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Are Structural VARs with Long-Run Restrictions Useful for Developing Monetary Policy Strategy in Egypt?

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On the basis of SVAR models of monetary policy in Egypt for the period December 1976–May 2006, our paper explores a new empirical assessment for the interest rate channel in correcting trouble in the Egyptian economy by imposing contemporaneous and long run restrictions. It appears that after a monetary policy expansion, output is stable in the first period, rises temporarily reaching the baseline at $t = 40$, and the global monetary aggregate rises but not significantly. In addition, the price level rises with great difficulties in response to a negative interest rate shock to the global liquidity aggregate. The excess of money supply has a transitory effect on the Egyptian output but it causes inflation pressures.

SVAR Blanchard and Quah (1989) estimation reveals contradictory results to the previous findings. Last but certainly not least, this means that the effect of bank lending and the interest rate channels on the economy are limited in time.

The paper shows that the transmission of monetary policy through the interest rate channel has become weak in the short run but more important in the long run. Nonetheless, the bank lending channel through the commercial bank lending is not a potent monetary transmission mechanism.

Keywords: Monetary policy; bank lending channel; interest rate channel; Egyptian economy; SVAR models; contemporaneous restrictions; long run restrictions.

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1. Introduction

The empirical properties of the monetary transmission mechanism are often characterized using impulse response functions of an estimated vector autoregressive system (VAR).

The slowdown of the Egyptian economy over the last few years has stimulated a debate over the effectiveness of monetary policy in stimulating the economy and maintaining its stability.

In this paper, an alternative estimation technique is used to give a special emphasis on the role of the interest rate channel and especially on the banklending channel which has been the recent focus on the literature. The latter focuses on lenders' financial status because loans and securities are not perfect substitutes; thus lenders will reduce loan supply following a contraction in monetary policy. Furthermore, it has already been recognized in the literature that determining what bank loans do after a monetary tightening is not as easy as one might think. Gertler and Gilchrist (1992, p. 2) summarize this as follows:

> Conventional wisdom holds that tightening of monetary policy should reduce bank lending. It is surprisingly difficult, however, to find convincing time series evidence to support this basic prediction of macroeconomic theory.

The economic procedure adopted in this paper will be a trial to clarify this ambiguity. So, for the first time, we treat an SVAR model with contemporaneous restrictions. In addition, we resort to an SVAR model with long-run restrictions proposed by Blanchard and Quah (1989), and King *et al.* (1991). An important contribution of the paper is the methodology for undertaking two empirical techniques to strengthen conclusions taken from estimation results.

To our knowledge, such a macroeconomic strategy has not been widely used to examine the effects of bank lending and interest rate channels in Egypt.

This paper aims to answer these following three questions: (1) What will SVAR models based on imposing short run and long run restrictions successively tell us about the intensity of banklending and interest rate channels in Egypt? (2) How does Egyptian monetary policy transmit its effect through banklending and interest rate channels? (3) How well do structural vector autoregression (SVAR) models enhance the predictive power of monetary policy strategy in Egypt?

Using monthly data from December 1976 to May 2006, we find a great benefit in using structural VARs with long-run restrictions to develop monetary policy strategy in Egypt.

The rest of this paper is organized as follows. Section 2 discusses the econometric procedure. Section 3 treats SVAR estimation results and interpretations after an unexpected monetary policy and banklending movements. The last section concludes.

2. The Econometric Procedure

This paper details the structural vector autoregression (VAR) model used to investigate the role played by banklending channel and interest rate channel in the short and long run separately. There have been two broad approaches to identification, the Cowles Commission (CC) methodology, and the so-called structural vector autoregression (SVAR) methodology.[1] The SVAR methodology was developed as a result of Sims' (1980) critique of the CC methodology, and is now arguably the most widely used method of structural analysis.

Structural vector autoregression (SVAR) models have become a popular tool in recent years in the analysis of the monetary transmission mechanism and sources of business cycle fluctuations (Christiano *et al.*, 1999; Kim and Roubini, 2000). It can be said that few convincing works have dealt with the monetary policy stance in Egypt. Moursi *et al.* (2007) estimate a six-variable semi-structural VAR based on Bernanke and Mihov (1998) to compute a consistent monetary policy stance measure for Egypt and assess its impact on the economy without enhancing the predictive power for the long term.

The seminal papers popularizing the use of SVAR models in the analysis of the source of business cycle fluctuations are Blanchard and Quah (1989), Sims (1986) and Bernanke (1986). On this point, it needs to be emphasized that SVAR models are intended to represent a "true" model of the economy. Moreover, SVAR models use monetary policy shocks to trace out the dynamics of the model and, for this purpose, the shocks need neither be large nor persistent.[2]

Because economic interpretations of reduced form VAR equations are difficult, we adopt the methodology of Bates and Hachicha (2009) in investigating a structural VAR, and use eligible economic theory and econometric considerations to impose the structure of the system. In this class of

[1]For a summary of the CC methodology, see Koopmans (1949) and Klein (1950).

[2]SVAR models provide a certain mix between a mere "data-driven" approach and an approach coherently based on economic theory (see Fry and Pagan, 2005, for the applications of VARs for macroeconomic research).

models, identification focuses especially on the error of the system, which are interpreted as linear combinations of exogenous shocks. Our analysis highlights the effects of shocks in the credit supply and short term interest rate on main key transmission variables such as lending rate, domestic credit, money supply, reserves from the banking survey and two objectives variables, i.e., the consumer prices and the gross domestic product.

The identification scheme and corresponding restrictions are based on the monetary regime of Egypt and also on exigent economic and econometric conditions. We use monthly data for the period from December 1976 to May 2006.[3] A logarithmic transformation is applied to all series taken in first difference. All variables were taken from the International Financial Statistics Database. Estimation are concluded using the software JMulti (2005), version 4.04.

To determine the order of integration of the underlying series, augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests are performed for all the series. In sum, these tests give rather strong evidence that all series in first difference are integrated of order zero.

Our empirical approach is based on a VAR approach which is repatriated into two types, i.e., SVAR AB model, and SVAR Blanchard and Quah model. The purpose of this research is to give an assessment of the Egyptian bank lending channel and interest rate channel by introducing restrictions in short and long horizons separately to compare their effects.

As in Mehrotra (2007), a reduced form VAR model can be written as:

$$Z_t = A_1 Z_{t-1} + \cdots + A_q Z_{t-q} + CD_t + u_t, \tag{1}$$

where q denotes the order of the VAR model. $Z_t = (Z_{1t}, \ldots, Z_{kt})'$ is a (K × 1) random vector, A_i are a fixed (K × K) coefficient matrix. C is the coefficient matrix associated with the possible deterministic terms D_t. The $u_t = (u_{1t}, \ldots, u_{kt})'$ is a K dimensional white noise process with $\mathrm{E}(u_t) = 0$. The structural representation of Equation (1) can be expressed as:

$$AZ_t = A_1^* Z_{t-1} + \cdots + A_p^* Z_{t-p} + C^* D_t + \mathrm{B}\varepsilon_t. \tag{2}$$

Here, the structural errors are assumed to be white noise with (0, I_k), the coefficient matrices are different from the reduced form coefficients in Equation (1). The matrix A allows for modeling of the instantaneous relations while B is a structural form parameter matrix. The structural shocks, ε_t,

[3]GDP is transformed to monthly data due to SAS software.

are related to the model residuals by linear restrictions. By omitting deterministic terms because they are unaffected by impulses hitting the system and do not affect such impulses, Equation (2) is rewritten as:

$$AZ_t = A_1^* Z_{t-1} + \cdots + A_p^* Z_{t-p} + B\varepsilon_t. \tag{3}$$

In order to link both reduced and structural form, we multiply Equation (3) by A^{-1}, where by $\mathrm{A}_j = \mathrm{A}^{-1}\mathrm{A}_j^*$ $(j = 1, 2, \ldots, p)$. According to Breitung *et al.* (2004), the relation between the reduced-form disturbances and the structural form innovation is expressed as:

$$u_t = \mathrm{A}^{-1} B\varepsilon_t, \tag{4}$$

and

$$\Sigma_u = \mathrm{A}^{-1} \cdot \mathrm{B} \cdot \mathrm{B}' \cdot \mathrm{A}^{-1'}, \tag{5}$$

where Σ_u is the maximum likelihood estimator of the reduced form model.

To estimate with bootstrap confidence intervals, we use the maximum likelihood of Amisano and Giannini (1997), Benkwitz *et al.* (2000) and Breitung *et al.* (2004). If an over-identified model is estimated, the following equation computes the value of a likelihood ratio statistic:

$$\mathrm{LR} = \mathrm{T} \cdot (\log|\Sigma_u^r| - \log|\Sigma_u|), \tag{6}$$

where Σ_u^r is the equivalent estimator Σ_u from the restricted structural form estimation.

In the Blanchard and Quah model, $\mathrm{A} = \mathrm{I}_k$ and the matrix of long run effects $(\mathrm{I}_k - \mathrm{A}_1 - \mathrm{A}_2 - \mathrm{A}_p)^{-1}$. B is assumed to be a lower triangular. The impulse responses are computed from the estimated VAR coefficients, and the Hall percentile interval is chosen to build confidence intervals (CI) that reflect the estimation's uncertainty:

$$\mathrm{CI} = [\phi_1 - t^*_{(1-\gamma/2)}, \phi_2 - t^*_{\gamma/2}], \tag{7}$$

where $t^*_{\gamma/2}$ and $t^*_{(1-\gamma/2)}$ respectively are the $\gamma/2$ and the $(1-\gamma/2)$ quantiles of the distribution of $\mathrm{CI} = [\phi_1 - \phi_2]$ (see Hall, 1992).

$\mathrm{K}^2 + \mathrm{K}(\mathrm{K}-1)/2$ restrictions have to be imposed for the identification of the system. The latter includes seven endogenous variables, namely, the deposit rate like a proxy of the short rate denoted (SRATE),[4] the lending rate (LRATE) to account for the banking financing, the reserve money monetary authorities (RESERVES), the quasi money (QMONEY) to account

[4]According to Al-Mashat and Billmeier (2007), the short term interest rate is the best interest rate that reflects monetary stance.

for the money supply, the domestic credit banking survey (DCREDIT), the gross domestic product denoted (GDP), and the consumer prices denoted (COPRICES).[5]

The errors of the reduced form VAR are written as $u_t = (u_t^S, u_t^L, u_t^R, u_t^Q, u_t^D, u^G, u_t^C)'$. The structural disturbances $\varepsilon_t^S, \varepsilon_t^L, \varepsilon_t^R, \varepsilon_t^Q, \varepsilon_t^D, \varepsilon_t^G, \varepsilon_t^C$ are short rate, long rate, reserves, quasi-money, domestic credit, industrial share prices, and consumer prices, respectively. The AB model with contemporaneous restrictions in the form $\mathrm{A}u_t = \mathrm{B}\varepsilon_t$ can be written as:

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & a_{43} & 1 & 0 & 0 & 0 \\ a_{51} & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & a_{64} & 0 & 1 & 0 \\ a_{71} & 0 & 0 & 0 & a_{75} & 0 & 1 \end{bmatrix} \begin{bmatrix} u_t^S \\ u_t^L \\ u_t^R \\ u_t^Q \\ u_t^D \\ u_t^G \\ u_t^C \end{bmatrix} = \begin{bmatrix} b_{11} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & b_{22} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & b_{33} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & b_{44} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & b_{55} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & b_{66} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & b_{77} \end{bmatrix} \begin{bmatrix} \varepsilon_t^S \\ \varepsilon_t^L \\ \varepsilon_t^R \\ \varepsilon_t^Q \\ \varepsilon_t^D \\ \varepsilon_t^G \\ \varepsilon_t^C \end{bmatrix}. \tag{5}$$

The first column of Equation (5) specifies that response of consumer prices to a contemporaneous nominal short term interest rate shock is not null and is denoted (a_{71}); domestic credit responses also did not take the null value and are denoted (a_{51}). (a_{43}), (a_{64}) and (a_{75}) refer to money supply response to reserve shock, industrial share price response to money supply and consumer prices response to domestic credit, respectively.

Following the structural vector autoregressive (SVAR) methodology with long-run restrictions proposed by Blanchard and Quah (1989), and King *et al.* (1991), the Blanchard and Quah (1989) model can be presented in

[5]Despite the important number of variables, we did not find any problem of convergence in estimating each system. Such a problem was avoided by using an important number of observations.

Equation (6) as follows:

$$\begin{bmatrix} a_{11} & a_{12} & a_{13} & a_{14} & a_{15} & a_{16} & a_{17} \\ a_{21} & a_{22} & a_{23} & a_{24} & a_{25} & a_{26} & a_{27} \\ a_{31} & a_{32} & a_{33} & a_{34} & a_{35} & a_{36} & a_{37} \\ a_{41} & a_{42} & a_{43} & a_{44} & a_{45} & a_{46} & a_{47} \\ a_{51} & a_{52} & a_{53} & a_{54} & a_{55} & a_{56} & a_{57} \\ a_{61} & a_{62} & a_{63} & a_{64} & a_{65} & a_{66} & a_{67} \\ a_{71} & a_{72} & a_{73} & a_{74} & a_{75} & a_{76} & a_{77} \end{bmatrix} \begin{bmatrix} u_t^S \\ u_t^L \\ u_t^R \\ u_t^Q \\ u_t^D \\ u_t^I \\ u_t^C \end{bmatrix}$$

$$= \begin{bmatrix} b_{11} & 0 & 0 & 0 & 0 & 0 & 0 \\ b_{21} & b_{22} & 0 & 0 & 0 & 0 & 0 \\ b_{31} & b_{32} & b_{33} & 0 & 0 & 0 & 0 \\ b_{41} & b_{42} & b_{43} & b_{44} & 0 & 0 & 0 \\ b_{51} & b_{52} & b_{53} & b_{54} & b_{55} & 0 & 0 \\ b_{61} & b_{62} & b_{63} & b_{64} & b_{65} & b_{66} & 0 \\ b_{71} & b_{72} & b_{73} & b_{74} & b_{75} & b_{76} & b_{77} \end{bmatrix} \begin{bmatrix} \varepsilon_t^S \\ \varepsilon_t^L \\ \varepsilon_t^R \\ \varepsilon_t^Q \\ \varepsilon_t^D \\ \varepsilon_t^I \\ \varepsilon_t^C \end{bmatrix}. \quad (6)$$

Equation (6) shows that in matrix B only shocks value in the column_i starting from b_{ii} are different from zero. Outside, the null value is attributed.

3. The Estimation Results

3.1. *SVAR with contemporaneous restrictions*

The SVAR methodology suggests imposing restrictions on the contemporaneous structural parameters only, so that reasonable economic structures might be derived (Gordon and Leeper, 1994; Sims and Zha, 1998; Leeper and Roush, 2003; Kim and Roubini, 2000; Mojon and Peersman, 2003; Dedola and Lippi, 2005). The fact that only contemporaneous restrictions are imposed however does not imply that there is no feedback among variables. In the (SVAR) structure, the lagged values enter each equation and thus all variables are linked instantaneously together.[6]

The structural parameter estimates of the A and B matrices using an SVAR model with contemporaneous restrictions are displayed in Table 1. To make an easy interpretation of the contemporaneous coefficients, we present the spontaneous theoretical negation of the A matrix.

[6]Aoki *et al.* (2002) use a recursive VAR to estimate the effects of monetary policy shocks on the housing market in the UK and find that UK house prices are 0.8% lower five quarters after a 50-basis points interest rate shock.

Table 1. Structural parameter estimates of −A and B matrices.

$$-\mathrm{A} = \begin{bmatrix} -1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1.1602 & -1 & 0 & 0 & 0 \\ -0.3423 & 0 & 0 & 0 & -1 & 0 & 0 \\ 0 & 0 & 0 & -0.0350 & 0 & -1 & 0 \\ -0.1765 & 0 & 0 & 0 & 0.0038 & 0 & -1 \end{bmatrix}$$

$$\mathrm{B} = \begin{bmatrix} 0.0165 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0.0481 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0.0129 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0.0137 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0.0645 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0.0078 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0.0024 \end{bmatrix}$$

The instantaneous responses carry limited statistical significance so that more information may be derived from a structural impulse response analysis. Taking advantage of the better small sample properties of bootstrap confidence intervals compared to other asymptotic methodologies, we construct bootstrap percentile 95% confidence intervals to illustrate parameter uncertainty following Benkwitz *et al.* (2001), and Lutkepohl and Kratzig (2004). Responses up to 80 periods ahead are considered using 1,000 bootstrapping replications. We focus on observing the impact of interest rate and credit shocks on all the series. The impacts of these shocks are depicted in Figures 1 and 2.[7] A depreciation shock in the short interest rate (SR) leads to a very slow statistically non-significant increase in real output only after 10 periods. Interestingly, the same shock also causes a dynamic trial in the price level to join the baseline. However, the magnitude of the impact of the credit shock on prices appears to be potent. The point estimates of the impulse responses suggest that a 1% increase in the domestic credit ranking survey (CR) lowers the price level by only 0.06%. This minimum impact is obtained after six periods have passed from the shock and had never been attenuated another time. Our results are in concordance with Bouakez *et al.* (2005) who find that a response of inflation to monetary policy shock is relatively pronounced and also the most persistent. Furthermore, the dynamic stochastic general equilibrium model of Sims and Zha (2006) generates inertial output and prices of this type. Nominal rigidities of this sort are common in Dynamic Stochastic General Equilibrium (DSGE) models.

[7] See Figures 3 and 4 for SVAR with long run restrictions.

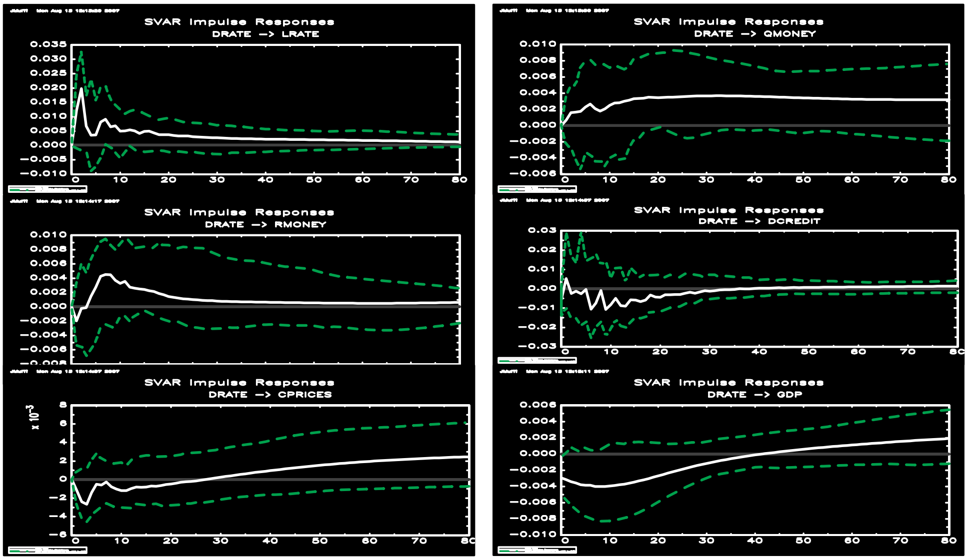

Fig. 1. Responses to monetary policy shock.

Note: Responses of long term interest rate, quasi-money, reserves, domestic credit, consumer prices and gross domestic product are displayed.

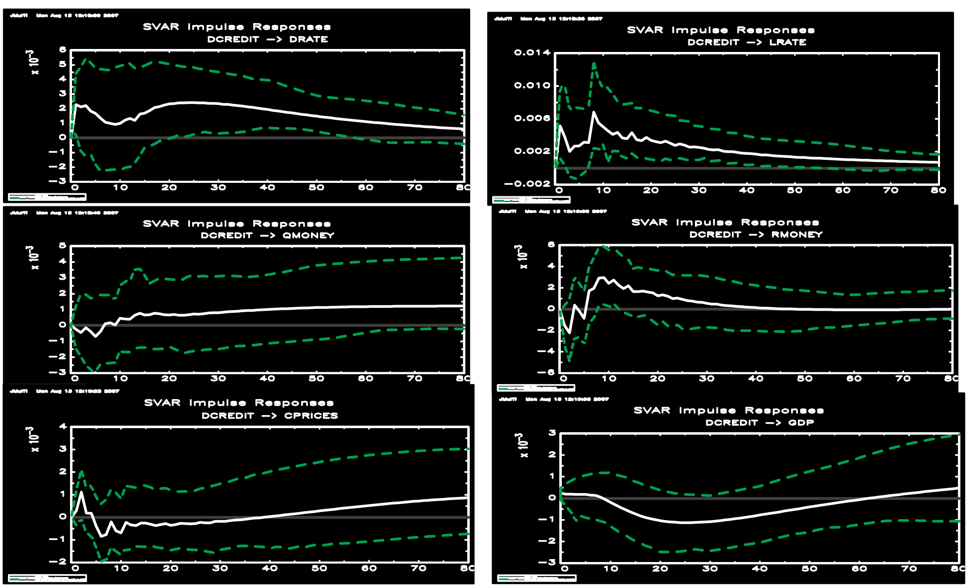

Fig. 2. Responses to a bank lending shock.

Note: Responses of deposit interest rate, quasi-money, reserves, domestic credit, consumer prices and gross domestic product are displayed.

Due to the low pass-through rate, our results are only weakly supportive of effect of a monetary expansion, output returns subsequently to its baseline level at $t = 40$. The price level falls but was not significant in response to an interest rate shock. The long term interest rate remains persistently positive after the period of the shock. The potency of the interest rate channel is weak, and the movements in the nominal interest rate are rather limited and close to the baseline. The figure does not highlight any abnormal phenomenon such as "price puzzle".[8]

Normally, one possible explanation of the price puzzle that is usually found in VAR studies is the omission of a variable useful in forecasting inflation (such as the commodity price index) which implies that endogenous responses to expected inflation increases will be mistaken as monetary policy shocks (see Giordani, 2004). In our case, we take into account this variable, which is why the price puzzle phenomenon disappears. But it is more important now is to see whether the price puzzle appears with Blanchard and Quah model.

Figure 2 depicts the impulse response functions to an unexpected credit shock. We can see that money supply decreases at impact but then tends to recover easily to its baseline. In addition, consumer prices rises after an increase in credit but the effect is short lasting on the gross domestic product which does not respond in the expected way.

To examine further the importance of different shocks, we perform forecast error variance decomposition plotted in Table 2. The procedure calculates the contribution of one monetary policy variable to the forecast error variance of another variable h periods ahead, as Breitung *et al.* (2004) discuss. As we are interested primarily in the contributions of the various structural shocks on all variables of our research, we report seven shocks in each table.

According to Table 2, the proportion of lending rate shocks in the forecast error variance of short term interest rate is quite weak in the short run, but it rises progressively over time (17%). In contrast, the importance of reserve

[8]Despite subsequent advances in SVAR modeling, the price puzzle has generally remained a problem for empirical researchers. Some authors have argued that the presence of a price puzzle should serve as an informal specification test of a VAR model: if such an anomalous result is observed, then what one has labeled as "monetary policy" has probably not been correctly identified. Proponents of this view include Zha (1997), Sims (1998), and Christiano *et al.* (1999). Viewed this way, understanding the price puzzle is a prerequisite for measuring the effects of monetary policy.

Table 2. Proportions of forecast error.

Forecast Horizon	DRATE	LRATE	QM	RM	DCR	CPRICES	GDP
Proportions of forecast error in "DRATE" accounted for by:							
1	1.00	0.00	0.00	0.00	0.00	0.00	0.00
40	0.59	0.04	0.25	0.01	0.04	0.00	0.08
80	0.57	0.05	0.26	0.01	0.05	0.01	0.07
Proportions of forecast error in "LRATE" accounted for by:							
1	0.00	1.00	0.00	0.00	0.00	0.00	0.00
40	0.17	0.43	0.26	0.01	0.06	0.01	0.06
80	0.17	0.41	0.28	0.01	0.07	0.01	0.06
Proportions of forecast error in "QMONEY" accounted for by:							
1	0.00	0.00	1.00	0.00	0.00	0.00	0.00
40	0.16	0.07	0.56	0.12	0.01	0.01	0.07
80	0.18	0.12	0.52	0.11	0.02	0.02	0.04
Proportions of forecast error in "RMONEY" accounted for by:							
1	0.00	0.00	0.39	0.61	0.00	0.00	0.00
40	0.05	0.01	0.33	0.18	0.03	0.04	0.37
80	0.04	0.01	0.32	0.18	0.02	0.03	0.39
Proportions of forecast error in "DCREDIT" accounted for by:							
1	0.01	0.00	0.00	0.00	0.99	0.00	0.00
40	0.06	0.01	0.11	0.07	0.45	0.04	0.26
80	0.06	0.02	0.11	0.08	0.44	0.04	0.25
Proportions of forecast error in "CPRICES" accounted for by:							
1	0.00	0.00	0.00	0.00	0.00	0.99	0.00
40	0.03	0.08	0.34	0.11	0.01	0.40	0.04
80	0.06	0.10	0.52	0.06	0.01	0.18	0.07

Notes: The forecast error variance decomposition is conducted based on the responses graphs, as shown in Figures 1 and 2. Month 1 is the contemporaneous month. Month 80 is the long-run month. Each panel shows how variance of each variable is explained in percentage following the short-run restrictions.

shock remains relatively constant and is highest 40 months after the shock (8%). The proportion of money supply, domestic credit and industrial share prices in the forecast error variance of consumer prices is quite high in the long run (66%). The variance decomposition for the interest rate gives us an idea of the variables in the model that the Bank of Egypt reacts to most when setting interest rates. The largest proportion of variance after 80 months (57%) is attributable to the deposit rate, although money supply shocks are also important throughout the six years reaching 26%. The variance decomposition for the domestic credit reveals that quasi-money and gross domestic product combined account for 36% of the observed variation in the domestic credit at the six-year horizon.

3.2. *SVAR with long run restrictions*

This approach is originally discussed by Blanchard and Quah (1989), and Shapiro and Watson (1988), and is in contrast to the more common approach of specifying short-run restrictions among the variables. An advantage of this form of identification is that the imposition of long-run restrictions circumvents the non-uniqueness problems of recursive VARs arising from variable reordering.

The structural parameter estimates of the A and B matrices using an SVAR model with contemporaneous restrictions are displayed in Table 3. Figure 3 shows responses of lending rate, reserves, money supply, domestic credit, gross domestic product and consumer prices to an unexpected interest rate shock.[9] We did not find any presence of the price puzzle phenomenon

Table 3. Structural parameter estimates of −A and B matrices.

A =	−0.0124	−0.0067	−0.0021	0.0003	−0.0003	−0.0038	−0.0031
	(−2.3803)	(1.4918)	(−0.7068)	(0.0762)	(−0.1216)	(−1.6008)	(−1.4166)
	−0.0180	−0.0270	0.0113	−0.0069	0.0065	−0.0044	−0.0253
	(−1.5066)	(−1.6267)	(0.9539)	(−0.6379)	(0.8662)	(−0.4996)	(−2.2263)
	0.0044	−0.0069	−0.0045	−0.0013	0.0037	0.0037	−0.0048
	(0.9891)	(−1.6283)	(−2.0165)	(−0.4002)	(1.6664)	(1.6429)	(2.2325)
	0.0058	−0.0041	0.0044	−0.0034	0.0106	0.0009	0.0078
	(1.1908)	(−0.9525)	(1.4091)	(−0.8753)	(3.7231)	(0.3350)	(2.3858)
	−0.0196	−0.0301	0.0074	−0.0022	−0.0329	0.0031	0.0324
	(−1.2814)	(−1.7255)	(0.6543)	(−0.1973)	(−2.8074)	(0.2417)	(2.3571)
	0.0019	−0.0019	−0.0020	−0.0003	−0.0013	−0.0062	−0.0001
	(1.3707)	(−1.1298)	(−1.5881)	(−0.1691)	(−0.9303)	(−3.7144)	(−0.0756)
	0.0019	−0.0014	−0.0003	−0.0018	0.0006	0.0010	0.0012
	(1.4379)	(−1.1986)	(−0.5270)	(−1.5240)	(1.1396)	(1.9168)	(1.7554)
B =	0.2895	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	(3.4500)	(0.0000)	(0.0000)	(0.0000)	(0.0000	(0.0000)	(0.0000)
	0.2299	0.2448	0.0000	0.0000	0.0000	0.0000	0.0000
	(2.5868)	(1.8759)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
	0.5299	1.2130	0.7046	0.0000	0.0000	0.0000	0.0000
	(1.1686)	(1.5565)	(4.0895)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
	0.3876	0.5736	0.4196	0.1573	0.0000	0.0000	0.0000
	(1.5275)	(1.5569)	(4.5821)	(2.1716)	(0.0000)	(0.0000)	(0.0000)
	0.3714	0.9134	0.5465	0.1507	0.1236	0.0000	0.0000
	(1.0376)	(1.5954)	(4.3547)	(1.8882)	(3.5673)	(0.0000)	(0.0000)
	0.1898	0.9596	0.4620	−0.1208	0.0164	0.1104	0.0000
	(0.5490)	(1.5659)	(3.7735)	(−1.7119)	(0.7117)	(2.4980)	(0.0000)
	0.2464	0.9875	0.5588	−0.0241	0.0417	0.0781	0.0389
	(0.6636)	(1.5626)	(4.1600)	(−0.3780)	(1.8811)	(2.3498)	(2.2230)

Note: Bootstrap t-values are presented in parentheses.

[9]See impulse response details to a banklending shock in Figure 4.

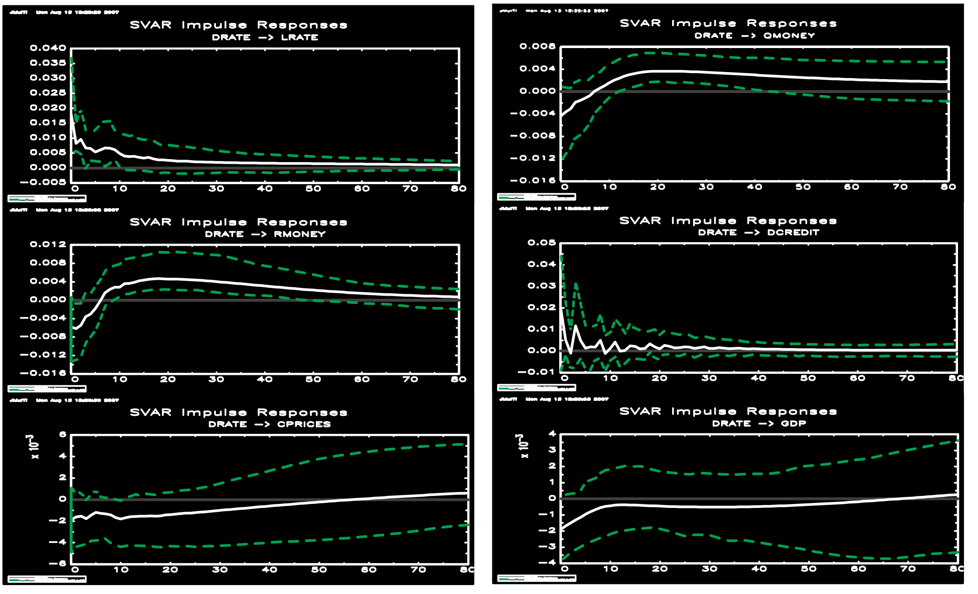

Fig. 3. Responses to monetary policy shock.

Note: Responses of long term interest rate, quasi-money, reserves, domestic credit, consumer prices and gross domestic product are displayed.

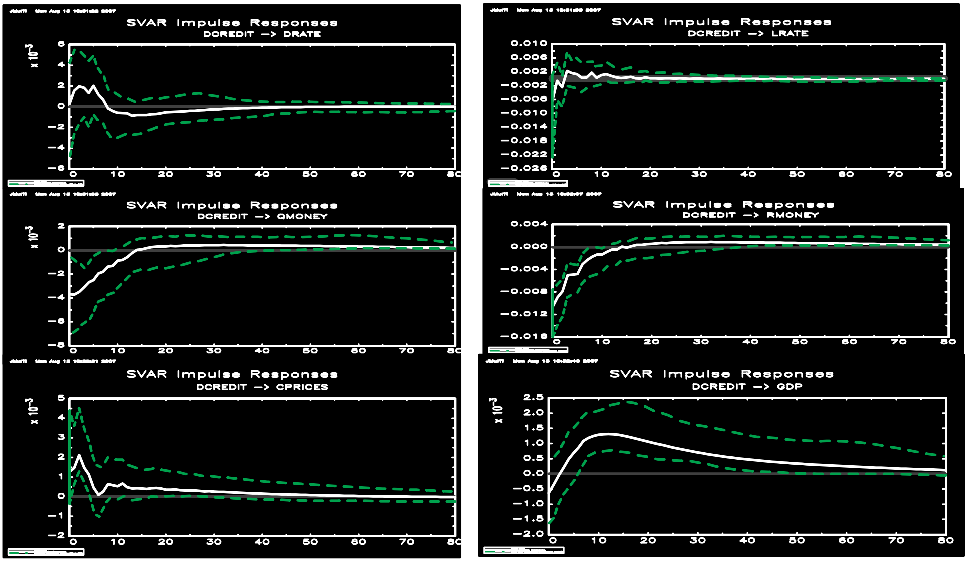

Fig. 4. Responses to a bank lending shock.

Note: Responses of deposit rate, quasi-money, reserves, long term rate, consumer prices and gross domestic product are displayed.

as seen before. However, we should not forget that monetary policy was tightened in 2003, but not by enough to contain inflation at single digit rates.

It is worth noting that, in Egypt, annual CPI inflation (12-month rate) stayed close to 12% for most of the year. With nominal interest rates remaining in the 10–13% range, real interest rates were close to, or below, zero throughout 2004. Recently released data shows a decline in consumer and wholesale prices in the first two months of 2005, bringing 12-month rates of inflation into single digits.[10]

The Egyptian banking sector comprises 57 banks. This number includes: 28 commercial banks of which four are state-owned banks; 26 investment banks of which 11 are joint-venture banks, and 15 are branches of foreign banks; and three specialized banks of which two are state-owned. The number of licensed branches of those banks in Egypt reached 2,443 in addition to 39 branches which are licensed to operate overseas. The rapid growth of the banking sector during the 1990s together with the liberalization of the whole economy added extra burden on the Central Bank of Egypt (CBE) as the sole regulator of the banking industry.

Banks are supervised by the Banking Control Department of the CBE and in practice supervision is strong.[11] The CBE has made considerable progress in developing its supervisory framework and staff using materials, procedures, and techniques obtained from other countries' supervisory systems. According to the Financial Sector Assessment Program (FSAP) report of 2002, the CBE complied with most of the Basel Core Principles for Effective Banking Supervision.

The initial impact effect of an increase in credit is negative on money supply. This shock is qualified as a transitory shock on reserves, gross domestic product and consumer prices, significant only in the first 10 periods and return to the base line temporarily. A possible explanation for this is that an increase in credit amplifies automatically the monetary policy transmission actions in Egypt. This interpretation is matched with results in Table 4 showing that domestic monetary shocks, as represented by interbank rate, reserve money and gross domestic product account for 53% of the forecast error in domestic credit.

For small and medium sized enterprises, banks play a crucial role in the provision of external finance and this gives rise to the bank lending channel

[10]To add to the strength of the CBE in the supervision of banks, the government, together with CBE, has drafted a new Central Bank and Banking Sector Law to increase the degree of independence of CBE in maintaining price stability.
[11]See: IMF, *FSAP Main Report*, December 2005.

Table 4. Proportions of forecast error.

Mon, 20 Aug 2007 19:17:41
SVAR FORECAST ERROR VARIANCE DECOMPOSITION

Forecast Horiz	DRATE	LRATE	QM	RM	DCR	CPRICES	GDP
Proportions of forecast error in "DRATE" accounted for by:							
1	1.00	0.00	0.00	0.00	0.00	0.00	0.00
40	0.59	0.00	0.20	0.01	0.04	0.00	0.08
80	0.19	0.08	0.20	0.26	0.10	0.04	0.19
Proportions of forecast error in "LRATE" accounted for by:							
1	0.00	1.00	0.00	0.00	0.00	0.00	0.00
40	0.04	0.58	0.07	0.08	0.06	0.10	0.07
80	0.04	0.58	0.07	0.08	0.06	0.10	0.07
Proportions of forecast error in "QMONEY" accounted for by:							
1	0.00	0.00	1.00	0.00	0.00	0.00	0.00
40	0.04	0.65	0.05	0.08	0.05	0.08	0.05
80	0.32	0.05	0.21	0.14	0.23	0.05	0.01
Proportions of forecast error in "RMONEY" accounted for by:							
1	0.00	0.00	0.39	0.61	0.00	0.00	0.00
40	0.05	0.01	0.33	0.18	0.03	0.04	0.37
80	0.14	0.07	0.48	0.08	0.12	0.06	0.06
Proportions of forecast error in "DCREDIT" accounted for by:							
1	0.01	0.00	0.00	0.00	0.99	0.00	0.00
40	0.06	0.01	0.11	0.07	0.45	0.04	0.26
80	0.13	0.04	0.07	0.10	0.26	0.35	0.06
Proportions of forecast error in "CPRICES" accounted for by:							
1	0.00	0.00	0.00	0.00	0.00	0.99	0.00
40	0.14	0.05	0.03	0.11	0.13	0.48	0.07
80	0.06	0.10	0.52	0.06	0.01	0.18	0.07
Proportions of forecast error in "GDP" accounted for by:							
1	0.61	0.00	0.00	0.00	0.00	0.00	0.39
40	0.18	0.00	0.23	0.18	0.02	0.03	0.37
80	0.15	0.10	0.09	0.08	0.25	0.11	0.23

Notes: The forecast error variance decomposition is conducted based on the responses graphs, as shown in Figures 3 and 4. Month 1 is the contemporaneous month. Month 80 is the long-run month. Each panel shows how variance of each variable is explained in percentage following the long-run restrictions.

(Bernanke and Blinder, 1988). It is assumed that bank loans and alternative sources of finance are imperfect substitutes and that persistent differentials in the spreads emerge because there is imperfect arbitrage. Imperfection in substitutability arises because small and medium sized firms may be unable to access other markets for funds and therefore have a certain dependence on banks for external sources of funds (Kashyap and Stein, 1993).

In Egypt, the credit excesses of the late 1990s have continued to weigh heavily on banks, hindering their ability to contribute to the recovery. Bank credit to the private sector declined again in real terms in 2004, and most of the recent expansion in banks' domestic claims has been to the government. Non-performing loans rose to over 25% of total loans in September 2004, compared to 20% in June 2003.

To examine further the importance of different shocks, we perform forecast error variance decomposition. According to Table 4, the proportion of lending rate shocks in the forecast error variance of short term interest rate is quasi absent in the short medium and long run (8%), but the proportions of money supply and gross domestic product are 20% and 19%, respectively. In contrast to the Table 2, the proportion of credit is more important in the forecast error of reserve, domestic credit, money supply, consumer prices and industrial share prices. We can say that results with long run restrictions highlight a potent role for the bank lending channel and for the interest rate channel. Egypt's economic performance continued to improve increasingly during 2006 due to the progress made in the implementation of the banking reform plan that has effectively contributed to raising the efficiency of banks' performance and strengthening their financial positions. The CBE has continued work to strengthen the monetary policy framework over the past year. IMF directors have encouraged the CBE to intensify these efforts, and to continue developing a cohesive and credible monetary policy framework that effectively anchors inflation expectations in the context of a flexible exchange rate, and that relies on a proactive interest rate policy. In this context, the importance of strengthening central bank independence was stressed.

4. Conclusion

In this paper, we investigate the predictive power of the SVAR models for developing monetary policy strategy in Egypt. Based on the advances of Bates and Hachicha (2009), we estimate an open Mediterranean country structural vector autoregressive (SVAR) models. First, we use contemporaneous restrictions. Second, we resort to the SVAR model of Blanchard and Quah (1989).

Our results suggest that in general through two SVAR estimations, the interest rate channel and the banklending channel are not playing a preponderant role in the transmission mechanism showing the shortcoming with the price indices and many difficulties for assessing the monetary policy stance in the short run. We could also say that monetary policy affects output with a delay due to lags in the transmission mechanism. Thus, we will urge the Central Bank of Egypt (CBE)[12] to strengthen more the monetary policy framework and to continue developing a cohesive and credible monetary policy framework that effectively anchors inflation expectations and relies on a proactive interest rate policy. There should be a larger role for the interest rate channel in the future.

The bank lending channel points to a stronger transmission of the monetary policy stance on output through credit (loans and securities) to the public sector compared to private sector lending. The bank lending channel should grow stronger as competition between banks enhances the sector's effectiveness of financial intermediation and contributes to a stronger link between policy and retail interest rates.

Effectively, the Central Bank of Egypt worked on four directions — the legislations required to introduce additional reforms, the prudential regulations for better banking practices, bank directors and corporate governance and the modernization of the informational infrastructure to support decisions of bank management. Some other important areas of responsibility of the CBE have also been developed, especially concerning legislations — CBE Prudential Regulations and Institutional Capacity Buildup, Banks Management and Corporate Governance Informational Infrastructure, and Credit Info-System. Those include monetary policy, foreign exchange system, payment system, and anti money laundering. The CBE has intentions to move to inflation targeting (IT) over the medium term, but this is conditional on strong banking system/interest rate channel because the exchange rate channel should no longer be prominent.

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[12]Law no. 88 of 2003 of the "Central Bank, Banking Sector and Monetary System" entrusts the CBE with the formulation and implementation of monetary policy, with price stability being the primary and overriding objective. The CBE is committed to achieving, over the medium term, low rates of inflation which it believes are essential for maintaining confidence and for sustaining high rates of investment and economic growth. The government's endorsement of the objective of price stability and its commitment to fiscal consolidation are quite important for achieving this objective.

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