the exchange rate in the transmission of interest rates effects is also obvious in the response of the GDP variable.

While the importance of the exchange rate channel is not surprising, given that Egypt is a small open economy, it still raises an important issue in the context of inflation targeting. If this channel plays an important role, a substantial part of the adjustment burden will fall on the traded goods sector, even if Egypt's central bank considers the interest rate to be its main monetary policy instrument. Substantial interest rates responses with potentially adverse effects on Egypt's competitiveness might be required. This may undermine the inflation target, and may induce the central bank to target once again the nominal exchange rate.

Egypt has recently allowed its exchange rate to float, and shifted to a monetary policy framework that focuses on price stability; its experience is very encouraging. First, inflation has come down significantly, paving the way for a new era of price stability. Second, recessions have become less frequent and milder, and economic expansions have been sustained and enhanced. In other words, the new era of price stability has been accompanied by a new era of overall economic growth and stability. The future success of the inflation targeting policy will depend on the ability of the central bank to isolate the real side of Egypt's economy from nominal domestic and foreign shocks.

Table 3 indicates that all four Jordanian series contain a unit root and are integrated of order 1, I(1). Given the evidence of no co-integration between the four series, Jordan's VAR model is therefore estimated with the variables taken in first difference (Table 4).

IRF are next deduced from Jordan's VAR model in first difference. Figure 2(a) indicates that Jordan's prices are insignificantly affected by an exchange rate shock. This is expected since Jordan has pursued a rigid monetary policy of nominal exchange rate targeting. The interest rate response is also insignificant in response to the appreciation of the exchange rate (Figure 2(c)), suggesting that the central bank would not attempt to offset some of the tightening in the monetary conditions. This is also expected – since by adopting a fixed exchange rate regime to the US dollar, Jordan has rendered its monetary policy ineffective. The dynamic response of GDP is quite similar to the responses of prices and the interest rate (Figure 2(b)). The empirical results suggest that Jordan's exchange rate is not effective with respect to GDP, interest and inflation rates. This is also not surprising given the fact that Jordan has

been pursuing a monetary policy with as unique target fixed nominal exchange rates since the early 1990s.

GDP decreases for two consecutive quarters as a result of the one percent increase in interest rates (Figure 2(e)). However, the response of prices and exchange rates are insignificant (Figure 2(d) and (f)). Comparing the price response observed under an interest rate shock with the response to an exchange rate shock, prices appear not to respond to either policy variables. While the importance of the exchange and interest rate channels are not surprising, given that Jordan has followed a rigid peg to the US dollar, this nevertheless raises an important issue in the context of inflation targeting. As Jordan proceeds with the liberalization of its trade and capital accounts, sticking with the fixed exchange rate regime will render monetary policy even more ineffective. In other words, free goods and capital movements and pegged exchange rates will render the independence of monetary policy obsolete, as interest rates will have to shadow the interest rate on the US dollar, irrespective of whether this interest rate level suits the economic situation in Jordan. This would render the shift to targeting the inflation rate an even harder goal to achieve.

Jordan's central bank does not yet enjoy the status of an independent and autonomous central bank. Since the end of the 1990s, the bank has gradually lowered interest rates (from 9% in 1998 to 2% at the end of 2006) on the back of decelerating US interest rates, in an effort to help bolster economic growth and investment. To shift to an inflation targeting, Jordan will have to allow more independence to its central bank, and introduce some flexibility in the exchange rate regime. However, the Jordanian Dinar has been effectively pegged to the US dollar since the early 1990s and this strategy, which is supported by high international reserves, has played a key role in attracting foreign capital.

Table 5 indicates that all of Lebanon's four series contain a unit root and are integrated of order 1, I(1). Lebanon's VAR model is therefore estimated with the variables taken in first difference, given the evidence of no co-integration between the four series (Table 6).

IRF are next obtained from Lebanon's VAR model in first differences. Figure 3(a) indicates that Lebanon's prices are significantly affected by the exchange rate shock. They first increase a little but subsequently decrease for 6 consecutive quarters. This is expected since the central bank has pursued a rigid monetary policy of nominal exchange rate targeting since the early 1990s, and has succeeded to a great extent in bringing down inflation. However, the interest rate response is insignificant in response to the appreciation of the exchange rate (Figure 3(c)), suggesting that the central bank would not attempt to offset some of the tightening in the monetary conditions. The dynamic response of GDP is quite similar to the response of interest rates (Figure 3(b)). The empirical results suggest that the exchange rate is not effective with respect to GDP and interest rates. The central bank has succeeded through the managed exchange rate policy in stabilizing the exchange rate around a central parity of Lebanese Lira (LL) 1500 per US dollar. The bank, through its continuous intervention in the foreign exchange market, gained confidence in its commitment which has enabled it to create a gradual immunity for the LL against political and economic pressures. Being a small open economy in which imported goods constitute about 90 percent of domestic consumption, price changes in Lebanon are closely related to the exchange rate. By achieving exchange rate stability and controlling the growth rate of money supply, the central bank was able to decrease the inflation rate from 120 percent in 1992, to about 2 percent in 2006.

Figure 3 (f) indicates that the exchange rate appreciates significantly as a result of an increase in interest rates. This is expected since the central bank has been using the TB rate to stabilize the domestic currency. However, GDP is insignificantly affected from a 1 percent increase in interest rates. The price response is also insignificant (Figure 3(d)). While it was pursuing a monetary policy with a fixed exchange rate, the monetary authority did not focus on GDP's

growth. The result was a significant decline in GDP growth rates since the late 1990s and consequently Lebanon entered into a period of consecutive recessions. Comparing the price response observed under an interest rate shock with the response to an exchange rate shock, prices appear to respond significantly to the exchange rate policy variable. Refinancing the growing budget deficit has been a challenging task for the central bank. The bank coordinated with the ministry of finance in order to help the government meet its obligations without recourse to seigniorage revenues which have inflationary effects. Sizable fiscal imbalances were largely financed through the issuance of TBs in an auction framework. Through a high interest rate policy, the central bank managed to ensure sufficient TBs subscription to secure adequate funding for the treasury. Accordingly, flexible and high interest rates on TBs were necessary to ensure the necessary inflow of capital. This of course led to exchange rate appreciations, which the central bank sterilized by accumulating foreign currency reserves, keeping the exchange rate fixed around a central parity of LP 1500 per US dollar.

Hence, the central bank succeeded so far in managing the budget deficit while maintaining exchange rate stability. Through the use of the TB rate, and the management of foreign exchange reserves, the central bank was able to achieve its intended objective– exchange rate stability. To shift to a monetary policy that targets the inflation rate, the central bank will have to quit targeting the nominal exchange rate, and allow more independence to the monetary authority. However, this can only be achieved smoothly and with the least cost, only after the fiscal stance is put back on a sustainable path. With the accumulation of a sizeable debt, targeting the nominal exchange rate may currently prove optimal to avert an imminent currency and debt crisis while keeping debt service under control. In all cases, if Lebanon still opts for maintaining fixed US Dollar exchange rate arrangements, it will have to implement crisis-prevention measures, through exercising fiscal discipline, properly managing its debts and foreign reserves, and avoiding future real exchange rate appreciations.

Table 7 indicates that all four Moroccan series contain a unit root and are integrated of order 1, I(1). However, given the evidence of co-integration between Morocco's 4 variables, a VECM model is therefore estimated (Table 8).

IRF are next obtained from Morocco's VECM. Figure 4(a), indicates that an exchange rate shock in Morocco decreases prices during the first 2 quarters, but these revert thereafter and increase for 3 consecutive quarters. In fact, prices respond quite quickly to an appreciation of the exchange rate. This is expected since in the small open economy of Morocco, prices of traded goods return rapidly to world levels following an exchange rate shock. Moreover, there is a persistent and significant interest rate fall in response to the exchange rate's appreciation (Figure 4(c)), suggesting that the central bank attempts to offset some of the tightening in the monetary conditions to preclude further appreciations of the exchange rate. It is well known that Morocco has extensive trade relations with the European Union (EU). Therefore, the central bank has regularly been intervening to offset any appreciation of the exchange rate. Such appreciation will harm exports and turn the current account surplus into a deficit, with negative consequences on the GDP's growth rate. In addition, GDP also declines as a result of an exchange rate appreciation, and that effect is persistent for about four quarters (Figure 4(b)), highlighting its sensitivity to innovations in the trade balance. The empirical results suggest that the exchange rate is quite effective with respect to GDP, inflation and interest rates in Morocco. The central bank has been successfully targeting the real exchange rate in order to maintain competitiveness, avoid currency overvaluation and stimulate the rate of growth of real GDP.

According to Figure 4(e), there is a persistent and significant decline in GDP as a result of a one percent increase in interest rates. The decrease in GDP does not peter out even after four years. This highlights the fact that investment is particularly sensitive to monetary shocks in

Morocco. Similar dynamics are observed for prices which also permanently decrease (Figure 4(d)). Comparing the price response observed under an interest rate shock with response to an exchange rate shock, prices respond more gradually to an interest rate shock. Moreover, an interest rate shock triggers the appreciation of the Dinar (Figure 4(f)), and this effect appears to be quite persistent. Recalling the significant negative effects of an appreciation on the price level above, this suggests that the transmission of the interest rate shock on prices occurred, at least to some extent, via the exchange rate channel. The importance of the interest rate in the transmission of exchange rate effects is also visible in the response of the GDP variable.

While the importance of the interest rate channel is not surprising, it still raises an important issue in the context of inflation targeting. If this channel plays an important role, a substantial part of the adjustment burden will fall on the growth rate of real GDP, even if the central bank considers the exchange rate to be its main monetary policy instrument. This would be particularly problematic if monetary policy is expecting the exchange rate to affect the growth rate of real GDP, since substantial interest rate responses will have potentially adverse effects on GDP, inflation and unemployment rates. This may undermine any future efforts to smoothly shift to the inflation target, and may pressure the central bank to keep targeting the real exchange rate.

The economic and monetary policies pursued over the last few years resulted in prices being brought under control, and the accumulation of considerable foreign exchange reserves. These two result would help Morocco continue the process of opening up the economy to the outside world with the conclusion of free trade agreements with the EU and the US, and a number of Arab countries through Morocco's participation in the Greater Arab Free Trade Area. However, with further balance of payments liberalization, the monetary authority may be compelled to introduce further flexibility in the exchange rate. Fully flexible exchange rates may render the independence of monetary policy more effective – as interest rates will no longer have to shadow the interest rate of the anchor currency to which the Dinar was pegged – and may be used towards addressing domestic macroeconomic imbalances.

The main objective of Tunisia's monetary policy has been to preserve the value of the domestic currency. The intermediary objective is to match the money supply growth with GDP growth. The main target of monetary policy has been the interest rate, which played a vital role in enhancing and attracting capital inflows, and stimulating domestic consumption and investment.

Table 9 indicates that all four Tunisian series contain a unit root and are integrated of order 1, I(1). However, given the evidence of co-integration between Tunisia's four variables a VECM model is therefore estimated (Table 10).

IRF are next obtained from Tunisia's VECM. Figure 5(a), indicates that an exchange rate shock decreases prices during the first two quarters, but these revert thereafter and increase for the next four consecutive quarters. In fact, prices respond quite quickly to an appreciation of the exchange rate. This is expected given the extensive openness of the Tunisian economy. The response of the interest rate to the appreciation of the exchange rate is rather ambiguous (Figure 5(b)), suggesting that the central bank has not been using the interest rate to affect the exchange rate. However, GDP declines as a result of an exchange rate appreciation, and that effect is persistent for about 8 quarters (Figure 5(c)). The transmission effects of the exchange rate to GDP are visible and significant, reflecting again the important role that exports play in the growth experience of Tunisia. The empirical results suggest that Tunisia's exchange rate is quite effective with respect to GDP.

There is a persistent and significant fall in GDP as a result of a one percent increase in interest rates (Figure 5(e)). However, the decrease in GDP peters out after eight quarters. Similar dynamics are observed for prices, which also decrease permanently and do not peter out even after eight years (Figure 5(d)). Comparing the price response observed under an

interest rate shock with the response to an exchange rate shock, prices are found to respond more gradually to an interest rate shock. Moreover, an interest rate shock triggers an exchange rate depreciation of the pound (Figure 5(f)), and this effect appears to be persistent in the short run only and for about 5 quarters.

While the importance of the interest rate channel is not surprising, given that Tunisia has targeted the interest rate to stimulate exports and GDP, this nevertheless raises an important issue in the context of inflation targeting. Can Tunisia smoothly shift to targeting the inflation rate knowing the consequences such a move may have on the growth rate of real GDP? This is doubtful under the current economic circumstances. Greater flexibility in the exchange rate should be allowed first to stimulate exports and ease up the pressure on interest rates. Once this is achieved, Tunisia will be able to shift to an inflation targeting mechanism with minimal costs in terms of GDP and employment. The transition from targeting output to prices needs to be accompanied with structural adjustment measures on the fiscal side.

Table 11 indicates that all four Turkish series contain a unit root and are integrated of order 1, I(1).Turkey's VAR model is therefore estimated with the variables taken in first difference, given the evidence of no co-integration between the four series (Table 12).

IRF are next deduced from Turkey's VAR model in first difference. Figure 6(a), indicates that an exchange rate shock in Turkey leads to a permanent increase in prices. The price response to an appreciation of the exchange rate is counter intuitive and may be explained by the high and erratic movements in both the exchange and inflation rates over the period under consideration. It is well known that Turkey has been experiencing significant increases in its inflation rates, which culminated into the 2001 currency crisis. There is an insignificant interest rate increase in response to the appreciation of the exchange rate (Figure 6(b)), suggesting that the central bank did not use the interest rate to counter movements in the exchange rate. Interest rates are already high in Turkey, and during the currency crisis of 2001, the central bank lost its last line of defense; that is the resort to increasing the interest rate. In addition, the response of GDP to an exchange rate appreciation is also insignificant (Figure 6(c)) pointing towards erratic increases in exchange rates with no corresponding impact on GDP. Thus, the empirical results suggest that for Turkey, and because of the recent currency crisis, the exchange rate is not effective with respect to GDP, inflation and interest rates.

However, there is a significant fall in GDP as a result of one percent increase in interest rates (Figure 6(e)). The decrease in GDP peters out after five quarters. Similar dynamics are observed for prices, which also decrease for about seven consecutive quarters (Figure 6(d)). Comparing the price response observed under an interest rate shock with the response to an exchange rate shock, prices respond significantly to an interest rate shock. Moreover, an interest rate shock triggers a depreciation of the Lira (Figure 6(f)), and this effect appears to be quite significant over the first 3 quarters. The importance of the interest rate effect is also visible in the response of the GDP variable.

While the importance of the interest rate channel is not surprising, given that Turkey has experienced several exchange rate crises, this nevertheless raises an important issue in the context of inflation targeting. As was the case during the 2001currency crisis, if this channel continues to play an important role, a substantial part of the adjustment burden will fall once again on the exchange rate, triggering another currency crisis. This would be particularly damaging, since monetary policy is targeting inflation. This may undermine the inflation target, and may force the central bank to target the nominal exchange rate once again. The central bank, which gained considerable independence in the past few years, has been working on the success of the inflation-targeting regime. The recent float of the exchange rate was one step in the right direction. However, Turkey will need to keep fiscal policy well under control; otherwise renewed fiscal pressures may once again put pressure on interest

rates, undermining the central bank's recent efforts in building up credibility and in shaping inflationary expectations.

5. Conclusion and Policy Implications

Monetary literature has now established that targeting inflation may improve the effectiveness of monetary policy, as opposed to discretionary monetary policies, which may increase uncertainty and are not likely to work on the real side of the economy due to the existence of time lags and other monetary and macroeconomic uncertainties. The first requirement for MENA countries considering the adoption of inflation targeting is to make their respective central banks more independent from political interferences. Even though full independence is not advisable, the monetary authorities must have the freedom to gear the instruments of monetary policy toward the inflation target without political pressure. While recent efforts in Turkey and Egypt have given their respective central banks more independence, other MENA governments – of Lebanon, Jordan, Morocco and Tunisia – will need to follow suit if they wish to successfully shift their monetary policy towards targeting inflation.

The second pre-requisite for adopting inflation targeting requires MENA central banks to refrain from targeting the level or path of any other nominal variable, such as the nominal exchange rate. A case in point is Jordan in the early 1990s, and more recently Lebanon. A country that chooses a fixed exchange rate system subordinates its monetary policy to the exchange rate objective, and is not effectively able to directly target any other nominal variable like the inflation rate. However, a crawling peg or exchange rate target zones may coexist with an inflation target in the short run. So long as it is clear, through actions of respective central banks, that the inflation target is the priority in case of conflict.

The empirical results of the paper have shown that with further capital account liberalization in Morocco, the monetary authority may be compelled to introduce further flexibility to the exchange rate. Fully flexible exchange rates may make the independence of monetary policy more effective, as interest rates will no longer have to shadow the interest rate of the anchor currency to which the Dinar was pegged, but may be used towards addressing domestic macroeconomic imbalances. Only then can Morocco smoothly shift to targeting inflation. Similarly, in Tunisia, greater flexibility in the exchange rate should be allowed first to stimulate exports and ease up the pressure on interest rates. Once this is achieved, Tunisia will be able to shift to an inflation targeting mechanism with minimal costs in terms of GDP and employment. The smooth transition from targeting output to prices needs to be accompanied by structural adjustment measures on the fiscal side.

By recently shifting to flexible exchange rates, Egypt was able to stimulate exports, and subsequently the growth rate of real GDP. Egypt's central bank has successfully managed the nominal exchange rate to achieve a certain level of the real exchange rate, and has subsequently maintained external competitiveness. At the same time, the central bank has been successful in targeting inflation, benefiting from increased monetary policy independence. Similar dynamics were observed in Turkey. Flexible exchange rates paved the way for the central bank to smoothly shift to targeting inflation. While the future success of the inflation targeting policy regime shift in Egypt will depend on the ability of the central bank to isolate the real side of the economy from nominal domestic and foreign shocks, its success in Turkey will depend on the ability to isolate the monetary side of the economy from weaknesses emanating from a weak public sector. Turkey should continue with its efforts to reduce the heavy debt burden and its related service costs, if it is to avoid further increases in interest rates and preserve the inflation target.

Lebanon's fiscal stance is quite similar to Turkey's. So far Lebanon's central bank has succeeded in managing the heavy debt burden and the recurrent budget and current account deficits while maintaining exchange rate stability. Through the use of the TB rate, and the management of foreign exchange reserves, the central bank was able to achieve that objective. Moreover, the recent accumulation of a sizable stock of external debt, and the high degree of dollarization of Lebanon's economy have both increased the risk of transforming the exchange rate into a nominal anchor for monetary policy that takes precedence over the inflation target. Therefore, if the monetary authority wants to shift to inflation-targeting, it will have to adopt a transparent policy of smoothing short-run exchange rate fluctuations, while making it clear to the public that it will allow the exchange rate to reach its equilibrium level in the long run. Moreover, to be able to shift smoothly, and with minimal cost, to a monetary policy that targets the inflation rate, the central bank will have to first quit targeting the nominal exchange rate by allowing it to float, and allow the monetary authority more independence. This, however, can only be achieved after the fiscal stance is put back on a sustainable path. In addition, with the accumulation of a sizeable external debt, and in order to keep debt service under control, targeting the nominal exchange rate may prove to be optimal at least in the short run to avert an imminent currency and debt crisis.

Other empirical results have highlighted the fact that for the MENA economies of Egypt and Turkey, the exchange rate played a dominant role in the transmission mechanism of monetary policy, while for Jordan, Lebanon, Morocco, and Tunisia, the interest rate played a dominant role in the transmission mechanism of monetary policy. These results have also pointed to the important role of the exchange and interest rates as policy instruments in the transmission mechanism of MENA's monetary policies. While, the direct linkages between the interest and inflation rates do not appear to be significant for Jordan, Lebanon and Turkey, they are particularly significant for Egypt, Morocco, and Tunisia. In fact, the extent to which the interest rate works through the exchange rate or through GDP to reduce inflation remains substantially uncertain. In the context of the transition to inflation targeting mechanisms of monetary policy for some MENA countries, this points to some risks that the exchange rate or GDP could be over burdened by a potential transition to targeting inflation. In other words, the byproduct could be further declines in the GDP's growth rate, further appreciations of the exchange rate and further deterioration in the current account and in economic activity. To avoid potential exchange rate overvaluations and renewed recessionary pressures, some flexibility in the inflation target may be required at least in the short run.

With the further integration of the MENA region with the world economy, the increased regional and inter-regional monetary and financial economic integration, and the fast liberalization of the respective capital account, Jordan and Lebanon's central banks should consider shifting to more flexible exchange rates regimes, if they wish to render their monetary policy more independent. An independent monetary policy constitutes an important pre-requisite that needs to be implemented before inflation targeting can be adopted. Moreover, given the high debt levels accumulated in both MENA countries, monetary policy set by their respective central banks should optimally interact in the future with public debt policy determined by the fiscal authorities, in order not to undermine any potential decision to shift to a monetary policy regime which targets inflation.

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Figure 1: Impulse Response Functions: Egypt
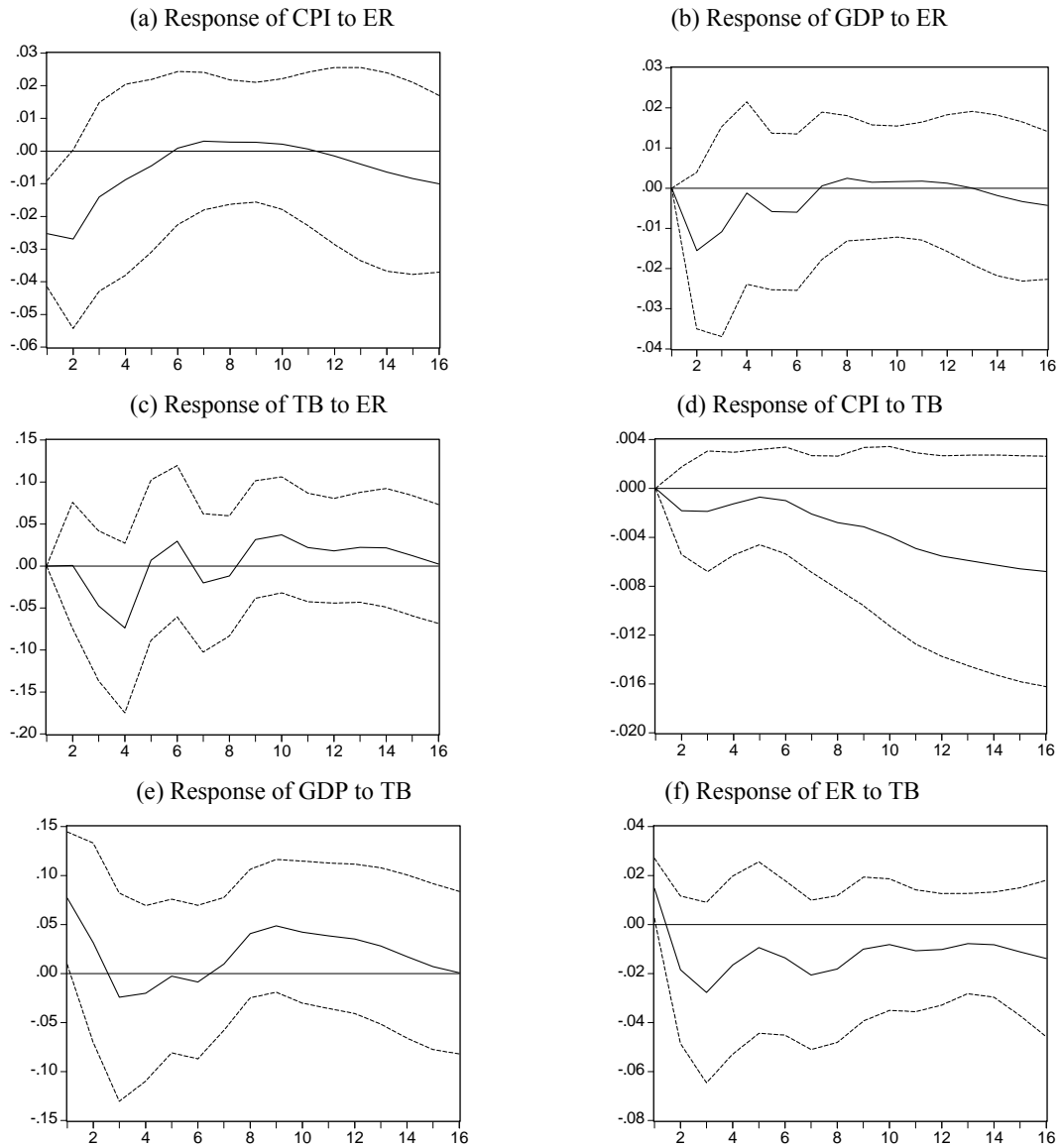
(a) Response of CPI to ER

(b) Response of GDP to ER

(c) Response of TB to ER

(d) Response of CPI to TB

(e) Response of GDP to TB

(f) Response of ER to TB

Notes: CPI is the consumer Price Index; ER is the nominal exchange rate; TB is the three months Treasury Bills rate; and GDP is Gross Domestic Product.
Source: Author's Estimates.

Figure 2: Impulse Response Functions: Jordan
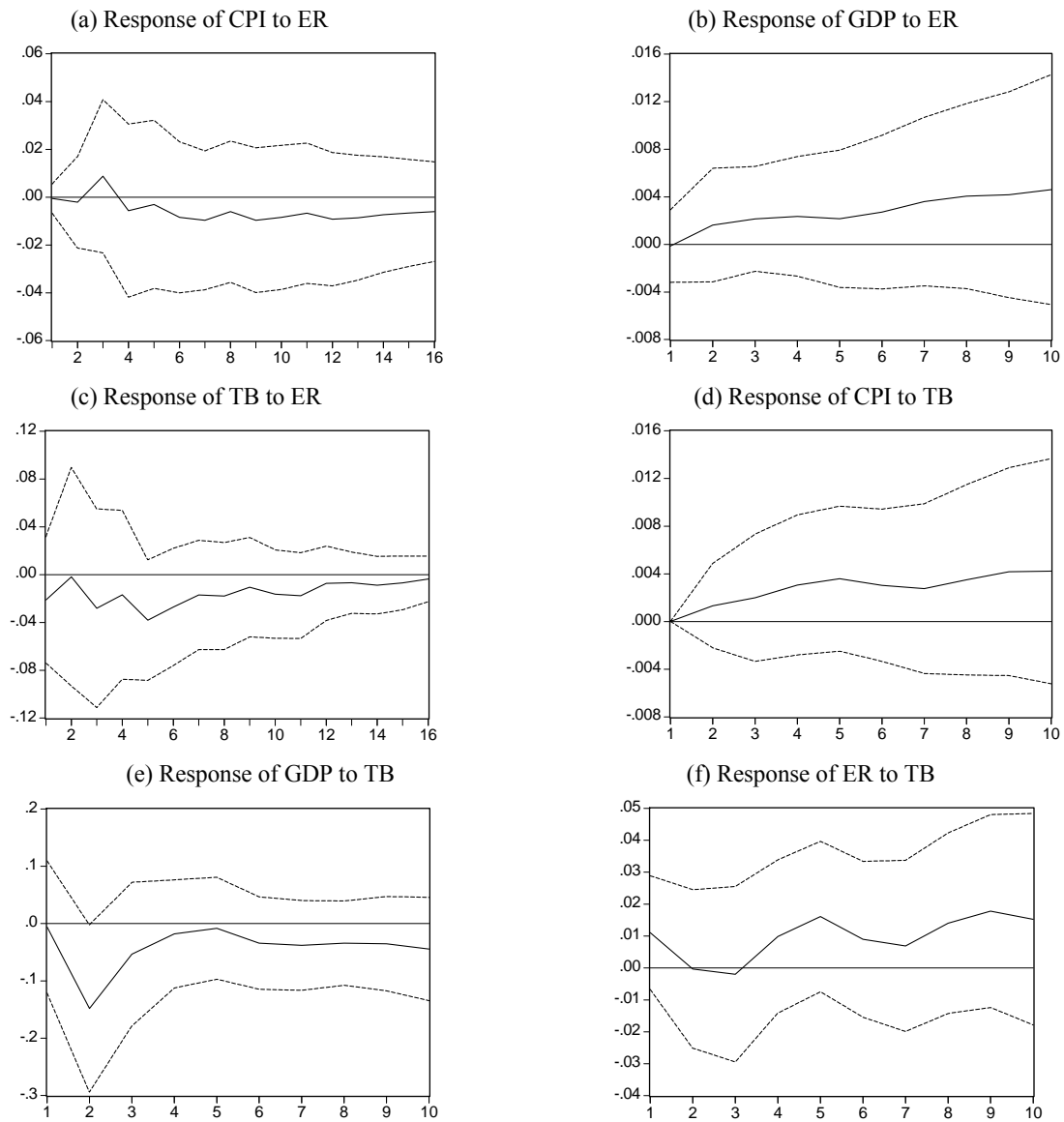
(a) Response of CPI to ER

(b) Response of GDP to ER

(c) Response of TB to ER

(d) Response of CPI to TB

(e) Response of GDP to TB

(f) Response of ER to TB

Notes: CPI is the consumer Price Index; ER is the nominal exchange rate; TB is the three months Treasury Bills rate; and GDP is Gross Domestic Product.
Source: Author's Estimates.

Figure 3: Impulse Response Functions: Lebanon

(a) Response of CPI to ER

(b) Response of GDP to ER

(c) Response of TB to ER

(d) Response of CPI to TB

(e) Response of GDP to TB

(f) Response of ER to TB

Notes: CPI is the consumer Price Index; ER is the nominal exchange rate; TB is the three months Treasury Bills rate; and GDP is Gross Domestic Product.
Source: Author's Estimates.

Figure 4: Impulse Response Functions: Morocco

(a) Response of CPI to ER

(b) Response of GDP to ER

(c) Response of TB to ER

(d) Response of CPI to TB

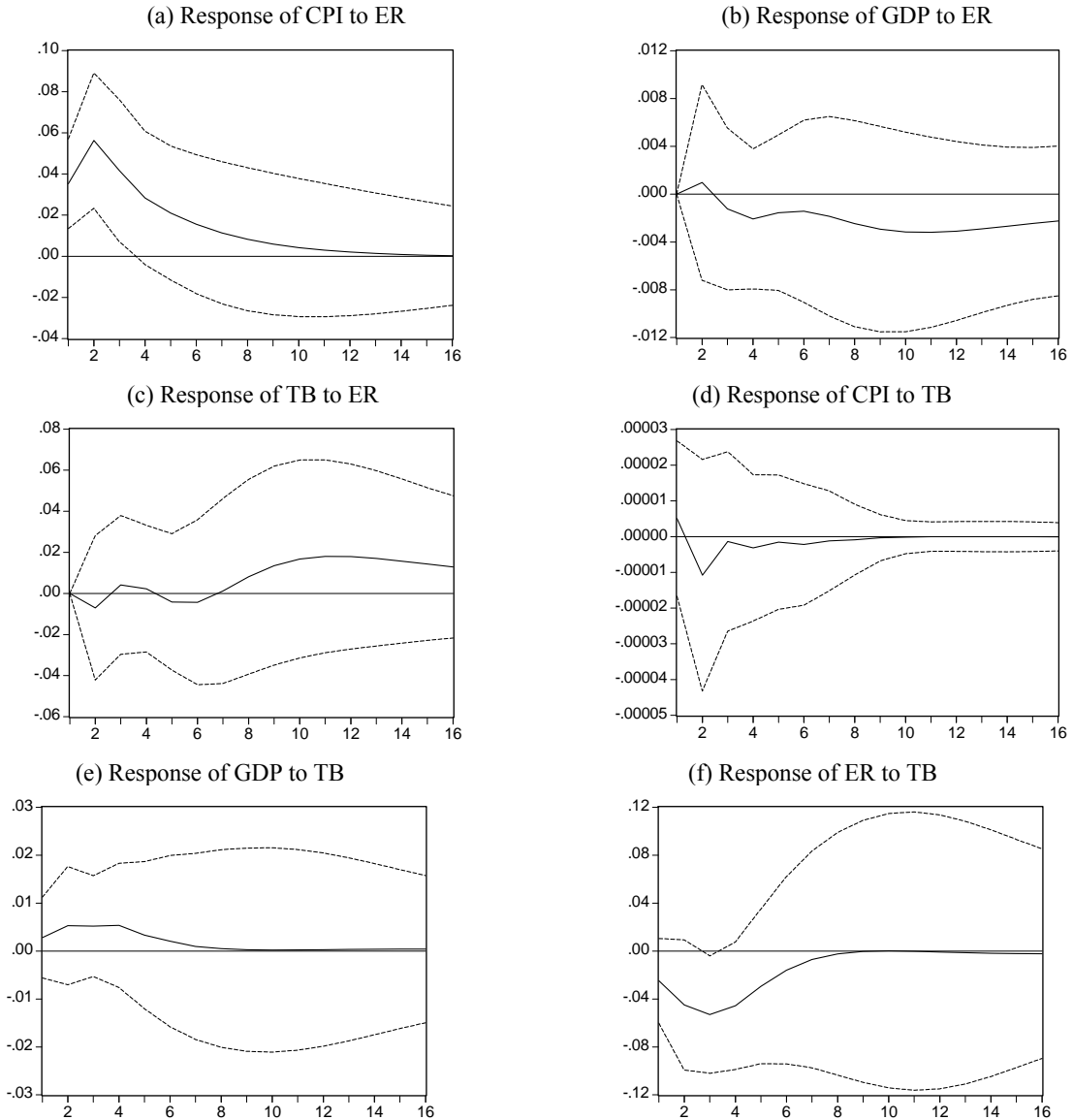(e) Response of GDP to TB

(f) Response of ER to TB

Notes: CPI is the consumer Price Index; ER is the nominal exchange rate; TB is the three months Treasury Bills rate; and GDP is Gross Domestic Product.
Source: Author's Estimates.

Figure 5: Impulse Response Functions: Tunisia

(a) Response of CPI to ER

(b) Response of TB to ER

(c) Response of GDP to ER

(d) Response of CPI to TB

(e) Response of GDP to TB
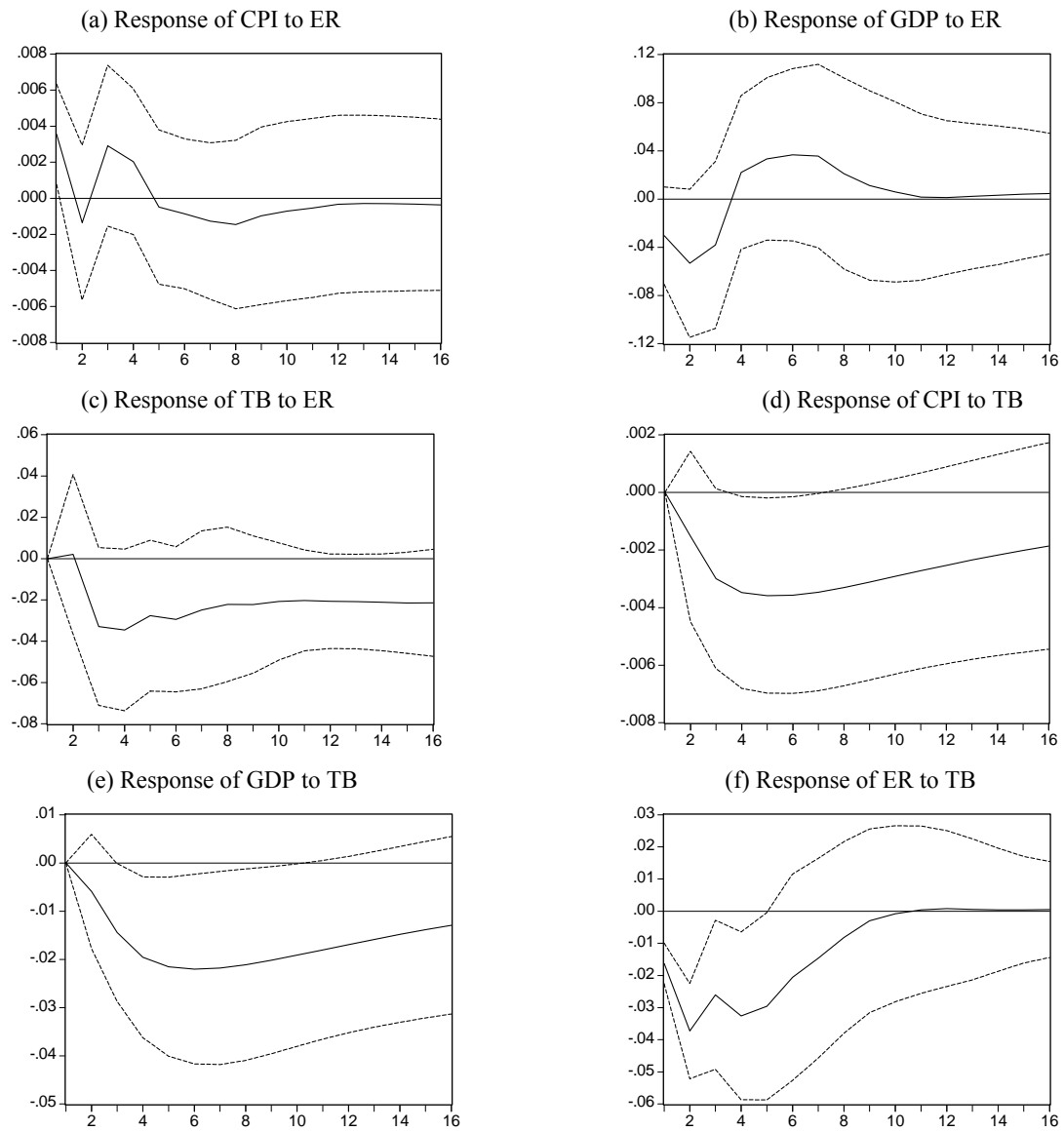
(f) Response of ER to TB

Notes: CPI is the consumer Price Index; ER is the nominal exchange rate; TB is the three months Treasury Bills rate; and GDP is Gross Domestic Product.
Source: Author's Estimates.

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Figure 6: Impulse Response Functions: Turkey

(a) Response of CPI to ER

(b) Response of TB to ER

(c) Response of GDP to ER

(d) Response of CPI to TB

(e) Response of GDP to TB
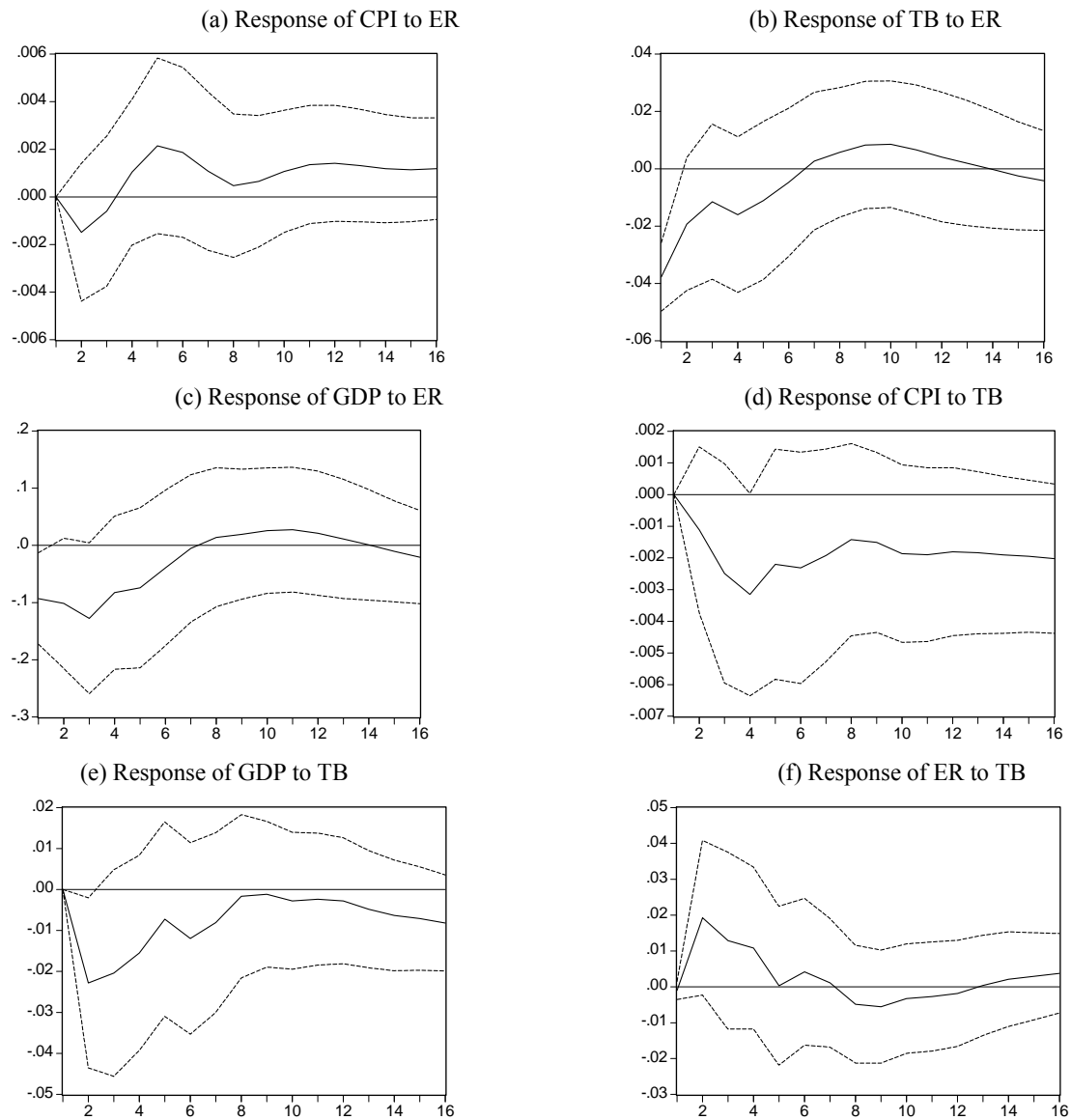
(f) Response of ER to TB

Notes: CPI is the consumer Price Index; ER is the nominal exchange rate; TB is the three months Treasury Bills rate; and GDP is Gross Domestic Product.
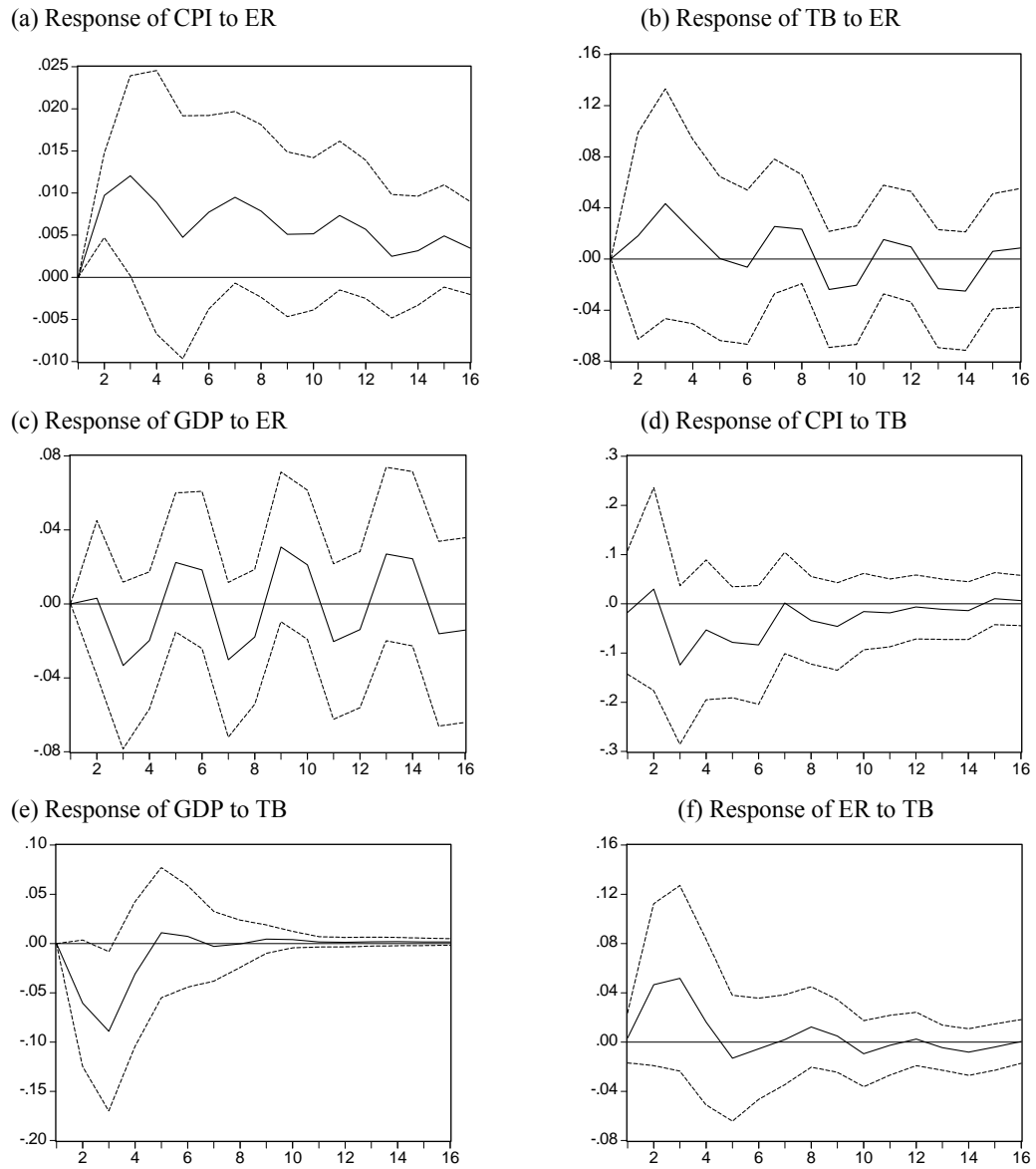Source: Author's Estimates.

Table1: Unit Root Statistics - Egypt

Variable	Lag	ADF t-statistic	KPSS(η)	Result
GDP	4	-1.38	0.22**(τ)	I(1)
CPI	1	-2.58	0.23**(τ)	I(1)
ER	1	-2.06	0.16* (τ)	I(1)
TB	8	-4.34**	0.12 (τ)	I(0)

Notes: All variables are in logs unless otherwise indicated. The asterisks indicate a rejection of the null hypothesis at the 5% (*) or the 1% (**) level. ADF denotes Augmented Dickey–Fuller test with the null hypothesis of non-stationarity. The lag length has been chosen on the basis of the Akaike Information and Hannan-Quinn criteria. Due to the apparent time trend in all series, the ADF tests have been specified to include a trend variable. The KPSS statistic implements the unit root test proposed by Kwiatkowski et al. (1992) with trend stationarity (τ) as the null hypothesis.

Source: Author's Estimates.

Table 2: Co-integration Tests - Egypt

Hypothesis			Critical Values	Prob.	λ- Max-Eigen Statistics	Critical Values	Prob.
Null	Alternative	λ- Trace Statistics	5%			5%	
r = 0	r ≥ 1	47.04	47.85	0.05	23.47	27.58	0.15
r ≤ 1	r ≥ 2	23.57	29.79	0.21	13.82	21.13	0.37
r ≤ 2	r ≥ 3	9.74	15.49	0.30	8.60	14.26	0.32
r ≤ 3	r = 4	1.13	3.84	0.28	1.13	3.84	0.28

Notes: 1-The Johansen Co-integration Likelihood Ratio Test is based on the Trace and the λ- Max-Eigenvalue of the Stochastic Matrix. 2-r represents the number of co-integrating vectors. 3-A (*) indicates significance at the 5% level of significance. The asymptotic critical values are from Osterwald-Lenum (1992), and the Probabilities (p-values) are from McKinnon-Haug-Michelis (1999). 4- Test assumes restricted linear deterministic trend in the data, and a constant.

Source: Author's Estimates.

Table 3: Unit Root Statistics - Jordan

Variable	Lag	ADF t-statistic	KPSS(η)	Result
GDP	4	-2.77	0.27**(τ)	I(1)
CPI	1	-2.85	0.24**(τ)	I(1)
ER	6	-1.00	0.28**(τ)	I(1)
TB	2	-2.63	0.52*(τ)	I(1)

Notes: Refer to Table 1. The ADF and KPSS tests have been specified to include a constant and no trend for the TB variable due to the absence of a trend.

Source: Author's Estimates.

Table 4: Co-integration Tests - Jordan

Hypothesis		λ- Trace Statistics	Critical Values 5%	Prob.	λ- Max-Eigen Statistics	Critical Values 5%	Prob.
Null	Alternative						
r = 0	r ≥ 1	38.30	43.21	0.12	20.33	23.15	0.20
r ≤ 1	r ≥ 2	20.06	22.17	0.35	12.36	16.89	0.65
r ≤ 2	r ≥ 3	9.32	13.11	0.41	5.05	12.33	1.56
r ≤ 3	r = 4	3.01	4.33	0.18	1.09	4.03	0.18

Notes: Refer to Table 2.

Source: Author's Estimates.

Table 5: Unit Root Statistics - Lebanon

Variable	Lag	ADF t-statistic	KPSS(η)	Result
GDP	8	-2.26	0.24**(τ)	I(1)
CPI	8	-2.52	0.25**(τ)	I(1)
ER	10	-11.67**	0.17*(τ)	I(1)
TB	2	-3.25	0.18*(τ)	I(1)

Notes: Refer to Table 1.

Source: Author's Estimates.

Table 6: Co-integration Tests - Lebanon

Hypothesis		λ- Trace Statistics	Critical Values 5%	Prob.	λ- Max-Eigen Statistics	Critical Values 5%	Prob.
Null	Alternative						
r = 0	r ≥ 1	36.40	40.17	0.11	19.31	24.15	0.19
r ≤ 1	r ≥ 2	17.08	24.27	0.30	10.41	17.79	0.44
r ≤ 2	r ≥ 3	6.67	12.32	0.35	4.52	11.22	0.54
r ≤ 3	r = 4	2.14	4.12	0.16	2.14	4.12	0.16

Notes: Refer to Table 2.

Source: Author's Estimates.

Table7: Unit Root Statistics - Morocco

Variable	Lag	ADF t-statistic	KPSS(η)	Result
GDP	1	-1.59	0.15*(τ)	I(1)
CPI	3	-2.06	0.25**(τ)	I(1)
ER	2	-1.50	0.18*(τ)	I(1)
TB	1	-1.93	0.20*(τ)	I(1)

Notes: Refer to Table 1.

Source: Author's Estimates.

Table 8: Co-integration Tests - Morocco

Hypothesis		λ- Trace Statistics	Critical Values	Prob.	λ- Max-Eigen Statistics	Critical Values	Prob.
Null	Alternative		5%			5%	
r = 0	r ≥ 1	58.68*	47.85	0.00	29.22*	27.58	0.03
r ≤ 1	r ≥ 2	29.45	29.79	0.05	20.64	21.13	0.05
r ≤ 2	r ≥ 3	8.80	15.49	0.38	8.16	14.26	0.36
r ≤ 3	r = 4	0.64	3.84	0.42	0.64	3.84	0.42

Notes: Refer to Table 2.

Source: Author's Estimates.

Table 9: Unit Root Statistics - Tunisia

Variable	Lag	ADF t-statistic	KPSS(η)	Result
GDP	2	-2.18	$0.17^*(\tau)$	I(1)
CPI	2	-3.26	$0.26^{**}(\tau)$	I(1)
ER	3	-2.25	$0.16^*(\tau)$	I(1)
TB	1	-1.39	$0.20^*(\tau)$	I(1)

Notes: Refer to Table 1.

Source: Author's Estimates.

Table 10: Co-integration Tests - Tunisia

Hypothesis		λ- Trace Statistics	Critical Values	Prob.	λ- Max-Eigen Statistics	Critical Values	Prob.
Null	Alternative		5%			5%	
r = 0	r ≥ 1	50.36*	40.17	0.00	29.53*	24.15	0.00
r ≤ 1	r ≥ 2	20.82	24.27	0.12	12.97	17.79	0.22
r ≤ 2	r ≥ 3	7.84	12.32	0.24	6.78	11.22	0.26
r ≤ 3	r = 4	1.06	4.129	0.35	1.06	4.12	0.35

Notes: Refer to Table 2.

Source: Author's Estimates.

Table11: Unit Root Statistics - Turkey

Variable	Lag	ADF t-statistic	KPSS(η)	Result
GDP	8	-2.26	$0.18^*(\tau)$	I(1)
CPI	1	3.42	$0.24^{**}(\tau)$	I(1)
ER	3	1.62	$0.23^{**}(\tau)$	I(1)
TBILL	9	-2.95	$0.20^*(\tau)$	I(1)

Notes: Refer to Table 1.

Source: Author's Estimates.

Table 12:Co-integration Tests - Turkey

Hypothesis		λ- Trace Statistics	Critical Values 5%	Prob.	λ- Max-Eigen Statistics	Critical Values 5%	Prob.
Null	Alternative						
r = 0	r ≥ 1	37.20	40.17	0.09	17.48	24.15	0.30
r ≤ 1	r ≥ 2	19.71	24.27	0.16	13.59	17.79	0.19
r ≤ 2	r ≥ 3	6.11	12.32	0.42	5.73	11.22	0.38
r ≤ 3	r = 4	6.37	4.12	0.60	0.37	4.12	0.60

Notes: Refer to Table 2.

Source: Author's Estimates.