A VAR ANALYSIS OF EXCHANGE MARKET PRESSURE: A CASE STUDY FOR THE MENA REGION

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Abstract

Recent currency crises in Asia and Latin America have once again raised the question of how policymakers can successfully defend exchange rates. In a managed exchange rate regime, exchange rate pressure can be translated into nominal devaluation and/or loss in international reserves. To capture this pressure, the exchange market pressure (EMP)- the sum of exchange rate depreciation and reserve outflows (scaled by base money)- was calculated and tested by a vector autoregression(VAR) framework for those MENA region countries (Egypt, Tunisia, and Turkey) adopting managed floating exchange rate regimes. The VAR framework enables us first to test whether contractionary policy- either a rise in real interest rate differential or a decrease in net domestic credit- has the expected effect on the exchange market pressure; and, second, to reckon how monetary authority uses its available short-term monetary tools to ease an increase in EMP.

I. Introduction

After the demise of the Bretton Woods system of fixed exchange rates in the early 1970s, developing countries were faced with the dilemma of the choice between fixed vs. flexible exchange rate. As usual economists did not pass on the chance of jumping onto the advisor's seat and catering to the policymakers with the merits and vices of each system. To make the matter more complicated, during the last three decades, the menu of exchange rate systems was not restricted to those two polarized regimes but it has expanded to include a number of hybrid systems, like crawling peg, managed floating and target zones. During this period and until this moment and despite the massive amount of literature on this subject, there is no consensus among economists on what is to be considered the optimal exchange rate regime that developing countries should adopt. Albeit this disagreement on the right exchange rate regime, almost all economists believe that such a choice should not be decided in a vacuum of the economic characteristics of the country. Indeed, features like the size, the degree of openness, and the type of shocks common to the economy are thematic variables that make one system dominate others. In addition, the choice of exchange rate regime has imperative implications on the monetary policy in the economy. In general, under a fixed exchange rate regime, the authority determines the price of the currency and lets the market determine the equilibrium quantity. In this case, the authority loses its monetary independence, as money supply has to adjust to clear the market for domestic money. In fact, under perfect capital mobility and perfect asset substitution, changing the peg (realignment) is the only form of monetary policy (Obstfeld, 1994). A floating system, on the other hand, buys the authority monetary autonomy where it can control monetary instruments such as interest rate and money supply but it looses one degree of freedom to the market; that is the price of its domestic currency.

In practice, the majority of countries, especially developing countries, are located on a spectrum between the two extremes: free floating and pure fixed exchange rate. In these hybrid regimes, the monetary authority allows some degree of flexibility in the exchange rate and at the same time it intervenes in the market by selling or buying international reserves. In such regimes, it is misleading if one considers only movements in the international reserves or movements in the nominal exchange rate to tally the extent of pressures on the exchange rate. Combining the two measures gives us what is known as Exchange Rate Market Pressure (EMP) (Girton and Roper, 1977) which reflects both movements in the international reserve holdings and the nominal exchange rate. This is a direct measure of pressures exerted on the exchange rate market as opposed to the less direct indicators methodology developed by Kaminsky, Lizondo and Reinhart (1998)[1].

In countries adopting these hybrid exchange rate regimes and faced with exchange rate pressures, policy options in the short run are only limited to monetary policy. To assuage these pressures and reduce EMP, the authority should react by embracing contractionary monetary policy. Interest rate defense has recently been emphasized in the literature[2] as a possible venue to defend the currency and contend the attack. A more traditional way is via controlling domestic credit; however, this is a bit trickier. Faced with early warnings of an attack reflected in escalating EMP, monetary authority may venture to sterilize this attack by pumping more credit to the financial sector and especially the banking sector. This expansionary monetary policy is an example of a self-defeating policy that only hastens tremors in the exchange rate market[3]. This detrimental policy reaction is unduly perilous as little appreciation in EMP may trigger the monetary authority to increase its outstanding liabilities pushing the economy toward a "groundless" attack! A similar scenario is often associated with financial crisis. Faced with bank-runs or more generally some pressures on financial intermediaries, the authority may opt for increasing net domestic credit extended to the financial sector (Velasco, 1987). This is in turn, is likely to undermine the currency deriving speculators to launch an attack on domestic currency leaving the country with a twin-crises in hand instead of just one!

The policy response to an attack is tied to a large extent to the stance of monetary policy as well as the degree of monetary autonomy. When EMP builds up, the authority decides whether to use domestic credit or interest rate or a combination of both to contend with such pressures, however the efficacy of the adopted policy rests on the degree of monetary independence that the country has. In case of low level of monetary independence, the authority has to vigorously change its monetary instruments for them to have a concrete effect on EMP. In contrast, in case of high degree of monetary independence, small changes in such instruments can effectively achieve the desired objectives.

This paper attempts - with the help of a monetary model for exchange rate - to gauge the degree of monetary autonomy and the policy reaction to EMP for a number of

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[1] This methodology uses a number of key macroeconomic indicators to reckon the susceptibility of a given country to a currency crisis.

[2] See for example Drazen (1999a,b), Kraay (1999) and Lahiri and Vegh (2000).

[3] Leiderman and Thorne (1996) provide some evidence that the Mexican authority faced with the incipient attack in 1994 increased the net domestic credit providing more liquidity to the market and hence intensifying the attack.

MENA region countries. The paper is organized as follows. Section two provides a theoretical background of the monetary model used to explore the nature of EMP and the factors controlling its behavior. Section three develops an estimable version of the model and justifies the usage of vector auto-regression analysis (VAR) technique as an estimation procedure. Section four provides a summary of the obtained results and their policy implications. Finally, section five concludes and lists a few policy recommendations.

II. Theoretical Background

The money market and monetary equilibrium summarize the basic behavior and changes in the exchange market. Monetary equilibrium must hold at any moment in time. This requires a number of variables to adjust to ultimately clear the market. Despite the spurious simplicity of this equilibrium relation, it requires an array of complex interactions between a number of major economic variables and policy tools. If one wants to espy how exchange rate markets function, one has to delve into these complex interdependent relations and be able to describe their different components and reckon their relative importance.

Our starting point is a simple model of monetary equilibrium similar to the one introduced by Frenkel (1976) and Mussa (1976).

$$H = F + D = PY^{\beta}e^{-ai} \qquad (1)$$

Where H: Base money, F: International reserves component of base money, D: Domestic credit, P: Price level, Y: Real income, i: Nominal interest rate, α and β are parameters > 0. Here the left-hand side represents an exponential demand for money. Also each variable has a time subscript that was deleted to simplify the notation.

Taking log of (1), we have:

$$\text{Log } H = \log(F + D) = \log P + \beta \log Y - \alpha i$$

Time differentiate this last equation, and we have:

$$\frac{\dot{H}}{H} = \frac{\dot{F} + \dot{D}}{F + D} = \frac{\dot{P}}{P} + \beta\frac{\dot{Y}}{Y} - \alpha\,\dot{i} \qquad (2)$$

Where the dot on any variable denotes the derivative of this variable with respect to time.

Also by definition of F:

$$\dot{F} = E\,\dot{R} \qquad (3)$$

Where E denotes the nominal exchange rate.

Using (3) in (2) and the fact that H=F+D, we get:

$$\frac{\dot{H}}{H} = \frac{E\,\dot{R}}{H} + \frac{\dot{D}}{H} = \frac{\dot{P}}{P} + \beta\frac{\dot{Y}}{Y} - \alpha\,\dot{i} \qquad (4)$$

Let $\frac{\dot{H}}{H} = h$, $\frac{E\,\dot{R}}{H} = r$, $\frac{\dot{D}}{H} = d$ and $\frac{\dot{P}}{P} + \beta\frac{\dot{Y}}{Y} - \alpha\,\dot{i} = \dot{m}$

Then (4) can be written as:

$$h = r = -d + \dot{m}$$

Or loss in reserves can be expressed as:

$$-r = d - \dot{m}$$

$$r' = d - \dot{m}$$

Adding the rate of domestic currency depreciation, $\dot{e}$ at both sides we get:

$$r' + \dot{e} = -d + \dot{e} - \dot{m}$$

$$\dot{e} = \pi - \pi^* + z$$

$$r' + \dot{e} = \pi - \pi^* + z + d - \dot{m} \qquad (5)$$

where

π : Domestic inflation,

π^* : International inflation,

z: Deviation from Purchasing Power Parity rule (PPP)[4].

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[4] According to PPP $E = \frac{p}{p^*}$ where P^* is the index of international price level. Under this rule $z = 0$ and the country index the nominal exchange rate to its domestic price level to keep real exchange rate constant and to maintain its level of competitiveness from deteriorating.

Let $r' + \dot{e} = EMP$ (Exchange Rate Pressure) and substitute the value of $\dot{m}$ in (5) and given that $\frac{\dot{P}}{P} = \pi$ then:

$$EMP = d - \pi^* + z - \beta y + \alpha \dot{i} \quad (6)$$

Where y denotes $\frac{\dot{Y}}{Y}$.

According to (6), EMP positively depends on the rate of change of domestic credit scaled by base money and the deviation from PPP rule, and negatively depends on international inflation rate and real money demand. In the short run, a limited list of policy variables could abet the authority in its efforts to subdue an upsurge in EMP. Stimulating real output is an onerous target in the long run and almost an impossibility in the short run. The only variable the authority could directly manipulate is domestic credit. Interest rate on the other hand, is not as pliant as domestic credit especially under capital mobility and fixed exchange rate. In addition, usually the domestic interest rate is a market-determined variable, influenced by a list of variables such as the country's creditworthiness and the market for loanable funds.

Despite its simple appearance, equation (6) embodies a number of interdependent relations between its variables. For instance, an increase in the interest rate has an effect on the demand for money as appearing on the right hand side of (6) but also it has a tacit effect on the supply side emanating from the fact that a higher domestic interest rate- relative to the international one- bolsters an inflow of capital to the country, which in turn increases the amount of international reserves pushing EMP downwards. This direction of causality often works in the opposite direction. When faced with a surge in EMP, the authority may choose to fend such pressures by driving the interest rate. In this case, the rise in EMP triggers the rise in interest rate. This is the usual interest rate defense used by authorities in case of currency attacks. Alternatively, the authority may opt for another contractionary policy by reducing domestic credit. According to this policy option, the line of causality runs from EMP to domestic credit. Similarly, in the case of a bulge in capital flows, the monetary authority may decide to sterilize these flows by lessening the amount of domestic credit. Here, a fall in EMP following the accumulation of international reserves induces a reduction in domestic credit. Equation (6) on the other hand depicts the opposite direction of causality from domestic credit to EMP. This relationship simply states that a lax monetary policy would likely result in a loss in reserves or a depreciation in domestic currency or both, spurring a rise in EMP.

This interdependence between the variables in (6) renders the process of empirically delineating the factors affecting EMP a bit challenging. In the coming section, we tackle this issue and present the justification for choosing the VAR technique as our estimation procedure.

III. Empirical Framework

As shown in the previous section, equation (6) involves a number of interdependent relations. Any attempt to estimate (6) as it is using a traditional estimation procedure like OLS would not produce robust results and would not be very useful for policy analysis[5] (more of this below). Girton and Roper (1977) estimated a version of (6) for Canada using OLS. They recognized one of the problems that could potentially result in a simultaneity problem, which is the possible effect of EMP on domestic credit in case of sterilization[6]. However, this is not the only source of endogeneity in (6) as noted earlier in the last section. In case of interest rate defense, interest rate would react to EMP change creating an endogeneity problem that could bias the obtained results if nothing is done to mitigate this source of biasness.

In this paper we use vector auto-regression analysis (VAR) as our estimation technique. There are mainly two reasons that justify our choice. First, VAR with three endogenous variables: EMP, domestic credit and interest rate would enable us to circumvent the endogeneity problems that exist in (6). Second, VAR technique is a very effective tool in portending how this system reacts to a shock in one of its components through impulse response functions. Of special importance for policy analysis is how the monetary authority reacts in the short term to a shock in EMP. This policy response function would unravel whether the authority uses interest rate defense and or/ uses the more traditional domestic credit; and if indeed the authority uses domestic credit, whether it is a prudential usage, i.e. a contractionary policy or a detrimental one, i.e. an expansionary policy.

The VAR system consists of three endogenous variables and two exogenous variables. The three endogenous variables are EMP, the change in domestic credit scaled by base money d, and interest rate differential ρ defined as the difference

[5] In order to sift out the reaction of the monetary authority to a rise in EMP, we need to portend the response of interest rate and domestic credit to a shock in EMP. This however cannot be accomplished under OLS framework.

[6] Despite the fact that Girton and Roper recognized the potential problem of simultaneous equation bias in the EMP equation together with the possible direction of biasness, they opt for not rectifying this problem.

between domestic interest rate and its international counterpart[7]. We choose to use interest rate differential instead of just domestic interest rate for the following two reasons. First, interest rate differential is a better gauge to measure the stance of monetary policy than the domestic interest rate, as movement in the latter could be induced by movement in the international interest rate that does not necessarily correspond to a change in the domestic monetary policy. Hence, using interest differential would enable us to abstract from changes in domestic interest rate caused by global factors. Second interest rate differential is a more suitable variable to assess the degree of monetary independence. The reason for that is the degree of monetary independence is measured by the ability of the authority to derive a wedge between the international interest rate and the domestic one.

The two exogenous variables in this VAR system are the deviation from PPP rule z, and international inflation π^*. According to (6), a rise in π^* or a contraction in z help in reducing EMP. Note that these two variables are determined outside the system and are independent of EMP assuming that we are dealing with a small open economy, which is indeed the case for each of the countries under investigation. Tanner (1999) has estimated a simpler version of this model for a group of Asian countries using VAR technique as well where he assumed that both z and π^* are equal to zero.

The VAR system can then be written as:

$$Y_t = \sum_{j=1}^{p} A_j Y_{t-j} + z_t + \pi_t^* + u_t$$

Where $Y_t = [EMP \quad d \quad \rho]'$,

$\{u_t\} \equiv iid(0, \Sigma_u)$,

$p = \arg Min\left\{Cr_T(p) : p = 0,1,...\bar{p}\right\}$ where $Cr_T(p)$ is a specific information criteria,

[7] Equation (6) also includes output. We did not consider output as part of the VAR system mainly because of data availability. In all of countries under investigation monthly output is not available and interpolating the data is unlikely to produce the variability associated with truly monthly data. In addition, Tanner (1999) in a similar exercise applied for Asian countries found that including output in the system did not change the obtained results.

and u_t is the error term matrix with variance covariance matrix Σ_u which is symmetric and positive definite.

To implement impulse response functions (IRF), we use Cholesky decomposition to represent the contemporaneous correlations among the individual components of u_t. These are assumed to take the following forms:

$$u_{t,d} = v_{d,t} \tag{7}$$

$$u_{t,\rho} = v_{\rho,t} + w_{\rho,d} v_{d,t} \tag{8}$$

$$u_{t,EMP} = v_{EMP,t} + w_{EMP,d} v_{d,t} + w_{EMP,\rho} v_{\rho,t} \tag{9}$$

According to this representation, shock to domestic credit affects its current value as well as current values of interest rate and EMP. Shock to interest rate affects its own value and current value of EMP, whereas shock to EMP only affects its current value. This representation implicitly assumes an "exogeneity ranking" of policy tools. Domestic credit is a policy variable over which the policymaker has a complete control. This is why in the above representation $u_{t,d}$ is only a function of its own innovation. Interest rate, on the other hand, is not completely controlled by the policymaker. Hence, interest rate differential is of lower exogeneity level compared to domestic credit. This is reflected in (8) in the above representation as $u_{t,\rho}$ is a function of its own innovation and domestic credit innovation. Finally, both innovations in interest rate and domestic credit affects $u_{t,EMP}$ and hence affects the direction of EMP as depicted in (9).

IV. Estimations and Policy Implications

To test the model stated above, it is required to select countries that maintain managed floating exchange rate regimes. In view of this requirement, we have chosen Algeria, Egypt, Tunisia and Turkey in the MENA region, as these countries have been categorized as exercising managed floating[8] since the early 1990s. However, due to the lack of sufficient data on domestic credit, Algeria was dropped later.

The data are monthly and obtained from IMF's International Financial Statistics (IFS). The starting date of the sample varies according to each country's adoption of its exchange rate regime. In Egypt, a managed floating regime was put into effect with the initiation of a comprehensive structural and reform program in 1991. In 1993, Tunisia's managed floating exchange rate regime was coupled with the removal of restrictions on the payments and transfers on current international transactions. As for

Turkey, a real exchange rate rule was abandoned and capital account liberalization completed in 1990. Thus, sample periods for Egypt, Tunisia, and Turkey, respectively, are January 1991-March 2000, January 1993-April 2000, and January 1990-February 2000.

Firstly, unit root tests for endogenous variables (d, ρ, EMP) for all countries were performed and as a result the null hypothesis of unit root at the 99 percent level or higher for all of them was rejected[8]. Below, the estimation results and policy implications are discussed country-by-country. The summary results of the VAR test, which is estimated for equation 6, is presented in the Table 1. Following that, a Granger causality test was conducted to assess the contribution of VAR elements for each endogenous variable. The results are summarized in Table 2. Next, the analysis of short-run dynamic interactions among the endogenous variables is illustrated in Figure 1 using the Impulse Response Function (IRF) (generated by the Cholesky decomposition, as discussed in Section III) by shocks to each endogenous variable (for detailed VAR and IRF coefficients and t-statistics results, see Appendices III and IV).

In addition to VAR tests, the coefficients of variation for the reserve and exchange rate series are calculated (standard deviation/mean) to observe the dominance of reserve or exchange rate adjustments in the monetary policy for each country. Under fixed exchange rate regimes, the authorities keep the changes in the exchange rate at zero. On the other hand, under floating exchange rate regimes, the authorities maintain the change in reserves at zero. Under the managed floating systems, both exchange rates and reserves are allowed to change. Here we want to illustrate where the countries under study stand across the spectrum of exchange rate arrangements.

Turkey

We can clearly see from Table 1 that the results for domestic credit growth equation (d_t) are more robust than for the interest rate differential (ρ_t) and EMP_t equations with high R-squared, adjusted R-squared, and F-statistics (0.79, 076, and 28.07, respectively). This indicates that a significant portion of variations in d_t are explained by the VAR system, together with its exogenous variables. It can be also seen that the signs of the estimated significant coefficients of EMP_t and ρ_t are positive indicating that increases in both EMP_t and interest rate differential raise the domestic credit.

Domestic credit shocks affect EMP_t positively, as depicted in Figure 1, where the first three responses were found to be significant, positive and they all exceeded one. Only one significant response (in the seventh month) is negative. The positive response of EMP_t to domestic credit shocks follows conventional wisdom, where an expansion in domestic credit builds up pressure on EMP_t . On the other hand, lagged d_t was found to be a less important factor in the determination of EMP_t : we cannot reject the null hypothesis of no effect of lagged d_t on EMP_t (F-statistics of 0.50).

There is only one significant response of ρ_t (first month) to domestic credit shocks, which is positive and exceeds one. This positive effect is consistent with a Fisher effect, which makes sense since the Fisher effect dominates the liquidity effect in high-inflation countries like Turkey. However, again, the lagged d_t does not have any influence in explaining ρ_t : thus the null hypothesis of no effect of lagged d_t on ρ_t cannot be rejected (F-statistics of 1.13).

Overall test results suggest that the variations in domestic credit can be explained by EMP and ρ_t in this VAR system. Moreover, there is a strong link among domestic credit and EMP_t , and ρ_t since current innovations to d_t affect both EMP_t (through a loss in reserves or a depreciation in domestic currency or both spurring a rise in EMP_t) and ρ_t (through a Fisher effect, since Turkey is a high inflation country, nominal interest rate increases as much as the domestic credit growth and inflation).

The ρ_t equation suffers from a low level of overall significance, with F-statistics of 2.23, R-squared of 0.12, and adj. R-squared of 0.23. Only the estimated EMP_t coefficient is significant with a positive sign (a rise in EMP_t triggers a rise in the interest rate). The low significance of the interest rate differential can be due to the exclusion of some explanatory variables, for instance, creditworthiness, from the system. Furthermore, in addition to a country risk premium, Celasun, Denizer, and He (1999) found that the exchange rate risk or policy risk premium has been the major factor in the determination of real interest rates in Turkey.

As for shocks to the interest differential, EMP_t does not show any significant response (no significant t-statistics). In addition, one cannot reject the null hypothesis of no effect of lagged ρ_t on EMP_t. Similarly, shocks to the interest rate differential have little effect on domestic credit (only one significant response, which is at the fifth period and has a positive sign). Again, the effect of lagged ρ_t seems to have no effect on d_t: the hypothesis cannot be rejected (F-statistics of 1.0). As a result, the overall interest rate differential has no effect in explaining either EMP_t or domestic credit.

As for the EMP_t equation, its significance level is low as well (F-statistics of 2.97, R-squared of 0.27, and adj. R-squared of 0.18). Coefficients of neither domestic credit nor the interest rate differential are significant and they are very small. This suggests that none of the endogenous components of the VAR system have anexplanatory

[8] For a complete description of variables and unit root test results, see Appendices I and II.

power on variations in EMP_t. The small coefficients of domestic credit and interest rate differential in the EMP_t equation may also imply that a high degree of monetary autonomy, that is, small changes in monetary instruments, can effectively achieve the targeted objectives.

As a policy reaction function, EMP_t shocks affect d_t and ρ_t positively in the second period. Both responses are highly significant, as seen in Figure 3 and Appendix IV, Table 3. Moreover, the null hypothesis of no effect of lagged EMP_t on d_t or on ρ_t is rejected at the 99 percent level. All of these results imply that shocks to EMP_t play an important role in explaining domestic credit growth and the interest rate differential. Monetary authorities respond to these shocks by using both policy instruments, that is, by expanding the domestic credit (by providing additional liquidity to the banking system, rather than contracting the money supply) and increasing the interest rate (due to either expected exchange rate depreciation, risk or both).

The exogenous variables z (deviation from the PPP rule) and π^* (international inflation rate)[9] are significant in the EMP_t equation with the correct signs. This implies that EMP_t in Turkey is sensitive to world inflation. Also, an increase in z will raise EMP_t by decreasing Turkey's competitiveness. Both findings suggest that the Turkish economy is open enough for EMP_t to be affected by the deviation from the PPP rule and the international inflation rate.

The idea of the openness of the Turkish economy is supported by the calculated coefficient of variation. Changes in the exchange rate dominate (1.33) reserve adjustments (0.59). Once again, this implies that Turkey has a higher degree of openness, which allows its exchange rate to float. Subsequently, the Turkish economy has more autonomy over monetary instruments, such as the interest rate and money supply, since stabilizing the exchange rate is not the main focus.

From the overall results, we find a strong link between domestic credit and EMP in Turkey. The response of EMP_t to domestic credit shocks proves that the increase in domestic credit triggers the increase in EMP. In addition, as a policy reaction function, the IRF in Figure 3 shows that when the pressure on EMP rises, the authorities respond by increasing both the domestic credit and the interest rate. From the estimated EMP_t equation, small coefficients for domestic credit and interest rate differential may suggest a high degree of monetary autonomy. The coefficients of variation calculated for reserve and exchange rate also verify the high degree of openness and monetary independence. Furthermore, the estimated significant exogenous variables indicate the connection between EMP and the world economy. Large deviations from the PPP rule or a decrease in world inflation will put pressure on EMP by requiring adjustments in either exchange rate or reserve levels.

Egypt

As we can see from Table 6, the domestic credit equation has the highest statistical inference, as was the case for Turkey. The F-statistic is large (4.42), and the R-squared and adj. R-squared are relatively high. The estimated two interest rate differentials and one EMP_t coefficients are significant (see Appendix III, Table 2). These results imply that the endogenous variables (ρ_t , EMP_t) can explain the variations in d_t for Egypt.

As we can see from Figure 4, shocks to domestic credit have a significant effect on EMP_t in the first two periods. The first response is negative and greater than two percent while the second one is positive. These two effects are contradictory and no significant conclusion can be drawn from it. However, from the Granger causality test, lagged d_t has an effect on EMP_t: we reject the null hypothesis of no effect of lagged d_t on EMP_t at the 99 percent level. On the other hand, the null hypothesis of no effect of d_t on interest rate differential cannot be rejected, while there is no significant response of ρ_t to domestic credit shocks.

The interest rate differential equation has the lowest level of significance. The F-statistic is 1.81. The R-squared and adjusted R-squared are quite low (0.22 and 0.10, respectively). The Poor results again imply that some of the important variables in explaining interest rate differential are not included in the tests.

A shock to the interest rate differential, however, has a significant effect on domestic credit. The significant response of d_t is in the first period and positive. This means that when the interest rate increases domestic credit also increases. This result presents an anomaly, compared with the prediction of the developed model. In addition, lagged ρ_t has an effect on d_t that is, we cannot reject the null hypothesis of no effect of lagged ρ_t on d_t, at the 99 percent level. As for the response of EMP_t, the significant and negative responses are in the second and sixth periods. This suggests that an increase in the interest rate escalates the capital flow, consequently increasing the amount of international reserves pushing EMP downward. On the other hand, lagged ρ_t has no effect on EMP_t: we cannot reject the null hypothesis of no effect of lagged ρ_t on EMP_t with low the F-statistic of 1.08.

[9] The null hypothesis of the deviation from the PPP rule (z=0) is tested and could not be rejected for three countries. Nevertheless, z and π^* are kept in the model since they exhibited mainly significant statistics and improved the performance of the VAR estimations.

EMP_t seems to be the second most significant equation, with an F-statistic of 2.78, and R-squared of 0.30, and adj. R-squared of 0.19. Again, one domestic credit and two interest rate differential coefficients are significant (magnitudes are around 0.25). Of the exogenous variables, only π^* is significant with a negative sign (which is as predicted in equation 6). This indicates that EMP in Egypt is sensitive to world inflation but not to deviations from the PPP rule. The connection between EMP and the world inflation may imply a degree of openness of the Egyptian economy.

The relatively high domestic credit and interest rate differential coefficients in the EMP_t equation may suggest a low degree of monetary autonomy, that is, to achieve the desired objectives, large changes are required in monetary instruments. This finding is the opposite of the case of Turkey. Once again, the coefficient of variation verifies the low level of openness and independence. The exchange rate variability is quite low (0.05) while reserve adjustments are high (0.34). This implies that the Egyptian authorities concentrate on stabilizing the exchange rate by changing the reserve levels frequently, consequently losing the monetary autonomy.

Finally, shocks to the policy reaction function, that is, to EMP_t, have no effect on the interest rate differential. There is no significant coefficient in the IRFs. Moreover, we cannot reject the null hypothesis of no effect of lagged EMP_t on ρ_t: the F-statistic is very low (0.31). On the other hand, lagged EMP, has an effect on d_t; we reject the null hypothesis of no effect of EMP_t on d_t at the 99 percent level. In addition, there are mixed responses of domestic credit to EMP_t shocks: one is negative and two are positive. Thus, these positive responses may suggest that the Egyptian authorities respond to a rise in EMP by increasing the domestic credit (instead of decreasing it). This weak evidence imply that the Egyptian authorities use domestic credit as a policy rule when there is a high pressure on EMP.

Overall, the test results for Egypt are weak. The domestic credit is explained well in this VAR system. The Egyptian economy indicates a low degree of monetary autonomy and openness. The coefficient of variation for the reserve level is higher than the coefficient of variation for the exchange rate, implying that variability is mainly on the reserve side. As for policy response function, the Egyptian authorities use the domestic credit as a policy tool to defend the currency.

Tunisia

The results of the VAR test for Tunisia shows a different picture from the results for Turkey and Egypt. It is clear from Table 5 that the interest rate differential has the highest level of significance (with an F-statistic of 6.62), while domestic credit has the lowest (with an F-statistic of 1.36). For Egypt and Turkey, the most significant variable is domestic credit whereas the interest rate differential is the least significant.

As depicted in the Table 5 and Appendix III, Table 3, the domestic credit equation statistics are very weak with no significant coefficients. F-statistic, R-squared, and adj. R-squared are very low (1.36, 0.15, and 0.04, respectively). This may imply that some explanatory variables for domestic credit are missing in this model.

Shocks to domestic credit have a significant effect on the interest rate differential. From the IRF in Figure 7 and Table 7 in Appendix IV, there are three significant responses of the interest rate differential, one with negative and two with positive signs. The significance of the negative response is lower than the positive responses. This means that a one percent increase in domestic credit increases the interest rate. This effect is consistent with a Fisher effect although Tunisia is not a high-inflation country. In addition to current d_t, lagged d_t has an effect on the interest rate differential: we can reject the null hypothesis of no effect of d_t on ρ_t at the 96 percent level. On the other hand, shocks to domestic credit have no effect on EMP_t: none of the coefficients are significant in IRF. Moreover, lagged d_t has no effect on EMP_t as well (we fail to reject the null hypothesis, with an F-statistic of 0.72).

All endogenous variable coefficients are significant in the interest differential equation. This suggests that the developed VAR system with its endogenous and exogenous variables explains the variations in the interest rate better for Tunisia than for Turkey and Egypt.

As for the interest rate differential shocks, domestic credit does not have any significant response. However, the null hypothesis of no effect of lagged ρ_t on d_t cannot be rejected. On the other hand, EMP_t has one positive significant response to the shocks to the interest rate differential. The Granger causality test also shows that lagged ρ_t has effect on EMP_t: we can reject the null hypothesis of no effect of lagged ρ_t on EMP_t at the 89 percent level. These significant results mean that an increase in interest rate may indicate a future devaluation, causing a rise in EMP in the form of either a reserve flow or devaluation.

As for the EMP_t equation, the F-statistic is significant although the R-squared and adj. R-squared are relatively poor. None of the endogenous variable coefficients is significant in the VAR estimate. The z is the only significant exogenous variable with a correct sign. World inflation does not have any significant effect on EMP_t, implying the low level of openness of the Tunisian economy. As we suggested in the case of Turkey, low coefficient values of endogenous variables in the EMP_t equation imply a high degree of monetary independence, that is, small changes in monetary instruments can effectively achieve the targeted objectives. However, due to the low statistics of EMP_t equation, this argument is rather weak. This idea of low monetary independence can be also supported by the coefficient of variation. For the reserve and exchange rate, the coefficients of variation are 0.30 and 0.10, respectively. It is obvious that the high variability is on the reserve side. As in Egypt, this means that the Tunisian authorities maintain exchange rate stability by adjusting the reserve levels and consequently losing monetary autonomy.

Finally, shocks to EMP_t, do not have any effect on domestic credit as can be seen from Figure 9 and Table 9 in Appendix IV. However, the null hypothesis of no effect of lagged EMP_t on d_t can be rejected (with the F-statistic of 1.79) at the 88 percent level. Again, interest rate differential responds to shocks to policy response function significantly in two periods. The first response is negative while the second is positive. The implication of this result is ambiguous due to contradictory signs of the responses. But, lagged EMP_t has an effect on the interest rate differential (we reject the null hypothesis of no effect of EMP_t on ρ_t at the 99 percent level). These weak effects of EMP_t on ρ_t may suggest that the Tunisian authorities use the interest rate as a monetary policy tool.

From this discussion of the test results for Tunisia, we can summarize that the variations in the interest rate differential for Tunisia are explained well by the VAR system. There is weak evidence of monetary independence. In support of this statement, the coefficients of variation for the reserve level and exchange rate show that the Tunisian authorities adjust reserve levels to keep the exchange rate stable by losing monetary autonomy. When there is a shock to EMP, the Tunisian authorities respond by using interest rates as a monetary policy tool rather than by increasing or decreasing the domestic credit.

V. Conclusion

This paper tried to gauge the degree of monetary autonomy and the policy reaction to EMP for Turkey, Egypt and Tunisia by developing a VAR model. For Turkey, we find a strong link between domestic credit and EMP. In addition, when the pressure on EMP rises, the authorities respond by increasing both the domestic credit and the interest rate. For Egypt, the authorities use domestic credit as a policy reaction function but the direction of the response is not clear from the results. As for Tunisia, interest rate changes are used as policy tool in response to EMP shocks. However, the direction of the response is again unclear from the results.

In terms of monetary autonomy, Turkey shows a higher degree of independence from small coefficients for domestic credit and the interest rate differential in the estimated EMP equation. Furthermore, the estimated significant exogenous variables indicate the connection between EMP and the world economy. Namely, large deviations from the PPP rule or a decrease in world inflation will put pressure on EMP by requiring adjustments in either exchange rate or reserve levels. This link also implies the high level of openness of the Turkish economy. This idea is also supported by the coefficient of variation, which is higher for the exchange rate than for the reserve levels.

For Egypt and Tunisia, the test results show a low degree of monetary autonomy and openness. The coefficient of variation for the reserve level is higher than the coefficient of variation for the exchange rate, implying that variability is mainly on the reserve side. The authorities adjust reserve levels to keep the exchange rate stable by losing monetary autonomy.

According to the previous discussion, it appears that monetary authorities in these countries can implement a more efficient monetary policy, faced with a rise in EMP, by contracting the net domestic credit, as EMP reacts more strongly to a change in net domestic credit than a change in the interest rate differential. Policymakers are often reluctant to use net domestic credit as a contractionary tool because they fear that they will weaken the position of the financial sector, which is in most cases already weak in most developing countries, and thus incur a heavy associated political cost.

Appendix I

Data Sources

All series were obtained from the IMF's International Statistics (IFS), except for treasury bill rates for Egypt between 1991and 1997, which were taken from the Central Bank of Egypt.

Net domestic credit is domestic credit (line 32).

Interest rate differential was calculated as follows:

Treasury bill rate (line 60C) is taken for Turkey and Egypt, and discount rate (end of period) (line 60) is taken for Tunisia.

When there are missing observations in interest rate data the following procedure is undertaken:

For Turkey, treasury bill rate is regressed on three Months' time deposit (line 60L) and estimated values are used as proxy for missing observations.

For Egypt, missing data for treasury bill rate from 1991 to 1997 is obtained from Central Bank of Egypt.

For Tunisia, discount rate is regressed on money market rate (line 60B) and estimated values are substituted for missing observations in discount rate.

Next, treasury bill rate (60C) is taken for interest rate in the United States. Then, interest rate differential was obtained as the difference between the each country interest rate and the interest rate in the United States.

Exchange Market Pressure (EMP) was calculated as follows:

First, change in reserves was obtained by dividing the change in the reserves holdings (line 1L.D) by lagged base money (line 14).

Second, nominal devaluation is defined as the change in exchange rate (line AE).

Then, EMP was obtained as nominal devaluation minus change in reserves.

Likelihood Ratio Test Used to Determine the Adequate Lag Length in VAR:

$H_0 : P_0$

$H_1 : P_1$

This test is to determine whether the system is VAR(P_0) against the alternative VAR(P_1) with

$P_1 > P_0$. Likelihood ratio: T [log $|\hat{\Omega}_0|$ - log$|\hat{\Omega}_1|$]. This ratio is χ^2 under $H_0(P_0)$ with degree of freedom $2^n (P_1 - P_0)$, where n is the number of endogenous variable.

Appendix II

Unit Root Tests for Endogenous Variables Used in the VAR System

Turkey

Change in Interest rate differential

Phillips-Perron test (one lag and an intercept)

PP Test Statistic = -9.60

We reject the null hypothesis of unit root at 99 percent level or higher

EMP

Phillips-Perron test (one lag and an intercept)

PP Test Statistic = -8.56

We reject the null hypothesis of unit root at 99 percent level or higher

Change in domestic credit

Phillips-Perron test (one lag and an intercept)

PP Test Statistic = -7.55

We reject the null hypothesis of unit root at 99 percent level or higher

Egypt

Interest rate differential

Phillips-Perron test (one lag and an intercept)

PP Test Statistic = -9.03

We reject the null hypothesis of unit root at 99 percent level or higher

EMP

Phillips-Perron test (one lag and an intercept)

PP Test Statistic = -8.85

We reject the null hypothesis of unit root at 99 percent level or higher

Change in domestic credit

Phillips-Perron test (one lag and an intercept)

PP Test Statistic = -11.57

We reject the null hypothesis of unit root at 99 percent level or higher

Tunisia

Interest rate differential

Phillips-Perron test (one lag and an intercept)

PP Test Statistic = -4.77

We reject the null hypothesis of unit root at 99 percent level or higher

EMP

Phillips-Perron test (one lag and an intercept)

PP Test Statistic = -9.89

We reject the null hypothesis of unit root at 99 percent level or higher

Change in domestic credit

Phillips-Perron test (one lag and an intercept)

PP Test Statistic = -9.73

We reject the null hypothesis of unit root at 99 percent level or higher

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Figure 1: Turkey: IRF of Domestic Credit Shock (d): Sample 1990:1-2000:2

(Dotted lines are 2 times standard error)

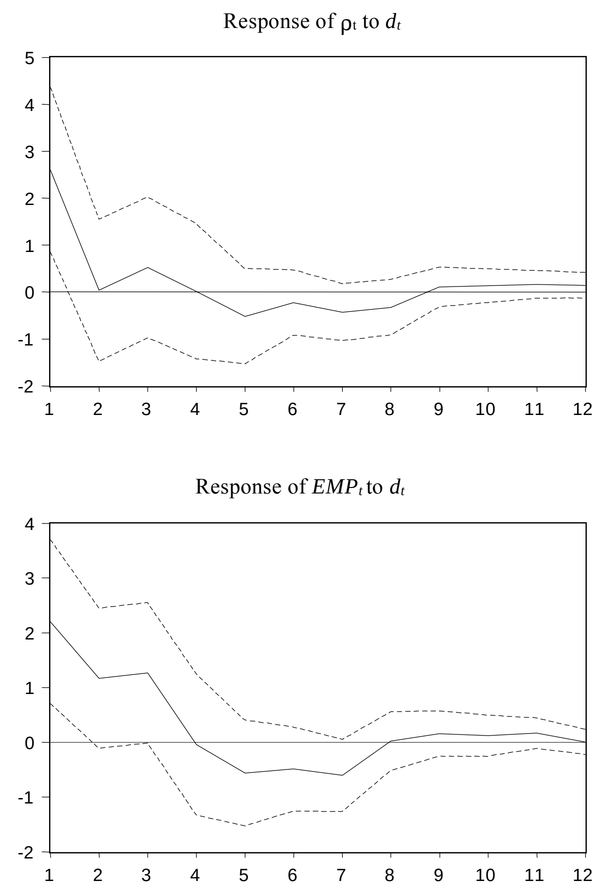

Figure 2: Turkey: IRF of Interest Rate Differential (ρ): Sample 1990:1-2000:2

(Dotted lines are 2 times standard error)

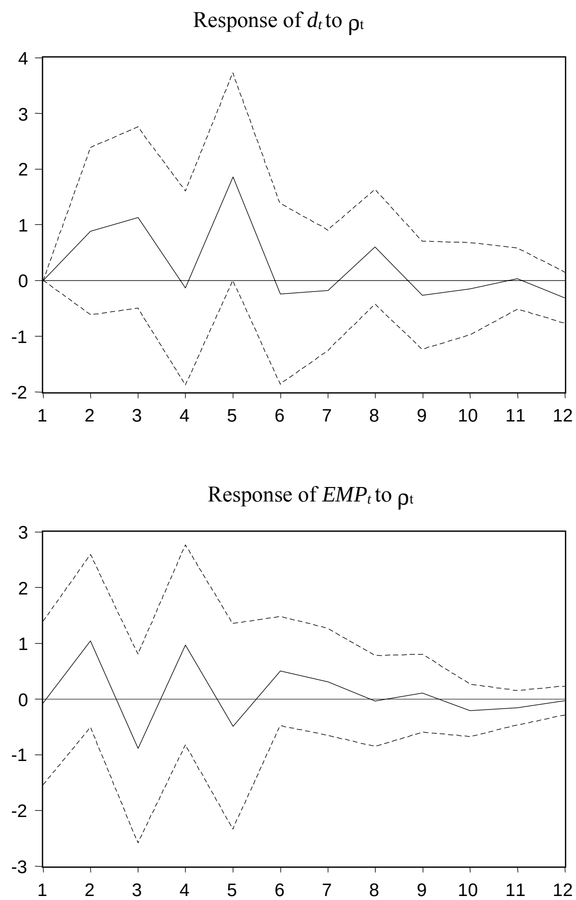

Figure 3: Turkey, IRF of EMP: Sample 1990:1-2000:2

(Dotted lines are 2 times standard errors)

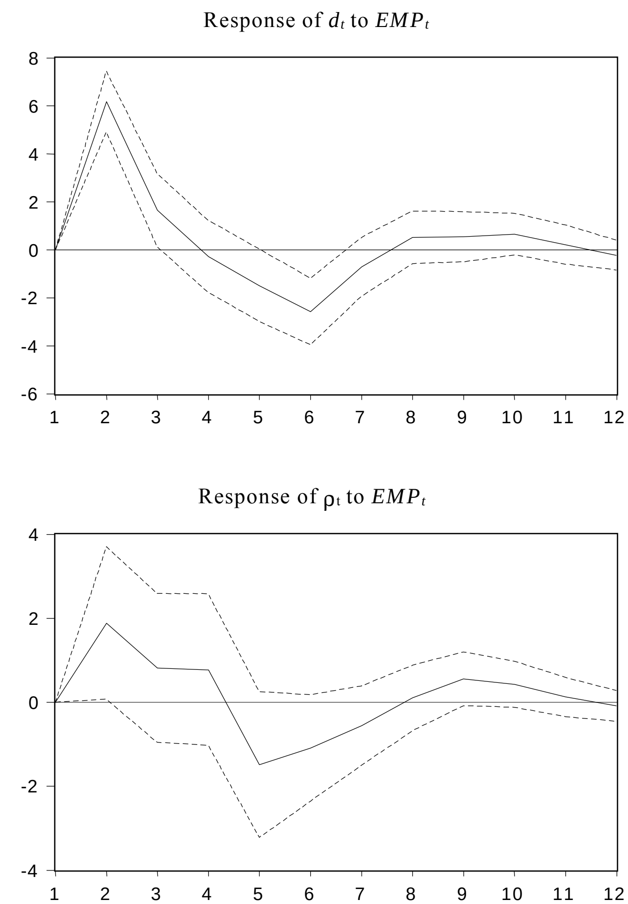

Figure 4: Egypt, IRF of Domestic Credit Shock (d): Sample 1991:1-2000:3

(Dotted lines are 2 times standard error)

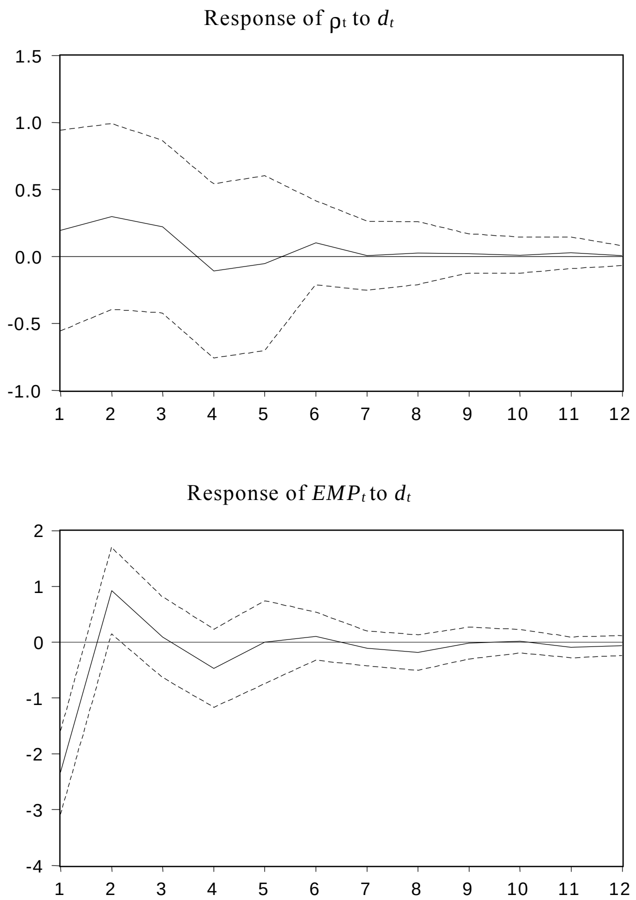

Figure 5: Egypt, IRF of Interest Rate Differential (ρ): Sample 1991:1-2000:3

(Dotted lines are 2 times standard error)

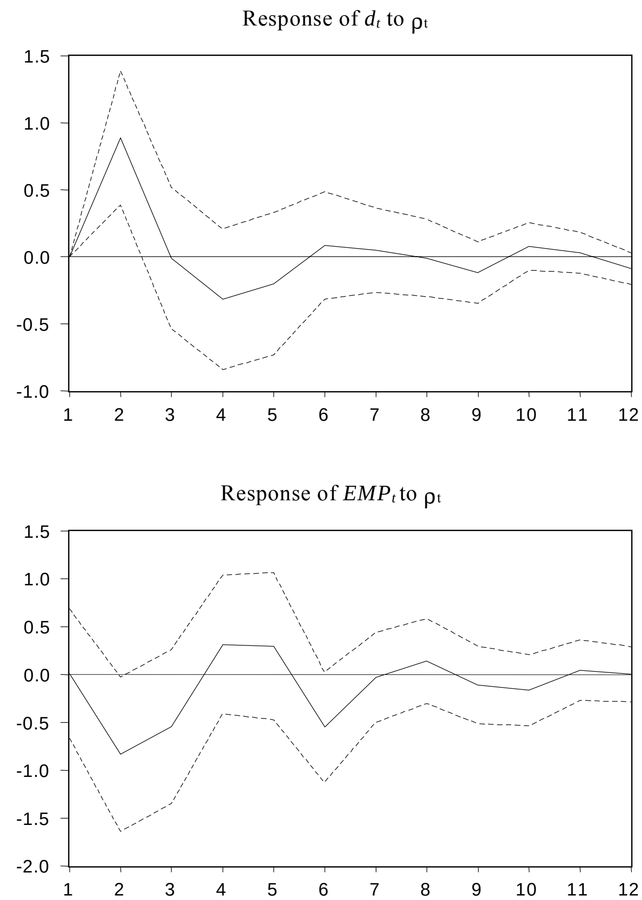

Figure 6: Egypt, IRF of EMP: Sample 1991:1-2000:3

(Dotted lines are 2 times standard error)

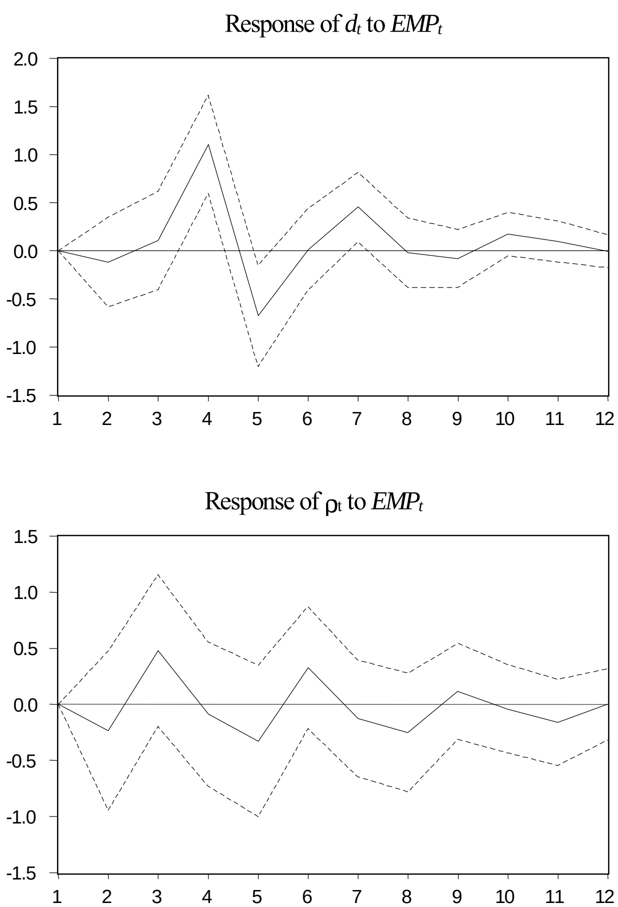

Figure 7: Tunisia: IRF of Domestic Credit Shock (d): Sample 1993:1-2000:2

(Dotted lines are 2 times standard error)

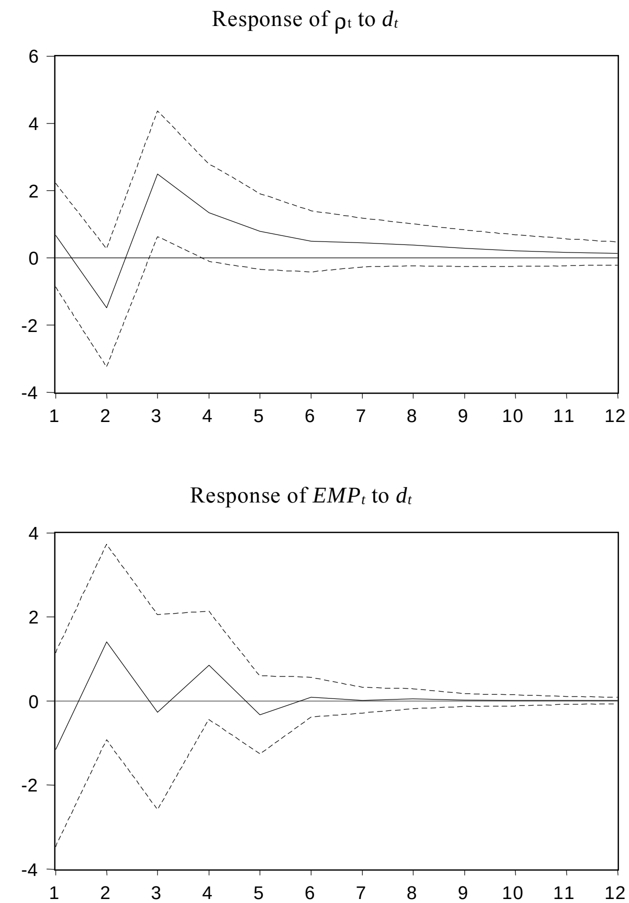

Figure 8: Tunisia, IRF of Interest Rate Differential (ρ): Sample 1993:1-2000:2

(Dotted lines are 2 times standard error)

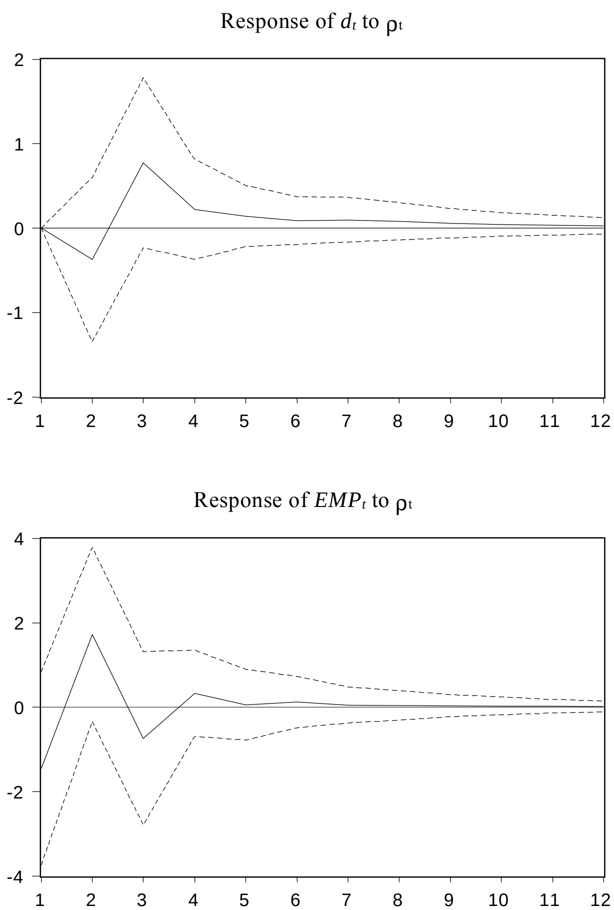

Figure 9: Tunisia, IRF of EMP: Sample 1993:1-2000:2

(Dotted lines are 2 times standard error)

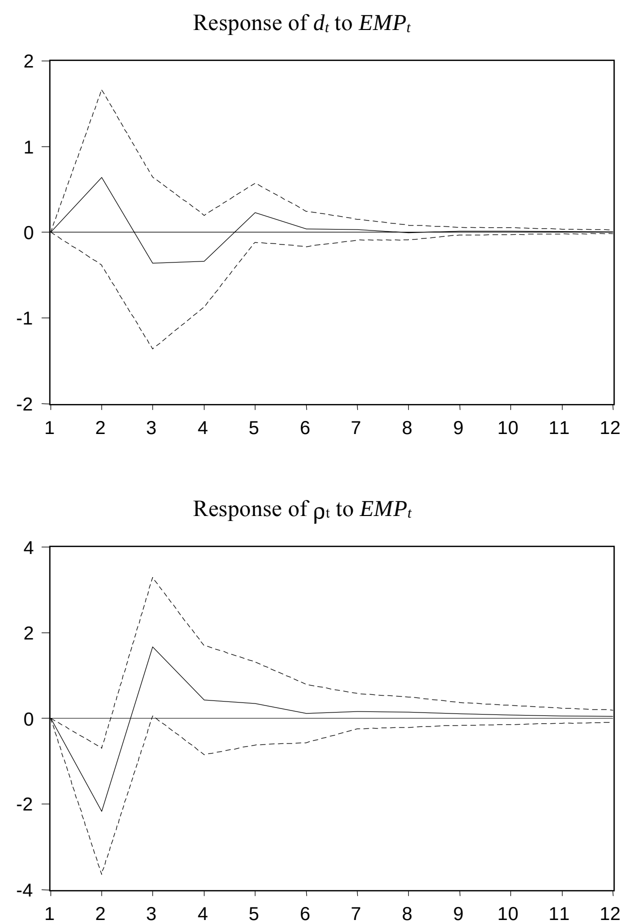

Table 1: Turkey, VAR Estimations

Dependent Variable	d_t	ρ_t	EMP_t
R-squared	0.79	0.23	0.28
Adj. R-squared	0.76	0.12	0.19
F- statistics	28.07	2.23	2.96
Z coefficient	0.75	0.66	0.82
t-statistics	(5.64)	(2.73)	(3.97)
π^* coefficient	-7.36	-2.93	-7.57
t-statistics	(-2.54)	(-0.56)	(-1.69)

Notes: The lag length is four; for a given lag if both the Akaike information criterion (AIC) and Schwarz information criterion are the lowest at that lag, then that lag is used. If, however, one criterion is increasing while the other one is decreasing as the number of lags rises, then the likelihood ratio method is used to determine the right lag (see Appendix I for a detailed description of the method).

Table 2: Turkey: Granger Causality Test

Null Hypothesis	F-Statistic	Probability
Lagged ρ_t has no effect on d_t	1.00	0.41
Lagged d_t has no effect on ρ_t	1.13	0.35
Lagged EMP_t has no effect on d_t	43.17	0.00
Lagged d_t has no effect on EMP_t	0.50	0.73
Lagged EMP_t has no effect on ρ_t	3.42	0.01
Lagged ρ_t has no effect on EMP_t	0.22	0.93

Table 3: Egypt: VAR Estimations

Dependent Variable	d_t	ρ_t	EMP_t
R-squared	0.41	0.22	0.30
Adj. R-squared	0.31	0.10	0.19
F-Statistics	4.42	1.81	2.78
Z coefficient	-0.24	0.41	-0.21
t-statistics	-0.85	0.97	-0.45
π^* coefficient	0.71	3.54	-4.87
t-statistics	0.43	1.43	-1.81

Notes: The number of lags used is four; it is determined by using the likelihood ratio method as explained in Appendix I.

Table 4: Egypt: Granger Causality Test

Null Hypothesis	F-Statistic	Probability
Lagged ρ_t has no effect on d_t	3.34	0.02
Lagged d_t has no effect on ρ_t	0.68	0.57
Lagged EMP_t has no effect on d_t	5.24	0.00
Lagged d_t has no effect on EMP_t	2.21	0.09
Lagged EMP_t has no effect on ρ_t	0.31	0.82
Lagged ρ_t has no effect on EMP_t	1.08	0.36

Table 5: Tunisia: VAR Estimations

Dependent Variable	d_t	ρ_t	EMP_t
R-squared	0.15	0.45	0.24
Adj. *R*-squared	0.04	0.38	0.14
F-Statistics	1.36	6.62	2.47
Z coefficient	-0.31	-0.86	1.73
t-statistics	-1.16	-2.27	3.06
π^* coefficient	-4.00	-6.28	4.34
t-statistics	-0.98	-1.09	0.50

Notes: The number of lags used is two – the lag at which both the AIC and Schwarz criteria are the lowest.

Table 6: Tunisia: Granger Causality Test

Null Hypothesis	*F*-Statistic	Probability
Lagged ρ_t has no effect on d_t	2.23	0.12
Lagged d_t has no effect on ρ_t	3.51	0.04
Lagged EMP_t has no effect on d_t	1.79	0.17
Lagged d_t has no effect on EMP_t	0.72	0.49
Lagged EMP_t has no effect on ρ_t	3.46	0.04
Lagged ρ_t has no effect on EMP_t	2.29	0.11

Appendix III

Table A3.1: Turkey: VAR Estimation Results

	d	ρ	EMP
d (-1)	-0.04 (0.09) (-0.46)	-0.11 (0.16) (-0.68)	0.16 (0.14) (1.17)
d (-2)	-0.30 (0.09) **(-3.32)**	-0.05 (0.16) (-0.32)	0.25 (0.14) **(1.78)**
d (-3)	0.12 (0.09) (1.36)	-0.14 (0.16) (-0.86)	0.07 (0.14) (0.52)
d (-4)	-0.21 (0.06) **(-3.51)**	-0.07 (0.11) (-0.62)	0.10 (0.09) (1.07)
ρ (-1)	0.10 (0.06) **(1.77)**	0.05 (0.10) (0.50)	0.11 (0.09) (1.26)
ρ (-2)	0.04 (0.06) (0.61)	0.13 (0.11) (1.18)	-0.11 (0.09) (-1.24)
ρ (-3)	0.05 (0.06) (0.83)	0.04 (0.11) (0.38)	0.05 (0.10) (0.51)
ρ (-4)	0.14 (0.06) **(2.32)**	0.01 (0.11) (0.09)	-0.03 (0.09) (-0.33)
EMP(-1)	0.76 (0.07) **(11.67)**	0.23 (0.12) **(1.97)**	0.00 (0.10) (-0.02)
EMP(-2)	0.21 (0.10) **(2.11)**	0.17 (0.18) (0.95)	-0.02 (0.16) (-0.14)
EMP(-3)	0.08 (0.10) (0.81)	0.09 (0.19) (0.50)	-0.44 (0.16) **(-2.80)**
EMP(-4)	-0.09 (0.10) (-0.92)	-0.06 (0.18) (-0.35)	-0.35 (0.15) **(-2.34)**
C	4.67 (0.95) **(4.90)**	1.31 (1.73) (0.76)	4.96 (1.48) **(3.35)**
Z	0.75 (0.13) **(5.64)**	0.66 (0.24) **(2.73)**	0.82 (0.21) **(3.97)**
π^*	-7.36 (2.90) **(-2.54)**	-2.92 (5.26) (-0.56)	-7.57 (4.49) **(-1.69)**

Notes: Sample: 1990:1 2000:02; Included observations: 122 after adjusting end points; Standard errors and t-statistics in parentheses; the number of lags is four; it is determined by using likelihood ratio method explained in Appendix I.

Table A3.2: Egypt: VAR Estimation Results

	d	ρ	EMP
d (-1)	-0.40 (0.12) **(-3.42)**	0.06 (0.18) (0.34)	0.41 (0.19) **(2.10)**
d (-2)	-0.27 (0.11) **(-2.51)**	0.26 (0.16) (1.59)	0.32 (0.17) **(1.82)**
d (-3)	0.15 (0.10) (1.55)	-0.02 (0.14) (-0.15)	0.11 (0.16) (0.69)
d (-4)	-0.14 (0.09) (-1.57)	-0.19 (0.14) (-1.37)	0.26 (0.15) **(1.72)**
ρ (-1)	0.23 (0.07) **(3.39)**	-0.06 (0.10) (-0.54)	-0.22 (0.11) **(-1.94)**
ρ (-2)	0.10 (0.07) (1.42)	0.13 (0.10) (1.30)	-0.24 (0.11) **(-2.17)**
ρ (-3)	-0.05 (0.06) (-0.94)	0.27 (0.09) **(3.11)**	0.06 (0.09) (0.64)
ρ (-4)	-0.13 (0.06) **(-2.29)**	0.10 (0.09) (1.13)	0.23 (0.10) **(2.44)**
EMP(-1)	-0.03 (0.07) (-0.47)	-0.07 (0.11) (-0.62)	0.03 (0.12) (0.23)
EMP(-2)	0.03 (0.07) (0.49)	0.14 (0.10) (1.33)	0.11 (0.11) (1.00)
EMP(-3)	0.30 (0.07) **(4.61)**	0.00 (0.10) (0.02)	0.14 (0.11) (1.28)
EMP(-4)	-0.07 (0.07) (-1.02)	-0.13 (0.11) (-1.21)	0.29 (0.12) **(2.46)**
C	0.36 (0.48) (0.75)	-1.55 (0.73) **(-2.13)**	0.44 (0.79) (0.55)
Z	-0.24 (0.28) (-0.85)	0.41 (0.42) (0.97)	-0.21 (0.46) (-0.45)
π^*	0.71 (1.63) (0.43)	3.54 (2.48) (1.43)	-4.87 (2.69) **(-1.81)**

Notes: Sample: 1991:6 2000:03; included observations: 106 after adjusting end points; standard errors and t-statistics in parentheses; the number of lags is four. It is determined by using likelihood method explained in Appendix I.

Table A3.3: Tunisia: VAR Estimation Results

	d	ρ	EMP
d (-1)	0.05	-0.43	0.23
	(0.13)	(0.18)	(0.26)
	(0.40)	(-2.45)	(0.88)
d (-2)	-0.12	0.77	0.09
	(0.13)	(0.18)	(0.26)
	(-0.97)	(4.38)	(0.33)
ρ (-1)	-0.04	0.41	0.23
	(0.08)	(0.11)	(0.16)
	(-0.55)	(3.81)	(1.43)
ρ (-2)	0.11	0.22	-0.16
	(0.08)	(0.11)	(0.17)
	(1.44)	(1.99)	(-0.95)
EMP(-1)	0.07	-0.22	-0.15
	(0.06)	(0.08)	(0.12)
	(1.16)	(-2.84)	(-1.25)
EMP(-2)	-0.04	0.26	0.04
	(0.06)	(0.08)	(0.12)
	(-0.70)	(3.23)	(0.34)
C	1.11	0.22	-1.99
	(1.05)	(1.47)	(2.20)
	(1.06)	(0.15)	(-0.90)
Z	-4.00	-6.28	4.34
	(4.10)	(5.76)	(8.61)
	(-0.98)	(-1.09)	(0.50)
π^*	-0.31	-0.86	1.73
	(0.27)	(0.38)	(0.57)
	(-1.16)	(-2.27)	(3.06)

Notes: Sample: 1993:1 2000:04; included observations: 73 after adjusting end points; standard errors and t-statistics in parentheses; the number of lags is two where both AIC and Schwartz criteria are the lowest.

Appendix IV

Table A4.1: Turkey: IRF of Domestic Credit Shock (d): Sample 1990:1-2000:2

Period	ρ	EMP
1	2.60	2.20
	(0.88)	(0.75)
	(2.97)	**(2.94)**
2	0.04	1.17
	(0.76)	(0.64)
	(0.05)	*(1.83)*
3	0.52	1.27
	(0.75)	(0.64)
	(0.70)	*(1.98)*
4	0.01	-0.04
	(0.72)	(0.65)
	(0.01)	(-0.07)
5	-0.52	-0.56
	(0.51)	(0.48)
	(-1.02)	(-1.17)
6	-0.22	-0.49
	(0.35)	(0.38)
	(-0.65)	(-1.28)
7	-0.43	-0.61
	(0.30)	(0.33)
	(-1.42)	*(-1.84)*
8	-0.32	0.02
	(0.30)	(0.27)
	(-1.10)	(0.08)
9	0.11	0.16
	(0.21)	(0.21)
	(0.50)	(0.77)
10	0.13	0.12
	(0.18)	(0.19)
	(0.74)	(0.65)
11	0.16	0.16
	(0.15)	(0.14)
	(1.07)	(1.18)
12	0.14	0.00
	(0.13)	(0.11)
	(1.05)	(0.02)

Notes: Standard errors and t-statistics are in parenthesis; italics coefficients have t-statistics greater or equal to 1.645; bold coefficients have t-statistics greater or equal to 2.

Table A4.2: Turkey: IRF of Interest Rate Differential Shock (ρ): Sample 1990:1-2000:02

Period	d	EMP
1	0.00 0.00 -	-0.07 (0.73) (-0.10)
2	0.89 (0.75) (1.18)	1.04 (0.78) (1.34)
3	1.13 (0.81) (1.39)	-0.89 (0.85) (-1.05)
4	-0.13 (0.87) (-0.15)	0.97 (0.90) (1.08)
5	1.86 (0.93) **(2.00)**	-0.49 (0.92) (-0.53)
6	-0.24 (0.81) (-0.30)	0.50 (0.49) (1.02)
7	-0.18 (0.54) (-0.33)	0.31 (0.48) (0.64)
8	0.60 (0.52) (1.17)	-0.04 (0.41) (-0.09)
9	-0.26 (0.48) (0.54)	0.10 (0.35) (0.30)
10	-0.15 (0.41) (-0.36)	-0.21 (0.23) (-0.88)
11	0.03 (0.27) (0.13)	-0.16 (0.15) (-1.03)
12	-0.31 (0.23) (-1.35)	-0.03 (0.13) (-0.23)

Notes: Standard errors and t-statistics are in parenthesis; italics coefficients have t-statistics greater or equal to 1.645; bold coefficients have t-statistics greater or equal to 2.

Table A4.3: Turkey: IRF of EMP: Sample 1990:1-2000:2

Period	d	ρ
1	0.00 0.00 -	0.00 0.00 -
2	6.18 (0.63) **(9.74)**	1.89 (0.91) **(2.08)**
3	1.65 (0.76) **(2.16)**	0.82 (0.89) (0.92)
4	-0.28 (0.75) (-0.37)	0.78 (0.90) (0.86)
5	-1.49 (0.75) *(-1.98)*	-1.48 (0.87) *(-1.71)*
6	-2.58 0.69 **(-3.72)**	-1.09 (0.63) (-1.73)
7	-0.71 (0.61) (-1.16)	-0.56 (0.47) (-1.19)
8	0.52 (0.55) (0.94)	0.10 (0.39) (0.26)
9	0.54 (0.52) (1.03)	0.56 (0.32) *(1.74)*
10	0.65 (0.44) (1.50)	0.42 (0.27) (1.55)
11	0.22 (0.41) (0.54)	0.12 (0.24) (0.52)
12	-0.23 (0.31) (-0.74)	-0.09 (0.18) (-0.48)

Notes: Standard errors and t-statistics are in parenthesis; italics coefficients have t-statistics greater or equal to 1.645; bold coefficients have t-statistics greater or equal to 2.

Table A4.4: Egypt: IRF of Domestic Credit Shock (d): Sample 1991:1-2000:3

Period	ρ	EMP
1	0.20	-2.33
	(0.38)	(0.37)
	(0.52)	**(-6.23)**
2	0.30	0.93
	(0.35)	(0.40)
	(0.86)	**(2.39)**
3	0.22	0.09
	(0.32)	(0.36)
	(0.69)	(0.26)
4	-0.12	-0.47
	(0.33)	(0.35)
	(-0.33)	(-1.34)
5	-0.05	0.00
	(0.33)	(0.37)
	(-0.16)	(0.00)
6	0.10	0.11
	(0.16)	(0.22)
	(0.66)	(0.49)
7	0.01	-0.11
	(0.13)	(0.16)
	(0.04)	(-0.72)
8	0.03	-0.19
	(0.12)	(0.16)
	(0.21)	(-1.18)
9	0.02	-0.02
	(0.07)	(0.14)
	(0.30)	(-0.12)
10	0.01	0.02
	(0.07)	(0.11)
	0.15	(0.16)
11	0.03	-0.09
	(0.06)	(0.09)
	(0.46)	(-1.00)
12	0.01	-0.06
	(0.04)	(0.09)
	(0.16)	(-0.68)

Notes: Standard errors and t-statistics are in parenthesis; italics coefficients have t-statistics greater or equal to 1.645; bold coefficients have t-statistics greater or equal to 2.

Table A4.5: Egypt: IRF of Interest Rate Differential Shock (ρ): Sample 1991:1-2000:3

Period	d_t	EMP_t
1	0.00	0.01
	(0.00)	(0.34)
	-	(0.02)
2	0.89	-0.83
	(0.25)	(0.40)
	(3.55)	**(-2.07)**
3	-0.01	-0.54
	(0.27)	(0.40)
	(-0.04)	(-1.35)
4	-0.32	0.31
	(0.26)	(0.36)
	(-1.21)	(0.87)
5	-0.20	0.30
	(0.27)	(0.39)
	(-0.76)	(0.77)
6	0.09	-0.55
	(0.20)	(0.29)
	(0.42)	*(-1.91)*
7	0.05	-0.03
	(0.16)	(0.24)
	(0.31)	(-0.13)
8	-0.01	0.14
	(0.14)	(0.22)
	(-0.70)	(0.63)
9	-0.12	-0.11
	(0.12)	(0.20)
	(-1.03)	(-0.54)
10	0.08	-0.17
	(0.09)	(0.19)
	(0.86)	(-0.89)
11	0.03	0.04
	(0.08)	(0.16)
	(0.39)	(0.28)
12	-0.09	0.00
	(0.06)	(0.15)
	(-1.50)	(0.00)

Notes: Standard errors and t-statistics are in parenthesis; italics coefficients have t-statistics greater or equal to 1.645; bold coefficients have t-statistics greater or equal to 2.

Table A4.6: Egypt: IRF of EMP: Sample 1991:1-2000:3

Period	d_t	ρ_t
1	0.00 (0.00) -	0.00 (0.00) -
2	-0.12 (0.23) (-0.50)	-0.24 (0.35) (-0.66)
3	0.11 (0.26) (0.41)	0.48 (0.34) 1.42
4	1.11 (0.26) **(4.34)**	-0.09 (0.32) (-0.27)
5	-0.68 (0.26) **(-2.58)**	-0.33 (0.34) (-0.98)
6	0.01 (0.21) (0.06)	0.33 (0.27) (1.20)
7	0.45 (0.18) **(2.50)**	-0.13 (0.26) (-0.49)
8	-0.02 (0.18) (-0.12)	-0.25 (0.27) (-0.95)
9	-0.08 (0.15) (-0.54)	0.11 (0.21) (0.54)
10	0.17 (0.11) (1.53)	-0.04 (0.20) (-0.21)
11	0.10 (0.11) (0.90)	-0.16 (0.19) (-0.85)
12	-0.02 (0.09) (-0.08)	0.00 (0.16) (0.00)

Notes: Standard errors and t-statistics are in parenthesis; italics coefficients have t-statistics greater or equal to 1.645; bold coefficients have t-statistics greater or equal to 2.

Table A4.7: Tunisia: IRF of Domestic Credit Shock (d): Sample 1993:1-2000:4

Period	ρ	EMP
1	0.68 (0.77) (0.87)	-1.16 (1.16) (-1.00)
2	-1.48 (0.88) *(-1.69)*	1.40 (1.16) (1.21)
3	2.50 (0.94) **(2.67)**	-0.27 (1.16) (-0.23)
4	1.35 (0.73) *(1.85)*	0.85 (0.64) (1.32)
5	0.78 (0.57) (1.38)	-0.33 (0.46) (-0.71)
6	0.49 (0.46) (1.07)	0.09 (0.24) (0.38)
7	0.45 (0.36) (1.24)	0.02 (0.15) (0.12)
8	0.38 (0.31) (1.24)	0.05 (0.12) (0.44)
9	0.28 (0.27) (1.04)	0.02 (0.08) (0.26)
10	0.21 (0.24) (0.90)	0.01 (0.07) (0.20)
11	0.16 (0.20) (0.81)	0.01 (0.05) (0.27)
12	0.13 (0.17) (0.75)	0.01 (0.04) (0.27)

Notes: Standard errors and t-statistics are in parenthesis; italics coefficients have t-statistics greater or equal to 1.645; bold coefficients have t-statistics greater or equal to 2.

Table A4.8: Tunisia: IRF of Interest Rate Differential Shock (ρ): Sample 1993:1-2000:4

Period	d	EMP
1	0.00	-1.44
	0.00	(1.15)
	-	(-1.26)
2	-0.37	1.73
	(0.49)	(1.03)
	(-0.76)	*(1.68)*
3	0.77	-0.74
	(0.50)	(1.03)
	(1.53)	(-0.72)
4	0.22	0.33
	(0.30)	(0.51)
	(0.75)	(0.65)
5	0.14	0.06
	(0.18)	(0.42)
	(0.78)	(0.14)
6	0.09	0.121
	(0.14)	(0.30)
	(0.62)	(0.40)
7	0.10	0.05
	(0.13)	(0.21)
	(0.74)	(0.25)
8	0.08	0.04
	(0.11)	(0.17)
	(0.72)	(0.24)
9	0.06	0.04
	(0.09)	(0.13)
	(0.65)	(0.29)
10	0.04	0.03
	(0.07)	(0.11)
	(0.60)	(0.27)
11	0.03	0.02
	(0.06)	(0.08)
	(0.56)	(0.27)
12	0.03	0.02
	(0.05)	(0.06)
	(0.53)	(0.26)

Notes: Standard errors and t-statistics are in parenthesis; italics coefficients have t-statistics greater or equal to 1.645; bold coefficients have t-statistics greater or equal to 2.

Table A4.9: Tunisia: IRF of EMP: Sample 1993:1-2000:4

Period	D	ρ
1	0.00	0.00
	(0.00)	(0.00)
	-	-
2	0.64	-2.17
	(0.51)	(0.74)
	(1.25)	**(-2.94)**
3	-0.36	1.67
	(0.50)	(0.81)
	(-0.71)	**(2.07)**
4	-0.34	0.42
	(0.27)	(0.64)
	(-1.26)	(0.67)
5	0.23	0.34
	(0.17)	(0.49)
	(1.31)	(0.71)
6	0.04	0.11
	(0.10)	(0.34)
	(0.38)	(0.33)
7	0.03	0.16
	(0.06)	(0.21)
	(0.49)	(0.80)
8	-0.00	0.15
	(0.04)	(0.18)
	(0.10)	(0.82)
9	0.01	0.10
	(0.02)	(0.13)
	(0.56)	(0.77)
10	0.01	0.08
	(0.02)	(0.11)
	(0.59)	(0.67)
11	0.01	0.06
	(0.01)	(0.09)
	(0.56)	(0.65)
12	0.01	0.05
	(0.01)	(0.07)
	(0.49)	(0.63)

Notes: Standard errors and t-statistics are in parenthesis; italics coefficients have t-statistics greater or equal to 1.645; bold coefficients have t-statistics greater or equal to 2.