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THE IMPACT OF MONETARY POLICY AND EXCHANGE RATE REGIME ON REAL GDP AND PRICES IN THE REPUBLIC OF MACEDONIA

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ABSTRACT: *This paper investigates the relative costs and benefits associated with introducing a more active monetary and a different exchange rate regime in the Republic of Macedonia. In this finding, the econometrics result show that introducing a more active monetary policy and a different strategy of the exchange rate targeting in order to promote rapid economic growth could easy disturb macroeconomic stability (after having achieved it at a substantial cost) without any significant economic benefits. Therefore, introducing a more active monetary policy and a different strategy of the exchange rate regime is likely to incur more costs than benefits, since changes of the monetary policy and exchange rate regime type do not show a persistent effect on real GDP, while changes of money stock and exchange rate regime do show a strong and persistent effect on prices level.*

Key words: *money stock, exchange rate, Structural Vector Autoregressive*

JEL classification: M31

1. INTRODUCTION

Monetary policy and its effect on real economic activity have traditionally attracted great attention from many researchers. It is well established that, in the long term, changes in monetary policy will affect price levels, i.e. the rate of inflation. Therefore, economists agree that the main long-term goal of monetary policy should be to maintain low and stable price levels (Abel, Bernanke and Smith, 2003). However, in the short term, monetary policy remains powerful tools for affecting real economic activity via several channels.

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The theory and the empirical evidence (based on the Structural Vector Autoregressive Model approach) have established that there are several channels through which the effects of monetary policy are transmitted to real economic activity (though much of this evidence comes from developed countries). In contrast to the conventional theory and empirical evidence from developed economies, both the theory and the empirical evidence pertaining to countries in transition suggest a potential weakness and a potential instability of the conventional channels (the short-term interest rate and the base money, and, through it, the money stock) of monetary transmission during transition because of structural and institutional deficiencies – in particular underdeveloped financial systems and higher dollarization. Additionally, the empirical literature suggests that the monetary transmission mechanism is different among countries in transition depending on characteristics of individual national economies, such as size, openness, development of the financial sector, the level of dollarization, and other factors. In addition, as transition is a dynamic trend marked by permanent qualitative changes, the literature suggests that the monetary transmission mechanism is an endogenous or dependent variable with regular features that is changeable over time. This point needs to ongoing research to further analyze the effect of monetary policy on real GDP and prices, in order to assess the relative costs and benefits associated with introducing a more active monetary policy.

Regarding the exchange rate regime, the question of the optimal monetary regime for small open economies is still unanswered (Ribnikar, 2004). According to Ribnikar, there is no optimal monetary regime; it depends on the circumstances of the country. For instance, in Slovenia there was a managed floating exchange rate. Economists have not been able to determine whether these countries should use floating or fixed exchange rates. With respect to such countries in transition, the exchange rate has often played a fundamental role in macroeconomic stabilization. However, in recent years, globalization and changes in policy orientation have resulted in closer international trade and financial linkages, which in turn have led to mobility of capital, i.e. capital inflow and outflows, generating potential external shocks and increasing the pressure for additional flexibility. The Republic of Macedonia, in particular, has faced many systemic changes, such as the liberalization of the capital account in 2003, becoming a member of the World Trade Organization in 2002, and gaining candidacy status for joining the European Union in 2004. Under such circumstances, any investigation of monetary policy and exchange rate regime must address a seemingly incompatible trinity: the liberalization of capital movement, fixed exchange rates, and independent monetary policy (Obstfeld 1998 and Mishkin 2003). Since the liberalization of capital accounts took place, the exchange rate could easily become a target of speculative attack (sudden large capital inflows), which in turn could lead to negative impacts on real economic activity due to increases in and fluctuation of the interest rate and fluctuation of foreign exchange reserve – foreign exchange reserve being important for international liquidity. On the other hand, the solution of simply shifting the exchange rate from a fixed exchange rate to a more flexible one, depreciating the domestic currency in order to settle the problem of deficit in the current account, and thereby promoting fast economic growth, could easily disturb macroeconomic stability without any real short-term economic benefits (Ribnikar

and Bole, 2006). This suggests a need for ongoing analyses of the effects of exchange rate policy on real GDP and prices in order to assess the relative costs and benefits associated with introducing different exchange rate regimes.

Although the role of monetary policy and exchange rate regime type is limited in influencing economic growth, the role of such policies and regimes in affecting economic growth – especially the costs and benefits of introducing a more active monetary and a different exchange rate regime (one using inflation targeting) – has received growing attention in the Republic of Macedonia.

Therefore, in this paper, I focus on identifying the effects that the monetary policy and exchange rate regime have on real GDP and prices in the Republic of Macedonia. Based on the data from 1997 to 2008, my empirical research is supported by empirical testing using the most-used methodology, such as SVAR. The theoretical and empirical literature concerning SVAR, both in the developed countries and the countries in transition, provides the foundation of my empirical research on the Republic of Macedonia.

The remainder paper is organized as follows: Section II explains the reviews the literature on the effect of the monetary policy and exchange rate regime; Section III econometrics model for testing the effect of money stock and exchange rate on real GDP and prices; Section IV conclusions.

2. REVIEW OF LITERATURE

The effective setting and manage of monetary policy depend basically upon proper assessment and understanding of the effect of monetary policy on relevant macroeconomic variables (such as real GDP and inflation) through various monetary channels. Theory and empirical evidence have established the existence of several transmission mechanisms or channels through which monetary policy can affect real economic activity. For the Republic of Macedonia as a country in transition, we examine the well-known conventional monetary channel by which the effect of monetary policy is transmitted to real economic activity: the money supply. We do not take into the consideration, the interest rate channels, since, the money market is not effectively functioning in the Republic of Macedonia, and they would not accurately reflect, market-type behaviour, so we design a model utilizing the money stock and exchange rate.

Regarding the exchange rate channel, we include the exchange rate into the model since the majority of the empirical research confirms that exchange rate channels seem to play an important role in the monetary transmission mechanism in countries in transition. Thus, with regard to the Republic of Macedonia and other similar countries in transition, it is impossible to evaluate the effect of monetary policy without taking into account the exchange regime. The exchange rate channel is important in the monetary transmission mechanism for several reasons, e.g. the credibility of the exchange rates for the economic agents and the actual behaviour of the exchange rate for the level of currency substitu-

tion. Eduardo and Berg (2000) show that the higher the level of dollarization or currency substitution in a country, the less effective will be the traditional set of monetary policies of the central bank. Actions on the part of the monetary authority relating to money market rates, reserve requirements, and refinancing may turn out to have a insignificant effect on real GDP and inflation.

The empirical evidence in developed countries is mixed relating to the effect of money supply on real GDP and prices. Recently, Giovanni and Gordan (2006) reconsider the role of money in output and prices in the U.S. and their results suggest that shocks to monetary aggregates have substantial and persistent effects on output and prices. Examining the economy of New Zealand, Citu (2003) finds a similar pattern to those seen in the developed countries, whereby money has an effect on output and prices in the short term. Applying VAR methodology, Hafer and Kutun (2001) examine 20 countries - including developed economies and countries in transition - and their results also suggest that money plays a significant role in explaining the behaviour of real output.

The empirical evidence in transitional countries shows that the money supply channel is relatively weak in transmitting the dynamic effect of monetary policy on real economic activity. However, I believe that the money supply constitutes a relatively useful indicator in measuring the dynamic effect of monetary policy on real GDP and prices in Republic of Macedonia. Starr (2004) examines four countries in transition using VAR methodology, and reaches the conclusion that money shocks do tend to increase output although the effect is not statistically significant. That is, she finds the effects of money supply on output in the Ukraine and Belarus to be insignificant, while noting a transitory real effect on output in Russia and Kazakhstan. Belullo's research (1999) into the impact of money on real economic activity finds that expansionary monetary policy does not have an effect on real economic activity in Croatia. Hristov (2004) examines two countries in transition (The Czech Republic and Poland) and finds that contractionary money shocks lead to persistent changes in the prices and onset of a decline in output in both countries.

Regarding exchange rate channel: *the early literature* on the choice of exchange rate regimes proposes that the smaller and more "open" an economy is (i.e. the more dependent it is upon exports and imports) the better it will be served by the adoption of a fixed exchange rate regime. *A later approach* to the choice of exchange rate regimes looks at the effects of various random disturbances on the domestic economy. In general, a fixed exchange rate regime is preferable if the disturbance in the economy is predominantly monetary, for example in the form of changes in the demand for money which affect the general level of prices.

The main reason why the Republic of Macedonia and other similar small countries in transition have pegged their currencies to their leading trading partner's currency is the unstable demand for money. The central banks in those countries were experienced difficulties in achieving their final goals of maintaining price stability through monetary strategy targeting the growth rate of money; thus, the Republic of Macedonia abandoned this strategy in 1995 and adopted a monetary strategy targeting the exchange rate.

A flexible exchange rate is preferable if disturbances are predominantly real factors or factors that originate abroad and affect the relative prices of domestic goods. In addition, *the literature in general indicates that a small open economy is better served by a fixed exchange rate than by a flexible exchange rate regime*. Most economists claim that the best exchange rate regime is one that stabilizes macroeconomic performance, i.e. one that minimizes fluctuations in output, domestic prices and other macroeconomic variables. The question of the optimal monetary regime for small open economies has yet to be definitively answered, however.

Following the path of most literature regarding U.S. and Western Europe countries, the few VAR studies which have been carried out on Central Eastern European and South Eastern European countries use the same identification in their models regarding the effect of exchange rate regimes on real GDP and inflation.

McCarthy (2000) analyzes the effect of exchange rate changes and import price fluctuation on producer and consumer prices in six industrialized OECD countries from 1976:1 to 1998:4. The impulse response function and variance decomposition show that the exchange rate has had a modest effect on domestic prices throughout the post-Bretton Woods era. He also finds that pass-through is somewhat stronger in countries with larger import shares. It can be seen that in large developed countries, the exchange rate channel does not play a significant role in the transmission of the dynamic effect of monetary policy. Cushman and Zha (1997) analyze monetary policy in Canada and find that the dynamic responses to identified monetary policy shocks are consistent with standard theory and highlight the exchange rate as a transmission channel of monetary policy. Kim and Rubini (2000) and Maćkowiak (2003) analyze small developed countries and find that the exchange rate channel did play an important role in transmitting the dynamic effect of monetary policy. Citu (2003) examines New Zealand and finds that exchange rate channels play an important role in the transmission of the dynamic effect of monetary policy. By this empirical evidence, it can be seen that in the big and developed countries the exchange rate does not play a significant role in transmitting the dynamic effect of monetary shock on real economic activity, while it does play such a role in smaller developed countries.

Recently, exchange rate channels have been examined in two ways in the small economies in transition: firstly, in terms of the pass-through effect of nominal exchange rate changes, via import prices, on prices in small and open economies, whereby a depreciation of domestic currency causes price level to rise; secondly, in terms of the possible implications of different exchange rate regimes on monetary strategy.

Billmeier and Bonato (2002) examine Croatia using VAR and VECM with the model including manufacturing and retail indices, the exchange rate nominal anchor, monetary aggregate, and output gap. They find a significant role for the exchange rate in the level of prices. Kuijs (2002) finds almost similar results for Slovakia. Hristov (2004) discovers an interesting result by analyzing monetary and exchange rate regime in two post-transition countries, the Czech Republic and Poland. By 1997, those countries had changed their

monetary strategy from one of exchange rate targeting to inflation targeting. Hristov finds that the changes in the exchange rate regimes did not produce marked differences in macroeconomic variables. Thus, he claims that the behaviour of macroeconomic variables remains constant irrespective of which regime is adopted. Mayes (2003) analyzes the Baltic States and finds that the exchange rate does not show any effect on real GDP in the Latvia case, whereas it has transitory effects on real GDP in the cases of Estonia and Lithuania. Horváth and Maino (2006,) examine the dynamic effect of monetary policy on real GDP and prices in Belarus. The model they employ incorporates four variables: price, money, exchange rate peg, and real GDP. They find that exchange rates have a strong effect on prices – i.e. a strong pass-through effect – but do not affect real GDP. In addition, money causes inflation but does not have an effect on real GDP.

My model is very similar to the model employed by Horváth and Maino (2006), Billmeier and Bonato (2002), and Kuijs (2002). The Republic of Macedonia, Croatia, and Belarus all have the same monetary strategy of targeting the exchange rate. In the Republic of Macedonia, like in the other small countries in transition, I expect the exchange rate channel to be more powerful than money stock channel in the monetary transmission mechanism.

3. ECONOMETRIC MODEL FOR TESTING SHORT-TERM DYNAMIC EFFECTS OF MONEY STOCK AND EXCHANGE RATES ON REAL GDP AND PRICES IN THE REPUBLIC OF MACEDONIA

Both theory and empirical evidence suggest that exchange rate channels seem to play an important role in the monetary transmission mechanism in almost all countries in transition. In section II, we explain that both theoretical and empirical research efforts imply a potential weakness and a potential instability of the conventional channel (money stock and short-term interest rate) of monetary transmission during transition. We introduce exchange rate channels into the model in order to get more information about the effect of money stock or money supply on real economic activity in the Republic of Macedonia. At the same time in this empirical research, *two channels of the dynamic effect of exchange rate can be identified. First, the direct channel of the exchange rate: that it affects inflation via the import prices pass-through effect. That is, changes in the nominal exchange rates directly affect import prices, which in turn cause domestic prices to rise. Second, the indirect channel of the exchange rate: that it affects real GDP through the balance of payments. It is important to recognize these possible implications of different exchange rate regimes, i.e. the costs and benefits of introducing a different exchange rate regime. The issue at hand is whether the exchange rate still plays a significant role in maintaining macroeconomic stability in the Republic of Macedonia.*

For this purposes, we perform several tests: diagnostic tests (JB-test, LB-test and ARCH-test); a test for VAR order; a test for reaction of the real GDP and prices to money stock and exchange rate disturbances, i.e. the dynamic effect of money stock and exchange rate

disturbances on real GDP and prices; and forecast error variance decomposition test of money stock and exchange rate disturbance on real GDP and prices.

3.1 Data in empirical research

We are limited to using data from the period of 1997:01-2008:12, in our work, because if we were to use time series before 1997, we think that our research would be of lesser quality due to high rate of inflation experience in the period 1992-1995. Because of the narrow time series in countries in transition, we use monthly data rather than quarterly in order to perform a more observation points. Almost all empirical research involving countries in transition follows this approach, owing to the short time periods inherent to such evaluation (excepting Mayes, 2003, who used annual data). Bernanke and Mihov (1998); and Christiano, Eichenbaum and Evans (1996 and 1999) furthermore show that inferences drawn from quarterly data are congruent with inferences gathered from monthly data.

The variables used in our model are: manufacturing prices index (MPI), retail prices index (RPI), money stock (M1), exchange rate (EXCH.R), and real gross domestic product (real GDP). All data is expressed in logarithmic form (denoted ln). Hence, coefficients on the logged levels measure constants of elasticity. The short-term interest rate has no included in the model since it does not reflect the market type behaviour in the Republic of Macedonia. The short term interest rate has no means to be included in the model (Billmeier and Bonato 2002) when countries use currency boards or employ the exchange rate as a nominal anchor.

The sources of data are mainly from the NBRM, the Ministry of Finance, and the Official State Statistics Bureau of the Republic of Macedonia.

3.2 Econometrics model and result

3.2.1 Testing the short-term dynamic effect of money stock and exchange rate on real GDP and prices: SVAR Sims-approach

The empirical research has some features in common with previous empirical research regarding both developed countries and countries in transition.

The specification of the model is:

$$x_t = v + A_1 x_{t-1} + \dots + A_p x_{t-p} + \psi D_t + \varepsilon_t$$

We start with identifying our model as a five-dimensional vector. In the equation above, the vector x_t includes five variables: the exchange rate (EURO), the manufacturing prices index (MPI), the retail prices index (RPI), the money stock (M1), and the real gross domestic product (real GDP). The v is the vector of the constant. All variables are expressed in logarithmic form to satisfy the theoretical assumptions of constant elasticity models.

During the period of investigation, there are notable structural monetary shocks and episodes of internal and external political turbulence. In order to eliminate the negative impact of internal and external shocks, we include several vector dummy variables, such as: the devaluation of the denar by 16.1 percent, the war between Serbia and Kosovo, the value-added tax, and ethnic conflict in the Republic of Macedonia.

The structural model is composed of five equations. Moreover, the series are estimated consistently in levels with OLS (ordinary least square). The variables in the model are divided into two blocks: the *non-policy vectors*, including the log of MPI, the log of RPI, and the log of real GDP; and the *policy vectors*, including the log of M1 and the log of EXCH.E. Vector e_t is the vector of structural disturbance. MPI and RPI are included in the model for two reasons:

First, we expect a strong link to emerge between the exchange rate and RPI and MPI. Second, the final goal of the NBRM is price stability; therefore, introducing these variables contributes to eliminating the so-called “price puzzle”.

In our empirical research we use Choleski which is just identified, and the number of coefficients of the matrix B_0 is 10 (lower triangular), which can be estimated in the monetary VAR (M-VAR henceforth) with unity on the main diagonal. Thereby, the covariance of the matrix will be a diagonal matrix. Before examining impulse response function and variance decomposition of monetary disturbance, we must select *VAR order and perform diagnostic tests*.

To begin, we make a visual inspection of the time series. All of the time series show trends, with the exception of exchange rate, which is fixed with the exception of devaluation in 1997. We are interested in performing tests for seasonality, i.e. whether or not the time series exhibit seasonality. The model is explained in detail in Appendix I.

In Appendix I, we show the model proposed by Gardner (1985) in order to reveal which time series shows seasonality. As we can see from the visual inspection of the time series, ***only real GDP displays seasonality***. This conclusion leads also to the result of Gardner’s methodology. Hence, we make a seasonal adjustment of real GDP, and in my further research, we use seasonally adjusted real GDP. On the other hand, MPI, RPI, M1, and EXCH.E do not display seasonality, and therefore we use these time series without seasonal adjustments.

To continue, we include these time series only in VAR level (Sims-approach) – estimated by OLS. In Appendix II, we show the result of the routine tests of VAR: *tests for selection of VAR order and for checking the “quality” of the VAR based on its residuals, such as: JB-test for normality distribution, LB-test and LM-test for autocorrelation, and ARCH test for the presence of heteroscedasticity in the VAR’s residuals*.

We test VAR-order according to criteria such as FPE, AIC, HQ and SC. Using these criteria, we select appropriate models that best fit the data. The tests show that by all

criteria the optimal order is **VAR (2)**. Therefore, we use VAR of order 2 in my further research. Concerning the matrix of residual correlation of diagonal elements, they are rather close to zero, such that no contemporaneous correlation is being ignored by the VAR. Therefore, we can conclude that: there are contemporaneous correlations residual between MPI', RPI, M1, IR and real GDP or contemporaneous and intertemporal correlation between the residuals of the variables.

Upon visual inspection, the residuals of almost all series exhibit a number of statistical outliers, such that we do expect significant non-normality. On the other hand, the result of the *JB-test for normality* distribution of residuals shows that the H_0 hypothesis of normality distribution cannot be rejected for MPI, RPI and real GDP at a significance level of 5%, while it is rejected for EXCH.E and M1. There are problems with the EXCH.E and M1 equations; however, the time series in the short term is quite sure to have this kind of problem since it includes monthly data with a great deal of noise. Furthermore, in models with many points of observation, there are often instances of non-normality of distribution of the residuals. Concerning the LB-test for non-significant residual autocorrelation, there are no statistically significant autocorrelated residuals and no visible patterns (see appendix II). The ARCH-test strongly rejects the assumption of heteroscedasticity of VARs residuals.

Finally, we can conclude that, despite an unstable VAR due to the inclusion of non-stationary time series in the model, *the diagnostic test is satisfactory and consistent with the assumption of white noise process with constant variance over time.*

3.2.1.1 *The dynamic effect of money stock and exchange rate disturbance on real GDP and prices: Choleski decomposition*

We employ a recursive VAR approach in order to analyze the dynamic effect of money stock and exchange rate on real GDP and prices. In addition, we use **Choleski decomposition** which is consistent with the methods used by McCarthy (2000), and Citu (2003) in their research on developed countries, and also with the methods used by Billmeier and Bonato (2002), Mayes (2003), and Horváth and Maino (2006) in examining small countries in transition via the recursive VAR approach or Choleski decomposition.

In order to identify shocks or their respective impulse-response functions via Choleski decomposition, the variables need to be given a plausible ordering. Following McCarthy (2000), we assume a recursive ordering with some small modifications, mostly due to the different characteristics of the national economy. The aforementioned authors assume that international supply shocks are exogenous shocks to the exchange rate by way of import prices. Shocks in the exchange rate will instantly affect the manufacturing prices index and retail prices index, whereas the central bank reaction function with money stock is ranked at the end of the ordering of the variables (Citu, 2003). Some research regarding countries in transition has employed shocks in the oil price index or exchange rate as the first variable (Billmeier and Bonato 2002). Therefore, with respect to the afore-

mentioned paper, my own methodology differs in that we do not include a measure of import prices due to a lack of relevant data in the Republic of Macedonia. Billmeier and Bonato (2002) have the same problem, and he also omits import prices (in the case of Croatia). Given that Macedonia is a small open economy, and an insignificant power in the world market, we expect the transmission of import prices to be complete over a rather short time horizon.

In contrast to the work of McCarthy (2000), which analyzes only the effect of the exchange rate on prices, we follow Horváth and Maino (2006) and other authors who focus on countries in transition, and we include real GDP and prices. That is, the **direct channel** of the effect of exchange rate on prices and the **indirect channel** of the effect of exchange rate on real GDP through the balance of payments. *We are interested in analyzing both channels of the dynamic effect of exchange rate on real economic activity in the Republic of Macedonia.*

It is assumed that an unexpected change in the exchange rate instantly affects the manufacturing prices index, while MPI instantly affects RPI. Since the central bank in Republic of Macedonia addresses its final goal of price stability through the exchange rate (EXCH.E-VAR), it reacts instantly to changes in the exchange rate and price indices with its operative targets: the base money and through it on the money stock M1. Moreover, according to McCarthy (2000), and Cítu (2003), central banks react to changes in the exchange rate and prices indices.

Concerning the ordering of the variables to follow the exchange rate, we address this in the first section (monetary policy M-VAR). The ordering of the variables is as follows: *EXCH.EURO* → *MPI* → *RPI* → *M1* → *realGDP*

The recursive approach (Choleski decomposition) is constructed like this:

$$x_t = \begin{bmatrix} EURO \\ MPI \\ RPI \\ M1 \\ realGDP \end{bmatrix} \quad B_0 = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ b_{12} & 1 & 0 & 0 & 0 \\ b_{31} & b_{32} & 1 & 0 & 0 \\ b_{41} & b_{42} & b_{43} & 1 & 0 \\ b_{51} & b_{52} & b_{53} & b_{54} & 1 \end{bmatrix}$$

The first period of the matrix shows that any unexpected change in the exchange rate will instantly affect the two prices indices, and then the central bank responds by the operational target M1 in order to maintain exchange rate stability as an intermediate target. Hence, by stabilizing the exchange rate, the central bank achieves the main goal of monetary policy: price stability. Thus, we can assume that the other variables do not react instantly to M1, but that M1 can instantly affect real GDP. In addition, real GDP can be affected by both channels – the money stock and the exchange rate.

In addition, it can be seen from the matrix that the Choleski decomposition model is just identified and that the number of coefficients of matrix B_0 are 10 (lower triangle), which can be estimated in the VAR with unity on the main diagonal. Therefore, the covariance of the matrix is a diagonal matrix. All variables are logarithmic and are estimated by the OLS, which produces residuals that are uncorrelated across the equations. The error bands (interval of confidence) corresponding to 95 percent probability intervals are computed by a Monte-Carlo simulation, following the methodology suggested by Sims and Zha (1999).

Money supply channel as an indicator of the dynamic effect of monetary policy on real GDP and prices: Choleski-decomposition-M1-VAR-level

The dynamic effects of money stock shock (disturbance) on real GDP and prices are reported in Figure 1 below. The *vertical axis* denotes the response of log MPI, log RPI, log M1, and log real GDP to a one percent shock in the money stock. The *horizontal axis* denotes time in months. As seen in Figure 1, real GDP response is insignificant to any money stock shock. That is, shock in the money stock does not generate a significant effect on real GDP. However, the response of the retail price index is significant at around 0.35 percent for 18 months. That is, money stock shock can cause an increase in the price level. As a result, we can conclude that dynamic effect of money stock does not have a significant impact on real GDP, but that it can affect the price level.

Furthermore, this result confirms that money stock has an important influence in determining inflation in the Republic of Macedonia. My conclusion is in line with most findings concerning countries in transition, e.g. Belullo (1999); Horváth and Maino (2006); Starr (2004); who all funded that money stock does not have an effect on real GDP, but that it does affect price level.

This finding is also consistent with most other findings regarding countries in transition, e.g.; Cecchetti and Krause (2001); and Elbourne, Kiviet and Bas (2003) who all conclude that the action of monetary policy in transitional economies may render traditional policy tools less effective than a neoclassical view would suggest. This result also is in line with the *monetarist view* that an increase of money growth by one percent causes the price level to rise by 0.35 percent. *Moreover, this result also supports the view that the primary role of monetary policy should be to control inflation in the Republic of Macedonia, since the money stock does not show a significant effect on real GDP, while it highlights a strong effect on price level.*

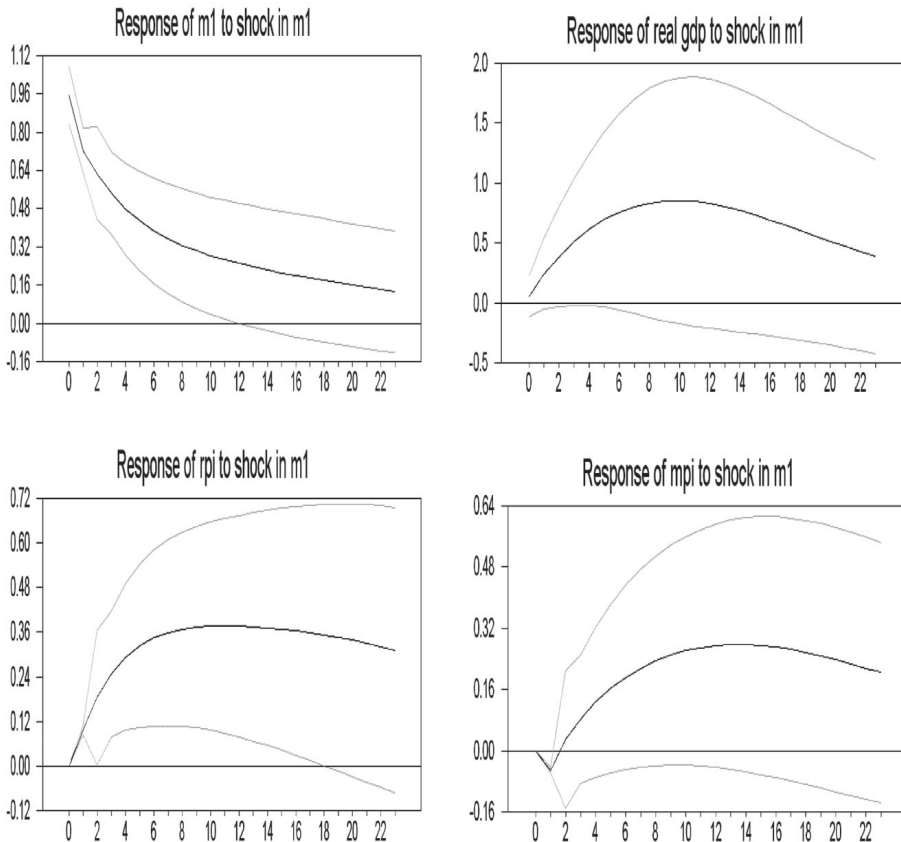


FIGURE 1: *Dynamic effect of money stock on real GDP and prices: Choleski decomposition M1-VAR level*

Source: Author's calculations

The result shows that the base money and through it money stock is endogenous to the level of inflation in the Republic of Macedonia. Figure 1 shows that the price level can – in the absence of changes in the other variables – are returned to its baseline trend within 18 months via the endogenous money stock adjustment. This result is consistent with my finding that the base money and through it the money stock in the period of investigation is an endogenous variable that adjusts to the demand for money, and therefore in this model it is driven by inflation.

We expect this empirical research to demonstrate that the money stock channel is weak as an independent channel of monetary policy in the Republic of Macedonia. This is a consequence of the fact that banking and financial sectors are still characterized by shallow levels of financial intermediation, the financial sector is underdeveloped, the banking sector suffers from low levels of competition, and the economy has a high degree of dollarization. *Thus, the impact of money supply on economic outcomes does not*

yet operate in the Republic of Macedonia the same way as it does in developed countries, namely by the asset price effect, the wealth effect, the bank-lending effect, and the firms' balance sheet effect. Particularly, the asset price effect does not work in Republic of Macedonia, since assets such as bonds, shares, real estate, and other domestic assets are not closely tied to economic outcomes in the Republic of Macedonia, so little impact is felt from changes in the values of these assets, which may arise from changes in the money stock.

One reason domestic assets are not closely tied to economic outcomes in the Republic of Macedonia is that the government sells treasury bills only to the banking system, not to households and firms. Such examples of structural and institutional deficiencies, in particular underdeveloped financial system, support the reasoning of most authors in explaining why monetary transmission mechanism in countries in transition is weak (Elbourne Kiviet and Bas, 2003; Krause, 1999; Cecchetti and Krause, 2001; and Juks, 2004,).

This result is also consistent with other findings regarding economies with significant degrees of currency substitution. In this context, higher dollarization in the Republic of Macedonia can also weaken the effect of expansionary monetary policy on bank lending channels. *An increase in the money stock in the Republic of Macedonia causes a decrease of foreign exchange reserves in the foreign exchange market, as a result of currency substitution between domestic currency and foreign currency, and this process may lead to deterioration of foreign exchange reserves.* As a result, an increase in the money stock will not **boost domestic credit**, but it can leak in the form of capital outflows, which results in very little or no increase in the amount of credit the banking system extends to the private sector. In addition, the dollarization in the Republic of Macedonia is motivated by asset substitution, both real and financial assets. Many prices of real estate and consumer durable goods are to some extent indexed to foreign currency, and residents use the foreign currency (as domestic currency) for buying and selling real estate (houses, lending, cars). As to financial assets, residents deposit or hold large proportions of their savings in foreign currency deposits either in the banking system or outside of the banks¹, and banks provide loans that are either denominated in foreign currency or indexed to foreign currency. Under such circumstances, the scope of monetary policy to increase exogenously the money supply over the demand for money in order to maximizing real GDP is limited. Therefore, an increase of money stock does not mean an increase of the **purchasing power**, but rather only a substitution of currencies.

In summary, an increase in the money supply does not have a significant effect on real GDP by either the asset price effect, the wealth effect, the bank-lending effect, or the firms' balance sheet effect, but it will cause a decrease in the level of foreign exchange reserves in the foreign exchange market, as a result of currency substitution between domestic currency and foreign currency in the Republic of Macedonia.

¹ Perhaps, as the people have had problem with exchange rate from 1992 to the middle of 1997, they do not trust domestic currency, and so many of them keep their savings in foreign currency.

Exchange rate channel as an indicator of the dynamic effect of exchange rate regime on real GDP and prices: Choleski-decomposition-EXCH.E-VAR-level

The effects of exchange rate shock or disturbances are displayed in Figure 2. The *vertical axis* denotes the response of log MPI, log RPI, log M1, and log real GDP to a one percent shock in the exchange rates by the initial period. The *horizontal axis* denotes time in months.

The dynamic effect of a one percent shock in the exchange rate generates a permanent increase in manufacturing and retail prices and money stock, whereas the response of real GDP is insignificant. *The shock in the exchange rate triggers: (i) a depreciation of the exchange rate; (ii) a sharp and rapid increase of the manufacturing prices index; (iii) an increase of the retail prices index; (iv) an insignificant effect on real GDP; and (v) an increase of money stock.* The manufacturing prices index responds in the first month, and thereafter it shows a permanent increase after twenty-four months of around 0.52 percent. The retail prices index shows a significant response, and it continues to show a permanent increase after twenty-four months of around 0.59 percent. Money stock shows a significant effect in the first month and a permanent increase after twenty-four months of around 0.32 percent.

The results of the empirical research suggest that the **direct channel** of the exchange rate has a strong pass-through effect on prices, but that the **indirect channel** of the exchange rate does not have an effect on real GDP. Figure 2 highlights this potentially strong pass-through exchange rate effect on prices in the Republic of Macedonia. There is strong transmission of the effect of changes in the nominal exchange rate *via import prices* to prices in the economy; therefore, a depreciation of domestic currency causes price levels to rise approximately 0.59 percent. Even within the first month, manufacturing prices react to changes in the nominal exchange rate, which reflects a strong pass-through effect of exchange rate changes into domestic prices via import prices. On the other hand, a depreciation of the domestic currency does not show a significant effect on real GDP in Republic of Macedonia.

In addition, the findings are consistent with those from other empirical studies in that the monetary transmission mechanisms are different between developed and small countries in transition. Due to relatively high dollarization of the domestic economy (asset substitution), we see a large pass-through effect from the exchange rate to prices. In contrast to the results of McCarthy (2000), which show that changes in the exchange rate have a modest effect on domestic prices in developed countries, the empirical evidence regarding countries in transition does not seem to suggest the same is true for them, possibly due to a lack of credibility of the monetary authorities, higher dollarization levels and/or the structural element of the price-taking nature of the firms in the international market.

My result is therefore consistent with most other findings regarding small countries in transition, such as those from: Billmeier and Bonato (2002), Kuijs (2002), Coricelli and

Jazbec et al.(2004), Mayes (2003), and Horváth and Maino (2006). Results from the empirical research of these authors is covered in the review of the literature on exchange rate regime type, where we mention that they find that exchange rate channels play a more significant role than do other channels in transmitting the dynamic effect of monetary policy to real GDP and prices.

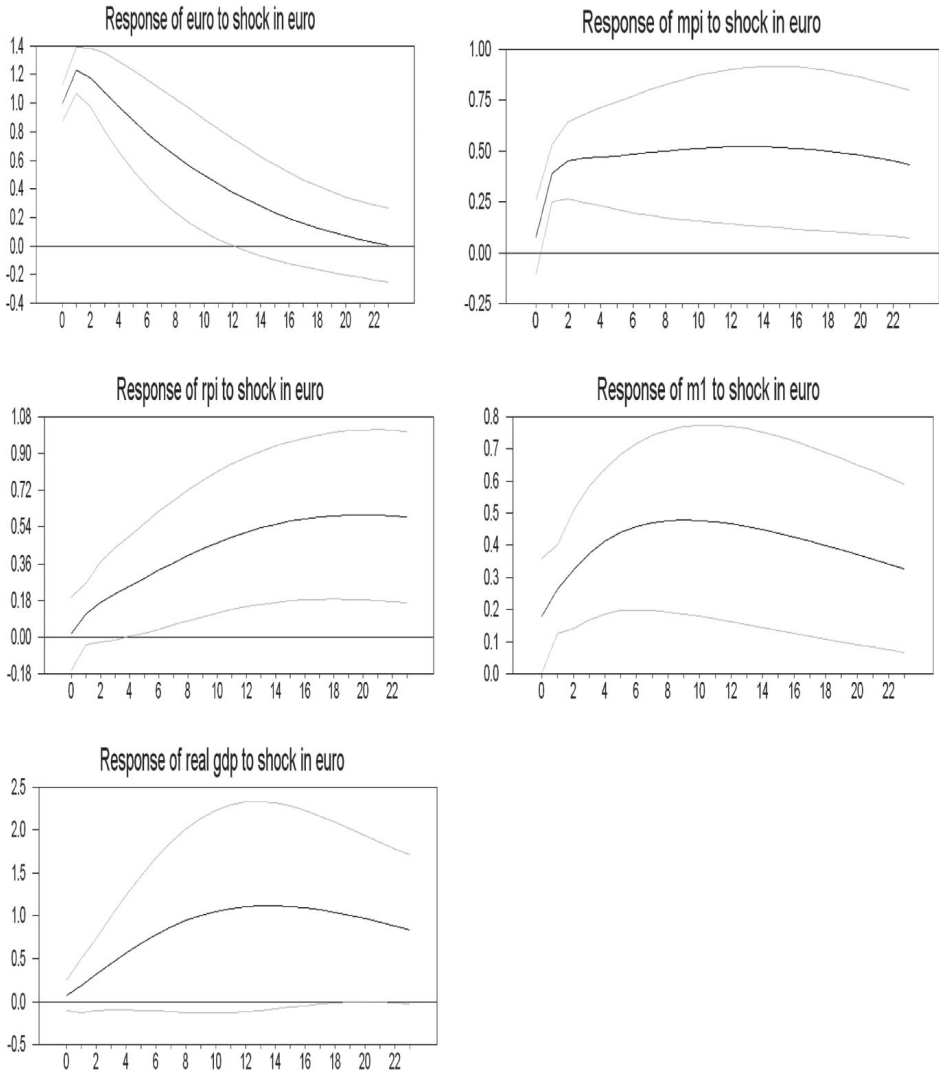


FIGURE 2: *Dynamic effect of exchange rate on real GDP and prices: Choleski decomposition EXCH.E-VAR-level*

Source: Author's calculations

The result reflects the NBRM's monetary strategy of targeting the exchange rate. Figure 2 shows that the prices level cannot be returned back to its baseline trend by endogenous exchange rate adjustments. Thus, this suggests that the exchange rate has been directly determined more by the NBRM than by the prices or real GDP – for example devaluation of the denar against the deutschmark in 1997. Also, this finding is consistent with the deficiency of short-term economic determinants of the exchange rate. Hence, in the absence of changes in the other variables, the prices level can be returned to its baseline trend gradually through changes in the rate of inflation and more rapidly by money supply adjustment. As an alternative, the prices level has to be brought into line with the exchange rate target. The result is consistent with the evidence that the base money and through it the money stock during the period of investigation is a predetermined endogenous variable, so employing rapid endogenous adjustments of money supply in order to return the prices level to its equilibrium is also consistent with endogeneity of money supply to exchange rate targeting. Therefore, the money supply is a predetermined endogenous variable to inflation and exchange rate movement through the NBRM's intervention in the foreign exchange market.

In addition, **I expected a potentially strong pass-through effect of exchange rate on prices in the Republic of Macedonia.** This is made clear when assessing the characteristics of the Republic of Macedonia's economy, such as: small open economy, high degree of dollarization at around 51.50 percent (see the topic of dollarization in the second chapter), a large imports share (particularly of raw materials), and the lack of influence of the Republic of Macedonia in the world economy. Moreover, many prices, mainly of property and consumer durable goods, are to some extent indexed to the exchange rate. Wages are even indexed to the exchange rate in some economic sectors. Therefore, my result is consistent with the features of the national economy in the Republic of Macedonia. *Hence, these results suggest that monetary policymakers in the Republic of Macedonia must take into account these features concerning the effects of the monetary policy transmission mechanism on the economy.*

Finally, the result shows that any change in the current monetary strategy of exchange rate targeting carries a likely risk of financial instability, due to higher dollarization in Republic of Macedonia, and such changes would adversely affect the NBRM's ability to control inflation due to the higher pass-through effect of the exchange rate regime change on prices.

4. CONCLUSIONS

The main objective of this paper is to examine the effect of monetary policy and exchange rate regime type on real GDP and prices in the Republic of Macedonia over the period from 1997 to 2008. The research includes the main conventional transmission channel of monetary policy (money supply), as well as the exchange rate channel, that are assumed to operate in the Republic of Macedonia. Based on the available theoretical and empirical evidence, we employ SVAR methodology in order to examine the relative costs and benefits associated with introducing a more active monetary policy and a different exchange rate regime in the Republic of Macedonia.

For countries in transition with short spans of data (which are sometimes of questionable quality), empirical results are to be indicative rather than definitive. With that caveat in mind, my main findings and their implications are as follows:

Assessing the relative costs and benefits associated with introducing a more active monetary policy and a different exchange rate regime in the Republic of Macedonia, using SVAR methodology, show that introducing such policies in order to promote rapid economic growth could easily disturb macroeconomic stability (after having achieved it at a substantial cost) without any significant economic benefits. Therefore, introducing more active monetary policy and a different exchange rate regime is likely to incur more costs than benefits, since changes of money stock and exchange rate regime type do not show a persistent effect on real GDP, while changes of money stock and exchange rate regime do show a strong and persistent effect on prices level.

(i) The empirical analyses reveal that money supply prove to be weak as independent channels of monetary transmission in the Republic of Macedonia, and therefore the result does not suggest that money supply are useful to the NBRM as independent instruments of monetary policy. This is a consequence of the fact that the bank and financial sectors are still characterized by shallow levels of financial intermediation – the financial sector is underdeveloped, the banking sector suffers from a lack of competition, and the economy has a high degree of dollarization. Therefore, an increase of money supply does not show any significant effect on real GDP via either the asset prices effect or the wealth effect, the bank-lending effect and the firms' balance sheet effect, while it does have a strong effect on prices level. Therefore, the result suggests that the primary role of monetary policy should be to control the rate of inflation in the Republic of Macedonia since changes in the money stock did not show a significant effect on real GDP, while they exhibit a strong and persistent effect on prices level.

(ii) As for the exchange rate regime, all results show that changes in the exchange rate exhibit a potentially strong pass-through effect on domestic prices via import prices. A depreciation of the domestic currency against the Euro causes a sharp and rapid increase in manufacturing prices, an increase in the retail prices index and an insignificant effect on real GDP. Since the Republic of Macedonia achieved macroeconomic stability at a substantial cost, the empirical result suggests that the stability of the exchange rate is very important for macroeconomic stability because it highlights a potentially strong pass-through effect on the domestic prices level. Without a doubt, changing the type of the exchange rate regime carries a likely risk of financial instability due to higher dollarization. Such changes also adversely affect the NBRM's ability to control inflation, due to the strong pass-through effect of the exchange rate changes on domestic prices. It is probably not worthwhile to do anything that may return Republic of Macedonia to inflation, which the flexible exchange rate regime may do, since the high cost of stabilization will once more be born by the people. Since the exchange rate reveals a strong potential effect on prices level, the results suggest that abandoning the exchange rate regime or depreciating the domestic currency would not be a wise strategy for promoting economic growth, since it would not create any economic benefit, while macroeconomic instability would follow with well-known negative consequences for economic growth.

APPENDIX I

A. Data sources

All data come from the NBRM, the, and the Macedonian Bureau of Statistics.

“GDP”: gross domestic product, provided by the Macedonian Bureau of Statistics.

“MPI”: manufacturing prices index, provided by the Macedonian Bureau of Statistics.

“RPI”: retail prices index, provided by the Macedonian Bureau of Statistics.

“M1”: money stock consists of the base money and balances held in chequing accounts (personal and current accounts), provided by the National Bank of the Republic of Macedonia (NBRM);

“EXCH.EURO”: monthly average exchange rate of Macedonian Denar (MKD) per EURO, provided by the NBRM.

B. The method and parameters for seasonality adjusting

The seasonality of the variables will be tested by the method of exponential smoothing. The following table shows the model proposed by E.S.Gardener (1985, pp. 1-28) for different combinations of the season and trend.

	No seasonality deviation (bais)	Additive seasonality	Multiplicative seasonality
No trend	$S_t = S_{t-1} + \alpha e_t$	$S_t = S_{t-1} + \alpha e_t$ $I_t = I_{t-\gamma} + \delta(1-\alpha)e_t$	$S_t = S_{t-1} + \alpha e_t / I_{t-\gamma}$ $I_t = I_{t-\gamma} + \delta(1-\alpha)e_t / S_t$
Linear trend	$S_t = S_{t-1} + T_{t-1} + \alpha e_t$ $T_t = T_{t-1} + \alpha \gamma e_t$	$S_t = S_{t-1} + T_{t-1} + \alpha e_t$ $T_t = T_{t-1} + \alpha \gamma e_t$ $I_t = I_{t-\gamma} + \delta(1-\alpha)e_t$	$S_t = S_{t-1} + T_{t-1} + \alpha e_t / I_{t-\gamma}$ $T_t = T_{t-1} + \alpha \gamma e_t / I_{t-\gamma}$ $I_t = I_{t-\gamma} + \delta(1-\alpha)e_t / S_t$
Exponential trend	$S_t = S_{t-1} T_{t-1} + \alpha e_t$ $T_t = T_{t-1} + \alpha \gamma e_t / S_{t-1}$	$S_t = S_{t-1} T_{t-1} + \alpha e_t$ $T_t = T_{t-1} + \alpha \gamma e_t / S_{t-1}$ $I_t = I_{t-\gamma} + \delta(1-\alpha)e_t$	$S_t = S_{t-1} T_{t-1} + \alpha e_t / I_{t-\gamma}$ $T_t = T_{t-1} + \alpha \gamma e_t / (I_{t-\gamma} S_{t-1})$ $I_t = I_{t-\gamma} + \delta(1-\alpha)e_t / S_t$

S_t smoothing the level of time series;
 T_t trend;
 I_t seasonal index
 e_t error in period t ;

α parameter of smoothing level;
 γ seasonal period;
 δ parameter of smoothing seasonal.

The estimation of parameters has utilized the simplex method, which minimizes the squares error e_t^2 .

The value of the parameters $\alpha \gamma \delta$ for GDP

Model with TREND=Linear, SEASONAL=Multiplicative

Estimated coefficients: alpha = 1.458067, gamma = -0.012734, and delta = -0.295535

C. Figures

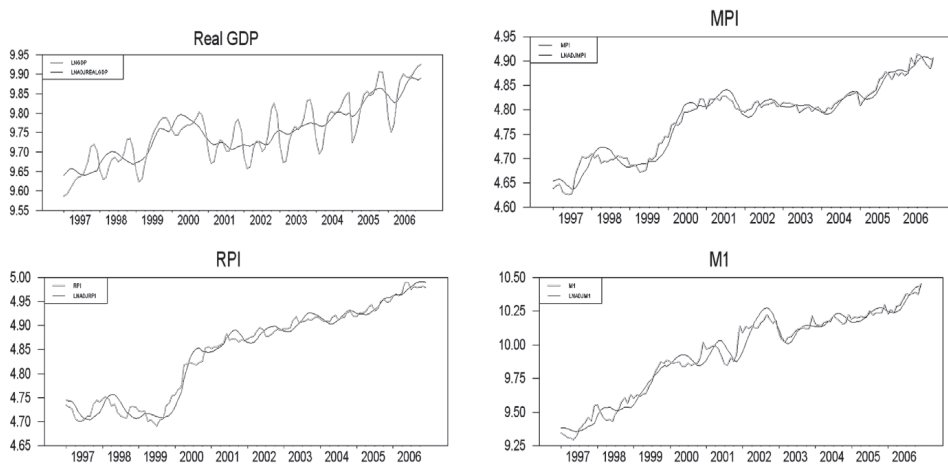


FIGURE C1: *Logarithms of time series MPI, RPI, M1 and GDP, except IR.*

Source: Author’s calculations

APPENDIX II

Endogenous variable: EXCH.EURO, MPI, RPI, M1, GDP

Deterministic component: constant and dummy

Criteria for VAR Order Selection

	FPE	AIC	HQ	SC
1	2.55219e-020	-45.19921	-44.96213	-44.61536
2	1.15089e-020	-45.99863	-45.52194	-44.82461
3	1.24219e-020	-45.92892	-45.21007	-44.15830
4	1.33478e-020	-45.86932	-44.90570	-43.49554
5	1.59554e-020	-45.71120	-44.50016	-42.72757

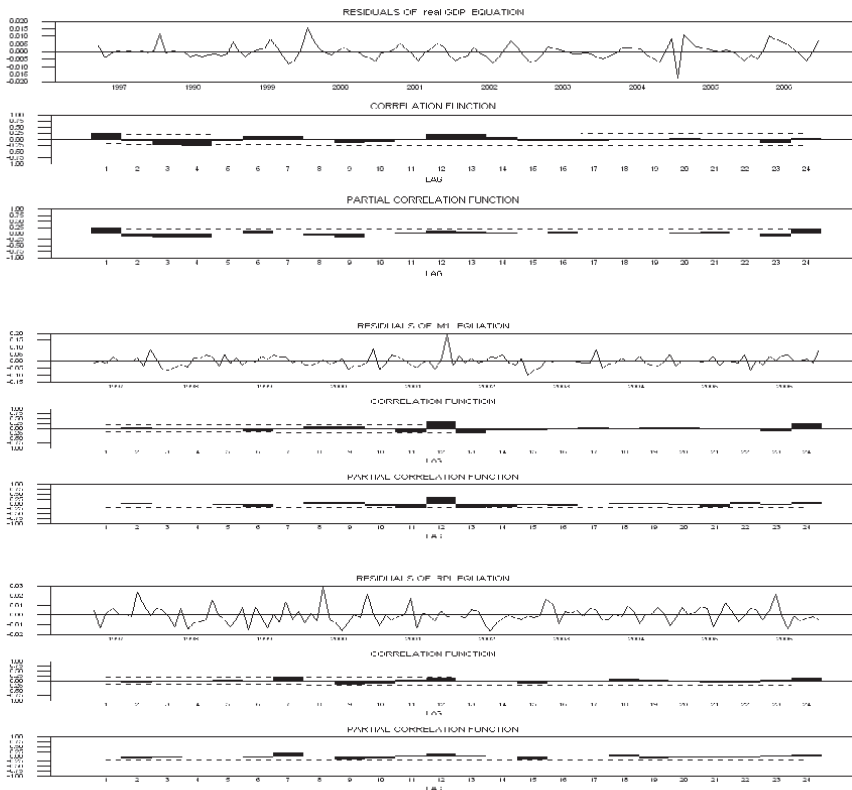
VAR Residual Correlation

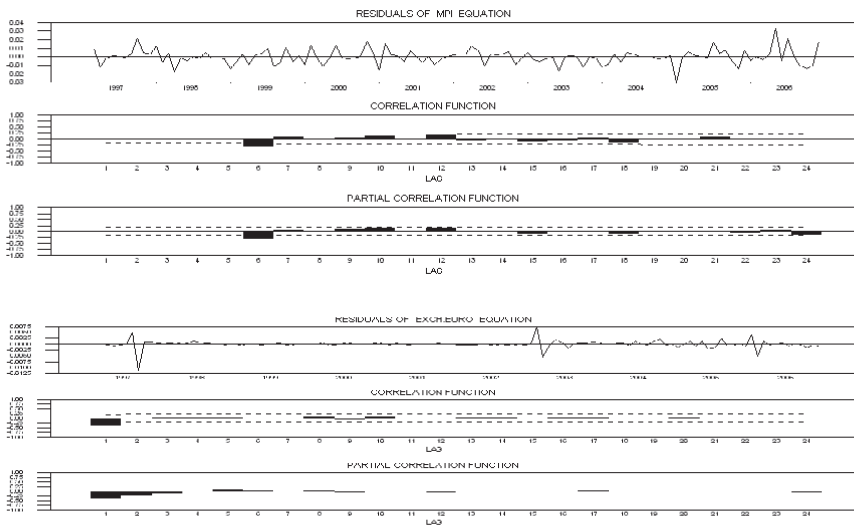
EURO	MPI	RPI	M1	GDP
1.0000	0.5764	0.1772	0.0853	-0.1319
0.5764	1.0000	0.1636	0.0277	-0.0191
0.1772	0.1636	1.0000	-0.0524	-0.0210
0.0853	0.0277	-0.0524	1.0000	-0.0358
-0.1319	-0.0791	-0.0210	-0.0358	1.0000

VAR Residual Analysis

	Skewness	Kurtosis	JB (2)	LB (16)	LM (16)	ARCH (16)
MPI	-0.0148	3.3293	0.4236	21.1956	32.8244	14.5937
RPI	0.4247	3.3826	3.3630	21.3262	34.9456	7.3163
EURO	0.6025	21.9501	1397.1654	30.4409	42.4985	30.9899
M1	1.4352	8.4074	145.2319	39.6502	45.2594	8.3360
GDP	1.0178	5.0301	32.0263	30.0941	48.1023	12.2267

Residual Analyses





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