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OPTIMAL STRATEGY OF MONETARY AND FISCAL POLICY IN FUNCTION OF MAINTAINING MACROECONOMICS STABILITY IN THE REPUBLIC OF MACEDONIA

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Statement of authorship

I, Mrsc. Besnik Fetai hereby state that I’m author of the doctoral dissertation titled “Optimal strategy of monetary and fiscal policy in function of maintaining macroeconomic stability in Republic of Macedonia”

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SUMMURY

In assessing the relative costs and benefits associated with introducing a more active monetary and fiscal policy and a different exchange rate regime in the Republic of Macedonia, all econometrics results, using different methodologies (SVAR and VECM), show that introducing such policies 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 more active monetary and fiscal policies and a different exchange rate regime is likely to incur more costs than benefits, since changes of monetary and fiscal 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.

(i) The empirical analyses reveal that money supply and interest rate 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 and interest rate are useful to the NBRM as independent instruments of monetary policy. This is a consequence of the fact that the banking 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, the wealth effect, the bank-lending effect and the firms' balance sheet effect, while it does have a strong effect on prices level. The interest rate in the Republic of Macedonia has not been an effective monetary policy instrument, since in relatively higher dollarized economies, such as that of the Republic of Macedonia, the potential effectiveness of an independent interest rate policy is limited. 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 fiscal policy, changes in the primary fiscal deficit and government expenditure do not show any significant conventional Keynesian effects on real GDP. The changes in primary fiscal deficit and government expenditure (expansionary fiscal policy) do not have a significant effect on real GDP due to the counteracting effect of monetary policy reactions (contractionary monetary policy) in the Republic of Macedonia. Monetary policy reacts immediately, and it continues its counteracting effects until the effects of fiscal policy disappear. This is consistent with the evidence that monetary policy reacts to sterilize excess liquidity in the banking system caused by expansionary fiscal policy. The only channel that shows a transitory effect on real GDP is tax-cuts, but it does not show a persistent effect on real GDP, so the result goes by the name "policy ineffectiveness result". Since the conventional Keynesian effects of fiscal policy on real GDP do not function in the Republic of Macedonia, the results suggest that the optimal fiscal policy in the Republic of Macedonia is to apply fiscal strategy based on fiscal rules (by determination of the mathematical targets of the fiscal deficit, public expenditure and the public debt in the medium term), in order to achieve positive macroeconomic outcomes.

(iii) 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 (see Chapter Two), 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.

POVZETEK

Na osnovi ovrednotenja relativnih stroškov in koristi, povezanih z uvedbo bolj aktivne monetarne in fiskalne politike ter drugačnega režima deviznega tečaja v Republiki Makedoniji, pri čemer sta bili uporabljeni dve metodologiji (SVAR in VECM), lahko zaključimo, da uvedba takšnih politik z namenom spodbujanja hitre gospodarske rasti lahko negativno vpliva na makroekonomsko stabilnost (zatem, ko je bila le-ta dosežena s precejšnjimi stroški), ne da bi prinesla pomembnejše gospodarske koristi. Zato lahko uvedba aktivnejše monetarne in fiskalne politike ter drugačnega režima deviznega tečaja hitro povzroči več stroškov kot pa prinese koristi, saj spremembe monetarne in fiskalne politike ter vrste režima deviznega tečaja nimajo večjega vpliva na realni BDP, medtem ko spremembe obsega denarne mase in režima deviznega tečaja kažejo močan in vztrajen vpliv na oblikovanje ravni cen.

(i) Empirične analize kažejo, da dobava denarja in obrestna mera kot samostojna kanala monetarne transmisije v Republiki Makedoniji nimata posebne moči, zato je na osnovi rezultata mogoče sklepati, da dobava denarja in obrestna mera za Narodno banko Republike Makedonije nista posebej učinkovita samostojna inštrumenta monetarne politike. To je posledica dejstva, da je za bančni in finančni sektor še vedno značilno slabo razvito finančno posredništvo – finančni sektor je nerazvit, v bančnem sektorju primanjkuje konkurence, za gospodarstvo pa je značilna visoka dolarizacija. Povečanje denarnih prilivov ne kaže pomembnega učinka na realni BDP, ne glede na to, ali do njega pride zaradi spremembe cen sredstev, učinka premoženja, bančnih posojil ali bilanc stanja v podjetjih; kaže pa močan učinek na oblikovanje ravni cen. Obrestna mera v Republiki Makedoniji ni učinkovit inštrument monetarne politike – za gospodarstvo z relativno visokim deležem dolarizacije, kakršno je tudi makedonsko, je potencialni vpliv učinkovitosti politike neodvisne obrestne mere precej omejen. Na osnovi rezultatov zato lahko sklepamo, da je primarna vloga monetarne politike nadzorovanje inflacije v Republiki Makedoniji, saj denarna masa nima signifikantnega vpliva na realni BDP, medtem ko močno vpliva na oblikovanje ravni cen.

(ii) Kar se tiče davčne politike, spremembe primarnega fiskalnega deficita in javnofinančni odhodki ne kažejo signifikantnega keynesijanskega učinka na realni BDP. Spremembe primarnega fiskalnega deficita in javnofinančni odhodki (ekspanzivna fiskalna politika) v Republiki Makedoniji zaradi nasprotnega učinka monetarne politike (restriktivna monetarna politika) ne izkazujejo signifikantnega učinka na realni BDP. Monetarna politika se odzove takoj in tako dolgo izvaja nasprotne ukrepe, dokler učinki fiskalne politike povsem ne izginejo. Ta odziv je v skladu z običajno reakcijo monetarne politike, in sicer s steriliziranjem presežne likvidnosti v bančnem sistemu, ki se pojavi zaradi ekspanzivne fiskalne politike. Edina metoda, ki prehodno vpliva na realni BDP, je znižanje davkov, vendar je ta vpliv na realni BDP le začasen, zaradi česar je ta učinek poimenovan "rezultat neučinkovitosti politike". Ker v Republiki Makedoniji ni običajnih keynesijanskih učinkov fiskalne politike na realni BDP, izsledki nakazujejo, da je optimalna davčna politika za Republiko Makedonijo v uvedbi fiskalne strategije, ki temelji na fiskalnih pravilih (s pomočjo določitve matematičnih ciljev davčnega

primanjkljaja, javnofinančnih odhodkov in javnega dolga na srednji rok), njen cilj pa je v doseganju pozitivnih makroekonomskih rezultatov.

(iii) Kar se tiče režima deviznega tečaja, vsi rezultati potrjujejo, da imajo spremembe deviznega tečaja prek uvoznih cen potencialno močan učinek prehajanja na domače cene. Depreciacija domače valute v primerjavi z evrom je povzročila ostro in hitro zvišanje proizvodnih cen ter povišanje indeksa maloprodajnih cen, pri čemer kaže nesignifikanten vpliv na realni BDP. Ker je Republika Makedonija makroekonomsko stabilnost dosegla šele s precejšnjimi stroški (gl. Drugo poglavje), empirični rezultati potrjujejo, da je stabilnost deviznega tečaja zelo pomembna za ohranjanje makroekonomske stabilnosti, saj izpostavlja potencialno močan učinek prehajanja na raven domačih cen. Sprememba vrste režima deviznega tečaja zaradi višje dolarizacije nedvomno prinaša tveganje pojava finančne nestabilnosti. Zaradi močnega učinka prehajanja sprememb deviznega tečaja na domače cene imajo tovrstne spremembe negativen vpliv na zmožnost Narodne banke Republike Makedonije, da bi ohranila nadzor nad inflacijo. Ukrepi, ki bi Republiko Makedonijo vrnili na raven inflacije (kar bi fleksibilni režim deviznega tečaja morda dosegel), najbrž niso smiselni, saj bi bili visoki stroški stabilizacije znova preloženi na ramena prebivalcev. Ker lahko devizni tečaj potencialno vpliva na oblikovanje ravni cen, rezultati kažejo, da opustitev režima deviznega tečaja ali depreciacija domače valute ne bi bili pametni strategiji za spodbujanje gospodarske rasti, saj ne bi prinesli nobenih ekonomskih koristi, sledila pa bi makroekonomska nestabilnost z že znanimi negativnimi posledicami za gospodarsko rast.

CONTENTS

FIGURES

TABLES

1 INTRODUCTION

Monetary and fiscal policies and their 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 or fiscal policy will affect price levels, i.e. the rate of inflation. Therefore, economists agree that the main long-term goal of monetary and fiscal policy should be to maintain low and stable price levels (Abel, Bernanke and Smith, 2003, p. 538). However, in the short term[1], monetary and fiscal policies remain powerful tools for affecting real economic activity via several channels.

Regarding monetary policy, the theory and the empirical evidence (based on the Structural Vector Autoregressive and the Vector Error Cointegration Model approaches[2]) 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 (Ganev et al., 2002; and Elbourne et al., 2003). 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 points to a

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1 Note: “short term” in my models is defined as the effect of monetary or fiscal policy on real GDP and prices during a period of less than 24 months,- This definition is common among most new Classical and new Keynesians authors.

2 Sims (1980), Blanchard and Watson (1986), Mishkin (1996, 2001), Kim and Roubini (2000), McCarthy (2000), Bernanke and Mihov (1998), Bernanke (1995, 2000, 2003), Mihov (2001), Ganev et. al (2002), Kuijs (2002), Juks (2004), Cîtu (2003), Christiano, Echenbaum and Evans (1996, 1999, 2005), Leeper, Sims and Zha (1996), Maliszewski (2003), Mayes (2003), Vonnák Balázs (2005), HM Treasury (2003), Coricelli, Jazbec and Masten (2004), Horváth and Maino (2006), Hristov (2004), Bin Li (2005), Uhling (2005), and Giovanni and Gordani (2006).

need for 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 fiscal policy, I include an analysis of its macroeconomic effect for several reasons. Recently, in the literature on structural VAR, some consideration has been given to the investigation of the macroeconomic effects of fiscal policy (e.g. Blanchard and Perotti, 2002; Fatás and Mihov, 2003, 2004; Mountford and Uiling, 2005; Restrepo et al. 2006; Rarytska, 2003). Since the foundation of the Euro Area, there has been a growing interest in the reinvestigation of fiscal policy as an effective instrument for stabilizing business cyclical fluctuations. The appearance of such a system with a single central bank has left the European countries with fiscal policy as their only instrument for macroeconomic stabilization. If a government is to attempt to smooth out its business cyclical fluctuations or to otherwise affect its economy, it will have to rely on some component of fiscal policy (expenditure and taxation), while keeping within the limits imposed by the Stability and Growth Pact and Economic Policy Coordination of the European Union (Ducanes et al. 2006, pp. 1-18). The other reason for reinvestigation of the macroeconomic effect of fiscal policy is to determine whether fiscal policy can be considered as a complementary instrument of monetary policy in achieving macroeconomic stability (Muscatelli and Tirelli, 2005, pp. 550-584). With respect to the countries in transition, little attention has been devoted to the macroeconomic effect of fiscal policy, even though these countries are interesting for their variety of types of economic growth. A key argument for tying governments' hands (in those countries) by imposing various restrictions on fiscal policy is based on the assumption that discretion in fiscal policy can harm macroeconomic stability. Also, an argument can be made for restricting fiscal policy on the basis of ensuring fiscal responsibility on the part of governments, which, if left unrestricted, would accumulate huge deficits and public debt. While it is undeniable that fiscal policy has the potential of being destabilizing, it is also clear that fiscal policy can smooth out business cyclical fluctuations via expansionary public spending or tax cuts during periods of recession and contractionary policies during periods of expansion (Fatás and Mihov, 2003). Moreover, the effect of monetary policy is more rapid; though it may be less effective than fiscal policy in those countries in transition with underdeveloped financial systems. Often both sides of the budget are changed (increasing/decreasing government spending and reducing/increasing tax) in order to promote economic growth, as is the case in the Republic of Macedonia, which is the topic of my empirical research. Therefore, this suggests a need for ongoing analyses of the effects of fiscal policy on real GDP and prices, in order to assess the relative costs and benefits associated with introducing more active fiscal policy. .

Regarding the exchange rate regime, the question of the optimal monetary regime for small open economies is still unanswered (Ribnikar, 2004, pp. 9-23). 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, pp. 9-30; 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 and fiscal 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 fiscal policy and a different exchange rate regime (one using inflation targeting) – has received growing attention in the Republic of Macedonia.

Therefore, in this dissertation, I focus on identifying the effects that the monetary and fiscal policy and exchange rate regime have on real GDP and prices in the Republic of Macedonia. Based on the data from 1997 to 2006, my empirical research is supported by empirical testing using the most-used methodologies, such as SVAR and VECM. I am limited to using data from 1997 to 2006 in my work because the time series for monthly government expenditure are only available from 1997 forward, and the data for 2007 are not yet available. If I were to use data before 1996, I believe my research would be of lesser quality due to the high rate of inflation experienced from 1992-1996. The theoretical and empirical literature concerning SVAR and VECM, both in the developed countries and the countries in transition, provides the foundation of my empirical research on the Republic of Macedonia.

My main objective is to confirm or reject the validity of the following hypotheses:

$H1_1$: **A change in the money stock does not have a significant effect on real GDP. A change in the short-term interest rate does not have an effect on real GDP. A change in the money stock has a strong effect on prices.**

$H1_2$: **A change in the primary fiscal deficit and government expenditure does not have a significant effect on real GDP. A change in taxation will have short-term effects on real GDP.**

$H1_3$: **Stability of the exchange rate, especially once such stability has been achieved at substantial cost, is important for macroeconomic stability. A change in the exchange rate primarily affects prices due to the strong pass-through effect of nominal exchange rate changes on domestic prices via import prices.**

After the introduction and formulation of the hypotheses, the empirical research is organized as follows:

In the first chapter, I analyze the history of the monetary and fiscal systems and monetary and fiscal policy in the Republic of Macedonia from 1992 to the end of 2006, also including recent events in 2007. I begin by describing the origin of the monetary and fiscal system and by analyzing the monetary policy based on monetary strategies of targeting the growth rate of the base money during 1992-1995 and targeting the exchange rate during 1996-2007. I then examine dollarization or eurozation as an important factor for designing an independent monetary policy. Fiscal policy and the fiscal system are analyzed in the context of two distinct periods: from 1992-1994 and from 1995-2007. Fiscal adjustment and the tax system are analyzed as important factors for macroeconomic stabilization immediately following the economic independence of the Republic of Macedonia.

In the second chapter, I review the theoretical and empirical literature, both on the developed countries and countries in transition, as relates to the effect of monetary and fiscal policy, and exchange rate regime on real GDP and prices. In particular, I focus on the theoretical and empirical evidence concerning conventional transmission channels of monetary and fiscal policy (e.g. money stock, interest rate, primary fiscal deficit as a ratio of GDP, government expenditure and revenue channels), as well as exchange rate regime types, i.e. the exchange rate channel. These variables are employed as indicators in evaluating the effects of monetary and fiscal policy and exchange rate regime on real GDP and prices in the Republic of Macedonia.

In the third chapter, I select and analyze the econometrics methodologies employed in the case of the Republic of Macedonia and discuss the implications of the other literature on countries in transition. The advantages of the **Structural Vector Autoregressive (henceforth SVAR)** over the Keynesian and Monetarist macroeconomic models are explained as well. In addition, there are explanations of all tests performed in the empirical section "the Macedonian case", such as: **diagnostic test for SVAR residuals, Granger-Causality test, impulse response functions (Choleski and Bernanke decomposition), and forecast error variance decomposition.** This methodology is used to examine the short-term effects of monetary, fiscal, and exchange rate policy on real GDP and prices in the Republic of Macedonia. The **Vector Error Correction Model (henceforth VECM)** is also explained. It is used in evaluating the long-term effects of monetary and fiscal policy and exchange rate regime type on real GDP and prices. For this purpose, testing for trends and the unit root test (Augmented Dickey Fuller test) and Johansen methodology are also utilized.

In the last chapter, the effects of monetary and fiscal policy and exchange rate regime are tested. First, I carry out the econometric model by two well-known channels, *money supply and short-term interest rate*, in order to investigate the effect of monetary policy on real GDP and prices. This empirical research tests the **first hypothesis: that a change in the money stock does not have a significant effect on real GDP. A change in the short-term interest rate does not have an effect on real GDP. A change in the money stock has a strong effect on prices.** In this context, money supply is assumed to operate via the asset prices effect, the wealth effect, bank lending, and firms' balance sheet channels. In my evaluation, I address the following questions: Does a relationship exist between an increase of money supply and economic outcomes via the asset prices effect, the wealth effect, banks' lending effect and firms' balance sheet effect, or will such changes affect only prices? Do changes in the short-term interest rate affect real GDP? Does the interest channel operate in the Republic of Macedonia as it does in developed countries? In the following section of the last chapter, I jointly analyze the effects of fiscal and monetary policy on real GDP and prices in the Republic of Macedonia. The testing of the effect of fiscal and monetary policy is organized by considering a monetary SVAR model and introducing three well-known channels (such as*: primary fiscal deficit, budget revenue minus transfers, and government expenditure*) in evaluating the effect of fiscal policy (Blanchard and Watson, 1986; Christiano et al., 1996; Lipper et al., 1996; and Mountford and Uhling, 2005). This research tests the **second hypothesis: that a change in the primary fiscal deficit and government expenditure does not have a significant effect on real GDP. A change in taxation will have a short-term effect on real GDP**. At the same time, I use a distance test to determine to what extent the effects of monetary policy are modified when fiscal variables are introduced. I attempt to determine whether or not fiscal changes can affect real economic activity and if they can be used as tools for stabilizing business cyclical fluctuation. I also investigate which fiscal changes have the desired properties in order to be used as tools to smooth large business cyclical downturns in countries in transition. **In the final section of the last chapter**, I research the short- and long-term effects of exchange rate on real GDP and prices. Specifically, I test the importance of the exchange rate in order to determine whether or not exchange rate channel still play a significant role compared to money and interest rate channels in the monetary transmission mechanism. I also investigate to what extent real GDP and inflation are affected by the different exchange rate regimes. Finally, I research whether monetary policy and exchange rate regime remain consistent in the Republic of Macedonia, i.e. if they support the goal of stabilizing inflation at a low level, while at the same time ensuring that the movement of the exchange rate regime in the short term is not disruptive to the real economy and financial market. This empirical research tests the **third hypothesis: that stability of the exchange rate, especially once such stability has been achieved at substantial cost, is important for macroeconomic stability. A change in the exchange rate primarily affects prices due to the strong pass-through effect of nominal exchange rate changes on domestic prices via import prices.**

2 MACROECONOMIC POLICY IN THE REPUBLIC OF MACEDONIA FROM 1992 to 2007

April 26, 1992 marked the economic independence of the Republic of Macedonia from the former Socialist Federal Republic of Yugoslavia (henceforth SFRY). The Republic of Macedonia seceded from the SFRY's Dinar monetary zone. On the same date, the independence of the monetary system of the Republic of Macedonia took place, with a formal and public declaration of its monetary unit-denar. Consequently, the institutional basis for the monetary system was established by passing the following acts: the National Bank of the Republic of Macedonia Act and the Republic of Macedonia's Currency Act. This created a precondition for designing and implementing an independent macroeconomic policy. In the first section, I begin with the stabilization program, or, as it was called, the anti-inflation program, which was necessary after the disintegration of the SFRY owing to the hyperinflation inherited from the former economic system. In the following sections, I analyze monetary and fiscal policy as a key pillar of macroeconomic policy from 1992 to 2006, also including recent events in 2007. In addition, dollarization is analyzed as an important factor in designing an independent monetary strategy, particularly in the small open countries in transition.

2.1 Stabilization program of the Republic of Macedonia

The economic independence of the Republic of Macedonia, like other newly independent republics from the SFRY, took place within the climate of hyperinflation inherited from the SFRY. The average monthly rate of inflation was 86.1 percent in January of 1992, while it reached an average of 1800 percent for the year, with the tendency towards increasing further. The rate of economic growth was -9.1 percent , and the exchange rate in the black market was 300 percent higher than the official rate of 200 denar for one deutschmark (see first Bulletin of NBRM, October, 1992). Other than hyperinflation, the Republic of Macedonia had to cope with the loss of its residents' foreign exchange deposits with commercial banks held in the National Bank of Yugoslavia, the breakdown of its trade linkages due to the embargo on the SFRY, the blockade by Greece, Kosovo's conflict in 1999, and internal ethnic conflict in 2001. All of these shocks had negative effects on the functioning of the economy and its stumbling structural, economic, and financial reform.

Immediately following the Republic of Macedonia's economic and monetary independence, there were two main questions: were the primary sources of hyperinflation on the demand side or the supply side of the economy? And which types of macroeconomic measures were appropriate in order to stabilize the economy? Analyzing the demand side and supply side in that period, it was clear that the main generators of the disturbance of the economic system or the negative macroeconomic performance (hyperinflation, higher unemployment, decline of real GDP, old technology systems, etc.) were on both the demand side and the supply side. As such, it was necessary that the government of the Republic of Macedonia immediately establish a stabilization program. To be more precise, the solution of getting the economy out of its crisis required radical stabilization measures, foremost among them restrictive monetary and fiscal policies. The government did not have much in the way of alternative strategies, other than to immediately prepare a stabilization program to reduce inflation and to start the process of transformation from the old market-planned system to a new economic, political, and social system. It is worthwhile to mention that from the beginning, the role of macroeconomic policy was to deliver economic stability, but the government did not always have a clear platform in this regard, and so it was largely unsuccessful. This is discussed in the further analyses.

The macroeconomic goals and target were set forth in the stabilization program approved or adopted by the Macedonian Parliament in 1992. The stabilization program consisted of several key policy measures aimed at significantly reducing the inflation rate by stabilizing it at an average monthly level of 4.5 percent in the last quarter of 1992. The key macroeconomic measures were: a) a restrictive monetary policy aimed at reducing the growth rate of the money supply (M1), which was considered to be the main source of inflation; b) a restrictive fiscal policy intended to reduce the public expenditure from 38 percent to 35 percent of GDP and to achieve a balanced budget – this embodied the war against inflation by the government; c) fixing all wages to the level of March, 1992, with the possibility for them to increase by 25-35 percent; and d) a fixed exchange rate with parity in relation to German currency at 1 deutschmark = 360 denars.

As mentioned above, aside from the hyperinflation, the Republic of Macedonia had many problems to cope with immediately after its independence. Among these were having almost no foreign exchange reserves, an unfavorable position concerning the balance of payments, the loss of the traditional market, the Serbian and Greek embargos, and the conflict in the SFRY. All of these factors had a huge impact on the efficiency of the stabilization program. Even so, the stabilization program achieved limited results immediately after its implementation. During the period from May to June, the monthly rate of inflation fell by 16.16 percent to 72.4 percent, down from 86.1 percent in January. Still, the rate of inflation was well higher than the target of 45 percent in May and 8 percent in June as designated by the stabilization program. The exchange rate in the black market was getting close to the official rate.

The decrease in the average rate of inflation brought about by the stabilization program was seriously undermined in Mid-August of 1992 when the parliament changed the wages law. This law enabled employers to increase wages by 50 percent in the economic sector and 141 percent in the public sector. Additionally, the Greek oil embargo created further pressures on the rate of inflation, which also seriously undermined the efficiency of the stabilization program. Immediately after the changes to the wages law, all control over wages was lost. The average wage level increased by 110.6 percent cumulatively during the period from August to September of 1992 compared to the June of 1992 base. The further trend of reducing inflation was thereby interrupted, and from September to October inflation increased by 21 percent. Also, the black market exchange rate increased by around 60% in relation to the official exchange rate. This new situation required a revision of the macroeconomic strategy. At the end of 1992, most components of the stabilization program were readjusted in order to provide conditions for relative stability, such as an inflation rate no higher than that determined by the fundamental factors in the economy. The average monthly rate of inflation had been targeted at 23 percent. The denar was devalued by 66.7 percent against the Deutschmark as well. Even though the stabilization program was readjusted, it did not accomplish any appreciable results in terms of inflation, so that the average rate of inflation was 1800 percent for 1992.

During 1993, there were two distinct aspects of the inflationary dynamic: first, immediately after taking office, the new government undertook several stabilization measures, but they were of fragile intensity and impact, owing to the higher and unpredictable movement of the inflation and exchange rates. Second, by the end of 1993 the new stabilization program had been established in cooperation with the International Monetary Fund (IMF). The key aspects of that stabilization program were: stabilization of the exchange rates, fixed wages in the public sector, and fiscal consolidation. Consequently, it contributed significantly to the drop in the rate of inflation, so that during the period from 1993 to 1994 it declined from 349 percent to 121.8 percent. In addition, this stabilization program made a huge contribution towards stabilizing the exchange rate, where it was close to the official exchange rate. Moreover, the negative trend of the rate of economic growth declined from -9.1 percent in 1993 to -1.8 percent in 1994. Although during the period from 1994 to 1995 the average rate of inflation continued to decrease from 121.8 percent in 1994 to 15.9 percent in 1995, it was still higher than the single-digit targets. Moving forward, the negative trend of economic growth continued to decline from -1.8 percent in 1994 to -1.2 percent in 1995. The exchange rate then was also close to the official rate.

It is worth noting that in December of 1995, the rate of inflation in the Republic of Macedonia declined to single-digit numbers (9.2 percent) for the first time since its independence. The subsequent stability of the exchange rate, the increase of foreign exchange reserves, greater control over monetary aggregates and wages in the public sector, and the consolidation of the fiscal sector all contributed to decreasing the rate of inflation. As a result, at the end of 1995 the NBRM abandoned the monetary strategy of targeting the base money and adopted the monetary strategy of exchange rate targeting. Hence, the base money, and through it the money stock, became endogenous to exchange rate and inflation movement. The domestic currency was pegged to the Deutschmark with parity at 27 denars = 1 deutschmark, and later to the Euro with parity at 61 denars = 1 euro.

There were two distinct important periods of the stabilization programs between 1992 and 1995. The first was from 1992 to 1994, when the rate of inflation had sluggishly decreased. The second was marked by the subsequent significant decrease of inflation. During the first period, from January to April of 1992, the Republic of Macedonia was still in the Dinar zone, and the monetization of the former Yugoslavia's federal budget deficit was the main source of inflation. Immediately after its independence, the main macroeconomic goal was to deliver price stability, however in that period the government did not have a clear platform regarding macroeconomic stability. The main factors in the collapse of the economy was the continuance of the seigniorage[3] financing of the deficit that culminated in 1992-1994 for the surges in inflation (particularly in the change of the law of wages) and the inability of the government to deal with bad loans from the socialist period. In addition, from 1992 to 1994 there was often conflict between the government and the NBRM. In one case, the NBRM attempted to stabilize the economy with a stabilization of the denar, which necessitated raising the interest rates. This interest rate increase affected budgets adversely and pressures to lower the base interest rate were then exerted on the NBRM. Lowering the interest rate led inevitably to currency substitution and an exchange rate crisis. It is difficult to evaluate the role of the monetary authority during the crisis period of 1992-1994. Taken at face value, all the crises in Macedonia had a significant monetary component: surges in inflation, banking sector instability, and sharp depreciations are all the result of poor management of monetary policy. Notwithstanding this evidence against the NBRM, one must admit that the government shared a great part of the blame**.** The economy faced higher inflation since the government had not yet approved its new stabilization program (enacted at the end of 1993). In the second period, from 1994 to 1995, the government had a clear platform concerning macroeconomic stability. It realized that stability of the exchange rate played a significant role in price stability, and that control of wages – particularly in the public sector – and fiscal policy should support and not oppose monetary policy in promoting the stabilization policy. The following section discusses two periods of the monetary policy and the role of its policy within macroeconomic stabilization. In the first period, from 1992 to 1995, the monetary policy was based on monetary strategy targeting the base money (M0 henceforth)[4] and through it the money stock (M1 henceforth), i.e. the money supply, while in the second period, from 1995 to 2007, the monetary policy was based on monetary strategy targeting the exchange rate.

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[3] Seigniorage is government revenue raised by the printing of money, also known as the inflationary tax.

[4] Note: Base money (M0) consists of the currency in circulation and banks reserves with the NBRM, also called the monetary base or high-powered money; Money stock (M1) consists of the base money and balances held in chequing accounts (personal and current accounts)

2.2 Monetary system and Monetary policy in Republic of Macedonia (1992-2007)

Prior to analyzing the two periods of monetary policy from 1992 to 2006 and recent events in 2007, I should first begin with a brief explanation of the origin of the monetary system and the starting position of the balance sheet of the National Bank of the Republic of Macedonia, where all important relationships can be seen. So the question is: what was the relationship between the National Bank of the Republic of Macedonia (NBRM) and the National Bank of Yugoslavia (the NBY)? And which consequences did the Republic of Macedonia face as a result of the breakdown of the SFRY?

2.2.1 Brief history of the origin of the Macedonian Monetary System

In 1976, according to the Act of the Decentralization of the Central Banking System of Yugoslavia, the National Bank of the Republic of Macedonia was founded. To be exact, in addition to the NBY, all republics and autonomous provinces had their own national banks, and as a result there were eight national banks (other than the NBY). What is important about this history? The decentralization of the central banking system was illogical in terms of the entire traditional relationships between the NBY and other national banks. According to Ribnikar (2001), the exception here are the claims of legal entities and others in the Republic of Macedonia on the NBY and, through the NBY, on the eight national central banks on the basis of the currency they held in their vaults (see Ribnikar, 2001, pp. 71-76 and Ribnikar and Košak 2004, pp.150-170). More precisely, relationships with the national bank of Yugoslavia implied the claims and debts of the entities and others in the Republic of Macedonia on the NBY and, passing through the NBY, on the other republics and autonomous provinces. Obviously, such an atypical relationship between the NBRM and the NBY became to a certain extent significant on April 26, 1992. It was standard practice that the newly independent states should have published their initial balance sheets immediately after their monetary independence from Yugoslavia. The Republic of Macedonia is probably an unusual case, in that since its monetary independence, the initial balance sheet has never been published on the books of the NBRM. Reviewing the first NBRM's bulletin that was published on October 1992, there are not sufficient recorded data or items to reconstruct an initial balance sheet for the NBRM in the Republic of Macedonia. As such, the balance sheet of the NBRM was published for the first time in 1993, though it did not clearly give evidence about relationships, i.e. claims and debts, between the NBRM and the NBY through the latter to the other republics and autonomous provinces, as was done by Ribnikar (2001, pp. 71-76) in the case of Slovenia. Nevertheless, I attempt to investigate these relationships in the case of the Republic of Macedonia using the first balance sheet published in 1993 (see Bulletin 4, 1995). Though it is likely that the balance sheet in 1993 arose from the unpublished initial balance sheet in Macedonia, there were significant changes in its size and composition during the period from 1992 to 1993.

I continue my discussion by examining the first NBRM's balance sheet in 1993, in which the assets and liabilities were not balanced. To be precise, the liabilities are less than assets by around 293 million denars, i.e. one item was missing or was not recorded on the liabilities side of the balance of sheet. This was probably to be expected, bearing in mind the relationship between the NBRM and the NBY. An illustration of the NBRM's balance sheet from 1993 is included in the following discussion.

As seen in Table 2.1, the most important assets and liabilities of the NBRM's balance sheet have been the following[5]: the foreign assets 5,302 million denars (60.8 percent), claim on the Republic of Macedonia 953 million denars (10.9 percent), claim on banks 1,275 million denars (14.60 percent), and other assets 1,200 million denars (13.70 percent). The total amount of the assets was **8,730** million denars. Among the liabilities, the notes in circulations were 3,671 million denars (43.5 percent), banks' deposits 214 million (2.50 percent), and others 4,552 million denars (54 percent), perhaps this "others" item included securities. The total amount of liabilities was **8,437** million denars. The difference between the assets and liabilities was **293** million denars. If this is accurate, the question is whether the unrecorded debt originated from the initial balance sheet or if there were accounting errors during the recording of the data. If the discrepancy arose from the initial balance sheet in October of 1992, then the Republic of Macedonia has had debts higher than the claims by the NBY or through the NBY by the newly independent states of the SFRY.

[5] Notes: The data of the first NBRM's balance sheet is denominated in hundreds in March, 1993. See bulletin 4 /1995 and 1/1996.

Table 2.1: A stylized NBRM balance sheet at the end of 1993, in percentages and millions of denars

Assets	Liabilities
1. Foreign assets 60.8 percent, (5.302)	5. Notes in circulation 43.5 percent (3.671)
	6. Banks' deposits 2.5 percent, (214)
2. Claim on Government 10.90 percent, (953)	7. Others liabilities 54 percent, (4.552)
3. Claim on banks 14.60 percent (1.275)	
4. Other assets 13.70 percent (1.200)	

Source: Bulletin 6/ 1994, NBRM, author's calculations (numbers are in millions)

This difference may well have been recorded in the NBRM's balance sheets in 1995 as a net debt (the difference between claims and deposits) of the Republic of Macedonia, as the assets and liabilities were equal in that period. However, it is difficult to discover exactly what occurred regarding the 293 million denars, as it either never appeared in the books of the NBRM or it is likely hidden within the item "others" in the NBRM's balance sheet. As Ribnikar (2001, pp. 71-76) explained in the case of Slovenia, if there had been an agreement as to the separation of the monetary system, then the Republic of Macedonia would have paid the difference of 293 million denars to the NBY in foreign currency, which would then have passed through the NBY to the other newly independent states, i.e. to their central banks.

Aside from hyperinflation, immediately after the monetary independence of the Republic of Macedonia, the banks' insolvency was another additional problem as a continuance of the economic crises inherited from the SFRY. The insolvency of the banks was expected owing to the atypical dealings between the NBY and banks, although it was not the only cause (see more Ribnikar, 2004, pp. 223-237). The banks were allowed to accept foreign currency deposits from their clients, but they were forbidden to provide loans in foreign currencies. It is clear that the banks were exposed to exchange rate risk due to depreciation of the currency on one side and non-performing loans on the other side. Thus, this generated "negative exchange rate differences". Moreover, all banks' foreign currencies were held in the NBY. So, the NBY admitted the "negative exchange rate differences" as its liabilities on one side, but it generated extra claims by banks on the NBY on the other side. A review of this process raises two questions: first, how were the "negative exchange rate differences" covered? And second, what happened to the foreign currency deposits held by the NBY after the breakdown of the SFRY? According to Ribnikar (2001 and 2004), the insolvency problem was formally resolved by the NBY, which did so through a sophisticated system of actual and fictitious foreign currency deposits by banks with the NBY and the ensuing interest-free loans to these banks. As he says, if there had been a peaceful disintegration of the monetary system, the NBY would not have had sufficient assets to settle these debts.

Immediately after the Republic of Macedonia's monetary independence, its banks had negative net assets on their balance sheets. The major source of these negative net assets consisted of accumulated losses as a result of the foreign currency deposits and potential losses of non-performing loans. Consequently, the banking system had problems with liquidity, non-performing loans, and insolvency. Aside from these problems, the banking system had also lost its foreign exchange deposits held in the NBY, which totaled around $1,400 million. So, all foreign currencies were blocked in the NBY, whereas the Macedonian banks' obligation to households remained. This was a big problem for the banking system in the Republic of Macedonia that required a comprehensive rehabilitation of the banking system. In the beginning of 1995, the Republic of Macedonia started its linear rehabilitation of the banking system by taking over all banks' liabilities toward households' foreign deposits (those blocked in the NBY, $1,400 million), partial liabilities toward foreign banks, and non-performing loans as well. On the other hand, the Republic of Macedonia gave government bonds to the banks in order to cover the losses for blocked foreign currencies and non-performing loans during the socialist period. The Republic of Macedonia did not have any other choice except to take over all of the liabilities of the NBY, as this was the only cost-effective solution to get the banking system out from under huge losses.

Having explained the origins of the monetary system and the starting position of the balance sheet of the National Bank of the Republic of Macedonia, I can continue the historical review with the investigation of the monetary policy based on different strategies and the instrument of monetary policy during 1992-1994.

2.2.2 Monetary policy in the Republic of Macedonia (1992-1994)

Immediately after its monetary independence, the characteristics of the Republic of Macedonia were: almost no foreign exchange reserves, a bad position concerning the balance of payments, underdeveloped financial instruments and institutions, interest rates unable to be used as instruments in the regulation of real economic activity, and a high degree of interdependence between money stock and aggregate demand. These factors were the key ingredients in designing the subsequent monetary strategy. The exchange rate regime was liberalized. There was no foreign exchange market; the buying and selling of foreign currency took place in the black market. Consequently, the NBRM didn't have a lot of choices in terms of the exchange rate regime. The practical option was a floating exchange rate regime, with possible interventions by the NBRM targeted at smoothing large fluctuations. Accordingly, the only viable monetary strategy option was targeting the base money, and through it the money stock, i.e. money supply. The growth rate of the money supply (M1) was set as a basic monetary target by the NBRM in its aims to achieve its final price stability goals or final target.

During 1992/1995, this strategy accomplished only limited results in terms of decreasing the rate of inflation, as it was undermined several times by the government and the instrument of monetary policy had not been established according to market economy principles. As a result, the single-digit rate of inflation was eventually achieved only in

1996, but by using a different monetary strategy, i.e. a monetary strategy of exchange rate targeting.

Aside from price stability goals within the monetary framework, the NBRM also utilized selective instruments, that is, orienting the high-powered money or base money into the higher priorities, e.g. agriculture and exports. These instruments were not consistent with market economy principles, and thus they actually impeded the efficiency of monetary policy during that period. Accordingly, the selective instruments of monetary regulation were abandoned in March of 1994. This move created the preconditions for establishing the indirect market instrument of the monetary regulation. In doing so, monetary policy could become much more efficient in accomplishing its ultimate goal, i.e. price stability.

During the period 1992/1995, the NBRM used quite a few monetary instruments to control its basic monetary target, i.e. the growth rate of money:

Refinancing of the banks. During 1992/1994, the bank refinancing operation represented the major instrument of monetary policy targeting the growth rate of the money supply. With this instrument, the NBRM had to observe its basic monetary targets. The operation of this instrument was based upon rediscounting the loans lent by banks for the specific purposes stipulated in the monetary policy goals and targets. Aside from the monetary targeting function, the NBRM also performed a selective function, directing the high-powered money into higher-priority purposes (Annual report, 1992/1993). The bank refinancing instrument was not able to achieve any results in term of monetary strategy by targeting the growth rate of money supply owing to the conflict between money targeting and the selective instrument of monetary policy. The conflict arose when the higher-priority purposes increased demand for high-powered money due to seasonal oscillation; whereas, the money target had to be kept within the target range. Moreover, prior to abandoning the bank refinancing instrument, around 84 percent of loans were unsecured. As a result, the bank refinancing instrument impeded the efficiency of monetary strategy. In preparation for the monetary strategy of exchange rate targeting, the NBRM therefore ceased to use bank refinancing as an instrument of monetary policy in March of 1994.

Reserve requirements. The objective of this monetary instrument has been to assert control over banks' credit potential (base money control) and money multiplication (the scope of monetary control). Regardless of the high reserve requirement of 27.2 percent at the outset of monetary independence, it was increased by 2.8 percent to 30 percent with the aim to reduce the high liquidity in the banking system. Since the liquidity decreased according to expected movement of the money target, the required reserve ratios dropped to 15 percent in 1992. The reserve requirements were used extensively as a monetary policy tool from 1992 until 1994.

Voluntary NBRM bills operation. The main objective of the voluntary NBRM's bills was to establish an institutional indirect market mechanism instrument of monetary policy in order to withdraw and issue higher-powered money with the goal of optimizing the level of liquidity in the banking system. However, the NBRM distributed bills and liquidity among the different sectors in an arbitrary manner that was not consistent with basic monetary principles (monetary policy instruments should be neutral in character). In doing so, the NBRM created an additional framework for the creation of higher-powered money within the existing issuance mechanism. As such, this instrument fell short of its main goals and was abandoned in July 1992.

The main assumption for effectively working out the monetary strategy of targeting money stock is that the demand for money is stable. By definition, the demand for money is determined by the level of income, prices, and short and long-term interest rates. The experience of the demand for money in the Republic of Macedonia is that it can be characterized as relatively unstable owing to higher dollarization. The NBRM thus abandoned the monetary strategy of targeting the growth rate of money and began to employ a monetary strategy targeting the exchange rate in October of 1995.

2.2.3. Monetary policy in the Republic of Macedonia (1995-2007)

Prior to changing the monetary strategy of targeting the base money, and through it the money stock, the movement of the exchange rate represented the main indicator of money demand and money supply (dis)equilibrium; namely, it was the indicator for monetary policy. On the other hand, with no initial foreign exchange reserves, after a short period, the major items of the NBRM's balance sheet were foreign assets at 57.7 percent in 1995, and the currency substitution coefficient measured as a share of foreign currency deposits in money stock (M1) reached 30 percent (see Annual report, 1995). Therefore, the increase of the foreign assets in the NBRM's balance sheet and a higher degree of currency substitution (bank assets in the form of foreign exchange reserves) reduced the effectiveness of the monetary policy because they influenced the equilibrium of money demand and money supply and consequently rendered less effective the NBRM's money supply and money demand coordination. During 1994 and 1995, foreign exchange surpluses in the foreign exchange market showed a tendency towards increasing, so the NBRM attempted to avoid the eventual appreciation of the domestic currency by buying foreign currencies (Annual report, 1996). With these purchases, the NBRM created the base money, which in turn led to a liquidity surplus in the banking system. Under such circumstances, the new situation required changes in the NBRM's monetary strategy and monetary policy instrument in order to deal with the liquidity surplus in the banking sector and foreign exchange surplus; namely, it required a changing of the operating monetary instrument towards the conditions of the foreign exchange market aimed at maintaining the stability of the exchange rate. As a result, in October of 1995, the NBRM changed its monetary policy based on the strategy of targeting the base money, and through it the money stock, and it has used a monetary strategy of targeting the exchange rate ever since. Therefore, the base money, and through it the money stock, became an endogenous variable, subject or subordinate to the basic exchange rate target of monetary strategy. That is, within the monetary strategy of targeting the exchange rate, the money supply is an endogenous variable determined by conditions in the foreign exchange market and the need to keep the exchange rate at the target level. Other than the high fluctuation of demand for money, which was strongly influenced by autonomous factors, there were additional factors which necessitated changing of the monetary strategy, such as: the liberalization of the economy (i.e. opening of the economy), the strong necessity to import monetary stability due to the history of hyperinflation and a lack of credible public institutions, and shallow levels of financial intermediation in the banking and financial markets (Petkovski, 2001, p. 237).

As I mentioned above, after starting with no initial foreign exchange reserves, the major items of the NBRM's balance sheet had become foreign assets (at 57 percent) by 1995. As result, the question is how has the NBRM been coping with liquidity surpluses prevailing in the banking system and which monetary instruments have been used by the NBRM to manage its liquidity position.

Almost as a rule, central banks in countries in transition have to deal with liquidity surpluses in the banking system as they open and go forward with privatization, and hence they become attractive targets for capital inflow (Ribnikar, 1996, pp. 1-16; and Ganely, 2002, p. 139). There are two major channels which produce surplus liquidity in the banking system: first, bearing in mind the changes of the NBRM's structure of the balance sheet in 1995, when, after a short period, the major assets were foreign assets, which produce liquidity surpluses in the banking system and are connected with current and capital account balance of payments and exchange rate; and second, an increase in net claims on the government, i.e. the monetization of the fiscal deficit.

In order to investigate the liquidity surplus in the banking system, first I employ a decomposition of the NBRM's balance sheet from 30.07.2007 (see Ribnikar and Bole, 2006, p. 10).

The major assets listed are foreign assets at around 94.5 percent, while claims on government and banks and other assets are around 5.5 percent. Consequently, the foreign assets are major channels of the creation of the base money, comprising around 94.5 percent, while the government's lending and banks are negligible at around 5.5 percent (claims on government are 1.70 percent, claims on banks and financial institutions are 1.30 percent, and other assets are 2.50 percent) in the total creation of the base money. It is typical for a small economy such as that of the Republic of Macedonia that there is little room for channels other than via purchases of foreign exchange in terms of the creation of the base money. Foreign assets turn out to be hugely important autonomous items in producing a liquidity surplus in the banking system.

Table 2.2: A stylized NBRM balance sheet as of 31.07.2007, in percentage and millions of denars

Assets	Liabilities
1. Foreign assets 94.5 percent, (89.718)	5. Base money 31.4 percent, (29.778)
	6. NBRM's bills 10.60 percent, (10.110)
	7. Government deposits 33.30 percent, (31.608)
2. Claim on government 1.7 percent (1.626)	8. Other liabilities 24.7 percent, (23.620)
3. Claim on banks 1.3 percent, (1.345)	
4. Other assets 2.50 percent, (2.427)	

Sources: Bulletin, I/2007, NBRM, author's calculations

Looking at the liabilities side, one can find very important components, such as: sterilized purchasing of foreign exchange (item 6 – instrument of monetary policy) and government deposits (item 7), both of which are more important quantitatively than the base money. The government's deposits and the NBRM's bills comprise around 43.9 percent against the 31.4 percent from the base money. Namely, the NBRM's bills and the government's deposits have played a significant role in offsetting the liquidity surplus in the banking system, i.e. through the sterilization mechanism. Since we find the sterilized purchases of foreign exchanges on the liabilities side of the NBRM's balance sheet (item 6), the sterilization policy is analyzed in the following discussion. Afterwards, I attempt to investigate autonomous components of the cumulative autonomous liquidity position as a percentage of GDP in the NBRM's balance sheet. Secondly, I investigate which types of monetary policy instruments have been utilized by the NBRM in order to offset the cumulative autonomous liquidity in the banking system over the period of 1992 to 2006.

2.2.3.1 The NBRM's sterilization policy in the Republic of Macedonia

This sterilization means that the monetary authority would sterilize the sale (or purchases) of the foreign exchange by purchases (or sales) of the securities denominated in domestic currencies. Otherwise, the intervention in the foreign exchange market is non-sterilized.

Data in Table 2.3 describe the autonomous components of the cumulative autonomous liquidity position as a percentage of GDP over the period of 1992 to 2006 in the Republic of Macedonia. The cumulative autonomous position expresses the historical activities of the NBRM as they are reflected in its balance sheet items (Bohnec and Košak, 2007, pp. 128-155). Moreover, if foreign assets are higher than foreign liabilities, it indicates additional liquidities in the banking system and otherwise withdrawal of the liquidities, i.e. net foreign assets, shows cumulative additional liquidity or withdrawal liquidity. It also represents the claims on the government and the government's deposits, i.e. the net government position reflects additional liquidity in the banking system or withdrawal liquidity.

Table 2.3 shows the developments of the three main factors that bolstered the cumulative autonomous liquidity position: net foreign assets, net government lending, and cash in public circulation.

Table 2.3 shows that there have been significant structural changes of the NBRM's balance sheet from the beginning to the end of 2006. Since 1995, and particularly since 2000, the net foreign assets as a percentage of GDP have considerably increased and are positive in all observation periods. As the net foreign assets are positive, this indicates that net foreign assets have been systematically producing liquidity in the banking sector – particularly over 2005 and 2006 when the capital account had already been liberalized. Moreover, the net foreign assets are almost two times higher than net claims on government, which shows the significance of the foreign currency inflow both in net transfer of capital and as direct investment.

Table 2.3: Autonomous components of the Cumulative Autonomous Liquidity Position in the NBRM's balance sheet, expressed as percentage of GDP from 1992-2006

YEAR	NFA/GDP	NCG/GDP	CASH/GDP
1992	0.00%	0.00%	0.00%
1995	4.10%	0.60%	-2.90%
1999	8.90%	-1.24%	-3.10%
2000	14.70%	-3.80%	-3.40%
2002	19.60%	-4.33%	-5.79%
2005	20.52%	-6.68%	-6.91%
2006	22.53%	-7.61%	-7.20%

Source: Annual report, 1992, 1995, 1999, 2000, 2002, 2003, 2004, 2006, author's calculations, IFS and Bohnec and Košak, + Creation of liquidity in the banking system, – Withdrawal of liquidity in the banking system. The second column expresses the difference between foreign assets and foreign liabilities as a percentage of GDP, the third column the difference between claims on government and government deposits as a percentage of GDP, and the fourth column expresses cash in public circulation as a percentage of GDP. The estimation for 2007 is not constructed because the data for GDP is not yet available.

The net government claims on the NBRM as a percentage of GDP from 1992 to the end of the 2006 also show a significant change from being the producer to becoming the depositor of liquidity in the banking system. During 1992/95, this item in the NBRM's balance sheet was positive, which means that the government was a producer of liquidity in the banking sector. From 1999 to the end of 2006, net claims on government were negative, indicating that the government began to be a net depositor with the NBRM (a fund for monetary purposes), and therefore the government did not produce forward liquidity in the banking system.

The amount of money in circulation as a percentage of GDP increased during the period 1992-2006, absorbing some of the liquidity surplus in the banking system. However, it has not achieved significant results in terms of absorbing the liquidity surplus in the banking system.

As seen in Table 2.3, the Republic of Macedonia had to cope with the prevailing liquidity surplus problems in the banking system. This is due to purchases of foreign currencies (capital inflow) by the NBRM, as well as the fact that net government claims on the

NBRM and money in circulation were not capable of offsetting this liquidity surplus in the banking system. If the NBRM does not react to liquidity surplus in the banking system, there may occur the reverse process in the foreign exchange market, or inflation will skyrocket with well-known consequences. In order to examine what could happen with an increase of the quantity of money, one has to use quantitative methodology. In the fourth chapter of this dissertation, I use Vector Autoregression Model and Vector Error Correction Model to investigate the effect on real economic activity and prices caused by an increase in the money stock. Here, I need to explain the current monetary policy. The issue is how the NBRM dealt with liquidity surpluses of around 8.70 percent as a percentage of GDP, which resulted from the NBRM's purchasing of foreign currencies in the foreign exchange market.

Data in Table 2.4 report types of monetary instrument that are used in order to offset the autonomous liquidity position in the NBRM’s balance sheet over the period 1995 to 2006 in the Republic of Macedonia.

From 1995 to the end of 1997, the reserve requirements were the only tool of monetary policy in terms of absorbing the liquidity surplus in the banking system. They also played an important role in the following years in reducing surplus liquidity in the banking sector.

Table 2.4: Autonomous Liquidity Position of the NBRM’s balance sheet and Offsetting factors

YEAR	Autonomous liquidity position as a % of GDP	Autonomous position	Deposit of money bank’s reserves with /NBRM	NBRM's bills	Treasury bills	NBRM's capital
1995	2.10%	100%	-85.00%			185.00%
1997	3.47%	100%	11.20%	7.90%		80.90%
1999	3.90%	100%	11.70%	14.60%		73.70%
2000	5.40%	100%	20.50%	23.80%		55.70%
2002	6.34%	100%	18.90%	16.90%		64.20%
2005	7.11%	100%	15.20%	29.20%		55.60%
2006	8.70%	100%	17.20%	23.50%	11.50%	47.80%

Source: Bulletin, 1995, 1997, 1999, 2000, 2002, 2005, 2006, author's calculations, IFS, and Bohnec and Košak. The estimation for 2007 is not constructed because the data for GDP is not yet available.

The denar bills were issued for the first time in 1995 as an instrument of monetary policy for sterilization purposes. They were intended to offset the liquidity surplus in the money market resulting from purchases of foreign currencies by the NBRM. However, from 1995 to the first half of 1997, the NBRM's bills did not play any role in terms of offsetting liquidity surplus in the banking system (see Bulletin, 1997). In that period, the NBRM's bills were still in their initial phases, and perhaps the NBRM did not have sufficient experience to use them for their intended purposes. Moreover, the banking system was not interested in buying the NBRM's bills. The banking system was instead more oriented towards selling and buying deposits with the NBRM rather than trading with the NBRM's bills.

From 1997 to 2006, sterilization of the foreign exchange purchases took place via selling of the NBRM's bills, and they became the most important instrument of monetary policy in terms of offsetting the liquidity surplus in the banking system. As we can see from Table 2.4, from 1999 to the end of 2006, the NBRM's bills played a more important role than the reserve requirements, except in 2002 when the NBRM's bills lost their attraction due to the ethnic conflict in the Republic of Macedonia. In March of 2006, the NBRM, along with the Ministry of Finance, issued treasury bills for monetary purposes (see Annual report, 2006). As seen in Table 2.4, treasury bills have also played an important role in terms of sterilizing the structural liquidity in the banking system, which reached an average of around 11.5 percent of the total structure of the autonomous liquidity position.

In addition, Table 2.4 also shows that only in recent years has the NBRM relied on the direct and indirect market instruments of monetary policy rather than reserve requirements for sterilizing the liquidity surplus in the banking system, which is probably not the case in other, more advanced countries in transition. For example, the Central Bank of Slovenia launched BS bills concurrently with its monetary independence (see more Ribnikar, 2001, Ribnikar and Košak 2004 and Bohnec and Košak, 2007). However, particularly in 2005/2006, the NBRM was more focused on developing market-oriented instruments of monetary policy as sterilization tools, even though they should have been used earlier for such purposes, which, perhaps, could have had a positive impact on the development of the financial market.

Let me now investigate the historical development of instruments of monetary policy that have been used by the NBRM.

The instrument of monetary policy: From 1995 to 2006 there have been significant changes in the instruments of monetary policy. The reserve requirements have been the traditional instrument of monetary policy aimed to offset the prevailing structural liquidity surplus since the monetary independence of the Republic of Macedonia. Later, in 1995, the NBRM launched its bills aimed at using the indirect instrument of monetary regulation in the form of auctions of these bills for monetary purposes (and more recently treasury bills for monetary purposes). I begin the discussion with the traditional reserve requirements instrument of monetary policy and continue on to more recent instruments of monetary policy.

Reserve requirement. The function of the reserve requirements, ever since the monetary independence of the Republic of Macedonia, has been partially as an instrument of monetary policy aimed at offsetting the structural liquidity surplus prevailing in the banking system from the country's independence through the end of 2006. Therefore, the NBRM relies upon the reserve requirements, as it is still to some extent a significant instrument of monetary policy in terms of offsetting surplus liquidity, even if recently both short-term bills (the NBRM's bills and treasury bills for monetary purposes) have played a greater role in liquidity surplus reduction in the banking system (see Table 2.4).

The system of required reserves (except reserve ratios) remained unchanged from the monetary independence of the Republic of Macedonia to the end of 1996 in terms of calculation and obligation for required reserves by banking system. By 1996, the calculation and obligation for required reserves allocation was determined on the basis of average balances of deposit accounts for every working day from the previous accounting period. This is in contrast to previous methods, by which estimates were based on the ten-day balances of deposits (see Annual report, 1996). The estimated average balance of deposit accounts is multiplied by the reserve ratio for required reserves allocation, 8 percent with maturity up to three months and 3.5 percent with maturity longer than three months. Consequently, this change in the methodology of calculating the required reserves, as a system of average reserve requirements, proved to be efficient for smoothing the fluctuations of the banks' liquidity position. It enabled the banks to adjust the amount of deposited required reserves with planned inflows and outflows fund(s).

During 2000 and 2005, there were several changes regarding the reserve ratios for required reserves, as it was an important instrument in offsetting the structural liquidity surplus in the banking system. As seen in Table 2.5, from 2000 to 2002 the reserve ratios for required reserves was increased from 8 percent to 10 percent (regarding domestic deposits with maturity up of three months) and from 3.5 percent to 5 percent (regarding domestic deposits with maturity up of over three months). During 2003 and 2004, reserve ratios for required reserves significantly changed from 10 percent and 5 percent to 7.5 percent for any kind of deposits, regardless of maturity. In 2003, the required reserve for foreign currency deposits was established for the first time at the reserve ratio of 7.5 percent.

In January 2005, there was a large increase of the reserve ratios from 7.5 percent to 10 percent for any kind of deposits – either foreign or domestic – and regardless of maturity. The increase of the reserve ratios from 7.5 percent to 10 percent for domestic deposits was due to the structural liquidity surplus in the banking system. The increase of the reserve ratios for foreign deposits was due to the increasing loans in foreign currency by the banking system following the liberalization of the credit system in July 2003. However, such dramatic changes in the reserve ratios are not consistent with the more advanced transitional economies, which sought to decrease the reserve ratios in order to develop market-oriented direct and indirect instruments of monetary policy, such as treasury bills and other types similar to the NBRM's bills (even if the NBRM's bills are transitory). There was also no diversification of the reserve ratios according to deposit maturity, which probably will not encourage long-term saving in the banking system. In addition, the NBRM is far from remunerating reserve requirements with the central bank at an interest rate that would correspond with short-term inter-banking interest rates, which is the practice of the European Central Bank (see more Ribnikar and Košak 2004, pp.150-170).

The NBRM's short-term bills (sterilized purchases of foreign exchange). The main objective of the NBRM's bills was to establish an institutional indirect market mechanism instrument of monetary policy in order to reduce the structural liquidity surplus in the banking system. As seen in Table 2.4, even if the reserve requirement played an important role in terms of offsetting the structural liquidity in the banking system, it was not sufficient to offset the huge growing liquidity surplus. It was therefore necessary to set up other, more intensive instruments aimed at absorbing the prevailing structural liquidity, which reached 4.10 percent as a percentage of GDP by the end of 1995 and increased in the following year, due to purchases of foreign exchange by the NBRM. The NBRM was constrained to issuing denar bills due to sterilization of a foreign exchange surplus in the foreign exchange market. From 1999 to the end of 2000, there was almost a doubling of the net purchases of foreign exchange by the NBRM, which in turn led to an equivalent increase of the liquidity surplus in the banking system, that is, from 8.90 percent in 1999 to 14.70 percent in 2000 (see Table 2.3). At the same time, the NBRM's bills increased almost as much, i.e. from 14 percent in 1999 to 23.80 percent in 2000 (see Table 2.4), which indicates that the NBRM's bills have played a significant role in terms of offsetting the structural liquidity surplus in the banking system.

The process of buying and selling the NBRM's bills has seen several changes from its beginning to the end of 2006, aimed at improving their functioning in the financial market. During 1997/2000 the NBRM supplied four types of bills, and the auction of bills (selling and buying) was conducted in the form of "volume tenders" of differing maturity from 7, 14, 30, 40, 60, and 91 days. During that period, the most-traded instruments were the NBRM's bills with 30-day maturity with corresponding average interest rates of 8.2 percent in 1997, 10 percent in 1998, 10 percent in 1999 and 6.8 percent in 2000 (see Table 2.5).

During 1999/2000, the NBRM's bills played a crucial role in absorbing the liquidity surplus resulting from the huge net capital inflow due to donation (immediately after the end of the conflict in former Yugoslavia) and the selling of the biggest states companies. The capital inflow (donation and foreign direct investment) led to a subsequent need for purchases on the foreign exchange by the NBRM in order to prevent the denar exchange rate from appreciating. As result, the liquidity surplus in the banking system grew, and the NBRM's bills played a significant role in offsetting this liquidity surplus (see Table 2.4).

In April of 2000, the NBRM made significant reforms in the modernization of the monetary instrument. The NBRM now offered two different types of bills for auction: "interest rate tender" and "volume tender" bills. Also, daily auctions in terms of their organization and standardized maturity of 28 days were launched. Moreover, the NBRM's "interest rate tender" bills were formed on the basis of the market, so they were fluctuating between an average of 9.8 percent (in May of 2000) and an average of 6.8 percent (in

December). As seen in Table 2.5, the NBRM's bills' average interest rate was reduced from 10 percent in 1999 to 6.8 percent in 2000. November of 2000 saw the introduction of the "interest rate tender" of its bills, along with a more flexible approach in the setting of the interest rate in order to adjust it in accordance with the market-based interest rate. During 2001/2002, the average interest rate of the NBRM's bills was increased from 6.8 percent to 12.16 in 2001 and 15.21 in 2002 due to the ethnic conflict in 2001.

In the period from 2005 to 2006, and continuing in 2007, the NBRM made significant changes in terms of the organization and functioning of its bills. In March of 2006, a new market-oriented instrument of monetary policy was introduced: government-issued bills for monetary purposes. In 2006, the NBRM's bills and the government's bills were the main instruments of monetary policy used for reducing the structural liquidity surplus in the banking system (see Table 2.4).

In the last quarter of 2005, the NBRM dramatically changed the operation of their bills by abandoning the "tender volume" auctions altogether and introducing the "tender interest rate" auctions valued on the basis of the market mechanism. Consequently, the shift from "tender volume" auctions to "tender interest rate" auctions contributed to dropping the NBRM's bills' average interest rate from 10 percent in 2004 to 8.52 percent in 2005 (see Table 2.5).

In 2005, the NBRM's bills played a crucial role in terms of sterilizing the effect of the autonomous factor – the production of higher liquidity in the banking system via purchases on the foreign exchange by the NBRM – due to the credit received from the World Bank (June, 2005) and the approval tranche from the IMF (September, 2005). In addition, in 2005 the NBRM's bills' role was greater (at around 29.2 percent) in relation to the reserve requirement (around 15.2 percent) in offsetting the structural liquidity surplus in the banking system (see Table 2.4), meaning that the NBRM was relying more on the market instrument of monetary policy than the required reserve.

In March of 2006, the NBRM, along with the Ministry of Finance, issued treasury bills with a maturity of 90 days that reached an average interest rate of 6.4 percent by the end of 2006 (see Annual report, 2006), declining to an average interest rate of 5.15 percent during 2007. Introducing these bills was intended to establish a longer period for sterilizing the structural liquidity in the banking system. Aside from sterilizing excess liquidity, the treasury bills also contributed to further development of the financial market in the short term instruments, which in turn led to improvement of the conduction of the liquidity surplus in the banking system and strengthened the operation and management of monetary policy.

Table 2.5: Reserve ratios, average interest rates of the NBRM and Treasury bills

Year	Reserve ratios with maturity less than 3 months	Reserve ratios with maturity greater than 3 months	Reserve ratios for foreign deposits	Reserve ratios for any kinds of deposits, regardless of maturity	Average interest rate of NBRM's bills	Average interest rate of Treasury bills
1995	8%	3.5%			12%	
1996	8%	3.5%			9.60%	
1997	8%	3.5%			8.20%	
1998	8%	3.5%			10%	
1999	8%	3.5%			10%	
2000	8%	3.5%			6.80%	
2001	10%	3.5%			12.16%	
2002	10%	3.5%			15.21%	
2003	7.5%	5.00%	7.5%		6.20%	
2004			7.5%	7.5%	10.00%	
2005			10%	10%	8.50%	
2006			10%	10%	5.70%	6.40%
2007			10%	10%	4.77%	5.15%

Source: Bulletin,1995,1996,1997,1998,1999,2000,2001,2002,2003,2004,2005,2006,2007

In April of 2006, the frequency of the NBRM's bill auctions was reduced from twice to once per week with a maturity up of 28 days, whereas the average interest rate was 5.70

percent at the end of 2006 – down from 8.50 percent in previous years and continuing to decline to 4.77 percent in 2007. The reduction of the frequency of the auctions was implemented in order to redirect the banks to purchase more of the treasury bills instead of the NBRM's bills, which resulted in an increase of the demand for treasury bills within the banking system by the end of 2006. The treasury bills played a significant role in terms of offsetting the structural liquidity surplus in the banking system (see Table 2.4).

In addition, in the recent years, the NBRM's bills and the treasury bills were the main instruments for absorbing the structural liquidity surplus, meaning that the NBRM has been more reliant on the market instrument in terms of conduction with sterilization due to purchases of the foreign exchange by the NBRM.

2.2.3.2 Monetary policy and exchange rate regime (1995-2007)

Since I have already addressed the reason for shifting from a floating to a managed floating exchange rate regime, which has been practically a de facto fixed exchange rate regime against the deutschmark and later the euro, I will now answer the following questions: why is stability of the exchange rate important for macroeconomic stability in the Republic of Macedonia? And what measures has the NBRM undertaken in order to provide a stable exchange rate?

According to the new law of the National Bank of the Republic of Macedonia, as of January 10, 2002, the main monetary policy goal is price stability. In order to achieve its primary goal, the NBRM began utilizing the operational target (the base money, and through it the money stock) and intermediate target (exchange rate) and through them achieving its main goal of price stability (final target). The base money became an endogenous variable controlled by the NBRM, which aims to maintain stability of the exchange rate.

Due to the sudden devaluation of denars against the deutschmark in the second half of 1997, the analysis of monetary policy and exchange rate regime is divided into two periods: first from 1995 to 1997, and second from 1998 to the end of 2006 (including recent events in 2007).

During 1995-1997, the monetary authority did not have a clear strategy for maintaining exchange rate stability in the Republic of Macedonia, and thus the devaluation of denars against the deutschmark occurred. The monetary policy based on the strategy of targeting the exchange rate required that the level of the quantity of money be consistent with the exchange rate target in order to prevent domestic currency from appreciating/depreciating on one side, while the optimal liquidity in the banking system could be achieved on the other side. Namely, monetary variables had to be subordinated to the need to maintain stability of the exchange rate of the denar against the deutschmark (henceforth DM), i.e. the movement of the base money was to depend on the condition of the foreign exchange market. Accordingly, this called for a tight connection between the foreign exchange market and monetary development, i.e. between monetary policy and exchange rate regime (Ribnikar,1999, pp. 183-218 and 2004, pp. 9-23). According to Ribnikar, it is impossible to analyze the monetary sector without accounting for the exchange rate regime and policy.

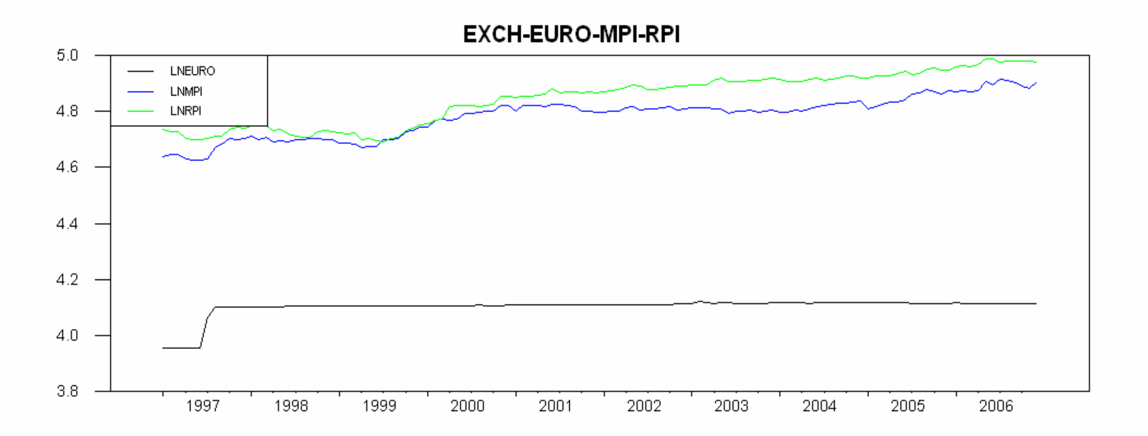
In contrast to 1995, when the NBRM was a net purchaser of the foreign exchange in the foreign exchange market in order to prevent appreciation of denars against the DM, in 1996 and the first half of 1997, the NBRM was a net seller of the foreign exchange (Annual report, 1996/97). During this period, the reserve requirements were not adequate for absorbing the relatively high starting level of liquidity surplus in the banking system, while the NBRM's bills added to the base money instead of reducing liquidity surplus in the banking system. However, the NBRM's bills were still in their initial phases, and perhaps the NBRM did not have sufficient experience to use them for their intended purposes. In this situation, the demand for foreign currency exceeded the supply, so in order to keep up the stability of the exchange rate the NBRM was forced to intervene by selling foreign currency in the foreign exchange market. In addition, even though there was a huge current account deficit, during 1996 and the first half of 1997 exports were decreased, while imports were increased, thus producing further pressure on the foreign exchange and exchange office market. By intervening, the NBRM reduced the amount of foreign exchange reserves on one side, while overvaluation of the denar took place on the other side. The divergence of the real exchange rate from its fundamental equilibrium level led to a huge increase in the interest rate, whereupon the exchange rate become a real obstacle for economic growth and determined the deficit in the current account of the balance of payments, thus losing the foreign exchange reserves.

Although the NBRM can maintain an overvalued denar for a time by further selling of the foreign exchange and by buying back its own currencies at a fixed price, it cannot do so forever because it has limited foreign assets. Eventually, there was no choice other than to correct the overvalued denar by devaluation against the DM, which took place in July of 1997 at 16.1 percent. If the NBRM attempted to continue in supporting the overvaluation of the denar for a long period of time, it would have resulted in the exhausted of the limited foreign exchange reserves, leaving the country no choice but to devalue its currency. Perhaps the devaluation would not had have happened if the NBRM, beginning with its monetary independence, would have introduced the bills for sterilization purposes much earlier and had not had to rely on the reserve requirements as the only monetary instrument for offsetting the liquidity surplus in the banking system. As it was, by not using the NBRM's bills as the primary monetary instrument for offsetting the liquidity surplus, the NBRM was forced to sell its foreign currencies in order to maintain exchange rate stability, which in the middle of 1997 ended in the devaluation of the denar.

Subsequent to the sudden devaluation of the denar, somehow liquidity became normalized in the banking system on one side; however, the losses from non-performing loans in the banking system and the disturbance of the manufacturing and retail prices indices took place on the other side. Moreover, the expectation of an increase in exports and a resulting increase of real GDP did not occur – probably owing to the sensitivity of manufacturing and retail prices indices (henceforth MPI and RPI, respectively) to changes in the exchange rate. In addition, since the sudden devaluation took place, I can make preliminary assessments regarding the impact of the exchange rate on real GDP and prices in the Republic of Macedonia and the importance of exchange rate stability (before my investigation by the Structural Vector Autoregressive (henceforth SVAR) and Vector Error Correction Models (henceforth VECM).

Let me now discuss the movement of the logarithm (henceforth ln) of manufacturing price index (henceforth lnMPI) and the logarithm of retail price index (henceforth lnRPI) to the changes of the logarithm of the exchange rate due to devaluation, and the second period of monetary strategy from 1998 to the end of 2006. Figure 2.1 shows the movement of lnMPI and lnRPI to the sudden devaluation of the exchange rate. As seen in Figure 2.1, lnMPI and lnRPI have strange patterns as the sudden 16.1 percent devaluation of the denar took place in the last half of 1997.

Figure 2.1: Monthly exchange rate, and manufacturing and retail price indexes (in logarithmic form)

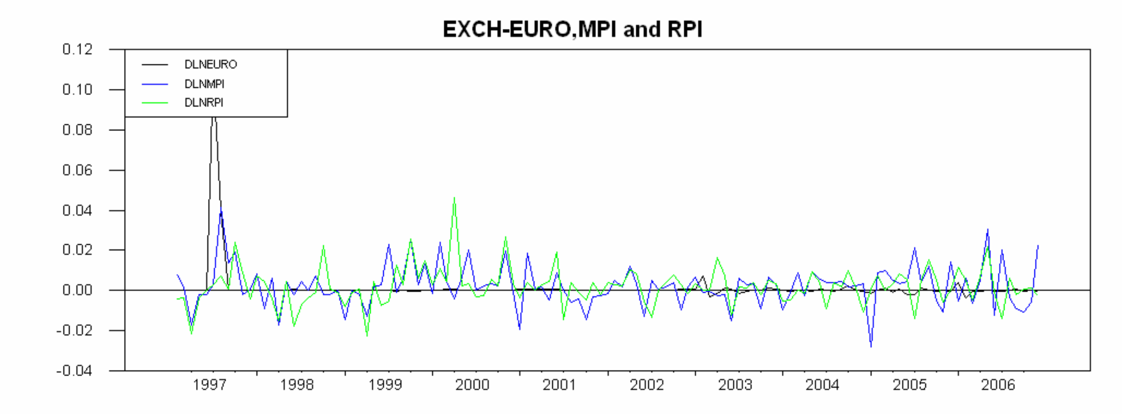


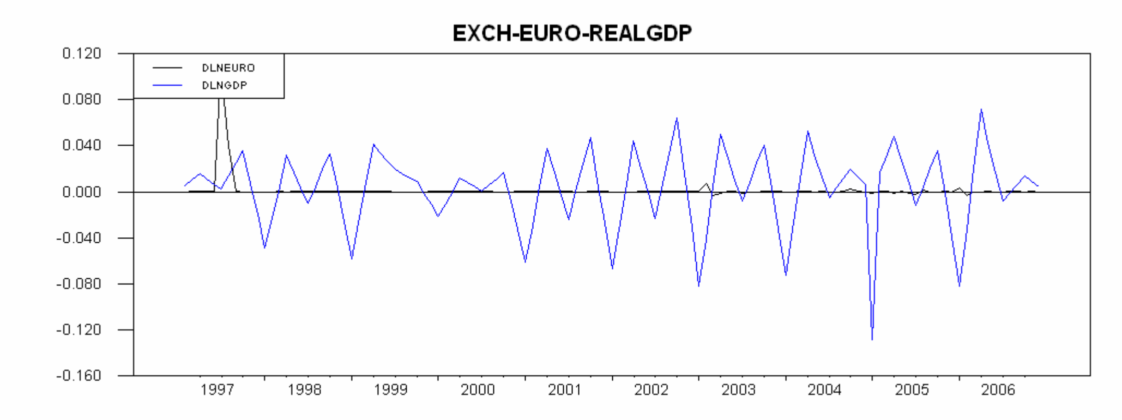
Source: Author's Calculations

Evidently, the sudden devaluation of the denar disturbed the prices indices, which subsequently normalized over more than a few periods. After the devaluation, the exchange rate was stable, and only a few events could be noted, such as: in the first quarter of 2003 there was a small depreciation of around 0.8 percent and at the end of 2005 and in the first quarter of 2006 0.5 percent and 0.2 percent depreciation took place, respectively.

By setting the time series in the first difference**,** the behavior of the univariate time series will be more explicable in terms of linkages between the exchange rate and MPI, RPI and real GDP during the period of observation. Figure 2.2 illustrates the time series (in the first difference) for the denar-over-euro average monthly exchange rate, together with manufacturing prices and retail prices. As can be seen in Figure 2.2, the manufacturing prices index responds right away, even within the first month, to the changes of the exchange rates, whereas the retail prices index has only a weak response six months after the devaluation of the denar took place. A visual inspection suggests strong links between prices indices and the exchange rate; however, such a link does not appear between exchange rate and the real GDP. Visual inspection of the real GDP does not show any response to the changes in the exchange rate; there were different patterns of real GDP in relation to the pattern of the exchange rate.

Figure 2.2: Monthly exchange rate, prices index and real GDP (in the first difference)





Note: I account for DM by the value of the EURO according to the estimation of the NBRM, and I think it performs well due to the behavior of the exchange rate.

Source: Author's calculations

Both figures (in level or logarithm and in the first difference) display almost the same path of the movement of MPI and RPI, which indicates a strong link between MPI and RPI and the exchange rate. Therefore, the preliminary assessment of the exchange rate has already suggested that the stability of the exchange rate is extremely important in the Republic of Macedonia due to the strong link between the exchange rate and the prices indices. However, one cannot make serious decisions on the basis of preliminary assessments regarding the effect of exchange rate on prices and real GDP, so the exchange rate's pass-through effect on prices and real GDP is examined using SVAR and VECM econometric methodology in the fourth chapter, where the results are much more reliable for the purpose of policy recommendation. *As the sudden devaluation in the Republic of Macedonia took place, followed by several other small changes, the acknowledgment that the prices changed due to particular exchange rate movements makes it easier to examine* *the effects of the exchange rate. Namely, such changes in the exchange rate help in examining its effect on prices and real GDP.*

Since 1998, the denar exchange rate against the euro has remained stable – even during the ethnic conflict in 2001. As was mentioned above, over almost all periods from 1998 to the end of 2006, the net foreign assets item of the NBRM's balance sheet dramatically increased via purchases of the foreign exchange aimed to prevent the appreciation of denar due to capital inflows. On the other hand, the NBRM's bills, and later the treasury's bills, were used as the primary instrument for offsetting the structural liquidity surplus in the banking system resulting from net purchases of foreign exchange. This has made a significant contribution towards stability of the exchange rate, which has in turn led to macroeconomic stabilization. I will now explain how the NBRM achieved a stable exchange rate when its stability was greatly threatened: during the ethnic conflict in 2001.

In 2001, the NBRM had to protect price stability by stabilizing the exchange rate, so it carried out restrictive monetary policy measures in order to sterilize the excess liquidity in the banking system resulting from the increase of government expenditure, i.e. the expansionary fiscal policy. The liquidity surplus in the banking system directly caused an increase in the demand for foreign currencies. In contrast to 1997, when the NBRM's bills did not succeed, in 2001 they were the primary monetary instrument in offsetting the liquidity surplus in the banking system, which in turn led to a considerable decline in the demand for foreign exchange on the part of participants in the foreign exchange market. The average interest rate of the NBRM's bills was increased from 6.8 to 12.20 percent, and they became more attractive to the banking system, so they redirected some of the demand for foreign exchange to demand for the NBRM's bills. The reserve requirement was increased from 8 percent to 10 percent, which also contributed to decreasing the demand for foreign exchange. In contrast to 1997, when the devaluation took place, we can see how much the NBRM's bills were instrumental in 2001 in terms of offsetting the surplus of liquidity in the banking system and preserving the stability of the exchange rate.

At the end of 2003, for the first time the NBRM introduced the required reserve for banks' deposits in foreign currencies, as previously banks were obliged to have liquid foreign currencies assets, i.e. they were represented as a substitute of the sterilization purchases of the foreign exchange via issuing NBRM's bills. The introduction of the new rules was not too important regarding stability of the exchange rate, as it remained stable due to the sterilization of foreign exchange purchases, but it was wise for the NBRM regarding the interest rate paid for NBRM's bills and required reserve in the foreign currencies.

In October of 2005 there was a significant change in terms of the influence or presence of the NBRM in the foreign exchange market (see Annual Report, 2005). Though the NBRM did not relinquish its discretionary right to operate in the foreign exchange market, it signed an agreement with four banks that they would be "market makers", whereby those banks would perform the selling and buying of foreign currencies in the foreign exchange market. However, the NBRM will meet the needs for foreign exchange in the foreign exchange market through those banks, while the supply and demand for foreign exchange by the other banks will occur only among those banks which are obliged to buy and sell foreign exchange, depending on the condition in the foreign exchange market. Through this arrangement, the NBRM only changed the method of trading with foreign exchange in the foreign exchange market and its presence in it, even if the NBRM would operate with banks as the "market makers". With this new regulation of the trading with foreign exchange in the foreign exchange market, the NBRM aimed to increase trading of the foreign exchange among the banks and thereby to achieve a more independent formation of the exchange rate. This is practiced by the central banks of more advanced economies.

I have already come to the important influence of the NBRM on the exchange rate, either by directly purchasing and selling foreign exchange in the foreign exchange market or, more recently, cooperating with banks as the "market makers" in the foreign exchange market. In addition, the liberalization of the capital account in 2003, i.e. the liberalization of the capital movement, created a much stronger connection between monetary and exchange rate policy (Ribnikar and Košak, 2004).

From 1998 to the end of 2006, and particularly in 2005/2006, the net foreign asset of NBRM's balance sheet (see the above tables) dramatically increased via purchases of foreign exchange in the foreign exchange market in order to prevent the denar's appreciation on the one hand, and the substantial changes in the monetary instrument towards using a more direct-indirect market-based monetary instrument in terms of offsetting structural liquidity in the banking system on the other hand. In doing so, stability of the exchange rate against the euro has been achieved. Consequently, the monetary strategy of targeting the exchange rate, i.e. the stability of the exchange rate, has played a significant role in terms of macroeconomic stabilization in the Republic of Macedonia, as from 1996 to the end of 2006 it succeeded in reducing inflation (inflation was 2.3% in 1996, 2.6% in 1997, -0.1% in 1998, -0.7% in 1999, 5.8% in 2000, 5.5% in 2001, 1.8% in 2002, 1.2% in 2003, -0.4% in 2004, 0.5% in 2005, and 3.2% in 2006). On the other hand, from 1998 to the end of 2006 there have been several changes of the NBRM's legislation and quite a lot of approval ACT by the NBRM towards using more market-orientated monetary instruments rather than non-market or unusual ones (trading with treasury bills is almost equal to trading with the NBRM's bills – see NBRM Bulletin, July 2007). Moreover, the Republic of Macedonia faced systemic changes because the method of trading in the foreign exchange market between the NBRM and banks was changed in 2005, the liberalization of the capital account took place in 2003, it gained membership in the World Trade Organization in 2002, and it became a candidate 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: liberalization of capital movement, fixed exchange rates, and an independent monetary policy (Obstfeld 1998, pp. 9-30; Mishkin 2003). Moreover, Levy-Yeyati and Sturzenegger (2001) claim that for nonindustrial economies a "long" peg (lasting five or more years) is associated with lower inflation than floats, but at the cost of slower growth. In the same vein are most Macedonian scientists, such as Bogoev (2004 p. XX), Fiti (2004 p. 14), Bishev (2004 p. 85), Petkovski (2004 p.61), and others, who all argue that the fixed exchange rate must shift towards a more flexible exchange rate – even if the Republic of Macedonia has de jure managing of the exchange rate. On the other hand, Ribnikar and Bole (2006) explain the Macedonian case very well by dividing the exchange rate regime into three parts: pure or floating exchange rate regime (complete monetary autonomy), intermediate exchange rate regime (partial monetary autonomy or no autonomy), and "hard" pegged exchange rate regime (no monetary autonomy). They said that the Republic of Macedonia has a de jure managing exchange rate regime from one perspective, while the fairly stable exchange rate against the euro has remained since the last quarter of 1997, i.e. a de facto truly fixed exchange rate regime or hard peg could also be said to exist. Ribnikar and Bole add that it does mean that results would have been the same if the Republic of Macedonia had adopted a de jure hard peg regime. For example, if it had adopted a currency board, i.e. "hard peg", foreign assets would be three time higher than money in circulation. Would monetary stability be possible under such circumstances?

Also, they explain that it is not wise to abandon the current strategy of exchange rate regime for what would probably be only a very short–term economic growth, which undoubtedly would end with monetary instability.

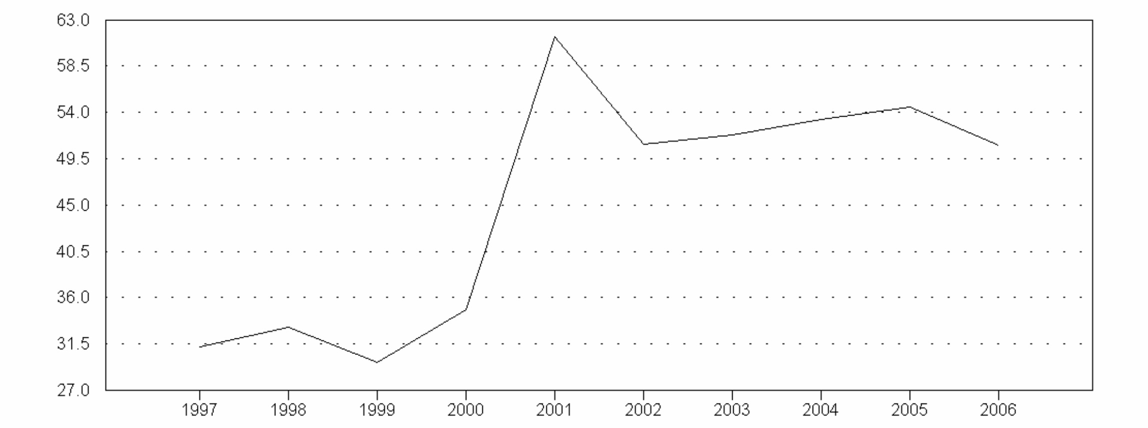
Finally, in recent years, the issue of exchange rate regime has become more pronounced ever since the liberalization of the capital account, and thus a monetary strategy targeting the exchange rate can become a target of speculative attack (a sudden large capital inflow in the short term) which in turn would lead to negative repercussions in the economy due to increases in and oscillation of the interest rate and oscillation of the foreign exchange reserves as well. On the other hand, the one-sided (aforementioned Macedonian scientists) suggestion or conclusion of shifting the exchange rate from a fixed to a more flexible exchange rate, or depreciation of the domestic currency in order to settle the problem of deficit in the current account (it is a fact that the Republic of Macedonia has had a deficit in the current account of balance of payments ever since its economic independence), and consequently to promote rapid economic growth, may easily disturb macroeconomic stabilization without any significant gains in terms of real economic growth in the Republic of Macedonia. In order to better understand the relative cost and benefit of shifting of the exchange rate from a fixed to a more flexible exchange rate, in the fourth chapter of this work the exchange rate pass-through effect on prices and real GDP is examined using SVAR and VECM in the Republic of Macedonia.

2.3 Dollarization in the Republic of Macedonia

Regarding dollarization of the economy, one usually analyzes this issue in order to make a preliminary assessment for the exchange rate pass-through effect on prices. As I find very interesting movement during the period 1994/ 2006, I may easily conclude that there must be a high coefficient of the exchange rate pass-through effect on prices in the Republic of Macedonia. As was previously mentioned, one of the factors that led the NBRM to peg the denar against the DM, and later to the euro, was higher dollarization in the economy. Even though macroeconomic stabilization has been maintained since 1998, the level of dollarization or eurozation has been high – particularly from 2000 to the end of 2006.

Figure 2.3 shows that during the ethnic conflict in 2001 there were huge increases in currency substitution, from 34.88 percent to 61.37 percent, due to political uncertainty. Consequently, the Republic of Macedonia continues to face relatively high dollarization levels in the coming year.

Figure 2.3: Dollarization in the Republic of Macedonia (Foreign currency deposit / total deposit)



Source: Author's calculations

Such extent of dollarization indicates that if the NBRM would have attempted to accelerate short-term economic growth by altering the exchange rate or a sudden depreciation, it would have created a serious risk of financial instability, and the effectiveness of monetary policy in controlling inflation would have likely been extremely limited (see more Ribnikar and Bole, 2006, p. 8).

In addition, monetary policy would be completely ineffective if prices and wages were denominated in foreign currency, and thus the only possible monetary strategy is to target the exchange rate (see more Ize and Levy Yeyati, 2001, p.23). The eurozation, or dollarization as it is called in the literature, in the Republic of Macedonia is mostly stimulated by means of asset substitution, as people continue to hold a large amount of their investments or savings in foreign exchange. In addition, banks provide foreign currency-denominated loans or loans indexed to foreign currencies. Moreover, in the Republic of Macedonia, many prices, particularly material goods or property and durable goods, are to some level or extent indexed to foreign currencies. Also, the wages in many economic sectors are indexed to foreign currency. Therefore, any changes in the exchange rate would have a strong effect on prices. This analysis indicates a strong pass-through effect of exchange rate on prices in the Republic of Macedonia. The pass-through coefficient is investigated using VECM in the fourth chapter of this work.

2.4 Fiscal policy and Fiscal system in the Republic of Macedonia from 1992 to 2007

April 26, 1992 marked the fiscal independence of the Republic of Macedonia from the former Socialist Federal Republic of Yugoslavia. Immediately after its economic independence, the Republic of Macedonia began its fiscal reforms on both the expenditure and revenue sides in order to create a fiscal environment that would be consistent with the fiscal system of the market economy. Since its economic independence, as I have already mentioned (in the stabilization program topic), the Republic of Macedonia had to cope with hyperinflation as an inherited problem from the SFYR. One of the major factors for high inflation was the monetization of the fiscal deficit. Accordingly, the basic aim of the fiscal reform was budget restraint, i.e. decreasing the budget by limiting budget expenditure and increasing revenue in order to reduce the fiscal deficit, which should in turn lead to a decline in the rate of inflation.

There are two types of fiscal policy based on fiscal rules that are used most often in practice: first, fiscal deficit adjusting towards smoothing the cyclical fluctuation of the economy; and second, fiscal rules based on the determination of mathematical or numerical targets for fiscal deficit, budget expenditure, and public debt in the medium term (Alesina and Perotti, 1995). Neither of these fiscal rules were applied in the Republic of Macedonia. That is, in the Republic of Macedonia the fiscal policy was not established and applied according to fiscal rules, i.e. no budget rules in the medium term or fiscal deficit adjustments towards smoothing the cyclical fluctuation of the economy; however, fiscal policy is applied by the discretionary fiscal regime. Even though the “golden budget rule”, meaning a balanced-budget in the medium term, is not proclaimed by the government of the Republic of Macedonia, its fiscal policy tended towards a balanced budget in the medium term, except in 2001/2002, and probably in the last quarter of 2007 due to the changes in the laws of wages. This tendency towards the “golden budget rule” is explained in the following discussion. I can distinguish two distinct periods regarding fiscal policy in the Republic of Macedonia: first, from 1992 to 1994; and second, from 1995 to 2006, including recent events in 2007.

From 1992 to 1994, as I have already mentioned (in the monetary part), the government did not have a clear platform regarding macroeconomic stability, and this sometimes resulted in conflict between monetary and fiscal authorities. The monetization of the fiscal deficit took place – the fiscal deficit was 12.5 percent of GDP and public expenditure was 53.6 percent of GDP – in 1993, and the tax system was still unchanged until the end of 1994, so in this fiscal environment the stabilization program failed in terms of its intended effects, i.e. a reduction in the rate of inflation.

At the end of 1994, the government of the Republic of Macedonia undertook a new approach regarding fiscal policy (within the stabilization program) by introducing several targets: reducing the fiscal deficit below 3 percent of GDP, limiting government expenditure to 35 percent of GDP, and keeping the public debt below 60 percent of GDP. At the same time, the fundamental changes of the tax system took place in substituting a new tax system for the old tax system from the SFRY. As a result, the new tax system has been consistent with the tax system of advanced market economies. Since by then the rapid decrease of the fiscal deficit due to a reduction in public expenditure, i.e. fiscal adjustment[6] (the average fiscal adjustment[7] from 1994-2006 was 0.88 percent of GDP), had been occurring on one side (see Figure 2.4 and 2.5, except during the ethnic conflict in 2001/2002), the new tax system and later in 2000 the value-added tax proved to be an efficient tax system on the other side. From 1995 to the middle of 2007 the fiscal policy in the Republic of Macedonia has remained unchanged in terms of fiscal adjustment (see Figure 2.4), and there have been only small changes of the rate for a few consumer goods (April 2003:4). However, during 2006 and 2007, both the public expenditure and revenue sides have made significant changes regarding fiscal policy by introducing the flat rate tax and increasing the wages in the public sector by around 30 percent, step-by-step, over three years. Let me now to discuss the chronological movement of fiscal deficit and fiscal adjustment, the public expenditure and its structure, the transformation of the tax system and its efficiency, and public revenue.

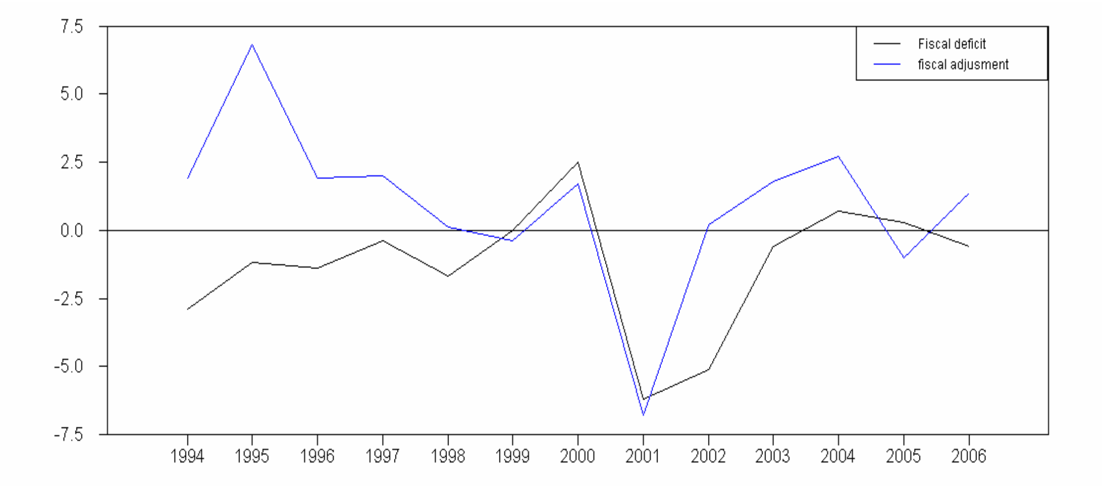
[6] “Fiscal adjustment”, “fiscal consolidation”, “fiscal contraction” and “tightening fiscal policy” –meaning reducing imbalances public in finances

[7] The average fiscal adjustment is estimated by increasing/decreasing public expenditure as a percentage of GDP divided by the number of periods

2.4.1 Fiscal deficit and fiscal adjustment in the Republic of Macedonia

The fiscal deficit was the main generator of inflation in the Republic of Macedonia until it was reduced by the new stabilization program at the end of 1994 (Atanasovski, 2004, p.494). Thereby, the government changed its approach by shifting from its inefficient fiscal policy to a new one, i.e. fiscal adjustment with economic growth or expansionary fiscal contraction. Immediately following the introduction of the new fiscal policy, which had to be consistent with the fiscal policy of the advanced market economy, the fiscal deficit decreased from 12.5 percent in 1993 to 2.9 percent in 1994. As shown in Figure 2.4, the fiscal adjustment or consolidation was achieved almost immediately after the stabilization program was launched. The huge reduction of the fiscal deficit in 1994 contributed, after a short period, to reducing the rate of inflation (see the topic of monetary policy and exchange rate regime).

Figure 2.4: Fiscal deficit and fiscal adjustment as a percent of GDP from 1994 to 2006



Source: Ministry of finance bulletin 2007, author's calculation and EBRD

As Figure 2.4 shows, the new fiscal policy begun in 1994 has dramatically reduced the fiscal deficit over the period from its inception through the end of 2006 (except in 2001 and 2002 during the ethnic conflict in the Republic of Macedonia), creating a balanced budget in 1999 and a surplus of 1.8 percent in 2000, i.e. a "golden budget rule" balanced budget. Such movement of the fiscal deficit is consistent with the fiscal targets of the government in the Republic of Macedonia, and it is surrounded by the limit of 3 percent (except in 2001 and 2002). This limit is consistent with the convergence towards the Maastricht criteria of the European Union (henceforth EU).

In addition, looking at Figure 2.4 we can see that in the first quarter of 2001 the fiscal deficit had a sharp increase of around 6.2 percent. This was due to the ethnic conflict in the Republic of Macedonia, and it continued until the conflict ended, i.e. the discretionary fiscal regime was applied. In the first quarter of 2002, the fiscal deficit began a sluggish decline from 6.2 percent to 5.1 percent. One can rapidly increase public expenditure, and through it the fiscal deficit; however, one cannot subsequently rapidly decrease them due to their nature of rigidity. Immediately after the election at the end of 2002, the new government took office and signed an agreement with the International Monetary Fund (henceforth IMF), in which one of the main goals was reducing the fiscal deficit. The government subsequently undertook measures on both sides of the budget, by reducing public expenditure (see Figure 2.4) and by increasing the taxes for several consumer goods. These measures resulted in a huge decrease of the fiscal deficit from 5.5 percent in 2002 to 0.6 percent in 2003. In the following year, the fiscal deficit continued to move surrounded by the government's fiscal target, i.e. a balanced budget or less than 3 percent, which is consistent with the direction of the Maastricht criteria of the EU. Moreover, the fiscal deficit was much lower (except in 2001 and 2002) than the average of around 2.8 percent for CEB and SEE transition countries[8].

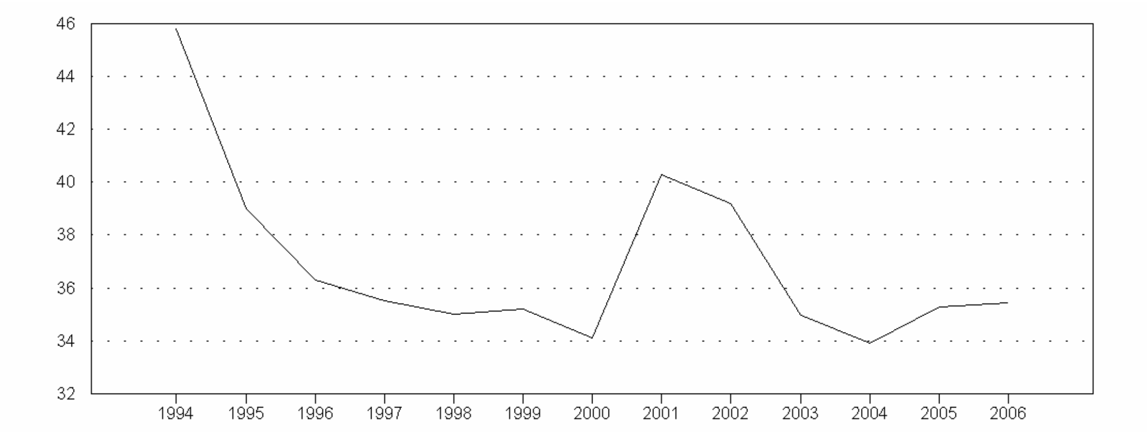
2.4.2 Public expenditure and its structure in the Republic of Macedonia

Since the introduction of the new fiscal policy, the government has mostly focused on limiting almost all items of budget spending. This resulted in a sizable decrease of budget expenditure, from 53.60 percent (in 1993) to 45.50 percent (in 1994). I may conclude that reduction of the public expenditure represented the major part of fiscal adjustment in the Republic of Macedonia. Looking at Figure 2.5, public expenditure decreased considerably further after a short period, from 45.5 percent in 1994 to 36.60 percent at the end of 1996, and further decreased by ending at 34.10 percent by the end of 2000. Almost all items in the budget expenditure had been decreased from 1994 to 2000, i.e. both current spending and capital spending. To be precise, the items regarding current spending within the total budget expenditure (wages in the public sector, current spending for goods and services, subsidies for production, and other intervention in the economy in terms of financing companies) were considerably reduced from 39.20 percent of GDP in 1994 to 34.10 percent at the end of 2000. Capital spending was also reduced from 3.8 percent of GDP to

[8] Transition report EBRD, 2006

1.8 percent. With these measures, the budget expenditure was reduced on one side, and consequently it led to a decrease of the fiscal deficit on the other side. This strategy was put on hold from the first quarter of 2001 until the end of 2002 due to the ethnic conflict, and consequently there was an increase in budget spending.

Figure 2.5: Annual movement of the public expenditure from 1994 to 2006 (% of GDP)



Source: Ministry of finance bulletin 2007, author's calculations and EBRD

Figure 2.5 shows that the first quarter of 2001 saw a sharp increase in budget expenditure from 34.10 percent (in 2000) to 40.30 (in 2001), which instantly led to an increase of the fiscal deficit from 1.8 percent budget surplus (in 2000) to 6.2 percent budget deficit (2001). As mentioned before, in the first quarter of 2003, the new government took office, and it immediately undertook measures to reduce government expenditure and increase budget revenue, which in turn led to a decrease of the fiscal deficit. The measures were undertaken on both sides: by decreasing current spending by 5 percent and by increasing the taxes for several consumer goods from 5 percent to 18 percent. In doing this, the government made a strong fiscal adjustment by reducing budget spending from 40.3 percent of GDP in 2001 to 34.9 percent in 2003, and it also simultaneously reduced the fiscal deficit from 6.2 percent in 2001 to 0.6 percent in 2003 (see Figures 2.4 and 2.5). In the following year, the strengthening and sustainability of the fiscal stance in the Republic of Macedonia was continued; the budget spending or size was 35.44 percent of GDP in 2006, which is much smaller than the average of 38.50 percent of GDP in the CEB and SEE countries[9].

[9] Transition Report EBRD, 2006

The budget size, or overall size of the budget of GDP, generally is not a problem in the Republic of Macedonia; however, there is still an issue concerning the unfavorable structure of overall budget spending. Namely, in 2006 the item of “current spending” represented 91.2 percent of total budget spending (wages and allowance was 22.1 percent, spending for goods and services was 12.2 percent, interest paid was 3 percent, and transfers to households was 53.20 percent[10]), while the item “capital spending” represented only 8.8 percent or 2.6 percent of GDP. Such a budget spending structure is not indicative of rapid economic growth. Compared to other transition countries, the Republic of Macedonia has a more unfavorable fiscal stance than most. The wages and allowance are important items within the structure of current spending, indicating overemployment of public administration (in the central administration). Public administration employs about 2 percent of the population in the Republic of Macedonia, which is double the percentage of other transition countries with lower and medium per capita/income (Atanasovski, 2004 p. 494 and World Bank, 2003). Regarding transfers to households, this item is higher than all other items within the structure of the current spending, which indicates higher poverty, unemployment (36 percent in 2006), and greater redundant owing due to bankruptcy of the companies in the Republic of Macedonia. Consequently, the higher level of the item “transfers to households” is an obstacle to the construction of an efficient budget in terms of the acceleration of economic growth (such as increased capital spending). Finally, managing of the budget spending is not established in order to contribute to acceleration of the economic growth in the Republic of Macedonia.

Aside from the unfavorable budget spending structure, the government in the Republic of Macedonia needs to undertake measures in order to change the budget spending structure on behalf of those items that will accelerate economic growth, while instead it has undertaken measures that are further deteriorating the budget spending structure, i.e. increasing the wages in public administration. The changes in the law of wages in public administration took place in September of 2007 with an increase of 30 percent in wages over three years, so wages will increase starting by 10 percent in 2007 and continuing by 10 percent in 2008 and 2009.

[10] Source: Ministry of Finance bulletin April 2007, authors calculation

Notwithstanding, I make a preliminary assessment concerning the recent fiscal measures that have been undertaken by the government of the Republic of Macedonia, as I test the effect of fiscal policy on real GDP and prices in the last chapter of this work using quantitative methodology (VAR and VECM). Consequently, the assessment of the effect of fiscal policy on real GDP and prices in the Republic of Macedonia (in the last chapter) is more reliable regarding the effect of fiscal policy changes. First, as previously mentioned, the current spending structure is unfavorable as a result of overemployment in public administration, which is twice that of other countries in transition ranked "low" or "medium" in terms of per capita income. Increasing the wages in public administration will cause the current spending structure to deteriorate, probably leading to a tax burden in the future, or an increase in public debt, or a strong fiscal adjustment, which in turn will lead to further deterioration of the real economic activity. The overemployment is an unsettled problem over the last eighteen years that was inherited from the SFRY. In addition, the government did not have any threat from the administration – e.g. a strike or some similar pressure – to increase the wages; however, it was probably a political measure which will likely end without any economic gains in the short term. It is true that in some sectors the wages may be lower, for example in the primary and secondary schools, but not in all areas of public administration (particularly not in the central administration). Second, most of the empirical evidence relating to the effect of fiscal policy on real economic activity does not support such measures in that an increase of the wages will not, in all likelihood, generate an increase of aggregate demand and through it a rise of output (for example Barro, 1991; Mountford and Uhling, 2005; and others) (see more in Chapter Three, where I provide an overview of the literature regarding the effect of fiscal policy). In some special cases, they suggest that if the government would decide to take fiscal action, it is much better to increase capital spending rather than wages or transfers as components of fiscal policy (Barro, 1991). Third, increasing of the wages in public administration is likely to increase the short-term interest rate, which leads to a crowding out effect, i.e. reductions in private investment with further consequences for economic growth. In addition, it is also likely to deteriorate further the current account of the balance of payments, which is already negative and has been so since the economic independence of the Republic of Macedonia. In the end, prior to changing the components of fiscal policy, one must examine both the qualitative and quantitative methodologies in many ways in order to gauge what the likely outcome may be of such changes on both sides of the budget, i.e. expenditure and revenue. Only after much investigation can governments make serious decisions concerning changes of fiscal policy and their effects, but not, in any case, by increasing the wages in public administration.

2.4.3 Tax system and public revenue in the Republic of Macedonia

The Tax Reform Act took place in 1994, reforming the inefficient tax system inherited from the SFRY to one that was consistent with the advanced market economy. Since then, and later with the introduction of the value-added tax system (henceforth VAT), from April of 2000 to the end of 2006 the tax system has proven to be efficient and consistent with a more advanced transitional economy. However, the recent changes to the tax system, in January of 2007, i.e. the introduction of the flat rate tax, are likely to alter the efficiency of the tax system in the Republic of Macedonia (see more Mencinger, 2006, p. 1).

The tax system of the SFRY was a system of public revenue based on levies and applied in the territory of the SFRY (Bogoev and Atanasovski, 1994, p. 161). The taxes, contribution, fees, and allowance were composed of four independent former fiscal self-governments, such as: federation, republic members, municipality, and organization of social insurance. The tax structures among the republics were mechanically connected and belonged to every fiscal sovereign authority. I may note there were several fiscal systems that operated in the territory of the SFRY. In any event, the former tax system was characterized by inefficiency, instability, and a lack of transparency, and it was not consistent with those of advanced market economies. Though the former tax system was not consistent with other contemporary tax systems, it operated in the Republic of Macedonia from its economic independence until the beginning of 1994.

During 1992 and 1993, the tax system was characterized by the distortion of the tax structure, instability and non-transparency. The distortion of the tax structure was reflected by the different taxation among particular economic sectors, which significantly deviated from other advanced market economy tax systems. That is, there was unequal treatment of the taxpayers, which is not consistent with the principle of neutrality of allocation of the fiscal factor in the market. The tax system was based on scheduler taxes that affected certain incomes, while the progressive income and profit taxes were not introduced. Aside from the distortion of the tax structure, there were numerous tax relief and special regimes

– introduced by legislation and executive order – and this made the tax system incomparable to the tax systems of advanced market economies, in that it was not consistent with the principle of transparency. The instability of the fiscal system was reflected by the several changes of the tax rate due to the potential risk of fiscal crises. The former tax system had many shortcomings, so the government of the Republic of Macedonia had to replace such an inefficient, unstable, and non-transparent tax system with one that was efficient, stable and transparent. As a result, the government of the Republic of Macedonia thoroughly changed the former tax system with the Tax Reform Act, which was enacted by the Parliament of the Republic of Macedonia in the beginning of 1994.

As I mentioned before, since 1994 and including the introduction of the value-added tax (April 2000), the tax system in the Republic of Macedonia has proven to be efficient, stable, and transparent – with the exception of several changes which were not, to some extent, adherent to the principle of fiscal consistency. From the fiscal independence of the Republic of Macedonia through the end of 2006, each new government has made changes in the tax rate, which in turn led to a perception of unreliability among investors concerning the tax system in the Republic of Macedonia.

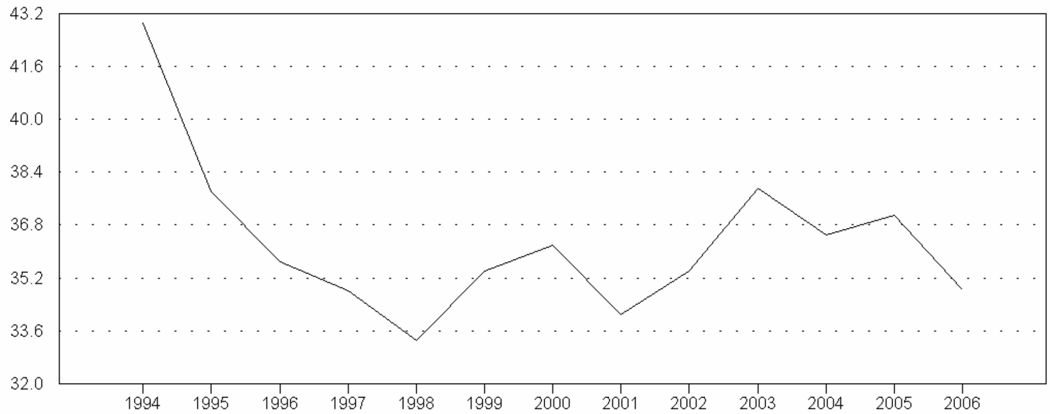
The new tax system has eliminated many of the shortcomings of the former tax system, starting by eliminating the distortion of the tax structure, i.e. the scheduler system of eight differential tariffs for income and profit taxes was abolished in favor of a tax system consistent with an advanced market economy, such as one including progressive income tax and profit tax. A large number of tax exemptions have been abolished as well. In addition, the taxes for goods and service have undergone significant changes, from single-stage sales tax to multi-stage sales tax, and excise for specific goods has been introduced as well. The base of taxation has been broadened to include income, profit, and goods and services, and taxes have been lowered as a result. For example, income tax changed from (eg) 10, 15, 25, 30, and 50 percent to 35 percent for the highest margin of incomes and 25 percent for the lowest, while taxes for goods and services went from 42 percent (in 1993) to 25 percent (in 1994). An additional emphasis has been placed on the control of tax payments to increase fiscal discipline. Customs duties have been lowered as well, but exemptions have been severally reduced. The value-added tax was not introduced at this point due to low development in the fiscal institutions needed for its implementation;

however, the tax for goods and services has been more or less in accordance with the value-added tax applied in an advanced market economy.

Since 1994 and later, with the introduction of the value-added tax (henceforth VAT), the tax system did not show the instability in terms of fiscal crises that had been usual under the previous tax system. The tax system has become transparent and comparable to the tax systems of advanced market economies, as the fiscal elements that contained the distortion and a large number of tax exemptions to income, profit and goods and services have been abolished. Consequently, the principle of equal treatment of taxpayers according to market mechanisms or the neutrality of allocation of resource principles of the tax system has been achieved. In addition, the progressive income tax has been introduced in order to build up the social welfare component in the budget, i.e. the redistribution of income according to taxpayers' ability to pay, which is consistent with most advanced economies, i.e. the vertical equity principle of the tax system has been achieved. The progressive income tax was introduced in order to create an equal distribution of income, and thus the possibility for social welfare. In addition, the tax system had to be adjusted to the movement of cyclical fluctuations of the economy. Even though the tax system was efficient from 1994 to the first quarter of 2000, within indirect taxes or tax turnover there were still to a certain extent tax exemptions and allowances for several goods and services. Therefore, in April of 2000 the Macedonian Parliament enacted the VAT system. By introducing the VAT system, they made significant changes in further abolishing tax exemptions, and in doing so they broadened the base of taxation. Consequently, the tax rate was reduced from 25 percent to 18 percent and 5 percent for several goods, i.e. 5 percent for goods and service that are most important for the standard of living. Introducing the VAT further increased the economic neutrality principle of tax systems in terms of taxation of consumption for goods and service. In addition, the Republic of Macedonia intends to be a full member of the EU, and by introducing the VAT, it became much more similar to other EU countries. More importantly, the VAT has proven to be more efficient than the previous system in terms of tax collection and in reducing the degree of tax evasion. As seen in Figure 2.6, public revenue increased to around 36.2 of GDP immediately after the introduction of the VAT.

From 1994 to the end of 1997, public revenue saw a huge decline, as the Macedonian economy underwent the transformation from state capital to private capital, and as a result the real GDP declined (most companies had huge losses) and inflation was present as well. Moreover, the new tax system was improperly used; tax evasion was present as well. Such an environment inevitably led to a significant decrease in public revenue (see Figure 2.6). From 1998 to the end of 2000, there had been a sizable increase in public revenue (particularly after the introduction of the VAT system). Therefore, the VAT has proven to be efficient and consistent with the tax systems of the more advanced transitional economies.

Figure 2.6: Annual movement of the public revenue from 1994 to 2006 (% of GDP)



Source: Ministry of finance, author's calculations, and EBRD

Since public revenue increased over 1999 to 2000, the government of the Republic of Macedonia made significant changes to the income tax from highest marginal tax income (35 percent to 23 percent) and the lowest (25 percent to 15 percent), and the profit tax also decreased, from 20 percent to 15 percent. The government reduced the income and profit tax with the intention of reducing the high rate of unemployment and increasing the rate of investment in the Republic of Macedonia. Since the beginning of the ethnic conflict in 2001, public revenue had considerably decreased due to the deterioration of the economy; therefore, real GDP decreased on one side, while budget spending increased (which consequently led to an increase in the fiscal deficit) on the other side.

In order to reduce the fiscal deficit that developed during 2001 and 2002 (see Figure 2.4), the government of the Republic of Macedonia undertook measures with regard to fiscal policy by decreasing budget spending (as I explained in the public expenditure topic) and increasing the tax rate on goods and services from 5 to 18 percent (enacted in April 2003). So, from 2003 to the middle of 2006 there has been only one tariff tax – on goods and services (18 percent). This was a huge fiscal adjustment on both sides of the budget, and as a result the fiscal deficit saw a huge decrease from 5.1 percent to 0.6 percent. In September of 2006, the tax rate for goods and services was reduced from 18 percent back to 5 percent for several goods and services (those which are important for the standard of living) and for agriculture equipment as well. As a result, from 1994 to the end of 2006 almost all governments in the Republic of Macedonia have changed the rate tax, which in turn contributed to the investor's perception of unreliability concerning the tax system in the Republic of Macedonia. In this context, the tax rate was reduced in order to achieve higher economic growth and thus to reduce the rate of unemployment; however, prior to changing the tax rate one must examine the issue by both qualitative and quantitative methodologies in order to determine what will happen. Only after much investigation and consideration of the experiences of other countries should the government make serious decisions concerning changes of fiscal policy, i.e. the reduction of the tax rate and its effect on real economic activity. The effect of tax changes on real GDP and prices are examined in the last chapter using SVAR and VECM.

In January of 2007, the government of the Republic of Macedonia made a significant change to the tax system by introducing the equal flat rate tax, i.e. equality of income and profit rate tax of 10 percent. The tax reform is scheduled to reduce the progressive income tax from 25, 18 and 15 percent to 12 and 10 percent respectively in 2007 and 2008, while the profit tax will be reduced from 15 percent to 12 and 10 percent respectively in 2007 and 2008. Even though the income tax burden had been lower by 8.08 percent (as a percent of GDP it was 2.6 percent) in relation to the average of CEB and SEE countries (15.4 percent as percent of total revenue), nevertheless the flat rate tax was launched in the Republic of Macedonia with the goal of increasing real GDP and reducing the rate of unemployment by achieving a lower cost for labor. What is flat rate income tax?

As previously mentioned, it is argued that the progressive income rate tax makes it possible to build an equal distribution of income, and as a result to accomplish specific social goals (increasing social cohesion or social welfare). The vertical equity principle concerns the incidence of tax among people with unequal income (Musgrave, 1988, p. 235). Namely, wealthy individuals with larger incomes have to pay more tax than others with lower incomes, and therefore an equitable distribution of the tax burden is achieved. Alternatively, the flat rate income tax is a proportional income tax on overall income.

There are pro and cons to a flat rate tax. Opponents of the flat rate tax claim that tax burdens may fall more heavily on the lower and middle class (Gale and Orszak, 2004), and that if this is not anticipated, it is likely to injure social welfare. On the other hand, proponents of the flat rate income tax believe that progressive income tax is too high and places a burden on the economy – being too complex and unfair as opposed to the simplicity, efficiency and fairness of the flat rate income tax. Consequently, a flat rate income tax may seem like a good idea, but if it can be raised in the future (it is likely to be more complex than simple), a flat rate income tax will be far worse for long-term economic growth than any short-term economic benefits it may achieve. That is, leaving the progressive income tax and applying a flat-rate tax may negatively affect long-term economic growth and employment. For example, according to Ricardian equivalence, if a government's tax reduction is interpreted by an agent as a postponed tax-liability, such policy action causes him to reduce consumption; therefore, it leads to a decrease in output via aggregate demand (and vice versa).

In addition, most of the empirical research (see more Mencinger, 2006, pp. 1-15) does not support the idea of a flat rate tax against a progressive income tax. According to Mencinger, the flat rate income tax will probably be better off for everyone in the beginning, but once people become aware of the redistribution of wealth, it would probably be "corrected" administratively and by new social transfer. As a result, he adds that the flat rate income tax would be even more complex than one including a few different tax rates. For example, there were three gradual rates of the progressive income tax in the Republic of Macedonia. Moreover, Mencinger has analyzed the flat rate tax regarding the question: can flat rate tax contribute to growth and welfare? He confirmed that changing from progressive income rate tax (gradualism) towards flat rate tax (supply-side economics) might adversely affect economic performance and social cohesion of the country. On the other hand, Mountford and Uhling (2005) claim that reducing tax may create a short-lived stimulus to the economy; however, if it results in a higher tax burden, the long-term consequences are far worse than the short-term benefits in terms of increasing real GDP. Moreover, the low profit tax should accelerate investment and possibly also saving; however, it depends on income and substitution effects (Dalsgaard, 2005, p. 16). In this context (the introduction of the flat rate tax or the reduction of the marginal tax) there is no accurate empirical evidence that a flat rate tax will cause an increase of investment, leading to increases in real GDP and lowering the rate of unemployment due to lower labor costs. In addition, the effect of a flat rate tax on aggregate work level is also uncertain. There is a problem with the wage elasticity of the labor supply (Zee, 2005, p.9; and Mencinger, 2006) owing to the differing effect of reducing marginal income tax rates, such as the substitution and income effect. For example, the response of individuals to lower income tax rates will be different; if the price of leisure rises relative to the price of income, one group of people substitutes income for leisure (substitution effect), while the other group would substitute leisure for income if the price of leisure were to fall relative to the price of income (substitution income). According to Mencinger, these effects may cancel each other out; however, he adds that the argument is not too significant in reality owing to regulation in the labor market and the structural problem of unemployment. However, it is too early and too difficult to pass judgment regarding the effect of such drastic changes in the income and profit tax, even though it will be answered in the last chapter, i.e. the effect of tax changes on real GDP and prices in the Republic of Macedonia (the result may be robust due to the changes in taxation over the past period). The theoretical and empirical evidence regarding the effect of both expenditure and taxation on economic growth and prices will be discussed in the next part of this work.

2.5 Summary

The following addresses the preliminary assessment pertaining to monetary and fiscal policy in the Republic of Macedonia over the sixteen years from 1992 to 2007. From 1992 to the end of 1995, the government did not have a clear platform regarding macroeconomic stability, which often led to conflict between monetary and fiscal authority. For example, the NBRM attempted to stabilize the economy via stabilization of the denar, which necessarily required a higher interest rate, thus it affected the budget adversely and the NBRM was pressured to lower the base interest rate. Doing so predictably led to currency substitution and an exchange crisis. Applying the monetary strategy of targeting the exchange rate, i.e. the stabilization of exchange rate, has proven very successful at reducing the rate of inflation. From 1997 to the middle of 2007, the rate of inflation has been a single-digit number. From 1998 to the end of 2006, there have been several changes in the NBRM's legislation and a quite a lot of approval Act by the NBRM towards using more market-orientated monetary instruments (trading with treasury bills has almost reached the same level as trading with NBRM bills – see NBRM Bulletin, July

2007) instead of non-market or unusual ones. Moreover, there have been many changes in the economic environment, such as a change in the method of trading in the foreign exchange market between the NBRM and banks (2005), the liberalization of the capital account (2003), the Republic of Macedonia's membership in the World Trade Organization (2002), and the country's candidate status for joining the European Union (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, pp. 9-30; Mishkin, 2003). Moreover, Levy-Yeyati and Sturzenegger (2001) claims that for non-industrial economies, a “long” peg (lasting five or more years) is associated with a lower rate of inflation than floats, but at the cost of a slower rate of growth. Finally, in recent years, the issue of exchange rate regime has become more pronounced since the liberalization of the capital account took place. Therefore, the monetary strategy of targeting the exchange rate can easily become a target of speculative attacks (sudden large capital inflows), which can in turn lead to negative impacts for the economy by increases in and fluctuation of the interest rates and the foreign exchange reserves (the level of which is extremely important for the international liquidity of the country). On the other hand, the unilateral suggestion to shift the exchange rate from a fixed to a more flexible exchange rate, or to depreciate the domestic currency in order to settle the problem of deficit in the current account (it is a fact that the Republic of Macedonia has had a deficit in its current account of balance of payments since its economic independence) and consequently to promote rapid economic growth, may easily disturb macroeconomic stabilization without achieving any positive effects in terms of real economic growth in the short term (Ribnikar and Bole, 2006). In order to better understand the shifting of the exchange rate from a fixed to a more flexible exchange rate, i.e. the costs and benefits of such policy changes, the last chapter of this work examines the exchange rate pass-through effect on prices and real GDP using SVAR and VECM, as well as the transmission mechanism or channels of the effect of money stock and short-term interest rate on real GDP and prices.

Regarding fiscal policy from 1992 to 2007, the Republic of Macedonia did not establish and apply fiscal rules, i.e. there were no budget rules based on a determination of the mathematical targets for fiscal deficit, public expenditure, public debt, and public revenue in the medium term, nor was there a rule-based fiscal policy to be adjusted according to cyclical fluctuation of the economy (though fiscal policy was applied by the discretionary fiscal regime). Additionally, from 1992 to the beginning of 1994, monetization of the fiscal deficit often took place, and the Yugoslavian tax system (SFRY) (which was characterized by instability, inefficiency and non-transparency) still operated in the Republic of Macedonia. From 1994 to the end of 2006, fiscal adjustment took place; however, there was marked significant variability of the fiscal deficit and public expenditure, which accordingly affected the level of real economic activity. In the beginning of 1994, the new tax system was instituted, which proved to be efficient, stable, transparent, and consistent with more advanced tax systems. As was the case with public expenditure, the public revenue varied several times due to changes in the tax rate, which accordingly affected the level of real economic activity. In 2007, the government undertook radical measures on both the budget expenditure and revenue sides, i.e. by increasing the wages in public administration by 30 percent and by abolishing the progressive income tax and applying a flat rate tax for income and a profit tax of 10 percent. However, prior to changing the components of fiscal policy, one must examine the issue in many ways via both qualitative and quantitative methodologies in order to know what will happen due to changes on either side of the budget, i.e. expenditure and revenue. Only after much investigation should governments make serious decisions concerning the changes of fiscal policy and their effects, but not, in any case, by increasing wages in public administration. In order to better understand the relative costs and benefits of the effect of fiscal policy changes on real GDP and prices in the Republic of Macedonia, the last chapter of this work investigates the effect of fiscal deficit, public expenditure, and revenue on prices and real GDP using SVAR and VECM.

3 THE MACROECONOMIC EFFECTS OF MONETARY AND FISCAL POLICY AND EXCHANGE RATE REGIME ON REAL GDP AND PRICES

In this chapter, I review the literature on the macroeconomic effects of monetary and fiscal policy and exchange-rate regime on real GDP and prices, examining theoretical aspects of this topic and reviewing empirical evidence gathered from both developed countries and countries in transition. Specifically, I focus on the primary conventional transmission channels such as interest rates, money supply, primary fiscal deficit as a ratio of GDP, government expenditure, revenue and exchange rate channels, through which monetary and fiscal policy and exchange-rate regime can affect real GDP and prices.

In addition, this review serves as the **foundation of my own empirical research** in evaluating the macroeconomic effects of monetary and fiscal policy and exchange-rate regime on real GDP and prices in the Republic of Macedonia.

3.1 The macroeconomic effect of monetary policy on real GDP and prices

A broad consensus has been reached among contemporary economists that changes of monetary policy is powerful tool for affecting real economic activity in the short term, while in the long term such policy changes affect price level i.e. the rate of inflation. In recent years, empirical evidence from developed countries has shown that changes in monetary policy can affect real economic activity via several monetary channels.[11] In contrast to the conventional theory supported by empirical evidence from developed economies, both theory and empirical evidence pertaining to countries in transition suggests a potential weakness and a potential instability of the conventional channels (money supply and short-term interest rate) of monetary transmission during transition because of structural and institutional deficiencies – in particular underdeveloped financial

[11] Mishkin (1996, 2001, 2003), Bernanke et al. (1995,2000,2003), Mihov (2001), Ganev (2002), Kujis (2002), Juks (2004), Citu (2003), Christiano, Echenbaum and Evans (1996,1999,2005) Liper, Sims and Zha (1996) Maliszewski (2003), M Treasury (2003), Mayes (2003), Bin Li (2005), Uhling (2005), Giovanni and Gordani (2006) e.g.

systems and higher dollarization. As the transition is a dynamic trend marked by constant qualitative changes, the literature recommends that the monetary transmission mechanism is an endogenous (or dependant) variable with regular features and which is changeable over time. This suggests a need for ongoing analysis regarding the macroeconomic effects of monetary policy in transitional economies – specifically, as to whether or not relationships exist between money supply and economic outcome via the asset prices effect, the wealth effect, the banks' lending channel effect and firms' balance sheet effect. Furthermore, there is a need to determine whether or not interest rates operate as they do in developed countries. The following section provides a theoretical and empirical overview of the major monetary transmission channels (such as the money supply and interest rates) as treated in the literature.

3.1.1 Review of literature

3.1.1.1 Theoretical and empirical evidence of the effect of monetary policy

The effective design and conduct of monetary policy depend fundamentally upon proper measurement 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. The analyses of the different transmission channels help to explain their specific characteristics, relative dominance, significance and the speed at which they transmit monetary effects to real economic activity. For the Republic of Macedonia as a country in transition, I examine two well-known conventional monetary channels by which the effect of monetary policy is transmitted to real economic activity: the interest rate and the money supply. Furthermore, both theoretical and empirical evidence traditionally consider *these channels to be indicators in measuring* the effect of monetary policy on real GDP and prices. The implications of these channels for real GDP and prices are as follows:

- ***Interest rate channels:*** a decrease in the central bank's interest rate (Taylor, 1995, pp. 11-26; Mishkin, 1996, p. 34 and 2001, p. 25; Abel, Bernanke, and Smith, 2003, p. 365), leads to a fall in both short and long-term interest rates, which in turn decreases the cost of capital and brings about an increase in investment spending and consumption. Furthermore, this leads to an increase in aggregate demand and, hence, a rise in output. In most developed countries, central banks directly control the interest rate in the money market (U.S. federal fund rates), and thus monetary policy decisions are modeled as changes in the short-term interest rate by the central bank. For example, Christiano et al. (2005, pp. 1-45), Bernanke et al. (2003, p. 15), Bin Li (2005, pp. 1-57), Uhling (2005) and others have used the federal fund rates as an indicator for measuring the dynamic effect of monetary policy. On the other hand, Mayes (2003, p. 52), Dovciak (1999, p. 5) and others have shown that in transitional countries the interest rate channels seem to be impeded (Brazil, Poland and Slovakia) by the low level of competition within the banking sector and the limited number of alternative sources of financing. The argument that interest rates do not constitute very powerful channels as monetary transmission mechanisms in countries in transition has been further supported by the research of Creel and Levasseur (2004, p. 12).

In smaller countries undergoing economic transition, such as the Republic of Macedonia, the financial and banking sectors are typically characterized by shallow financial intermediation. Moreover, in the Republic of Macedonia, the money market is less developed and treasury bills (for monetary purposes) were first launched in 2006, and therefore monetary transmission mechanisms will deliver insufficient information as to the dynamic effect of monetary policy (Ceccheti and Krause, 2001, pp. 1-31). Ganev, Molnar, Rybinski and Wozniak (2002, p. 22) demonstrate another argument by analyzing the dynamic effect of monetary policy via market rates channel to output and inflation. Of the 10 countries in transition, they consider three that had given up their monetary policy autonomy by adopting currency boards. They claim that there is no means of setting official market rates in the model as an indicator for measuring the dynamic effect of monetary policy in countries with currency boards. However, in the other seven countries in transition, they find that the interest rate channels seem to be weak as a monetary transmission mechanism. In addition, Billmeier and Bonato (2002, p. 15) do not include market rates in the model when analyzing monetary policy in Croatia. The authors claim that since there is no effectively functioning money market, the interest rate would not accurately reflect market-type behavior, so they design a model utilizing the exchange rate and money stock. In addition, the Central Bank in Croatia uses the exchange rate as a nominal anchor.

Finally, most of the empirical evidence with regard to the dynamic effect of monetary policy on real GDP and prices through interest rate channels shows the interest channels to be weak as monetary transmission mechanisms. Moreover, the Republic of Macedonia uses the exchange rate as an intermediate target in order to achieve its ultimate goal of price stability. There is therefore no basis for selecting the interest rate in the money market as an indicator for measuring the dynamic effects of monetary policy on real GDP and prices (Ganev, Molnar, Rybinski, and Wozniak, 2002, p. 22). *Nevertheless, I analyze short-term interest rate channels as an indicator in evaluating the dynamic effect of monetary policy on real GDP and prices in the Republic of Macedonia.*

- ***Money supply channels:*** central banks, may employ instruments to affect liquidity in the banking system through changes to the bank's reserve account and their "cash in vault", thereby influencing the base money and through it the money stock and so on. This channel is assumed to take effect via a money multiplier on the money supply, which in turn can affect real GDP and inflation (Mishkin, 1996 and 2001). An increase in the money supply will affect the asset prices, and, as shown by Kuttner et al. (2002, pp. 1-35), changes in financial asset prices cause a wealth effect on households that tends to change their consumption. This, in turn, leads to an increase in the aggregate demand, whereby output and prices level rises as well. This channel is assumed to be strong in the U.S. Mishkin (2001) claims that changes in the money supply affect prices of equities, so such changes will have a wealth effect on firms due to the improvement of their balance sheets. I assume the asset prices effect to be weak in Macedonia due to shallow levels of financial intermediation in the banking and financial markets.

  In a monetary case – an increase in money supply – the public will have more money that they want, and therefore they will reduce their holdings of money by increasing spending. Hence, the public will spend more money in the stock market, and this in turn will increase the demand for equities and consequently raise their prices (Boughrara, 2003, p. 6).

In addition, an increase in the money supply affects two main credit aspects: bank lending and firms' balance sheet (Juks, 2004, p. 42).

The basic idea of the ***bank-lending effect*** is that changes in monetary policy affect the supply of bank loans and therefore impact upon bank-dependent borrowers and private investments (Abel, Bernanke, and Smith, 2003, p. 538). A monetary contraction will result in a reduction of bank reserves, causing an increase in external finance premiums, which will in turn lead to a lower level of real economic activity. An increase of *external finance premiums,* because of asymmetric information, will consequently affect a larger number of small companies. However, these firms will then be faced with higher cost-capital, and they are likely to reduce their production and employment levels**.**

Hülsewig, Mayer and Wollmershäuser (2004, p. 16) show that banks decrease their loan supplies after a monetary tightening. This causes a drop in the output level and an increase in the loan rate (such was the case in Germany). Recently[12], most of the empirical evidence shows that the bank lending effect is actually powerful in developed countries. *This is a very interesting finding, because I assume the lending effect to be more powerful in countries with relatively underdeveloped financial systems and those where information standards are poor.* As for countries in transition, with small banks, less-healthy banking systems, and poorer direct capital access, they do show the expected greater sensitivity to policy changes than countries with robust banks and deep, well-developed capital markets (Ceccheti, 1999, p. 2). Thus, Creel and Levasseur (2004, p. 3) show that the bank-lending effect is strong if agents are dependent on financing from banks and in those countries with shallow levels of financial intermediation in the banking and financial sectors.

The second credit aspect is ***firms' balance sheet effect.*** Changes in the money supply affect real economic activity through their effects on the financial health of firms (Juks, 2004, p. 43). Access to credit depends upon the financial strength of borrowers, and therefore any change in the quality of borrowers' balance sheets

[12] De Bondt (2000), Kakes and Sturms (2002), Ehrmann and Worms (2001), Holtemöller (2003), Hülsewig, Winker, and Worms (2004), e.g.

due to monetary policy should affect their investment and spending decisions. Therefore, we can see then that the channel of money supply can affect real GDP and prices several ways, in both developed and developing countries.

There is mixed empirical evidence relating to the effect of money supply on real GDP and prices. Recently, Giovanni and Gordani (2006, p. 23) 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, Cîtu (2003, p. 18) 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 Kutan (2001, p. 15) examine 20 countries - including developed economies and countries in transition - and their results also suggest that money plays a significant role in explaining the behavior of real output.

Starr (2004, p. 14) 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, p. 220) 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, p. 16) 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.

Gilliam and Nakov (2004, pp. 653-681) examine the effect of money on output and inflation, and they find a positive relationship between money and inflation and a negative relationship between inflation and growth.

The empirical evidence in transitional countries shows that both interest rate and money supply channels are 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.

3.2 The macroeconomic effect of fiscal policy on real GDP and prices

In recent years, monetary policy has been the central issue in discussions about how to provide sustainable growth and low inflation. Fiscal policy has lost its appeal as an instrument for stabilizing cyclical fluctuations because of the considerable time required for fiscal policy actions (long inside lag) to achieve the desirable stabilization outcomes, as well as the problem of budget deficits. Therefore, the role of fiscal policy has thus changed over the last several decades in all of the industrialized countries. In the 1960s, fiscal policy played an important role as a stabilization tool. The rapid increase of budget deficits and debts during the 1980s, however, made it clear that fiscal policy needed to bring public finance back towards a sustainable path. In addition, the last decade saw fiscal policy decisions in the U.S. and other developed countries being led by budgetary rules imposed after the increasing budget deficit and public debt during the 1980s.

Nevertheless, I have chosen to analyze the macroeconomic effects of fiscal policy for the following reasons. Firstly, the recent literature on the structural VAR has given some consideration to the reinvestigation of macroeconomic effects of fiscal policy[13]. The creation of the European Monetary Union (henceforth EMU) has contributed to a growing interest in reexamining the use of fiscal policy as an effective instrument for stabilizing business cyclical fluctuations. The emergence of such a system with a single central bank

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[13] Von Hagen et al.(2001), Blanchard and Perotti, (2002); Wyplosz (2002), Perotti (2002), Fatás and Mihov (2003, 2004), Castro (2003), Von Hagen et al. (2003), Arcangelis and Lamartina (2003), Muscatelli and Tirelli (2005), Mountford and Uhling 2005) e.g.

has left fiscal policy as the European countries' only tool for macroeconomic stabilization. Therefore, any attempt on the part of governments to smooth out business cyclical fluctuations must rely on components of fiscal policy (expenditures and taxes) applied within the limits imposed by the Stability and Growth Pact and Economic Policy Coordination of the European Union (Ducanes et al., 2006, pp. 1-18). Further grounds for reinvestigating the macroeconomic effects of fiscal policy relate to discussion as to whether fiscal policy might be considered as a complementary instrument of monetary policy in achieving macroeconomic stability (Muscatelli and Tirelli, 2005, pp. 550-584).

Little attention has been devoted to the macroeconomic effects of fiscal policy in countries in transition; even though the wide variety of economic growth in these countries is interesting. A key argument for tying the hands of governments in such countries through the imposition of various restrictions on fiscal policy is based on the assumption that discretion in fiscal policy may undermine macroeconomic stability. Of course, restrictions on fiscal policy can also be justified on the basis of enforcing responsible behavior on the part of governments that, if left unrestricted, may accrue excessive deficits and debt. There is, however, some tension in this argument: while its potential for destabilization is obvious, it is also clear that fiscal policy can smooth out business cyclical fluctuations via expansionary public spending or tax cuts during recessions or contractionary policies during expansions (Fatás and Mihov, 2003). Moreover, while the effects of monetary policy are more rapid than fiscal policy in developed countries, they may be less effective than fiscal policy in countries in transition with underdeveloped financial systems. These arguments suggest the need for ongoing analyses of the macroeconomic effects of fiscal policy in these countries. Particularly, there is a need to determine whether fiscal changes can affect real economic activity, i.e. whether or not they can be used as tools for stabilizing business cyclical fluctuations. Additionally, it is important to recognize which kinds of fiscal changes are most effective at smoothing large business cycle downturns in the countries in transition. The following section provides a theoretical and empirical overview of the effects of fiscal policy as discussed in the literature.

3.2.1 Review of literature

3.2.1.1 Theoretical and empirical evidence of the effects of fiscal policy

3.2.1.1.1 Theoretical aspect of the effects of fiscal policy

The central issue of fiscal policies is how a fiscal expansion or contraction influences real economic activity. It is well-established among economists that, in the long term, changes of fiscal policy will affect price levels. Looking at the effects of the fiscal policy in the short term, however, I may distinguish two central approaches: the traditional Keynesian effects and the non-Keynesian effects (Abel, Bernanke, and Smith, 2003, pp. 404-472).

The Keynesian effects of fiscal expansion have a direct affect on output, however, under certain conditions, price rigidity and liquidity constrain households and firms. Such effects of fiscal expansion are transmitted via a multiplier effect on output, while contractionary fiscal action would reduce output. The conventional wisdom is that increased government spending leads to an expansion of output, while increasing taxes has the opposite effect (Blanchard and Perotti, 2002, p. 26).

The non-Keynesian effects of fiscal policy are theoretically justified in the new classical literature with supply-side oriented models, rational expectations, the Ricardian equivalence theorem, and credibility, as summarized below (Giavazzi, Jappelli, and Pagano, 2000, p. 16; and Aslund, 2002, p. 15).

If agents *have rational expectations,* a continuous fiscal expansion leads them to expect a continuous increase in interest rates, which discourages private investment and thus reduces the output effect. This is known as the crowding out effect. In contrast, a reduction in government spending leads to a reduction of interest rates and thus to an increase in private investment, which in turn leads to an increase in real GDP. The greater rate of investment would offset the effects of the contractionary fiscal policy. This is referred to as the crowding-in effect.

Ricardian equivalence: if a government's reduction in taxes is anticipated by the agent as a postponed tax liability, such policy leads them to reduce consumption, thereby leading to a decrease in real GDP via a drop in aggregate demand (and vice versa).

Credibility: if the government gives a signal for credible consolidation of its budget towards Maastricht convergence criteria, which lead to a reduction in interest rates, this will stimulate investment, leading in turn to an increase in real GDP. In this light, fiscal contraction can have expansionary effects.

3.2.1.1.2 Empirical evidence of the effects of fiscal policy

Among economists, there is far greater disagreement as to the empirical evidence for the effect of fiscal policy than is the case with monetary policy (Bernanke and Mihov, 1998, pp. 869-902). The empirical evidence does not provide a unique answer to the issue by showing that non-Keynesian effects may take place under well-defined circumstances. However, it has shown varied and inconclusive outcomes as to the effect of fiscal policy on real economic activity.

The empirical studies are based on various methodologies. First, the effects of fiscal policy are examined using the structural macroeconometric models. Second, sets of studies have sought to identify large fiscal episodes. Recently, many econometric models are based on a VAR methodology aiming to identify sources of real GDP fluctuation – both in supply shocks and demand shocks, i.e. monetary and fiscal impulses on aggregate demand and supply.

- ***Empirical evidence from structural macroeconometric models***

In general, the empirical evidence from macro-structural models suggests that the fiscal multiplier has shown to be positive in the short term, whereas in the long term, owing to crowding out effects, it is zero. However, there are other, limited studies of the short-term negative fiscal multipliers shown by structural macro-models.

Examining EU countries, Barell et al. (2002, pp. 263-293) find that all countries have a positive fiscal multiplier on output. Germany is found to have the highest fiscal multiplier, a fact which has been used to support the claim that the German economy is more focused on manufacturing and has a greater variety of manufacturing sectors. On the other hand, Guidice, Turrini, and In't Veld (2003, p. 195), using the QUEST macro-structural model to highlight non-Keynesian effects of fiscal consolidation in EU countries, find that if the consolidation comes from a tax increase the output growth rate is unlikely to be higher, whereas expenditure cuts may show non-Keynesian effects in the short term. In addition**,** they find that half of the consolidation episodes seen in EU countries during the past three decades were followed by acceleration in output growth. New-Keynesian economists also agree with this finding, claiming that such policy will reduce interest rates and in turn will increase the institution's credibility, thus leading to an increase in wealth and consumption in the economy.

However, regarding the assumptions that monetary policy will accompany fiscal action- for example, the nominal interest rate has been fixed in value during the first year and therefore the real interest rate is likely to fall during the fiscal expansion. It can be seen that such methodology contains subjectivity, so such results reflect the authors' viewpoint.

- ***Empirical evidence: identifying large fiscal episodes***

In reviewing the econometric methodology regarding large fiscal changes, I can divide them into the following three broad categories:

*First generation***:** this includes those empirical studies performed before the fiscal-output growth model of Romer (1986, pp. 1002-1037) and Barro (1990, pp. 103-117), where a variety of ad hoc hypotheses related to the dynamic effects of fiscal policy on output growth are tested. These studies are poorly specified, use limited data, and employ econometric techniques which are now regarded as unreliable and non-robust, as well as non-comparable. The following are examples of some researchers who belong to this generation:

Landau (1986, pp. 35-75) examines 16 OECD countries over the period from 1961 to 1976, and, using cross-section econometric methods, he finds that investment spending such as education, defense, and capital spending have no significant effect on growth, while consumption spending has a significant negative effect on growth.

Ram (1986, pp. 191-203) examines 19 OECD countries over the period from 1960 to 1980, and, using cross-section time series, he finds that total expenditure has a significant positive effect on output growth.

Grier and Tullock (1989, pp. 259-276) examines 115 countries over the period from 1950 to 1981, and, using the panel econometric method, they find that consumption spending has a significant negative effect on output growth.

The researchers of this first generation, who use different methodologies and fiscal variables in their studies, clearly come to different conclusions.

Second generation: The second generation's research is based on the endogenous output growth model involving fiscal policy. The econometric methods of this generation are generally more sophisticated than those of the first generation's studies. However, most researchers in this group tested for either tax or public expenditures, or fiscal deficit effects on output, and ignored the role of governments' budget constraints and the importance of their implicit financing (tax or debt), as is emphasized in Barro’s model. The second-generation studies also rely on cross-section methods. The following are examples of some researchers who belong to this generation:

Romer (1990, pp. 47-57) examines data from 90 countries over the period from 1960 to 1985, and, using cross-section econometric methods, he finds that consumption spending has a significant positive effect on output.

On the other hand, Alexander (1990, pp. 1197-1204) examines 13 OECD countries over the period from 1959 to 1984, and, using the panel method, he finds that consumption spending has a significant negative effect on growth.

Barro (1991, pp. 407-444) simultaneously examines investment and consumption spending in 98 countries during the period from 1960 to 1985, and, using cross-section time series, he finds that investment spending has a significant positive effect on growth, while consumption spending has a significant negative effect on growth.

Angell et al. (1999, pp. 359-366) simultaneously examines taxation, investment spending, and consumption spending in 23 OECD countries over the period from 1970 to 1992, and, using cross-section and panel methodology, he finds that neither taxation nor total expenditure has a significant effect on growth.

Obviously, researchers of the second generation also use different data and methodologies in their studies, again producing different results.

Third generation: researchers of this generation recognize (implicitly or explicitly) the role of governments' budget constraints (i.e. that a government's expenditure must stay within the limits set by its ability to finance it), and they examine at least two of the following three effects simultaneously rather than separately: *tax/expenditure/deficit.* They have also adopted recent advances in panel or time series econometrics. Like the first and second generations, the third generation of researchers also arrives at mixed conclusions from the empirical evidence.

Cashin (1995, pp. 237-269) analyzes 23 OECD countries over the period from 1971 to 1988, and, using panel econometric methods, he finds that taxation has a significant negative effect on output growth, whereas investment spending and social welfare spending have significant positive effects relating to the impact of fiscal components on growth.

Kneller et al. (1999, pp. 171-190) studies 21 OECD countries over the period from 1970 to 1974, and, using panel econometric methods, they find that distortionary tax has a significant negative effect on growth, whereas non-distortionary tax has no effect on output-growth. Moreover, productive expenditures have a significant positive effect on output-growth, whereas neither consumption spending nor social welfare spending have significant effects on output-growth. Bleaney et al. (2001) reach similar conclusions to Kneller as regards the impact of fiscal policy on economic growth, Alesina et al. (2002, pp. 571-589) analyze the influence of public sector wages on private investment. They use the data for 18 OECD countries from 1960 to 1996 and find that government spending has a sizable negative effect on private investment. They conclude that cuts in public spending – particularly in public wages and transfers – are expansionary in their impact on output-growth, i.e. a reduction of government wage bills and transfers has a substantial positive influence on private investments.

The results of the empirical research by the first and second generation can be said to exhibit a degree of non-robustness (excepting the work by Barro), as the researchers reach contradictory conclusions, finding strongly positive, negative or non-significant effects from their studies of similar variables. The work of Agell (1999) and Folster and Henrekson (1999, pp. 337-358) show that even when the same dataset and variables are used, different econometric specifications might lead to widely differing outcomes. However, the deficiencies of these studies arise primarily from the omission of the governments' budget constraints (henceforth referred to as GBC). Omitting these elements from regression specifications in their studies produces non-robust outcomes. Concerning the third generation of researchers (excepting the work by Kneller and Bleaney), most of the studies of this generation are either imprecise in their application of the GBC or incorporation of the GBC is not related explicitly to the kinds of theoretical models proposed by Barro (1990) and Mendoza (1997, pp. 99-126). De la Funte (1997, pp. 99-126) is the only author who uses quadratic terms in regressions; he finds strong evidence supporting the positive impact of public capital spending on output growth. However, this study relates only to OECD countries. Nevertheless, the results of the third generation's research appear to be more robust.

In general, the taxes tested are found to have negative effects on output growth, while at least some public investment spending is found to have a positive influence on output growth. Consumption and social security spending is found to have zero or negative output growth effects.

- ***Empirical evidence -SVAR-methodology***

Applying the Structural Vector Autoregression (SVAR) methodology, recent researchers deliver some of the most relevant contributions to the literature.[14] This methodology avoids the problem of subjectively choosing indicators of the fiscal stance and imposes contemporaneous relationships among the variables.

By this methodology, Blanchard and Perotti (2002, pp. 1329-1368) increase the scope of the model for measuring the impact of fiscal policy on economic output growth and other macroeconomic variables by incorporating more relationships among the variables, e.g. government expenditure, tax revenues, nominal interest rates, price level, consumption, savings and output. The evidence shows a standard Keynesian reaction of the economy to both kinds of shocks: an increase in taxation has negative effects on output and consumption, while positive innovations in public expenditure produce positive effects on these variables.

Fatás and Mihov (2000, p. 25) attempt to examine how fiscal policy can affect economic productivity, which in turn will generate positive effects on consumption. Using quarterly US data and applying SVAR for the period 1959-2002, they show that output, consumption and employment all increase following a spending shock**.** A spending shock, they conclude, will increase productivity and generate positive effects on consumption.

The positive output effects of increases in government consumption are also confirmed in the empirical studies undertaken by Fatás and Mihov (2002, pp. 1-25), which find that increases in government consumption are associated with increases in private consumption – not decreases as implied by Ricardian equivalence.

Numerous studies employing Structural Vector Autoregression (SVAR) methodology prove that fiscal policy has positive effects on economic activity. However, these studies relate only to OECD countries.

[14] Blanchard and Watson (1986); Edelberg, Eichenbaum, and Fisher (1999); Blanchard and Perotti (2002); Fatás and Mihov (2000, 2002, 2003, 2004); Mountford and Uhling (2005); and Restrepo and Rincón (2006).

Fatás and Mihov (2003, pp. 1-32) examine 20 OECD countries using SVAR and find strong evidence in favor of a dynamic discretionary fiscal policy, claiming that large governments are associated with less volatile business cycles and thus increase the rate of economic output growth. Aggressive use of discretionary fiscal policy, on the other hand, amplifies business cyclical fluctuation and harms economic output growth.

Other studies have shown different results. Perotti (2002, p. 30), for example, sets up a SVAR for 5 OECD countries to study the impact of fiscal policy on real GDP and prices. He finds that the effect of fiscal policy on real GDP and its components had become very much weaker over the preceding 20 years, with the exception of the U.S. The author explains this as being a result of the increased openness of economies and possible changes of monetary policy regimes.

For the four largest economies of the European region, Marcellino (2002) also finds a small positive effect of fiscal policy on output; however, the variation between different countries is large.

Investigating the effect of fiscal policy and monetary policy shocks on real GDP and prices using SVAR methodology, Mountford and Uhling (2005, p. 19) find that spending shocks have a crowding out effect on investment and thus negate the effect of fiscal spending on real GDP. The most immediately effective fiscal policy for stimulating the economy, they claim, would appear to be one involving tax-cuts. While they point out that such unanticipated tax-cuts work as a short-lived stimulus on the economy, they do not claim that such cuts are sensible. The resulting higher burdens may have negative long-term consequences which greatly outweigh the short-term gains in real GDP, and 'surprising' the economy in this manner may not be wise in any case.

Von Hagen et al. (2001, pp. 279-295) analyze the effect of fiscal consolidation in OECD countries and find that fiscal policy had no effect on output due to the reaction of monetary policy. When this estimation is restricted to EU countries in the period 1990-1998, the traditional direct effect of fiscal policy disappears and monetary policy no longer responds to fiscal policy. This result suggests that in some countries the “non-Keynesian effect” has compensated for the traditional effect of fiscal policy.

In addition, I expect the findings of Von Hagen et al. (2001) to be consistent with my findings regarding the Republic of Macedonia, due to the fiscal strategy of the Macedonian government, i.e. the fiscal adjustment, economic growth and monetary strategy of the central bank of Macedonia.

Muscatelli and Tirelli (2005, p. 566) analyze the effect of fiscal policy and monetary policy in EU countries using two different approaches. In the first version, they find that fiscal policy plays a limited role in the model. This finding is consistent with findings by Andrés and Doménech (2003). In the second, they find that fiscal policy can provide a useful complement to monetary policy.

For countries in transition there are few studies concerning the effect of fiscal policy on real GDP. Regarding fiscal policy in the Republic of Macedonia and other similar countries in transition, the majority of authors believe a non-Keynesian effect prevails. In many studies (Fischer and Sahay, 2000; Aslund, 2002), fiscal austerity is advocated for countries in transition as a means of successful macroeconomic stabilization, while fiscal spending is associated with no output growth and delayed transition.

Segura-Ubiergo et al. (2006, p. 22) analyze fiscal adjustment and output growth in 26 countries in transition. However, the main results of this research are not qualitatively different from those found for industrial, emerging markets and low-income economies. Segura-Ubiergo et al. find a strong correlation between fiscal adjustment and growth in all countries, however, the relationship is strongest in those countries which need to achieve macroeconomic stability. In addition, the correlation between fiscal adjustment and growth seems stronger depending on the initial level of the deficit, and when fiscal adjustment exceeds about 10 percent the positive impact on growth begins to decrease.

Rarytska (2003, p. 42) examines the Ukrainian economy using SVAR methodology and finds the effect of fiscal policy on output to be smaller in magnitude and persistence. In addition, she explains this result by reference to the strengthening of the fiscal policy institution in Ukraine and improved confidence in government policies as the economy experienced significant growth in the previous year.

Rzonca and Cizkowicz (2005, p. 28) analyze the effects of fiscal policy in new member states of the EU and existing EU countries. The results they find with regard to these countries are close to those found in developed countries. Their results show that fiscal consolidation in those countries contributes substantially to the acceleration of output growth even in the short term. They suggest that the non-Keynesian effect leads to higher growth.

Restrepo and Rincón (2006, p. 20) analyze Chile using VAR methodology and find the effect of public expenditure (and taxation) on output to be minor and transitory.

Ducanes et al. (2006, p. 17) analyze Asian countries and find short-term fiscal multipliers arising from untargeted increases in government expenditure to be positive and far greater than fiscal expansion via a tax-rate reduction.

Finally, it can be seen from the empirical evidence that different outcomes and non-conclusive outcomes vis-á-vis the effects of fiscal policies are found in both developed countries and countries in transition.

3.3 The macroeconomic effect of exchange rate regime on real GDP and prices

Changes in the exchange rate can affect the economy through two channels. The first of these is a direct channel whereby the exchange rate affects inflation via import prices, i.e. the exchange rate pass-through effect on prices. The second is an indirect channel whereby the exchange rate affects real GDP via the balance of payments. In small open economies, as in the case of the Republic of Macedonia and similar small countries in transition, the *exchange rate channel* seems to play an important role in macroeconomic stabilization. The direct channel is so dominant due to the relatively higher dollarization in such countries. Higher dollarization implies a potentially strong pass-through of the nominal exchange rate effect via import prices to prices in small open economies. The second issue is the possible implication of different exchange rate regimes in the monetary transmission mechanism. The theoretical and empirical evidence relating to the effect of monetary policy point to the potential weakness and the potential instability of the conventional channels of monetary transmission during transition. The issue, therefore, is whether the exchange rate channels may play a more significant role than money stock and interest rate channels in the monetary transmission mechanism. To what extent are real GDP and inflation affected by different exchange rate regimes? To what extent are monetary and exchange-rate policies consistent in countries in transition, i.e. do they support the goal of stabilizing inflation at a low level while at the same time ensuring that movements of the exchange rate in the short term are not disruptive for the real economy and financial market?

The question of which monetary regime is optimal for small open economies remains wide open (see more Ribnikar, 2004, pp. 9-23). There are arguments both for and against the exchange rate regimes. Economists have not offered clear and persuasive answers as to whether the countries should use floating or fixed exchange rates. This suggests a need for ongoing research into the macroeconomic effects of exchange rate regimes in small open countries. The following section provides a theoretical and empirical overview of the effect of exchange rate regime type as discussed in the literature.

3.3.1 Review of literature

3.3.1.1 Theoretical and empirical evidence of the effect of exchange rate regime

3.3.1.1.1 Theoretical aspect of exchange rate regime

The exchange rate regime is the price at which the national currency is valued in relation to foreign currencies (Jovanovski, 1995, p. 78 and 2007). The exchange rate can be fixed or flexible. Under a fixed exchange rate regime, the government will change the exchange rate either by adjusting the interest rate or through the sale or purchase of foreign currencies in order to maintain a fixed value for the currencies. By contrast, a flexible exchange rate regime is allowed to fluctuate freely in response to changes in economic conditions and is not determined by the buying and selling of currencies on the part of the monetary authorities. Whether to apply a fixed or flexible exchange rate regime depends on the structure and circumstances of each country in question: no universal law applies to all.

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. Rapid inflation due to an excess money supply and excess demand in the economy would generate a depreciation of currencies in the foreign exchange markets, which in turn would add to aggregate demand in the economy and generate further inflationary pressure. An increase in prices would cause a rise in money wages, which in turn would induce more inflation, and so on. If inflation is generated by such monetary factors, it is better to use a fixed exchange rate than a flexible one.

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.

3.3.1.1.2 A brief history of shifting exchange rate regime

Over the past few decades, the mixture of exchange rate arrangement in developing countries has changed significantly. In recent years, the same trend has emerged in countries in transition. The shift from fixed to more flexible exchange rate regimes in developing countries has been gradual, following the major currencies after the breakdown of the Bretton-Woods system of fixed exchange rate regimes in the early 1970s. In the beginning, the majority of the developing countries pegged their currencies to a single key currency: usually to the US dollar or the French Franc, or to basket currencies.

Similarly, after the breakdown of communism, most of the central and south-eastern European countries in transition pegged their currencies to the deutschmark, and later to the euro (e.g. the Czech Republic, Poland, Hungary, Croatia, Albania, Slovenia, and the Republic of Macedonia).

Since the early 1980s, however, developing countries have shifted away from pegged currencies towards more flexible exchange rate arrangements (e.g. Chile, Costa Rica, Ecuador, Egypt, Venezuela, Honduras, Pakistan, Saudi Arabia, and the United Arab Emirates). In 1997, for example, Brazil, Chile, the Czech Republic, Poland, and Hungary abandoned pegged currencies and began using inflation targeting. In 1975, 87 percent of developing countries had some type of pegged exchange rate currency. By 1996, the proportion had fallen to below 50 percent. The overall trend is clear: many countries officially describe their exchange rate as “managed floating”, or even “independently floating”, though in practice they often continue to set their exchange rate regimes unofficially or to use their exchange rate regimes as policy instruments. Some countries returned to a fixed exchange-rate regime after trying flexible exchange rates: Argentina, for example, which adopted a type of currency-board arrangement in 1991; or Hong-Kong SAR (Special Administrative Region), which has had a similar arrangement since 1983.

Nevertheless, the general shift from fixed to flexible exchange rate regimes has occurred almost worldwide. One reason for this shift is that many developing countries experienced a series of external shocks in the past decades. In the 1980s, these included a sharp increase in interest rates internationally, a slowdown of growth in the developed countries and higher deficits associated with debt crises. These disturbances required not only currency depreciation but also the adoption of more flexible exchange rate regimes.

In recent years, globalization and changes in policy orientation have resulted in closer international trade and financial linkages, which in turn led to greater mobility of capital, i.e. capital inflows and outflows, thereby generating potential external shocks and increasing pressures for flexibility of the exchange rate regimes. Moreover, most developing countries tend to have increasingly more open economies and more outward-looking policies on trade and investment, thus leading to an increased emphasis on market-determined exchange rate regimes and interest rates.

3.3.1.2 Empirical evidence from the evaluation of macroeconomic performance under alternative exchange rate arrangements

Concerning the empirical evidence, economists do not offer clearly convincing answers to the question of whether a country should allow its currencies to float or should fix its currencies to other currencies. The experience of many countries suggests that neither of these two main types of exchange rate regime can be unambiguously ranked above the other in terms of macroeconomic experience. *While countries with a pegged-fixed exchange rate have experienced a relatively lower and more stable rate of inflation and a relatively less volatile real exchange rate regime, output growth does not appear to differ significantly between countries with fixed and flexible exchange rate regimes.* Thus, there are pros and cons to different exchange rate regimes. After the experience of floating exchange rate regimes, it is difficult to determine the correct choice of exchange rate regime.

A number of studies explore the effect of exchange rate arrangements on economic performance. I can divide this empirical research into two groups. The first group includes those studies that involve before/after case studies with regard to countries that changed their arrangements; comparative case studies; narrative explanations; and econometric analyses of the pooled experiences of a cross-section of countries. Studies that use SVAR methodology make up the second group.

3.3.1.2.1 Empirical research of the exchange rate regime according to a variety of macroeconomic models

Ghosh et al. (1997) examine 140 countries over thirty years under nine types of exchange rate arrangements. They find that both levels and variability of inflation are clearly lower under fixed exchange rate regimes than under floating exchange rate regimes. In contrast to inflation, the level of growth does not seem to be greatly influenced by the exchange rate arrangement, perhaps because investment ratios are higher under fixed exchange rate regimes. On reviewing previous empirical literature, Quirk (1994) reaches a contrary conclusion, finding that there is little linkage between exchange rate arrangements and inflation.

Hausmann et al. (1999) find that during the 1990s, Latin American countries with fixed exchange rate regimes had greater financial depth (as measured by M2/GDP), lower real interest rates, and less-effective wage indexation than those with floating exchange rate regimes. Monetary policy under a floating exchange rate regime has greater autonomy and has been shown to be more pro-cyclical than monetary policy under a fixed exchange rate regime.

Levy-Yeyati and Sturzenegger (2001) find that for non-industrial economies, “long” pegs (lasting five years or more) are associated with lower inflation than floats, but at the cost of slower economic growth. A similar trade-off between inflation and economic growth is observed in the case of the “hard” peg, whose growth performance does not differ significantly from that of conventional pegs. In contrast, “short” pegs under-perform floats, as they grow slower without any gains in terms of reducing the rate of inflation.

Jazbec Boštjan (2001) makes a model of real exchange rate determination in countries in transition. He finds that the exchange rate does not seem to play a direct role in explaining output performance in different countries in transition. However, he claims that the fixed exchange rate regime serves better to keep up inflationary pressure and therefore has an indirect effect on real output growth via better inflation performance.

The IMF (1997) reports that inflation rates under fixed exchange rate regimes are, on average, lower than those of floating exchange rate regimes. For de facto classification, pegged regimes continue to exhibit a significantly lower rate of inflation than freely floating regimes, at 4.5 percent lower. The intermediate exchange rate regimes exhibit 2.9 percent lower inflation rates than those of freely floating exchange rate regimes. Regarding economic performance, the pegged and floating exchange rate regimes of both de jure and de facto classification show that economic growth does not exhibit a relationship with exchange rate flexibility. For developing economies, economic growth appears to decline with increased flexibility. Thus, the association observed above of lower rate of inflation with greater rigidity clearly does not come at the expense of economic growth. For emerging markets, the relationship between economic growth and regimes is noisy as well as for rate of inflation.

Ribnikar (2004, pp.9-23) suggests that exchange rate regimes and monetary arrangements in countries in transition are important because, in the process of abandoning their monetary autonomy, countries must go through an intermediate exchange rate regime. Therefore, it is important to determine what combinations of monetary autonomy and nonautonomy are available and how to combine discretion and commitment in monetary policy.

Ghosh et al. (2000, pp. 270-335) compare the economic performance of countries with currency boards, other pegs, and floating exchange rate regimes, to countries placed into regimes by the IMF de jure classification. Countries with currency boards grow the most rapidly, on average, by a considerable margin. No differences in economic performance are found between floating and fixed exchange rate regimes.

Levy-Yeyati and Sturzenegger (2003) report an interesting finding: when they use the IMF classification system, the intermediate regime performs best, but when they use their own de facto system (LYS), the ranking is precisely reversed, in that more floaters perform better. According to the IMF classification, intermediate regimes do perform best; while according to the LYS classification, the intermediate regimes do the worst, and those with floating exchange rate regimes perform the best.

Reinhart and Rogoff (2002) suggest treating countries with dual or multiple exchange rate regimes as a separate category. They claim that countries with limited flexibility perform the best, while floaters come in last. But as far as average growth rate is concerned, the different regimes do not seem to make very much difference.

Ghosh et al. (2003) conduct more rigorous studies that control for other determinants of inflation, such as: factor accumulation (investment ratio, education, and population level and growth), trade openness, terms-of-trade shocks, and the importance of the government sector (tax ratio and central government balance). They find that, on average, pegged and intermediate regimes are associated with significantly lower inflation rates than floating regimes, while the average growth rates of the floaters and the regular pegs are fairly similar. Long-term growth, of course, depends on many variables besides the exchange rate regime, such as: lagged income, the investment rate, population growth, openness, and political stability.

It can be seen from the empirical research that there is no clear answer as to which exchange rate regime is optimal for the different countries. Not surprisingly, therefore, the results are inconclusive and sometimes contradictory; varying with the countries covered, the period, the detailed specification of the econometrics model used, and subjectivity on the part of the authors.

Nevertheless, theory suggests – and most of the empirical evidence proves – that the best regime is one that will stabilize fluctuating macroeconomic variables.

3.3.1.2.2 Empirical research of the exchange rate regime according to SVAR-methodology

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.

Campa and Goldberg (2004) provide empirical evidence on the exchange rate pass-through for twenty-three OECD countries. Using quarterly data from 1975 through 2003, they estimate pass-through elasticity. They find that countries with less exchange rate and inflation variability are likely to have lower pass-through of exchange rate via import prices.

Cushman and Zha (1997, pp. 433-448) 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, p. 561-586) and Maćkowiak (2003, 2005) analyze small developed countries and find that the exchange rate channel did play an important role in transmitting the dynamic effect of monetary policy..

Loayza (2002) provides an overview of empirical studies concerning the effect of monetary policy in Australia, Canada and the United Kingdom. He claims that interest rate and exchange rate channels are important in all of the mentioned countries.

Cunningham and Haldane (2002) provide more specific information on the relative importance of the interest rate and exchange rate channels in the UK. They find that the marginal effects on output of the interest rate and exchange rate are equal. As for the exchange rate channels, the average pass-through is 70%. However, the exact degree of pass-through depends on the economy's cyclical position: it is higher in a boom and smaller in a recession.

Kuttner (2002, p. 19) examines how changes in exchange rates affect countries' price competitiveness, which, in turn, affects the net-export. Many other factors can affect net-export in this way, and through it affect output.

Mishkin (2001, pp. 1-30) highlights the way that the exchange rate channel also works through the balance sheets of both financial and non-financial agents. If a substantial amount of the domestic debt is denominated in foreign currency, this results in changes in the debt burden through changes in the exchange rate.

Disyatat (2001 pp. 1-49) shows that substantial unanticipated exchange rate depreciations could actually reduce output when a significant share of debt in the economy is denominated in foreign currency. Further, the increase in foreign denominated debt would be offset by its liquidation upon its translation into domestic money. This transmission is similar to those of any nominal shocks to prices.

Cîtu (2003, pp. 1-28) 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[15].

Billmeier and Bonato (2002, pp. 1-34) 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, p. 26) 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 behavior of macroeconomic variables remains constant irrespective of which regime is adopted. This result is consistent with the findings of Jarociński (2004), Maćkowiak (2003), and Maliszewski (2002).

Dovciak (1999) and Kuijs (2002) analyze Slovakia, and both authors find that the exchange rate channel plays an important role in the monetary transmission mechanism. In their view, the exchange rate can affect inflation, and they find a strong pass-through effect of the exchange rate in Slovakia. In addition, Kuijs claims that the degree and direction of the exchange rate depends on many factors, such as the elasticity of demand for exports and imports, the openness of the economy, and the exchange rate pass-through.

Lyziak (2001) analyzes the effect of monetary policy in Poland and finds that the exchange rate affects inflation.

[15] Clark (1999), Kuijs (2002), Ganev, Molnar, Rybinski and Wozniak (2002), Leigh and Ross (2002), Billmeier and Bonato (2002), Mayes (2003), Juks (2004), Golinelli and Rovelli (2004), Hyder and Shah (2004), Vonnák (2005) Horváth and Maino (2006) e.g.

Mayes (2003, pp. 1-38) 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.

Ganev et al. (2002, p. 27) analyze the dynamic effect of monetary policy on real GDP and inflation in 10 CEE countries. The evaluation of the pass-through effect of monetary policy on real GDP and inflation is examined by two indicators: the interest rate and the exchange rate. Positive exchange rate shocks (deprecation) seem to boost real GDP in most countries, though this effect dies out after a short-period. *In Latvia, the exchange rate shock does not have any effect on real GDP. Depreciation shocks fuel core inflation in most countries. The effect is greatest in Slovakia, Latvia, the Czech Republic, Bulgaria, Romania and Poland, and it seems to persist after 36 months. Core inflation does not seem to be significantly influenced by depreciation in Hungary, Slovenia and Lithuania.* It can be seen that the exchange rate has played a significant role in these countries, showing a strong pass-through of the dynamic effect of monetary policy; whilst interest rates had a lower effect on the monetary transmission mechanism. The weakness of these traditional channels is explained by the lower degree of competition in the banking sector, the shallowness of financial intermediation, currencies substitutions, etc.

Coricelli, Jazbec, and Masten (2004, pp. 1-32) examine the exchange rate pass-through effect for acceding countries to the European Union, such as the Czech Republic, Hungary, Poland, and Slovenia. They find a strong pass-through from nominal exchange rates to domestic inflation. In this context, countries with accommodative exchange rate policies show a high and fast pass-through effect, as is demonstrated in the case of Hungary and Slovenia. According to the authors, a different choice of exchange rate policy can achieve disinflation at low costs in terms of output decline and with potential benefits in social welfare.

Horváth and Maino (2006, pp. 1-22) 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), Kuijs (2002), and Ganev et al. (2002). The Republic of Macedonia, Croatia, and Belarus all have the same monetary strategy of targeting the exchange rate.

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 behavior of the exchange rate for the level of currency substitution. 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 negligible effect on real GDP and inflation.

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 and interest rate channels in the monetary transmission mechanism.

4 SELECTION OF THE ECONOMETRICS METHODOLOGIES AND IMPLICATION OF LITERATURE

In this chapter, I examine the SVAR and VECM research methodologies, whereby the effect of monetary and fiscal policy and exchange rate regime on real GDP and prices are examined in the Republic of Macedonia.

4.1 Selection of the econometric methodology

The Structural Vector Autoregressive (henceforth SVAR) methodology is a dynamic system of equations in which the current level of each variable depends on past movements of that variable and all other variables involved in the system. This places minimal restrictions on descriptions of how monetary fiscal and exchange rate shocks affect the real economy**.**

This methodology became popular for several reasons (Stock and Watson, 2001, pp. 1-28). Prior to its widespread use, there were two other approaches which were primarily used to examine the macroeconomic effects of monetary and fiscal policy.

First, according to the Keynesian approach the macroeconomic models that are used consist of sets of equations, whereby these equations are estimated separately and then jointly included in an econometric model (e.g. Brooking SSRC-Suits and Sparks, 1965, pp. 210-220, econometric model or Modigliani MPS model). This type of econometric model imposes many restrictions. In contrast, *VAR methodology* imposes minimal restrictions and enables the simulation of the dynamic response to identified shocks, as well as the evaluation of the contribution of the different shocks to economic fluctuation.

Second, in the monetarist approach the macroeconomic models consist of reduced-form equations (based on the St. Louis model developed by L. Anderson and J. Jordan).
The Anderson and Jordan (1968, pp. 11-23) equation is as follows:

$$\Delta Y = f(\Delta M_t, \Delta M_{t-1}, \Delta M_{t-2}, \Delta E_t, \Delta E_{t-1}, \Delta E_{t-2})$$

Where:

ΔY expresses changes in output,

ΔM_t changes in money stock and

ΔE_t changes in budget deficit.

Equations used in this methodology cannot provide feedback between output, money stock and fiscal deficit. This is *Sims's criticism of* the monetarist approach, and therefore he claims that if a government wants to affect real GDP by monetary and fiscal action, logically there will be feedback between the variables (money affects real GDP or fiscal deficit affects real GDP). This type of model is unable to identify shocks and therefore produces erroneous outcomes. According to Sims, the equation of real GDP has to be estimated simultaneously with equations incorporating the reaction of the monetary and fiscal authority to the changes in real GDP (feedback) within unrestricted reduced forms of equation in which all variable are endogenous.

Accordingly, Stock and Watson (2001, p. 1) and Bernanke et al. (2003, p. 1) revised VAR-methodology, and they have since claimed that over the last 20 years VAR has been a leading methodology in researching monetary and exchange rate regime, i.e. ever since the basic principals were proposed by Sims (1980). Therefore, VAR as an econometric methodology[16] has been used extensively by researchers to model the macroeconomic effect of monetary policy on closed and open economies, in developed and developing countries, as well as in countries in transition.

Recently, this methodology has found a place in evaluating fiscal policy as well (Mountford and Uhling, 2005, pp. 1-38; and Fatás and Mihov, 2003, pp. 1-37). However, before examining monetary, fiscal, and exchange rate policy, I explain VAR methodology as it is used in my empirical research.

[16]**Open economy**: Sims (1992, 1998); Christiano, Eichenbaum, and Evans (1996, 1999, 2005); Cushman and Zha (1997); Kim (1999); Kim Roubini (2000); Canova and De Nicolo (2002), Bernanke et al. (1995, 2000, 2003); Bin Li (2005); and Uhling (2005). **Closed economy studies include:** Sims (1986); Gali (1992); Gordon and Leeper (1994); Bernanke and Mihov (1998); and Sims and Zha (1998). **Countries in transition:** Ganev, Molnar, Rybinski, and Wozniak (2002); Hafer and Kutan (2001); Kuijs (2002); Billmeier and Bonato (2002); Jazbec et al. (2004);Mayes (2003); Maliszewski (2003); Mihov (2001); Juks (2004); Hyder and Shah (2005); Hristov (2004); Horvath and Maino (2006); and Balazs and Vonnak (2005).

4.2 Implication of the literature in countries in transition

Ganev et al. (2002, p. 3) have compiled an excellent survey concerning the econometric methodology that has been used in transitional economies. Different approaches are used to research the dynamic effects of monetary policy via its channels on output and prices, such as: the comparisons and narrative method used by Mayes (2003, pp. 5-37) and Juks (2004, pp. 34-56), the structural macroeconomic model used by Golinelli and Roveli (2004), and SVAR and VECM, employed by all authors listed in the footnote (16). Most empirical studies of countries in transition have employed SVAR and VECM methodologies, so I use such methodologies (SVAR and VECM) in my own empirical research. However, regardless of the different methodologies used, most of the findings share very similar results. They indicate that exchange rate channels play an important role in countries in transition, whereas the interest rate and money supply show little importance. Moreover, in contrast to the developed countries, the economies of countries in transition display weak dynamic effects of monetary policy on output due to the shallow degree of financial intermediation in banking and financial systems and a high degree of dollarization. As a high degree of dollarization leads to reduced efficiency of monetary policy due to its impact in the equilibrium of money demand and supply, it makes a much less effective tool for a monetary authority to use in the coordination of money demand and supply. Ganev et al. (2002, p. 11); Ceccheti and Krause (2001, pp. 1-31); and Elbourne, Kiviet and Bas (2003, pp. 1-35) conclude that the action of monetary policy in transitional economies may render traditional policy tools less effective than neoclassical settings would suggest. Next, I examine how VAR-econometric methodology is used in my empirical research.

4.3 Structural Vector Autoregressive (SVAR) - Econometric Methodology

I examine the structural VAR (or primitive restricted VAR) and standard VAR (or reduced-form unrestricted VAR). The structural VAR (p) model (VAR model of order p) is expressed with equations such as:

$$x_t = a + B_0 x_t + B_1 x_{t-1} + \ldots\ldots + B_p x_{t-p} + e_t \qquad (4.1)$$

where $x_t = (x_{1t},.......x_{kt})'$ is a $(K \times 1)$-dimensional random vector containing k variables included in the VAR, B_i are fixed $(K \times K)$ coefficients of matrices, $a = (a_1,.......a_k)'$ is a fixed $(K \times 1)$ vector of intercept terms with the nonzero mean $E(x_t)$, and $e_t = (e_{1t},.......e_{kt})'$ is a *K*-dimensional white noise innovations process or vector of error terms, where $E(e_t) = 0, E(e_t e_t') = \sum, E(e_t e_s') = 0$ for $s \neq t$. (Lütkepohl, 2005, p. 13). The variance-covariance matrix (Johnston and DiNardo, 1997, p. 287; and Gujarati, 2003, p. 947) $\sum_e$ is a diagonal matrix such that among the coefficients, those of vector e_t are serially uncorrelated or time invariant.

$$\sum_e = \begin{bmatrix} \operatorname{var} \sigma_1^2(e_{1t})........ \operatorname{cov} \sigma(e_{1t}e_{2t}) \\ \operatorname{cov} \sigma(e_{1t}e_{2t})........ \operatorname{var} \sigma^2(e_{2t}) \end{bmatrix} \tag{4.2}$$

Concerning matrix B_0, the main diagonal has a value of zero, whereby the elements outside of the main diagonal insure instant "shock" from one variable to another via the vector x_t (Enders, 1995 and 2004).

This VAR is not a reduced form of equations, and therefore it is called structural or primitive VAR. It is impossible to directly solve this structural VAR. One way to identify the shock within the model is to use the type of recursive system proposed by Sims (1980, pp. 1-49).

I put in the left side $B_0 x_t$

$$x_t - B_0 x_t = a + B_1 x_{t-1} + ...+ B_p x_{t-p} + e_t \tag{4.3}$$

After rearranging:

$$(I_k - B_0) x_t = a + B_1 x_{t-1} + ...+ B_p x_{t-p} + e_t \tag{4.4}$$

where I_k is an identity matrix of order $(K \times K)$. If I divide Equation 4.4 by $(I_k - B_0)$, I obtain:

$$x_t = \frac{a}{(I_k - B_0)} + \frac{B_1}{(I_k - B_0)} x_{t-1} + ... + \frac{B_p}{(I_k - B_0)} x_{t-p} + \frac{e_t}{(I_k - B_0)} \tag{4.5}$$

After rearranging, I obtain Equation 4.6, as follows:

$$x_t = (I_k - B_0)^{-1} a + (I_k - B_0)^{-1} B_1 x_{t-1} + ... + (I_k - B_0)^{-1} B_p x_{t-p} + (I_k - B_0)^{-1} e_t \tag{4.6}$$

Substituting the matrix $(I_k - B_0)$ for *B*, I obtain following equation:

$$x_t = v + A_1 x_{t-1} + \ldots + A_p x_{t-p} + \varepsilon_t \tag{4.7}$$

Where:

$$v = B^{-1} a$$
$$A_i = B^{-1} B_i$$
$$\varepsilon_t = B^{-1} e_t$$

Note that in the right side of Equation 4.7 (the standard VAR) there are only predetermined variables. Therefore, each equation in the system can be estimated using the Ordinary Least Square (henceforth OLS). Moreover, the OLS estimates are consistent and asymptotically efficient. The vector ε_t is like e_t, with the difference being that the covariance matrix $\sum \varepsilon$ is not the same diagonal matrix as $\sum e$, since the matrix B has elements other than zero outside of the main diagonal. Also we can see that in Equation 4.2 the variance is found in the main diagonal of the matrix, whereas the covariance is outside of the main diagonal. This profile of VAR is called the “standard unrestricted VAR” (Lütkepohl, 2005). Consequently, each VAR in Equation 4.7 can be extended easily to VAR (p) processes p>1 because any VAR (p) process can be written in VAR (1) form:

$$X_t = V + AX_{t-1} + U_t \tag{4.8}$$

Where,

$$X_t = \begin{bmatrix} x_t \\ x_{t-1} \\ \vdots \\ x_{t-p+1} \end{bmatrix}, \quad V = \begin{bmatrix} v \\ 0 \\ \vdots \\ 0 \end{bmatrix}, \quad \mathbf{A} = \begin{bmatrix} A_1 & A_2 & \cdots & A_{p-1} & A_p \\ I_K & 0 & \cdots & 0 & 0 \\ 0 & I_K & \cdots & 0 & 0 \\ \vdots & \vdots & \ddots & \vdots & \vdots \\ 0 & 0 & \cdots & I_K & 0 \end{bmatrix}, \quad U_t = \begin{bmatrix} \varepsilon_t \\ 0 \\ \vdots \\ 0 \end{bmatrix}$$

$$(K_p \times 1) \qquad (K_p \times 1) \qquad (K_p \times K_p) \qquad (K_p \times 1)$$

Let me explain the stability condition of VAR in the first order and for higher order systems: Equation 4.8 expresses the variables of VAR in the first order as a linear combination of lagged values of itself and lagged values of all groups.

In practice, the VAR equations may be broadened by including deterministic time trends and other exogenous variable. Using the iteration method or differencing the variables of Equation 4.8 (starting at some time t =1), I obtain the following:

$$X_1 = v + A_1 X_0 + \varepsilon_1$$
$$X_2 = v + A_1 X_1 + \varepsilon_2 = v + A_1(v + A_1 X_0 + \varepsilon_1) + \varepsilon_2$$
$$(I_k + A_1)v + A_{1^2} X_0 + A_1\varepsilon_1 + \varepsilon_2$$

I_k is the identity matrix. After n iterations, I get the equation:

$$X_t = (I_k + A_1 + A_1^2 + \dots\dots\dots\dots + A_1^n)v + A_1^n X_0 + \sum_{i=0}^{n} A_1^i \varepsilon_{t-1} \qquad (4.9)$$

If these iterations are continued, it clear that convergence requires the expression A_1^n to disappear as n approaches infinity.

$$\mathbf{A}^n \mathbf{X_0} \xrightarrow[n\to\infty]{} \mathbf{0}$$

$$(I_k + A_1 + A_1^2 + \dots\dots\dots\dots + A_1^n)v \xrightarrow[n\to\infty]{} (I_k - A)^{-1} v$$

Moreover, the vector ($X_1, X_2,..., X_n$) is uniquely determined by X_0 and $(\varepsilon_1, \varepsilon_2,..., \varepsilon_n)$. The joint distribution is determined by the joint distribution of $X_0, \varepsilon_1.........\varepsilon_t$. Therefore, the behavior of X_t will depend on the property of the matrix A. If the eigenvalues of the companion matrix of A have a modulus less than one, then it lies within the unit circle and the stability condition of VAR is satisfied (Enders, 2004). If the eigenvalues of the companion matrix A have a modulus equal to one or greater than one, then it lies outside of the unit circle, and therefore the process leads to an explosive system. For further information concerning eigenvalues and eigenvectors of the A matrix, please see Appendix 3. However, I must point out that VAR is established by the assumption of a stability process and a starting process from an infinite point in the past, whereas this is not an appropriate model for an explosive process.

4.3.1 Hypothesis testing in VAR

Since VAR models express the correlation among a group of variables, they are often used to analyze some aspects of relationships between variables of interests. In this context, I should introduce the Granger Causality test.

4.3.1.1 Granger Causality test

In general VAR formulations such as Equation 4.8, the lagged values of each variable exist in all equation of the VAR. Therefore, I use this test to check whether a specific variable or group of variables plays any role in the determination of other variables in the VAR.

Granger (1969, p. 430) defines a concept of causality which is easy to use in the context of VAR modeling. Hence, this test has become popular in recent years. The basic idea is that a cause cannot follow its effect. For example: if variable y_2 causes variable y_1, the former variable needs to improve the prediction of the latter variable because lagged values of variable y_2 contain additional information about variable y_1. If the lagged values of y_2 do not play any role in the determination of y_1, it is said that y_2 does not "Granger-cause" y_1. Since in the structural VAR the coefficient of each equation is estimated by itself, the Granger Causality test is valid only in the F-test (Gujarati, 2003, p. 620). The hypothesis that y_2 does not Granger-cause y_1 can be tested by simply running the VAR of y_1 on lagged values of y_1 and y_2, and then examining whether the coefficient of the later variable is significantly different from zero. If an F-test of the lagged coefficient of variable y_2 within the equation y_1 does not show statistical significance level, then I may conclude that y_2 does not Granger-cause y_1. Many researchers have recently applied Granger Causality to test the link between money stock, real GDP, and prices[17].

I should point out, however, that a Granger Causality test is only useful to test coefficients of one equation, whereas when I test many equations, the F-test is not appropriate. Therefore, it is not possible with an F-test to test the Granger Causality of one variable against the other variables, or to make a block exogenity test of any variable.

A block exogenity test is useful for detecting whether one should incorporate a particular variable into a VAR model. Therefore, the Granger Causality test could be called a "block causality" test. Nevertheless, the utility of Granger Causality is to determine whether lags of one variable y_2 Granger-cause another variable y_1 in the system. Block exogeneity will restrict all lags of y_2 in many equations to be equal to zero. However, the simplest test for cross-equation in the VAR is the likelihood ratio-test, which is based on the variance-covariance matrix (VCV) of the residuals.

4.3.1.2 The Likelihood Ratio test-LR-test

The likelihood ratio test is usable for any type of cross-equation restriction. The LR-tests statistics are established by Sims (1980, pp. 1-49), in which he uses the variance and covariance matrices of the unrestricted and restricted systems ($\sum_r \ and \sum_u$) and defines c as the maximum number of regressors contained within the equations. So, the LR-test is:

$$LR = (T - c)(\log|\Sigma_r| - \log|\Sigma_u|)$$

Where:

---

[17] Christiano and Ljngquist (1988); Sims (1980); Stock and Watson (1989); Estrella and Fuhrer (2003); Walsh (2003); Gillman and Nakov (2004); and others.

T = number of usable observations;

$\log\left|\Sigma_n\right|$ = is the natural logarithm of the determinant of Σ_n

c = number of parameters estimated in each equation of the unrestricted systems.

This statistic has a χ^2 (chi-square) distribution with the number of degrees of freedom equal to the number of restrictions in the system. With the LR-test, I can evaluate many equations in the VAR – which could not be accomplished with an F-test (Enders, 2004). Furthermore, this test provides a way to make some restriction on the model, whereby the LR test shows each restriction to be a significant or insignificant level. If the test results show a significant level, then I can conclude that my restriction is good (and vice versa).

4.3.2 Testing VAR residuals

There are several tests for examining residuals in the VAR model, such as: the Ljung-Box *(Q-test)* test is used to examine autocorrelation of residuals; the normal distribution of VAR residuals by Jarque-Berra test *(JB-test);* and the model for testing autoregressive conditional heteroscedasticity *(ARCH-test).*

Ljung and Box (1978, pp. 298-300) provide this equation for estimating the autocorrelation of residuals: $Q = T(T+2)\sum_{k=1}^{s} r_k^2 /(T-k)$, where T is the sample size and r is the coefficient of autocorrelation. The Q-statistic is asymptotically χ^2 distributed with s degrees of freedom. If the calculated value of Q exceeds the critical value of χ^2 with 4 degrees of freedom, then at least one value of r_k is statistically different from zero at the specified significance level. In other words, if the calculated value of Q exceeds the appropriate value in a X^2 table, then we can reject the null hypothesis of no significant autocorrelation. Note that rejecting the null hypothesis requires accepting an alternative that at least one autocorrelation is not zero (Gujarati, 2003).

The JB test for normality is an asymptotic, or large-sample, test following the chi-square distribution with 2 degrees of freedom. The equation has been given by Jarque and Berra (1987, pp. 163-173) (JB test):

$$JB = n\left[\frac{S^2}{6} + \frac{(K-3)^2}{24}\right]$$, where **S** represent skewness and **K** kurtosis.

Since for a normal distribution the value of **skewness** is zero and value of **kurtosis** is 3, under the null hypothesis the residuals are normally distributed. If the *p* value is sufficiently low, we can reject the null hypothesis that the residuals are normally distributed, whereas if the p value is high, we cannot reject the null hypothesis of the normality assumption.

I test for the presence of autoregressive conditional heteroscedasticity according to the following equation:

$$u^2 = \gamma_0 + \sum_{j=1}^{p} \gamma_j u_{t-j}^2 + e_t$$

With this equation I can test the possibility that all coefficients $\gamma_1, \gamma_2, ...\gamma_p$ are equal to zero, which would mean that the variance of the residuals is constant over the period (Johansen, 1995, p. 24).

4.3.3 Criteria for VAR Order Selection

For this purpose, I use four criteria in selecting the most appropriate model: **AIC, FPE, HQ and SC.** Before estimating VAR, it necessary to choose the order of the VAR as it will be included in the model. It is important because the behavior of the impulse response function and forecast error variance decomposition depends on the order of the VAR model. By incorrect selection of order in the VAR, we are likely to obtain different outcomes. Therefore, selection of order in the VAR is a necessary step in designing a good model. For example, adding an incorrect or additional lag for *p* reduces the sum of the squares of the estimated residuals. Adding such a lag requires the estimation of additional coefficients and an associated loss of degrees of freedom (Lütkepohl, 2005, p. 146). Moreover, the inclusion of extraneous coefficients reduces the forecasting performance of the fitted model.

Therefore, as Akaike (1971, pp. 160-180) suggests, the first test for selecting VAR order is called the final prediction error (FPE) criterion, that is,

$$FPE(m) = \det\left[\frac{T+Km+1}{T}\frac{T}{T-K_m-1}\sum(m)\right] = \left[\frac{T+K_m+1}{T-K_m-1}\right]^K \det\left(\sum(m)\right).$$

Here, m denotes the order of the VAR processes fitted to the data, T is the sample size, and K is the dimension of the time series. Based on the *FPE* criterion, the order of minimizing the FPE values is chosen as estimate p. That is, the minimal value of the *FPE* criterion would be chosen as the lag in the VAR.

Akaike (1974, pp. 715-725), though using quite different reasoning, derives a very similar criterion called *AIC* (Akaike's Information Criterion). For a VAR (m) process, the criterion is defined as:

$$AIC(m) = \ln\left|\sum(m)\right| + \frac{2}{T}(\text{number of freely estimated parameters}) = \ln\left|\sum(m)\right| + \frac{2mK^2}{T}$$

In the same procedure, the order that will minimize the AIC criterion-value is chosen.

The third model regarding order in the VAR is suggested by Hannan and Quinn (1979, pp. 189-196). It is called the HQ criterion:

$$HQ(m) = \ln\left|\sum(m)\right| + \frac{2\ln\ln T}{T}mK^2$$

Therefore, the order is selected that will minimize the HQ criterion-value.

Finally, I apply the SC criterion in order to choose the order of VAR. That is:

$$SC(m) = \ln\left|\sum(m)\right| + \frac{\ln T}{T}mK^2$$

By these criteria, I choose the order of the VAR in the Macedonian case.

4.3.4 Impulse response function-Choleski decomposition and Bernanke Sims decomposition

In a previous section, I discuss the test for Granger Causality between the variables. However, it is often of interest to know the specific response of one variable to an exogenous shock of another variable, while including a number of other variables in the system as well. In the following discussion, I examine the relationship between two variables in a higher dimensional system in order to draw out the response of one variable to an impulse in another variable. In other words, I present the effect of an exogenous shock of one variable to many or all variables in the system. This type of impulse response analyses is called "impulse response function" or "dynamic impact multiplier" (Enders, 2004, p. 305).

In the previous section, I discuss the unrestricted VAR (1),

$$X_t = V + AX_{t-1} + U_t$$

of VAR (p) process.

If the stability assumption is satisfied, I can write this equation in a moving average (MA) representation:

$$X_t = \boldsymbol{\mu} + \sum_{i=0}^{\infty} \mathbf{A}^i U_{t-i} \qquad (4.10)$$

The process of X_t is expressed with past and present error or innovation vectors U_t and the mean term, such that: $\boldsymbol{\mu} = E(X_t) = (I_{Kp} - \mathbf{A})^{-1}\mathbf{v}$ for all $t = 0, \pm1, \pm2, \ldots,$. In the previous section, I also point out that the distribution and joint distributions of X_t is uniquely determined by the distributions of the U_t process. Therefore, in Equation 4.10 we can see that the stable VAR has a constant μ for all t, whereas $\sum_{i=0}^{\infty} \mathbf{A}^i U_{t-i}$ shows deviation from the mean of the VAR process (Lütkepohl, 2005, p. 41).

However, the standard or reduced unrestricted VAR does not show instant shocks. The vector x_t can be returned back from the vector X_t using the $\left(K \times K_p\right)$ matrix of order $J = \left[I_k ...0 \ldots 0\right]$, consequently the vector x_t is obtained as $x_t = JX_t$. That is, $E\left(x_t\right) = J\mu$ is constant for all periods, whereas autocovariance is time invariant. Thereby, x_t can be found by premultiplying Equation 4.10 by the matrix $J = \left[I_k ...0 \ldots 0\right]$, such as:

$$x_t = JX_t = J\boldsymbol{\mu} + \sum_{i=0}^{\infty} J\mathbf{A}^i J' JU_{t-i} = \mu + \sum_{i=0}^{\infty} \Phi_i \varepsilon_{t-i} \tag{4.11}$$

where: $\mu = J\boldsymbol{\mu}$; $\Phi_i = J\mathbf{A}^i J'$; $\varepsilon_t = JU_t$. Hence, in matrix J we can draw out the first K element from the vector $\boldsymbol{\mu}, X_t, U_t$, i.e. returning back the vector μ, x_t, ε_t , as well as the first row of the matrix of order from the companion matrix $\mathbf{A}$, whereas Φ_i is the dynamic impact multiplier.

In addition, as the reduced VAR is over-parameterized and unrestricted, I must make restrictions in the model, because many of the coefficients that are estimated can be properly excluded from the model. In other words, I should identify the model by employing a recursive approach, and, in doing so, the impact of orthogonal shock can be found by Choleski decomposition, whereby structural shock can be examined.
However, I must recall Equation 4.7**,**

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

Where:

$$v = B^{-1} a$$
$$A_i = B^{-1} B_i$$
$$\varepsilon_t = B^{-1} e_t$$

From the reduced VAR I have already obtained v and A_i. Now, I must estimate the element of the matrix B and element of the covariance matrix $\sum e$ in the structural VAR.

The relation between the VCV matrices from the reduced and structural VAR are as follows:

$$\Sigma_e = \left(e_t e_t^{'}\right) = B\Sigma_\varepsilon B'$$

Whereby, using Choleski decomposition, I can receive from the reduced VAR $\left(K^2 - K\right)/2$ different elements of matrix B, where the model is just identified, and therefore I can write the covariance matrix as the product $\Sigma_e = PP^{'}$, where P is a lower triangular non-singular matrix with positive diagonal elements (Enders, 2004, p. 294).

By defining a diagonal matrix D with the same diagonal of the matrix P, I can find solutions for B and Σ_e, such as: $B = \left(PD^{-1}\right)^{-1}$ and $\Sigma_e = DD^{'}$. Therefore, the covariance matrix Σ_e will be a diagonal matrix of order $\left(K \times K\right)$ with variances on the main diagonal, whereas matrix B will be lower triangular matrix of order $\left(K \times K\right)$ with one on the main diagonal. Since I know the matrix B and covariance matrix Σ_e, I can compute the effect of orthogonal shocks e_t on the system. From the equation:

$x_t = \left(I_k - B_0\right)^{-1} a + \left(I_k - B_0\right)^{-1} B_1 x_{t-1} + \ldots\ldots\ldots\ldots + \left(I_k - B_0\right)^{-1} B_p x_{t-p} + \left(I_k - B_0\right)^{-1} e_t$, it can be seen that the element $\left(I_k - B_0\right)^{-1} = B^{-1}$ shows the instantaneous effect of the shock e_t on the system. Hence, $B^{-1}\left(\Sigma_e\right)^{\frac{1}{2}}$ shows the instantaneous impact of one standard deviation on the system. Recall that Σ_e is the diagonal covariance matrix of the structural shock. Since I defined $\left(\Sigma_e\right)^{\frac{1}{2}} = D$ (recall $\Sigma_e = DD^{'}$), I can denote $B^{-1}\left(\Sigma_e\right)^{\frac{1}{2}}$ as $B^{-1}D = P$. From MA, I have already found $x_t = \mu + \sum_{i=0}^{\infty} \Phi_i \varepsilon_{t-i}$; the coefficient Φ_i is a dynamic impact multiplier.

Hence, I can receive the impulse-response functions of orthogonal impulse if I multiply matrices Φ_i (whose elements are nonorthogonal impulse-response functions) by matrix P. In other words, I can write:

$$\mathbf{\Theta}_i = \Phi_i \mathrm{B}^{-1}\left(\Sigma_{\mathbf{e}}\right)^{\frac{1}{2}} = \Phi_i \mathrm{P} \; ; \qquad \text{for all } i = 1, 2, \ldots, n$$

where, the elements $\mathbf{\Theta}_i$ is the response of the system by one standard deviation. Moreover, the *jk-th* element of $\mathbf{\Theta}_i$ is assumed to represent the effect on variable j by a unit innovation in the *k-th* variable that will occur in $t+1$.

In continuing, I can show the matrix B_0, which is the Choleski decomposition and Bernanke-Sims decomposition throughout matrix B. As I know from Equation 4.1, only the matrix B_0 contains the structural coefficient of instantaneous impact among the variables in the vector x_t. Since matrix B is a lower triangular matrix with one on the main diagonal

$$B = \begin{bmatrix} 1 & 0 & 0 & \cdots & 0 \\ \beta_{21} & 1 & 0 & \cdots & 0 \\ \beta_{31} & \beta_{32} & 1 & & \vdots \\ \vdots & \vdots & & \ddots & 0 \\ \beta_{K1} & \beta_{K2} & \cdots & \beta_{K,K-1} & 1 \end{bmatrix}$$

the matrix B_0 is:

$$B_0 = \left(I_K - B\right) \text{ or } B_0 = \begin{bmatrix} 0 & 0 & 0 & \cdots & 0 \\ -\beta_{21} & 0 & 0 & \cdots & 0 \\ -\beta_{31} & -\beta_{32} & 0 & & \vdots \\ \vdots & \vdots & & \ddots & \\ -\beta_{K1} & -\beta_{K2} & \cdots & -\beta_{K,K-1} & 0 \end{bmatrix}$$

Therefore, matrix B_0 is a lower triangular matrix with zeros on the main diagonal. From matrix B_0 we can see that the first equation (first row) does not allow for an instantaneous effect on x_{1t}, whereas the second equation allows instantaneous effects of shock in the second variable on x_{2t}. More generally, k_{th} equation contains $x_{1t}, \ldots, x_{k-1,t}$ on the right side, but does not contain $x_{kt}, \ldots, x_{kt}$.

Therefore the first variable in the system will instantaneously affect all of the variables, whereas none of the variables will affect the first variable. Moreover, the second variable will affect instantly all variables (except the first), whereas only the first variable will affect the second variable, and so on. I must pay attention concerning the ordering of variables when using this decomposition because different orderings will produce different outcomes. In econometrics, such a system is called a recursive model or Wold- Causality.

In contrast to Choleski decomposition, which is mechanic and does not take into account economic theory, in the Bernanke-Sims decomposition the ordering of variables is not important; however, it requires sufficient knowledge concerning the economic theory. Bernanke-Sims decomposition minimizes the coefficient relating to the restriction on matrix B as well as the restriction on covariance matrix $\sum_e$. With this methodology, it is possible to identify whether the structural VAR is only identified or if it is overidentified. I examine the procedure for identifying and overidentified system proposed by Sims (1986, pp. 4-20).

$$-2\log[\det(A)] + \log[\det(\sum A \sum A')]$$

Therefore, obtaining the unrestricted variance/covariance matrix $\sum_e$ in the reduced-form VAR, the determinant of this matrix is an indicator of the overall fit of the model. Based on this equation, Sims and Bernanke obtain structural coefficients by the proper restrictions and maximize the likelihood function with respect to the free parameters of matrix B and covariance matrix $\sum_e$.

Sims claims that by this method the structural VAR can be identified as far as it is exactly identified, or overidentified, nevertheless that matrix B has less than $(K^2 - K)/2$ respectively free parameters. Therefore, he analyzes six variable VAR: real GDP, real business fixed investment (i), GDP-deflator (p), the money supply as measured by M1 *(m)*, unemployment (u), and the treasury bill rate (r). He used 4 lag of each variable and a constant term. Sims obtained 36 impulse response functions by Choleski decomposition with this ordering: $y \to i \to p \to m \to u \to r$. According to Sims, some of the impulse response functions have reasonable interpretations. However, the responses of some variables to money supply shock are unreasonable. The impulse-response functions suggests that money supply shock instantly has a modest effect on prices and real GDP due to menu cost, rigidity of real GDP, etc. Therefore, Sims proposed an alternative decomposition that is consistent with money market equilibrium. Sims restricts the B matrix such that:

$$B = \begin{bmatrix} 1 & \beta_{12} & 0 & 0 & 0 & 0 \\ \beta_{21} & 1 & \beta_{23} & \beta_{24} & 0 & 0 \\ \beta_{31} & 0 & 1 & 0 & 0 & \beta_{36} \\ \beta_{41} & 0 & \beta_{43} & 1 & 0 & \beta_{46} \\ \beta_{51} & 0 & \beta_{53} & \beta_{54} & 1 & \beta_{56} \\ 0 & 0 & 0 & 0 & 0 & 1 \end{bmatrix} \quad x_t = \begin{bmatrix} r \\ m \\ y \\ p \\ u \\ i \end{bmatrix}$$

We can see from the matrix B that there are 17 zero restrictions, instead of the $(6^2 \times 6)/2 = 15$ restrictions relating to the Choleski decomposition.

In my empirical work, I employ both Choleski decomposition and Bernanke decomposition in order to compare the results between the first and second decomposition, i.e. to obtain results which are more robust.

4.3.5 Forecast Error Variance Decomposition

The VAR relies on the general proposition that economic variables tend to move together over time and to be autocorrelated. Therefore, the forecasts error variance is decomposed into the components accounted for by its "own" innovations and by innovations in the different variables of the system (Lütkepohl, 2005, p. 94). Let me assume that I have a stable VAR (p) process. The minimal mean square forecast error for horizon *h* in time *t* is the conditional expectation:

$$E_t(x_{t+h}) = E(x_{t+h} \mid \Omega_t) = E(x_{t+h} \mid \{x_s \mid s \le t\})$$

where Ω_t is the informational set available in time t. Hence, for VAR *Kp* dimensional of VAR (1) is:

$$X_t = \mathbf{v} + \mathbf{A}X_{t-1} + U_t \,,$$

I can recursively compute the conditional expectation for different horizons starting from *h*=1:

$$\begin{aligned}
E_t(X_{t+1}) &= \mathbf{v} + \mathbf{A}X_t \\
E_t(X_{t+2}) &= \mathbf{v} + \mathbf{A}(\mathbf{v} + \mathbf{A}X_t) = (I_{Kp} + \mathbf{A})\mathbf{v} + \mathbf{A}^2 X_t \\
&\vdots \\
E_t(X_{t+h}) &= (I_{Kp} + \mathbf{A} + \mathbf{A}^2 + \cdots + \mathbf{A}^{h-1})\mathbf{v} + \mathbf{A}^h X_t
\end{aligned}$$

I already know that:

$$X_{t+h} = (I_{Kp} + \mathbf{A} + \mathbf{A}^2 + \cdots + \mathbf{A}^{h-1})\mathbf{v} + \mathbf{A}^h X_t + \sum_{i=0}^{h-1} \mathbf{A}^i U_{t+h-i} \,.$$

Therefore the forecast error will be:

$$X_{t+h} - E_t(X_{t+h}) = \sum_{i=0}^{h-1} \mathbf{A}^i U_{t+h-i} \,.$$

When I extrapolate the vector *Xt* to vector x_t, I obtain:

$$x_{t+h} - E_t(x_{t+h}) = \sum_{i=0}^{h-1} J\mathbf{A}^i J' J U_{t+h-i} = \sum_{i=0}^{h-1} \Phi_i \varepsilon_{t+h-i} \,,$$

This for orthogonal impulses would be:

$$x_{t+h} - E_t(x_{t+h}) = \sum_{i=0}^{h-1} \Phi_i \varepsilon_{t+h-i} = \sum_{i=0}^{h-1} \Phi_i P P^{-1} \varepsilon_{t+h-i} = \sum_{i=0}^{h-1} \Theta_i e_{t+h-i} \,.$$

Denoting the *mn-th* element of Θ_i with $\theta_{mn,i}$, the *h*-step forecast error of the *j-th* component of x_t is:

$$x_{j,t+h} - E_t\left(x_{j,t+h}\right) = \sum_{i=0}^{h-1}\left(\theta_{j1,i}e_{1,t+h-i} + \cdots + \theta_{jK,i}e_{K,t+h-i}\right) = \sum_{k=1}^{K}\left(\theta_{jk,0}e_{k,t+h} + \cdots + \theta_{jk,h-1}e_{k,t+1}\right).$$

Thus, the forecast error of the *j-th* component potentially consists of innovations $\left(e_{1t}........e_{kt}\right)$ of all of the other components. Of course, some of the $\theta_{mn,i}$ may be zero, so the innovations of some components may not appear in the above equation. Since the $w_{k,t}$ are uncorrelated and have a variance of one, the Minimal Square Error (henceforth-MSE) of $x_{y,t}(h)$ is:

$$E\left(x_{j,t+h} - E_t\left(x_{j,t+h}\right)\right)^2 = \sum_{k=1}^{K}\left(\theta^2{}_{jk,0} + \cdots + \theta^2{}_{jk,h-1}\right)$$

Where, $\theta^2{}_{jk,0} + \cdots + \theta^2{}_{jk,h-1} = \sum_{i=0}^{h-1}\left(\varepsilon_j^{'}\Theta_i\varepsilon_k\right)^2$ is sometimes interpreted by the contribution of innovation in variable *k* to the forecast error variance or MSE of the *h*-step forecast of variable *j* (Lütkepohl, 2005, p. 64). Here, e_k is the *k-th* column *of* I_k. Dividing this equation by MSE gives:

$$\omega_{jk,h} = \sum_{i=0}^{h-1}\left(\varepsilon_j^{'}\Theta_i\varepsilon_k\right)^2 / \mathrm{MSE}\left[E_t\left(x_{j,t+h}\right)\right],$$

Where $\mathrm{MSE}\left[E_t\left(x_{j,t+h}\right)\right]$ is the main diagonal of matrix $\mathrm{MSE}\left[E_t\left(x_{t+h}\right)\right] = \sum_{i=0}^{h-1}\Theta_i\Theta_i^{©}$.

Since the decomposition of forecast error variance decomposition is based on the matrix of response by orthogonal impulses, it is affected by the decomposition of matrix B. It is a good practice to examine forecast error decomposition for different horizons. Lately, researchers have used forecast error decomposition to analyze the dynamic effect of monetary and fiscal policy or to analyze to what degree monetary shocks are contributing to the fluctuation of macroeconomic variables[18]. However, in my dissertation, I use forecast error decomposition to examine the effect of monetary policy on real GDP and prices.

4.4 Vector Error Correction Model (VECM)-Econometric Methodology

4.4.1 Econometric methodology-VECM

In contrast to the previous econometric methodology SVAR, where the time series are non-stationary in level and are analyzed in the short term, the VECM contains stationary time series, which are integrated in the first order or second order and converge to their "own" long-term equilibrium. Therefore, by VECM methodology I test the long-term effect of the monetary and fiscal policy and exchange rate regime on real GDP and prices. This methodology also tests the short-term effects of monetary and fiscal policy and exchange rate regime.

To establish the linear combination among the variables in the long-term equilibrium, I must employ the concept of cointegration. In the beginning, I must check the nature of trends in the time series in order to examine linear combinations of these variables. In other words, I must check whether a trend is stochastic or deterministic. This work is performed with the augmented Dickey- Fuller test, in order to detect the time series, which are called in economic jargon difference-stationary (DS) or trend-stationary (TS) processes. If the time series exhibits difference-stationarity, they can be transformed into stationary processes by differencing. However, if the time series exhibit trend-stationarity, they can be transformed into stationary processes by removing the deterministic trend (Gujarati, 2003).

In addition, if the time series by Dickey-Fuller test shows a unit root, we may conclude that such time series are difference-stationary. On the other hand, if the time series do not show a unit root, we may conclude that such time series are trend-stationary.

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[18] Sims (1992); Bernanke and Blinder (1992); Sims and Zha (1998); Konuki (2000); Canova and De Nicola (2002); Blanchard and Perotti (2002); Mountford and Uhling (2005); Bernanke et al. (2003); Bin Li (2005); Giovanni and Giordani (2006); and others.

4.4.1.1 Testing of trend and Unit-Roots: Dickey- Fuller Test

Most time series exhibit visually identifiable trend patterns, however, mere observation of time series visually without any testing is perilous. In other words, many of the time series visually exhibit trends, but they are non-stationary, so the sample means do not appear to be constant or there is the strong appearance of heteroscedacity. In such circumstances, the assumption of constant variance (homoscadasticity) is inappropriate, since the stability of a VAR model or VECM depends on stationary variables that will be entered into the model. So I can say that x_t process is stationary if its mean and variance are constant over time and if the value of the covariance between two time periods depends only on the distance or lag between the two time periods and not on the actual time in which covariance is estimated.

According to the assumption in the VECM model, a shock in the economic system within a stationary time series is necessarily temporary. Over time, the effects of such shock will dissipate, and the series will revert or converge to its long-term mean level. On the other hand, in the nonstationary time series there is no long-term mean to which the time series returns. However, the process x_t is covariance stationary or weak stationary if:

$$E(x_t) = \mu$$
$$E(x_t - \mu)(x_{z-j} - \mu) = \begin{cases} \sigma^2 & \text{for} \quad j = 0 \\ 0 & \text{for} \quad j \neq 0 \end{cases}$$

It can be seen that the covariance stationary process has a mean and variance which are not a function of time; therefore, the mean and variance are constant through time.

As I point out above, time series that show trends can be trend-stationary or difference-stationary. Now I will explain how to transform time series from non-stationary to stationary processes in order to obtain stable VAR model or VECM model, and, as a result, I can examine long-term links among the variables. There are two approaches by which the time series could be analyzed. The first approach argues that the trend is deterministic due to a deterministic long-term growth of the real economy. Second, the approach of the “Real business cycle” school argues that technological advancements have permanent effects on a series. Given that technological innovations are stochastic, the trends should also have stochastic elements. To conclude, it will be useful to consider models with stochastic and deterministic trends.

The deterministic trends will be linear time trends or polynomial time trends, using the following equations:

$x_t = a_0 + a_1 t + e_t$ (Linear time trend)

$x_t = a_0 + a_1 t + a_2 t^2 + ... + a_n t^n + e_t$ (Polynomial time trend)

Here, t is a time trend ($t=1, 2, 3, ..., T$; T denotes the sample size), and $\{\varepsilon_t\}_{t=-\infty}^{\infty} \sim N(0, \sigma^2)$ is a Gauss process with white noise process. On the other hand, the stochastic trend can be as a random walk plus drift and noise model, whereby the deviation is an irregular component of series. Therefore, there are two types of non-stationary processes: stochastic trend and deterministic trend. The stochastic trend can be transformed from nonstationary to stationary by taking the first difference of the time series (or higher). Deterministic trends can be transformed from nonstationary to stationary by detrending time series. As result, I obtain two types of time series: difference-stationary processes and trend-stationary processes.

By examining the stochastic process of random walk with the drift model, the change in x_t, partially deterministic and partially stochastic processes could be estimated by adding a constant term a_0 into the random walk (Enders, 2004). Such as:

$$x_t = x_{t-1} + a_0 + e_t$$

Including the initial condition x_0, the general solution for x_t would be:

$$x_t = x_0 + a_0 t + \sum_{i=1}^{t} e_i$$

Hence, the behavior of x_t is run by two non-stationary components: a linear deterministic trend and the stochastic trend $\sum_{i=1}^{t} e_i$. By taking the first difference, I obtain:

$$\Delta x_t = a_0 + e_t \ .$$

Now it can be seen that the Δx_t sequence is equal to a constant plus a white-noise disturbance, which is stationary.

Furthermore, the expectation of x_t will be:

$$\begin{aligned}
&E(\Delta x_t) = E(a_0 + e_t) = a_0 \\
&Var(\Delta x_t) \equiv E(\Delta x_t - a_0)^2 = E(e_t)^2 = \sigma^2 \\
&Cov(\Delta x_t, \Delta x_{t-s}) = E\left[(\Delta x_t - a_0)(\Delta x_{t-s} - a_0)\right] = E(e_t e_{t-s}) = 0
\end{aligned}$$

The above equation shows that since the mean and variance are constant and the covariance between Δx_t and Δx_{t-s} depends solely on s, the $\{\Delta x_t\}$ sequence is stationary. This kind of processes is called integrated processes I *(d)*, where *d* denotes the order of integration. Generally, it is possible to transform the I (*d*) processes to stationary processes by differencing the processes of the *d* times series.

Now to explain the method by which deterministic trend processes can be transformed from nonstationary processes to stationary processes. An appropriate way to transform this model is to estimate the regression equation $x_t = a_0 + a_1 t + e_t$. Subtracting the estimated values of x_t from the observed series yields estimated values of the $\{e_t\}$ series. However, time series could be the trend polynomial such that $x_t = a_0 + a_1 t + a_2 t^2 + \ldots\ldots\ldots\ldots\ldots + a_n t^n + e_t$ where $\{e_t\}$ is a stationary process. Hence, detrending is obtained by regressing $\{x_t\}$ on a polynomial trend. There are also other methods that can detrend time series from nonstationary to stationary processes, such as ARMA estimation and the Hodrick-Prescot filter (the HP-filter).

As mentioned above, the augmented Dickey-Fuller test is used within the time series to detect whether the system contains a trend and whether the trend is deterministic or stochastic (Fuller, 1996). For example, consider the simple equation $x_t = a_1 x_{t-1} + e_t$, where $a_1 = 1$. By subtracting x_{t-1} from each side of the equation, I can write the equivalent form $\Delta x_t = \gamma x_{t-1} + e_t$, where $\gamma = a_1 - 1$. Of course, testing the hypothesis $a_1 = 1$ is equivalent to testing the hypothesis $\gamma = 0$. Therefore, Dickey and Fuller employ three different models that can be used to test the presence of a unit root:

$$\Delta x_t = \gamma x_{t-1} + e_t$$
$$\Delta x_t = a_0 + \gamma x_{t-1} + e_t$$
$$\Delta x_t = a_0 + \gamma x_{t-1} + a_2 t + e_t$$

The first equation is a pure random walk model, the second adds a drift term, and the third includes both a drift and linear time trend. The difference between the three equations is the presence of the deterministic elements a_0 and $a_2 t$. However, the parameter γ shows whether the time series have a unit root or not, so if $\gamma = 0$, the $\{x_t\}$ sequence contains a unit root. Using the ordinary least square (OLS), I obtain the estimated value of γ and associated error. Therefore, comparing the result of the τ (tau)-statistic and the value reported in the Dickey-Fuller table, I can determine whether to accept or to reject the null hypothesis of $\gamma = 0$. Under the null hypothesis $\gamma = 0$, if the calculated value τ is smaller than that reported by the Dickey-Fuller test, I cannot reject the null hypothesis that $\gamma = 0$, which indicates that the time series contain a unit root. However if the τ is larger than is the value reported by the Dickey-Fuller table, I can reject the null hypothesis that $\gamma = 0$, which indicates that the time series does not contain a unit root.

In my empirical research, I use critical values of the ADF test, which are shown by Enders (2004). However, Enders (2004) reports critical values of the ADF test that are published by Dickey-Fuller (1981).

4.4.1.1.1 Linear Combination of Integrated Variables

Let's start by the set of economic variables I use in my own research:

$$x_t = B_0 + B_1 x_{1t} + B_2 x_{2t} + B_3 x_{3t} + \ldots\ldots.. B_n x_{nt} + e_t$$

All variables are expressed in logarithmic form except those variables that are in percent (%). As I point out in the previous section, the system can be examined in the long term only if the variables are stationary, owing to their property to converge to their "own" long-term equilibrium. From the equation above, all variables are characterized as nonstationary $I_{(1)}$ time series. Thus, each variable can meander without any tendency to return to its long-term level. The equation reflects that there is the presence of a linear combination of such nonstationary variables. However, if we put all variables in the first difference, the difference of the time series will be stationary; therefore, we may claim that the original series are integrated in the first order. The assumption is that random variables also have to be e_t stationary. Moreover, if the original time series need to be differenced twice before they will become stationary, we may claim that the series are integrated in the second order. Thus, if the linear combinations of integrated variables are stationary, it could be claimed that such variables are cointegrated. In my research, all of the variables are integrated in the first order except for real GDP, which is integrated in the second order.

In the following subsection, I illustrate the concept of cointegration and error correction models.

4.4.1.1.2 Cointegration and Vector Error Correction Model

Cointegration means that despite being individually nonstationary, a linear combination of two or more time series can be stationary. The Johansen test is used to detect whether two or more time series are cointegrated. The concept of cointegration was introduced by Engle and Granger (1987). Their formal analysis considers a set of economic variables in long-term equilibrium, such as:

$B_1 x_{1t} + B_2 x_{2t} + ...+ B_n x_{nt} = 0$

Let B and x_t denote the vectors $(B_1, B_{2,}..............B_n)$ and $(x_{1t}, x_{2t},............, x_{nt})'$, the system is in long-term equilibrium if $Bx_t = 0$. The deviation from long-term equilibrium is called the equilibrium error (e_t); which is expressed $e_t = Bx_t$. In this context, the error equilibrium process also has to be stationary. Therefore, Engle and Granger provide the following definition of cointegration (see more in Mosconi, 1999; Enders, 2004; and Lütkepohl, 2005). The components of the vector $x_t = (x_{1t}, x_{2t},............, x_{nt})'$ are said to be cointegrated of order *d, b;* and therefore they are denoted by $x_t \approx CI(d,b)$. If all components of x_t are integrated of order d and there exists a vector $B = (B_1, B_2,.............B_n)$, then the linear combination of $Bx_t = B_1 x_{1t} + B_2 x_{2t} + ...+ B_n x_n x_{nt}$ is integrated in the order $(d - b)$ where $b > 0$. The vector B is called the cointegrating vector. Moreover, I can say that there are long-term links among the variables if the $x_{1t}, x_{2t},........, x_{nt}$ are all integrated $I_{(1)}$ processes and linear combination $x_t - B_0 - B_1 x_{1t} - B_2 x_{2t} - B_3 x_{3t} - .... - B_n x_{nt} = e_t$ is stationary, then the variables are cointegrated in the order (1, 1). The vector x_t is $x_{1t}, x_{2t},........, x_{nt}$ and cointegrating vector B is $(1 - B_0 - B_1 - B_2 - B_3).$, whereas the deviation from long-term equilibrium is e_t. Since $\{e_t\}$ is stationary, this deviation disappears over time.

In addition, the cointegration vectors are not unique. For example, if $(B_1, B_2,..............B_n)$ is a cointegrating vector, than for any nonzero value of λ, $(\lambda B_1, \lambda B_2,......\lambda B_n)$ is also a cointegrating vector. Hence, one of the variables is used to normalize the cointegrating vector by fixing its coefficient at unity. In our case, I normalize manufacturing price index and retail price index in order to research how the money stock and exchange rate affect them. Moreover, the number of different cointegrating vectors is called the cointegrating rank of x_t. Thereupon, if I include the cointegration vector in the reduced VAR, the VECM will be obtained. The VECM-model is a tool of jointly analyzing the short-term behavior of an economic variable with its long-term behavior. Therefore, in the Error

Correction Model, the short–term dynamics of the variables in the system are influenced by the deviation from the long-term equilibrium.

The basic model from the multivariate cointegration analyses is the following k dimensional VAR (p) model with Gauss errors:

$$x_t = A_1 x_{t-1} + \cdots + A_p x_{t-p} + \mu_0 + \Psi D_t + \Theta w_t + e_t \qquad (4.12)$$

Here, x_t is a vector of stochastic variables, $A_1, A_2, ..., A_p$ are matrices of parameters, μ_0 is a vector of constants, D_t is a vector of non-stochastic seasonal dummy variables, w_t is the dimensional vector of any intervention dummies, and e_t is a vector of disturbances (Mosconi, 1999, pp. 1-131, Enders, 2004). By subtracting x_{t-1} from each side of Equation 4.12 and then rearranging, I obtain the Vector Error Correction Model (VECM):

$$\Delta x_t = \sum_{i=1}^{p-1} \Gamma_i \Delta x_{t-i} + \Pi x_{t-1} + \mu_0 + \Psi D_t + \Theta w_t + e_t \qquad (4.13)$$

Here, $\Gamma_i \Delta x_{t-i}$ are the matrices of parameters that describe the short-term dynamic effect of the model, while $\prod = \alpha\beta'$ contains information regarding the long-term relationships of the variable in the models. Moreover, α and β are $p \times r$ matrices, while r is the number of cointegration relation. The columns of β are cointegrating vectors, while α are the loadings of the cointegrating vectors that show the speed of adjustment of the variables towards their long-term equilibrium.

Finally, I follow standard cointegration methodology as found in Johansen and Juselius (1990); Johansen (1995); Mosconi (1999); and Enders (2004).

4.4.1.1.3 Hypothesis testing for Cointegration: Johansen Methodology

The main feature of cointegration analyses is testing the rank of the Π matrix. This rank is equal to the number of independent cointegrating vectors. Evidently, if rank of Π=0, i.e. the matrix is null, it would indicate a usual VAR model in the first difference. However, if the matrix has a rank Π=1, there is a single cointegrating vector, and the expression Πx_{t-1} represents the Error-Correction Vector. The number of cointegrating vectors can be obtained by checking the significance level of the eigenvalues vectors of matrix Π, which should be different from zero. Suppose I obtain the matrix Π and an order of the *p* eigenvalues that is different from zero. In this case, the eigenvalues would be: $\lambda_1 > \lambda_2 > ..... > \lambda_p$. If the variables in x_t are not cointegrated and the rank of Π is zero and therefore all of these eigenvalues vectors would be equal to zero. Hence, ln(1)=0, and each of the expressions $\ln(1-\lambda_i)$ will be equal to zero because the variables are not integrated.

Johansen proposes the following two tests that can be used in order to identify cointegrating rank:

$$\lambda_{\text{trace}}(r) = -T\sum_{i=r+1}^{K}\ln\left(1-\hat{\lambda}_i\right)$$
$$\lambda_{\max}(r,r+1) = -T\ln\left(1-\hat{\lambda}_{r+1}\right)$$

Here, $\hat{\lambda}_i$ is the estimation of the eigenvalues of matrix Π order such as: $\hat{\lambda}_1 > \hat{\lambda}_2 > ... > \hat{\lambda}_p$, and *T* is the number of usable observations. In addition, the first statistic test gives the null hypothesis that the number of the distinct cointegrating vectors is less than or equal to *r* against a general hypothesis. The second statistics tests gives the null hypothesis that the number of cointegrating vectors is *r* against the alternative of *r+1* cointegrating vectors.

5 ECONOMETRIC MODEL OF TESTING DYNAMIC EFFECT OF MONETARY AND FISCAL POLICY AND EXCHANGE RATE REGIME ON REAL GDP AND PRICES IN THE REPUBLIC OF MACEDONIA

After reviewing the theoretical and empirical evidence of the dynamic effect of monetary, and fiscal policy and exchange rate regime on real GDP and prices and selection of the econometrics methodologies, let me now test the dynamic effect of monetary and fiscal and exchange rate regime on real GDP and prices in the Republic of Macedonia. The review of the empirical evidence – both from developed countries and countries in transition – serves as the foundation of my own empirical research in the case of the Republic of Macedonia.

At the end, the results of my empirical research evaluate the validity of the following three hypotheses:

$H1_1$: A change in the money stock does not have a significant effect on real GDP. A change in the short-term interest rate does not have an effect on real GDP. A change in the money stock has a strong effect on prices.

$H1_2$: A change in the primary fiscal deficit and government expenditure does not have a significant effect on real GDP. A change in taxation will have short-term effects on real GDP.

$H1_3$: Stability of the exchange rate, especially once such stability has been achieved at substantial cost, is important for macroeconomic stability. A change in the exchange rate primarily affects prices due to the strong pass-through effect of nominal exchange rate changes on domestic prices via import prices.

5.1 Econometrics model of testing short-term dynamic effect of monetary policy on real GDP and prices in the Republic of Macedonia

In this section, I investigate the dynamic effect of monetary policy changes on real GDP and prices in the Republic of Macedonia. The evaluation of the monetary policy is examined by two well-known monetary indicators: money stock and short-term interest rate channels. This empirical research tests the first hypothesis: **a change in the money stock does not have a significant effect on real GDP. A change in the short-term interest rate does not have an effect on real GDP. A change in the money stock has a strong effect on prices.**

For this purpose, I perform several tests: seasonality adjusting test; diagnostic test (JB-test, LB-test and ARCH-test); Granger-Causality-test; test for reaction of the real GDP and prices by the monetary disturbance, i.e. the dynamic effect of monetary disturbance on real GDP and prices. In addition, I test for fluctuation of real GDP and prices by such monetary action or forecast error variance decomposition of monetary disturbance on real GDP and prices.

5.1.1 Data in empirical research

I am limited to using data from 1997 to 2006 in my work, because time series for monthly government expenditures are only available from 1997 forward, and the data for 2007 are not yet available. If I were to use time series before 1997, I think that my research would be of lesser quality due to the high rate of inflation experience in the period 1992-1995. Therefore, I limit my empirical research to the period of 1997:01-2006:12. Because of the narrow time series, I am forced to use monthly data rather than quarterly in order to have more observation points and therefore to ensure that the results are robust. Most empirical research regarding countries in transition compensates for short periods of observation in the same manner (with the exception of Mayes, 2003, which uses annual data). In addition, Bernanke and Mihov (1998, pp. 869-902) and Christiano, Echenbaum and Evans (1996) and (1999) show that inferences gathered from quarterly data compare favorably with inferences gathered from monthly data.

In this work, I do take into account the important structural shocks or structural breaks, both internal (devaluation, war, add value taxes) and external (Kosovo war) in order to obtain robust outcomes.

The Macedonian variables in my first model are: manufacturing prices (henceforth MPI) and retail prices (henceforth RPI) indices, money stock (henceforth M1), lending short-term interest rate (henceforth IR) and real gross domestic product (henceforth real GDP). All variables are expressed in logarithmic form (denoted ln), with the exception of the interest rate (IR), (see Mosconi, 1999, p. 6). Hence, the coefficients on the logged levels measure the constant of elasticity. In order to be consistent with my models, I set both MPI and RPI because I expect strong links between MPI, RPI and the exchange rate in the last section. In addition, as I point out in the third chapter of this work, most recent research on both developed countries and countries in transition uses two well-known indicators in measuring the dynamic effect of monetary policy: *monetary aggregates and interest rates.* However, each of these indicators has its own problems.

The first problem is that the empirical evidence suggests that innovations in monetary aggregates are associated with increasing rather than decreasing interest rates-*liquidity puzzle* (Leeper and Gordon, 1992).

The second problem is that tight monetary policy is identified with positive interest rate innovations; it seems that prices increase rather than decrease-*price puzzle* (Leeper and Gordon, 1992, pp. 341-369; and Sims 1992, pp. 975-1011). Leeper, Sims, and Zha (1996, pp. 1-78) and Christiano, Echenbaum and Evans (1996a, pp. 16-34) suggest including commodity prices to account for this puzzle.

The third problem is that positive innovation in the interest rate is associated with impact depreciation of the local currency rather than appreciation – *exchange rate puzzle* (Sims, 1992; and Grilli and Roubini, 1995). However, we can see that both indicators have their problems in measuring the dynamic effect of monetary policy.

In addition, most of the empirical research regarding developed countries (developed financial markets) uses *federal fund rates as an indicator* in measuring the dynamic effect of monetary policy. Recently, Giovanni and Gordani (2006, p. 23) show that shocks to monetary aggregates have substantial and persistent effects on output and prices in the US. Cîtu (2003, p. 18) examines the economy of New Zealand and finds a similar pattern as in the developed countries – that money stock has an effect on output and prices in the short term.

In the countries in transition with shallow levels of financial intermediation in the banking and financial market and different intermediate targets of monetary strategy (e.g. exchange rates, inflation, monetary aggregates, and short-term interest rate), the different indicators have been taken into account when measuring dynamic effect of monetary strategy.

As I point out in the second chapter, the NBRM is using exchange rate as an intermediate target in order to achieve the final goal of price stability. Therefore, the short-term interest rate has no means to be chosen as an indicator in measuring the dynamic effect of monetary policy (see more on interest channels in Ganev et al., 2002, p. 22; Hafer and Kutan, 2001, p. 15; and Billmeier and Bonato, 2002, p. 15). Neverthless in this section I research both channels of monetary policy: the money stock and the short-term interest rate.

The sources of data are mainly from the National Bank of Republic of Macedonia, the Ministry of Finance, the Official State of Statistics Bureau of Republic of Macedonia and the Internationally Monetary Fund. *Full details concerning the data, including sources, are available in Appendix 2.*

5.1.2 Econometrics model and result

5.1.2.1 Testing short-term dynamic effect of monetary policy on real GDP and prices in Republic of Macedonia: SVAR Sims-approach

This empirical research has some features in common with previous empirical studies concerning developed countries and countries in transition.

The specification of the model is:

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

This is Equation 4.7, which I examine in the topic *SVAR methodology*, and therefore I begin the model with the five-dimensional vector. From Equation 4.7, vector x_t includes five variables: manufacturing prices (MPI), retail price index (RPI), money stock (M1), short-term interest rate (IR), and real GDP, whereas v is the vector of the constant. Except for the interest rate, all variables are expressed in logarithmic form in order to satisfy theoretical assumptions of constant elasticity models. In order to eliminate the negative structural impact of internal and external shock in the economy, I include in the equation vector D_t, which expresses dummy variables such as: the Serbia-Kosovo war, devaluation, value-added taxes, and the ethnic conflict in Republic of Macedonia. The vector e_t is the vector of structural disturbance.

In addition, the structural model is composed of five equations, and the time series are estimated consistently in levels with OLS (Ordinary least square). I also divide variables in the model into two blocks: the *non-policy vector*, which includes the log of MPI, the log of RPI, and the log of the real GDP; and the *policy vector*, which includes the log of M1 and IR with no log.

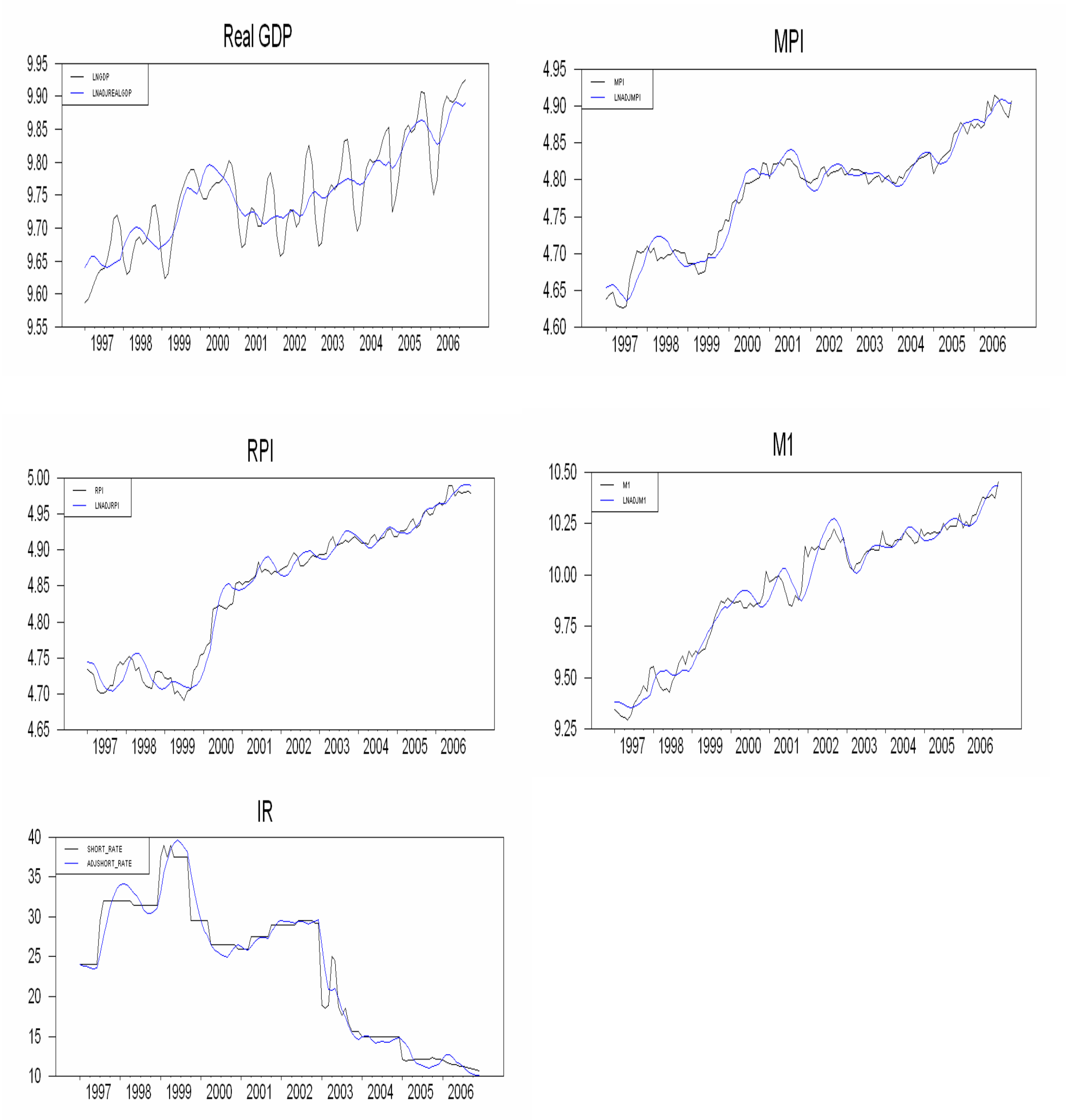
The manufacturing and retail price indices are included in the model for two reasons. First, I am interested in examining the dynamic effect of exchange rate on MPI and RPI, and therefore I expect a strong link between exchange rate, MPI, and RPI. Second, the final goal of the Central Bank in Macedonia is price stability, and therefore their introduction contributes to eliminating the so-called “price puzzle”.

As I point out in the fourth part, the Choleski decomposition model 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. On the other hand, in the Bernanke-Sims decomposition I must identify the model by means of the restriction on the B_0 matrix. I assume that the vector of non-policy variables cannot respond simultaneously to monetary shocks. This is a standard assumption in the literature regarding both monthly and quarterly data (Christiano et al., 1999). In addition, an important issue in estimating structural VAR-s (Bernanke-Sims decomposition), as in all system of equations, is the question of normalizing the coefficient of the dependent variable (Waggoner and Zha, 1997; and Stock and Watson, 2001). Thereby, first I must make a restriction in the matrix B_0, and then I need to reestimate the model by normalizing these coefficients to one. Before examining impulse response function and variance decomposition of monetary disturbance, I must select *VAR order, perform diagnostic tests, and test for Granger-Causality.*

To begin, I make a visual inspection of the time series. All of the time series show trends, with the exception of short-term lending interest rate, which shows a tendency to decline. Whether they are trend-stationary or difference-stationary is examined in the last section with VECM. However, I am interested in performing tests for seasonality, i.e. whether or not the time series exhibit seasonality. The model is explained in detail in Appendix 4.

In Appendix 4, I show the model proposed by Gardner (1985, pp. 1-28) 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, I make a seasonal adjustment of real GDP, and in my further research, I use seasonally adjusted real GDP. On the other hand, MPI, RPI, M1, and IR do not display seasonality, and therefore I use these time series without seasonal adjustments.

Figure 5.1: Logarithms of time series MPI, RPI, M1 and GDP, except IR.



Source: Author's calculations

To continue, I include these time series only in VAR level (Sims-approach) – estimated by OLS,. In Appendix 5, I 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.*

I test VAR-order according to criteria such as FPE, AIC, HQ and SC. Using these criteria, I select appropriate models that best fit the data. The tests show that by all criteria the optimal order is **VAR (1).** Therefore, I use VAR of order 1 in my further research. Moreover, it is interesting to note that in all of the models (with different variables involved), the FPE, AIC, HQ, and SC tests all lead to a conclusion of 1 lags (see Appendices for VAR criterion). This indicates that my VAR models are very robust to lags selection criteria. 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, I 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 I 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 M1 and IR.

There are problems with the M1 and IR 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. According to Johansen and Juselius (1992, pp. 211-244), non-normality is not such a problem in the short term if, in the long term, the variables prove to be weakly exogenous. As can be seen in the final section, M1 is a weak exogenous variable (see Brooks 2004).

Concerning the LB-test for non-significant residual autocorrelation, there are no statistically significant autocorrelated residuals and no visible patterns (see appendix 5).

The ARCH-test strongly rejects the assumption of heteroscedacity of VARs residuals.

Finally, I 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.***

Let me now test for Granger-Causality. That is, whether M1 and IR cause MPI, RPI and real GDP in Republic of Macedonia.

5.1.2.1.1 Granger-Causality test

In the VAR structures, is easy to test if one variable Granger-cause another variable included in the VAR. A test of causality is if the lags of one variable entered into the equation of another variable would cause the later variables. Since I have one lag, I have to restrict one coefficient, which is linked to the lag of one variable in the equation of the other variables. Hence, I have to use a standard *F-test for testing the null hypothesis* (restrictions) that this coefficient is equal to zero. If I can reject the null hypothesis, I can conclude that the lags of one variable affect other variables, or we can say that one variable Granger-causes another variable.

For example, looking at the first equation of VAR model regarding MPI

$$MPI_t = a + \sum_{i=1}^{1}\alpha_i MPI_{t-i} + \sum_{i=1}^{1}\beta_i RPI_{t-i} + \sum_{i=1}^{1}\gamma_i M1_{t-i} + \sum_{i=1}^{1}\theta_i IR_{t-i} + \sum_{i=1}^{1}\eta_i GDP_{t-i} + \Psi D_t + e_t$$

I have to restrict the parameter $\gamma_1 = 0$ in order to test the possibility that M1 Granger-causes MPI. If the null hypothesis can be rejected at the significance level of 5%, I may conclude that M1 Granger-causes MPI. Table 5.1 shows the results of the Granger-causality test.

Table 5.1 shows that the null hypothesis that M1 does not Granger-cause MPI, RPI and real GDP at the significance level of 5% is rejected, whereas it is not rejected for IR. Thus, I may conclude that M1 Granger-causes MPI, RPI, and real GDP, while it does not Granger-cause IR. On the other hand, none of these variables Granger-cause M1.

With respect to IR, the null hypothesis that IR does not Granger-cause MPI, RPI and real GDP is not rejected at the significance level of 5%. That is, IR does not Granger-cause MPI, RPI, M1 or real GDP. This test indicates that money stock is more important than the interest rate.

Table 5.1: Granger-Causality test: F- Statistics with p values in the parenthesis

		Dependent variables (equation)				
		MPI	RPI	M1	IR	real GDP
Independent variables (lags)	MPI		3.70 (0.13)	0.58 (0.44)	3.98 (0.12)	0.96 (0.32)
	RPI	0.09 (0.75)		0.49 (0.48)	2.95 (0.18)	0.14 (0.78)
	M1	1.90 **(0.04)**	3.50 **(0.01)**		0.01 (0.96)	11.12 **(0.00)**
	IR	0.21 (0.64)	3.55 (0.07)	1.58 (0.21)		1.12 (0.36)
	GDP	1.85 (0.14)	0.95 (0.33)	0.93 (0.33)	1.50 (0.15)	

Note: Significance test statistics (at the **5 %** level) are in bold. Author's calculation.

In addition, the Granger-Causality test does not show the spread over time or the dynamic movement of the variables. Next, I continue my research with dynamic effect and forecast error variance decomposition of monetary disturbance. With the impulse response functions, I research the dynamic effects of monetary policy shock on real GDP and prices via money stock and short-term interest rate channels as an indicator for measuring the effect of monetary policy in the Republic of Macedonia. The test is conducted based on the empirical research concerning developed countries and countries in transition.

5.1.2.1.2 Dynamic effect of money stock and short-term interest rate disturbance on real GDP and prices

As mentioned in Chapter 4, I can get the instantaneous effects (structural VAR) from the reduced VAR if I restrict matrix B_0. One way to accomplish this, as I mentioned, is to restrict matrix B_0 via Choleski decomposition, i.e. the recursive method. The shocks that come from structural VAR are called orthogonal shocks. The Choleski decomposition, originally proposed by Sims (1980, pp. 1-48), is the most well known method, and it is employed by McCarthy (2000), Billmeier and Bonato (2002), and many others. Furthermore, this methodological approach has been revised in detail by Stock and Watson (2001, pp. 3-27) and Mountford and Uhling (2005, pp. 1-38).

Following them, I must pay attention to the ordering of variables, i.e. which variable instantly affects some other variable. In my case, changes in the ordering do not significantly affect the outcomes. Nevertheless, I do pay attention concerning the ordering of the variables.

To perform the impulse response of orthogonal shocks, I use triangular decomposition with the following Wald ordering: $MPI \rightarrow RPI \rightarrow M1 \rightarrow IR \rightarrow realGDP$. I decided on this decomposition for several reasons: *First,* the final goal of the Central Bank in Macedonia is price stability, and therefore its policy is based on fighting inflation. Thereby, the Central Bank of Macedonia is maintaining stability by monitoring the prices indices. My assumption is that if MPI changes owing to internal or external shocks (e.g. changes in oil prices) RPI will instantly be affected. After that, the Central Bank in the Republic of Macedonia will react according to its target M1 in order to maintain the exchange rate as the nominal anchor. In this context, I assume that other variables will not react instantly to M1. A *second* reason is based on the theoretical assumption that M1 instantly affects real GDP (Sims, 1980, pp.1-40). In addition, real GDP could be affected by both channels: money stock and interest rate. I assume that IR instantly affects real GDP as well. In addition, the new Keynesian approach claims that money stock via interest rate instantly affects real GDP, while prices are rigid in the short term. I must emphasize that the new Keynesian approach regarding the rigidity of prices in the short term points to the possible impact of monetary policy on real GDP (see Appendix 1).

For the reasons mentioned above, I think that such ordering of the variables in the model is completely valid – both from a theoretical point of view and when considering the behavior of the Central Bank in the Republic of Macedonia.

The recursive approach (Choleski decomposition) is as follows:

$$x_t = \begin{bmatrix} MPI \\ RPI \\ M1 \\ IR \\ realGDP \end{bmatrix} \qquad B_0 = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ b_{21} & 1 & 0 & 0 & 0 \\ b_{31} & b_{32} & 1 & 0 & 0 \\ b_{41} & b_{42} & b_{43} & 1 & 0 \\ b_{51} & b_{52} & b_{53} & b_{54} & 1 \end{bmatrix}$$

In the first equation of the corresponding recursive VAR, MPI is the dependent variable and the regressors (explanatory variables) are lagged of all five variables plus disturbance of MPI.

In the second equation, RPI is the dependent variable and the regressors are lagged of all five variables, the current value of the MPI, and the disturbance of RPI.

The M1 is dependent variable in the *third equation,* and the regressors are lagged of all five variables, the current value of MPI, RPI, and the disturbance of M1.

The IR is dependent variable in the *fourth equation,* and the regressors are lagged of all five variables, the current value of MPI, RPI, M1, and the disturbance of IR.

Finally, in the *last equation, real* GDP is the dependent variable and the regressors are lagged of all five variables, the current value of MPI, RPI, M1, and the disturbance of real GDP.

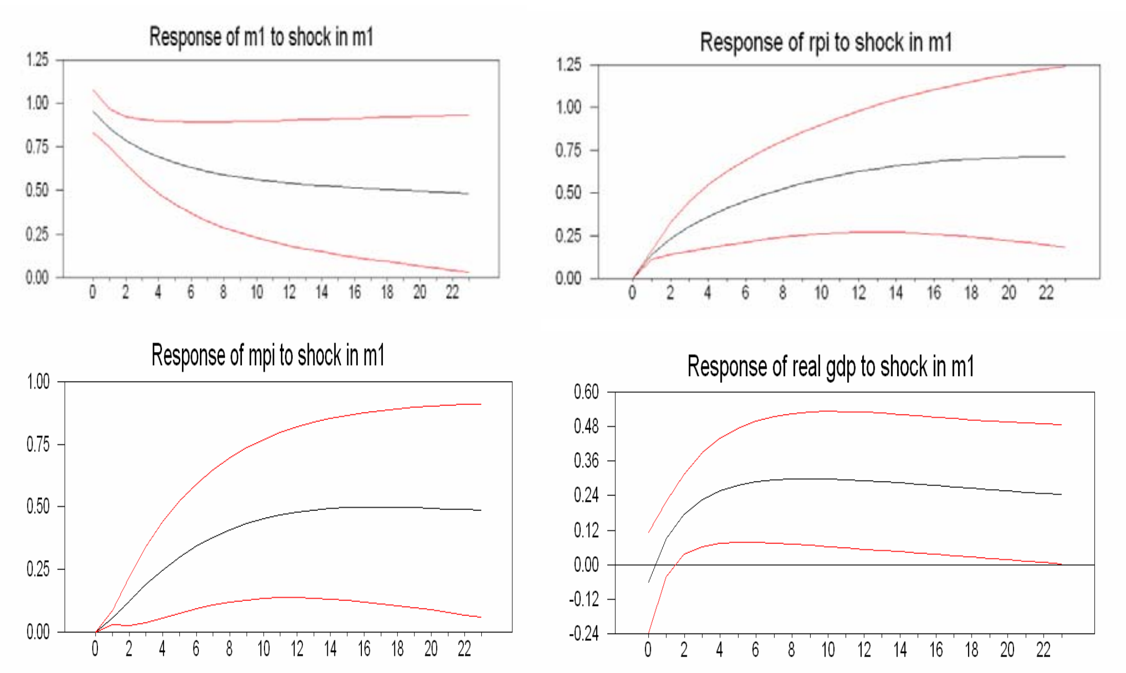
In addition, all variable are in logarithmic form, thus the impulse response functions are measured in the relative scale. This means that the IR functions reveal what percentage variable **A** will be changed due to a one percent shock in variable **B**. In reduced VAR I do not have simultaneous equations, so all parameters of reduced VAR can be estimated by the OLS method. After that, I can restrict the reduced VAR, with its already estimated coefficients, by Choleski decomposition into the structural VAR with orthogonal shocks.

The error bands (interval of confidence) corresponding to 95 percent probability intervals are computed by the Bayesian Monte-Carlo procedure based on 500 simulations. This is in accordance with the methodology suggested by Sims and ZHA (1999, pp. 113-1155).

- **Money supply channel as indicator for measuring the dynamic effect of monetary policy on real GDP and prices and interpretation of result**

The dynamic effects of money stock shock (disturbance) are reported in Figure 5.2 below. Figure 5.2 displays the impulse responses of the variables included in the M-VAR to a one percent increase in the money stock (M1), i.e. a one percent monetary orthogonal shock**.** ***The vertical axis*** denotes the response of the log MPI, log RPI, and log real GDP to a one percent impulse in the monetary policy disturbance. ***The horizontal axis*** *denotes time in months.*

Figure 5.2: Dynamic effect of money stock on real GDP and prices (M-VAR): money stock



Source: Author's calculations

Figure 5.2 shows the pattern of the monetary shock (disturbance) as such: (i) an increase in the money stock, (ii) a slight increase in the real GDP, and (iii) a sharp and sudden permanent increase both in the MPI and RPI. This result illustrates that real GDP responds slowly and reaches its maximum at 4 and 5 months. Over the next 4 months, real GDP then returns to its initial level, which suggests that money stock does not permanently affect real GDP. Concerning prices, they respond sooner and sharply – even within the first month – and these effects are still significant after 22 months. Therefore, monetary policies permanently affect prices (MPI and RPI). An unexpected increase of one percent in the money stock (M1) produces a maximum increase in real GDP of 0.30 percent, and it dies out after 18 months. The maximum increase in the manufacturing prices level is more than 0.49 percent, while the maximum increase in the retail price is more than 0.71 percent. However, they are still significant after 22 months, which suggests that monetary policy shocks have a permanent effect on price indices in the Republic of Macedonia.

Based on the empirical research, this model **partially proves the first hypothesis: that a change in the money stock has a strong effect on prices.**

Furthermore, Figure 5.2 shows that within a meaningful horizon, the prices level cannot be restored to its long-term equilibrium level or its baseline trend in relation to the other variables in the model by endogenous money stock and real GDP adjustment. Hence, this result highlights the persistence of a money stock shock on the prices level, and it confirms that the money stock has an important influence in determining inflation in the Republic of Macedonia. Thus, the result reflects that money stock can cause inflation in the Republic of Macedonia. This finding is consistent with other findings regarding countries in transition (Horváth and Maino, 2006, p. 8, Gilliam and Nakov, 2004, pp.653-684 and others).

With respect to the real GDP, there is some research concerning countries in transition that shows that the money stock has a transitory effect on output**.** For example Hristov (2004, p. 16) and Jarociński (2004) find that in both countries (The Czech Republic and Poland) output declines after the money stock contraction. Also, Berumnet (2002, p. 12) finds that money stock has a transitory effect on output in Turkey.

However, a direct comparison is difficult because of the different assumptions made in these other studies. Broadly speaking, my estimates of the monetary policy effect on prices and real GDP are similar to the results of those authors.

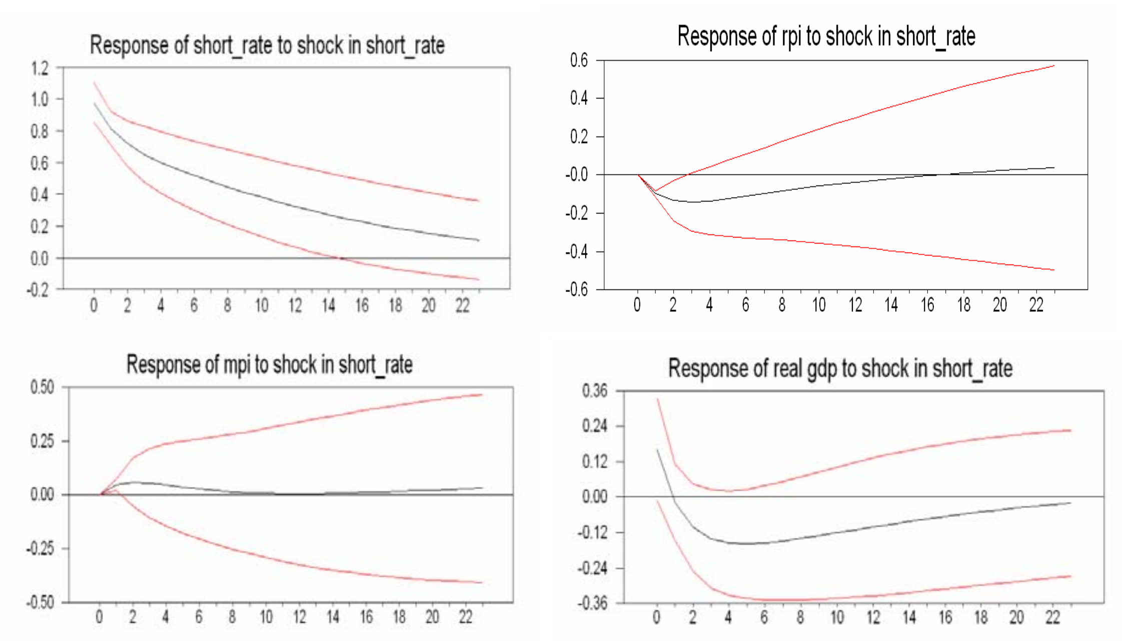
In addition, the empirical result that money stock has a transitory effect on real GDP was unexpected due to the shallow level of financial intermediation in the banking and financial sector and the higher dollarization in the Republic of Macedonia. Moreover, both theoretical and empirical research indicates the potential weakness and the potential instability of the conventional channels of monetary transmission in the countries in transition. *So, this result suggests the need for ongoing research in order to check the robustness of the result concerning the transitory effect on real GDP by the monetary shock, as well as to prove or reject the hypothesis that a change in the money stock does not have a significant effect on real GDP in the Republic of Macedonia.*

- **Short-term interest rate channel as an indicator for measuring the dynamic effect of monetary policy on real GDP and prices**

Looking at the interest rate channel, we can see how the dynamic effects of monetary policy on real GDP and prices are measured by the short-term interest rate (disturbance). The result is reported in Figure 5.3 below. Figure 5.3 shows the impulse responses of the variables to a one percent increase in the lending short-term interest rate, i.e. a one percent interest rate orthogonal shock. ***The vertical axis*** denotes the response of the log MPI, log RPI and log real GDP to this one percent impulse in the interest rate. ***The horizontal axis*** denotes time in months. Figure 5.3 shows that an increase in the short-term effect does not have an effect on real GDP and the prices indices. Only the short-term interest rate will be disturbed from its long-term equilibrium, and it returns to its baseline trend after 14 months.

The result of this empirical research proves **the first hypothesis: a change in the short-term interest rate does not have an effect on real GDP.** This suggests that operation of monetary strategy via the interest rate channels would not work in the Republic of Macedonia. This result is consistent with most of the empirical findings regarding countries in transition that concern the dynamic effect of monetary policy on real GDP and prices via the interest rate channels.

Figure 5.3: Dynamic effect of short-term interest rate on real GDP and prices (M-VAR): Short-term interest rate



Source: Author's calculations

Therefore, in the Republic of Macedonia, as in other countries in transition, the traditional mechanism of monetary policy via interest rate channels does not work as it does in the developed countries (see the empirical evidence for countries in transition: Égert and McDonald, 2006; Horváth and Maino, 2006, pp. 1-25; and Ganev et al., 2002). This result is also consistent with that of Uhling (2005) regarding developed countries, wherein he does not find a clear direction for response of real GDP to a surprise rise in the interest rate. In addition, Kuijs (2002, pp. 1-24) finds that interest rate plays a modest role in real economic activity in Slovakia due to the shallow level of financial intermediation in the financial sector, a lack of competition in the banking sector, and a limited number of alternative sources of financing.

In addition, figure 5.3 shows that the short-term interest rate is a weak channel of monetary policy due to the underdeveloped financial sector, a lack of competition in the banking system and higher dollarization. The result is consistent with the findings of Égert and McDonald (2006) regarding how the interest rate channels may be more effective in those transition economies with more developed financial markets; otherwise, it is not an effective tool of monetary policy. This suggests that one of the preconditions of a working interest rate channel in the Republic of Macedonia is to focus on the development of the financial sector – particularly the money market.

The result is also consistent with evidence that the interest rate in Macedonia would not reflect the market type behavior, since there is no well functioning of money market and thus has not been ***an effective monetary policy instrument.*** The interest rate on NBRM bills is a leading interest rate and benchmark for banks' interest rate; however, the supply of the central bank bills is exogenously determined by the necessity of the NBRM to issue its bills to absorb liquidity surplus in the banking system or to increase its foreign exchange reserve (Ribnikar and Bole, 2006, p. 10).

Higher dollarization is another factor that contributes in explaining this result. With heavy dollarization, as is found in the Republic of Macedonia (first chapter), the scope for an independent interest rate policy is limited. Monetary policy will have little independent control over domestic interest rate, since domestic interest rate is influenced by the foreign euro or dollar interest rates. These, in turn, are in close parity with foreign euro or dollar interest rates which affect the commercial risk of domestic banks.

Finally, since the short-term interest rate does not accurately show market behavior, I exclude the interest rate as an indicator in measuring the dynamic effect of monetary policy.

5.1.2.1.3 Forecast error variance decomposition of money stock and short-term interest rate disturbance on real GDP and prices

Let me now research the decomposition of the forecast error variance in order to evaluate the contribution of money stock and interest rate shock to fluctuations in the real GDP, MPI and RPI. The detailed methodology of the forecast error variance decomposition is shown in the "selection of VAR methodology" topic in Chapter 3. Table 5.2 reports the contribution of monetary (M1 and IR) disturbance to fluctuation in the real GDP, MPI and RPI in the median value and 95% probability intervals of h-steps ahead forecast error variance decomposition. The numbers in the ***second column*** report various horizons. The numbers in ***the third and fourth column*** of the table report the contribution of the monetary disturbance to the fluctuation of the MPI, RPI and real GDP.

Table 5.2 shows that money stock shock become important in producing fluctuation after one month. Over a period of 12 months, money stock innovation accounts for 17 percent of the forecast error variance decomposition of the MPI, while the forecast error variance decomposition of RPI is similar. After 24 months, money stock shock is the most important source for generating fluctuation in prices fluctuation, accounting for 28 percent of MPI and 37 percent of RPI. However, in the mid-term the forecast errors of variance decomposition continue to increase. Thus, after 3 years, money stock innovations account for 35 percent of the variance of MPI, while money stock innovation account for 42 percent of the variance of RPI. *This suggests that money stock shock is an important source of the prices fluctuation in the Republic of Macedonia.* With respect to real GDP, money stock disturbance becomes important in generating real GDP fluctuation after 12 months. After 12 months, money stock innovation account for 17 percent of the forecasts error variance decomposition, and thereafter it continues increasing over the horizons. In the medium term at 48 months, the monetary disturbance accounts for 32 percent of the variance in real GDP, which suggests that money stock disturbance is an important source of the fluctuation in real GDP.

Interest rate shocks explain a small percentage of prices fluctuation after 48 months, and thus interest rate innovation accounts for 8 and 5 percent of the forecast error variance decomposition of MPI and RPI respectively. With respect to real GDP, the interest rate shock does not generate fluctuation. That is, in the medium term at 48 months, interest rate innovation does not account for any disturbance in real GDP, which suggests that interest rate disturbance is not an important source of real GDP fluctuation, whereas it has only small and weak contribution to the fluctuation of the prices indices.

Table 5.2: Forecast error variance decomposition, h periods ahead, accounted for by innovations in M1 and IR: M-VAR

Forecast error in	Forecast horizon *h*(months)	Innovation in M1	Innovation in IR
MPI	1 12 24 48	0.01 0.17 0.28 0.35	0.00 0.00 0.01 0.08
RPI	1 12 24 48	0.01 0.17 0.37 0.42	0.00 0.03 0.04 0.05
real GDP	1 12 24 48	0.00 0.17 0.26 0.32	0.00 0.00 0.00 0.00

Source: Author's calculations

Finally, all of my testing shows that money stock has a transitory effect on real GDP, whereas interest rate does not show such an effect. In addition, money stock has a stronger and more permanent effect on prices than does the interest rate. This result is in accordance with that the findings of Hafer and Kutan (2001, p. 3), who estimate four variables (output, money stock, interest rate and prices) using VAR methodology for 20 developed and developing countries. They conclude that money stock plays a more significant role than the interest rate in explaining movement of the real GDP – both in developed and in developing countries.

5.2 Econometric model of testing short-term dynamic effect of monetary and fiscal policy on real GDP and prices in the Republic of Macedonia

The review of the relevant literature (Chapter 2) shows that SVAR methodology has recently become popular in measuring the dynamic effect of fiscal policy as well. Therefore, I use SVAR econometric methodology to investigate the effects of fiscal policy on real GDP and prices in Republic of Macedonia. The fiscal policy is evaluated via three well-known indicators: primary fiscal deficit, government expenditure, and government revenue. This empirical research will test the second hypothesis**: that a change in the primary fiscal deficit and government expenditure does not have a significant effect on real GDP. A change in taxation will have short-term effects on real GDP.**

To test the second hypothesis, I perform several tests, such as: diagnostic test (JB-test, LB-test and ARCH-test), Granger-Causality test, test for reaction of real GDP and prices to monetary and fiscal shocks, and forecast error variance decomposition of monetary and fiscal disturbance on real GDP and prices.

In addition, this empirical research reveals another, perhaps more interesting result. It shows the extent to which the standard conclusion of the monetary VAR literature concerning the effect of monetary policy is modified when fiscal variables are introduced in the model. Thus, *do we really need to model both monetary and fiscal policy in Republic of Macedonia?* This is evaluated via a distance test. This is the first time such investigation has been undertaken regarding countries in transition.

Christiano et al. (1996a, pp. 16-34); Lipper, Sims and Zha (1996); Bernanke et al. (2003, p. 25) and Lütkepohl (2005, p.62) all emphasize that the omission of important variables in the SVAR model may lead to mistaken measurements of the effect of monetary policy. The authors identify serious problems in the model that imply significant real effects of monetary policy if the fiscal or other important variables are ignored. They argue that this problem can be corrected by setting up larger models that can trace the effects of policy shocks across a variety of variables.

Therefore, I believe that jointly analyzing monetary and fiscal policy is the correct approach in order to accurately check the effect of both monetary policy and fiscal policy.

5.2.1 Data in empirical research

My empirical research is limited to data from 1997:01 to 2006:12 in order to be consistent with my econometrics models. The primary data sources are the Central bank of Macedonia, the Ministry of Finance, the Official State of Statistics Bureau of Macedonia, and the IMF. *Full details on the data including sources are available in Appendix 2.*

I use monthly data in order to maximize the number of observations because of the short span of data available during the period of transition. Another reason for using more frequent data points is that it allows for separating the automatic response of the fiscal system from any discretionary fiscal adjustment (Rarytska, 2003, p. 25; Rzonca and Cizkowicz, 2005, p. 28; and others). Moreover, fiscal adjustments cannot take effect during these short spans of time, so using monthly data serves to identify the fiscal shocks.

The Macedonian variables in the first model of this section are: MPI, RPI, M1, real GDP and primary fiscal deficit (PD); whereas the second model includes MPI, RPI, M1, real GDP and revenue (T) and expenditure (G). All variables are expressed in logarithmic form except for the primary deficit, which is a ratio of the real GDP. To determine whether the time series exhibit seasonality, I use the same methodology as in the previous model – M-VAR. Accordingly, non-fiscal variables reveal seasonality, so I continue with only real GDP adjusted for seasonality.

Recently, different methods have been used in designing indicators for measuring the effects of fiscal policy. However, they have mainly explored discretionary changes in budgets due to exogenous fiscal policy actions (not the endogenous responses of budget components to economic states). Most of them adhere to the ideas put forth in Blanchard (1990), Blanchard and Perotti (2002), and Fatás and Mihov (2003), which argue that one of the desirable features of a fiscal policy indicator is simplicity. The simplest measure of fiscal impulse is changes in the primary fiscal deficit in relation to the previous year. Blanchard (1990) interprets a deficit as an indicator of fiscal policy stance by the estimation of the difference between the actual deficit and the estimated deficit. Different methods are used by the IMF, which constructs a “cyclically-adjusted” fiscal balance. The cyclical adjustment is performed by establishing a benchmark cyclical indicator (e.g. output gap) and comparing the deficit to the state of the cycle relative to the benchmark.

The indicator that I use to evaluate the dynamic effects of monetary and fiscal policy in the Republic of Macedonia draws on the work of several researchers. Blanchard and Watson (1986, pp. 1-29) jointly analyze the effect of monetary and fiscal policy with structural VAR. They provide evidence that aggregate demand, aggregate supply, and fiscal and monetary policies are important to explain fluctuations in output and prices. Blanchard and Watson (1986) and Bernanke and Mihov (1998) use M1 as an indicator in measuring the effect of monetary policy. Mountford and Uhling (2005, pp. 1-40) analyze the effects of monetary, fiscal and business shock using SVAR methodology. They use the interest rate as a monetary indicator in measuring the effect of monetary policy. I choose to follow Blanchard and Watson and Bernanke and Mihov for several reasons**:** *first,* Macedonia uses M_0 and M_1 as operational targets in order to maintain stable exchange rates and price stability; and *second***,** I can not use the interest rate as an indicator of monetary policy because it does not show any result in the previous section. Unlike in the U.S. and other developed countries, the interest rate is not an intermediate target of monetary policy in the Republic of Macedonia. Additionally, the interest rate follows a nominal exchange rate anchor in the Republic of Macedonia.

With respect to the fiscal indicator, and taking into account Blanchard's advice about simple measures of fiscal policy shocks and following Fatás and Mihov (2003), I choose *the ratio of the primary deficit to real GDP* as the indicator for measuring the dynamic effects of fiscal policy. The ratio of the primary deficit to real GDP is used in the VAR (henceforth PD-VAR) in order to eliminate any fluctuation in the primary deficit due to the state of the economy. Thus, the fiscal shock is calculated as the difference between the actual deficit (revenue minus expenditure) and the estimated deficit (a change of the primary fiscal deficit in relation to the previous period). The use of the primary budget surplus yields the same qualitative result. Contrary to Fatás and Mihov (2003), I use the total real GDP instead of only the private sector output, since this is a more conventional measure of economic activity and has been used in most empirical SVAR analyses of monetary and fiscal policy.

In addition, one of the shortcomings of utilizing primary fiscal deficits is that the effect of government expenditures and revenue cannot be separated. It is equivalent to assuming that changes in taxation and expenditures have identical impacts on macroeconomic variables. Therefore, I disaggregate the data for government budget into two fiscal variables: expenditure minus transfers and revenue minus transfers. With this new specification of fiscal variables, I am able to differentiate between the effects of taxation and expenditures. I define the fiscal variables within the SVAR in the same manner as Blanchard and Perotti (2002, pp. 1329-1368) and Mountford and Uhling (2005, pp. 1-40). Hence, total government expenditure **(**G) is equal to total government consumption and government investment minus transfers and total revenue (T) is equal to total tax revenue minus transfers. Netting out transfer payments from the government expenditure and revenue variables is a non-trivial decision, and I choose to follow Blanchard and Perotti and Mountford and Uhling in doing so. This new specification (henceforth RE-VAR) also tests the robustness of the result obtained with the PD-VAR.

Moreover, the results from my model are compared with the results from both developed countries and countries in transition. The distance test between M-VAR, PD-VAR, and RE-VAR are compared with models described in Christiano et al. (1996), which evaluate contractionary monetary and fiscal policy in order to determine how much the conclusion regarding the benchmark of monetary policy would change when fiscal variables are introduced.

5.2.2 Econometrics model and result

5.2.2.1 Testing the short-term dynamic effect of money stock and primary fiscal deficit on real GDP and prices in Republic of Macedonia: SVAR Sims-approach

Based on empirical research concerning both developed countries and countries in transition, the specifications of the model are as follows:

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

The VAR methodology is explained in detail in Chapter 3.

Regarding a five-dimensional VAR, the vector x_t includes five variables: manufacturing prices (MPI), retail price index (RPI), money stock (M1), primary fiscal deficit (PD-henceforth), and real gross domestic product (real GDP), while v is the vector of the constant. With the exception of the primary fiscal deficit, all variables are expressed in logarithmic form to satisfy theoretical assumptions of constant elasticity models. The dummy variable D_t contains the structural "brake" of the economic system in the Republic of Macedonia – internal and external shocks. The structural model is composed of five equations. Moreover, the series are estimated consistently in levels with OLS (Ordinary least square). The vector ε_t is the vector of structural disturbance.

In the first section, I determine that the *primary fiscal deficit does not show any seasonality*. Moreover, it is expressed as a ratio of real GDP, which is already adjusted for seasonality. Therefore, my empirical research only includes real GDP seasonality adjustment. Next, I am going to perform *hypothesis testing in VAR, a form of diagnostic testing.*

In Appendix 6, I show various diagnostic test of the model, such as: tests for selection VAR-order, matrix of VAR residual correlation, JB-test for normality distribution, LB-tests for residual autocorrelation, LM Lagrange test for residual autocorrelation and ARCH-test for autoregressive conditional heteroscedasticity.

Concerning VAR-order, I have chosen the optimal ordering of VAR-1 (see Appendix 6). Therefore, I use VAR with one lag due to it being the most appropriate model for fitting the data. Regarding the other tests, they are rather similar to the M-VAR model in the previous section (see Appendix 5). Thus, the diagnostic tests of the model are generally satisfactory and are consistent with the assumption of the white noise process. That is, the residuals are distributed consistently over time.

Finally, I can conclude that despite an unstable VAR (due to the inclusion of non-stationary processes)**,** *the diagnostic test results are satisfactory and consistent with the assumption of the white noise process – showing constant variance over time.*

5.2.2.1.1 Granger-Causality test

I test the null hypothesis with the standard F-test. If I can reject the null hypothesis, then I can conclude that the lags of one variable affect another variable, i.e. that one variable Granger-causes another variable.

A Granger-Causality test on a five-dimensional VAR (looking at the first equation of my VAR model regarding MPI) is expressed as follows:

$$MPI_t = a + \sum_{i=1}^{1} \alpha_i MPI_{t-i} + \sum_{i=1}^{1} \beta_i RPI_{t-i} + \sum_{i=1}^{1} \gamma_i M1_{t-i} + \sum_{i=1}^{1} \theta_i GDP_{t-i} + \sum_{i=1}^{1} \eta_i PD_{t-i} + \Psi D_t + e_t$$

As such, I must restrict the parameter $\eta_1 = 0$ in order to test for the possibility that PD Granger-causes MPI. If the null hypothesis can be rejected at a significance level of 5 percent, we may conclude that PD Granger-causes MPI.

Table 5.3 shows that the null hypothesis is rejected for money stock, so M1 does not Granger-cause MPI, RPI, or real GDP at the significance level of 5 percent. Since the null hypothesis is rejected, I may conclude that M1 Granger-causes MPI, RPI and real GDP, but none of these variables Granger-cause M1.

Regarding the null hypothesis that primary deficit does not Granger-Cause MPI, RPI, M1, and real GDP, it was rejected at a significance level of 5 percent only for MPI.

From this, I can conclude that primary deficit causes only MPI, whereas it does not cause RPI, M1, and real GDP, and neither do any of these variables cause primary deficit. In introducing the fiscal variable (i.e. primary fiscal deficit) into the benchmark of M-VAR, there is no resulting difference on the shape of the effect of monetary policy. In both models, the Granger-test showed that M1 causes MPI, RPI and real GDP, whereas primary fiscal deficit causes only MPI.

Table 5.3: Granger-Causality test: F- Statistics with p values in the parenthesis

		Dependent variables (equation)				
		MPI	RPI	M1	real GDP	PD
Independent variables (lags)	MPI		2.23 (0.13)	2.43 (0.12)	0.17 (0.67)	0.75 (0.38)
	RPI	0.01 (0.93)		0.16 (0.68)	0.16 (0.68)	0.34 (0.55)
	M1	3.33 **(0.03)**	7.28 **(0.00)**		4.99 **(0.02)**	0.24 (0.61)
	real GDP	1.57 (0.23)	0.01 (0.93)	0.02 (0.96)		2.15 (0.25)
	PD	3.82 **(0.01)**	3.99 (0.07)	1.22 (0.27)	0.16 (0.68)	

Note: Significance test statistics (at the 5% level) are in bold. Author's calculations

However, the Granger-Causality test does not show the spread over the time or its dynamic nature. Therefore, I continue the research with dynamic effects and forecasts error variance decomposition of monetary and fiscal policy.

5.2.2.1.2 Dynamic effect of money stock and primary fiscal deficit disturbance on real GDP and prices

Following the examples of Fatás and Mihov (2003, pp. 1-31) and Mountford and Uhling (2005, pp. 1-40), I employ Choleski decomposition where the model is just identified and the number of coefficients of the matrix B_0 are 10 (lower triangular) that can be estimated in the M-VAR and PD-VAR, with unity on the main diagonal. Thereby, the covariance of the matrix is a diagonal matrix. In using Choleski decomposition, one must pay attention to the ordering of the variables, i.e. which of the variables instantly affect some other variable. Although examining the variables in different orders found no difference in the outcome, I take the variable ordering into consideration, nevertheless.

Contrary to the assumption of Blanchard and Watson (1986) that both fiscal and monetary variables respond instantly to changes in output and prices, I assume that only fiscal policy will respond instantly to changes in real GDP and prices – due to the strategy of monetary and fiscal policy in Republic of Macedonia. The ultimate goal of the NBRM in Republic of Macedonia is price stability, and therefore its policy is based on fighting inflation. The NBRM, therefore, closely monitors the prices indices. For these reasons, my assumption is that if MPI changes owing to internal or external shocks, it will instantly affect RPI. In such a case, the NBRM would react instantly in order to maintain the exchange rate as the nominal anchor, not by the instruments of fiscal policy, but by monetary instrument. According to the Government's strategy of fiscal consolidation, there is little or no discretionary response of fiscal policy to changes in prices and output. Most of the response depends on institutional arrangements, such as the structure of income tax rates, the degree and timing in the transmission mechanism of the fiscal policy, and so on. Therefore, I assume that real GDP and prices cannot respond instantly to the fiscal indicator, and that primary deficit as a ratio of real GDP depends on the current state of the economy or movement of real GDP and prices. Moreover, Fatás and Mihov (2003, p. 22) place restrictions on the output equation so that output does not respond instantly to primary deficit shock, whereas primary deficit does respond instantly to output. Mountford and Uhling (2005, p. 7) identify fiscal policy shocks as follows: fiscal variables are orthogonal to both output as well as monetary policy shocks (it is same in our case).

By triangular decomposition with the following Wald Causality: $MPI \rightarrow RPI \rightarrow M1 \rightarrow GDP \rightarrow PD$, I construct impulse response functions of monetary and fiscal disturbances.

I believe that such ordering of the variables in the model is completely validated – by both available empirical evidence and the behavior of the NBRM in the Republic of Macedonia.

The recursive approach (Choleski decomposition) is as follows:

$$x_t = \begin{bmatrix} MPI \\ RPI \\ M1 \\ realGDP \\ PD \end{bmatrix} \qquad B_0 = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ b_{21} & 1 & 0 & 0 & 0 \\ b_{31} & b_{32} & 1 & 0 & 0 \\ b_{41} & b_{42} & b_{43} & 1 & 0 \\ b_{51} & b_{52} & b_{53} & b_{54} & 1 \end{bmatrix},$$

As seen from the matrix, only in the first period does MPI instantly affect RPI, MPI and RPI both instantly affect M1, and MPI, RPI and M1 all instantly affect real GDP. Thereby, PD is affected by all variables.

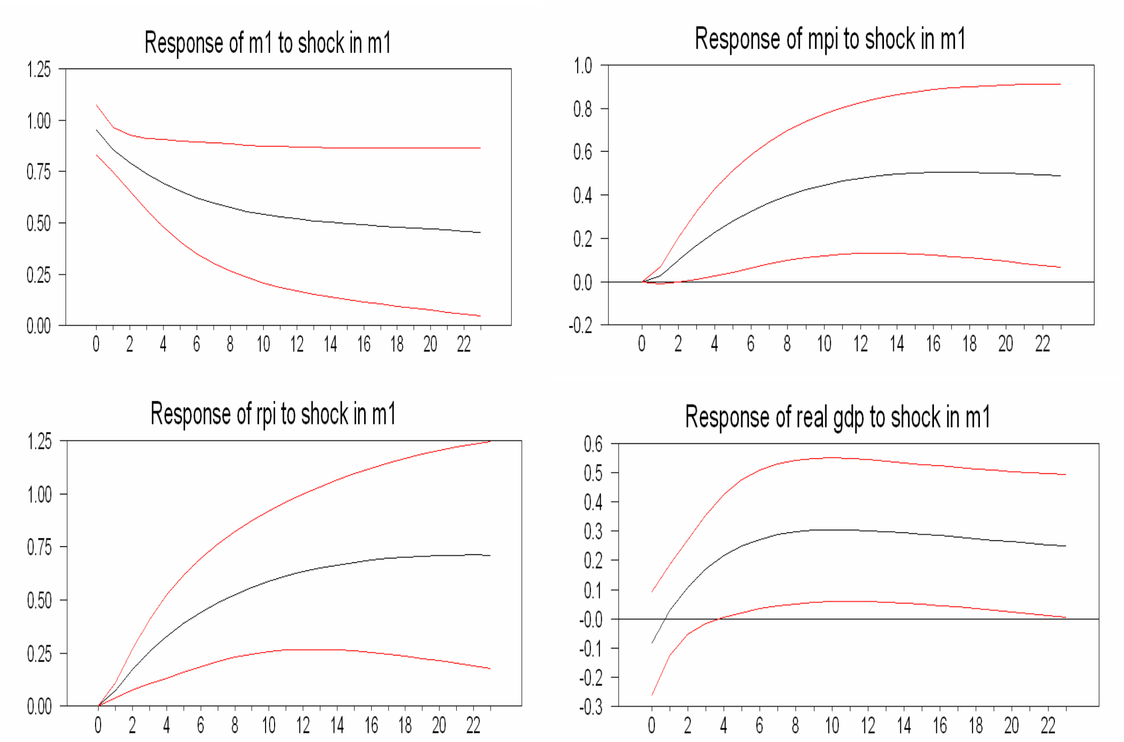
All variables are in logarithmic form and are estimated by OLS. The error bands (interval of confidence) corresponding to 95 percent probability intervals are computed by Monte-Carlo simulation, following the methodology suggested in Sims and ZHA (1999, pp. 1113-1155).

To continue, I investigate the conventional Keynesian effects of fiscal policy and how much the conclusions on the effects of monetary policy are modified when fiscal variables are introduced into the M-VAR.

- **Money supply channel as an indicator of the dynamic effect of monetary policy and interpretation of results (M-VAR with PD)**

Figure 5.4 shows the effect of money stock shock on real GDP and prices. The response of the real GDP has the same shape as was obtained with an M-VAR that only considered monetary policy. An increase of one percent in the money stock produces a maximum increase in real GDP of 0.29 percent against the 0.30 percent found in the M-VAR. Thus, we can see that monetary policy has the almost same effect on real GDP, and that the effect dies out after 18 months. With respect to prices, the maximum increase in the MPI is more than 0.47 percent against the 0.49 percent found in the M-VAR, and the maximum increase in the RPI is more than 0.64 percent against the 0.71 percent found in the M-VAR. Even at the prices level, monetary policy has almost the same effect, and therefore it has a persistent effect on MPI and RPI. As seen Figure 5.4, the result of the dynamic effect of monetary policy on real GDP and prices closely approximates the result obtained in the previous section's M-VAR. Therefore, both the M-VAR and this model demonstrate that money stock can cause inflation in the Republic of Macedonia.

Figure: 5.4 Dynamic effect of money stock on real GDP and prices (M-VAR with PD)



Source: Author’s calculations

Figure 5.4 also shows that, within a meaningful horizon, price levels cannot be restored to their baseline trends in relation to the other variables in the model by endogenous money stock and real GDP adjustment. Therefore, *this result highlights the persistent effects of a money stock shock on price levels, and it confirms the importance of determining inflation in the Republic of Macedonia.*

In addition, the primary fiscal deficit does not affect the conclusion of monetary policy; that is, the omission of such variables in the monetary model does not change the conclusion of monetary policy obtained from the M-VAR. This result is consistent with the conclusions in Mucatelli and Tirelli (2005, p. 566) that fiscal policy plays a limited role in the monetary model. However, Christiano et al. (1996a, pp. 16-34) finds that fiscal policy has a significant role in the monetary model.

Finally, because the result is close to the results obtained in the M-VAR, the interpretation of the dynamic effect of money stock on real GDP and prices (M-VAR with PD) is the same as the interpretation concerning the previous section's M-VAR.

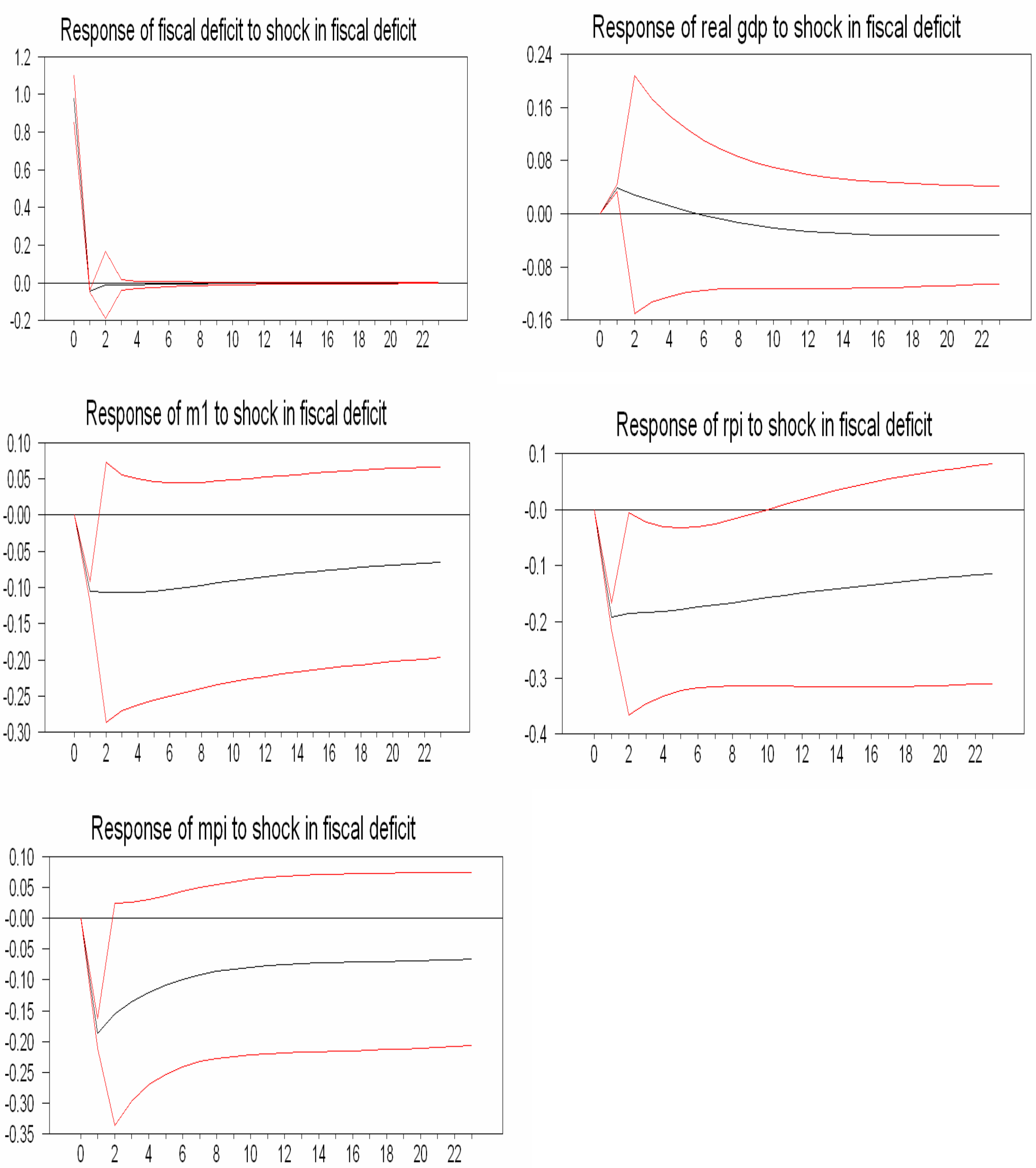
- **Primary fiscal deficit as an indicator of the dynamic effect of fiscal policy and interpretation of results (PD-VAR)**

The dynamic response to primary fiscal deficit shocks is reported in Figure 5.5 below. It shows the responses of log MPI, log RPI, log M1, and log real GDP to a one percent shock in the primary fiscal deficit. ***The vertical axis*** denotes the response of log MPI, log RPI, log real GDP and log M1 to a one percent impulse in fiscal disturbance. *The **horizontal axis** denotes time in months*. An expansionary fiscal shock, measured by a one percent primary fiscal deficit does not have a significant effect on real GDP. The primary fiscal deficit may contribute weak effects for only two months, dying out after this period.

The results of this empirical research prove the second hypothesis: that a change in the primary fiscal deficit does not have a significant effect on real GDP.

Fiscal policy does not show any effect on real GDP in the Republic of Macedonia due to the counteracting effect of the monetary policy reaction. *Hence, the monetary policy counteracts the effects of fiscal policy and persists until the effects of fiscal policy changes* *disappear.* This causes a crowding out effect. In other words, the fiscal expansion is accompanied by a tightening in the monetary policy. *The result is consistent with the monetary policy reactions in the Republic of Macedonia, which sterilizes excess liquidity in the banking system caused by expansionary fiscal policy in order to maintain a stable exchange rate.*

Figure 5.5: Dynamic effect of primary fiscal deficit on GDP and prices (PD-VAR)



Source: Author's calculations

My findings show that money stock is endogenous to the movement of all variables in the system. Figure 5.5 shows that monetary policy responds to fiscal shock in the first month. This result is consistent with the finding that the primary deficit and price levels go back to their baseline trends less than three months after fiscal shocks. In addition, these results show that price levels can be restored to their baseline trends via rapid endogenous money stock adjustments.

This result is consistent with findings from both developed countries and countries in transition, where it was found that fiscal policy does not have a significant effect on real GDP and prices – particularly after the period of fiscal consolidation. In many studies regarding countries in transition (Fischer and Sahay, 2000; and Aslund, 2002), fiscal austerity is promoted as a means of successful macroeconomic stabilization, while fiscal spending is associated with no growth in output and a deterred transition. Even if my results are consistent with those regarding the developed countries (Mountford and Uhling, 2005, p. 19; and Perotti, 2002, p. 33), it is difficult to draw a comparison between my results and theirs. They suggest that the crowding out effect of primary fiscal deficit shock is due to reactions of the monetary policy, such as a rising interest rate. In addition, Perotti uses his results to highlight the benefits of increased openness of economies and the possibilities of the monetary policy regime. Also, Von Hagen et al. (2001, pp. 279-295) and Andrés and Doménech (2003) analyze the reaction of monetary policy to fiscal shocks and find that fiscal policy does not have an effect on output due to the reaction of the monetary policy.

Price levels show short-term decreases of one percent after the expansionary fiscal shock. During the two months, the maximum decrease of MPI is 0.17 percent, after which it becomes insignificant or returns to its equilibrium level, while the maximum decrease of RPI is 0.17 percent over four months, after which it becomes insignificant.

The response of prices to the increase in primary fiscal deficit is a little puzzling since both MPI and RPI show decline. Although this is a counterintuitive result, it should also be noted that this negative relationship between prices and fiscal shocks has been found in other studies as well, such as Canova and Pappa (2003, pp. 37-46); Edelberg, Eichenbaum and Fischer (1999, pp. 166-206); and Mountford and Uhling (2005, pp. 1-38).

5.2.2.1.3 Forecast error variance decomposition of money stock and primary fiscal deficit disturbance on real GDP and prices

I continue by examining the decomposition of the forecast error variance in order to evaluate the contribution of monetary and fiscal policy shocks to fluctuations in the real GDP, MPI and RPI. Table 5.4 shows the contribution of monetary and fiscal disturbances to fluctuations in the real GDP, MPI and RPI, in the median value and 95% probability intervals of h-steps ahead forecast error variance decomposition. The numbers in the *second column* report various horizons. For comparison, I am also including the figures obtained in the M-VAR. The numbers in the *third and fourth columns* show the contribution of the money stock disturbance in the model (M-VAR) and the model (PD-VAR) to the fluctuation of the MPI, RPI and real GDP. The *fifth column* represents the contribution of fiscal disturbance to the MPI, RPI and real GDP.

Table 5.4: Forecast error variance decomposition, h periods ahead, accounted for by innovations in M1 and primary deficit

Forecast error in	Forecast horizon *h* (months)	Innovation in M1		Innovation in Deficit ratio
		M-VAR	PD-VAR	PD-VAR
MPI	1	0.01	0.01	0.01
	12	0.17	0.16	0.01
	24	0.28	0.27	0.01
	48	0.35	0.34	0.01
RPI	1	0.01	0.01	0.01
	12	0.17	0.17	0.03
	24	0.37	0.36	0.02
	48	0.48	0.46	0.01
GDP	1	0.00	0.00	0.00
	12	0.17	0.15	0.01
	24	0.26	0.25	0.02
	48	0.32	0.32	0.02

Source: Author's calculation

The contribution of money stock innovation to the prices and real GDP fluctuations is similar to that seen in the M-VAR. Money stock innovation accounts for 34 percent of the forecast error decomposition of MPI against the 35 percent shown in the M-VAR, while money stock innovation accounts for 46 percent of the forecast error decomposition of RPI against the 48 percent shown in the M-VAR model. Interestingly, with respect to the forecast error decomposition of real GDP, money stock innovation accounts for the same percentage of the real GDP fluctuation as was shown in the M-VAR.

Primary fiscal deficit innovation accounts for one percent of the forecast error decomposition of fluctuations of MPI and RPI, whereas it accounts for 2 percent of the forecast error decomposition of fluctuations in real GDP.

The results show that throughout all horizons monetary policy is an important source for generating fluctuation in prices and real GDP, while fiscal policy is not. These findings suggest that the contribution of monetary disturbances in determining endogenous variables is much more important than the contribution of fiscal disturbances. This may seem puzzling. In all likelihood, it merely indicates that unexpected components of monetary policy are more important than the corresponding components of fiscal policy (fiscal policy being perhaps more predictable). However, several studies have found monetary policy to be a more effective instrument than fiscal policy in determining fluctuations in output and prices (e.g. Blanchard and Watson, 1986, p. 24; and Konuki, 2000, pp. 3-21).

Let me now evaluate the residuals from structural VAR models capturing the main fiscal and monetary events of the last 10 years.

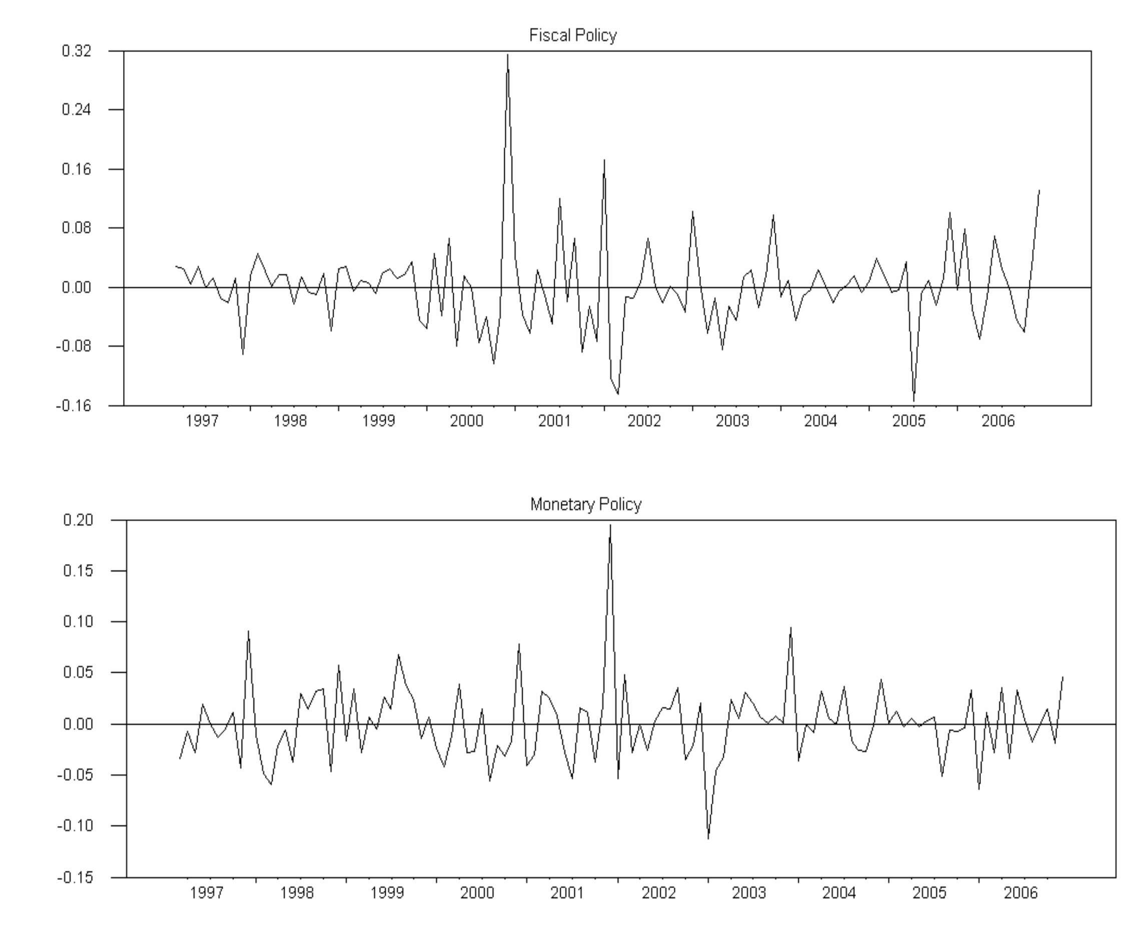
Structural shocks can be computed from structural VAR:

$$e_t = B_0^{-1}\varepsilon_t$$

Here, e_t represents the vector of reduced form residuals. Fiscal shocks provide my measure of discretionary fiscal policy.

Figure 5.6 reports the structural fiscal and monetary policy shocks. Several fiscal events can be identified. The value-added taxes in 2000 (approved in 2000:4) led to a decrease in the budget deficit and produced a budget surplus in 2000. In the beginning of 2001, the Republic of Macedonia's government approved a decision to increase expenditures due to the ethnic conflict. The first quarter of 2001 saw a sharp increase of fiscal deficit that continued after hostilities had ended. In the first quarter of 2002, the government made strong adjustments in fiscal policy according to its strategy of fiscal consolidation. However, near the end of 2002, the fiscal deficit again increased due to the 2002 election. After the election, the new government made an arrangement with the IMF, for which one of the preconditions was to reduce the budget deficit by increasing taxes for some goods from 5 to 18 percent (this was approved in April, 2003).

Figure 5.6: Structural shocks (PD-VAR and M-VAR)



Source: Author's calculations

It seems that the VAR performs quite well in capturing the most important fiscal events in Macedonia. *I consider this to be an important criterion in the overall evaluation of the proposed VAR.*

With respect to monetary policy shocks, Figure 5.6 reveals clearly those events that had strong effects on the variability of operational target money stock (e.g. the sudden devaluation of 16.1 percent in 1997:7). This demonstrates that inflationary policies are detectable. During the ethnic conflict of 2001, there were also detectable inflationary shocks that produced strong variability in M1 – particularly at the beginning and end of the hostilities. *Again, the VAR also performs quite well at capturing these significant monetary events.*

5.2.2.2 Testing short-term dynamic effect of money stock and budget revenue and expenditure on real GDP and prices - Sims approach

Some well-known problems make fiscal deficit a poor indicator of discretionary fiscal policy. Since the fiscal deficit (or surplus) captures both exogenous policy shifts (Fatás and Mihov, 2003, pp. 2-30), i.e. budget expenditure and revenue, it confuses fiscal policy effects and endogenous economic fluctuation. Moreover, even when changes in the fiscal deficit reflect purely discretionary policy decisions, the source of the change – whether it be a change in revenue or a change in government spending – is important for the subsequent reaction of the private sector. Blanchard and Perotti (2002, pp. 1329-1368) note such problems.

In this context primary fiscal deficit as an indicator of fiscal policy cannot separate the effects of government expenditure and revenue. It is equivalent to assuming that changes in taxation and expenditure have the same impact on macroeconomic variables. Therefore, I try to avoid this shortcoming of primary deficit by disaggregating the budget into two fiscal variables: revenue and expenditure minus transfers. With this new specification of fiscal variables, I am able to differentiate between the effect of taxation and expenditure. Moreover, the new specification (henceforth RE-VAR) also tests the robustness of the results obtained with the PD-VAR.

Following Blanchard and Perotti (2002, pp. 1329-1368) and Mountford and Uhling (2005, pp. 1-38), I define the fiscal variables within the VAR as follows: total government expenditure (G) is equivalent to total government consumption minus transfers and total revenue (T) is equivalent to total tax revenues minus transfers. Netting out transfer payment from the government expenditure and revenue variable is a non-trivial decision. In doing so, I choose to follow the methods of Blanchard and Perotti and Mountford and Uhling.

According to the *test for seasonality,* government expenditures and revenue did not show any seasonality. Therefore, I continue the research with only GDP adjusted for seasonality.

I must now check whether the descriptions of the data are in accordance with the assumption of the white noise process using several tests. As in the previous models, I perform diagnostic tests for six-dimensional VAR, such as: MPI, RPI, M1, real GDP, T and G. Appendix 7 shows the following diagnostic and selection for VAR-order tests of the six dimensional VAR: test for **selection VAR-order**, matrix of VAR residual correlation, **JB-test** for normality distribution, **LB-**test for residual autocorrelation, **LM** Lagrange test for residual autocorrelation, and **ARCH**- test for autoregressive conditional heteroscedasticity.

According to the AIC and HQ tests, VAR (1) is the optimal ordering of the model, whereas VAR (2) is optimal according to the SQ test. Since two criteria reveal VAR-1 to be the model that best fits the data, I decide further to use VAR with one lags. Furthermore, the most relevant criterion in developing and countries in transition with many structural problems is the HQ criterion, so this criterion has a VAR of order 1. Results from the testing have also demonstrated that VAR order 1 is an effective model for prediction. Moreover, it is interesting to note that according to these criteria all of my models are selected VAR with one lag (see Appendix 5,). As such, I can conclude that my models are very robust to the changes of specification, i.e. including various variables. Concerning the matrix of VAR residuals, I can conclude that there are contemporaneous correlations between residuals of M1, MPI, RPI, real GDP, T and G or contemporaneous and intertemporal correlations between the residuals of the variables. The JB-test, LB-test, LM-test and ARCH-test show similar findings, as did the first model M-VAR and second model PD-VAR.

Finally, I can conclude that despite an unstable VAR (including VAR lag), the diagnostic test is satisfactory and consistent with the assumption of the white noise process showing constant variance over time.

5.2.2.2.1 Granger-Causality test

The Granger-Causality test on six dimensional VAR (1) is displayed below. Table 5.5 shows that the null hypothesis that M1 does not Granger-cause MPI, RPI, and real GDP is rejected at a 5 percent significance level. Since the null hypothesis is rejected, I may conclude that M1 Granger-causes MPI, RPI and real GDP, while none of the variables in the model Granger-causes M1. The null hypothesis that M1 does not Granger-cause T and G is not rejected at a 5 percent significance level. This is to say that M1 does not Granger-cause T and G. The fact that M1 does not cause G is very interesting, as it means that there is no monetization of fiscal deficit in the Republic of Macedonia.

Concerning T and G, the null hypothesis that T and G does not Granger-cause MPI, RPI, and real GDP is rejected at a 5 percent significance level for only MPI, while it is not rejected for RPI and real GDP. Therefore, T and G only Granger cause MPI, and they do not cause RPI and real GDP. The result of this test is rather similar to the result as in the previous model M-VAR with PD-VAR. Therefore, including disaggregated fiscal variable in the benchmark of M-VAR does not change the shape of monetary policy.

In addition, the null hypothesis that M1 does not Granger cause MPI, RPI and real GDP is rejected in all models, whereas the null hypothesis that primary fiscal deficit, T and G, does not cause MPI, RPI and real GDP is rejected only for MPI and it is not rejected for RPI and real GDP.

Table 5.5: Granger-Causality test: F- Statistics with p values in the parenthesis

		Dependent variables (equation)					
		MPI	RPI	M1	GDP	T	G
Independent variables (lags)	MPI		1.21 (0.30)	0.47 (0.62)	0.41 (0.65)	3.36 **(0.04)**	1.03 (0.36)
	RPI	0.01 (0.98)		0.06 (0.94)	0.17 (0.83)	1.36 (0.26)	0.62 (0.53)
	M1	2.92 **(0.04)**	3.71 **(0.02)**		3.83 **(0.02)**	1.40 (0.24)	0.84 (0.43)
	GDP	2.89 (0.06)	0.18 (0.82)	0.03 (0.96)		0.83 (0.43)	0.15 (0.85)
	T	3.71 **(0.00)**	1.06 (0.34)	2.14 (0.12)	0.66 (0.51)		2.95 (0.06)
	G	3.03 **(0.01)**	1.38 (0.25)	1.18 (0.30)	0.01 (0.98)	1.43 (0.24)	

Note: Significance test statistics (at the 5 % level) are in bold. Authors' calculation

As I mention in the previous section, the Granger-Causality test does not show the spread over the time or its dynamic nature. Therefore, I can continue the research with analyses of the impulse response function and forecast error variance decomposition. Employing impulse response functions, I examine the dynamic effect of fiscal policy on real GDP and prices, as well as how the effects of monetary policy are modified when the disaggregated fiscal variables have been taken into account.

5.2.2.2.2 Dynamic effect of money stock and budget revenue and expenditure disturbance on real GDP and prices

As in the previous section, I follow Fatás and Mihov (2003) and Mountford and Uhling (2005) in using Choleski decomposition, whereby the model is just identified and the number of coefficients of the matrix B_0 are 15 (lower triangular), which can be estimated in the M-VAR and RE-VAR, with unity on the main diagonal. Thereby, the covariance of the matrix will be a diagonal matrix.

As in the previous model, I must take into the account the ordering of the variables, by which one variable instantly affects other variables. As in the second model, contrary to the work in Blanchard and Watson (1986) that both fiscal and monetary indices respond instantly to shocks in output and prices, I conclude that only fiscal variables would respond instantly to prices, money stock and real GDP. I conclude this for the same reason that I mention regarding the previous model PD-VAR – I assume that real GDP and prices cannot respond instantly to the fiscal variables, and also that fiscal variables depend on the current state of the economy or movement of real GDP and prices. Moreover, I assume that revenue responds instantly to shocks in real GDP. This assumption is also shared by Blanchard and Perotti (1999), who find that the results hold no matter which variable is assumed to be first: revenue or expenditure. In addition, I also examine revenue and expenditures using a different ordering, but the test yielded the same results.

Fatás and Mihov (2003) place restrictions in their equation of output, and therefore output does not respond instantly to revenue and expenditure, whereas these two variables do respond instantly to output. Mountford and Uhling (2005, p. 7) identified fiscal policy shocks whereby fiscal variables are orthogonal to both output as well as monetary policy shocks. Thus, I consider this orthogonal ordering to be a reasonable assumption and consistent with a number of theoretical views.

Using triangular decomposition with the following Wold Causality: $MPI \rightarrow RPI \rightarrow M1 \rightarrow realGDP \rightarrow T \rightarrow G$, I can construct impulse response functions of monetary and fiscal disturbances. Such ordering of the variables in the model is completely valid, both according to empirical evidence and theoretical points of view as well as the behavior of the government of the Republic of Macedonia

Next, I can show the result from the recursive approach of the six dimensional VAR (1). For the purposes of comparison, I could not find any similar studies on countries in transition, so I have to make my comparisons between my model and Christino's model (1996a). However, the results will also be compared with those from other studies on developed countries and countries in transition that have examined monetary or fiscal policy.

The recursive approach (Choleski triangular decomposition) will be as follows:

$$x_t = \begin{bmatrix} MPI \\ RPI \\ M1 \\ realGDP \\ T \\ G \end{bmatrix} \qquad B_0 = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ b_{21} & 1 & 0 & 0 & 0 & 0 \\ b_{31} & b_{32} & 1 & 0 & 0 & 0 \\ b_{41} & b_{42} & b_{43} & 1 & 0 & 0 \\ b_{51} & b_{52} & b_{53} & b_{54} & 1 & 0 \\ b_{61} & b_{62} & b_{63} & b_{64} & b_{65} & 1 \end{bmatrix}$$

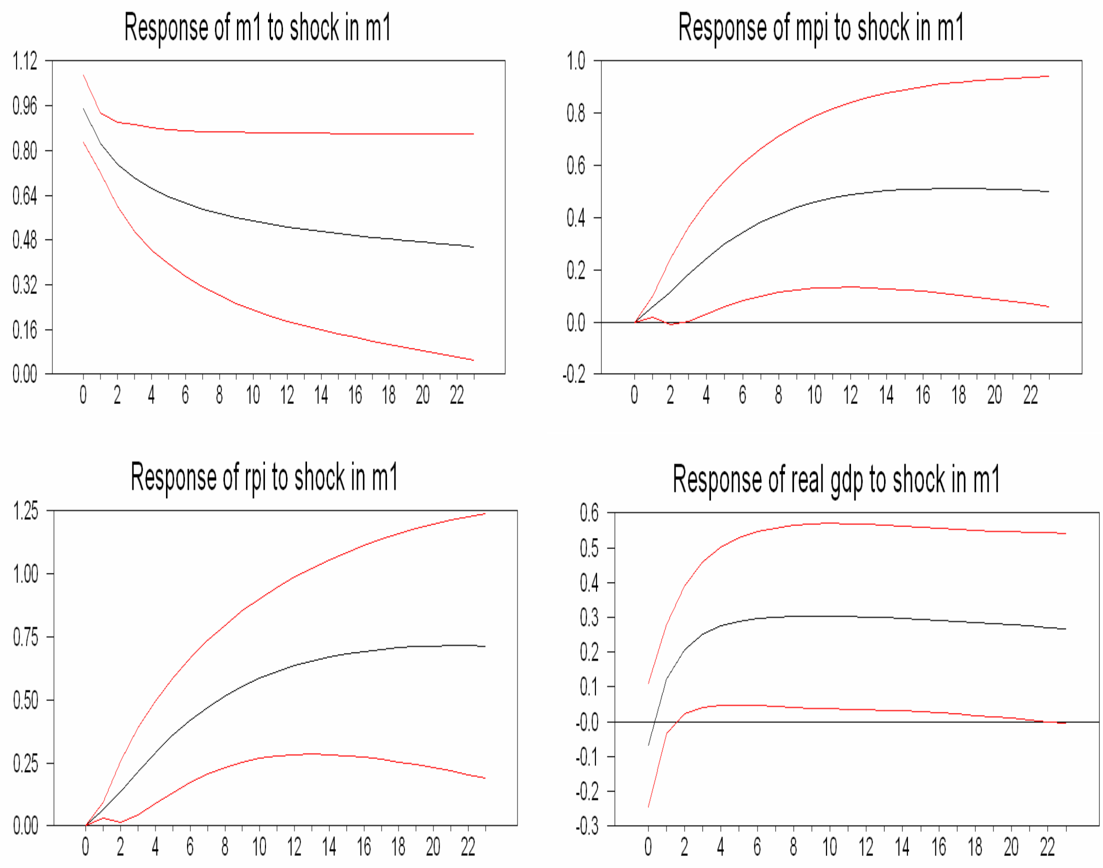
As seen from the matrix, fiscal variables are orthogonal to both real GDP and money stock. That is, revenue responds instantly to shocks in real GDP, M1, and prices, whereas only expenditure responds instantly to revenue shock. All variables are in logarithmic form and have been estimated by OLS. As in the previous model, 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, pp. 1113-1155).

Next, I examine the dynamic effect of monetary and fiscal shocks in order to evaluate the dynamic response of real GDP and prices to each of these shocks separately.

- **Money stock channel as an indicator of the dynamic effect of monetary policy and interpretation of result (M-VAR with RE)**

Even if I disaggregate the government budget into revenues and expenditures, little changes in the shape of the benchmark of monetary VAR. Figure 5.7 reports the effect of money stock shock on real GDP and prices when government expenditure and revenue are introduced. The response of the real GDP has the almost same magnitude as is obtained with the M-VAR that considers only monetary policy (an increase of one percent in the money stock produces a maximum increase in real GDP of 0.29 and 0.30 percent, respectively). In addition, the persistence of the effect of money stock on real GDP is the same as found in M-VAR, i.e. transitory, and it dies out after 18 months.

Figure 5.7: Dynamic effect of money stock on GDP and prices (M-VAR with RE-VAR)



Source: Author's calculations

Regarding prices, the maximum increase in the MPI is more than 0.50 percent against the 0.49 percent found in the M-VAR. Also, the maximum increase in the RPI is more than

0.72 percent against the 0.71 percent found in the M-VAR. As we can see, monetary policy has also almost the same effect on price levels, and therefore it has a persistent effect on MPI and RPI. Moreover, Figure 5.7 shows that within a meaningful horizon, price levels cannot be restored to their baseline trend levels in relation to the other variables in the model by endogenous money stock and real GDP adjustment. Therefore, this result highlights the long persistence of a money stock shock on price levels, and it confirms the importance of determining the level of inflation in the Republic of Macedonia.

Additionally, government expenditure and revenue as an indicator of fiscal policy does not show a significant effect in the M-VAR. Thus, the omission of those variables in the benchmark of monetary VAR will not significantly change the conclusions regarding monetary policy obtained in the M-VAR. Disaggregating the government's budget shows that fiscal policy plays a limited role in the monetary model. This result is consistent with the results of Mucatelli and Tirelli (2005, p. 566) and Andrés J. and Doménech (2003). However, Christiano et al. (1996a, pp. 16-34) finds that fiscal policy does have a significant role in the monetary model.

Finally, because the results are similar to those obtained in the M-VAR, the interpretation of the dynamic effect of money stock on real GDP and prices (M-VAR with RE) is the same as that set forth in section 5.1.2.1.2 (M-VAR with PD).

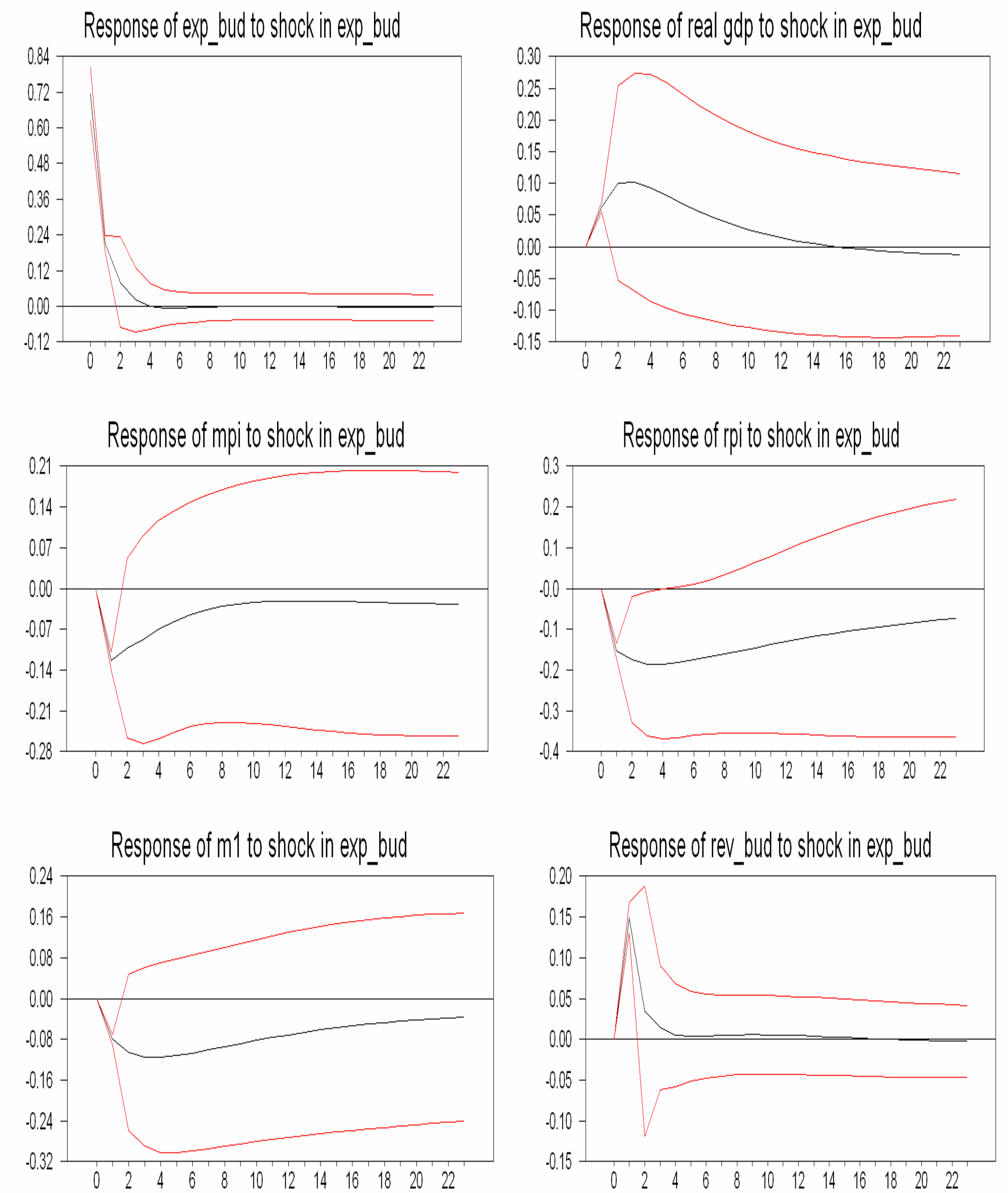
Let me now examine the dynamic effect of fiscal expenditure and revenue on real GDP and prices.

- **Fiscal expenditure as an indicator of the dynamic effect of fiscal policy and interpretation of result (RE-VAR): Expenditure**

The response function to a fiscal shock of expenditure is shown in Figure 5.8. As seen in Figure 5.8 the results are rather similar to those from the first model PD-VAR. Because the results are so similar, they can also be interpreted in the same way. As in the previous models, the *vertical axis* reflects the response of log real GDP, log RPI, log MPI, log M1 and log T, whereas the *horizontal axis* depicts monthly periods. Figure 5.8 shows that an expansionary fiscal shock of a one percent increase in government expenditure does not have a significant effect on real GDP. *The change in government expenditure may have weak effects for only two months, but it is insignificant after this period.*

Therefore, the results of this empirical research **prove the second hypothesis that: a change in government expenditure does not have a significant effect on real GDP.**

Figure 5.8: Dynamic effect of government expenditure on GDP and prices (RE-VAR): Expenditure



Source: Author's calculations

The fiscal policy does not have a significant effect on real GDP and prices due to the counteracting effect of monetary policy reaction. *Monetary policy reacts immediately and continues to counteract the effect of fiscal policy until they disappear.* It causes a crowding out effect. In other words, the fiscal expansion is accompanied by a tightening of monetary policy.

The result is consistent with the monetary policy reactions in the Republic of Macedonia, which sterilize excess liquidity in the banking system caused by expansionary fiscal policy in order to maintain a stable exchange rate.

In addition, the results indicate that money stock is endogenous to the movement of all variables in the system – particularly regarding the prices level. In Figure 5.8, monetary policy responds in the first month, whereby government expenditure returns back to its baseline no more than two months after the shock. The prices level can thus be restored to their baseline trends by rapid endogenous money stock adjustment. In other words, money stock is endogenous to inflationary movement.

As in the previous model PD-VAR, this result is consistent with the findings concerning both developed countries (Mountford and Uhling, 2005, p. 19; Perotti, 2002, p. 33; Von Hagen et al., 2001, pp. 279-295; and Andrés and Domenéch, 2003) and countries in transition (Fischer and Sahay, 2000; and Aslund, 2002). Even if this finding is similar to other research on developed countries, it remains difficult to make comparisons. However, my results are similar to those of Von Hagen et al. (2001, pp. 279-295) and Andrés and Doménech (2003), in that the direct traditional effects of fiscal policy disappear due to the response of monetary policy. Mountford and Uhling (2005) suggest the existence of a crowding out effect of government expenditure shocks due to interest rate increases. On the other hand, some studies of both developed and transitional countries show persistent effects on real GDP due to changes in government expenditure (Fatás and Mihov, 2003, pp. 1-32; Rarytska, 2003, p. 42; and others).

Concerning the response from revenue to expenditure shocks, this may be due to the reaction of real GDP. It can be assumed to *be correlated with the tax base***,** so that revenue tends to increase whenever real GDP increases.

With respect to price level, as in the PD-VAR, both MPI and RPI show rapid and brief declines of around 0.17 percent, with MPI decreasing during the first month and RPI during the second. This result indicates that after two months prices become insignificant and return back to their equilibrium via endogenous money stock adjustment. However, the result is a *little puzzling*, since both MPI and RPI show decline. Like in the second model, PD-VAR, a negative relationship between prices and fiscal shocks is demonstrated – both here and in other studies (Canova and Pappa, 2003; Edelberg, Eichenbaum, and Fischer, 1999, pp. 166-206; and Mountford and Uhling 2005).

As in the model PD-VAR (with primary fiscal deficit), this model RE-VAR using government expenditure demonstrates that an *expansionary fiscal policy seems to be an ineffective instrument of macroeconomic policy in the Republic of Macedonia.*

- **Fiscal revenue as an indicator of the dynamic effect of fiscal policy and interpretation of result (RE-VAR): Revenue**

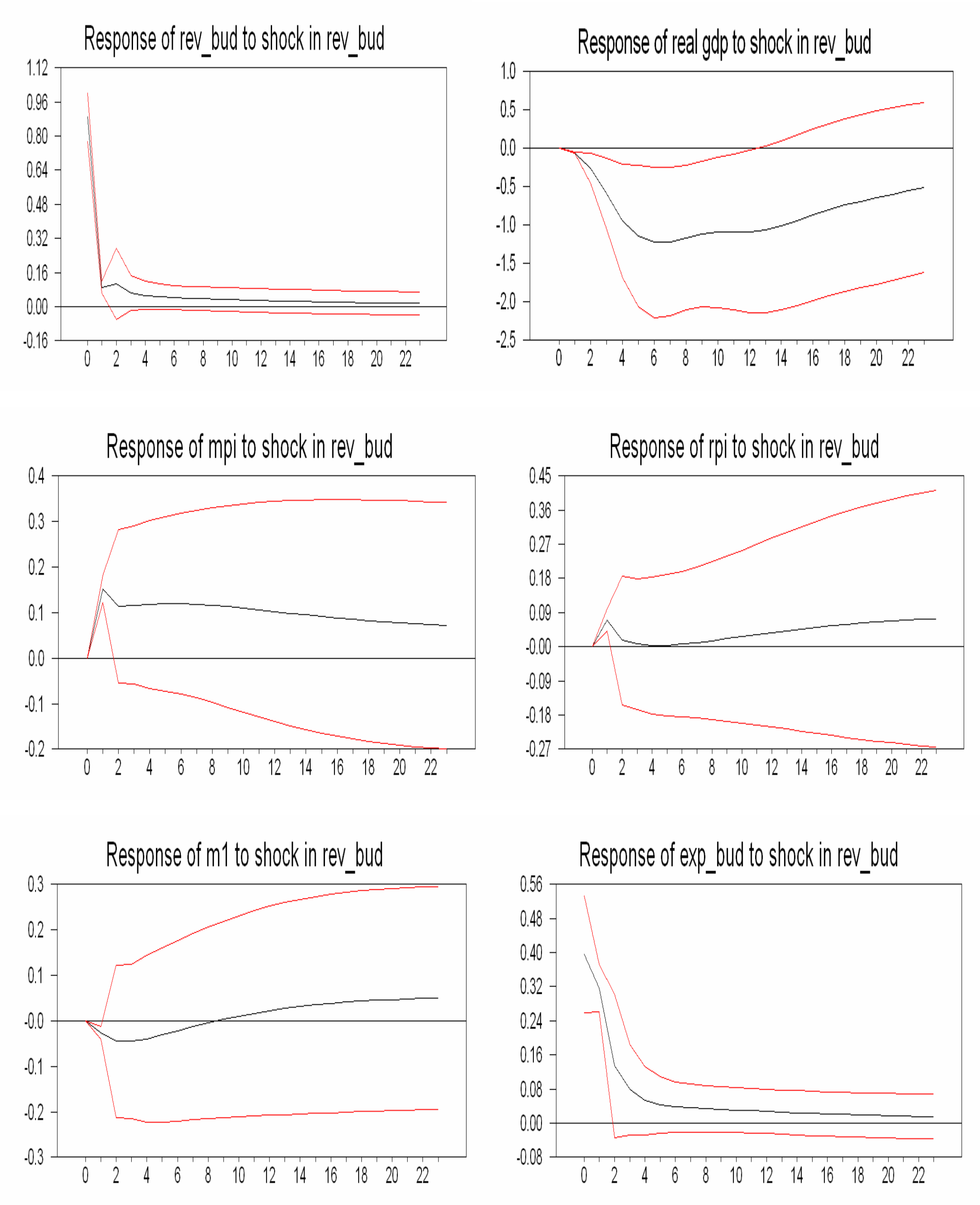
In continuing, I examine the response of real GDP, MPI, RPI, M1 and G to shocks in government revenue (T). The responses of the variables to this shock are displayed below in Figure 5.9. A contractionary fiscal policy measured by a one percent increase in taxation induces an immediate decrease in real GDP. The maximum decrease reaches 0.95 percent after six months and thereafter became insignificant after twelve months. This result is expected *due to a tax hike causing a decrease in real GDP.* An increase in taxation produces a decline in disposable income, which leads to lower levels of investment, which causes a decrease in real GDP.

Therefore, the result of this empirical research proves the second hypothesis: that a change in taxation will have short-term effects on real GDP.

With respect to the price levels, MPI and RPI exhibit rapid and brief increases. The maximum increase of MPI is 0.15 percent in the first month due to the increased taxation, and it dies out after two months. The maximum increase of RPI is 0.10 percent, which becomes insignificant after one month.

The expenditure level and money stock do not show any significance. As seen in Figure 4.6, all variables will eventually return back to their baseline trends, excepting real GDP, which has transitory effects for 12 months.

Figure 5.9: Dynamic effect of government revenue on real GDP and prices (RE-VAR): Revenue



Source: Author's calculations

The same result has been found by several other authors, including Fatás and Mihov (2003, pp. 1-31); Blanchard and Perotti (2002); and Mountford and Uhling (2005, pp. 1-38). Among other things, their findings indicate that an increase in taxation produces a higher magnitude of the effect of fiscal policy on output and prices. Over time, the response of output decreases to shocks in taxation, whereas the response of prices increases to shock in taxation. My results generally follow the same general pattern as those of the aforementioned authors.

However, the difference between their results and mine is that they find larger and more persistent effects on output from changes in tax revenue, with the exception of Mountford and Uhling (2005, pp. 1-38). Mountford and Uhling find short-term effects on output due to the exogenous changes resulting from the changes in taxation. *My results also show a transitory effect on real GDP via exogenous changes caused by taxation.* According to Mountford and Uhling (2005), the best fiscal policy for stimulating the economy appears to be one of tax-cuts. In addition, they point out that while such policy works as a short-lived stimulus to the economy, it is not necessarily sensible. The resulting higher burdens may have long-term consequences which far outweigh the benefits gained from short-term increases in real GDP.

Therefore, my result is close to that of Mountford and Uhling, in that changes in taxation may generate short-lived effects on real GDP; however these may, in turn, lead to greater burdens in the future. Hence, the findings of my empirical research may be named **"policy ineffectiveness result"** due to undesirable long-term consequences stemming from short-lived gains in real GDP. This result is similar to those of the "neoclassical model", and therefore the dynamic effect of fiscal policy on real GDP is inefficient (see Appendix 1). Therefore, an expansionary fiscal policy of tax-cuts seems to be an ineffective instrument of macroeconomic policy in the Republic of Macedonia, since changing of the fiscal policy may only produce short-lived effects on real GDP, while it may have long-term consequences which far outweigh the short-term benefits.

Finally, the government of the Republic of Macedonia should apply fiscal strategy based on fiscal rules (by determination of the mathematical or numerical targets of the fiscal deficit, public expenditure and the public debt in medium term) in order to achieve *positive macroeconomic outcomes, since the conventional Keynesian effects of fiscal policy do not show a persistent effect on real GDP.*

5.2.2.2.3 Forecast error variance decomposition of monetary and budget revenue and expenditure disturbance on real GDP and prices.

I examine the forecasts error decomposition of MPI, RPI and real GDP in the RE-VAR. Table 5.6 shows the simultaneous evaluation of the contribution of monetary and fiscal disturbances to fluctuations in the real GDP, MPI and RPI in the median value and 95 percent probability intervals of h-steps ahead forecast error variance decomposition.

For comparison, I also report the variance decomposition of MPI, RPI and real GDP at various horizons, which I obtain via the M-VAR. *The third and fourth columns* show the contribution of monetary disturbance in model one (M-VAR) and model three (RE-VAR) to the fluctuation of the MPI, RPI and real GDP. *The last columns* (fifth and sixth) depict the contribution of fiscal disturbances to fluctuations of the real variables.

As we can see from Table 5.6, there is a small difference of around 0.02 between the first (M-VAR) and the third model (RE-VAR) concerning the contribution of monetary disturbance to the fluctuation of real GDP and prices.

With respect to the contribution of fiscal disturbance to the fluctuation of real GDP and prices, expenditure innovation is insignificant to the fluctuation of MPI, RPI and real GDP. It accounts for one percent of the behavior of MPI and real GDP and two percent of the behavior of RPI. At the same time, tax shock is also measured, whereby tax innovations account for 9 percent of the forecasts error decomposition of fluctuation of MPI and 7 percent of RPI. Shocks in taxation do not contribute significantly to fluctuation in prices. However, the contribution of shocks in revenue is to some extent a source of real GDP fluctuation, since they account for 12 percent of the forecasts error variance decomposition of GDP. Therefore, in terms of increasing taxation in the Republic of Macedonia, fiscal policy can be source of real GDP fluctuation, but not for affecting the prices level.

Table 5.6: Forecast error variance decomposition, h periods ahead, accounted for by innovations in M1, T, and G

Forecast error in	Forecast horizon *h*(months)	Innovation in M1		Innovation in T	Innovation in G
		M-VAR	RE-VAR	RE-VAR	RE-VAR
MPI	1	0.01	0.01	0.01	0.02
	12	0.17	0.19	0.08	0.01
	24	0.28	0.28	0.08	0.01
	48	0.35	0.33	0.09	0.01
RPI	1	0.01	0.05	0.01	0.01
	12	0.17	0.20	0.02	0.04
	24	0.37	0.36	0.05	0.02
	48	0.42	0.40	0.07	0.02
GDP	1	0.00	0.04	0.01	0.01
	12	0.17	0.20	0.08	0.01
	24	0.26	0.26	0.12	0.01
	48	0.32	0.35	0.12	0.01

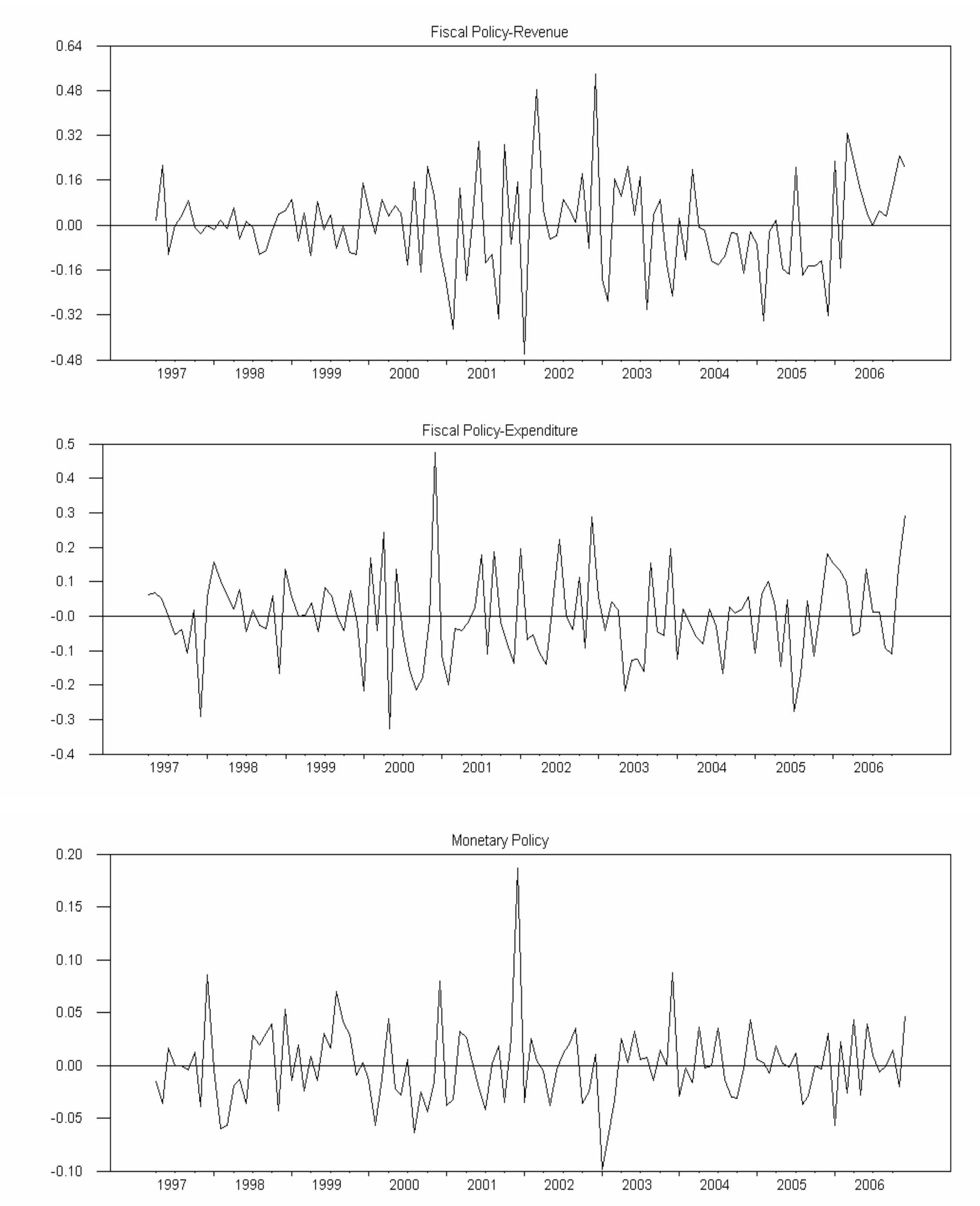
Source: Author's calculations

Finally, I can conclude by saying that throughout the 48 horizons, in all models, *monetary policy is a more effective tool for generating fluctuation in prices and real GDP than fiscal policy is.* That monetary policy is more effective is also shown in other studies, such as Blanchard and Watson (1986, p. 24) and Konuki (2000, pp. 3-21).

Next, I show the structural fiscal and monetary shocks obtained in the RE-VAR residuals.

Figure 5.10 depicts the structural fiscal and monetary shocks over the last 10 years as captured by the VAR. Regarding the tax shocks, the value-added tax enacted in 2000:4 clearly led to an increase in budget revenue over the year. Also clear is the decline in budget revenue during the ethnic conflict of 2001 due to decreased economic activity.

Figure 5.10: Structural shocks (RE-VAR and M-VAR)



Source: Author's calculations

However, we can see that in the middle of 2001 there is an increase in budget revenue. This is due to increased "war taxes" during the ethnic conflict. After 2001, the budget revenue normalized with the recovery of real economic activity. With respect to government expenditure shocks, the conflict period is clearly detectable and represents the most important event in the economic history of the Republic of Macedonia. As we can see in Figure 5.10, government expenditure increases at the beginning of the conflict and continues until its resolution in the last quarter of 2001.

With respect to monetary policy, the same events are detectable as in the previous model (M-VAR). Figure 5.10 depicts the sudden devaluation by 16.1 percent in 1997:7, which exhibits a strong effect on the variability of operational target money stock, showing that inflationary policy is detectable. During the conflict in 2001, I also observe detectable inflationary shocks that produce strong variability of M1 – particularly at the beginning and the end of the conflict.

Finally, I can conclude that monetary and fiscal policy seems to be quite well represented in the VAR, since they are capturing the most important monetary events in Macedonia.

As seen in Figure 5.11, I next perform a comparison of the response functions of the real variables to shocks in monetary policy by via the models M-VAR, PD-VAR and RE-VAR. For purposes of the comparison, I report the impulse response function to an exogenous response in the federal fund rates (Christiano et al., 1996, pp. 16-34). The VAR is modified to include the ratio of primary surplus to real GDP as an indicator of fiscal policy.

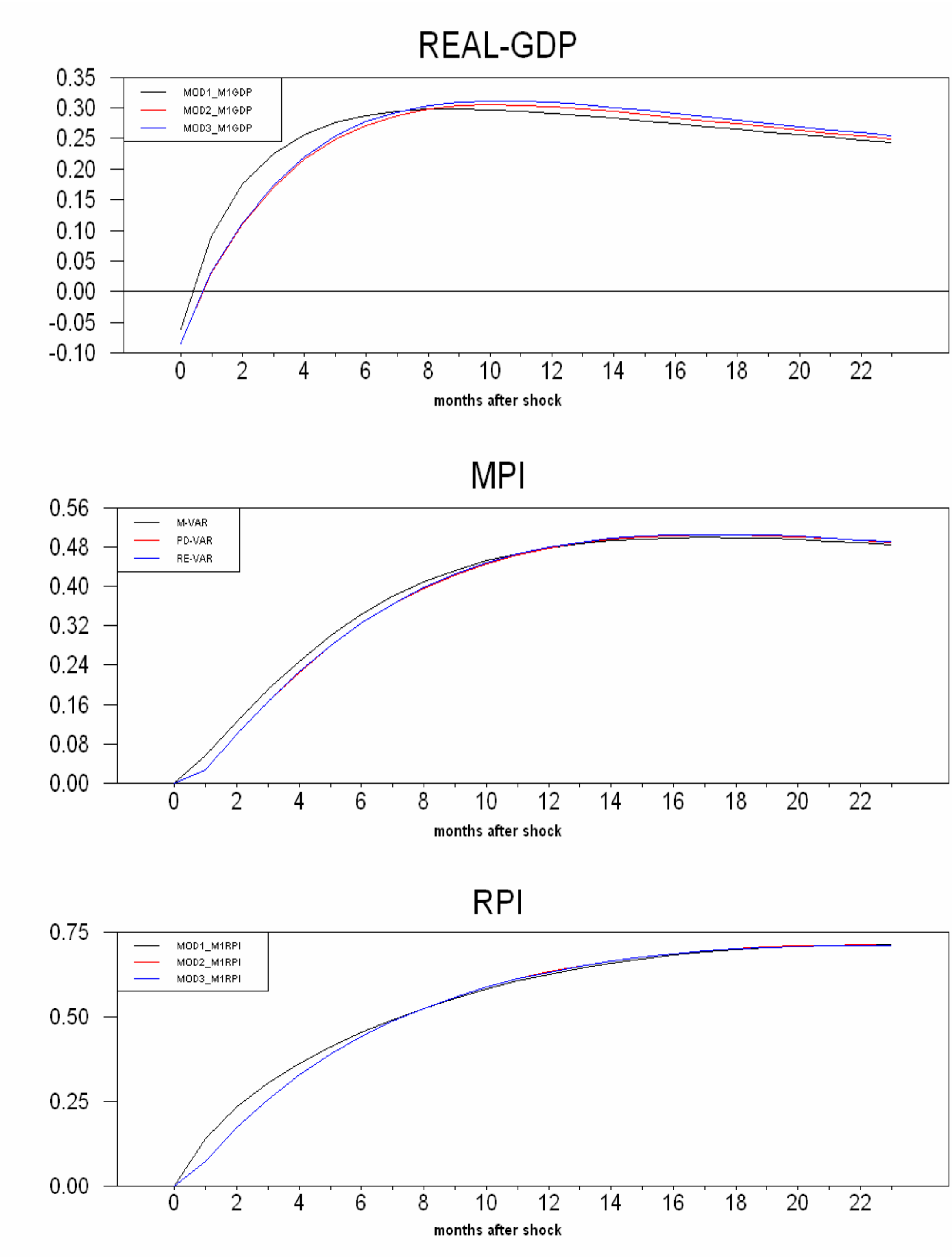
I choose Christiano's model because I did not find any studies in transitional countries, using VAR methodology, where both monetary and fiscal policies are examined. Therefore, comparing my results to other research is quite difficult for several reasons:

First, they analyze developed countries whereas I analyze countries in transition.

Second, they analyze monetary and fiscal policy rules in the U.S., whereas, following Blanchard, I analyze imposed measures of monetary and fiscal policy.

Third, they use federal funds rate as an indicator for measuring monetary policy, whereas, following Blanchard and Watson, I use M1.

Figure 5.11: Comparison of responses to a monetary policy shock: M-VAR, PD-VAR and RE-VAR



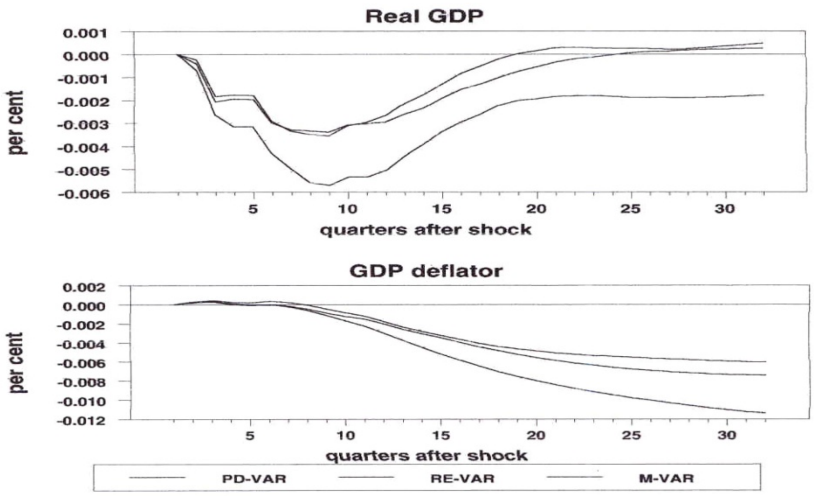
Source: Author's calculations

With respect to the fiscal indicator, there is no difference, because they and I both use standard indicators in measuring fiscal policy that are found in the literature. However, I use *expansionary monetary and fiscal policy***,** and therefore my model shows a transitory increase in real GDP that dies out after a short period and permanent increases in prices;

whereas they use *contractionary monetary and fiscal policy***,** so their models show transitory decreases in real GDP and permanent decreases in prices. To make comparison easier, error bands are not included. .

The results I obtain from the M-VAR model with fiscal variables clearly confirms that the omission of fiscal policy does not affect the conclusion regarding the quantitative effect of monetary policy (or it is insignificant at only approximately 0.01 percent).

Figure 5.12: Comparison of impulse responses to a monetary shock: Christiano et al. (1996)



Source: Christiano et al. (1996)

In contrast to my model, Christiano's model finds the conclusion of monetary policy does change when fiscal policy is introduced. Figure 5.12 depicts the impulse responses of real GDP and price levels to a contractionary monetary policy shock obtained either with or without fiscal variables. Thus, Christiano's model shows that the omission of fiscal policy variables in the VAR significantly increases the magnitude of the effect of monetary policy on real GDP and prices. However, it finds that monetary and fiscal policies have small transitory effects on real GDP and small permanent effects on prices. Finally, Christiano's model suggests that fiscal policy plays a significant role in the model, whereas ***I find that fiscal policy plays only a limited role in the model in the Republic of Macedonia.*** Von Hagen et al. (2001, pp. 279-295) and Andrés and Doménech (2003), Mucatelli and Tirelli (2005, p. 566) also arrive at this same conclusion in their research, however they do not test for the significance of the difference between responses of output and prices to a monetary policy shock and responses that contain fiscal variables.

Up to this point, my conclusion regarding the limited role of fiscal policy in the monetary model has been based solely on the qualitative comparison of impulse responses.

Next, I perform a distance test in order to analyze the significance of the differences between the response of real GDP and prices to a monetary policy shock in the M-VAR and the two VAR models that contain fiscal variables. Ultimately, my aim is to determine *if we really need to model both monetary and fiscal policy in the Republic of Macedonia.*

5.2.2.3 Do we really need to model both monetary and fiscal policy in the Republic of Macedonia

The distance test is established by the statistic given below, which is distributed asymptotically as X^2 with one degree of freedom. It is estimated with the equation proposed by Sims and Zha (1999, pp. 1113-1155):

$$\chi_i^2(k) = \frac{\left(c_i^b(k) - c_i^f(k)\right)^2}{\sigma^2\left(c_i^b(k)\right) + \sigma^2\left(c_i^f(k)\right)}$$

Here, *k* represents the steps at which the impulse response is evaluated, c_i gives average response functions (b represents the benchmark and f for two fiscal models, whereas i represents real GDP and prices), and $\delta^2(c_i(k))$ is the variance of impulse response functions.

The following tables include the results of the distance tests.

Table 5.7 reports the difference in response of the manufacturing prices index to a monetary policy shock when I introduce fiscal policy, Table 5.8 reports the difference in response of the retail prices index, and Table 5.9 reports the difference in response of the real GDP. The distance test reveals that there is no significant difference in either real GDP or prices to a monetary policy shock when fiscal policy is introduced.

Table 5.7: Distance test of impulse response function for MPI to a monetary policy shock

Distance test of IFR for MPI								
M-VAR and PD-VAR			M-VAR and RE-VAR			PD-VAR and RE-VAR		
Steps	Distance	p-value	Steps	Distance	p-value	Steps	Distance	p-value
0	0.00000	1.00000	0	0.00000	1.00000	0	0.00000	1.00000
1	1.34099e-007	0.99971	1	0.01829	0.89242	1	0.01845	0.89195
2	1.77040e-006	0.99894	2	0.01154	0.91444	2	0.01188	0.91322
3	4.85716e-006	0.99824	3	0.01041	0.91874	3	0.01091	0.91681
4	8.95038e-006	0.99761	4	0.00948	0.92245	4	0.01012	0.91988
5	1.36040e-005	0.99706	5	0.00793	0.92904	5	0.00865	0.92591
6	1.84369e-005	0.99657	6	0.00593	0.93864	6	0.00665	0.93503
7	2.31514e-005	0.99616	7	0.00390	0.95021	7	0.00456	0.94619
8	2.75353e-005	0.99581	8	0.00221	0.96254	8	0.00275	0.95817
9	3.14527e-005	0.99553	9	0.00101	0.97463	9	0.00142	0.96998
10	3.48310e-005	0.99529	10	3.17991e-004	0.98577	10	5.72903e-004	0.98090
11	3.76461e-005	0.99510	11	3.10706e-005	0.99555	11	1.41567e-004	0.99051
12	3.99089e-005	0.99496	12	2.23225e-005	0.99623	12	3.13262e-006	0.99859
13	4.16538e-005	0.99485	13	1.69569e-004	0.98961	13	4.09601e-005	0.99489
14	4.29286e-005	0.99477	14	3.76734e-004	0.98451	14	1.61217e-004	0.98987
15	4.37883e-005	0.99472	15	5.78897e-004	0.98080	15	2.98877e-004	0.98621
16	4.42895e-005	0.99469	16	7.39117e-004	0.97831	16	4.15370e-004	0.98374
17	4.44870e-005	0.99468	17	8.41840e-004	0.97685	17	4.92666e-004	0.98229
18	4.44317e-005	0.99468	18	8.85872e-004	0.97626	18	5.26734e-004	0.98169
19	4.41696e-005	0.99470	19	8.78374e-004	0.97636	19	5.21872e-004	0.98177
20	4.37411e-005	0.99472	20	8.30387e-004	0.97701	20	4.86446e-004	0.98240
21	4.31808e-005	0.99476	21	7.53860e-004	0.97810	21	4.30029e-004	0.98346
22	4.25184e-005	0.99480	22	6.59891e-004	0.97951	22	3.61693e-004	0.98483
23	4.17785e-005	0.99484	23	5.57876e-004	0.98116	23	2.89156e-004	0.98643

** Source: Author's calculations. The distance is the absolute value of the difference between the responses to a monetary policy shock

Therefore, in all periods, the statistical test shows that the omission of fiscal variables from the benchmark of the monetary VAR cannot cause a bias in the response to a monetary policy shock.

Table 5.8: Distance test of impulse response function for RPI to a monetary policy shock

Distance test of IFR for RPI								
M-VAR and PD-VAR			M-VAR and RE-VAR			PD-VAR and RE-VAR		
Steps	Distance	p-value	Steps	Distance	p-value	Steps	Distance	p-value
0	0.00000	1.0000	0	0.00000	1.00000	0	0.00000	1.00000
1	0.04744	0.8275	1	0.04761	0.82728	1	6.50206e-008	0.99980
2	0.04069	0.8401	2	0.04099	0.83957	2	3.54441e-007	0.99952
3	0.02551	0.8731	3	0.02583	0.87231	3	7.76549e-007	0.99930
4	0.01284	0.9097	4	0.01313	0.90879	4	1.26596e-006	0.99910
5	0.00526	0.9421	5	0.00547	0.94104	5	1.77918e-006	0.99894
6	0.00162	0.9679	6	0.00175	0.96667	6	2.28881e-006	0.99879
7	2.61345e-004	0.9871	7	3.20551e-004	0.98572	7	2.77787e-006	0.99867
8	5.63355e-007	0.9994	8	1.24287e-006	0.99911	8	3.23621e-006	0.99856
9	1.44002e-004	0.9904	9	1.00462e-004	0.99200	9	3.65814e-006	0.99847
10	3.58174e-004	0.9849	10	2.83964e-004	0.98656	10	4.04087e-006	0.99840
11	5.13073e-004	0.9819	11	4.19936e-004	0.98365	11	4.38353e-006	0.99833
12	5.79190e-004	0.9808	12	4.76750e-004	0.98258	12	4.68646e-006	0.99827
13	5.68820e-004	0.9809	13	4.64644e-004	0.98280	13	4.95083e-006	0.99822
14	5.06524e-004	0.9820	14	4.06368e-004	0.98392	14	5.17831e-006	0.99818
15	4.16214e-004	0.9837	15	3.24329e-004	0.98563	15	5.37089e-006	0.99815
16	3.16720e-004	0.9858	16	2.36159e-004	0.98774	16	5.53076e-006	0.99812
17	2.21242e-004	0.9881	17	1.54132e-004	0.99009	17	5.66019e-006	0.99810
18	1.38261e-004	0.9906	18	8.60354e-005	0.99260	18	5.76152e-006	0.99808
19	7.28026e-005	0.9931	19	3.63781e-005	0.99519	19	5.83703e-006	0.99807
20	2.75632e-005	0.9958	20	7.48608e-006	0.99782	20	5.88900e-006	0.99806
21	3.78433e-006	0.9984	21	3.32994e-007	0.99954	21	5.91961e-006	0.99806
22	1.85234e-006	0.9989	22	1.51140e-005	0.99690	22	5.93096e-006	0.99806
23	2.16847e-005	0.9962	23	5.16092e-005	0.99427	23	5.92505e-006	0.99806

** Source: Author's calculations. The distance is the absolute value of the difference between the responses to a monetary policy shock

Table 5.9: Distance test of impulse response function for GDP to a monetary policy shock

Distance test of IFR for real GDP								
M-VAR and PD-VAR			M-VAR and RE-VAR			PD-VAR and RE-VAR		
Steps	Distance	p-value	Steps	Distance	p-value	Steps	Distance	p-value
0	0.02976	0.86304	0	0.03401	0.8536	0	1.69292e-004	0.98962
1	0.22378	0.63618	1	0.21349	0.6440	1	2.25800e-005	0.99621
2	0.27684	0.59878	2	0.25107	0.6163	2	2.95448e-004	0.98629
3	0.20067	0.65418	3	0.17104	0.6791	3	7.12893e-004	0.97870
4	0.11124	0.73873	4	0.08578	0.7696	4	0.00114	0.97303
5	0.04938	0.82415	5	0.03145	0.8592	5	0.00152	0.96889
6	0.01650	0.89780	6	0.00652	0.9356	6	0.00182	0.96596
7	0.00307	0.95580	7	3.57905e-005	0.99521	7	0.00204	0.96399
8	2.74044e-006	0.99868	8	0.00238	0.9610	8	0.00218	0.96275
9	0.00130	0.97129	9	0.00755	0.9307	9	0.00226	0.96207
10	0.00371	0.9514	10	0.01251	0.9109	10	0.00229	0.96181
11	0.00581	0.9392	11	0.01610	0.8990	11	0.00229	0.96186
12	0.00713	0.9327	12	0.01813	0.8929	12	0.00225	0.96214
13	0.00768	0.9301	13	0.01882	0.8908	13	0.00220	0.96258
14	0.00764	0.9303	14	0.01855	0.8916	14	0.00214	0.96313
15	0.00720	0.9323	15	0.01766	0.8942	15	0.00207	0.96373
16	0.00654	0.9355	16	0.01640	0.8980	16	0.00199	0.96438
17	0.00578	0.9393	17	0.01499	0.9025	17	0.00192	0.96504
18	0.00501	0.9435	18	0.01353	0.9073	18	0.00185	0.96570
19	0.00427	0.9478	19	0.01212	0.9123	19	0.00178	0.96635
20	0.00359	0.9522	20	0.01078	0.9173	20	0.00171	0.96699
21	0.00297	0.9565	21	0.00954	0.9221	21	0.00165	0.96760
22	0.00242	0.9607	22	0.00840	0.9269	22	0.00159	0.96819
23	0.00194	0.9648	23	0.00736	0.9316	23	0.00153	0.96876

** Source: Author's calculations. The distance is the absolute value of the difference between the responses to a monetary policy shock

In all of the tests, fiscal policy plays a very limited role in the effect of monetary policy on the economy – approximately 0.01 percent. The omission of fiscal policy does not mean that monetary policy would capture the effect of fiscal variables when these variables are omitted. This result indicates that the specification of fiscal variables is robust, since it is obtained either by using the primary fiscal deficit or by disaggregating the budget into expenditure and revenue minus transfers.

In conclusion, this test demonstrates that we do not need to model both monetary and fiscal policy in the Republic of Macedonia.

5.3 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 Chapter 2, I explain that both theoretical and empirical research efforts imply a potential weakness and a potential instability of the conventional channels (money stock and short-term interest rate) of monetary transmission during transition. However, the results of the previous section show a transitory effect of money stock on real GDP in the Republic of Macedonia. In order to check the robustness of this result, I 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.

In addition, I am taking into account the advice of Christiano et al. (1996, p. 20); Lipper, Sims, and Zha (1996); and Bernanke et al. (2003, p. 25), who claim that omitting important variables in the VAR model may lead to mistaken assessment of the effect of monetary shocks. On the other hand, given that the exchange rate channels in small and transitional countries are significant channels of the monetary transmission mechanism, I believe that with such ongoing research (introducing exchange rate channels into the model) I would get more information concerning the dynamic effect of monetary policy.

As for the exchange rate regime 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.

Finally, I believe that this empirical research tests the **third hypothesis: that stability of the exchange rate, especially once such stability has been achieved at substantial cost, is important for macroeconomic stability. A change in the exchange rate primarily affects prices due to the strong pass-through effect of nominal exchange rate changes on domestic prices via import prices. At the same time, the first hypothesis will also be checked – that a change in the money stock does not have a significant effect on real GDP. A change in the money stock has a strong effect on prices.**

As in the previous VAR model, I 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.

5.3.1 Data in empirical research

In the estimated VAR, the data for the average monthly real exchange rate is provided by the Central Bank of Macedonia. I have to maintain consistency between all of the models regarding their time series in order to make comparison between models. Therefore, I limit my empirical research to the period of 1997:01-2006:12. Most of my data sources are from the Central Bank of the Republic of Macedonia, the Ministry of Finance, the Official State Statistics Bureau of the Republic of Macedonia, and the IMF.

As in the previous model, because of the narrow time series in countries in transition, I use monthly data rather than quarterly in order to perform a more thorough evaluation. 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). Furthermore, Bernanke and Mihov (1998, pp. 869-902); and Christiano, Eichenbaum and Evans (1996 and 1999) show that inferences drawn from quarterly data are congruent with inferences gathered from monthly data. Full details on the data, including sources, are available in Appendix 2.

The variables used in my 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.

As is mentioned in the second chapter, the Republic of Macedonia uses the exchange rate as an intermediate target in order to achieve the final goal of price stability. Therefore, in this section, I investigate both channels of monetary policy and exchange rate regime – money stock and the exchange rate – as indicators in measuring the dynamic effect of monetary policy and exchange rate regime. The short-term interest rate has been excluded as an indicator in this model for several reasons – the foremost being that the interest rate does not show any effect on real GDP in the first section.

In addition, in the first section, I find that the interest rate does not reflect the market type behavior since the money market does not yet function well in the Republic of Macedonia. Paczynski (2004) reports the same result. Also, the short-term interest rate has no means to be chosen as an indicator of the effect of monetary policy (see more on interest channels from Ganev et al., 2002, p. 22; Hafer and Kutan, 2001, p. 15; and Billmeier and Bonato 2002, p. 15) when countries use currency boards or employ the exchange rate as a nominal anchor.

Therefore, exchange rate and money stock or money supply channels are researched as indicators in measuring the dynamic effect of monetary policy and exchange rate regime. I conduct this examination with SVAR and VECM methodology – both in the short term and the long term. In addition, my results are compared with other findings regarding both developed countries and countries in transition.

As for the *test for seasonality* of the time series, I estimate this (excepting exchange rate) in the first section of this chapter (see Appendix 4). Upon visual inspection, the exchange rate does not appear to show any seasonality, and therefore it is not necessary to perform such a test. Hence, I continue my analyses with only the real GDP seasonally adjusted, whereas the other variables are not.

5.3.2 Econometrics model and result

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

Previous empirical research regarding both developed countries and countries in transition have common features that are incorporated into my own investigation.

As in the previous example, the specification of the model is:

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

In the fourth chapter, the VAR methodology is discussed, so I can start with identifying my 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, I include several vector D_t 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 EURO. Vector e_t is the vector of structural disturbance. MPI and RPI are included in the model for two reasons**:**

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

In beginning with the VAR-model, I have to perform *tests for VAR order and diagnostic tests.* In Appendix 8, I elaborate on the results of the following tests: criteria for selection of **VAR-order**, matrix of VAR residual correlations, **JB-test** for normality distribution, **LB-test** for residual autocorrelation, **LM-**Lagrange test for residuals autocorrelation, and **ARCH-test** for autoregressive conditional heteroscedasticity. Appendix 8 contains the criteria for selecting the VAR order, in which all criteria, such as **AIC, HQ, and SC,** point to the selection of a VAR order with two lags. This model fits the data most appropriately, and it is a good model for prediction. Concerning the diagnostic tests, they are rather the same as in the previous models (see Appendices 5, 6, and 7). The **ARCH-test** strongly rejects the assumption of heteroscedasity, and all time series exhibit the assumption of homoscadicity; therefore, the residuals of all series are distributed constantly over time.

Despite an unstable VAR (2), I can conclude that the diagnostic test results are satisfactory and consistent with the assumption of the white noise process, showing constant variance over time.

5.3.2.1.1 The dynamic effect of money stock and exchange rate disturbance on real GDP and prices

(i)- Choleski decomposition

I 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, I use both ***Choleski and Bernanke-Sims decomposition*** in order to compare the outcomes between the first and second decomposition. This is consistent with the methods used by McCarthy (2000), Campa and Goldberg (2004), and Cîtu (2003) in their research on developed countries, and also with the methods used by Billmeier and Bonato (2002), Ganev et al. (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) and Campa and Goldberg (2004), I 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 (Cîtu, 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, p. 14). Therefore, with respect to the aforementioned paper, my own methodology differs in that I 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, I expect the transmission of import prices to be complete over a rather short time horizon. Furthermore, I exclude the interest rate (see the results in the first section regarding the interest rate channel).

In contrast to the work of McCarthy (2000), which analyzes only the effect of the exchange rate on prices, I follow Horváth and Maino (2006) and other authors who focus on countries in transition, and I 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. *I am 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), Campa and Goldberg (2004), and Cîtu (2003), central banks react to changes in the exchange rate and prices indices.

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

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

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

The first period of the matrix shows that any unexpected change in the exchange rate will instantly affect the two prices indices, 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, I 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. As in the previous model, 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).

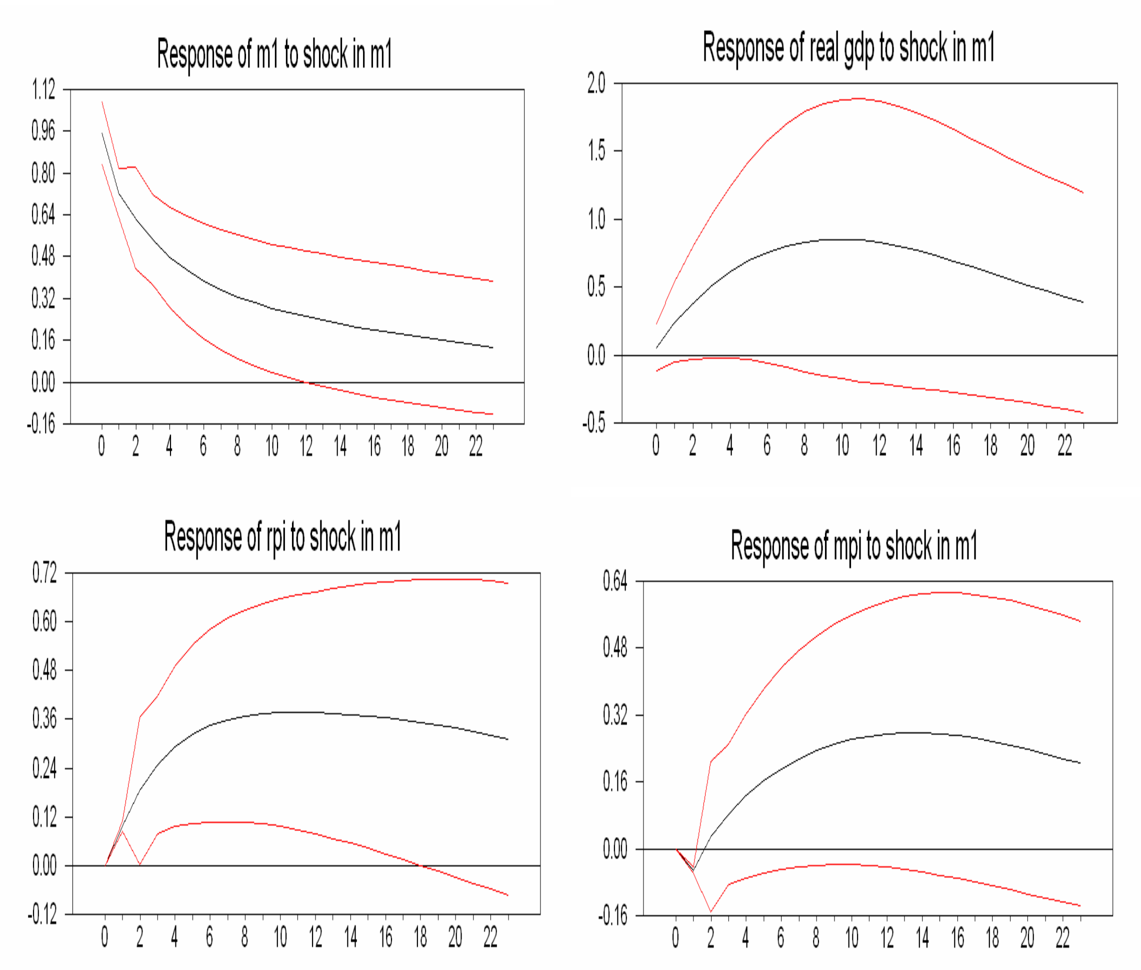
- **Money supply channel as an indicator of the dynamic effect of monetary policy on real GDP and prices: Choleski-decomposition-M1-VAR-level**

The dynamic effects of money stock shock (disturbance) on real GDP and prices are reported in Figure 5.13 below. As in the previous models, 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 5.13, 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, I 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.

This result proves the first hypothesis – that a change in the money stock does not have a significant effect on real GDP. A change in the money stock has a strong effect on prices.

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, p. 8); Starr (2004, p. 14); and Gilliam and Nakov (2004, p. 640), who all find 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. Ganev et al. (2002, p. 11); Ceccheti and Krause (2001, pp. 1-31); and Elbourne, Kiviet and Bas (2003, pp. 1-35) 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 5.13: 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 5.13 shows that the price level can – in the absence of changes in the other variables – be returned to its baseline trend[19] 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.

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[19] The baseline trend represents the trend of variables or long-term growth path of variables. The concept of baseline trend is also used by many authors (for example Fatás and Mihov 2003, p.24 when they interpreted their results).

I 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 et al., 2003, pp. 1-35; Cecchetti, 1999, pp. 655-673; Ceccheti and Krause, 2001; and Juks, 2004, pp. 39-59).

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 (see the topic of dollarization in the second chapter) 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 estates (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 banks[20], 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.

The analysis also provides another, perhaps more interesting result. This research provides more information concerning the effect of money stock shock on real GDP and prices. Figure 5.13 shows that I obtain a correct result about the money stock or money supply channel when the identification of the VAR is performed with relevant variables in the model, such as the exchange rate. Thus, the omission of the exchange rate means that money stock would not capture the effect of exchange rate variables when this variable is omitted from the model. In contrast to the fiscal policy, which does not have any significance in the monetary VAR, the exchange rate provides correct information concerning the evaluation of the effect of monetary policy on real GDP and prices. Hence, with the omission of exchange rates it is impossible to accurately evaluate the effect of monetary policy – particularly in countries in transition. Examining monetary policy without considering the exchange rate may lead to erroneous conclusions concerning the proper strategy of monetary policy; since the consequences of omitting a relevant variable from the model can include inconsistent impulse response functions and variance decomposition (see Braun and Mittinik, 1993, pp. 319-341). This conclusion is in

[20] 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.

agreement with the suggestions of Leeper, Sims and Zha (1996, pp. 1-78) and Bernanke (2003, p. 25), who emphasize the importance of correctly identifying structural shocks by setting up relevant variables in the model in order to accurately trace the effects of policy shocks across a variety of variables. The authors identify serious problems in models that imply a significant real effect of monetary policy when a relevant variable is omitted from the model.

- **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 5.14. As in the previous models, 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.

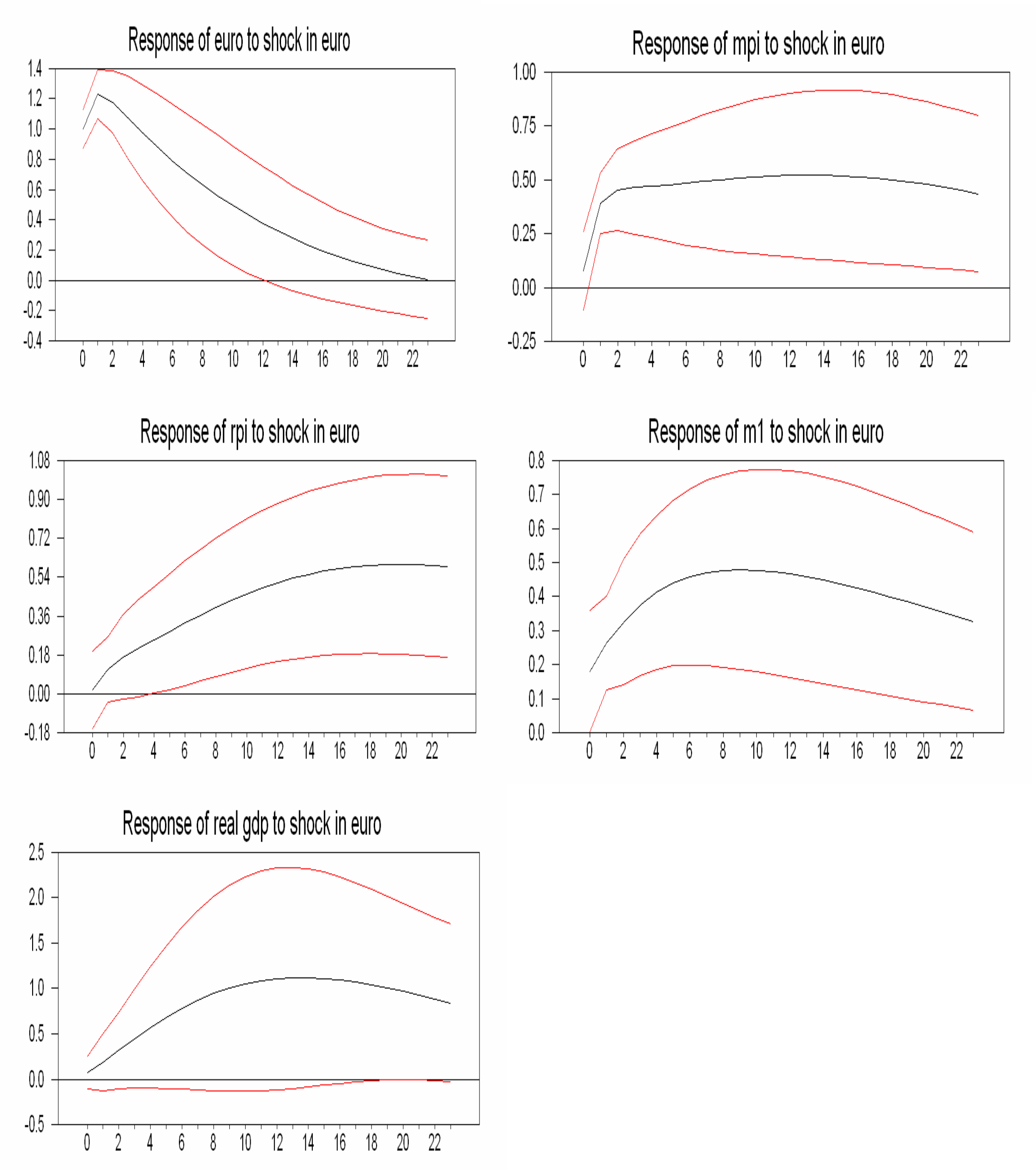
The dynamic effect of a one percent shock in the exchange rate generates a permanent increase in manufacturing and retail prices and money stock, whereas the response of real GDP is insignificant. *The shock in the exchange rate triggers: (i) a depreciation of the exchange rate; (ii) a sharp and rapid 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 5.14 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 deprecation 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.

Therefore, **these results prove the third hypothesis: that stability of the exchange rate, especially once such stability has been achieved at substantial cost, is important for macroeconomic stability. A change in the exchange rate primarily affects prices due to the strong pass-through effect of nominal exchange rate changes on domestic prices via import prices.**

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), Lyziak (2001), Jazbec et al.(2004), Ganev et al. (2002), 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 I 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 5.14: 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 5.14 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 endogenety 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.

(ii) Bernanke-Sims decomposition

In order to compare the result obtain with the Choleski decomposition, I use Bernanke–Sims decomposition. In Bernanke-Sims decomposition, the plausible ordering of variables is not important, however, I must perform the **LR-test** proposed by Sims. This test is discussed previously in the fourth part (topic: VAR methodology). As such, both channels of the effect of exchange rates on economy are analyzed by Sims and Zha (1998, pp. 98-120), Brischeto and Voss (1999), Kim and Rubini (2000), and Uhling (2005) using Bernanke-Sims decomposition.

The variables in the model are divided into two groups: the **non-policy vectors,** which include the log of GDP, the log of MPI, and the log of RPI; and the **policy vectors,** which include the log of the exchange rate and the log of M1. *In order to identify the policy shock in the structural VAR, I assume that the non-policy vector-variables cannot respond instantly to the policy vector-variables***.** This is a standard assumption in the literature both with quarterly and monthly data (Christiano et al., 1996, pp. 16-34). Furthermore, as shown by Sims and Zha (1998, pp. 98-120), a non-recursive identification scheme allows for simultaneous interaction between exchange rates and money stock. The work of Christiano et al. also allows simultaneous interaction between policy vector-variables. In addition, an important issue in estimating structural VAR-s (Bernanke-Sims decomposition), as is true in all systems of equations, is the question of normalizing the coefficients of the dependent variable (Waggoner and Zha, 1997; and Stock and Watson, 2001). Therefore, I must first make restrictions on the matrix B_0, and then I will re-estimate the model by normalizing these coefficients to one.

I propose the following restriction on the B_0 matrix:

$$x_t = \begin{bmatrix} EURO \\ MPI \\ RPI \\ M1 \\ realGDP \end{bmatrix} \qquad B_0 = \begin{bmatrix} 1 & b_{12} & b_{22} & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & b_{32} & 1 & 0 & 0 \\ b_{41} & 0 & 0 & 1 & b_{42} \\ 0 & b_{52} & b_{53} & 0 & 1 \end{bmatrix}$$

The fourth row can be interpreted as the monetary policy reaction to changes in the exchange rate regime; therefore, I allow an instantaneous response of money stock shock to exchange rate shock. On the other hand, the non-policy variables in the *second, third and fifth rows* do not respond instantly to policy variables. *Finally*, the exchange rate responds instantly to innovations in the manufacturing and retail prices indices, whereas manufacturing and retail prices and real GDP do not respond instantly to innovations in either the exchange rate or the money stock.

In order to examine the significance of identification restriction, it is necessary to perform the likelihood ratio test. The LR-test returns significant results, so our identification restriction is accepted.

The **LR TEST is:**

χ^2 **(2) =3.88052; p= 0.17031.**

It can be seen that the significance level p>0.05 is greater than 0.05, so I cannot reject the hypothesis *that the restrictions are not binding*. Therefore I can accept the imposed identification restrictions within matrix B_0.

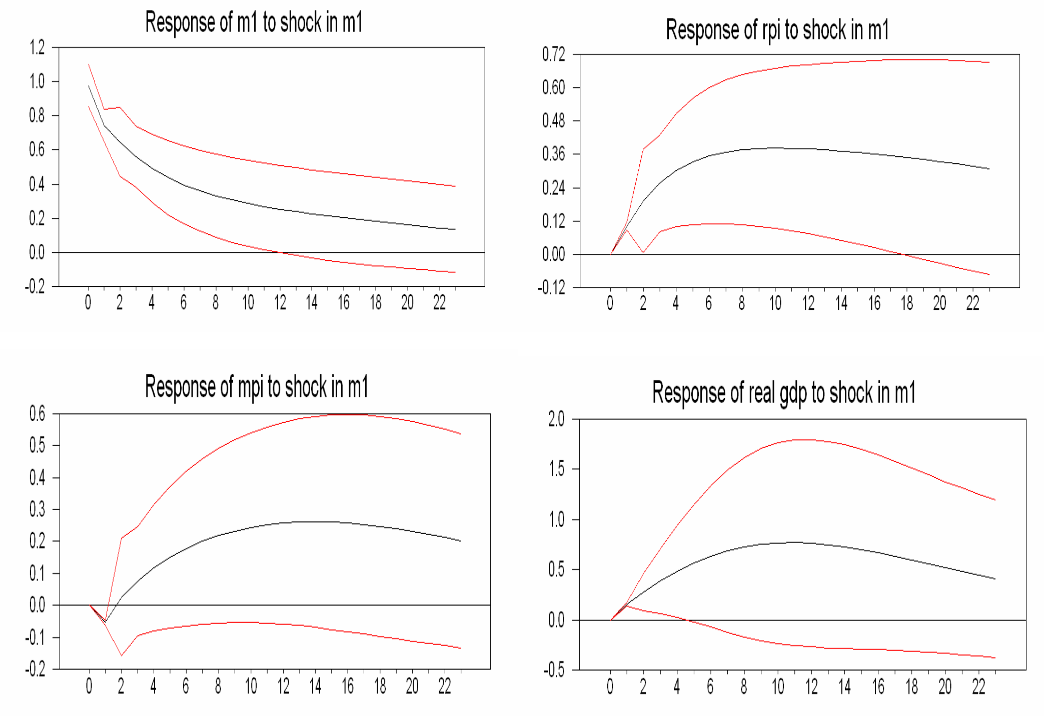
To continue, the result obtained by the Bernanke-Sims decomposition is rather similar to the result obtained by the Choleski decomposition. This similarity between the decompositions suggests that the model is robust.

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

The dynamic effect of the money supply on prices and real GDP is displayed in Figure 5.15 below. It indicates that the pattern of the impulse response function is much the same as it was in the Choleski decomposition. As mentioned above, this suggests that the model is robust, since similar results are obtained by the different decompositions.

Figure 5.15 shows that the dynamic effect of money stock can generate an increase in the prices level, yet it does not generate real GDP. Therefore, the Bernanke-Sims decomposition **proves the first hypothesis: that a change in the money stock does not have a significant effect on real GDP. A change in the money stock has a strong effect on prices.**

Figure 5.15: Dynamic effect of money stock on real GDP and prices: Bernanke-Sims-decomposition. M1-VAR- level



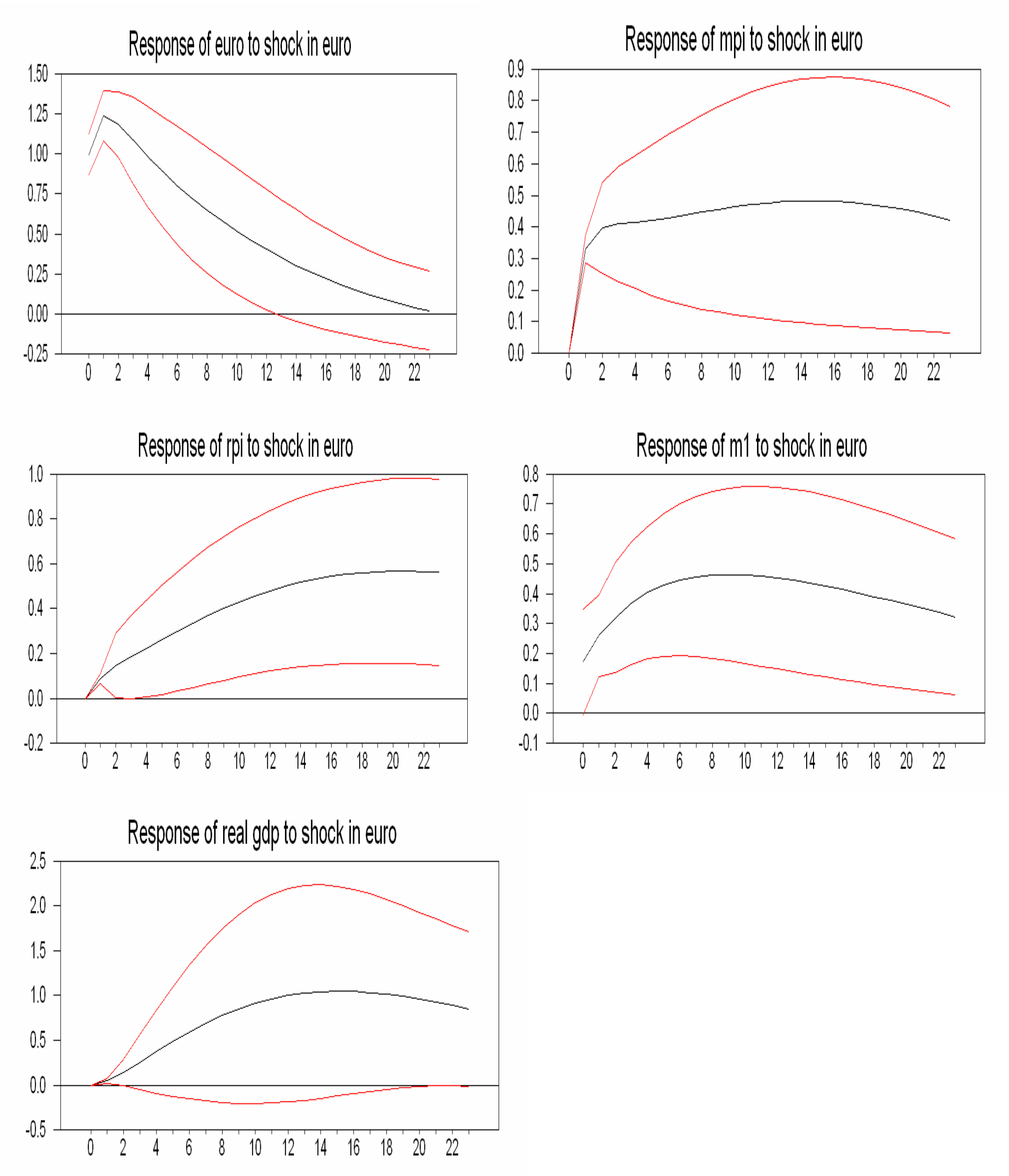
Source: Author's calculations

In addition, this decomposition suggests that money supply is weak as an independent instrument of monetary policy in the Republic of Macedonia. Since the results of the Bernanke-Sims decomposition are close to the results of the Choleski decomposition, the interpretation of the results is the same as was mentioned for that previous decomposition.

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

The dynamic effect of the exchange rate on prices and real GDP is displayed in Figure 5.16 below. Figure 5.16 shows that the exchange rate has the same pattern in its impulse response function as is seen in the previous Choleski decomposition. Again, this similarity between the results confirms that the model is robust.

Figure 5.16: Dynamic effect of the exchange rate on real GDP and prices: Bernanke-Sims decomposition EXCH.E-VAR-level.



Source: Author's calculations

Therefore, the results of the Bernanke-Sims decomposition **prove the third hypothesis: that stability of the exchange rate, especially once such stability has been achieved at substantial cost, is important for macroeconomic stability. A change in the exchange rate primarily affects prices due to the strong pass-through effect of nominal exchange rate changes on domestic prices via import prices.** *However, changes in the* *exchange rate may have a weak effect on real GDP for only two months – dying out thereafter – but they have a persistent effect on the prices indices.*

In addition, this decomposition shows that the exchange rate plays a significant role in the Republic of Macedonia, which is in line with almost all findings regarding small countries in transition. Figure 5.16 shows that Bernanke-Sims decomposition highlights a potentially strong exchange rate pass-through effect on prices; whereas it does not generate a significant effect on real GDP. Since the results found by this Bernanke-Sims decomposition are close to the results from the earlier Choleski decomposition, the interpretation of these results is the same as is noted for that previous decomposition.

5.3.2.1.2 Forecast error variance decomposition of money stock and exchange rate disturbance on real GDP and prices

Table 5.10 reports the contribution of money stock and exchange rate disturbances to fluctuations of the MPI, RPI and real GDP. This information is obtained by the forecasts error variance decomposition of endogenous variables generated by the money stock and exchange rate disturbances.

The real variables are accounted for by the median value and 95 percent probability intervals of h-steps-ahead forecasts error decomposition. The result of this test is consistent with the determination of the impulse response functions. Table 5.10 shows that the contributions of money stock to the fluctuation in the manufacturing and retail prices indices are 9 and 18 percent, respectively. Regarding the forecasts error variance decomposition of real GDP, the contribution of money stock to the fluctuation of real GDP is 10 percent.

As for the exchange rate, Table 5.10 shows that the contributions of the exchange rate to the fluctuation in the manufacturing and retail prices indices is 47 and 48 percent, respectively. Regarding the forecasts error variance decomposition of real GDP, the contribution of exchange rate to the fluctuation of real GDP is insignificant (around 5 percent).

These results are consistent with those obtained in the impulse response function by two decompositions. Table 5.10 shows that exchange rate changes **play a more significant role in the fluctuation of prices than do money stock changes.** Both channels of the monetary transmission mechanism do not have any significant effect on the fluctuation of real GDP.

Table 5.10: Forecast error variance decomposition, h periods ahead, accounted for by innovations in M1 and exchange rates-VAR

Forecast error in	Forecast horizon *h* (months)	Innovation in M1		Innovation in Exchange rates
		M-VAR	M1-VAR	EXCH.E-VAR
MPI	1	0.01	0.01	0.09
	12	0.17	0.05	0.33
	24	0.28	0.09	0.37
	48	0.35	0.09	0.47
RPI	1	0.01	0.01	0.01
	12	0.17	0.15	0.19
	24	0.37	0.17	0.36
	48	0.42	0.18	0.47
Real GDP	1	0.00	0.01	0.01
	12	0.17	0.08	0.02
	24	0.26	0.09	0.04
	48	0.32	0.10	0.05

Source: Author's calculations

In addition, the results suggest that the money supply channel is weak as an independent instrument of monetary policy. On the other hand, the exchange rate highlights a strong exchange rate pass-through effect on domestic prices.

This result also proves the third hypothesis: **that stability of the exchange rate, especially once such stability has been achieved at substantial cost, is important for macroeconomic stability. A change in the exchange rate primarily affects prices due to the strong pass-through effect of nominal exchange rate changes on domestic prices via import prices.**

In order to demonstrate the effect of omitting important variables in the models, I also show the figures obtained in the first section's M-VAR. The comparison confirms that omitting important variables such as the exchange rate from a model is likely to lead to erroneous conclusions. In this case, omitting the exchange rate causes one to overestimate the importance of money stock shock in determining real GDP fluctuation.

5.4 Econometric model for testing long-term dynamic effect money stock and exchange rate on real GDP and prices in the Republic of Macedonia: Vector Error Correction Model (VECM)

In this part of my empirical research, I use a Vector Error Correction Model (VECM) in order to examine both the short and long-term dynamic effects of money and exchange rate shocks on real GDP and prices in the Republic of Macedonia. One of the advantages of the VECM model is that such methodology makes it possible to examine *jointly both the short-term and long-term behavior of an economic variable.* Initially, I test the long-term dynamic effect of money and exchange rate on real GDP and prices. **This empirical research tests the third hypothesis: that stability of the exchange rate, especially once such stability has been achieved at substantial cost, is important for macroeconomic stability. A change in the exchange rate primarily affects prices due to the strong pass-through effect of nominal exchange rate changes on domestic prices via import prices. At the same time, this part of the empirical research tests the first hypothesis: that a change in the money stock does not have a significant effect on real GDP. A change in the money stock has a strong effect on prices.**

For purposes of comparison, and to check the robustness of the results obtained by the SVAR methodology (where the time series has been at the non-stationary level), I test the short-term dynamic effect of money stock and exchange rate on real GDP and prices by the VECM (using stationary time series).

I also test for long-term dynamic effects of money stock and exchange rate on real GDP and prices in the Republic of Macedonia by the VECM. The data for this empirical research are reported in the previous section (5.3.1).

5.4.1 Econometric model and result

5.4.1.1 Testing long-term dynamic effect of money stock and exchange rate disturbances on real GDP and prices in Republic of Macedonia: VECM

A review of previous empirical research on this topic, regarding both developed countries and countries in transition, reveals common features that are incorporated into my own empirical investigation.

Initially, I test for integrated properties of the variables – i.e. an augmented Dickey Fuller test (henceforth-ADF test) – in order to check whether the time series are difference-stationary or trend-stationary, as well as to check whether the time series are integrated in the first or second order. Subsequent to the Dickey Fuller test, I perform tests for cointegration of the properties of the variables and for the presence of long-term links between exchange rates, money stock, real gross domestic product, and manufacturing and retail prices indices. In doing so, I follow the methods used by Johansen (1995, pp. 1-24), Mosconi (1999), Enders (2004), and Lütkepohl (2005).

5.4.1.1.1 Test for Integrated Properties of the Variables-A Testing for Trends and Unit Roots Test - Augmented Dickey-Fuller-Test

By visual inspection of the univariate time series, it can be seen that all of the time series exhibit trend patterns, with the exception of the exchange rate. However, I cannot differentiate between those that are trend-stationary and those that are difference-stationary by visual inspection alone. Moreover, if the time series exhibit difference-stationarity (henceforth DS), they can be transformed into a stationary time series by differencing, whereas if the time series exhibits trend-stationarity (henceforth TS), they can be transformed into a stationary model by removing the deterministic trend.

To examine the integration properties of the time series – i.e. whether they are DS or TS series – I use an Augmented Dickey-Fuller test (henceforth ADF). ***The null hypothesis of the ADF test is that the process has a unit root, i.e. the process is nonstationary.*** Therefore, if the calculated value τ (tau) is higher than the value reported by the Dickey-Fuller table, the null hypothesis can be rejected; hence, the time series does not have a unit root and it is stationary. Conversely, if τ is smaller than the critical value, the null hypothesis cannot be rejected, so I can conclude that the time series does have a unit root and therefore it is nonstationary. As in the previous models, I use monthly data ranging from 1997:1 to 2006:12, so there are 120 observations. The choice of the number of lags is based on Schwartz's Bayesian Information Criterion.

Table 5.11: Tests for integration properties of the variables in levels with linear trend (t) and constant term(c): level

LEVELS			
Variables	Test Statistic	Deterministic	k
LNECXH.E	-3.9326	t,c	0
LNMPI	-2.1446	t,c	0
LNRPI	-2.1236	t,c	0
LNM1	-2.5226	t,c	0
LNADJGDP	-1.9425	t,c	2

Critical value for 93 observations:

ADF; -4. 04 (1% significance); -3.45 (5% significance.); -3.15 (10% significance).

The critical values for the ADF test are taken from Hamilton (1994) and Enders (2004)

Source: Author's calculations

The first column in Table 5.11 reports the variables that will be estimated by the ADF test: log of the Exchange rate, log of MPI, log of RPI, log of M1 and log of the seasonally adjusted real GDP. All variables are in levels. The second column shows the Dickey–Fuller statistics. The third column shows the deterministic components that are used for testing. The last column shows the number of lags selected by the Schwartz Bayesian Criterion (SBC), (Enders, RATS, 2004, p. 56; and Mosconi, MALCOM, 1999 and 2007). The critical values of the ADF test are denoted in the button of Table 5.11.

This test includes real GDP seasonality because the variable used in the model is seasonally adjusted real GDP. Using trend and constant as a deterministic component for the variables in levels, Table 5.11 shows that all variables have a unit root and are therefore non-stationary, because *I cannot reject the null hypothesis of a unit root against the alternative of stationary for any of the variables.* The null hypothesis for exchange rates is rejected at the five percent and ten percent significance level, while it is not rejected at the one percent significance level. The result for the exchange rate is inconclusive, but upon taking the first difference it became stationary, so therefore the exchange rate is integrated in the first order I(1) process (see Table 5.12). Therefore, I can conclude that the variables are difference-stationary (DS) and not trend-stationary (TD).

Table 5.12: Tests for Integration Properties of the variables in first difference with constant: in differences

FIRST/SECOND DIFFERENCE			
Variables	Test Statistic	Deterministic	k
LNECXH.E	-7.0998	c	1
LNMPI	-11.1527	c	1
LNRPI	-10.098	c	0
LNM1	-6.9505	c	3
LNADJGDP	-11.8327	c	10

Critical value for 93 observations:

ADF; -3. 51 (1% significance); -2.89 (5% significance.); -2.58 (10% significance.)

Source: Author's calculations

I continue the analysis by taking the first difference, so that I may determine in which order the properties of the variables are integrated. Table 5.12 shows that when taking the first difference with deterministic component constant across all variables (excepting real GDP), the null hypothesis is strongly rejected at all significance levels. Therefore, I can conclude that the time series are stationary and are integrated in the first order I(1). With respect to real GDP, the null hypothesis can not be rejected in the first difference at any level, so it does not become stationary and integrated in the first order. Further, in the second difference, real GDP can reject strongly the null hypothesis at all levels of significance and thus becomes a stationary process, but it is integrated in the second order I(2). Therefore, I can conclude that real GDP becomes stationary once it is calculated in the second difference. According to Johansen (1995), having this one variable as I(2) should not cause significant problems because all of the other variables are integrated in I(1), and therefore I am allowed to establish the VECM model (see Mosconi, 1999 and 2007; and Enders, 2004).

Finally, I can conclude that the time series are not trend-stationary (TS) processes; whereas instead they proved to be difference-stationary (DS) and integrated in the first order I(1).

5.4.1.1.2 Test for cointegration of the properties of the variables and long-term links between exchange rates, money stock, real GDP, and prices

According to the Augmented Dickey-Fuller test, the cointegration link among the variables can be investigated only if the variables are difference-stationary (DS) and integrated in the first order. Aside from the fact that the time series have to be integrated in the first order, I must also include error correction terms into the standard VAR in order to examine the cointegration of time series, i.e. to analyze issues in the VECM. I must then attempt to determine if there is any linear combination among the variables in the long-term equilibrium. Using Johansen methodology, the linear combination between the variables in the long term is then analyzed. The main advantage of this methodology is that it allows for imposing restrictions on long-term and short-term scenarios. In doing so, I can analyze both types of dynamic processes in the economic system.

Therefore, based on Johansen methodology (see the fourth chapter topic on econometrics methodology) and the data from 1997:1 to 2006:12, the VECM specification is given as**:**

$$\Delta x_t = \sum_{i=1}^{p-1} \Gamma_i \Delta x_{t-i} + \Pi x_{t-1} + \mu_0 + \Psi D_t + \Theta w_t + e_t$$

Here, $\Gamma_i \Delta x_{t-i}$ is the matrix of parameters relating to *the short-term dynamics* of the model, while $\prod = \alpha\beta'$ contains information relating to the *long-term relationships* of the variables in the model. With regard to α and β are $p \times r$ matrices, and r is the number of cointegrating relation. The colum of β is a cointegrating vector, whereas α is the *loadings matrix* of the cointegrating vector and shows the speed of adjustment towards the long-term equilibrium, μ_0 is a *vector of the constant,* D_t is a *vector of intervention dummy,* and e_t is a *vector of disturbance.* The linear combination expresses $\beta' x_{t-1} = ECT_{t-1}$ the cointegration relationships (error correction terms) between the variables.

I start with specification of the tests, such as: ***the maximum lags, the trend polynomial, the cointegration ranks, the stability of parameters, and the testing hypothesis for the I(1) model.***

The maximum lags are based on AIC, HQ, and SC criterion. All of the criteria have shown that *two lags* are the optimal number of lags, and therefore I use two lags in my model.

The test for the trend polynomial clearly supports the model with a *constant in the short-term matrix*, whereas it does not support the alternative model with a trend in the cointegration space (see Appendix 9). In this model, the restriction that the trend coefficient is zero in the cointegration space cannot be rejected against the model with a trend in the cointegration space. In continuing, *I establish a model with a constant in the short-term matrix and no trend in the cointegration space.*

In the next step, I examine the trace test statistics for cointegration rank, as reported in Table 5.13, which is estimated using *Johansen's maximum likelihood procedure.*

In the trace statistic tests, the null hypothesis that the number of cointegration vectors rank $(\mathbf{\Pi})$ is less than or equal to *r* will be evaluated against a general alternative hypothesis.

I use Johansen and Nielsen's (1993) critical value of the λ_{trace} statistics for dummy variables included in the system. These should be appropriate since the impact of impulse dummies on the asymptotic distribution of the rank test is usually negligible (Hubrich 2001, p. 278).

Table 5.13 Test for cointegration rank (r)

Null Hypothesis	**Alternative Hypothesis**	λ **-trace**	**90% critical value**	**95% critical value**	**97.50 critical value**
$r = 0$	$r > 0$	**77.20**	**64.84**	**68.52**	**71.50**
$r \leq 1$	$r > 1$	**46.55**	**43.95**	**47.21**	**50.35**
$r \leq 2$	$r > 2$	**29.87**	**26.79**	**29.68**	**32.56**
$r \leq 3$	$r > 3$	**16.02**	**13.33**	**15.41**	**17.52**
$r \leq 4$	$r > 4$	**3.48**	**2.69**	**3.76**	**4.95**

Note: The hypothesis is accepted when the calculated value < table value

Source: Author's calculations

The null hypothesis is rejected if the trace statistic is larger than the critical value. It can be seen in Table 5.13 that under the null hypothesis **r =0** is rejected because the trace statistic is higher than the critical value at the 95 and 97.5 percent significance levels. On the other hand, the alternative hypothesis of the presence of one or more cointegrating vectors is accepted. Since, *46.55 is less than the 95 and 97.5 percent critical values (47.21 and 50.35 percent respectively),* I cannot reject the null hypothesis at these significance levels. Based on the results of the trace test, I accept a rank **r = 1, w**hich implies that I need to find one cointegration vector of long-term relationship among the variables.

In addition, the parameter's stability has been evaluated using tests such as stability of cointegration vectors and cointegration space (see Appendix 9). The test shows that both cointegration vectors and the cointegration space are stable in all periods of observation. In the interpretation, a value of more than one means that the hypothesis is rejected, whereas a value of less than one means that the hypothesis cannot be rejected. The cointegration rank **r** is stable if rank **r-1** is rejected for any sample size and if rank **r** is not rejected for any sample size. As seen in Appendix 9, the uppermost line represents the test for hypothesis **r = 0**, which in this case is clearly rejected for any sample size since the ratio of the test value to the critical value is more than one. The second line shows that **r = 1** is selected for any sample size and therefore it cannot be rejected since the ratio of the test value to the critical value is less than one. Actually, this choice corresponds to the true rank in the Data Generation Process.

With respect to cointegration space Sp(B*), the figure in Appendix 9 shows that the normalized test results are well below one for the Z-model and the R-model for any sample size, which is evidence in favor of the stability of Sp(B*). Also, in this case, a value greater than one means that the hypothesis is rejected, whereas a value less than one means that the hypothesis cannot be rejected. Here**,** *both models are less than one and converge to long-term equilibrium.*

Next, I examine the I(1) model by employing tests such as: the *test for stationary, the weak exogenity test of variables , and the test for exclusion of variables from the model.* I also examine the identification of the B matrix and test for linear restrictions on loading in matrix A and matrix B.

The likelihood ratio test (LR-test) for each of these hypotheses is that they are asymptotically X^2 distributed with **r** degrees of freedom under the null hypothesis, with a significance level of 5 percent. The first row of each table in Appendix 9 shows the variables of the model; the second row shows degrees of freedom; and the third and fourth row show **LR TEST statistics and significance level *p*.**

The evidence as to whether or not the series are stationary**,** as reported in Appendix 9, shows that the hypothesis of stationarity is rejected for all variables. This confirms the Dickey-Fuller test that the time series have a unit root and are non-stationary. The results of analyses of weak exogenity are also reported in Appendix 9. The exchange rate, money stock, and real GDP all show weak exogenity variables, i.e. these variables are not affected by the cointegration of long-term relationships of the variables – they are affected only by the short-term relationships. *Since money stock has this characteristic, I may conclude that the NBRM does not apply monetary rules, but that instead the monetary policy is being lead by discretionary measures.* In addition, during the investigated period, the base money and through it the money stock have been endogenous to inflation and exchange movement via central bank intervention in the foreign exchange market. *This is* *consistent with my finding that money supply is endogenous to the exchange rate target, whereby money supply is highly determined by developments in the foreign exchange market.*

Finally, the result of the exclusion of the variables from the cointegration vector is reported in Appendix 9. According to this analysis, only real GDP is excluded from the cointegration vector, whereas exchange rate, manufacturing prices, retail prices, and M1 are not. ***Thus, there is only one long-term stable linear combination: between exchange rate, manufacturing prices, retail prices, and money stock.*** Furthermore, the manufacturing prices and retail prices react to long-term equilibrium between exchange rate, manufacturing prices, retail prices, and money stock, whereas exchange rate and money stock do not react to such equilibrium due to their characteristic of weak exogenity. *The result is consistent with the evidence that the exchange rate is endogenous to Macedonian monetary policy, i.e. part of the managed exchange rate regime.*

In the next section, I examine the linear restriction on the loadings matrix and the matrix of the cointegration vector, and therefore I normalize with one RPI. For this purpose, I employ the likelihood ratio test for this hypothesis, where chi squared with **1 degrees** of freedom is **1.64251**, whereas the level of significance is **0.64979***. Thus, the linear restrictions on α and β are accepted because the significance level is **0.64979,** which is higher than **0.05.**

Table 5.14: Linear restriction on loading and cointegration vector matrices

Variables	β	α
EXCH.E	-0.5212	-0.06
MPI(exog.)	-0.5622	0
RPI(exog.)	1	0
M1	-0.17	-0.13

Note: α adjustment coefficient, β cointegration vector, coefficient is normalized on the RPI.

Source: Author's calculations

In other words, the **LR-test** shows that overidentifying restrictions on both matrices are accepted[21]. I also compute the “standard error” for both matrices in order to calculate the ***t*** value, i.e. the significance of the estimated coefficient. The “standard error” in the loadings matrix are **MPI = 0.06 and RPI = 0.0647**, and the “standard error” in the matrix of cointegration vector are **EXCH.E= 0.2329, MPI=0.2363 and M1=0.0557.** I can now estimate the ***t*** value: **(MPI = (*t*) 2.60** and **RPI = (*t*) 2.72,** while **EXCH.E 0.5212/0.2329 = (*t*) 2.23, MPI 0.5622/0.2363=.(*t*) 2.37 and M1 0.17/0.0557= (*t*) 3.15**

Finally, I may conclude that all estimated coefficients are statistically significant and have the expected signs.

In continuing, I can rewrite the long-term equilibrium relation as follows for easier interpretation of the cointegration vector:

RPI = 0.5212 EXCH.E+0.5622MPI+0.17M1			
(see)	**(0.2329)**	**(0.2363)**	**(0.0557)**
(*t*)	**(2.23)**	**(2.37)**	**(3.15)**

The long-term relationship between exchange rate, manufacturing prices, retail prices, and money stock is statistically significant due to the high value of the t statistic (EXCH.E=2.23, MPI=2.37 and M1=3.15).

The cointegration vector can be interpreted as a causal model with the price level as the dependent variable. Therefore, the cointegration vector shows that retail prices are positively correlated with exchange rate, manufacturing prices, and money stock.

Table 5.14 shows that the retail prices index moves positively according to changes in the exchange rate. A depreciation of the domestic currency of one percent against the euro will generate an increase in the price level of 0.5212 percent. Therefore, **the coefficient *of EXCH.E (in the above equation)*** *shows a strong pass-through effect of nominal exchange rate changes to prices level in Republic of Macedonia.* Moreover, the coefficient of the

[21] Note: Overidentifying restriction is accepted when the significance level is larger than 005.

exchange rate could be interpreted as a long-term coefficient of elasticity (due to logs), ***indicating that a 10 percent devaluation (depreciation) of domestic currency results in a 5.2 percent rise of the retail prices level in the long term in the Republic of Macedonia.*** In other words, the exchange rate has a long-term coefficient of **0.52,** indicating that **52** percent of changes in the EXCH.E are fed into the prices level.

It can be seen that the exchange rate is a potential source of inflation both in the short and long term in the Republic of Macedonia. Hence, I can conclude that the **direct channel** of exchange rate has a strong effect on inflation in the long term, whereas the **indirect channel** of exchange rate has no effect on real GDP. These results lend solid support in favour of the NBRM's monetary strategy of exchange rate targeting, since a strong link between exchange rate and prices in the Republic of Macedonia is present.

The long-term empirical evidence also proves the third hypothesis: that stability of the exchange rate, especially once such stability has been achieved at substantial cost, is important for macroeconomic stability. A change in the exchange rate primarily affects prices due to the strong pass-through effect of nominal exchange rate changes on domestic prices via import prices.

In comparing these results with the findings of other research on small open countries in transition, e.g. Kuijs (2002) for Slovakia, Billmeier and Bonato (2002) for Croatia, and Ganev et al. (2002) for CEES countries, it can be determined that the Republic of Macedonia has a higher long-term pass-through coefficient. Kuijs finds that the long-term pass-through coefficient is 0.2 for Slovakia, whereas Billmeier and Bonato find it to be 0.33 in Croatia. Ganev et al. finds that in most countries in transition the coefficient is close to the value (1.0) that economic theory suggests (e.g. Latvia, Slovakia, Romania, Bulgaria, Czech Republic, and Poland). However, core inflation does not seem to be significantly influenced by depreciation in Hungary, Slovenia, or Lithuania. My result is consistent with the conclusions of McCarthy (2000), who claims that pass-through is stronger in countries with larger import shares.

The coefficient of the money stock (in the above equation) shows that changes in the money stock will generate an increase in the price level by 0.17 percent. This is in accordance with the monetarist view that an increase of the nominal quantity of money will cause the price level to rise, i.e. rate of inflation.

The long-term empirical evidence also **proves the first hypothesis: that a change in the money stock does not have an effect on real GDP. A change in the money stock has a strong effect on prices.**

The result is close the result of Belullo (1999), who finds that an increase of money stock will cause inflation (in Croatia). In addition, the result shows a persistent effect of money stock on retail price level that is statistically significant and which confirms the importance of money stock as a source of inflation – both in the short and long term in the Republic of Macedonia.

Regarding α the coefficient of adjustment, RPI will adjust to its long-term equilibrium after 18 months by endogenous exchange rate adjustment. This supports the evidence that exchange rate is endogenous to Macedonian monetary policy, i.e. part of managed exchange rate regime. Because of exchange rate targeting by the NBRM, relatively rapid endogenous exchange rate adjustments can "catch up" to a price level above equilibrium via the nominal depreciation of the exchange rate after 18 months. *This reflects a relative degree of exchange rate stability after the devaluation in 1997.* On the other hand, the mechanism of adjustment implies that the prices level can be brought into line with the exchange rate target more rapidly. This can be achieved via rapid money supply adjustment to return the prices level to long-term equilibrium. This is consistent with the endogeneity of money supply to exchange rate targeting, whereby money supply has been made endogenous to inflation and exchange rate movement through central bank intervention in the foreign exchange market.

I can now examine the short-term dynamic effects of money stock and exchange rate on real GDP and prices by the VECM methodology and the forecasts error variance decomposition of money stock and exchange rate disturbances.

5.4.1.2 Testing of the short-term dynamic effect of money stock and exchange rate on real GDP and prices in Republic of Macedonia: VECM

In the previous section, I examine the short-term effect of monetary policy and exchange rate regime on real GDP and prices (where the variables have been in level or non-stationary) Sims-approach (VAR-level). I will now examine the effect of money stock and exchange rate on real GDP and prices by the VECM, in which the variables are differenced and included as a stationary process (variables are in the first difference).

In addition, the results from both methodologies are compared in order to draw conclusions concerning a sustainable strategy of monetary policy in the Republic of Macedonia.

5.4.1.2.1 Dynamic effect of money stock and exchange rate disturbances on real GDP and prices in the VECM

As in the previous model VAR-level, and according to VECM methodology, I use both Choleski and Bernanke-Sims decomposition. As I examine these decompositions in the previous section, I use the same ordering of the variables in the Choleski decomposition and the same restriction in the Bernanke-Sims decomposition.

(i) Choleski decomposition

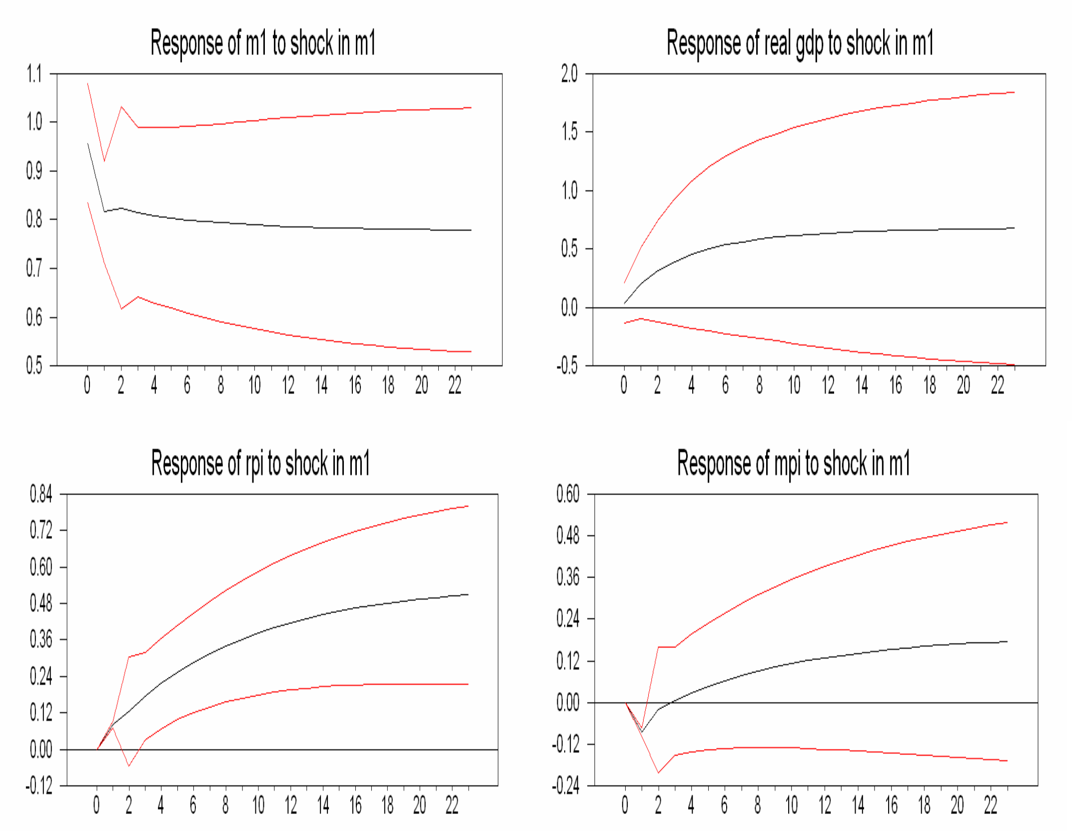
- **Money supply channel as an indicator of the dynamic effect of monetary policy on real GDP and prices: Choleski - decomposition-M1-VECM**

The Choleski decomposition model already identifies the numbers of coefficients (10 lower triangular matrices), but now they are estimated in the first difference within the VECM. The same error bands are computed as in the previous model, i.e. 95 percent intervals of confidence as computed by the Monte-Carlo simulation – the method proposed by Sims and Zha (1999).

The dynamic effects of monetary policy are reported in Figure 5.17 below. As we can see, the result of the VECM is rather similar to the result I obtain in the M1-VAR level Sims-approach.

This similarity confirms that the model is robust, since the same result is obtained via different methodologies. Figure 5.17 also shows that the dynamic effect of money stock causes a rise in the prices level, whereas it does not have a significant effect on real GDP.

Figure 5.17: Dynamic effect of money on real GDP and prices-Choleski-decomposition M1-VECM



Source: Author's calculations

By this VECM methodology, I prove the first hypothesis: that a change in the money stock does not have a significant effect on real GDP. A change in the money stock has a strong effect on prices.

Figure 5.17 highlights the persistence of a statistically significant money stock shock on the retail prices level, which confirms the importance of money in determining inflation in the Republic of Macedonia. Since the result obtained by the VECM is similar to the result obtained by the M1-VAR-level, the interpretation of the result is the same as that of the ***Choleski decomposition M1-VAR-level*** (see section 5.3.2.1.1).

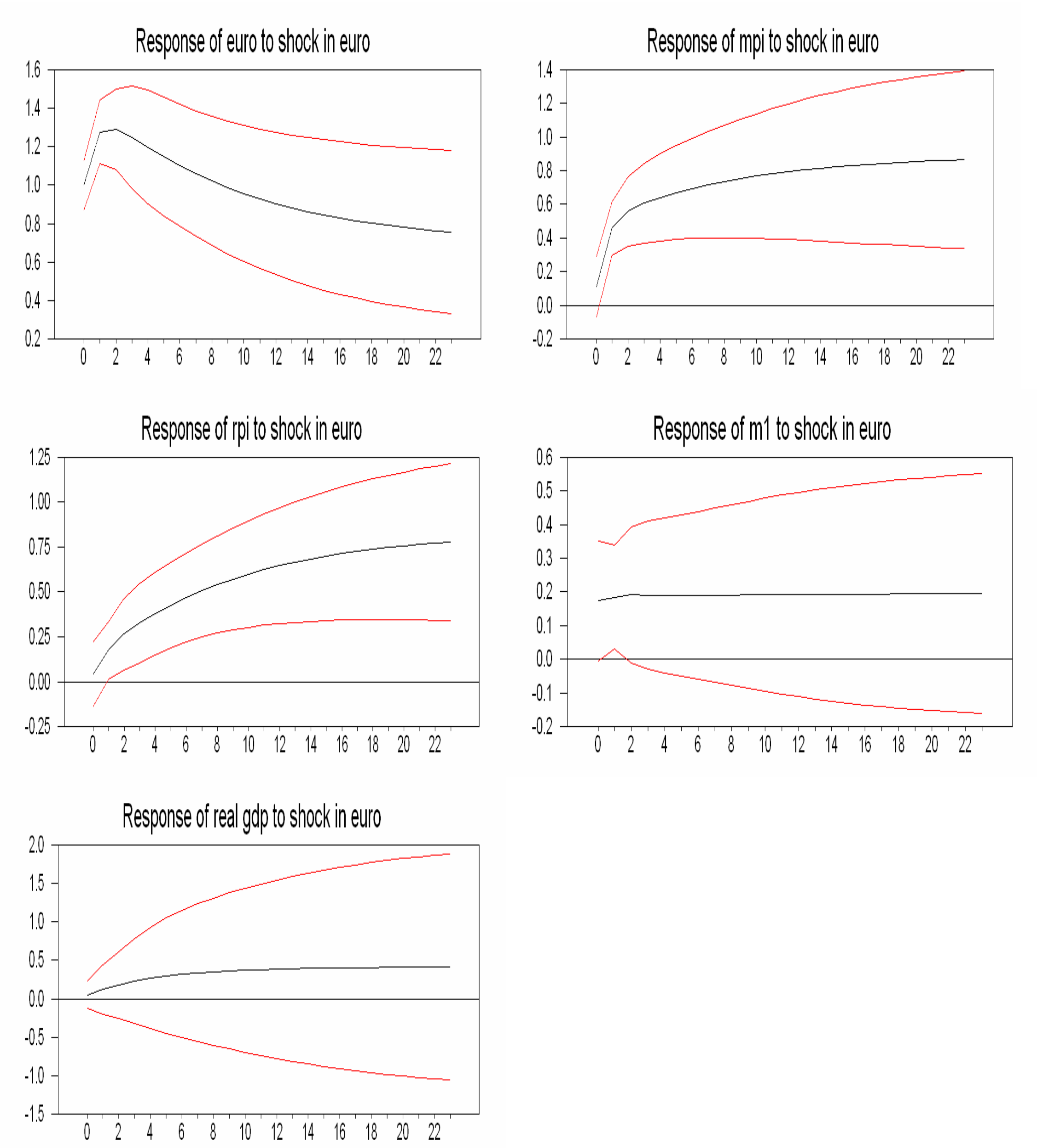
- **Exchange rate channel as indicator of the dynamic effect of exchange rate regime on real GDP and prices: Choleski decomposition-EXCH.E-VECM**

The dynamic effect of exchange rate disturbance is shown in Figure 5.18. The responses of real GDP and M1 are insignificant to shocks in the exchange rate, whereas the response of MPI and RPI are significant to shocks in the exchange rate. As Figure 5.18 illustrates, the depreciation of the exchange rate will generate a permanent increase of manufacturing and retail prices, whereas it will not generate real GDP.

Using Choleski decomposition, the result of the EXCH.E-VECM model is rather similar to the result obtained via the EXCH.E.-VAR level. Furthermore, the response of the manufacturing and retail prices indices is around 0.52 and 0.59 percent respectively, and they continue to increase permanently after twenty-two months, whereas the response of real GDP is insignificant over all periods of observation.

By this VECM methodology, I prove the third hypothesis: that stability of the exchange rate, especially once such stability has been achieved at substantial cost, is important for macroeconomic stability. A change in the exchange rate primarily affects prices due to the strong pass-through effect of nominal exchange rate changes on domestic prices via import prices.

Figure 5.18: Dynamic effect of exchange rate on real GDP and prices: Choleski decomposition EXCH.E-VECM



Source: Author's calculations

Figure 5.18 highlights a strong pass-through exchange rate effect on prices, which confirms that stability of the exchange rate is important for macroeconomic stability in the Republic of Macedonia. Because the results obtained by VECM methodology are close to those obtained in EXCH.E-VAR-level, the interpretation of the results is the same as that of the results from the ***Choleski-decomposition-EXCH.E-VAR-level*** (see section 5.3.2.1.1).

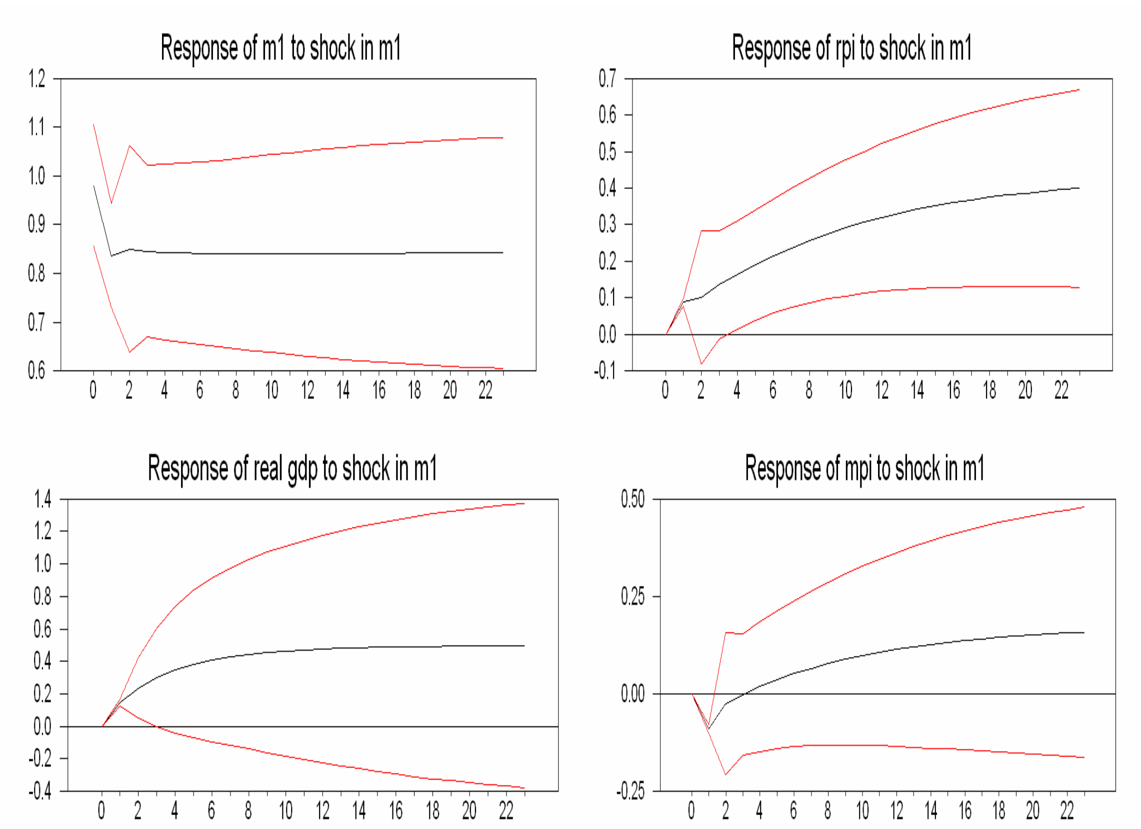
(ii) Bernanke-Sims decomposition

- **Money supply channel as an indicator of the dynamic effect of monetary policy on real GDP and prices: Bernanke-Sims decomposition-M1-VECM**

In continuing, I use Bernanke-Sims decomposition to evaluate the robustness of the model, as well as to make a comparison between the two decompositions or between VAR level and VECM. In the Bernanke-Sims decomposition, the LR-test is significant, and therefore the identification restriction is accepted by the VECM.

Thus, the **LR-test is: CHI-SQUARED (3) = 0.588989 SIGNIFICANCE LEVEL = 0.11709.**

Figure 5.19: Dynamic effect of money stock on real GDP and prices: Bernanke-Sims-decomposition M1-VECM



Source: Author's calculations

The result of the dynamic effect of money stock on real GDP and prices obtained by the Bernanke-Sims decomposition in the VECM is displayed by in Figure 5.19 below. It shows that the pattern of the impulse response function to money stock shock found by Bernanke-Sims decomposition in M1-VECM is the same as that found in the Choleski decomposition M1-VECM. Therefore, the results of both decompositions in M1-VECM prove that money supply is a weak channel as an independent instrument of monetary policy, and it highlights the persistence of a statistically significant money stock shock on the retail prices level, thus confirming the importance of money in determining inflation in the Republic of Macedonia.

With this Bernanke-Sims decomposition M1-VECM, I prove the first hypothesis: that a change in the money stock does not have a significant effect on real GDP. A change in the money stock has a strong effect on prices.

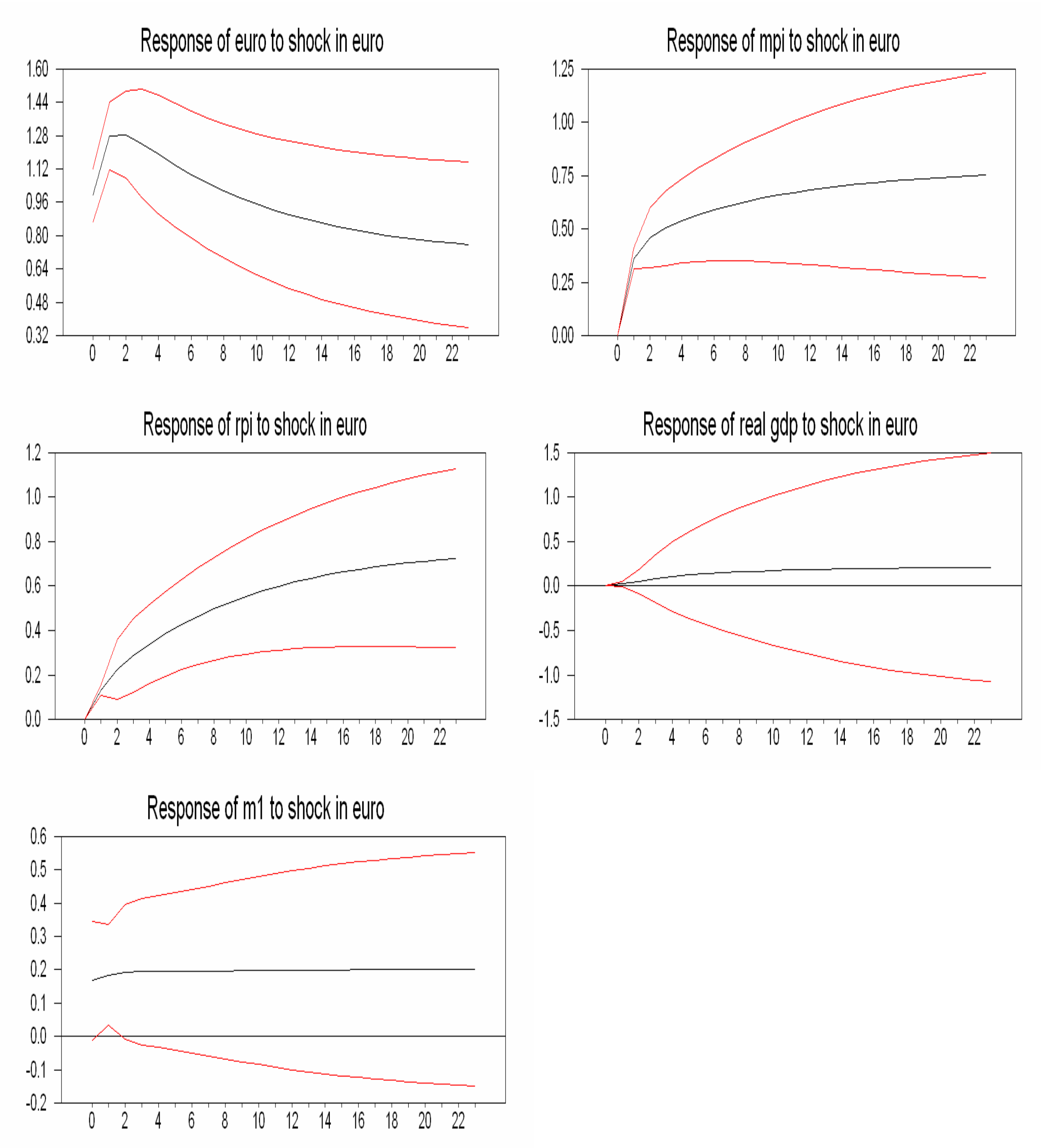
In addition, the result can be described as robust, since tests using different methodologies and decompositions all found the same result. The result is also in line with most other findings regarding countries in transition.

I obtain the same result by different methodologies, so the interpretation is the same as that given for **Choleski decomposition M1-VAR- level** in the previous section (see 5.3.2.1.1).

- **Exchange rate channel as an indicator of the dynamic effect of exchange rate regime type on real GDP and prices: Bernanke-Sims decomposition-EXCH.E-VECM**

The dynamic effect of exchange rate on real GDP and prices by the Bernanke-Sims decomposition in the VECM is displayed in Figure 5.20 below. It can be seen that the pattern of the impulse response function to exchange rate shock by Bernanke-Sims decomposition in EXCH.E-VECM is the same as the pattern found in the Choleski decomposition EXCH.E-VECM.

Figure 5.20: Dynamic effect of exchange rate on real GDP and prices: Bernanke-Sims-decomposition EXCH.E-VECM



Source: Author's calculations

Therefore, the results from both decompositions in EXCH.E-VECM prove that the exchange channel plays an important role in the monetary transmission mechanism in the Republic of Macedonia. Also, the results of both decompositions highlight a strong pass-through effect of exchange rate on price levels in the Republic of Macedonia, whereas they do not show any effect on real GDP.

In addition, the result of Bernanke-Sims decomposition EXCH.E-VECM proves the **hypothesis that stability of the exchange rate, especially once such stability has been achieved at substantial cost, is important for macroeconomic stability. A change in the exchange rate primarily affects prices due to the strong pass-through effect of nominal exchange rate changes on domestic prices via import prices.**

The results can be considered robust, since tests using different methodologies and decompositions all yielded the same findings. The results are also in line with most other findings regarding countries in transition. *I obtain the same results using different methodologies, so the interpretation of the result is the same as that given for the results obtained by the* ***Choleski-decomposition EXCH.E-VAR-level*** *(see section 5.3.2.1.1).*

Finally, all of the results, using different methodologies and decompositions, suggest that money supply is weak as an independent channel of monetary policy in the Republic of Macedonia. An increase of money supply will not affect real GDP by the asset price effect, the wealth effect, the bank-lending effect, or the firms' balance sheet effect, but it will cause a decrease of the foreign exchange reserves in the foreign exchange market, as a result of currency substitution between domestic currency and foreign currency. Moreover, the primary role of monetary policy in the Republic of Macedonia should be to control the rate of inflation, (especially once inflation rate stability has been achieved at substantial cost) since changes in the money stock does not show a significant effect on real GDP, while it has a strong effect on prices level (see more in the interpretation of the M1-VAR level results).

With respect to the exchange rate, all of the results show that it plays a significant role as a transmission channel of monetary policy in the Republic of Macedonia. Thus, any changes of the current monetary strategy of exchange rate targeting, perhaps due to higher dollarization in the Republic of Macedonia, is likely to cause the NBRM to be faced with a serious risk of financial instability. Moreover, the NBRM is likely to lose its effectiveness in controlling inflation due to the higher pass-through effect of exchange rate changes on price level via import prices in the Republic of Macedonia.

5.4.1.2.2 Forecast error variance decomposition of money stock and exchange rate disturbance on real GDP and prices in VECM

In continuing, I examine the forecast error variance decomposition of the manufacturing and retail prices indices and real GDP. Table 5.15 reports the contribution of money stock and exchange rates shocks to fluctuation of the real variables (manufacturing and retail prices indices and real GDP).

Table 5.15: Forecast error variance decomposition, h periods ahead, accounted for by innovations in M1 and exchange rates: VECM

Forecast error in	Forecast horizon *h* (months)	M1-VAR level	M1-VECM	EXCH.E-VAR	EXCH.E-VECM
MPI	1	0.01	0.01	0.09	0.11
	12	0.05	0.06	0.33	0.35
	24	0.09	0.11	0.37	0.40
	48	0.09	0.08	0.47	0.48
RPI	1	0.01	0.01	0.01	0.03
	12	0.15	0.17	0.19	0.25
	24	0.17	0.19	0.36	0.41
	48	0.18	0.22	0.47	0.49
real GDP	1	0.01	0.01	0.01	0.01
	12	0.08	0.05	0.02	0.02
	24	0.09	0.07	0.04	0.03
	48	0.10	0.07	0.05	0.06

Source: Author's calculations

To facilitate comparisons, I am reporting monetary M1-VAR level and EXCH-VAR. As in the previous section, the real variables are accounted in the median values and 95 percent probability intervals of *h*-steps-ahead forecasts error decomposition.

The result of this test is consistent with the results of the impulse response functions. Table 5.15 shows that the contributions of money stock to the fluctuation of the manufacturing and retail prices indices are 8 and 22 percent respectively. Regarding the forecasts error variance decomposition of real GDP, the contribution of money stock shock to the fluctuation of real GDP is 7 percent.

As for the exchange rates, it can be seen that both methodologies (VAR and VECM) reveal a significant contribution of the exchange rate to the fluctuation of the manufacturing and retail prices indices, whereas there is no significant contribution to real GDP. Table 5.15 shows that the contributions of exchange rate to the fluctuation of the manufacturing and retail prices indices are 48 and 49 percent, respectively. However, the contribution of exchange rate to the fluctuation of real GDP is insignificant.

This result is consistent with the result obtained in the impulse response function by two decompositions in VECM. The exchange rate changes play a more important role in the fluctuation of the prices than money stock or money supply. Both channels of monetary transmission mechanisms of monetary policy do not have any significant contribution to the fluctuation of real GDP. Because the result is rather similar by methodologies and decomposition, as well as by forecast error variance decomposition, I can conclude that the models are robust.

In addition, the VECM shows that the money supply channel is weak as an independent instrument of monetary policy. On the other hand, the exchange rate highlights a strong pass-through effect of exchange rate changes on domestic prices.

This result proves the third hypothesis: that stability of the exchange rate, especially once such stability has been achieved at substantial cost, is important for macroeconomic stability. A change in the exchange rate primarily affects prices due to the strong pass-through effect of nominal exchange rate changes on domestic prices via import prices.

6. CONCLUSIONS

The main objective of this dissertation is to examine the effect of monetary and fiscal policy and exchange rate regime type on real GDP and prices in the Republic of Macedonia over the period from 1997 to 2006. The research includes the main conventional transmission channels of monetary and fiscal policy (money supply, short-term interest rate, primary fiscal deficit, government expenditure and revenue), 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, I employ SVAR and VECM methodologies in order to verify the validity of the three main hypotheses.

In the first chapter of the dissertation, I make a preliminary assessment of the monetary and fiscal strategies in the Republic of Macedonia, from its monetary and fiscal independence through the end of 2007. I also include some recent events in 2007. This analysis shows that a monetary strategy of targeting the exchange rate, i.e. the stability of the exchange rate, has been successful at reducing the rate of inflation in the Republic of Macedonia over the examined period. In recent years, the issue of exchange rate regimes has become more pronounced since the Republic of Macedonia liberalized its capital account, became a member of the World Trade Organization, and was granted candidate status for joining the European Union. Consequently, further investigation of monetary policy and exchange rate regime must address the seemingly incompatible trinity of liberalization of capital accounts, fixed exchange rates, and independent monetary policy (Obstfeld, 1998 and Mishkin, 2003). As a result, the transmission mechanism of monetary policy and exchange rate regime type, i.e. the effect of money stock, short-term interest rate, and exchange rate channels on real GDP and prices, is examined in the last chapter of this work (employing SVAR and VECM). The analysis of the fiscal policy demonstrates that fiscal policy is not implemented according to fiscal rules or rules intended to adjust the budget deficit according to business cyclical fluctuations, but rather that it is managed by the discretionary fiscal regime. The government of the Republic of Macedonia, from 1992 to the end of 2006 (and particularly in 2007), has made several changes either in the fiscal deficit, public expenditure, or revenue in order to promote rapid economic growth. As a result, the effect of fiscal deficit, public expenditure, and revenue on real GDP and prices are examined in the last chapter of this work (employing SVAR and VECM).

In the second and third chapter of this dissertation, the theory, empirical evidence, and econometric methodologies are reviewed, including research on both developed countries and countries in transition. Both theory and empirical evidence show that the transmission mechanism of monetary policy varies among the developed countries and countries in transition. In contrast to findings from the developed countries, the effects of monetary policy on real economic activity via money supply and interest rate channels are weak in the countries in transition due to the significant role of the exchange rate in those countries. The data from countries in transition highlights a potentially strong exchange rate pass-through effect on prices due to relatively higher dollarization (asset substitution) within those economies. This suggests that monetary policy makers need to take into account these characteristics of the transmission mechanism of monetary action via exogenous monetary shocks on real GDP and prices. Regarding fiscal policy, in recent years the empirical evidence in developed countries shows different and inconclusive outcomes concerning the effects of fiscal policy on real economic activity. In contrast to the developed countries, there are relatively few studies regarding the effect of fiscal policy on real economic activity in countries in transition. In this context, most researchers believe in non-Keynesian effects on the economy, that fiscal austerity or adjustment is suggested as a means of successful macroeconomic stabilization, and that fiscal spending is associated with no growth in real economic activity and a deterred transition.

The empirical literature, both in the developed countries and countries in transition, employs SVAR and VECM methodologies in evaluating the effect of monetary and exchange rate regime type on real GDP and prices. Only recently have some researchers begun employing SVAR and VECM methodologies to assess the effect of fiscal policy on real GDP and prices.

In the last chapter of this dissertation, I investigate the effect of monetary and fiscal policy and exchange rate regime type on real GDP and prices from 1997 to 2006. I begin the analyses with two well-known conventional channels of monetary policy (money stock and interest rate), and I continue, in the next section, with three well-known fiscal channels (primary fiscal deficit, public expenditure, and public revenue). The last chapter is the core of this dissertation. In it, I examine the effect of the exchange rate channel on real GDP and prices, i.e. I attempt to find out to what extent price level and real GDP are affected by the exchange rate, i.e. the costs and benefits of introducing different exchange rate regimes. In addition, for the first time in the literature for countries in transition, I conduct joint modeling of the effects of monetary and fiscal policy on real GDP and prices.

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:

Regarding money supply channels, the results from the two methodologies (SVAR and VECM) and from the Choleski and Bernanke-Sims decompositions (Enders, 2004 and Lütkepohl, 2005), support **the first hypothesis: that a change in the money stock does not have a significant effect on real GDP. A change in the money stock has a strong effect on prices.** My findings highlight the persistent effect of a money shock on price level, and they confirm that money has an important influence in determining inflation in the Republic of Macedonia. Within a meaningful time horizon, the price level cannot be restored to its baseline trend in relation to the other variables in the model by endogenous money adjustment. Since money showed a persistent effect on prices, money is confirmed as *a potential source of inflation in the Republic of Macedonia*. In the absence of changes in the other variables, the price level can be returned to its baseline trend gradually through changes in the rate of inflation and more quickly by money supply adjustment. The result is consistent with the fact that the base money, and through it the money stock, i.e. the money supply, in the period of investigation has been either an endogenous/dependent variable or controlled by the NBRM, i.e. adjusted to money demand (determined by inflation in this model). This result is in line with most findings concerning countries in transition. Belullo (1999), Gilliam and Nakov (2004, pp. 653-684), Starr (2005, p. 14), and Horváth and Maino (2006, p. 8) all find that money is a potential source of inflation. In addition, this result is also in accordance with the monetarist view that an increase in money growth causes a rise in the price level. My findings are therefore consistent with the view that the primary role of monetary policy should be to control inflation in the Republic of Macedonia, as the money stock does not show any significant effect on real GDP, while it exhibits a strong effect on price level.

As to the effect of money supply on real GDP, I find that money supply is weak as an independent channel of monetary policy in the Republic of Macedonia, due to the fact that the banking and financial sectors are still characterized by shallow levels of financial intermediation, underdevelopment in the financial sector, a lack of competition in the banking sector, and higher dollarization. Thus, the phenomenon of the impact of money supply on economic outcomes (via the asset prices effect, the wealth effect, the bank-lending effect, and the firms' balance sheet effect) does not yet operate in Macedonia as it does in developed countries. Particularly, the asset prices effect is not found in the Republic of Macedonia, by which the impact of money supply on asset values such as bonds, shares, real estate, and other domestic assets should in turn lead to an increase in household wealth and firms' market values. This finding is consistent with most other research concerning countries in transition, which concludes that the monetary transmission mechanism in these countries is weak due to structural and institutional deficiencies, in particular underdeveloped financial systems (Elbourne et al., 2003, pp. 1-35; Ceccheti and Krause, 2001; and others). In addition, this result is also consistent with the most common finding concerning economies with a significant degree of currency substitution. In this context, greater dollarization in the Republic of Macedonia (see the topic of dollarization in the second section) can also weaken the expansionary monetary policy on banks' lending channels. *An increase of the money supply in the Republic of Macedonia causes a decrease of the foreign exchange reserves in the foreign market, as a result of currency substitution between domestic currency and foreign currency, and this process may lead to deterioration of the foreign exchange reserves.* As a result, an increase of money supply *does not boost domestic credit*, but instead it can leak in the form of capital outflows, resulting in very little or no increase in banking system credit to the private sector. Dollarization in the Republic of Macedonia is primarily motivated by asset substitution of both real and financial assets. Many prices of real estate and durable consumer goods are to some extent indexed to foreign currency, and residents use the foreign currency (as domestic currency) for buying and selling real estate. As for financial assets, residents deposit large proportions of their savings in foreign currency deposits either as bank deposits or outside of the banking systems, and banks provide loans that are either denominated in foreign currency or indexed to foreign currency. *Therefore, an increase of money supply does not mean an increase of purchasing power but rather an increase in the rate of substitution of currencies.*

Regarding the effect of the short-term interest rate, the result of the empirical research **proves the hypothesis that a change in the short-term interest rate does not have an effect on real GDP.** This result is consistent with most findings regarding countries in transition, which claim that monetary transmission via interest rate channels to real GDP does not function as it does in the developed countries (Égert and McDonald, 2006; Horváth and Maino, 2006; Ganev et al., 2002; Kuijs, 2002; Ceccheti and Krause, 2001; and Elbourne et al, 2003). Furthermore, my findings indicate that the short-term interest rate is a weak channel of monetary policy in the Republic of Macedonia due to the underdeveloped financial sector, lower competition in the banking system, and higher dollarization. Thus, the result is consistent with evidence that the interest rate has not reflected the market type behavior because the money market does not yet function well in the Republic of Macedonia, and thus the interest rate has not been an effective monetary policy tool. The same conclusion is put forth by Bonato and Billmeier (2002) for Croatia, and therefore the interest rate is not included in the model. Moreover, the interest rate on NBRM bills is a leading interest rate and a benchmark for banks' interest rates, since the supply of the NBRM's bills is exogenously determined by the necessity of the central bank to issue its bills to absorb surplus liquidity in the banking system or to increase its foreign exchange reserves (Ribnikar and Bole 2006, p. 10). The additional factor that could contribute in explaining this result is higher dollarization. In economies with relatively higher dollarization, such as that of the Republic of Macedonia, the potential effectiveness of an independent interest rate policy is limited. Monetary policy would have small independent control over domestic interest rates, since they are influenced by the foreign euro or dollar interest rates. That is, domestic interest rates are in close parity with foreign euro interest rates, which affects the commercial risk of domestic banks.

Regarding the effect of fiscal policy on real GDP and prices, my empirical findings prove **the first part of the second hypothesis: that a change in the primary fiscal deficit and government expenditure does not have a significant effect on real GDP.** My findings do not reveal a conventional Keynesian effect of fiscal policy on real GDP in the Republic of Macedonia. The primary fiscal deficit and government expenditure may have had a weak effect on real GDP, but only for four months, after which it died out. Therefore, fiscal action has only insignificant effects on real GDP in the Republic of Macedonia. *Fiscal policy does not show an effect on real GDP in the Republic of Macedonia due to the counteracting effect of the monetary policy reaction. Monetary policy reacts* *immediately and continues to counteract the effects of fiscal policy as long as they persist.* This causes a crowding out effect. In other words, an expansionary fiscal policy is accompanied by a tightening of the monetary policy. In addition, my findings show that money supply is endogenous to the movement of the fiscal variables and inflation, as the primary deficit and prices level both return to their baseline trends less than three months after the fiscal shocks. The results also show that prices level could be restored to their baseline trends by rapid money supply adjustment. This conclusion is consistent with previous findings, both concerning developed countries (Mountford and Uhling, 2005; and Perotti, 2002) and countries in transition (Fischer and Sahay, 2000; and Aslund, 2002). The aforementioned research finds that fiscal policy action does not have an effect on real economic activity, particularly since the period of fiscal consolidation took place. In addition, Von Hagen et al. (2001, pp. 279-295), Andrés and Doménech (2003), and Muscatelli and Tirelli (2005) argue that fiscal policy does not have an effect on real GDP due to the reaction of the monetary policy. *Therefore, in my research, the result is consistent with the monetary policy reactions in the Republic of Macedonia, whereby excess liquidity which might accumulate in the banking system due to the expansionary fiscal policy is sterilized in order to maintain a stable exchange rate.*

Regarding public revenue, my results show that tax cuts have a short-lived effect on real GDP; however, they do not show any persistent effect on real GDP in the Republic of Macedonia. This result is expected *due to a tax hike decrease in real GDP.* An increase in taxation produces a decline in disposable income, which leads to lower levels of investment, which in turn causes a decrease in real GDP. **This empirical result confirms the second part of the second hypothesis: that a change in taxation will have short-term effects on real GDP.** The same conclusion is drawn in Fatás and Mihov (2003), Blanchard and Perotti (2002), and Mountford and Uhling (2005). In addition, my result is very similar to that of Mountford and Uhling (2005), in that a change in taxation may produce a short-lived effect on real GDP; however, such action is likely to generate higher burdens in the future. The higher burdens are likely to have long-term consequences that far outweigh any short-term benefits in terms of real GDP. Hence, this finding may be termed the **"policy ineffectiveness result"** due to the short period of the beneficial effect of tax changes on real GDP. This finding is also similar to the conclusion of the "new-Classical model", whereby the effects of fiscal policy are inefficient (see more in Appendix 1, where I attempt to simulate Lucas's model). In this context*, an expansionary* *fiscal policy of cutting taxes is an ineffective instrument of macroeconomic policy in the Republic of Macedonia, since it does not have a persistent effect on real GDP, and it may have negative long-term consequences that far outweigh any short-term increases in real GDP.*

This empirical research, in jointly analyzing fiscal and monetary policy, generates an additional, possibly more interesting result. In all of my testing, SVAR reveals that fiscal policy plays a more limited role than monetary policy, and therefore the omission of the fiscal variables would not affect interpretations of the effect of monetary policy. It is important from an econometric point of view to consider that omitting important variables and misidentification of the SVAR may lead to inconsistent estimated coefficients and thus generate erroneous conclusions as to the effect of monetary policy (Liper et al., 1996; Christiano et al., 1996; Bernanke et al., 2003 and Lütkepohl, 2005). The result of *the statistical distance test* shows that fiscal policy plays a much more limited role than does the effect of monetary policy. This confirms that *there is no need to use SVAR modeling for both monetary and fiscal policy in the Republic of Macedonia, since fiscal policy plays a limited role in such a model.* In contrast to Christiano et al. (1996), which asserts that fiscal policy plays a significant role in monetary and fiscal model, Von Hagen et al. (2001, pp. 279-295), Andrés and Doménech (2003), and Muscatelli and Tirelli (2005), also argue that fiscal policy plays a limited role in the monetary and fiscal model in terms of macroeconomic stabilization.

Regarding the empirical result of the exchange rate regime, the short and long-term effects of exchange rate on real GDP and prices in the Republic of Macedonia are tested using SVAR and VECM methodologies and Choleski and Bernanke-Sims decomposition (Enders, 2004; and Lütkepohl, 2005). The result of the empirical research reveals that the direct channel of the exchange rate has a strong *pass-through effect on prices*, whereas the indirect channel of the exchange rate does not have an effect on real GDP. This highlights the potentially strong pass-through effect of exchange rate on prices in the Republic of Macedonia. Namely, it shows the strong transmission effect of nominal exchange rate changes via import prices on the domestic prices, i.e. a deprecation of domestic currency generates a rise in prices level in the Republic of Macedonia. Even within the first month, the manufacturing price level reacts to nominal exchange rate changes, which indicates the 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 any significant effect on real GDP in the Republic of Macedonia. The exchange rate changes may have a weak effect on real GDP, but this only occurrs for two months before the effect died out. The result of this **empirical research proves the third hypothesis: that stability of the exchange rate, especially once such stability has been achieved at substantial cost, is important for macroeconomic stability. A change in the exchange rate primarily affects prices due to the strong pass-through effect of nominal exchange rate changes on domestic prices via import prices.** This result is consistent with other empirical studies, which find that the effects of the transmission mechanism of monetary policy are different between developed countries and small countries in transition, purportedly due to relatively high dollarization of the domestic economy (currency and asset substitution) in transitional countries, which results in a high pass-through effect from exchange rate changes into prices. In contrast to the conclusion of McCarthy (2000) regarding developed countries, my own conclusion is consistent with most findings regarding small countries in transition, such as those in Bonato and Billmeier (2002), Kuijs (2002), Lyziak (2001), Ganev et al. (2002), Mayes (2003), and Horváth and Maino (2006) – all of which find that the exchange rate channels play a more significant role than do money and interest rate in the monetary transmission mechanism. A strong pass-thorough effect of exchange rate changes on prices in the Republic of Macedonia is to be expected, bearing in mind the characteristics of the national economy: small open economy, higher dollarization (see the topic of dollarization in the second section), and a larger import share (particularly of raw materials).

The long-term effect of monetary policy and exchange rate regime type are tested with VECM methodology. *The statistical test for stationarity* shows that the hypothesis for stationarity can be rejected for all variables. This test is consistent with the Dickey-Fuller test, in which all time series have unit roots and are non-stationarity. *The results of analyses for weak exogenity* show that exchange rate, real GDP, and money stock are all weak exogenous variables, meaning that these variables are not affected by the cointegration of long-term relationships between the variables, but that they are instead affected only by short-term relationships. As the money stock has this characteristic, I conclude that the NBRM does not base its monetary strategy on monetary rules, but rather that monetary policy is run according to discretionary measures. As a final point, the result of the *test for the exclusion of variables* from the cointegration vector shows that only real

GDP is excluded, while the exchange rate, manufacturing price, retail price, and money stock are not excluded from the cointegration vector. Thus, I conclude that there is only *one long-term stable linear combination between the exchange rate, manufacturing price, retail price, and money stock.* Furthermore, the manufacturing price and retail price react to the long-term equilibrium between exchange rate, manufacturing prices, retail prices, and money stock, while the exchange rate and money stock do not react to such equilibrium due to their characteristic of weak exogenity. This finding is consistent with the fact that the exchange rate and money stock are endogenous to Macedonian monetary policy, whereas exchange rate is part of the managed exchange rate regime. Therefore, the VECM finds only one long-term cointegration vector between exchange rate, manufacturing and retail prices, and money stock. In this context, ***the coefficient EXCH.E (exchange rate euro)*** *shows a greater* ***pass-through effect of nominal exchange rate changes to prices in the Republic of Macedonia.*** Hence, the exchange rate is a potential source of inflation in both the short and the long term in the Republic of Macedonia. In the long term, the direct channel of exchange rate changes has a strong effect on the rate of inflation, while the indirect channel of exchange rate changes shows no effect on real GDP. The result also lends support to the NBRM's monetary strategy of targeting the exchange rate due to the strong pass-through effect of nominal exchange rate changes to prices in the Republic of Macedonia. For the sake of easier interpretation, the results reveal that the exchange rate has a ***long-term coefficient of 0.5212, indicating that 52 percent of changes in the EXCH.E feed into the prices level.*** For comparative purposes, I report the results of other findings from small open countries in transition: e.g., Kuijs (2001) finds that the long-term pass-through coefficient is 0.2 for Slovakia, and Bonato and Billmeier (2002) finds that the coefficient is 0.33 in Croatia. As we can see, Macedonia has a higher pass-through than those countries in transition. However, my result is almost consistent with the finding reported in Ganev et al. (2002), which claims that the coefficient is close to 1.0 (in keeping with economic theory) for most countries in transition (e.g. Latvia, Slovakia, Romania, Bulgaria, Czech Republic and Poland). However, depreciation does not seem to significantly influence core inflation in Hungary, Slovenia and Lithuania. ***In the long term, the coefficient of money stock shows that a one percent change in the money stock will generate an increase in the prices level of 0.17 percent,*** which is in accordance with the monetarist view that an increase in the nominal quantity of money will cause the prices level to rise, i.e. inflation. The result shows that the persistent effect of money stock on retail price level is statistically significant, confirming the importance of money stock as a source of inflation, both in the short and the long term in the Republic of Macedonia.

Regarding α *, the coefficient of adjustment in the VECM*, the result shows that in the absence of changes in the other variables, retail prices return to long-term equilibrium after 18 months via endogenous exchange rate adjustment, i.e. domestic currency deprecation. This finding is consistent with the monetary strategy of targeting the exchange rate in the Republic of Macedonia, i.e. part of the managed exchange rate regime, and it is also consistent with evidence that the exchange rate is determined more by the NBRM than by real GDP or prices. Moreover, the result is consistent because it is statistically insignificant – there is a shortage of sizable economic short-term determinants of the exchange rate. Throughout the period of investigation, the base money, and through it the money stock, is endogenous to inflation and exchange rate movement via NBRM's intervention in the foreign exchange market. As such, the test of weak exogenity shows that the money stock has characteristics of weak exogenity, i.e. money stock is affected by short-term equilibrium but not long-term equilibrium of the variables. This finding is consistent with the endogeneity of money supply, in which monetary policy is not determined according to monetary rules, but it is lead by discretionary measures, adjusting to the demand for money. Moreover, the money supply is consistent with the evidence of its endogeneity to the exchange rate target, meaning that the money supply is determined by the development of foreign exchange (Ribnikar and Bole, 2006). In addition, because of the monetary strategy of exchange rate targeting used by the NBRM, the relatively rapid endogenous exchange rate can **catch up to** a price level above equilibrium via the nominal depreciation of the exchange rate after 18 months. This reflects relative exchange rate stability after the devaluation in 1997. In addition, the price level can be returned to its long-term equilibrium with rapid money supply adjustment. This is consistent with the conclusion that money supply is endogenous to exchange rate targeting, whereby money supply has been made endogenous to exchange rate and inflation movement due to the NBRM's intervention in the foreign exchange market.

Finally, assessing the relative costs and benefits associated with introducing a more active monetary and fiscal policy and a different exchange rate regime in the Republic of Macedonia, all econometrics results, using different methodologies (SVAR and VECM), show that introducing such policies 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 more active monetary and fiscal policies and a different exchange rate regime is likely to incur more costs than benefits, since changes of monetary and fiscal 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.

(i) The empirical analyses reveal that money supply and interest rate 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 and interest rate are useful to the NBRM as independent instruments of monetary policy. This is a consequence of the fact that the banking 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, the wealth effect, the bank-lending effect and the firms' balance sheet effect, while it does have a strong effect on prices level. The interest rate in the Republic of Macedonia has not been an effective monetary policy instrument, since in relatively higher dollarized economies, such as that of the Republic of Macedonia, the potential effectiveness of an independent interest rate policy is limited. 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 fiscal policy, changes in the primary fiscal deficit and government expenditure do not show any significant conventional Keynesian effects on real GDP. The changes in primary fiscal deficit and government expenditure (expansionary

fiscal policy) do not have a significant effect on real GDP due to the counteracting effect of monetary policy reactions (contractionary monetary policy) in the Republic of Macedonia. Monetary policy reacts immediately, and it continues its counteracting effects until the effects of fiscal policy disappear. This is consistent with the evidence that monetary policy reacts to sterilize excess liquidity in the banking system caused by expansionary fiscal policy. The only channel that shows a transitory effect on real GDP is tax-cuts, but it does not show a persistent effect on real GDP, so the result goes by the name "policy ineffectiveness result". Since the conventional Keynesian effects of fiscal policy on real GDP do not function in the Republic of Macedonia, the results suggest that the optimal fiscal policy in the Republic of Macedonia is to apply fiscal strategy based on fiscal rules (by determination of the mathematical targets of the fiscal deficit, public expenditure and the public debt in the medium term), in order to achieve positive macroeconomic outcomes.

(iii) 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 (see Chapter Two), 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.

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Appendix 1

Critical overview of the different macroeconomic theoretical models

Brief history of the main macroeconomic approach

Since the beginning of the economic theory, one of the deepest contradictions is whether the economy has a tendency to go towards long-term equilibrium on full employment without the interference of the government (Woodford, 1999, pp. 1-32). The first occupation of the classical economists was to explain the economic variables, as well as monetary and fiscal policy. According to them, the government must not interfere. In addition, oversupply is not possible; which today is expressible as “supply creates its own demand”. Whereas, monetary and fiscal policy has no role, and it cannot affect production and employment, but it can influence the level of prices and the structure of real GDP. In that period, even the most outstanding economists, like Ricardo, Mill, and Marshal, claimed that when one-fourth of the American population were unemployed, oversupply was not possible by monetary and fiscal policy measures.

The leading attack against the classic model was in the time of the Great World Crisis, when 24.9% of the active labor force in the U.S.A. was unemployed. In that period the Keynesian theory had appeared, which claimed active government stabilization policy by measures of fiscal and monetary policy can stimulate economic development. Thereby, it would achieve a higher level of output and employment. Precisely, the Keynesian theory represents the opposite view; “demand creates its own supply”. The biggest part of the economic policies in the post-war period was concentrated on management demand by using fiscal and monetary instruments.

In the mid-seventies, a high level of inflation and unemployment appeared. The management demand as a Keynesian prescription was ineffective for economic stabilization. The problem of stagflation in the seventies was as harmful as the great crisis of the classical model. Therefore, there was a need to search for an answer of the new problems which had appeared. In that time, the economists were searching for resurgence of classical economic theory in different forms: monetarism, rational expectation, etc.

In the eighties, the Keynesian theory appeared again, but now as supply-side economics. As a result, the outstanding economists in the twentieth century classified themselves into two groups:

The first group seeks a resurgence of the most important elements in the original classic model, including not only rational expectation, but also other useful elements of the postwar classicism. The "New Classical School" agreed with incomplete market information, which disturbs the process of self-regulating and self-stabilizing economy, whereby, the effect of monetary and fiscal policy are significantly shorter on output, and monetary and fiscal policy are always inefficient due to the fast cleaning of the market. This has been termed the "new classical policy ineffectiveness" proposition. Therefore the government should not use active monetary and fiscal policy because it is harmful to the economy; instead, they should use systematic monetary and fiscal policy actions in order to create macroeconomic stability. They also believe in "supply creates its own demand".

The second group belongs to the Keynesian theory, which asserts that incomplete market information and inflexibility in prices and wages are the key factors in understanding and forecasting economic events. These economists were developing the theory that the inflexibility of prices and wages are an outcome of irrational decisions. This modern theory, which at the same time led to the "new-Keynesian school" is often emphasized as "demand creates its own supply". The "new-Keynesian school" claims that monetary and fiscal policy are not neutral, i.e. such policies are efficient and the government should use monetary and fiscal policy in order to smooth cyclical fluctuation.

The theoretical models in the economic theory are dividing into two groups: **new-Keynesian and new-Classical.** I am going to examine the theoretical model of the main macroeconomic schools, such as: **new-Keynesians school-Taylor's model and new-Classical-Lucas's model.**

The new Keynesian school-Taylor's model

After the "revolution" on introducing rational expectation, the Keynesians' "resurgence" as the so-called "New Keynesian School" had success within the rational expectation of companies to find a place for active economic policy. Therefore, the "New Keynesian School" developed its model based on nominal rigidity (prices and wages) and rational expectation in order to create the possibility for monetary and fiscal policy influence on economic activity. Latest studies[22] show that such rigidity exists in price and wage movement, and therefore monetary policy has short-run real effects on output. The model was developed by Taylor (1980, pp. 1-24) with the assumption of the nominal inertia of wages in the form of long-contracts with employees.

Furthermore, most of the researchers based their research on Taylor's model; therefore I am going to present the theoretical New Keynesians-Taylor model by predetermined and staggered wages. Blanchard (1986, pp 543-565) built up a linkage between staggered wages and price decisions by producers, so that in 1987 he theoretically and empirically examined the influence of predetermined and staggered price structures in the linkage between nominal money supply and output in the U.S.A. **(**Blanchard 1987, pp 57-122). From these works, in the presence of predetermined and staggered prices or wages, and in the presence of rational expectation, monetary and fiscal policy is able to influence economic activity. Such influence on the new Keynesian school can be long-lasting and intensive, which normally depends on which values the model takes. Moreover, using the same measures, the model can be examined with prices setting instead of wages by predetermined and staggered prices setting. Therefore, Blanchard (1999, p. 19-22) has examined a model with prices setting, whereby he explained the adjustment of nominal rigidity, i.e. a slow adjustment of the prices level in reaction to changes in the money supply. Thus, monetary policy can produce real effects in the short run because prices are relatively inflexible.

In this context, the new Keynesians framework may serve as the foundation of the design of an optimal or at least desired monetary policy (see also Gali, 2001, p.1-19). Recently,

[22] Taylor (1980, 1999), Blanchard et.al. (1986,1999, 2005), Rotenberg and Woodford (1999), Hall (2005), Mankiw and Reis (2002), Holden and Driscoll (2003) e.g.

Blanchard and Gali (2005, pp. 1-36 and 2006 pp. 1-43), Hall (2005, pp. 50-64) and others[23] are extending the new-Keynesians model to include real wage rigidity, which is due to special features of the model. By introducing real wages rigidity, Blanchard and Gali are attempting to give answer to criticism that the standard new Keynesians model lacks trade-off between inflation and output gap stabilization. Therefore, they have argued that the introduction of the real wage rigidities is the natural way to overcome that shortcoming. In addition, they have shown the nature of the trade-off between inflation and unemployment stabilization, and they have drawn the implications of optimal monetary policy. Blanchard and Gali (2006, p. 34) found out that the optimal monetary policy minimizes a weighted average of unemployment and inflation fluctuation. Furthermore, in the presence of real rigidities, strict inflation targeting does not deliver the best monetary policy. The best policy implies some accommodation of inflation, and it includes some persistent fluctuations in unemployment.

However, I am going to investigate the standard new-Keynesians model with nominal rigidity and check the dynamic effect of monetary policy on output and prices. Most of the authors establish their models based on the predetermined and staggered wages structure which is the foundation of Taylor's model. Therefore, I am going to mathematically simulate such a model.

In addition, there are broad consensuses that the effects of monetary policy are more certain than the effects of fiscal policies. However, the effects of fiscal policy have an identical argument. In order to make a comparison between the "New-Classical" model, which neglects fiscal policy, and the "new–Keynesians model", I am going to examine the dynamic effect of money stocks on output.

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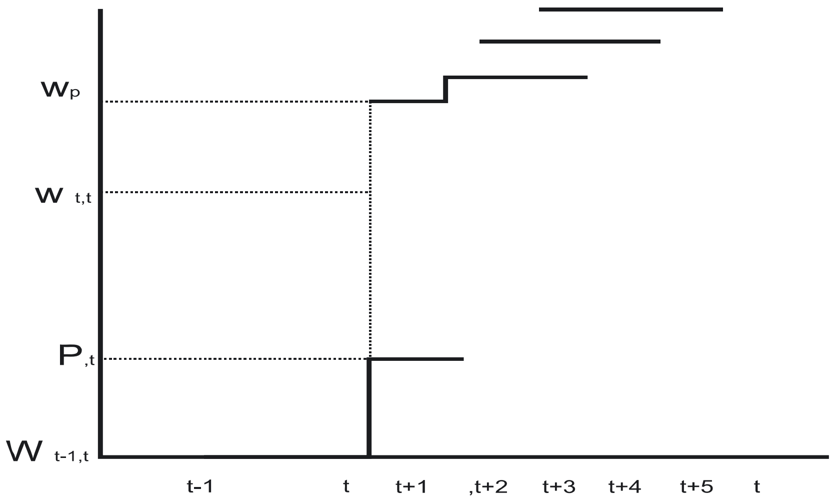
[23] Felices (2005), Rabanal (2004) e.g.

Figure A1-1: Wage staggered structure-Taylor model



Source: Taylor (1980, p. 1-24)

Staggered wages structure is an important foundation. Staggered wages structure is present when wage contracts are set (negotiated) for a certain period ahead. A key assumption for the presence of such structures is that not all agents in the model make wage contracts in the same period.

Figure A1-1 represents staggered wages in conditions when two groups of agents make job contracts in different times that are persistent for two periods. The first group makes contracts in time **t-1** for period **t-1** and period **t**. With $\mathbf{w}_{\mathbf{t-1,t}}$, I note the wages that are determined in time **t-1** for period **t**, and with **wt, t+1,** I note the wages that are determined in time **t** for period **t+1**. In time **t** there are two different levels of wages, those that are determined in time **t-1** for period **t** and those that are determined in time **t** for the current period. Other than wage-staggered structure, economists from the new-Keynesian school also constructed price-staggered structure, which are founded on the assumption that producers predetermine prices (the mark-up hypothesis) for the actual period and the next periods (Blanchard 1999, p. 19-22).

The equations that will be examined in this model are as follows:

$$y_t = m_t - p_t + e_t \tag{A.1.1}$$

Where the output, money supply and price level, are all measured in logarithms ($y_t \equiv \log Y_t, m_t \equiv \log M_t; and; p_t \equiv \log P_t -$):

$$p_t = \frac{1}{2}\left(w_{t,t} + w_{t-1,t}\right) \tag{A.1.2}$$

$$w_{t,t} = (1-a)E\left[p_t \middle| I_t\right] + aw_{t-1,t}; 0 \leq a \leq 1 \tag{A.1.3}$$

$$w_{t,t+1} = (1-a)E\left[p_{t+1} \middle| I_t\right] + aE\left[w_{t+1,t+1} \middle| I_t\right] \tag{A.1.4}$$

Also $w_t \equiv \log W_t$ wage –measured in logarithms.

The additional variable e_t represents the velocity of money or disturbance of demand that is non-political influence. Since in our works we are not concerned with the non-political shock influence in the analyzed model, I will neglect e_t, as do Taylor and Blanchard in their works.

Equation (A.1.1) represents output as a function of real money balance. In this model, we assume that nominal wage contracts are decided for two periods in advance. Half of the workforce is on wage contracts formed in the period **t-1**, and the other half has contracts formed in period **t.** By these measures of wage contract settings, staggered structures are obtained.

Equation (A.1.2) represents the "mark-up hypothesis", i.e. price-makers set their prices based on the cost of production and profit. Hence, producers establish their prices on the basis of nominal wages. With respect to $w_{t,t}$ I note the predetermine wages in time **t** for period **t** (for the current year). However, $w_{t-1,,t}$ wages are defined over the previous period **t-1** from the other half of the workforce for the current period **t.** If we assume that half of the population made contracts for jobs in period **t**, the other half did so in time **t-1**.

Therefore, prices based on the mark-up hypothesis will be (w_{t-1}, w_t), i.e. the average between wages that have been paid in the current period but were contracted in the previous period, and wages that have been paid during the current period but were negotiated in the current period ($w_{t,t}$).

Figure (A 1-1) shows that prices in time **t (pt)** will be determined exactly halfway through the interval which links $w_{t-1,t} and w_{t,t}$. Therefore, the information set contains all current and previous realization variables that are analyzed in the model. However, it might contain any variable outside the model that is important for forecasting the value which the analyzed variables might take on. Equations (A.1.3) and (A.1.4) represent the way that agents establish wages for the current period and one period ahead. Equation (A.1.3) shows that nominal wages in the current period are established on the basis of convex [24] combination of expectation prices for the current period and wages determined from the other half of the workforce in time t-1 for period t.

If the coefficient a is zero, a staggered wage structure does not exist, and therefore wages in the current period will be determined on the basis of rational expectation of price shifting in the current period. In other words, if there is no staggered structure, nominal wages for the current and future period will be formed on the basis of price expectation in that period. Because in our model I assume that different wages might be determined in time **t** for period **t** and for period **t+1**, from equation (4) I show how agents make decisions in time **t** for wages in time **t+1**. Coefficient **a** in the staggered structure represents the scale inertia of nominal wages. Namely, if **a=1**, the agent can decide in period **t** the wages in time **t**, completely dependent on the level of nominal wages in time **t,** which are determined from representatives of the other half of the population in time **t-1**. Whereas, wages that are determined in time **t** for period **t+1** completely depend on wage expectation that will be determined by the other half of the population in time **t+1** for period **t+1**. Using the equation (A.1.5) below, I report that the price expectations for the current and future period are equal to the realization expectations of the nominal money in the current and future period – all based on the information set that is available in time **t.**

[24] Convex- Property of sets whereby if any two points are members of a set, any convex linear combination of them is also a member.

$$E[p_t|I_t] = E[m_t|I_t];....; E[p_{t+1}|I_t] = E[m_{t+1}|I_t] \qquad (A.1.5)$$

The difference $\{m_t - E[m_t|I_t]\} and \{m_t - E[m_t|I_{t-1}]\}$ represents forecasting error of agents in the current and previous periods in relations to the level of the money supply in the current period. These are forecasting errors that occur due to the unpredictable changes of monetary or fiscal policy.

Let me now mathematically simulate the model of the impulse response function (Taylor's model). Assuming money stock as a random walk process, I obtain:

$$m_t = m_{t-1} + v_t$$

From the equation above, agents have information only for period **t-1**, i.e. realization of the money stock in the period **t-1**, whereas they do not have information for the current realization of the money stock in time **t**.

If we project the above equation for the upcoming period, it will look like the following:

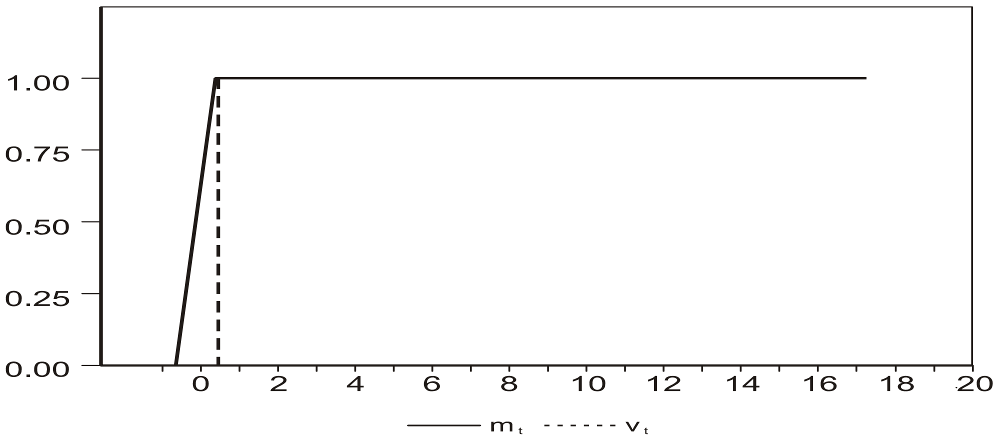
$$m_{t+k} = m_t + \sum_{i=i}^{k} v_{t+k}; \;\; k \geq 0 \qquad (A.1.6)$$

Equation (A.1.6) represents the random walk or disturbance of the system for t+**k** period. This period contains the set of all shocks which occur during the periods **t** and **t+k.** Because the influence of money shocks to output is preferable and desirable to the "new-Keynesians economists", in my simulation I assume that **a=1,** i.e. the agent did not have information about the current realization of the m_t, i.e. the money shocks are unanticipated by the agent. Therefore, in this case money shocks have a permanent effect on the economic variables.

The figure (A1-2.) reports the impulse response function of the stochastic process with random walk by one impulse of v_t in the period **t.**

It can be seen that although the shock occurs only in the period **t,** the effect of such shocks will be permanent on money stock and economic variables.

Figure A1-2: The dynamic effect of the money stock-Taylor's model

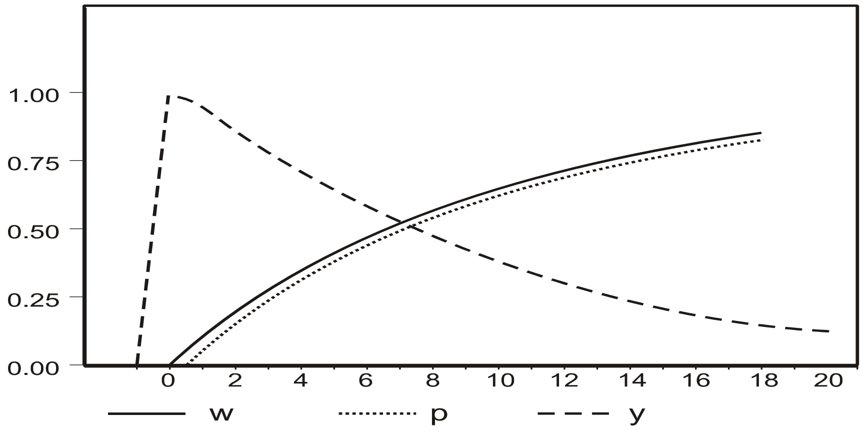


Source: Author's calculations

Furthermore, it can be seen from figure (A 1-2) that after twenty periods the money stock has had a permanent effect on the economy. Such a policy will have a permanent effect on output, whereas prices and wages will adjust after a certain period. In my case, I assume that **a=1**, whereby the money stock will have a permanent effect on economic variables. Thus, none of the variables return back to the previous equilibrium. From figure (A 1-3) below, it can be seen that after the unpredicted money shocks in the period **t,** the level of the money stock will change permanently, whereas output will not return back to its previous level after twenty periods. In other words, an unpredictable money shock will have a permanent effect on output.

With respect to the changes in prices and wages resulting from an unpredictable money shock, they will adjust slowly after a certain period. Thus, unpredictable permanent money shocks will have a permanent effect on prices and wages. However, the dynamic effect of monetary shock depends on the speed of the adjustment of the nominal prices and wages, i.e. it depends on the parameter a.

Figure A1-3: The impact of money stocks on output and prices-Taylor's-model with staggered wages and prices setting.



Source: Author's calculations

For instance, if the parameter **a=0,** the effect of money stocks will be lower due to flexibility of prices and wages. Blanchard (1999, p. 22) has examined that the speed of adjustment of the nominal prices depends on the elasticity of the desired relative prices in reaction to changes in money stocks. The higher this elasticity is, the higher individual price-setters will set their prices. Hence, the price level will rise faster, while the effect of money stock on output tends to be short-lived.

Furthermore, the simulation of this model reports that in the first period the effect of unpredictable money stock will affect around 0.96 percent of the level of output, 0.03 percent of the level of prices, and 0.1 percent of the level of wages. In the second period, the effect on the level of output will be 0.86 percent, 0.15 percent on the level of prices, and 0.18 percent on the level of wages. After twenty periods, there is still an effect on the level of output of around 0.15 percent, whereas the level of prices and wages are closer, at about 0.85 percent. As we can see, after twenty periods unpredictable money stocks will have an effect on output, wages, and prices. However, from figure A 1-3 it can be seen that in the long run (all variables in the model are expressed in logarithmic form) a money shock will not have an effect on output – it will only affect prices and wages. In other words, in the long run unpredictable money shocks will increase prices, wages, and money stock by one percent. I must point out that the effect of fiscal policy has an identical argument as the effect of monetary policy.

This result of simulating Taylor's model is the foundation of the new-Keynesian approach, whereby the government should use monetary and fiscal action in order to smooth cyclical fluctuation and to create macroeconomic stability. **Thus, by the simulation of the impulse response function (standard new-Keynesians Taylor's model), I found out that the monetary and fiscal policy are efficient and that such policy should be used in order to smooth cyclical fluctuation and to create macroeconomic stability (new-Keynesians model).** That is, an unpredictable money shock has persistent effects on output, and it may last more than twenty periods due to the rigidity of wages and prices in the short-run. The long-run money stocks and prices will have a permanent effect.

The New Classic School-Lucas's model

The name of this school is called "The New Classic School" because it is based on the classical assumption that prices and wages are completely flexible. I have to point out that this school was developing within the school of monetarist macroeconomics until the 1970's. After the seventies, "The New Classic School" developed as a separate school of thought including several components of the monetarist approach (such as the monetarist explanation of inflation), e.g. Hoover (1984). This school is often a synonym of R. Lucas's research, who Parkin (1992) describes as "the leading macro mountaineer of our generation". The foundation of the "New Classic School" is the joint acceptance of three main sub-hypothesis: the rational expectation hypothesis, the assumption of continuous market clearing, and the aggregate supply hypothesis.

After Muth's revolution on rational expectation, Robert Lucas was the first person who used a stronger version in designing macroeconomic models. As a result, Robert Lucas was awarded with the Nobel Prize in 1995 for his two well-known works "Expectations and Neutrality of Money" (Lucas 1972, p. 103-124) and "Some International Evidence on Output-Inflation Tradeoffs" (Lucas 1973, p. 326-334). After a few years, other economists also began to incorporate the rational expectation hypothesis in their macroeconomic models, such as Sergent and Wallace (1975, p. 241-254). Lucas's (1972; 1973) hypothesis is that monetary shocks have real effects because of imperfect information about prices. In the Lucas formulation, it is unanticipated monetary shocks that have real effects, which is a consequence of the assumption that ex ante information about monetary shocks is common knowledge. He claims that such an effect is significantly shorter – only one period – and that it depends on random or non-systematic monetary policy, which will either only increase the variation of output and employment around their natural levels or it will disturb macroeconomic stability.

Recently[25], many researchers have extended the Lucas model, in which agents are allowed to have ext ante private information. Woodford (2003, p. 33) is one such researcher who has reexamined the Lucas model while allowing agents to have ext ante private information about monetary shocks. He has focused on demonstrating the persistence of the real effect of money disturbance. Woodford found out that there would be no persistent effect of monetary policy if the true state of the economy were revealed to all agents after a delay of one period. Morris and Shin (2002, p. 1521-1534), have shown that the real effects of money shocks are small – not only when public signals contain very precise information – but also when they contain very imprecise information. This result is related to the welfare of public information studied. Takashi (2003, p. 1-8) has reexamined the Lucas model extending model by allowing agent to have private and ex-ante public information about monetary shocks. He shows that the real effects are small if the agent possesses private and public imprecise information. Whereas, if the agents will have full and precise information, money is neutral. Amato and Shin (2003) consider a targeting rule in an economy in which firms can access both public and private signals about the natural rate of interest. On the other hand, Klaus (2006, p. 311-325) determines that the optimal monetary environment will be in an economy in which the firms have imperfect common knowledge about real demand and supply shocks.

As we can see, empirical analyses have different result concerning reexamination of the new-Classical Lucas model.

Nevertheless, I am going to investigate the standard new-Classical-Lucas model, in which the true value of the money stock in the current period (m_t) becomes common knowledge amongst all firms with a delay of only one period, i.e. in period t+1, and then I will evaluate the effect of monetary policy on output and prices. Woodford (2003, p. 33) has used the same assumption that agents anticipate the current realization of the money stock

25 Woodford (2003), Moris and Shin (2002), Amato and Shin (2003), Fukunaga (2006) and others.

with a delay of only one period. Furthermore, most of the authors establish their models based on the Lucas model; therefore I will mathematically simulate such a model.

Hence, throughout this theoretical model I will investigate the linkage between the money stock and output. According to the “New Classic School”, the budget by itself causes crowding effects and instability in the economy. The empirical model shows that prices and wages slowly adjust in imperfect competition-settings, in which there is an existing linkage between active policy and output, so Lucas attempted to give an answer without jeopardizing the assumption of perfect flexibility in prices and wages. Lucas’s model is based on the idea that Phelps E. was developing around market decentralization, in which the agent in each market has limited information about other markets. If the agent misinterprets the price signals, wrong responses to shocks may occur. If the agents have all available information-sets, they will not respond to those shocks. Lucas assumes that agents of certain goods are allocated in numerous physically separated competitive markets. Lucas also claims that demand is not equally distributed among different markets; hence, prices of those goods are different in each market. According to Lucas, there are two shocks that affect demand in all markets:

First, the aggregate shock, which affects the changes in the general price level, and, secondly, the relative shock, which affects the changes in the relative price in this market in relation to other markets. Agents respond differently to these shocks; they will not respond to aggregate shocks, but they will respond to relative shocks by changing their output. However, since agents have imperfect information at the time when they make decisions about their output, they cannot accurately differentiate between aggregate shocks and relative shocks. Thus, we derive the assumption that nominal aggregate shocks affect real economic activity.

The equations of the model are as following:

$$y_t^k = \rho\left(p_t^k - E\left[p_t \middle| I_t^k\right]\right) \qquad \rho > 0 \qquad \text{(A.1.7)}$$

$$p_t = E\left[p_t \middle| I_{t-1}\right] + \sigma_t \qquad \text{(A.1.8)}$$

$$p_t^k = p_t + e_t \qquad \text{i= 1,2,.......n} \qquad \text{(A.1.9)}$$

$$y_t = m_t - p_t \qquad \text{(A.1.10)}$$

In the equation (A.1.7) we can see that the output of market ***k*** responds to the gap between the actual price level in the ***k*** market and the expected values of the general price level; based on I_t^k. Lucas in his model assumes that the agents have imperfect knowledge for expecting movement of the general prices level p_t. They have only knowledge for the current price of their market p_t^k. The expression in the equation (A.1.7) $\left(p_t^k - E\left[p_t \middle| I_t^k\right]\right)$ shows that agents respond to changes that they anticipate as changes in relative prices. On the other hand, they will not respond to changes that they perceive as changes in the general price level. Parameter ρ shows elasticity-supply to changes in the relative price.

Equation (A.1.8) shows aggregate price shock in time **t** as σ_t – a random walk variable.

Equation (A.1.9) shows that the prices in the **K** market p_t^k depend on the general price level p_t and market shocks e_t. Equation (A.1.10) represents the relation between output and money stock, which in my case are all expressed in logarithmic form. This means output is a function of the real money stock.

Defining y_t as set of y_t^k we will obtain the Lucas aggregate supply:

$$y_t = \phi\left(p_t - E\left[p_t \middle| I_{t-1}\right]\right) \qquad \phi > 0 \qquad \text{(A.1.11)}$$

whereby y_t is the natural logarithm of the aggregate output (all suppliers in all markets), p_t is the natural logarithm of the general price level, and $E[p_t|I_{t-1}]$ is the natural logarithm of the expected value of the general price level in period **t** based on information **t** in period **t-**1. This equation shows that the aggregate supply is an increasing function of unanticipated changes in the general price level if the agents anticipate it as changes in relative prices. If the change in the general price level has been completely anticipated by the agent, such changes will not have a short-run influence on output.

Coefficient ϕ is elasticity of the changes in output by unanticipated price shocks. If the coefficient ϕ of the elasticity supply is large in comparison to changes in the relative price, the influence of the unanticipated shock will be significant in relation to output, because the agents would misinterpret it as changes in relative prices in their markets.

Let me now examine the impulse response function of the money stock on output and prices. Plugging equation (A.1.11) into equation (A.1.10), I obtain:

$$\phi(p_t - E[p_t|I_{t-1}]) = m_t - p_t$$

After rearranging the equation, we obtain:

$$\phi(E(\ p_t|I_{t-1} - E[p_t|I_{t-1}]) = E(\ m_t|I_{t-1} - E(\ p_t|p_{t-1}\ )$$

If the left side is zero, the equation will be:

$$E[p_t|I_{t-1}] = E[m_t|I_{t-1}]$$

After rearranging this equation and equation (A.1.10), the Lucas aggregate supply will be:

$$y_t = \phi(m_t - E[m_t|I_{t-1}]) \qquad \text{(A.1.12)}$$

Now, I can examine the mathematical model that is the impulse response function of the Lucas model.

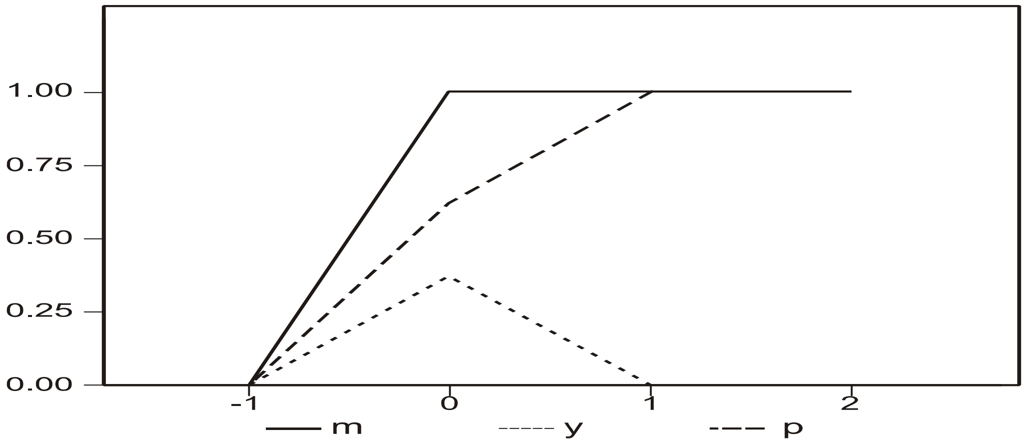
Assuming money stocks as a random walk process, I obtain:

$$m_t = m_{t-1} + e_t$$

Which, in this case, will be:

$$E\left[m_{t+i} \middle| I_{t-1}\right] = m_{t-1} \qquad \text{(A.1.13)}$$

Figure A1-4: The impact of money stocks on output and prices-Lucas model



Source: Author's calculations

In this case I assume that $\phi = 1$, and all agents will anticipate money shocks after one period. From the figure (A 1-4) we can see that after the unpredicted money shocks in the period **t,** the level of the money stock will change permanently, whereas output will return back to its previous level after one period. That is, unpredictable money shocks will affect output for only one period – from period **t** to period **t+1** (Takashi 2003, p. 1-28). With respect to the changes in prices generated by the unpredictable money shock, they fully adjust one period later.

Furthermore, in the first period, the effect of money stock will be 0.6 percent on the level of prices and 0.4 percent on the level of output. In the second period, the level of the prices will be 1 percent, while the level of output will be 0.0 percent. After the first period, output will return back to its baseline, while changes in prices and in the money stock will be permanent. Because all variables in the model are expressed in logarithmic form, I may conclude that if the money stock permanently increases by 1 percent, then the price level one period later will also increase by 1 percent. From this simulation, we can see the foundation of the new-Classical school regarding fast price adjustment and continuous market clearing.

In contrast to the "New Keynesian School" model where the influence of changes in the nominal money stock might last more than twenty periods, in the model of the "New Classic School**", these effects are significantly shorter**. They may last only one period before dying out.

According to the "New Classic School", this result goes by the name **"policy ineffectiveness result"** because monetary policy will only jeopardize macroeconomic stability. The result of simulating Lucas's model is the foundation of the new-Classical approach, whereby the government should not use monetary and fiscal action because such policy jeopardizes macroeconomic stability (the same argument is made for fiscal policy). **Thus, by the simulation of the impulse response function (standard new-Classical Lucas model)**, **I found out that monetary and fiscal policy are not efficient, and that such policies jeopardize macroeconomic stability (new-Classical model).** In other words, according to the new-Classical model, an unpredictable money shock does not have permanent effects on output; such effects will probably last only one period due to the perfect flexibility of prices and wages, while changes in the money stock have permanent effects on prices and wages. This result goes by the name **"policy ineffectiveness result",** and it implies that monetary policy and fiscal policy are inefficient. Such policies are harmful to the economy because they disturb macroeconomic stability.

Appendix 2

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);

"PD" : government primary deficit(-) or surplus(+); "EX": government current expenditures, provided by the Macedonian Ministry of Finance.

"RE" : government revenue minus transfers, provided by the Macedonian Ministry of Finance.

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

Transfers = social funds and other transfers

Revenue = value-added taxes + direct taxes on business + indirect taxes + social funds;

Expenditure = government consumption;

Primary budget deficit = revenue – expenditure – transfers – interest paid + interest paid

List of the data that I use in my empirical research in testing the hypotheses.

1. Manufacturing prices index (MPI), monthly data from 1997: 01 to 2006:12.

MPI						
1997:01	103.30	104.10	104.30	102.50	102.30	102.10
1997:07	102.40	106.70	108.20	110.30	110.10	110.20
1998:01	111.10	110.10	110.80	108.90	109.40	109.20
1998:07	109.70	109.70	110.50	110.30	110.10	110.10
1999:01	108.50	108.50	108.30	106.90	107.10	107.40
1999:07	109.90	109.80	110.50	113.30	113.60	115.10
2000:01	114.90	117.70	118.20	117.70	118.50	120.90
2000:07	120.90	121.20	121.60	121.90	124.30	124.20
2001:01	121.80	124.10	124.20	124.40	123.80	124.90
2001:07	124.90	124.20	123.70	121.90	121.50	121.20
2002:01	121.00	121.60	121.80	123.30	123.70	122.10
2002:07	122.70	122.80	123.00	123.50	122.30	122.50
2003:01	163.90	123.80	123.70	123.70	123.30	121.30
2003:07	122.50	122.90	123.30	122.20	122.90	123.10
2004:01	122.70	122.50	123.50	123.60	124.50	125.20
2004:07	125.00	120.50	126.00	126.30	126.60	124.70
2004:07	125.00	120.50	126.00	126.30	126.60	124.70
2005:01	122.00	123.00	124:00	125:00	125:00	126:00
2005:07	129:00	129:00	131:00	130:00	129:00	131:00
2006:01	130.00	131:00	130:00	131:00	135:00	133:00
2006:07	136:00	135:00	134.00	133.00	132.00	135:00

Source: State Statistical Office of the Republic of Macedonia

2. Retail prices index (RPI), monthly data from 1997: 01 to 2006:12.

RPI						
1997:01	113.80	113.80	112.90	110.50	110.10	110.10
1997:07	110.40	111.20	111.30	114.00	115.00	114.50
1998:01	115.30	115.80	115.30	113.60	114.10	112.10
1998:07	111.30	110.90	110.80	113.30	113.40	113.30
1999:01	112.40	112.30	112.40	109.90	110.40	109.60
1999:07	109.00	110.40	110.70	113.60	114.30	116.00
2000:01	116.30	117.60	118.10	123.70	124.00	124.40
2000:07	124.00	123.70	124.40	124.70	128.10	128.50
2001:01	128.00	128.50	128.50	128.90	129.50	132.00
2001:07	130.10	130.60	130.50	129.90	130.40	130.10
2002:01	130.60	131.00	131.30	132.70	133.80	133.10
2002:07	131.30	131.30	131.80	132.80	133.20	133.00
2003:01	133.90	133.70	133.70	136.00	137.10	135.30
2003:07	135.50	135.60	136.10	136.00	136.50	137.00
2004:01	137.10	136.30	136.30	136.00	137.10	137.50
2004:07	136.10	136.70	136.90	138.30	138.50	136.80
2005:01	136.00	137.00	137.00	138.00	139.00	140.00
2005:07	138.00	139.00	141.00	142.00	141.00	141.00
2006:01	142.00	143.00	142.00	143.00	146.00	146.00
2006:07	144.00	145.00	145.00	145.00	145.00	145.00

Source: State Statistical Office of the Republic of Macedonia

3. Money stock (M1), monthly data from 1997: 01 to 2006:12.

M1						
1997:01	11.433	11.252	11.069	11.031	10.841	11.183
1997:07	11.739	12.089	12.366	12.863	12.482	13.983
1998:01	14.098	13.322	12.796	12.564	12.672	12.456
1998:07	13.174	13.615	14.378	14.853	14.212	15.178
1999:01	14.774	15.186	14.969	15.280	15.367	16.057
1999:07	16.794	17.907	18.640	19.389	19.244	19.694
2000:01	19.418	19.201	19.335	19.417	18.779	18.752
2000:07	19.220	18.819	19.146	19.238	19.896	22.338
2001:01	21.290	21.533	21.786	21.843	21.262	20.213
2001:07	19.064	18.932	19.899	19.494	20.399	25.324
2002:01	24.000	25.235	24.788	25.358	24.935	24.963
2002:07	25.855	26.409	27.533	26.664	25792	26.406
2003:01	23.770	22.868	22.494	23.212	23.405	24.081
2003:07	24.660	24.895	24.913	24.811	24.862	27.273
2004:01	25.653	25.463	25.313	26.039	26.144	26.150
2004:07	27.290	26.826	26.327	25.691	25.929	27.550
2005:01	26.584	27.006	26.948	27.111	26.993	27.142
2005:07	28.285	29.663	27.906	27.939	27.933	29.663
2006:01	27.699	28.596	27.962	29.459	29.584	30.768
2006:07	32.151	31.905	32.090	32.587	32.014	34.747

Source: National Bank of the Republic of Macedonia ***(Note: Data are in Millions of Denars)***

4. Short term interest rate (IR), monthly data from 1997: 01 to 2006:12.

SHORT_RATE						
1997:01	24.00	24.00	24.00	24.00	24.00	24.00
1997:07	29.50	32.00	32.00	32.00	32.00	32.00
1998:01	32.00	32.00	32.00	32.00	31.50	31.50
1999:07	31.50	31.50	31.50	31.50	31.50	31.50
1999:01	37.45	38.95	37.45	38.95	37.45	37.45
1999:07	37.45	37.45	37.45	29.50	29.50	29.50
2000:01	29.50	29.50	29.50	26.50	26.50	26.50
2000:07	26.50	26.50	26.50	26.50	26.50	26.00
2001:01	26.00	26.00	26.00	27.50	27.50	27.50
2001:07	27.50	27.50	27.50	29.00	29.00	29.00
2002:01	29.00	29.00	29.00	29.00	29.00	29.50
2002:07	29.50	29.50	29.50	29.50	29.25	29.25
2003:01	18.85	18.55	18.85	25.00	24.50	18.60
2003:07	17.60	18.50	16.60	15.60	15.60	15.60
2004:01	15.00	15.00	15.00	15.00	15.00	15.00
2004:07	15.00	15.00	15.00	15.00	15.00	15.00
2005:01	12.10	11.19	12.00	12.00	12.20	12.20
2005:07	12.20	12.20	12.20	12.20	12.20	12.20
2006:01	12.00	11.80	11.60	11.50	11.50	11.30
2006:07	11.30	11.10	11.00	10.90	10.80	10.70

Source: National Bank of the Republic of Macedonia

5. Gross domestic product (GDP), monthly data from 1997: 01 to 2006:12.

GDP						
1997:01	14.573	14.652	14.811	15.048	15.218	15.319
1997:07	15.353	15.566	15.959	16.531	16.654	16.328
1998:01	15.553	15.199	15.266	15.755	16.026	16.080
1998:07	15.915	15.989	16.301	16.851	16.905	16.463
1999:01	15.526	15.117	15.237	15.885	16.427	16.862
1999:07	17.190	17.462	17.678	17.839	17.820	17.621
2000:01	17.242	17.057	17.066	17.269	17.406	17.478
2000:07	17.483	17.587	17.789	18.089	17.946	17.360
2001:01	16.330	15.850	15.918	16.535	16.814	16.756
2001:07	16.361	16.366	16.771	17.577	17.740	17.261
2002:01	16.139	15.626	15.722	16.427	16.766	16.740
2002:07	16.348	16.464	17.088	18.221	18.505	17.941
2003:01	16.529	15.860	15.935	16.753	17.251	17.427
2003:07	17.283	17.431	17.872	18.605	18.670	18.068
2004:01	16.798	16.250	16.422	17.315	17.877	18.110
2004:07	18.012	18.069	18.281	18.648	18.893	19.015
2005:01	16.723	17.009	17.583	18.442	18.942	19.082
2005:07	18.861	18.950	19.350	20.059	20.027	19.254
2006:01	17.739	17.162	17.521	18.817	19.625	19.947
2006:07	19.781	19.760	19.885	20.155	20.334	20.424

Source: State Statistical Office of the Republic of Macedonia ***(Note: Data are in Millions of Denars)***

6. Budget revenue (RE), monthly data from 1997: 01 to 2006:12.

REV_BUD						
1997:01	2.796	3.279	2.952	2.850	3.247	2.573
1997:07	3.652	3.201	3.413	3.490	3.072	4.040
1998:01	2.822	3.022	3.352	3.372	3.185	3.237
1998:07	3.564	3.059	3.364	3.436	3.385	4.081
1999:01	2.944	3.189	3.686	3.209	3.608	3.706
1999:07	3.744	3.559	4.152	4.284	3.852	5.206
2000:01	3.837	3.821	5.268	5.603	6.333	5.389
2000:07	4.615	5.238	4.186	5.918	6.312	6.575
2001:01	4.508	4.156	5.139	4.021	4.833	6.819
2001:07	4.719	4.893	4.322	6.434	5.121	8.147
2002:01	2.803	6.956	8.121	5.853	5.020	4.871
2002:07	6.087	5.972	5.632	5.613	4.526	8.973
2003:01	4.119	4.040	5.705	5.696	6.517	5.179
2003:07	5.779	3.631	4.646	5.170	4.246	4.420
2004:01	4.506	4.058	5.538	4.775	4.706	4.409
2004:07	4.728	4.423	4.806	4.986	4.593	4.456
2005:01	4.764	3.422	4.658	5.443	4.673	4.574
2005:07	7.981	4.525	5.256	5.433	5.260	5.264
2006:01	7.337	6.756	8.979	9.295	8.666	8.345
2006:07	9.202	8.483	8.527	8.846	8.706	10.952

Source: Macedonian Ministry of Finance **(Note: Data are in Millions of Denars)**

7. Government current expenditures (EX), monthly data from 1997: 01 to 2006:12.

EXP_BUD						
1997:01	3.194	3.195	3.198	3.202	3.207	3.214
1997:07	3.222	3.232	3.243	3.255	3.268	3.283
1998:01	3.229	3.315	3.331	3.346	3.360	3.375
1998:07	3.388	3.402	3.415	3.428	3.440	3.452
1999:01	3.463	3.484	3.515	3.556	3.606	3.666
1999:07	3.736	3.816	3.905	4.004	4.113	4.232
2000:01	2.883	3.675	3.968	5.448	3.591	4.579
2000:07	3.905	3.657	3.437	3.960	5.733	12.902
2001:01	5.202	3.461	5.029	5.274	5.352	6.544
2001:07	7.379	5.630	6.174	5.298	5.259	8.360
2002:01	5.627	5.283	5.984	5.965	4.856	5.350
2002:07	7.546	6.436	5.893	5.768	4.348	8.543
2003:01	5.330	3.990	4.799	5.937	5.313`	5.254
2003:07	5.200	4.074	5.164	4.868	4.539	6.778
2004:01	4.149	4.209	4.741	4.895	4.583	4.775
2004:07	4.948	3.851	4.542	4.921	5.143	5.853
2005:01	4.677	4.462	4.676	5.054	4.302	4.977
2005:07	4.870	4.061	5.295	4.923	5.463	7.278
2006:01	6.903	8.206	8.429	8.340	7.976	9.948
2006:07	9.425	8.123	7.536	7.670	9.272	13.929

Source: Macedonian Ministry of Finance ***(Note: Data are in Millions of Denars)***

8. Exchange rate (EXCH.E), monthly data from 1997: 01 to 2006:12.

EURO						
1997:01	52.0907	52.0900	52.1030	52.1118	52.1187	52.1318
1997:07	58.1107	60.4785	60.4806	60.4816	60.4834	60.4841
1998:01	60.4832	60.4828	60.4865	60.4865	60.5080	60.5336
1998:07	60.5567	60.5698	60.5763	60.5833	60.5892	60.5954
1999:01	60.6011	60.6054	60.6106	60.6160	60.6300	60.6399
1999:07	60.6381	60.6238	60.6225	60.6056	60.5955	60.6076
2000:01	60.6238	60.6469	60.6739	60.6995	60.7209	60.7411
2000:07	60.7577	60.7112	60.7661	60.7612	60.7620	60.7732
2001:01	60.7998	60.8322	60.8619	60.8915	60.9165	60.9456
2001:07	60.9556	60.9474	60.9403	60.9500	60.9552	60.9584
2002:01	60.9580	60.9517	60.9501	60.9516	60.9557	60.9625
2002:07	60.9697	60.9756	60.9856	60.9940	61.0225	61.0554
2003:01	61.0850	61.5266	61.3269	61.2386	61.2970	61.3273
2003:07	61.2388	61.1987	61.1935	61.2037	61.2634	61.2913
2004:01	61.2839	61.2791	61.2933	61.2995	61.2638	61.3099
2004:07	61.3068	61.2892	61.3394	61.4684	61.4706	61.4414
2005:01	61.3500	61.3600	61.4200	61.3600	61.4100	61.3000
2005:07	61.1600	61.2300	61.2300	61.1900	61.2000	60.8700
2006:01	61.4100	61.1800	61.1700	61.6000	61.1800	61.1700
2006:07	61.1600	61.1700	61.2000	61.1700	61.1800	61.1700

Source: National Bank of the Republic of Macedonia ***(Note data are in denars)***

9. Primary budget deficit is estimated as such: revenue–expenditure/ gross domestic product in program RATS (Enders, 2004).

Appendix 3

Eigenvalues and Eigenvectors

Let **A** be a *(n x n)* square matrix with vector $x \neq 0$ where x is *(n x 1)* vector. The scalar λ is called the eigenvelue of matrix **A,**such as:

$$\mathbf{A}x = \lambda x \qquad (1)$$

Let *I* be a *(nxn*) identity matrix, so that I can rewrite equation (1) as follows:

$$\mathbf{A}x - \lambda x = 0$$

$$(\mathbf{A} - \lambda I)x = 0 \qquad (2)$$

Since x is a vector containing values not equal to zero, the equation (2) requires to be singular or, in other words, to have zero determinants, which gives

$$|\mathbf{A} - \lambda I| = 0 \qquad (3)$$

This condition gives **1** the characteristic equation of the matrix **A.** It is a polynomial of degree k in unknown λ that can be solved for the k roots. As mentioned above, these λ 's are eigenvalues of **A.** They are also known as latent roots or characteristic roots. Each λ may be substituted back into Equation (2) and the corresponding x vector obtained.

The x vector is known as the eigenvectors of **A.** They also known as latent vectors or characteristics vectors Enders (2004). Assembling all k solutions produces the matrix equations

$$\mathbf{AX} = \mathbf{A}\begin{bmatrix} \vdots & \vdots & \vdots \\ x_1 & x_2 \cdots & x_k \\ \vdots & \vdots & \vdots \end{bmatrix} = \begin{bmatrix} \vdots & \vdots & & \vdots \\ \lambda_1 x_1 & \lambda_2 x_2 & \cdots & \lambda_k x_k \\ \vdots & \vdots & & \vdots \end{bmatrix}$$

$$= \begin{bmatrix} \vdots & \vdots & \vdots \\ x_1 & x_2 \cdots & x_k \\ \vdots & \vdots & \vdots \end{bmatrix} \begin{bmatrix} \lambda_1 & 0 & \cdots & 0 \\ 0 & \lambda_2 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & \lambda_k \end{bmatrix} = \mathbf{X\Lambda}$$

which is written more compactly as:

$$\mathbf{AX} = \mathbf{X\Lambda}$$

where **X** is the square matrix if eigenvectors and is the diagonal matrix of eigenvalues. If we assume for the moment that **X** is nonsingular, it follows that $\mathbf{X}^{-1}\mathbf{A}\mathbf{X} = \mathbf{\Lambda}$ and the matrix of eigenvectors serves to diagonalize the matrix **A.**

Appendix 4

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	$S_t = S_{t-1} + \alpha e_t$	$S_t = S_{t-1} + \alpha e_t$ $I_t = I_{t-p} + \delta(1-\alpha)e_t$	$S_t = S_{t-1} + \alpha e_t / I_{t-p}$ $I_t = I_{t-p} + \delta(1-\alpha)e_t / S_t$
Linear trend	$S_t = S_{t-1} + T_{t-1} + \alpha e_t$ $T_t = T_{t-1} + \alpha\gamma e_t$	$S_t = S_{t-1} + T_{t-1} + \alpha e_t$ $T_t = T_{t-1} + \alpha\gamma e_t$ $I_t = I_{t-p} + \delta(1-\alpha)e_t$	$S_t = S_{t-1} + T_{t-1} + \alpha e_t / I_{t-p}$ $T_t = T_{t-1} + \alpha\gamma e_t / I_{t-p}$ $I_t = I_{t-p} + \delta(1-\alpha)e_t / S_t$
Exponential trend	$S_t = S_{t-1}T_{t-1} + \alpha e_t$ $T_t = T_{t-1} + \alpha\gamma e_t / S_{t-1}$	$S_t = S_{t-1}T_{t-1} + \alpha e_t$ $T_t = T_{t-1} + \alpha\gamma e_t / S_{t-1}$ $I_t = I_{t-p} + \delta(1-\alpha)e_t$	$S_t = S_{t-1}T_{t-1} + \alpha e_t / I_{t-p}$ $T_t = T_{t-1} + \alpha\gamma e_t /(I_{t-p}S_{t-1})$ $I_t = I_{t-p} + \delta(1-\alpha)e_t / S_t$

S_t smoothing the level of time series;	α parameter of smoothing level;
T_t trend;	γ seasonal period;
I_t seasonal index	δ parameter of smoothing seasonal.
e_t error in period t;	

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

The value of the parameters α γ δ for GDP

Exponential Smoothing Model Selection

TREND	SEASONAL	Sum Squares	Schwarz
Linear	None	0.04317472283	-292.551311
Linear	Additive	0.01255733333	-406.542199
Linear	Multiplicative	0.01249603149	-407.011995

Model with TREND=Linear, SEASONAL=Multiplicative

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

Appendix 5

M-VAR

Endogenous variable: MPI, RPI, M1, IR, GDP.

Deterministic component: constant and dummy

Criteria for VAR Order Selection

	FPE	AIC	HQ	SC
1	6.83470e-015	-32.70123	-32.46414	-32.11738
2	8.20220e-015	-32.52183	-32.04515	-31.34782
3	1.04942e-014	-32.28204	-31.56319	-30.51142
4	1.05731e-014	-32.28684	-31.32322	-29.91306
5	1.29248e-014	-32.10633	-30.89530	-29.12271

VAR Residual Correlation

LNMPI	LNRPI	LNM1	SH_RATE	LNADJGDP
1.0000	0.3893	0.2312	-0.0.898	-0.0733
0.3893	1.0000	0.0194	-0.2039	-0.1040
0.2312	0.0194	1.0000	0.1414	0.0845
-0.0898	-0.2039	0.1414	1.0000	0.1881
-0.0733	-0.1040	0.0845	0.1881	1.0000

VAR Residual Analysis

	Skewness	Kurtosis	JB (2)	LB (16)	LM (16)	ARCH (16)
LNMPI	0.3400	3.8367	3.6054	10.6482	34.8980	10.9651
			0.1649	0.6403	0.0041	0.8116
LNRPI	0.3835	3.4010	2.9028	19.0319	26.7129	9.6516
			0.2342	0.1221	0.0448	0.8842
LNM1	1.4121	8.9551	168.3276	39.7522	47.9886	6.8046
			0.0000	0.0002	0.0000	0.9768
SH_RATE	-1.1240	11.4394	295.5707	10.1253	16.5101	9.0948
			0.0000	0.6837	0.4180	0.9095
LNADJGDP	0.8152	4.3256	7.1094	28.7682	40.4195	12.8155
			0.0702	0.0071	0.0007	0.6862

Appendix 6

M-VAR with PD-VAR

Endogenous variable: MPI, RPI, M1, GDP, PD

Deterministic component: constant and dummy

Criteria for VAR Order Selection

	FPE	AIC	HQ	SC
1	1.13059e-017	-39.10566	-38.86858	-38.52181
2	1.47143e-017	-38.84517	-38.36848	-37.67115
3	1.88461e-017	-38.60432	-37.88546	-36.83369
4	1.85729e-017	-38.63121	-37.66759	-36.25743
5	2.00761e-017	-38.57371	-37.36267	-35.59008

VAR Residual Correlation

MPI	RPI	M1	GDP	PD
1.0000	0.5083	0.1304	-0.1276	-0.0394
0.5083	1.0000	-0.0110	-0.0947	-0.1423
0.1304	-0.0110	1.0000	0.0542	0.2156
-0.1276	-0.0947	0.0542	1.0000	-0.1370
-0.0394	-0.1423	0.2156	-0.1370	1.0000

VAR Residual Analysis

****

	Skewness	Kurtosis	JB (2)	LB (16)	LM (16)	ARCH (16)
MPI	0.2772	5.1709	19.4531	15.6572	38.5802	6.8388
			0.0001	0.2681	0.0012	0.9762
RPI	0.1807	3.0723	0.5262	18.5843	30.6796	10.3158
			0.7687	0.1366	0.0148	0.8496
M1	1.0419	7.2574	87.0636	34.3211	46.3869	7.0099
			0.0000	0.0011	0.0001	0.9731
GDP	0.8947	4.7042	23.6612	29.3016	43.9377	9.8156
			0.0000	0.0059	0.0002	0.8761
PD	1.6335	13.8629	498.6156	9.7448	24.2289	7.5720
			0.0000	0.7147	0.0846	0.9606

Appendix 7

M-VAR with RE-VAR

Endogenous variable: MPI, RPI, M1, GDP, RE

Deterministic component: constant and dummy

Criteria for VAR Order Selection

	FPE	AIC	HQ	SC
1	1.76272e-018	-40.98133	-40.63993	-40.14058
2	2.60507e-018	-40.59616	-39.90973	-38.90557
3	3.14537e-018	-40.42057	-39.38542	-37.87087
4	3.29033e-018	-40.40019	-39.01257	-36.98194
5	3.90235e-018	-40.27126	-38.52736	-35.97484

VAR Residual Correlation

1.0000	0.5546	0.1467	-0.1096	0.2822	0.1718
0.5546	1.0000	0.0019	-0.1187	0.1240	0.0024
0.1467	0.0019	1.0000	0.0338	0.3904	0.5718
-0.1096	-0.1187	0.0338	1.0000	-0.1159	-0.3048
0.2822	0.1240	0.3904	-0.1159	1.0000	0.5250
0.1718	0.0024	0.5718	-0.3048	0.5250	1.0000

VAR Residual Analysis

****

	Skewness	Kurtosis	JB(2)	LB(16)	LM(16)	ARCH(16)
MPI	0.0890	5.2732	20.3634	14.8279	30.4150	10.6812
			0.0000	0.3900	0.0160	0.8287
RPI	0.2873	3.6440	2.9177	19.3240	25.2560	10.2970
			0.2325	0.1529	0.0654	0.8507
M1	1.2823	7.4580	103.5986	26.9088	39.6328	4.7159
			0.0000	0.0198	0.0009	0.9970
GDP	0.6628	4.9692	22.0703	89.2937	59.5594	11.7244
			0.0000	0.0000	0.0000	0.7627
REV	0.5914	3.9825	9.2612	29.0434	30.6355	22.1839
			0.0097	0.0103	0.0150	0.1374
EXP	1.5806	9.1453	187.0558	43.3199	42.6852	8.7428
			0.0000	0.0001	0.0003	0.9236

Appendix 8

M1-VAR with EXCH.E-VAR

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
			0.8091	0.0691	0.0078	0.5546
RPI	0.4247	3.3826	3.3630	21.3262	34.9456	7.3163
			0.1861	0.0667	0.0040	0.9667
EURO	0.6025	21.9501	1397.1654	30.4409	42.4985	30.9899
			0.0000	0.0041	0.0003	0.0635
M1	1.4352	8.4074	145.2319	39.6502	45.2594	8.3360
			0.0000	0.0002	0.0001	0.9382
GDP	1.0178	5.0301	32.0263	30.0941	48.1023	12.2267
			0.0000	0.0046	0.0000	0.7282

Appendix 9

M1-VECM with EXCH.E-VECM

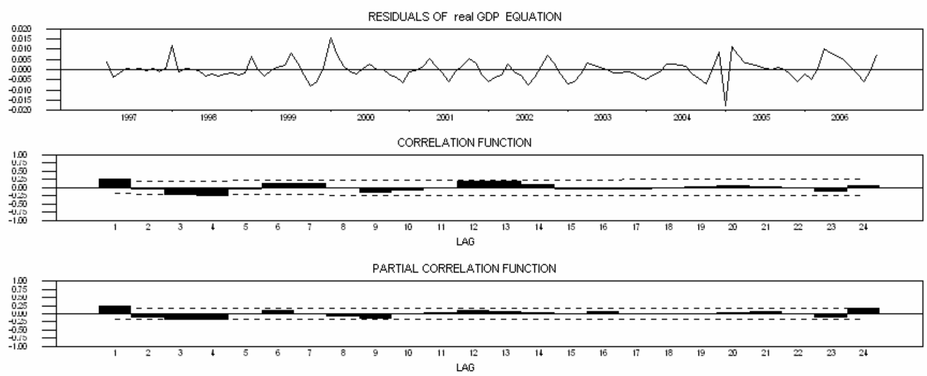
Endogenous variable: EXCH.E, MPI, RPI, M1, GDP

Deterministic component: constant and dummy -VECM

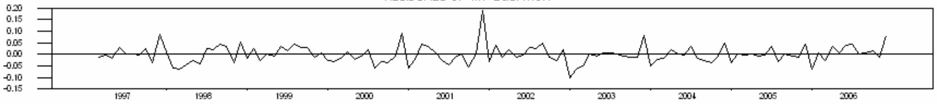
Maximum Lag Analyses

LAG	AKAIKE	HANNAN-QUINN	SCHWARZ
1	-44.919	-44.386	-43.606
2	-45.666	-44.891	-43.757
3	-45.607	-44.590	-43.101
4	-45.485	-44.226	-42.382
5	-45.199	-43.697	-41.499

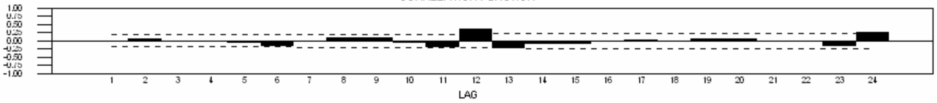
Residual Analyses



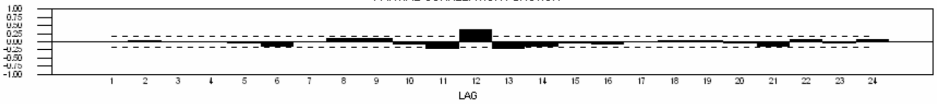
RESIDUALS OF M1 EQUATION



CORRELATION FUNCTION

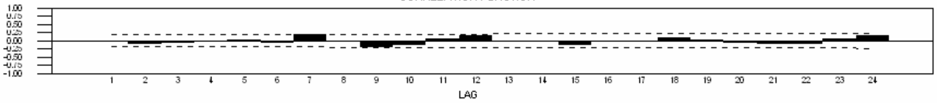


PARTIAL CORRELATION FUNCTION



RESIDUALS OF RPI EQUATION

CORRELATION FUNCTION



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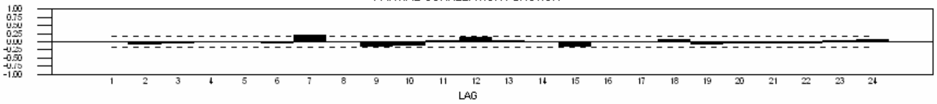
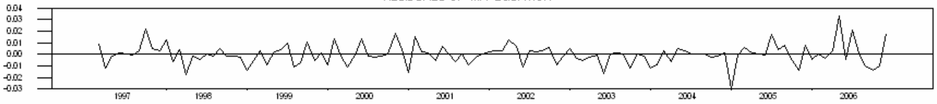


RESIDUALS OF MPI EQUATION



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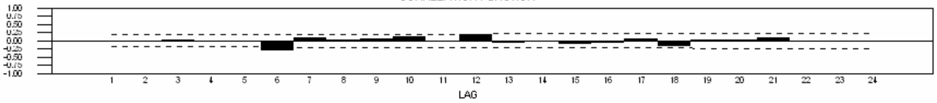

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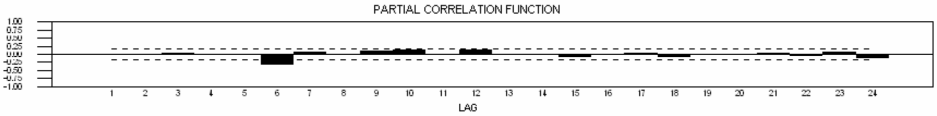
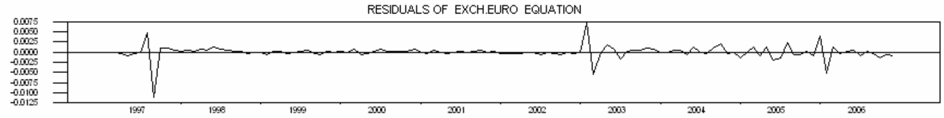
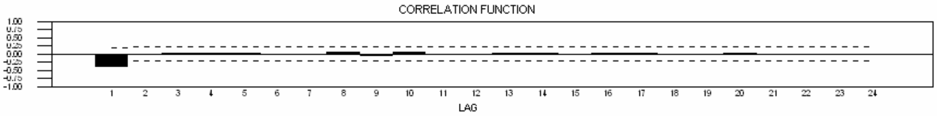


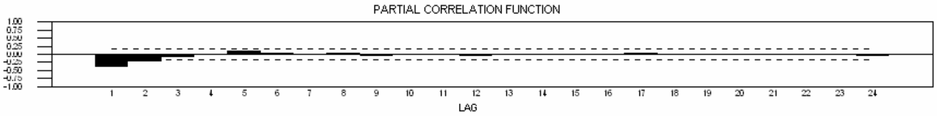
RESIDUALS OF EXCH.EURO EQUATION



CORRELATION FUNCTION



PARTIAL CORRELATION FUNCTION



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TESTS FOR THE TREND POLYNOMIAL (r GIVEN):

****

H0	HA	\ TEST	DGF	SIG.LEV.
m0 = m0; m1 = 0	**m0 = m0; m1 = ab1**	**6.610**	**1**	**0.158**

****

****

NOTE: THE HYPOTHESIS IS ACCEPTED WHEN SIG.LEV > 0.05. The mo=mo;m1=0 is a model with constant in the short-run against the model with constant and trend in the cointegration space. It can be seen that model without trend in the cointegration space is better than the model with trend.

Tests for stationarity, weak exogeneity and exclusion

TESTS FOR STATIONARY					
VARIABLES	EXCH.E	MPI	RPI	M1	REAL-GDP
D.F	4	4	4	4	4
χ^2	31.41597	38.13822	27.18662	34.01207	27.91391
Sig.level	2.52E-06	1.05E-07	1.82E-05	7.41E-07	1.30E-05

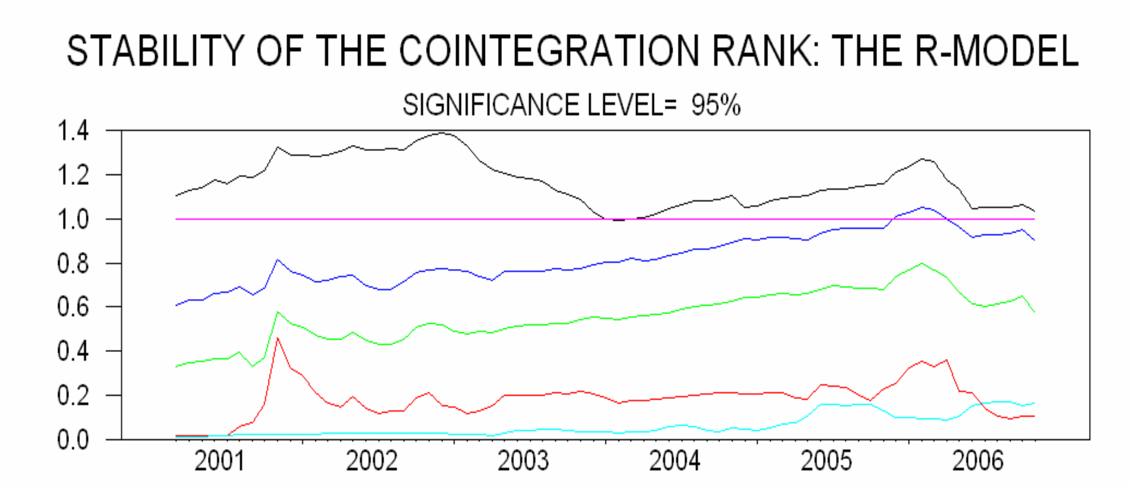
TESTS FOR WEAK EXOGENEITY					
VARIABLE	EXCH.E	MPI	RPI	M1	REAL-GDP
D.F	1	1	1	1	1
χ^2	3.086	5.56521	6.79681	0.11	0.02
Sig.level	0.11	0.01	0.02	0.74	0.86

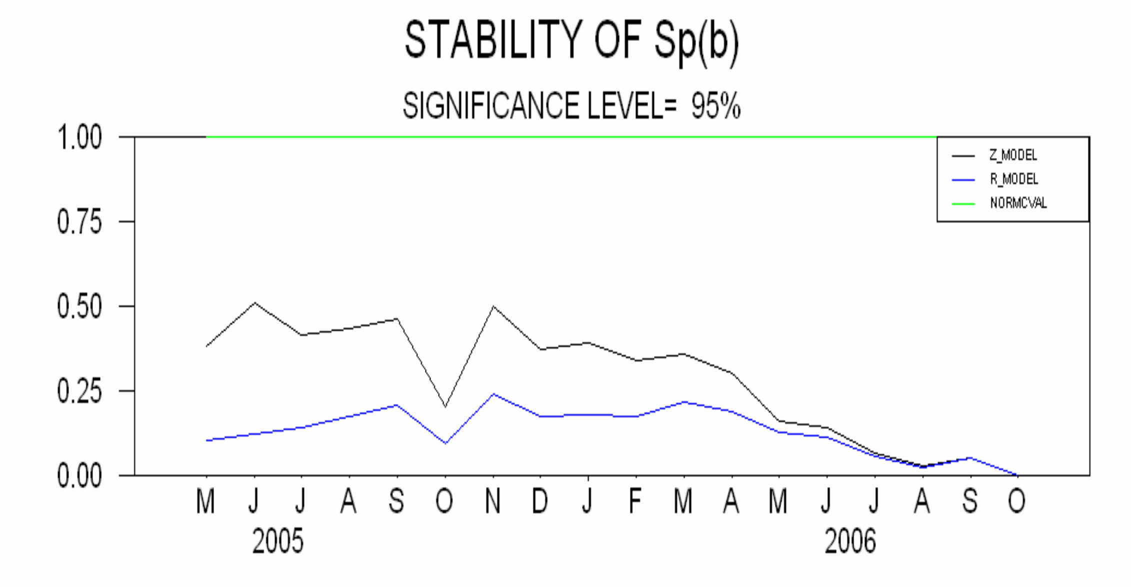
TESTS FOR EXCLUSION					
VARIABLE	EXCH.E	MPI	RPI	M1	REAL-GDP
D.F	1	1	1	1	1
χ^2	9.118	8.74	9.04	7.94	1.55
Sig. level	0.001	0.03	0.001	0.03	0.212

Note: Stationarity, weak exogeneity and exclusion is accepted when the significance level is larger than 0.05.

Author's calculations.

Parameter of stability





UNIVERZA V LJUBLJANI
EKONOMSKA FAKULTETA

BESNIK FETAI

OPTIMALNA STRATEGIJA MONETARNE IN FISKALNE V FUNKCIJI OHRANJANJA MAKROEKONOMSKE STABILNOSTI V REPUBLIKI MAKEDONIJI

DOKTORSKA DISERTACIJA

LJUBLJANA, 2008

POVZETEK

Strokovnjaki se že dolgo posvečajo raziskovanju pomena monetarne in fiskalne politike ter njunemu vplivu na realno gospodarstvo. Dolgoročno gledano spremembe v monetarni oziroma fiskalni politiki vplivajo na oblikovanje ravni cen oziroma na stopnjo inflacije. Po mnenju ekonomistov naj bi bil osrednji dolgoročni cilj monetarne in fiskalne politike prav vzdrževanje nizkih in stabilnih cen (Abel, Bernanke in Smith, 2003, s. 538). Kratkoročno gledano pa monetarna in fiskalna politika ostajata pomembni orodji, s katerima je po različnih poteh mogoče vplivati na realno gospodarstvo. V tej razpravi sem se osredotočil na vlogo monetarne in fiskalne politike ter režima deviznega tečaja in na njihov vpliv na oblikovanje realnega BDP in cen v Republiki Makedoniji, pri čemer želim definirati relativne stroške in koristi, ki so povezani z uvedbo aktivnejših denarnih in fiskalnih politik ter drugačnih režimov deviznega tečaja. Raziskava se nanaša tako na primarne konvencionalne poti monetarne in davčne politike (denarna ponudba, kratkoročna obrestna mera, primarni fiskalni primanjkljaj, javnofinančni odhodki in prihodki) kot tudi na kanal deviznega tečaja, ki so aktivni v Republiki Makedoniji. Empirična raziskava o položaju v Republiki Makedoniji temelji na teoretični in empirični literaturi o SVAR in VECM, ki je aplikativna tako v razvitih kot v državah v tranziciji. Podatki se nanašajo na obdobje med letoma 1997 in 2006, empirična raziskava pa je izvedena s pomočjo dveh najpogosteje uporabljenih metodologij pri tovrstnih raziskavah, in sicer s SVAR in VECM. Metodi SVAR in VECM sta uporabljeni z namenom preverjanja veljavnosti treh glavnih hipotez, predstavljenih v zadnjem poglavju raziskave. Raziskava ima naslednjo strukturo:

Prvo poglavje predstavlja predhodno oceno monetarne in fiskalne politike v Republiki Makedoniji v obdobju med letoma 1992 in 2007. Od leta 1992 pa vse do konca leta 1995 vlada ni imela jasnega programa, ki bi se nanašal na makroekonomsko stabilnost, kar je pogosto povzročilo konflikte med monetarno oblastjo in davčnimi organi. Narodna banka Republike Makedonije je, na primer, poskušala stabilizirati gospodarstvo s pomočjo stabilizacije domače valute (denar), kar je povzročilo zvišanje obrestne mere in negativno vplivalo na proračun; posledično je bila Narodna banka Republike Makedonije prisiljena znižati temeljno obrestno mero. Glede na situacijo je bilo moč predvidevati, da se bosta pojavili potreba po uporabi tuje konvertibilne valute in devizna kriza. Uporaba monetarne strategije ciljanja deviznega tečaja oz. stabilizacija deviznega tečaja je v raziskovanem obdobju uspešno znižala stopnjo inflacije. Med letoma 1997 in 2007 se je Republika

Makedonija soočila z mnogimi sistemskimi spremembami: trgovanje Narodne banke Republike Makedonije z bankami na deviznem trgu (2005), liberalizacija računa kapitala (2003), članstvo Republike Makedonije v Svetovni trgovinski organizaciji (2002) in status države kandidatke za članstvo v Evropski uniji (2004). Nadaljnje preučevanje monetarne politike in režima deviznega tečaja je zato potrebno usmeriti v navidez neskladno trojico: liberalizacija računa kapitala, fiksni devizni tečaj in neodvisna monetarna politika (Obstfeld, 1998, s. 9−30; Mishkin, 2003). Zaradi liberalizacije računa kapitala lahko devizni tečaj zlahka postane tarča preračunljivih napadov (nenadni visoki pritoki kapitala), saj višanje in nihanje obrestnih mer ter devizne rezerve (katerih raven je izredno pomembna za mednarodno likvidnost države) posledično vodijo v morebitne negativne posledice za gospodarstvo. Po drugi strani pa lahko enostranska pobuda, da se fiksni devizni tečaj zamenja z bolj fleksibilnim oziroma da se vrednost domače valute zniža, s čimer naj bi se rešila težava primanjkljaja na tekočem računu (Republika Makedonija ima namreč že od začetka gospodarske neodvisnosti dalje na tekočem računu plačilne bilance primanjkljaj) in posledično spodbudila hitra gospodarska rast, zlahka vznemiri makroekonomsko stabilizacijo, kratkoročno pa z vidika realne gospodarske rasti ne prinese pozitivnih posledic (Ribnikar in Bole, 2006).

Da bi ocenili relativne stroške in koristi, do katerih bi prišlo zaradi uvedbe aktivnejše monetarne politike in drugačnih režimov deviznega tečaja, so v zadnjem poglavju te raziskave (z uporabo metod SVAR in VECM) predstavljeni mehanizmi transmisije monetarne politike in režima deviznega tečaja, tj. učinek denarne ponudbe, kratkoročna obrestna mera in kanali deviznega tečaja na realni BDP in cene. Analize fiskalne politike kažejo, da vlada Republike Makedonije ni uvedla in ne uporablja davčnih predpisov; to pomeni, da proračunska pravila, ki bi temeljila na določitvi srednjeročnih matematičnih ciljev za reguliranje davčnega primanjkljaja, javne porabe, javnega dolga in javnih prihodkov, ne obstajajo, kakor tudi ne obstaja na predpisih temelječa fiskalna politika, ki bi se prilagajala konjunkturnemu nihanju gospodarstva (čeprav se diskrecijski fiskalni režim izvaja prek davčne politike). Od leta 1992 vse do začetka leta 1994 se je v Republiki Makedoniji še vedno uporabljal jugoslovanski davčni sistem (SFRJ) z zanj značilnimi nestabilnostjo, neučinkovitostjo in netransparentnostjo, zato se je pogosto pojavila monetizacija davčnega primanjkljaja. Od leta 1994 do konca leta 2006 je sicer potekal postopek fiskalnega prilagajanja, vendar je zaradi spodbujanja gospodarske rasti prihajalo do pomembnih nihanj v obsegu davčnega primanjkljaja in javne porabe. Na začetku leta 1994 je bil uveden nov davčni sistem, ki se je pokazal kot učinkovit, stabilen, transparenten in skladen z naprednejšimi davčnimi sistemi. Na področju javne porabe je vlada Republike Makedonije nekajkrat prilagodila davčno stopnjo, da bi s tem spodbudila gospodarsko rast. V letu 2007 je vlada izvedla radikalne ukrepe v zvezi s proračunsko porabo in prihodki: plače v javni upravi je zvišala za 30 odstotkov, odpravila je progresivni davek na dohodek, uvedla pavšalno obdavčenje dohodka in 10-odstotni davek na dobiček. Pred spreminjanjem komponent fiskalne politike je treba opraviti tako kvalitativne kot kvantitativne metodološke raziskave, na osnovi katerih lahko predvidimo spremembe na obeh straneh proračuna, tako pri odhodkih kot pri prihodkih. Vlada bi naj resne odločitve glede spremembe fiskalne politike sprejela šele po temeljitem preučevanju vseh morebitnih posledic, nikakor pa ne tako, da zviša plače v javni upravi. Z namenom ovrednotenja relativnih stroškov in koristi, povezanih z uvedbo aktivnejše davčne politike, so v zadnjem poglavju tega besedila (z uporabo modelov SVAR in VECM) predstavljeni učinki fiskalne politike oz. davčnega primanjkljaja, javne porabe in kanalov prihodka na realni BDP in oblikovanje cen.

V drugem poglavju te razprave so pregledno predstavljene teorije in empirični dokazi, vključno z raziskavami vpliva monetarne in fiskalne politike ter režima deviznega tečaja na realni BDP in cene tako v razvitih kot v državah v tranziciji. Teorije in empirični dokazi, ki temeljijo na modelih SVAR (strukturni vektorski avtoregresivni model) in VECM (vektorski model popravljanja napak s kointegracijo), se nanašajo na različne kanale denarnega pretoka, prek katerih lahko spremenjena monetarna politika vpliva na realno gospodarstvo (večina teh dokazov se sicer nanaša na raziskave, opravljene v razvitih državah). Za razliko od običajnih teorij, podprtih z empiričnimi dokazi iz razvitih držav, pa teorije in empirični dokazi, ki se nanašajo na države v tranziciji, pričajo o potencialnih slabostih oziroma nestabilnosti običajnih poti denarne transmisije v času tranzicije (denarna ponudba in obrestna mera), do katerih lahko pride zaradi strukturnih in institucionalnih pomanjkljivosti – še posebej zaradi nerazvitosti finančnih sistemov (za finančni in bančni sektor je namreč značilno šibko razvito finančno posredništvo) in višje dolarizacije.

Kar se tiče učinkov monetarne politike, večina empiričnih dokazov iz držav v tranziciji potrjuje, da so zaradi pomembne vloge deviznega tečaja tako obrestna mera kot tudi poti povečanja denarne ponudbe, če jih opazujemo z vidika neodvisnih kanalov monetarne politike (tj. vplivanja monetarne politike na realno gospodarstvo s pomočjo prilagajanja obrestne mere in obsega denarne ponudbe), relativno šibki. Pričujoča empirična raziskava kaže, da v mehanizmih denarne transmisije teh držav kanali deviznega tečaja igrajo najbrž pomembnejšo vlogo kot obrestna mera in denarna ponudba. Kar se tiče fiskalne politike, dajejo v zadnjih nekaj letih empirični dokazi iz razvitih držav različne in nedokončne rezultate učinkov fiskalne politike na realno gospodarstvo. Med ekonomisti je zaslediti bistveno večje nesoglasje o učinkih fiskalne politike kakor to velja za monetarno politiko. Empirične študije temeljijo na različnih metodologijah. Najprej se na osnovi strukturnih makroekonomskih modelov opredelijo učinki fiskalne politike, nato se sklopi študij usmerijo na daljša fiskalna obdobja. V zadnjem času precej ekonometričnih modelov temelji na metodologiji SVAR, ki poskuša identificirati vzroke nihanja realnega BDP, ki se kaže v šokih ponudbe in povpraševanja, tj. monetarnih in fiskalnih impulzih na skupno povpraševanje in ponudbo. Empirični dokazi, ki temeljijo na strukturnih makroekonomskih modelih, na splošno kažejo, da je fiskalni multiplikator kratkoročno gledano pozitiven, dolgoročno pa je zaradi učinkov izpodrivanja ničeln. Na strukturnih makroekonomskih modelih temeljijo tudi druge, sicer bolj omejene študije kratkoročnih negativnih fiskalnih multiplikatorjev. V zvezi z empiričnimi dokazi za določanje daljših fiskalnih obdobij je ugotovljeno, da imajo davki na gospodarsko rast negativen učinek, že najmanjša poraba sredstev za javne investicije pa na gospodarsko rast vpliva pozitivno. Široka potrošnja in poraba za socialno varnost na gospodarsko rast nimata učinka oziroma je le-ta negativen. Sodobni strokovnjaki z uporabo metodologije SVAR v teoriji postavljajo nove mejnike. Številne študije, ki temeljijo na metodologiji SVAR, sicer dokazujejo, da ima fiskalna politika pozitiven vpliv na realno gospodarstvo, vendar je potrebno izpostaviti, da se te študije nanašajo le na države članice Organizacije za ekonomsko sodelovanje in razvoj (OECD). V nasprotju z razvitimi državami pa je doslej izvedenih le majhno število študij o učinku fiskalne politike na realno gospodarstvo v državah v tranziciji. V tem kontekstu večina raziskovalcev pričakuje nekeynesijanske gospodarske učinke; fiskalna resnost oz. prilagajanje se predpostavlja kot sredstvo uspešne makroekonomske stabilizacije, fiskalna poraba pa se povezuje s stagnacijo realnega gospodarstva in zaviranjem procesa tranzicije. Kar se tiče režima deviznega tečaja, ostaja vprašanje optimalnega monetarnega režima majhnih odprtih gospodarstev še vedno odprto (Ribnikar, 2004). Empirični dokazi ne ponujajo prepričljivih odgovorov na vprašanje, ali naj bi države uporabljale drseči ali fiksni devizni tečaj. Zato ne preseneča, da so rezultati nedokončni in si včasih nasprotujejo, saj variirajo glede na države, na katere se nanašajo, glede na časovno obdobje, podrobno specifikacijo uporabljenega ekonometričnega modela in pristranskost avtorjev. Ribnikar meni, da optimalni monetarni režim ne obstaja; odvisen je namreč od značilnosti posameznih nacionalnih gospodarstev, na primer od velikosti, odprtosti, razvitosti finančnega sektorja, obsega dolarizacije itn.;

neko splošno pravilo, ki bi veljalo za vse, torej ne obstaja. V Sloveniji, na primer, je bil uveden uravnavani drseči devizni tečaj. Večina empiričnih raziskav potrjuje, da je v tranzicijskih državah devizni tečaj pogosto igral bistveno vlogo v doseganju makroekonomske stabilizacije, tj. v minimiziranju nihanja realnega BDP, domačih cen in drugih makroekonomskih spremenljivk. Podatki iz tranzicijskih držav poudarjajo potencialno moč učinka prehajanja deviznega tečaja na cene, do česar lahko pride zaradi relativno visoke dolarizacije (zamenjava naložb – tako nepremičnin kot finančnih naložb) v okviru teh gospodarstev. Močan učinek prehajanja deviznega tečaja potrjuje pomembno vlogo kanala deviznega tečaja v mehanizmu denarne transmisije. Enak rezultat je potrjen tudi v zadnjem poglavju te disertacije in temelji na raziskavi učinka prehajanja deviznega tečaja na cene, ki je bil raziskan na primeru Republike Makedonije. Iz tega sledi, da morajo oblikovalci monetarne politike vsekakor upoštevati značilnosti mehanizma denarne transmisije prek eksogenih denarnih šokov na realni BDP in cene. Empirična literatura, ki se nanaša tako na razvite kot na tranzicijske države, za ovrednotenje učinka monetarnega režima in režima deviznega tečaja na realni BDP in cene uporablja metodologiji SVAR in VECM. Šele pred kratkim pa so raziskovalci obe metodologiji pričeli uporabljati tudi za ovrednotenje učinka fiskalne politike na realni BDP in cene.

V tretjem poglavju te disertacije sta predstavljeni analiza ekonometričnih metodologij SVAR in VECM na primeru Republike Makedonije in razprava o pomenu druge strokovne literature za države v tranziciji. Stock in Watson (2001) ter Bernanke idr. (2003) so izboljšali metodologijo SVAR in verjamejo, da je bila v zadnjih dvajsetih letih metodologija SVAR nedvomno najbolj uporaben pristop k raziskovanju monetarne politike in režima deviznega tečaja, skratka, vse odkar je Sims (1980) oblikoval njena osnovna načela. Pred kratkim je ta metodologija našla svoje mesto tudi na področju evalvacije fiskalne politike. Simsova kritika zadnjega tipa analiz (keynesijanski in monetaristični makroekonomski model) izpostavlja, da so makroekonomske analize zelo omejujoče in ne upoštevajo povratne informacije s strani posameznih spremenljivk. Gospodarski sistemi pa se vendarle odzivajo. Pri tem je težko ugotoviti, kdaj na časovni potek neodvisnih eksogenih spremenljivk ne vpliva tudi časovni potek odvisnih endogenih spremenljivk. Nasprotno pa metodologija SVAR postavlja le minimalne omejitve in vse spremenljivke v modelu upošteva kot skupno endogene (s tem se razlikuje od restriktivnejših metodologij), s čimer se izogne vsakršnemu razlikovanju med endogenimi (odvisnimi) in eksogenimi (neodvisnimi) spremenljivkami. Po metodologiji

SVAR je trenutna raven vsake spremenljivke v dinamičnem sistemu enačb odvisna od preteklega gibanja te spremenljivke in vseh ostalih spremenljivk, ki vplivajo na sistem (Enders, 2004 in Lütkepohl, 2005). Z uporabo te metodologije lahko raziskujemo odnose med spremenljivkami v modelu. Ker SVAR postavlja le minimalne omejitve oziroma ne vsiljuje vnaprejšnjih omejitev, se za prepoznavanje morebitnih ovir uporabijo drugi statistični inštrumenti. Kot diagnostični preizkusi modela SVAR se zato uporabljajo statistična predpostavka normalne porazdelitve ostankov (test Jarque-Berra), nesignifikantna avtokorelacija ostankov (test Ljung-Box) in avtoregresivna pogojna heteroskedastičnost ostankov (test ARCH). S temi testi se preverja »kakovost« modela VAR. V tem kontekstu so diagnostični testi v vseh modelih empirične raziskave na primeru Republike Makedonije zadovoljivi in skladni s predpostavko belega šuma v procesu in konstantne variance skozi čas. Nato je predstavljena analiza orodij, uporabljenih po modelu VAR, in sicer Grangerjev test vzročnosti, funkcije impulznega odziva (razčlenitev oz. dekompozicija po Choleskem in Bernankeju) in dekompozicija variance pojasnjevalne spremenljivke. Z Grangerjevim testom vzročnosti ugotavljamo, ali bo odlog ene spremenljivke, ki je v razmerju z drugo spremenljivko, pri slednji povzročil pojav t. i. »Grangerjeve vzročnosti«. Ker Grangerjev test vzročnosti ne pokaže časovne porazdelitve ali dinamičnega gibanja spremenljivk, je na tem mestu koristno analizirati podatke s funkcijo impulznega odziva in z dekompozicijo variance pojasnjevalne spremenljivke. Osnovni model VAR je zelo omejen in z njim ni mogoče identificirati strukturnih šokov, zato sem pri raziskavi uporabil dekompozicijo po Choleskem ter po Bernankeju in Simsu. Eden od načinov opredelitve strukturnega modela je uporaba metode dekompozicije Choleskega, pri čemer je potrebno strukturni model samo identificirati. Po tej metodi se ostanki razčlenijo na trojni način. Z uporabo dekompozicije Choleskega je moč doseči raven standardnega neomejenega VAR, s katerim se raziskujejo odnosi med spremenljivkami v višjem dimenzionalnem sistemu, in sicer z namenom, da bi se dosegel odziv ene spremenljivke na šoke in na ostale spremenljivke; v mojem primeru je to odziv realnega BDP in cen na spremembe deviznega tečaja. Z namenom primerjave rezultatov prve in druge dekompozicije uporabljam metodo dekompozicije Bernankeja in Simsa. Na ta način pridem do skoraj identičnega rezultata, ne glede na to, ali uporabim dekompozicijo Choleskega ali dekompozicijo Bernankeja in Simsa. SVAR nam nudi tudi možnost identificiranja dekompozicije variance pojasnjevalne spremenljivke. Dekompozicija variance je razčlenjena v komponente, ki so utemeljene z njenimi lastnimi inovacijami iz z inovacijami različnih spremenljivk v sistemu. To tehniko uporabljam z namenom evalvacije vpliva monetarnih in fiskalnih šokov ter šokov deviznega tečaja na nihanje realnega BDP in cen v Republiki Makedoniji. Za razliko od prej predstavljene metodologije (SVAR), kjer so časovne vrste nestacionarne in analizirane na kratek rok, pa vektorski model popravljanja napak (VECM) vključuje stacionarne časovne vrste, integrirane prvega ali drugega reda, ki se približujejo svojemu lastnemu ravnovesju. Za opredelitev časovnih vrst (ne glede na to, ali časovna vrsta vsebuje enotni koren) se uporabljata trend testiranja in enotni koren (razširjeni test Dickey-Fuller). Če časovne vrste vsebujejo enotne korene, lahko na osnovi tega sklepamo, da so nestacionarne. Časovne vrste z uporabo metode diferenciranja postanejo stacionarne in integrirane prvega reda; če je linearna kombinacija integriranih spremenljivk stacionarna, lahko rečemo, da so takšne spremenljivke kointegrirane. Da bi ugotovili, ali sta dve oz. ali je več časovnih vrst kointegriranih, uporabimo Johansenovo metodo. Ta metodologija je v pričujoči empirični raziskavi uporabljena z namenom, da prikaže dolgoročne učinke monetarnega režima in režima deviznega tečaja na realni BDP in cene v Republiki Makedoniji. Rezultati Johansenovega testa so pokazali le eno dolgoročno stabilno linearno kombinacijo: med deviznim tečajem, proizvodnimi cenami, maloprodajnimi cenami in denarno maso.

V zadnjem poglavju te disertacije so predstavljeni učinki monetarne in fiskalne politike ter režima deviznega tečaja na realni BDP in cene v obdobju med letoma 1997 in 2006. Analizo začnem s predstavitvijo dveh dobro znanih običajnih poti monetarne politike (denarna ponudba in obrestna mera), nadaljujem pa s tremi dobro znanimi davčnimi kanali (primarni fiskalni primanjkljaj, javna poraba in javni prihodek). Na koncu je predstavljen ključni del disertacije. V njem raziskujem učinek deviznega tečaja na realni BDP in cene, in sicer ugotavljam, v kakšnem obsegu devizni tečaj vpliva na raven cen in realni BDP oziroma kolikšni so stroški in koristi uvedbe različnih režimov deviznega tečaja.

V nadaljevanju je izveden skupen prikaz učinkov monetarne in fiskalne politike na realni BDP in cene, kar na primeru države v tranziciji v strokovni literaturi doslej še ni bilo predstavljeno.

Pri državah v tranziciji, za katere so na voljo le omejeni razponi podatkov (ki so včasih vprašljive kakovosti), je vrednost empiričnih rezultatov bolj okvirna kot dokončna. Opozarjajoč na to dejstvo, v nadaljevanju predstavljam svoje ugotovitve:

Kar se tiče kanalov denarne ponudbe, rezultati prvih dveh uporabljenih metodologij (SVAR in VECM) in dekompozicije po Choleskem ter dekompozicije po Bernankeju in Simsu (Enders, 2004 in Lütkepohl, 2005) potrjujejo **prvo hipotezo**: **da sprememba denarne ponudbe nima signifikantnega učinka na realni BDP. Sprememba denarne ponudbe ima pomemben učinek na oblikovanje ravni cen.** Moje ugotovitve izpostavljajo pomembnost učinka denarnega šoka na oblikovanje ravni cen in potrjujejo, da ima denar pomemben vpliv pri določanju stopnje inflacije v Republiki Makedoniji. V doglednem časovnem obdobju raven cen z uporabo endogene denarne prilagoditve ne more ponovno doseči svojega osnovnega trenda v razmerju z drugimi spremenljivkami v modelu. Ker se je denar pokazal kot močan dejavnik vpliva na cene, iz tega sledi, da je denar *potencialen vir inflacije v Republiki Makedoniji*. V primeru, da se ostale spremenljivke ne spreminjajo, lahko raven cen ponovno doseže svoj osnovni trend na dva načina: postopno, s prilagajanjem stopnje inflacije, in na hiter način, s prilagajanjem obsega denarne ponudbe. Ta rezultat izhaja iz dejstva, da je bil primarni denar (in prek njega denarna ponudba) v raziskovanem obdobju bodisi endogena/odvisna spremenljivka bodisi pod nadzorom Narodne banke Republike Makedonije, ki se je prilagajala povpraševanju po denarju (v tem modelu je njegov obseg določala inflacija). Rezultat je v skladu z večino ugotovitev, ki se nanašajo na države v tranziciji. Belullo (1999), Gilliam in Nakov (2004, s. 653−684), Starr (2005, s. 14) ter Horváth in Maino (2006, s. 8) se strinjajo, da je denar potencialen vir inflacije. Ta rezultat je prav tako skladen z monetarističnim prepričanjem, da povečanje denarne ponudbe povzroči zvišanje cen. Moje ugotovitve potrjujejo prepričanje, da je primarna vloga monetarne politike nadzorovanje inflacije v Republiki Makedoniji; denarna ponudba namreč nima signifikantnega vpliva na realni BDP, medtem ko močno vpliva na oblikovanje ravni cen.

Kar se tiče vpliva denarne ponudbe na realni BDP, ugotavljam, da je v Republiki Makedoniji dobava denarja prek neodvisnih poti monetarne politike precej šibka, na kar vplivajo dejstva, da je za bančni in finančni sektor še vedno značilno slabo razvito finančno posredništvo, finančni sektor je nerazvit, v bančnem sektorju primanjkuje konkurence, dolarizacija pa je visoka. Fenomen vpliva denarne ponudbe na oblikovanje gospodarskih rezultatov (prek cen sredstev, učinka premoženja, bančnih posojil in bilanc podjetij) v Makedoniji še ne deluje v enaki meri kot v razvitih državah. V Republiki Makedoniji je še posebej opazna odsotnost učinka cen sredstev; z njim sicer vpliv denarne ponudbe na vrednost sredstev, kot so npr. obveznice, delnice, nepremičnine in druga domača sredstva, vodi k povečanju zasebnega premoženja in tržne vrednosti podjetij. Izsledki so skladni z večino drugih raziskav, ki se nanašajo na tranzicijske države in ki ugotavljajo, da gre slabo razvitost mehanizma denarne transmisije v teh državah pripisati strukturnim in institucionalnim pomanjkljivostim, še posebej nerazvitim finančnim sistemom (Elbourne et al., 2003, s. 1−35; Ceccheti in Krause, 2001 in drugi). Rezultat je skladen tudi z običajnimi izsledki, ki izhajajo iz proučevanja gospodarstev s signifikantnim obsegom uporabe tuje konvertibilne valute. V tem kontekstu lahko večja dolarizacija Republike Makedonije (gl. temo dolarizacije v drugem poglavju) oslabi ekspanzivno monetarno politiko bančnega posojanja. *Povečanje denarne ponudbe v Republiki Makedoniji zaradi uporabe tuje konvertibilne valute vpliva na zmanjšanje deviznih rezerv na tujem trgu in lahko vodi v padec deviznih rezerv.* Povečanje denarne ponudbe *ne spodbuja domačih kreditov*, ampak lahko v nasprotju s tem povzroči odliv kapitala, kar posledično vpliva na zelo nizko stopnjo bančnega kreditiranja zasebnega sektorja oziroma le-tega sploh ni. Glavna spodbuda za dolarizacijo v Republiki Makedoniji je zamenjava sredstev – tako dejanskih kot finančnih sredstev. Cene nepremičnin in trajnih življenjskih potrebščin so do neke mere indeksirane na tujo valuto, pa tudi sicer prebivalci za kupovanje in prodajo nepremičnin namesto domače uporabljajo tujo valuto. Kar se tiče finančnega premoženja, prebivalci hranijo velik del svojih prihrankov v obliki deviznih depozitov na bankah ali izven bančnega sistema, banke pa odobrijo posojila, ki so bodisi denominirana v tuji valuti bodisi indeksirana nanjo. *Zato povečanje denarne ponudbe ne pomeni nujno tudi povečanja kupne moči, ampak prej kaže na večji obseg uporabe tuje konvertibilne valute.* Kar se tiče učinka kratkoročne obrestne mere, rezultati empirične raziskave **potrjujejo hipotezo, da sprememba kratkoročne obrestne mere ne vpliva na realni BDP**. Ta rezultat potrjuje večino dognanj, ki se nanašajo na države v tranziciji in poudarjajo, da denarna transmisija prek obrestne mere nima takšnega vpliva na realni BDP, kot ga je opaziti v razvitih državah (Égert in McDonald, 2006; Horváth in Maino, 2006; Ganev idr., 2002; Kuijs, 2002; Ceccheti in Krause, 2001; Elbourne idr., 2003). Moje ugotovitve kažejo tudi, da je v Republiki Makedoniji kratkoročna obrestna mera slabo razvit kanal monetarne politike, kar gre pripisati predvsem nerazvitosti finančnega sektorja, pomanjkanju konkurence v bančnem sistemu in višji dolarizaciji. Izsledki zato potrjujejo ugotovitev, da obrestna mera ne odraža tržnega obnašanja, saj denarni trg v Republiki Makedoniji še ne deluje dovolj dobro in zato obrestna mera ne more biti učinkovit inštrument monetarne politike. Do enakega zaključka sta na primeru Hrvaške prišla Bonato in Billmeier (2002); obrestna mera zato ni vključena v model. Nadalje, obrestna mera za vrednostne papirje Narodne banke Republike Makedonije je temeljna obrestna mera in kot takšna merilo za določanje bančnih obrestnih mer; dobava vrednostnih papirjev Narodne banke Republike Makedonije se namreč zunanje uravnava s potrebo centralne banke po izdajanju vrednostnih papirjev zaradi umikanja presežne likvidnosti iz bančnega sistema oziroma z namenom povečanja deviznih rezerv (Ribnikar in Bole 2006, s. 10). Dodatni dejavnik, ki lahko prispeva k razlagi tega rezultata, je višja dolarizacija. V gospodarstvu z relativno visoko dolarizacijo, kakršna je na primer v Republiki Makedoniji, je potencialna učinkovitost politike neodvisne obrestne mere precej omejena. Monetarna politika lahko domačo obrestno mero neodvisno nadzoruje le v manjši meri, saj nanjo vplivata tako evrska kot tudi dolarska obrestna mera. Zaradi tega je domača obrestna mera zelo podobna evrski, kar vpliva na poslovno tveganje domačih bank.

Kar se tiče učinka fiskalne politike na realni BDP in cene, moji empirični izsledki potrjujejo **prvi del druge hipoteze: gibanje primarnega davčnega primanjkljaja in javnofinančni odhodki nimajo signifikantnega učinka na realni BDP.** S temi empiričnimi dokazi je na primeru Republike Makedonije predpostavka o običajnem keynesijanskem vplivu fiskalne politike na realni BDP ovržena. Primarni davčni primanjkljaj in javnofinančni odhodki so pokazali zelo šibek vpliv na realni BDP, pa še ta je trajal le štiri mesece, nato pa je izginil. Zato velja, da fiskalna dejavnost na realni BDP v Republiki Makedoniji ne kaže signifikantnega vpliva. *Fiskalna politika v Republiki Makedoniji zaradi izravnalnega vpliva monetarne politike ne vpliva na realni BDP. Monetarna politika se namreč takoj odzove in tako dolgo nevtralizira učinke fiskalne politike, dokler le-ti ne izginejo.* To povzroči učinek izrinjanja. Z drugimi besedami, ekspanzivno fiskalno politiko spremlja poostritev monetarne politike. Moji izsledki prav tako potrjujejo, da je denarna ponudba endogena gibanju davčnih spremenljivk in inflaciji, saj se primarni davčni primanjkljaj in raven cen vrneta k osnovnemu trendu že v manj kot treh mesecih po pojavu fiskalnega šoka. Rezultati kažejo, da bi lahko raven cen ponovno dosegla svoj osnovni trend s hitro prilagoditvijo denarne ponudbe. Ta sklep potrjuje rezultate predhodnih raziskav, ki se nanašajo tako na razvite države (Mountford in Uhling, 2005; Perotti, 2002) kot na države v tranziciji (Fischer in Sahay, 2000; Aslund, 2002). Prej omenjena raziskava ugotavlja, da aktivnosti fiskalne politike ne vplivajo na realno gospodarstvo, kar je še posebej opazno v obdobju fiskalne konsolidacije. Von Hagen idr. (2001, s. 279−295), Andrés in Doménech (2003) ter Muscatelli in Tirelli (2005) so prepričani, da fiskalna politika zaradi odziva monetarne politike ne izkazuje vpliva na realni BDP. *Rezultati moje raziskave odražajo reakcijo monetarne politike v*

Republiki Makedoniji, pri čemer je presežna likvidnost, ki bi se lahko zaradi ekspanzivne fiskalne politike pojavila v bančnem sistemu, sterilizirana, s čimer se ohranja stabilen devizni tečaj.

Kar se tiče javnega prihodka, je iz empiričnih rezultatov razvidno, da ima znižanje davka na realni BDP le kratkotrajni učinek – v Republiki Makedoniji namreč ne izkazuje trajnejšega učinka na realni BDP. Ta rezultat je zaradi upada količine pobranega davka (kljub njegovemu zvišanju) v realnem BDP pričakovan. Višja obdavčitev povzroči padec razpoložljivega dohodka, kar vodi k znižanju stopnje investiranja, to pa posledično povzroči padec realnega BDP. **Ta empirični rezultat potrjuje drugi del druge hipoteze: sprememba obdavčitve bo imela na BDP kratkoročne učinke.** Do istega zaključka so prišli tudi Fatás in Mihov (2003), Blanchard in Perotti (2002) ter Mountford in Uhling (2005). Moj rezultat je zelo podoben Mountfordovemu in Uhlingovemu (2005), in sicer v tem, da lahko sprememba obdavčitve za kratek čas vpliva na realni BDP; vendar se bodo zaradi tega posledično najbrž pojavile večje bremenitve. Večje bremenitve lahko imajo za realni BDP bistveno bolj razsežne dolgoročne posledice in presegajo vse kratkoročne koristi. Zaradi kratkotrajnega pozitivnega učinka davčnih sprememb na realni BDP lahko to stanje označimo kot »**posledica neučinkovitosti politike**«. Ta izsledek je podoben »novemu klasičnemu modelu«, pri čemer je vpliv fiskalne politike neučinkovit (gl. Dodatek 1, kjer je predstavljena simulacija Lucasovega modela). V tem kontekstu ekspanzivna fiskalna politika nižanja davkov predstavlja neučinkovit inštrument makroekonomske politike v Republiki Makedoniji, saj ne kaže trajnega učinka na realni BDP in lahko ima negativne dolgoročne posledice, ki daleč presegajo kakršen koli kratkoročni dvig realnega BDP.

Pričujoča empirična raziskava je s skupno analizo fiskalne in monetarne politike pokazala dodaten, najbrž še zanimivejši rezultat. Analiza SVAR je pokazala, da fiskalna politika igra precej manjšo vlogo kot monetarna, zato opustitev fiskalnih spremenljivk ne bo vplivala na interpretacijo učinkov monetarne politike. Z ekonometričnega vidika je potrebno opozoriti, da izpuščanje pomembnih spremenljivk in napačno razumevanje metodologije SVAR lahko vodi v nekonstistentno oceno koeficientov in tako pripelje do zmotnih sklepov v zvezi z učinki monetarne politike (Liper idr., 1996; Christiano idr., 1996; Bernanke idr., 2003). Rezultat *testa statistične distance* pokaže, da ima fiskalna politika precej bolj omejen vpliv kot ga imajo učinki monetarne politike. Iz tega sledi, da *metodologije SVAR ni potrebno uporabiti za raziskavo tako monetarne kot tudi fiskalne* *politike v Republiki Makedoniji, saj fiskalna politika v takšnem modelu igra le manjšo vlogo*. V nasprotju s Christianom idr. (1996), ki poudarjajo, da fiskalna politika igra pomembno vlogo v monetarnem in fiskalnem modelu, pa so Von Hagen idr. (2001, s. 279−295), Andrés in Doménech (2003) ter Muscatelli in Tirelli (2005) prepričani, da je vpliv fiskalne politike v monetarnem in fiskalnem modelu z vidika makroekonomske stabilizacije precej omejen.

Kar se tiče empiričnih rezultatov v zvezi z režimom deviznega tečaja, so z uporabo metodologij SVAR in VECM, kakor tudi z dekompozicijo Choleskega ter dekompozicijo Bernankeja in Simsa, testirane kratkoročne in dolgoročne posledice deviznega tečaja na realni BDP in raven cen v Republiki Makedoniji (Enders, 2004; Lütkepohl, 2005). Izsledki empirične analize so pokazali, da ima direktni kanal deviznega tečaja *močan učinek prehajanja na cene*, medtem ko indirektni kanal deviznega tečaja ne kaže vpliva na realni BDP. S tem je poudarjena potencialna moč učinka prehajanja deviznega tečaja na cene v Republiki Makedoniji. Opazen je namreč močan učinek sprememb nominalnega deviznega tečaja, ki se prek uvoznih cen odraža na domačih cenah, z drugimi besedami, depreciacija domače valute je v Republiki Makedoniji povzročila zvišanje cen. Že v prvem opazovanem mesecu se proizvodna cena odzove na spremembe nominalnega deviznega tečaja, kar kaže na močan učinek prehajanja sprememb deviznega tečaja prek uvoznih cen na domače cene. Po drugi strani pa depreciacija domače valute v Republiki Makedoniji ne kaže signifikantnega vpliva na realni BDP. Spremembe deviznega tečaja so sicer šibko vplivale na realni BDP, vendar je to trajalo le dva meseca, nato je učinek izginil. **Rezultati te empirične raziskave potrjujejo tretjo hipotezo: da je stabilnost deviznega tečaja za makroekonomsko stabilnost zelo pomembna, še posebej v primeru, ko je bila le-ta dosežena s precejšnjimi stroški**. **Spremembe deviznega tečaja v prvi vrsti vplivajo na oblikovanje ravni cen, kar gre pripisati močnemu učinku prehajanja sprememb nominalnega deviznega tečaja prek uvoznih cen na domače cene.** Ta rezultat je skladen z drugimi empiričnimi študijami, ki ugotavljajo, da se učinki mehanizma prenosa monetarne politike med razvitimi in majhnimi tranzicijskimi državami razlikujejo, na kar najverjetneje vpliva visoka dolarizacija domačega gospodarstva (zamenjava valute in premoženja) v tranzicijskih državah, kar posledično povzroči večji učinek prehajanja sprememb deviznega tečaja na cene. V nasprotju z zaključki McCarthyja (2000), ki se nanašajo na razvite države, moji zaključki potrjujejo večino dognanj, ki se nanašajo na države v tranziciji; Bonato in Billmeier (2002), Kuijs (2002), Lyziak (2001), Ganev idr. (2002), Mayes (2003) ter

Horváth in Maino (2006) prav tako ugotavljajo, da kanali deviznega tečaja v mehanizmu prenosa monetarne politike igrajo pomembnejšo vlogo kot denar in obrestna mera. V Republiki Makedoniji je močan vpliv prehajanja sprememb deviznega tečaja na cene tudi pričakovan, saj so značilnosti nacionalnega gospodarstva naslednje: majhno odprto gospodarstvo, višja dolarizacija (gl. poglavje o dolarizaciji v drugem poglavju) in večji uvozni delež (še posebej surovin).

Dolgoročni učinki monetarne politike in vrsta režima deviznega tečaja sta testirana z uporabo metodologije VECM. *Statistični test za preverjanje stacionarnosti* kaže, da hipoteza o stacionarnosti ne velja za nobeno od spremenljivk. Ta test je skladen s testom Dickey-Fuller, v katerem imajo vse časovne vrste enotni koren in niso stacionarne. *Rezultati analiz o šibki eksogenosti* kažejo, da so devizni tečaj, realni BDP in denarna masa šibke eksogene spremenljivke, kar pomeni, da nanje ne vpliva kointegracija dalj časa trajajočih odnosov med spremenljivkami, vendar pa nanje vplivajo krajši čas trajajoči odnosi. Zaradi te značilnosti denarne mase sklepam, da Narodna banka Republike Makedonije ne gradi svoje monetarne strategije na monetarnih pravilih, pač pa se monetarna politika prilagaja diskrecijsko določenim merilom. Kot zadnje, rezultat *testa izločanja spremenljivk* iz kointegracijskega vektorja kaže, da je izključen le realni BDP, medtem ko so devizni tečaj, proizvodna cena, maloprodajna cena in denarna masa v kointegracijski vektor vključene. Zato sklepam, da med deviznim tečajem, proizvodno ceno, maloprodajno ceno in denarno maso *obstaja samo ena dolgoročno stabilna linearna kombinacija*. Nadalje, proizvodna in maloprodajna cena se odzivata na dolgoročno ravnovesje med deviznim tečajem, proizvodnimi cenami, maloprodajnimi cenami in denarno maso, medtem ko se devizni tečaj in denarna masa na tovrstno ravnovesje zaradi svoje značilne šibke eksogenosti ne odzivata. Ta ugotovitev je skladna z dejstvom, da sta devizni tečaj in denarna masa v monetarni politiki Republike Makedonije določeni endogeno, pri čemer je devizni tečaj delno uravnavan z režimom deviznega tečaja. Zato VECM med deviznim tečajem, proizvodno ceno, maloprodajno ceno in denarno maso pokaže samo en dolgoročen kointegracijski vektor. V tem kontekstu ***koeficient EXCH.E (devizni tečaj evra) v Republiki Makedoniji kaže večji učinek prehajanja sprememb nominalnega deviznega tečaja na cene***. Iz tega sledi, da je v Republiki Makedoniji devizni tečaj tako kratkoročno kot dolgoročno gledano potencialen vir inflacije. Dolgoročno gledano ima direktni kanal sprememb deviznega tečaja močan vpliv na stopnjo inflacije, medtem ko indirektni kanal sprememb deviznega tečaja ne kaže nobenega vpliva na realni BDP. Ta rezultat je skladen z monetarno strategijo Narodne banke Makedonije – ciljanje deviznega tečaja zaradi močnega učinka prehajanja sprememb nominalnega deviznega tečaja na cene v Republiki Makedoniji. Iz rezultata je razvidno, da ima devizni tečaj ***dolgoročni koeficient 0,5212, kar nakazuje na to, da 52 odstotkov sprememb v EXCH.E vpliva na določanje ravni cen.*** Za primerjavo navajam rezultate drugih raziskav majhnih odprtih držav v tranziciji: Kuijs (2001) ugotavlja, da je dolgoročni koeficient prehajanja na Slovaškem 0,2, Bonato in Billmeier (2002) pa za Hrvaško navajata koeficient 0,33. Iz tega je razvidno, da ima Makedonija višji delež prehajanja kot druge države v tranzicij. Moj rezultat se približuje izsledkom Ganeva idr. (2002), da je za večino držav v tranziciji (npr. Latvija, Slovaška, Romunija, Bolgarija, Češka in Poljska) koeficient blizu 1,0. Vendar ni videti, da bi depreciacija na Madžarskem, v Sloveniji in Litvi pomembno vplivala na stopnjo inflacije. ***Če situacijo opazujemo dolgoročno, koeficient denarne mase kaže, da se bo enoodstotna sprememba v obsegu denarne mase odrazila v porastu 0,17 odstotka na ravni cen, kar je skladno z monetarističnim prepričanjem, da porast nominalne količine denarja povzroči porast cen oziroma inflacijo***. Rezultati kažejo, da je vpliv obsega denarne mase na maloprodajne cene statistično pomemben, kar potrjuje pomembno vlogo denarne mase kot vira inflacije v Republiki Makedoniji tako na kratek kot na dolgi rok.