SHOULD SERBIA ADOPT EURO BEFORE ENTERING EU?

By
Igor Madzarevic

Submitted to
Central European University
Department of Economics

In partial fulfillment of the requirements for the degree of Master of Arts

Supervisor: Professor Julius Horvath

Budapest, Hungary
2008

Acknowledgements

I would like to thank to my family and friends that provided me with support throughout all this time. Moreover, I am grateful to Professor Julius Horvath for helpful suggestions regarding this thesis. Also, I would like to thank to Professor Lajos Bokros for giving me suggestion about the topic of this thesis.

Abstract

This thesis analyzes if Serbia should early unilaterally adopt Euro as official currency before entering European Union. The research is done by looking at business cycles of countries that joined European Union at 2004, the ones that joined in 2007 with addition of Croatia and Serbia. Moreover, these countries' business cycles are compared to old European Union members'. The estimations are based on simple Vector Autoregressive model. The data covers periods from first quarter of 1997 until second quarter of 2007 for most of the countries. However, few countries cover somewhat shorter time period. Having in mind analysis throughout whole thesis work and applying it to the case of Serbia, the conclusion is reached that it would be beneficial if Serbia would adopt Euro before entering European Union.

Table of Contents

Introduction

There was a lot of discussion and huge amount of literature contributing to the topic about countries joining European Union (EU) and later Economic and Monetary Union (EMU). Among the ones that explore this issue are Buiter (2004), Filáček, Horváth and Skopera that discuss Maastricht convergence criteria. Frankel and Rose (1998), Horvath (2003) and Eichengreen (2008) lead the debate about Optimum Currency Area (OCA). Dabrowski and Rostowski (2000), Backé and Wójcik (2002) and Petkova (2007) argue on topic of euroization. Many advantages and disadvantages of both unilateral and multilateral Euro adoption have been discussed in these works, but not clear agreement was made. Mostly the decisions about which policy should each of the potential European Union accession countries follow differ from each other on specific features and their economic development. There is general opinion that, once countries achieve full EU membership, fulfill Maastricht criteria[1] -and become members of Economic and Monetary Union, there are numerous advantages for the overall economy of the country. However, to reaching this stage, as we could see from the experience of many countries, is very hard and painful process. Moreover, it is very lengthy process and there are many requirements that need to be fulfilled.

In this text I would like to analyze if early unilateral adoption of Euro in the near future would be advantageous for Serbia. As Serbia is one of the countries that see its future in European Union, the suggestions for unilateral euroization will be given, looking at recent EU members' experiences. Instability of domestic currency is connected with idea of euroization and that is one of the reasons for this particular research as citizens of Serbia lost their trust in national currency. This is not new approach if it is to be looked at suggestions for

[1] Maastricht criteria are criteria that all European Union member states should fulfill on their way towards adopting Euro as official currency and becoming the members of Economic and Monetary Union.

other countries' early unilateral adoption of Euro, as well as general analysis without referring to one particular country. However, there are very few suggestions as far as particularly Serbia's case is concerned. Ilirjani (2006) is among very few authors that touched upon the topic of unilateral Euro adoption by looking at examples of Former Yugoslav Republic of Macedonia, Albania and Serbia. This is why my contribution to this topic can be important as far as further research about Serbia's Euro adoption is considered.

It should be noted that the reliable data for the Balkan countries is very hard to obtain or it is available for very short period of time, so that is why theoretical approach cannot be completely backed up with econometric analysis. However, general trends could be seen and distinguished based on other countries and they serve as main support for the analysis in case of Serbia.

This paper is organized as follows. Chapter 1 gives a short overview of Serbia's currency background. Chapter 2 discusses Maastricht criteria and shows its bad and good sides. Chapter 3 shows different exchange rate regimes. In Chapter 4 gives an euroization debate. Optimum Currency Areas are discussed in next Chapter. Chapter 6 analyzes movement of business cycles by estimations of simple Vector Autoregressive Model mainly based on work of Horvath and Rátfai (2004) and Korhonen and Fidrmuc (2001). Finally, I will give conclusion on the whole topic.

Chapter 1: Serbia's currency background- short overview

It should be known that in the 1990's Serbia went through two wars and big economic and political crises. The hyperinflation in Serbia at 1994 was one of the biggest that ever happened to one county. It amounted to 10^{27} compared to 1990, which was consequence of civil war in Yugoslavia. Already in 1999 there was huge inflation rate which was 45.4% at the end of the year. This time it was consequence of NATO bombing. Furthermore, next year citizens of Serbia felt even more severe consequences as inflation amounted for 111.9% at the end of 2000. Even in the following years, the inflation was always the problem that citizens of Serbia had to cope with. The inflation rate was falling from year to year, until the end of 2003, when it amounted 7.8%. However, already next year it was 13.7% and even 17.7% at the end of 2005. In 2006 there was huge drop in inflation rate compared to the previous year, and it amounted for 6.6%. Again, at the end of 2007[2] inflation increased to 10.1% and there is tendency that it will increase even more until the end of this year, even though Serbia has unofficial inflation targeting regime. I will speak in more detailed way about exchange rate regime in Serbia further in the text. However, it is worth to mention that Serbia is having managed floating exchange rate regime. Even though the Central Bank announces that it will try to avoid intervening in the foreign exchange market, it does it very often. Sudden daily fluctuations of exchange rate are something that people can expect every day. Having in mind all of these facts, the consequence is that citizens of Serbia do not have too much confidence in the legal tender, Dinar. Even nowadays, in Serbia all large transactions are calculated in Euros and it is unofficial currency which is widely used. It is very common practice to

[2] Information about inflation rates was taken from Statistical Bulletin of National Bank of Serbia from 2008.

denominate Dinar transactions by using Euro as strong foreign currency. The proof for this can be seen in Dvorski, Scheiber and Stix (2007) based on results of OeNB[3] survey. OeNB survey was conducted in eleven countries in CESEE region[4] and it was about foreign currency holdings. The results of this survey show that 33% of respondents are holding foreign cash which is in case of Serbia mainly Euro. Furthermore, the median amount of Euro cash that respondents hold is 650 Euros in case of Serbia. Finally, 94% of foreign currency deposits are denominated in Euro. Instability of domestic currency is closely connected with idea of euroization/dollarization and that is one of the motivations for this research. Furthermore, Serbia is one of the countries that are going to join EU in the future as it already signed Stabilisation and Association Agreement with EU on March 2008. Thus, sooner or later it should adopt Euro as official currency. One more very important fact is that Serbia's trade is highly dependent on EU at the moment. It can be seen from Statistical Bulletin (2008) that out of 8.825 million of $ value of Serbia's exports 4.935 million $ was exported to EU. This is more than 55% of all exports. Moreover, out of these 55%, 38% is exported to oldest fifteen EU member states. When it is to be looked at imports, it can be seen that there is exactly the same reliance on imports from EU compared to exports. Namely, out of 18.554 million $ worth of imports, 10.221 million $ came from EU, which is again 55%. From these 55%, 37% are imported from oldest fifteen EU member states. Thus, it can be seen that Serbia has already well established trade with EU. By Euro adoption it would be even easiest to trade with EU and I am sure that trade would be even more intensified. The support for idea of euroization is found in analysis done by Nuti (2002), Petkova (2007) and Eichengreen (2008). However, the main support for unilateral euroization is found in Bratkowski and Rostowski (2002). The main conclusion of the paper is that EU would benefit from supporting unilateral

[3] OeNB means Oesterreichische Nationalbank (Austrian National Bank)

[4] CESEE means Central, Eastern and South Eastern Europe.

euroization by EU applicant countries. They claim that most of the arguments against unilateral euroization are actually misunderstanding between Euro adoption and participation in European Central Bank (ECB) decision making. EU should support unilateral euroization instead of opposing it since all countries that decide to unilaterally adopt euro need to convert almost all of their deposits into Euros, which increases demand for Euro. As far as Maastricht criteria are concerned, they would be anyways met by unilateral euroization countries, just the exchange rate criterion would be automatically met by having Euro as official currency. Thus, meeting the Maastricht criteria would be more realistic. Furthermore, the countries that are candidates for EU membership are mainly small economies, so their even negative impact on EMU can be at most small. As unilateral euroization would be just the step towards full membership in EMU it would not last for too long period of time, which implies that potentially huge asymmetric shock is very unlikely to happen. The contradictions between different Maastricht criteria are mentioned as one more reason for unilateral euroization. Unilateral euroization is better way for making countries more dedicated to stability compared to going through Maastricht criteria. It is argued that unilateral euroization is not the easier way for entering EMU. It is just better way of dealing with the criteria that are required before entering EMU, which on the other side can be better for the sake of stability of whole EMU. The issue euroization is very relevant to consider nowadays in the case of Serbia as it is the right moment for early unilateral adoption of Euro. Namely, Serbia is already in process of negotiations with EU, but it did not go too far with the negotiations that this possibility would be disapproved by European Central Bank. More detailed analysis about pros and cons of euroization will be discussed in Chapter 5.

Eichengreen (2008) concludes, while examining financial sector reforms, that there is mistrust in domestic currency in many transition economies. Furthermore, as a consequence, there are numerous maturity mismatches in these transition economies. The banks are unable

to rely on borrowing abroad in domestic currency. He argues that if there was sudden depreciation of domestic currency, which is very usual scenario, the borrowers would find themselves in very difficult situation. Because of this situation neither will borrowers borrow in domestic currency from abroad nor will foreign banks be very happy to lend knowing that there is high default risk involved. Furthermore, this situation spreads to the companies with long term projects which are unable to fund themselves with the long term loans. Finally, this creates the situation where banks are left with short term financial assets which create maturity mismatches. This can be clearly seen in the case of Serbia. The real danger with this scenario is that the situation prone to crisis comes as logical outcome. By having strong international currency replacing the weak domestic one the crisis can be avoided.

If we look at the case of Serbia and other countries in the region in a similar situation and knowing all of the above facts, it is very easy to conclude that adopting euro can solve some if not all of these problems. With the strong international currency replacing the weak domestic one, the currency risk is eliminated at once. The result of eliminating currency risk is that there is no risk in borrowing long term both abroad and domestically. Furthermore, the maturity mismatches would be eliminated and finally the stable financial market can come as a consequence of all of these.

In the following section I will show advantages and disadvantages of Maastricht criteria as it is closely related to further analysis and considerations of early unilateral adoption of Euro. As fulfillment of Maastricht criteria is prerequisite for each EU country for joining EMU, it is very important part of the analysis. I will show that there are numerous contradictions between Maastricht convergence criteria and that early unilateral adoption of Euro would make it easier to fulfill these criteria.

Chapter 2: Advantages and disadvantages of Maastricht criteria

I will start with the overview of Maastricht criteria and then show how these criteria influence my thinking about unilateral Euro adoption in Serbia. The European Central Bank report (2008) and more importantly Buiter (2004) mention the very well known Maastricht criteria which are obligatory for all new EU members in order to be able to adopt Euro and become members of EMU. There are five types of Maastricht criteria. The first type includes financial criteria which are first of all that the upper limit for government deficit to GDP ratio should be 3% and that government debt to annual GDP ratio should be at highest 60%. The second is interest rate criterion and it states that long term public debt interest rates must be within range of 2% of the three EU countries with lowest inflation rate average. Moreover, this criterion has to be fulfilled for a period of one year before the EMU process. Third criterion is inflation criterion which is similar to interest rate criterion. It states that yearly inflation rate should not exceed 1.5% over the average of three EU countries with the lowest inflation and all of that one year before EMU process. Next criterion is exchange rate criterion. It says that exchange rate should not exceed the 15% band around fixed euro parity for last two years before EMU process. The last among the Maastricht criteria is institutional criterion and it asks for Central Bank independence.

There have been many discussions about how realistic and efficient the Maastricht criteria really is and is there some alternative and more efficient way of creating another type of the criteria which would not contradict itself. Filáček, Horváth and Skopera (2006) are among many that criticize the Maastricht convergence criteria. They argue that there is trade off between inflation and exchange rate criteria. Fulfillment of all necessary criteria is very difficult and time consuming task for most of the new EU member countries. Moreover, it does not necessarily mean that Maastricht criteria comply with the monetary policies of the

new EU countries which means that there must be some changes in these countries' policies. It should be noted that even if country is complying with the criteria it does not automatically mean that it is the best option for the given country's economic performance. There is general opinion that it is almost impossible to comply with all of the criteria efficiently. That is why the main challenge for each Euro adopting country is actually to find the compromise between these different types of criteria.

It is interesting that, even though Sweden is one of EU countries that still did not adopt Euro, Heikensten (2003), the Governor of Swedish Central Bank, is discussing in his speech the benefits of European Monetary Union. By mentioning benefits of Euro area enlargement, he points out the problematic inflation criterion. He says that, the main advantage for the countries that are about to join EMU can come from their trade and capital markets integration with the rest of the EMU countries and consequently with the biggest economic powers in the World. Moreover, if both trade and capital markets are stimulated, the GDP growth is almost impossible to miss. Everybody would agree that once the country is in EMU, there are numerous benefits to its economy, otherwise it would not even consider entering the union. Thus, I would say that, in this matter Heikensten is completely right. However, he further emphasizes the risks that ERM II[5] carries with itself. He, like many other economists, states that two targets in form of pegged exchange rate and inflation are almost impossible to meet at the same time. Moreover, there is always possibility of attack against the currency when its exchange rate is close to its upper or lower band and it can be very dangerous for countries that need to comply with convergence criteria. The solution for the problem can be found in changing the inflation criterion. There is almost no risk that price stability will be damaged in the Euro area due to its large size and relatively small size of countries that are

[5] Exchange Rate Mechanism II. It is the mechanism that is part of convergence criteria towards EMU. Currencies of the countries that enter EMR II are required to keep the level of plus and minus 15% band around fixed Euro parity.

about to enter Euro area. This suggests that inflation should not be too strict criteria for the future EMU members. Thus, it should be either abandoned or changed by more realistic one.

Buiter (2004) argues that the decisions about Euro adoption should be made based on some different perspectives rather than on current convergence criteria. He states that first of all it is natural that each of the new EU members would like to adopt Euro as official currency as soon as it is possible. The main argument for that is integration into international financial markets which is achieved in easiest way by having Euro instead of domestic currency. The countries that are not financially integrated with the rest are exposed to many different risks and shocks. Furthermore, he argues that having inflation criteria fulfilled should not get too much emphasis even though it is important. The next point is that real sector convergence is not even necessary to be implemented before the adoption of Euro. Buiter's radical view is that the weaker the country's real sector is, the more emphasis should be put on early adoption of euro as it can solve the problems in much faster way. However, the most important suggestion is that the fiscal sustainability is the most necessary condition before Euro adoption and that as such should be sufficient condition for adopting euro as official currency. The last suggestion is that ERMII is not just contradictory by itself but it can be very dangerous process as it puts requirements on three different nominal targets which are almost impossible to fulfill. The most obvious conflict within convergence criteria is between exchange rate target and inflation target. The countries can get into major crisis trying to fulfill all of three targets and can end up with not complying with any of them.

These are just some of the perspectives against Maastricht convergence criteria. One can definitely make conclusion that it is very hard to fulfill all of the criteria. Thus, this was one among many motivations for me to start thinking about alternative policies for the countries with EU perspective. One of them is early unilateral adoption of Euro which would entirely avoid Maastricht criteria. With early Euro adoption, country can avoid contradictions

between different nominal targets. Petkova (2007) analyzes euroization prior to membership in EU. I will analyze euroization in more details later in the text. However, it is worth to mention here the opinion of European Central Bank about countries that decide to early unilaterally euroize. None of EU institutions, especially ECB, approves early Euro adoption by countries that are not part of European Union. They claim that early unilateral Euro adoption is inconsistent with Maastricht treaty because every country that wants to adopt Euro should go through some predetermined steps. Thus, there is some sequence of steps that each country needs to go through which comply with economic rationale of Maastricht treaty. Moreover, in case of early unilaterally adoption countries, the convergence criteria would need to be changed as they would already have Euro as official currency. Thus, EU institutions should think about the solution for this problem and come up with new criteria. Moreover, this becomes more important knowing the fact that Montenegro already has Euro as official currency and that it is also in negotiations with EU. Basically, in my opinion there should be just criteria that lead towards stabilization policies and integration of the business cycles with other EMU members. Clearly, as Serbia is the country with EU perspective and is already in negotiation process with EU, it can be one of the countries that would theoretically need to comply with criteria different from Maastricht ones.

The next section deals with different exchange rate regimes and their strengths and weaknesses for overall economic performance of the country as well as when integration to EMU is considered. It is very important part of overall analysis because the countries do not have the same exchange rate regimes and consequently they should have different policies in order to deal with different shocks to domestic economy.

Chapter 3: Exchange rate regimes

There are many pros and cons for each of the exchange rate regimes. I will mention the main differences between two extremes -fixed and flexible exchange rate regimes. Countries with flexible exchange rate regime usually have lower levels of inflation, which is analyzed by Calmuc (2007). However, this comes at expense of usually smaller economic growth. There is also another approach that compares different exchange rate regimes according to their potential to absorb the shocks. Mundell (1963) explores this view. He states that having floating exchange rate is usually better if there are real shocks to the domestic economy and fixed exchange rate regime is better if nominal shocks are the dominant in the domestic economy. However, most importantly, Rogoff, Husain, Mody, Brooks and Oomes (2003) summarize economic performance of fixed and flexible regimes. Thus, fixed exchange rate regime can improve monetary policy credibility and lower inflation in case there of prudent authorities. Furthermore, it can raise growth, trade, and investment and reduce transaction costs and interest rates. However, in case of real shocks volatility can increase and most importantly there is high risk of speculative attacks on domestic currency when there are volatile capital flows. With flexible exchange rate regime the importance of imported credibility becomes minor with strong domestic financial institutions in place. Flexible exchange rate is able to absorb shocks and increase growth, especially if there are real shocks to the economy. Furthermore, volatility of exchange rate can spill over into real activity and finally, there is low risk of banking and currency crisis with flexible exchange rate mechanism.

Fixed exchange rate regimes are often found in poorer countries. However, as countries develop economically, as well as institutionally, there is tendency of adopting more

flexible exchange rate regime. It should be kept in mind that emerging market economies[6] have strong ties with international capital markets, but also many weaknesses such as usually higher inflation, large unsustainable debts and weak banking systems. Keeping in mind that these and other sources of macroeconomic volatility are present in emerging market economies, it is more likely that these countries can benefit more from flexible exchange rate regime compared to the fixed one. As country becomes more integrated into international capital markets and develops more sound financial system, it can benefit more from flexible exchange rate regime. Crisis in the past were more often within countries that had fixed exchange rate regimes and had access to international capital markets. On the other hand, the choice of fixed exchange rate regime for the countries that have more limited access to international capital markets is more recommendable.

In their paper, Rogoff, Husain, Mody, Brooks and Oomes (2003) make the distinction between de jure and de facto exchange rate regimes. De jure classification is based on three main categories -pegged regimes, limited flexibility regimes and flexible regimes such as managed and freely floating ones. De jure classification has many drawbacks as in most cases exchange rate regimes differ from what they were officially announced to be. De facto classification by International Monetary Fund (IMF) combines information on exchange rate policy, monetary policy, formal as well as informal policy intentions of authorities and actual exchange rate and reserves movements. After looking at, all of these, the judgment about actual, de facto, exchange rate regime is reached. Very often stated exchange rate regime is different from the actual one. Moreover, as far as flexible exchange rate mechanisms are concerned, usually there is so called fear of floating which means that actual exchange rate flexibility is much less from announced one. Intermediate exchange rate regimes are most often observed in emerging markets. The tendency of increase in fixed exchange rate regimes

[6]I would include Serbia in this category.

can be observed only in the countries that are on their way towards entrance to EMU. However, generally, change of the exchange rate regime from one to another is very rare nowadays. This further implies that transitions form one to another exchange rate regime involve significant costs.

Serbia has managed floating exchange rate regime. At the moment this is the best strategy for Serbia as it can reduce the effects of potential sharp shocks to its economy. Moreover, as Serbia is opening up more towards EU, this can bring transmission of inflationary shocks. Furthermore, knowing the fact that Serbia is having unofficial inflation targeting regime, in such circumstances having fixed exchange rate regime cannot lead to goal of keeping low and stable inflation. However, the main threat with Serbia's managed floating regime can be that country is exposed to foreign exchange volatility risk knowing that it relies heavily on Euro. One of the most important facts for Serbia is that outcomes of flexible exchange rate regime are easily observable in form of inflation rate and exchange rate which are easily checked on a daily bases. So, through flexible exchange rate regime there is much less space for manipulation by the fiscal authorities. The main support for these ideas in case of different transition countries is stated in Obstfeld and Rogoff (1996).

It is often suggested that Currency Board Arrangement (CBA) is good exchange rate regime for the countries that are joining EU and later EMU. Lithuania, Estonia and Bulgaria as recent EU members had CBA at the time they entered EU. It is worth to consider CBA as possible policy for Serbia, before thinking about early unilateral euroization. Nuti (2000) and Enoch and Gulde (1998) discuss pros and cons of CBA. Currency Board Arrangement is type of fixed exchange rate regime where monetary authority stands ready to exchange any amount of domestic currency for foreign, anchor currency, at predetermined fixed exchange rate. CBA can be introduced as long– run policy only in the case that country has enough foreign exchange reserves to cover at least whole monetary base, M0. Thus, every domestic currency

in circulation has to be backed up by the same amount of foreign, anchor currency. Positive sides of CBA are that with this policy in place, the goal of low inflation can be easily kept. Moreover, changes in interest rates are lower, as well as transaction costs. Low transaction costs in turn make trade much easier. As I already mentioned, the main advantage of CBA and its specific features is that it is very good policy for countries that are about to join EU as it makes them easier to comply with Maastricht criteria, which brings them much closer to EMU. However, there are also numerous limitations regarding CBA. Obvious limitation of introducing CBA is for the countries that have very weak banking system and are easily offset by economic shocks. However, in normal circumstances, the country that introduces CBA losses the right on sovereign monetary policy. Moreover, Currency Board cannot act as lender of last resort to banks. Loss of seigniorage, as potential revenue from issuance of domestic currency, is price to be paid by having CBA. Furthermore, the risk of change in parity is present as complete credibility of anchor currency cannot be preserved without credible domestic government policies.

Country that considers Currency Board Arrangement needs to have enough foreign exchange reserves in order to back up whole domestic currency in circulation. As, in case of unilateral euroization the country also needs to have enough foreign exchange reserves, the choice between CBA and unilateral Euro adoption should be made based on facts different then amount of reserves. Thus, in my opinion, early unilateral euroization would bring more benefits to Serbia compared to CBA as after joining EU it would need sooner or later to change domestic currency to Euro.

It cannot be judged with certainty which exchange rate regime is better for countries that have perspective of joining EU and later EMU. Also, as far as CBA is concerned, for the countries that already have CBA it is easier to comply with Maastricht criteria. However, I do not think that in case of Serbia adopting Currency Board Arrangement would be wise decision

to make at this moment. This would require a lot of adjustments for very short time until CBA would work properly and after that, in very short time, again new adjustments for compliance with Maastricht criteria, supposing that Serbia is going to enter EU in the future. The experiences among different countries are quite mixed as far as choice of exchange rate regime is concerned. It all depends on country specific features which type of regime would work better for a given time. However, the fact is that most of the countries at the time of joining EU were unofficially targeting inflation and had managed floating exchange rate regime, which is the same policy that Serbia has at the moment.

The next section deals with issues of euroization. Advantages and disadvantages of euroization will be shown as well as different types of euroization. Euroization is important in my analysis as it is exactly what I am proposing as potential policy for Serbia in the future.

Chapter 4: Euroization

It was already mentioned in the first section that instability of domestic currency is closely related with idea of euroization/dollarization, which is explored in more details in Petkova (2007). This is exactly the case that can be applied to Serbia. It is easily noticeable that if we look at exchange rate regimes that different countries choose, there are many situations where the strongest currencies are used as anchor for domestic currency. Example is when we have fixed exchange rate regime as domestic currency is pegged to other, stronger foreign currency. The most common international currencies that countries choose to peg their domestic currency to are Dollar and Euro. From the point of view of European Central Bank, it would be good for EU to have as many countries to join euro zone and also to adopt Euro separately from EMU. The main benefit from ECB is that it can pick up seigniorage revenues that come from issuing Euro notes. Moreover, it should be kept in mind that there is potential for huge political benefits that ECB could get from increased influence in countries where Euro is used as official currency.

There is the clear distinction between different types of euroization. First type is unilateral euroization which is for the countries that are having no perspective of joining EU at the moment. This type has the same characteristics, but different perspectives as early unilateral euroization countries. The main difference between these two types is that latter type includes the countries that have perspective of joining EU in the future and are in process of negotiation just like new EU member countries. The characteristics of these two types are that these countries are not having any role in ECB decision making process, that there is no possibility of seigniorage made by Central Bank and that the financial system in the country is supervised by national authorities. Third type is multilateral euroization which is basically

EMU membership. It has same characteristics as previous two types except that Central Bank is official member of ECB council.

Advantages from considering early euroization can come from the fact that more Foreign Direct investments into the country could be expected and more pronounced trade as well as closer cooperation with the EU on the path towards EU membership. In my opinion, this is exactly what is needed for Serbia at this moment. However, there are risks associated with early unilaterally euroization, too. The first and main disadvantage mentioned in almost all articles connected to this topic, such as Nuti (2002), Eichengreen (2008) and Petkova (2007), is that adoption of Euro as official currency instead of the domestic one means automatically giving up domestic monetary policy. The main trouble here is if there are asymmetric shocks compared to EU appearing in the domestic economy. However, if domestic monetary policy has been known as performing very poorly, than giving it up and replacing it by much more prudent one can be seen as big advantage. There is one fact that has to be known and that is by joining EU and furthermore EMU, passing through some predetermined stages and fulfilling different requirements is much more approved by official EU institutions compared to early unilaterally euroization which EU institutions are not very glad to approve. However, in my opinion it is the time for ECB to change its views and to consider options of early unilateral euroization with more support. Petkova (2007) examines that potential disadvantage for country that unilaterally adopts Euro can be that there is no possibility of having direct influence on ECB. However, in my opinion this should not be the biggest concern for smaller countries and smaller economies in Europe because even if they are officially members of ECB council, they still do not have much influence on policies of ECB. The biggest power is in hands of few big EU powers, which are mainly deciding on ECB policies.

The advantages and disadvantages of euroization are analyzed by many other economists among who is Nuti (2002) who looks at a bit different perspective. He argues that euroizaion can bring many positive advantages. The main advantages are avoiding difficulties in international borrowing, having weak government institutions replaced by more prudent ones, avoidance of speculative attacks on domestic currency, low transaction costs, more stimulated trade and more investments flowing into the country. The main disadvantage of euroization is surely loss of seigniorage possibility. By giving away the possibility of seigniorage, the countries are giving up on additional funds that could be generated by issuance of domestic currency. The seigniorage is very important source of revenue for many small economies' Central Banks. However, here we come back again to the issue of weak governments which can overuse the possibility of seigniorage. So, it is arguable if loss of seigniorage is advantage or disadvantage for one country as it depends on how prudent government and Central banks really are. As far as seigniorage revenues are concerned, Serbia relies a lot on it. If 3 billion of Euros, which approximately circulate in Serbia, would be replaced by equivalent amount of dinar denominated cash, forgone seigniorage revenue would be 0.6% of GDP[7]. Nuti (2002) continues his analysis by mentioning that disadvantage of euroization is that from the time another currency is adopted, the country has to give up its monetary policy. This means that there can be problem if there are shocks to the domestic economy because there is not enough flexibility in policies to deal with different kinds of shocks.

Eichengreen (2008) argues that the timing of euroization is the crucial point for each country. The first prerequisite for successful euroization is that the banking system has to be strong, fiscal system strengthened and the public debt should be long term in order to avoid

[7] The information is gathered from Saker, Neil and Westphal, Andreas (2005): "Euroization in Serbia: Macroeconomic, Prudential and Policy Implications", International Monetary Fund, IMF Country Report No. 05/232

sudden crisis. Very important issue here is to synchronize business cycles with EU by possibly making interest rates similar to the ones in EU. Eichengreen (2008) looks at the evidences from other countries that decided to dollarize and euroize and looks at three different spheres that are to be taken into consideration before these policies come into place. First is the labor market reform. There are different approaches about is euroization going to speed up labor market reforms or on contrary slow them down. Again, the clear decision could not be made because of country specific features. However, author states that one fact is certain which is that euroization will put a pressure for labor market reforms to be completed, no matter if they are done before or after adopting the euro. The second suggestion is that financial sector should be strengthened before even thinking about the euroization. Third suggestion is that adopting euro can bring down domestic interest rates closer to the EU level which automatically reduces costs of debt-servicing. Eichengreen argues that having all of the above suggestions taken into consideration the euro adoption can make domestic economy very successful.

The issue of euroization cannot be discussed without mentioning the work of Dabrowski and Rostowski (2000) and Backé and Wójcik (2002). Thus, Dabrowski and Rostowski (2000) and Rostowski (1999)[8] gives many arguments in favor of unilateral adoption of Euro as official currency looking at Eastern European countries. He suggests that if countries would adopt Euro at that time, which was much before they entered EU, they would avoid appreciation bubble. He suggested that the countries that had enough of international reserves should have abolished domestic currency and adopted Euro as fast as they could. Moreover, by this, contradiction in Maastricht criteria could be avoided, especially inflation requirement. He also points out that unilateral Euro adoption would lead

[8] This is the interview that Jacek Rostowski gave for Financial Times where he summarizes his views about euroization.

towards expansion and not contraction that can happen by complying with convergence criteria. He concluded that it would have been better if these countries adopted Euro by comparing all of its advantages and disadvantages. At the moment this book was written, the author suggested early unilateral adoption of Euro for Poland. At that time Poland had 26 billion of dollars as foreign exchange reserves. Mainly because of this high amount of foreign exchange reserves Poland was able to consider unilateral Euro adoption. Serbia has 14.38[9] billion of Euros of foreign exchange reserves at the moment. I think that this amount of reserves is more than enough condition for Serbia to start thinking about early unilaterally Euro adoption. Nowadays, Serbia has opportunity to evaluate all the alternatives, by looking at examples of other countries that recently joined EU, learn from their mistakes and decide about which policy to pursue in the future. One of the solutions is surely unilateral euroization.

Backé and Wójcik (2002) are among the ones that criticize the work of Rostowski and suggest that it would be very costly for any country to unilaterally adopt Euro. First argument against this policy is that it contradicts EMU economic reasoning. It is said that rapid unilateral euroization would open its door to huge number of structural problems. They further argue that benefits from unilateral adoption are insignificant and that potential risks can be huge. Throughout the paper they try to give convincing argument that full monetary integration by complying with convergence criteria must be positive after few years if prudent economic policies are to be kept. It is concluded that unilateral euroization would most likely be very harmful for EU accession countries due to their uncertainty.

Overall, the conclusion if euroization is good or bad differs from country to country. All costs and benefits should be weighted against each other and only than the decision is to

[9] The data was taken from Statistical Bulletin (2008), National Bank of Serbia

be made. In my opinion, looking at the case of Serbia, having all of the above analysis in mind is that euroization would bring more advantages than disadvantages.

The last section before exploring data and making estimations with the econometric model is the one that deals with Optimum Currency Area. The analysis about Optimum Currency Area date back to 1961 when Mundell started to think what would happen to the countries that would have the same currency. This analysis is important here knowing the fact that EMU is also considered as Optimum Currency Area.

Chapter 5: Optimum Currency Area

The first one to start discussion about Optimum Currency Area (OCA) was Mundell (1961). His main contribution to OCA theory was connected to choice of exchange rates based on factor mobility. After his work there were many contributions connected to this topic. Among the best recent analysis is the one done by Frankel and Rose (1998). They argue that countries with closer links in trade have more correlated business cycles. Moreover, the countries with very close trade ties would surely benefit from having Euro as the same currency. However, the biggest possible restriction of having Euro is giving up monetary policy which is crucial in being stabilizing tool acting against business cycle fluctuations and asymmetric shocks. According to them it is much easier for countries that have symmetric shocks with EMU to adopt Euro. That is why correlation among business cycle shocks is important when analyzing EMU and countries going towards it. Countries that once become the members of the same currency union are more likely to have their business cycles change towards majority of the countries that are already in the currency union. The greater are the linkages between the countries, the greater are similarities between business cycles and there are more reasons for having the same official currency. Independent monetary policy matters the most for the countries that have their business cycles not too much correlated with the other countries business cycles. Case of Serbia is that its monetary policy depends on other countries as Euro is heavily used in domestic economy. However, like always, benefits and costs of having independent monetary policy should be analyzed before deciding about adopting Euro in any country' s case. Frankel and Rose (1998) reached the conclusion that the effect of trade integration on correlation of business cycles between the countries is ambiguous. Closer trade can bring trade specialization in different countries and can lead to asymmetric business cycles affecting these countries. On the other side, closer trade

integration can bring business cycles closer and moving with each other. It again differs from country to country.

Horvath (2003) reviews the Optimum Currency Area[10] literature in a detailed way. According to the author, OCA theory is applicable in three main areas –the choice of exchange rate regime in one country, role of exchange rate adjustment as far as balance of payment disequilibria is concerned and monetary integration especially for EMU. OCA theory suggests that choice of exchange rate regime depends on many factors such as the degree of openness of economy, degree of product diversification, policy tradeoffs and political factors. Thus, it is suggested that small and open economies would have more benefits from joining large currency areas and have fixed exchange rate and well diversified economies would find it most beneficial to have fixed exchange rates. The strong argument is given if favor that long term political willingness of entering monetary union is actually the most important factor when speaking about Optimum Currency Areas. As long as choice of optimal exchange rate regime in OCA theory is concerned, there are three approaches –which regime is the most appropriate for different shocks to the economy, which one best suits stabilization plans of a country and new approach that is based on general –equilibrium models. However, it is concluded that there is no particular guidance for choice of exchange rate regime because it differs from country to country. Naturally, the incentives for one country or region to join currency union differ from the incentives of countries that are already in monetary union to admit that particular country or region into the union. However, the main benefits for being part of one currency union increase with countries' correlation of real shocks, variability of monetary shocks, level of adjustment of fiscal policy and labor, differences in inflation bias between entrant country and currency union and amount of losses

[10] In OCA, Currency Area is defined as area that has common currency or the area where there are fixed exchange rates. However, there are many different views what is defined by Optimal or Optimum in OCA.

that are eliminated by having common currency. The most important in this work, however, is how OCA theory relates to European transition countries and symmetry of shocks that are affecting these countries on their way towards EMU. It is concluded that there are differences in shocks between old EU members and transition countries. However, countries with close trade ties are usually having more correlated business cycles. Moreover, country that joins currency union has more correlated business cycles over time with old currency union members because of common monetary policy and even closer trade. Thus, there is evidence that adjustment processes are going towards euro area and are getting even more similar with time.

Obstfeld and Rogoff (1996) shortly summarize the costs and benefits of common currency. The benefits of having common currency are reduced transaction costs, reduced accounting costs, protection form monetary shocks that can lead towards fluctuation of exchange rate, less pressure from politicians for trade protectionism as it would result in sudden movement in exchange rate. They state that costs of common currency are that monetary policy cannot respond to macroeconomic disturbances, there is no option of using inflation for reducing public debt, that the decision how to split seigniorage revenues should be made by countries and that there can be speculative attacks on domestic currency in transition process towards new currency.

Eichengreen (2008) states that the most important is that there should be harmonization of macroeconomic conditions prior to Euro adoption in order not to have mismatched business cycles among the countries. This is the main reason behind having Maastricht criteria to be fulfilled before joining EMU. He argues that adopting Euro would surely eliminate the asymmetric monetary shocks. Furthermore, it would improve the fiscal position and encourage trade and investment which has to lead towards even more similar business cycle movements between the countries that are having euro as the official currency.

Since movement in business cycles is important in analysis of EMU as Optimum Currency Area and early unilateral euroization that has as a final goal being the member of euro area, the business cycles are analyzed in more detailed way in following chapters.

Chapter 6: Business cycles analysis

Data and methodology

In this part the distinction should be made between the old EU member states that are in EMU and Sweden, UK and Denmark that are not part of EMU, I will refer to these countries as "leaders"[11] further in the text. The next group of countries are the ones that joined EU in 2004 and 2007 but are still not part of EMU, with an exception of Slovenia, which I will refer to as "entrants"[12]. Furthermore, there are two additional countries, Croatia and Serbia that are still not part of EU, but have perspective to become its members in the near future. Finally, there is one additional group of data which does not refer to particular country, but for EU as group. The data used for this analysis is GDP growth and GDP deflator having 2000 as a base year for most of the countries. The base year for France is 1995 and for Serbia is 2000 in case of GDP and 2002 for GDP deflator. All data was taken from International Financial Statistics (IFS) with the exception of Serbia in whose case the data had to be obtained directly from Republic of Serbia- Republic Statistical Office, Statistical Bulletin (2004), Statistical Bulletin (2006) and Statistical Bulletin (2008). The data that I will use in analysis from now on covers the period from first quarter of 1997 until second quarter of 2007. This time period is available for all of the countries with the exception of Hungary, Bulgaria, Romania and Serbia. Data for Hungary cover period between first quarter of 1997 until second quarter of 2006. The data for Romania starts at first quarter of 1998, for Bulgaria just at first quarter of 2002. However, both of these countries have data available until second

[11] I call them leaders because they are the big, leading economies in EU and they serve as the benchmark for the countries that recently entered EU

[12] I call them entrants as they are the countries that recently entered EU

quarter of 2007. Again, even in this matter, Serbia is the special case. For Serbia, the data for GDP is available from first quarter of 2001 and for GDP deflator from first quarter of 2002. Finally, the data for EU as a group of countries is available from first quarter of 1998.

As Horvath and Ratfai (2004), I will first look at means and standard deviations of output growth represented by GDP volume, and inflation growth represented by GDP deflator. Furthermore, I will analyze the data in its row form by looking at correlation between the countries. It will be just from the next section that I will describe the correlation of business cycles between the countries, based on output and inflation, in order to draw conclusion if it would be advantageous for Serbia to adopt Euro or not and to see the difference between EMU members and the rest of the countries in how their business cycles relate to each other.

Table 1
Means and standard deviations for GDP growth and GDP deflator

	GDP deflator		GDP growth	
	Mean	**Standard Dev.**	**Mean**	**Standard Dev.**
Cyprus	0.008	0.013	0.010	0.054
Czech R.	0.010	0.015	0.009	0.046
Estonia	0.017	0.034	0.019	0.064
Hungary	0.020	0.044	0.013	0.052
Latvia	0.018	0.076	0.019	0.029
Lithuania	0.011	0.053	0.019	0.093
Malta	0.007	0.022	0.009	0.066
Poland	0.013	0.016	0.012	0.088
Slovakia	0.012	0.027	0.014	0.049
Slovenia	0.014	0.019	0.011	0.034
Bulgaria	0.013	0.019	0.024	0.152
Romania	0.048	0.092	0.027	0.312
Croatia	0.012	0.038	0.010	0.070
Serbia[13]	-0.046	0.246	0.019	0.102
Germany	0.002	0.003	0.004	0.005
Austria	0.003	0.019	0.006	0.045
France	0.004	0.004	0.005	0.005
Italy	0.006	0.005	0.003	0.005
UK	0.006	0.004	0.007	0.002
Sweden	0.004	0.033	0.008	0.092
Denmark	0.005	0.007	0.006	0.044
EU	0.006	0.005	0.006	0.005

Note: All variables are in first log differences. All coefficients are rounded on three decimal places. The data is not adjusted for the seasonality. Time periods: Cyprus, Czech R., Estonia, Latvia, Lithuania, Malta, Slovakia, Slovenia, Croatia(GDP growth), Germany, France, Sweden: 96Q1 -07Q4; UK, Italy: 96Q1 -07Q3; Poland, Denmark: 96Q1 -07Q2; Austria: 96Q1 -07Q1; Hungary: 96Q1 -06Q3; Croatia(GDP deflator): 97Q1 -07Q4, EU: 98Q1 -07Q4; Romania 98Q1 -07Q3; Serbia(GDP growth): 01Q1 -07Q4; Serbia(GDP deflator): 02Q1 -07Q4; Bulgaria: 02Q1 -07Q4.

Table 1 shows means and standard deviations, for both output and inflation measured by GDP growth and GDP deflator, respectively. By looking at Germany, France, Italy and EU as whole it is very obvious that there is very small fluctuation of output and inflation and means are very small, too. This information is very interesting if we know that these are the old EU members and the countries that are members of EMU. UK is somewhat similar to these countries even though it is not member of EMU. However, in case of Sweden it can be

[13] Serbian coefficient for mean of GDP deflator is negative because the inflation level was too high in first years of data availability, namely 2002 and 2003, and in other years it stabilized on much lower levels

noticed that fluctuation of inflation and especially output is much higher even compared to the new EU members. High output fluctuation can be noticed in the case of Denmark, too. This information is important as it is already known that Sweden and Denmark are old EU members but they are not part of EMU. However, in the case of new EU member states it can be seen that the fluctuations of inflation and output are much larger compared to members of EMU, excluding Slovenia which is by the way the country with lowest output fluctuation and among lowest as inflation fluctuation is observed, compared to other countries that joined EU at 2004. Two countries that are EU members from 2007, namely Romania and Bulgaria, have huge output fluctuation. This is especially pronounced in case of Romania whose standard deviation for output is 0.312. Moreover, Romania has also very high inflation fluctuation. Bulgarian inflation can be said that is quite stable and this is to be expected knowing the fact that it has Currency Board Arrangement which is characterized with low levels of inflation. Interesting fact is that Croatia has lower means and fluctuations of output and inflation compared to some of EU members. Case of Serbia is special if inflation is to be observed, as in 2002 and 2003 there were still very high levels of inflation as a consequence of the past. However, Serbia's fluctuation of output is lower compared to both Bulgaria and Romania that are EU member states.

The overall conclusion that can be drawn from Table 1 is that entrants grow on higher extent compared to the leaders. The same fact that is seen in case of entrants applies to Croatia and Serbia, too. Moreover, it can be noticed that Bulgaria and Romania, as more recent EU members, grow much faster than any other country in analysis. As far as fluctuations of output and inflation are observed, it seems that it is very easy to see clear trend if it is to be looked at the time when these countries joined EU. More recent EU members have higher fluctuations compared to older EU members. The high standard deviation for both inflation and output in case of Serbia is mainly due to the its problem with data as years

following the war have unusual coefficients compared with years of more or less stable economic situation. This fact makes it very difficult to draw very reliable conclusions for Serbia by looking at means and standard deviations.

From now on I will use seasonally adjusted data. The seasonally adjusted GDP growth and GDP deflator for each country separately are obtained from Eviews econometric program by using multiplicative moving average method of seasonal adjustment. This procedure guarantees that data are adjusted for seasonality. The graphs of GDP deflator and GDP growth for each country before and after adjusting for seasonality can be found in Appendix.

Table 2
Correlations of output growth

	Ger	**Aus**	**Fra**	**Ita**	**UK**	**Swe**	**Den**	**EU**
Cyprus	0.024	-0.050	0.086	0.014	0.160	-0.441	-0.056	0.306
Czech R.	0.016	-0.052	-0.120	-0.088	-0.088	0.083	-0.090	-0.054
Estonia	0.179	-0.122	-0.040	0.224	0.034	0.475	0.056	0.216
Hungary	0.062	0.329	0.185	0.405	0.349	0.012	0.285	0.492
Latvia	0.242	0.109	0.074	0.252	-0.174	0.064	0.030	0.237
Lithuania	-0.097	0.257	0.077	0.079	0.150	0.046	-0.275	0.111
Malta	0.234	0.170	0.475	0.289	0.002	0.261	-0.132	-0.000
Poland	0.085	-0.244	0.083	0.176	0.099	-0.172	0.107	-0.033
Slovakia	0.238	-0.043	-0.124	-0.079	0.054	-0.211	-0.015	0.135
Slovenia	0.164	0.082	0.109	0.197	-0.021	0.364	0.346	0.192
Bulgaria	0.038	0.251	0.056	-0.130	0.143	-0.234	0.087	-0.114
Romania	-0.324	0.039	-0.238	-0.038	0.084	0.299	-0.167	-0.029
Croatia	-0.070	-0.028	0.060	0.254	0.040	0.644	-0.069	0.047
Serbia	0.054	0.499	0.146	0.170	0.061	0.260	0.211	0.175

Note: All variables are measured in log differences. All coefficients are rounded on three decimal places. The data is adjusted for the seasonality. Hungary, Romania, Bulgaria and Serbia have fewer observations compared to other countries.

Correlations of output growth between the countries are shown in Table 2. From the left side there are entrants, plus Croatia and Serbia as non EU countries. It is noticeable that these countries in most cases have positive correlations of output growth with leaders and most of the coefficients that measure this are high. However, the exceptions are Czech Republic and Slovakia that have only two positive correlations of output growth with leaders,

and moreover they are not highly significant. On the other hand, Hungary does not have even one negative correlation with leaders. Furthermore, it is highly correlated with almost all of them. Very similar is the case of Serbia's output growth correlation. In case of Germany, three out of fourteen countries have no correlation with it, six of them have very weak correlation and five countries have somewhat higher correlations of output. The situation is more or less similar looking at correlation of output growths of rest of the leaders. It is noticeable that in case of UK, just Cyprus, Hungary and Lithuania are more significantly correlated with it. Most of the countries' output growths are correlated with Italy and EU as a group.

From Table 2 it can be seen that Serbia is not in disadvantage compared to recent EU entrants as far as movement in output growth is observed. Moreover, at the moment, its output growth is more highly correlated with the leaders than it is the case with most of other entrants' output growth. This means that, by looking at correlation of output growths with leaders, Serbia would not be more severely damaged with adoption of Euro as official currency compared with entrants. Furthermore, it can even have advantage over them.

Table 3 presents correlations of inflation among leaders and entrants, with Croatia and Serbia as additional countries. Almost all of the entrants have different trends of inflation movements compared to Germany and Austria. If it is to be looked at Sweden, there is either negative correlation of inflation with entrants or highly positive correlation that can be observed in case of Hungary, Lithuania and Romania. Half of countries are highly correlated with EU and half are not. As far as correlation of entrants with other leader countries is concerned, the situation is quite mixed.

If it is to be looked at Serbia's correlation of inflation with leaders, it seems that it is not in disadvantage compared to entrants. Its movement of inflation is very similar to any other entrant observed in Table 3. Thus, once again Serbia is not in disadvantage compared to recent EU members, which implies that Euro adoption could be considered in this case.

Table 3
Correlations of inflation

	Ger	**Aus**	**Fra**	**Ita**	**UK**	**Swe**	**Den**	**EU**
Cyprus	-0.075	0.177	-0.013	-0.235	0.021	-0.186	0.087	0.157
Czech R.	0.052	-0.129	0.090	-0.019	0.111	-0.130	-0.014	0.395
Estonia	-0.170	-0.229	0.001	0.072	0.225	0.294	-0.121	0.030
Hungary	-0.108	-0.315	0.067	0.234	-0.087	0.477	0.054	-0.334
Latvia	-0.219	-0.124	0.030	-0.125	0.092	0.051	0.139	-0.274
Lithuania	-0.086	-0.212	0.147	0.090	0.285	0.525	0.199	-0.142
Malta	-0.164	0.046	0.039	0.020	-0.328	-0.116	0.184	-0.204
Poland	-0.167	-0.212	0.065	0.015	-0.175	-0.205	-0.173	0.229
Slovakia	-0.273	-0.259	-0.012	0.194	0.109	-0.107	-0.008	0.198
Slovenia	-0.195	0.084	-0.215	-0.016	-0.041	-0.147	0.054	-0.043
Bulgaria	-0.186	-0.260	0.103	-0.042	-0.543	0.034	0.062	0.276
Romania	-0.209	-0.180	-0.362	0.165	0.029	0.520	0.038	-0.303
Croatia	-0.066	0.059	0.299	-0.176	-0.097	-0.092	0.000	-0.061
Serbia	0.046	-0.026	-0.253	0.097	-0.085	-0.023	0.357	0.311

Note: All variables are in first log differences. All coefficients are rounded on three decimal places. The data is adjusted for the seasonality. Hungary, Romania, Bulgaria and Serbia have fewer observations compared to other countries

Table 4

Correlations of output growth and inflation among new EU members with addition of Croatia and Serbia

	Cyprus	**Czech R..**	**Estonia**	**Latvia**	**Lithuania**	**Malta**	**Poland**	**Slovakia**	**Slovenia**	**Hungary**	**Romania**	**Bulgaria**	**Croatia**	**Serbia**
Cyprus	1	-0.074	-0.112	-0.011	-0.243	-0.219	0.040	0.251	-0.248	0.345	-0.349	-0.151	-0.264	-0.178
Czech R.	0.259	1	-0.086	-0.139	0.243	-0.086	0.051	0.221	-0.023	-0.112	0.211	0.263	0.126	0.234
Estonia	0.326	0.220	1	0.384	-0.054	0.073	-0.126	-0.037	0.146	0.025	-0.067	-0.517	0.547	-0.063
Latvia	-0.162	-0.185	0.059	1	0.125	0.283	-0.073	0.272	0.211	0.206	-0.375	-0.327	-0.060	0.120
Lithuania	-0.255	0.061	0.182	0.389	1	0.116	-0.060	0.278	0.039	0.044	0.184	0.388	-0.018	0.323
Malta	-0.178	-0.237	-0.220	0.235	0.104	1	-0.214	0.092	0.205	-0.096	-0.322	0.136	0.289	-0.107
Poland	-0.100	0.307	-0.012	0.040	0.064	0.100	1	-0.084	0.061	-0.093	0.362	-0.492	-0.022	-0.031
Slovakia	0.383	0.241	0.399	-0.112	-0.021	-0.041	0.121	1	-0.078	0.030	-0.123	0.078	-0.192	0.136
Slovenia	0.145	0.197	-0.135	-0.191	-0.166	-0.056	-0.012	0.010	1	0.181	0.030	-0.291	0.193	0.227
Hungary	-0.472	0.011	-0.128	0.165	0.601	0.231	0.360	-0.069	-0.024	1	-0.059	0.424	-0.023	0.481
Romania	-0.178	-0.120	0.140	0.338	0.287	0.310	-0.072	0.179	-0.067	0.375	1	0.044	0.379	0.170
Bulgaria	-0.101	0.064	0.234	0.339	0.072	0.139	0.308	-0.264	-0.002	-0.197	0.011	1	-0.045	0.133
Croatia	-0.078	-0.117	-0.147	-0.100	-0.100	-0.287	-0.007	-0.275	0.203	-0.023	-0.438	-0.078	1	0.171
Serbia	0.284	-0.087	0.134	0.153	0.232	0.077	0.264	-0.010	-0.178	-0.162	-0.031	0.168	-0.105	1

Note: The lower triangle shows correlations of inflation and upper triangle shows correlations of output growth. All variables are in first log differences. All coefficients are rounded on three decimal places. Hungary, Romania, Bulgaria and Serbia have fewer observations compared to other countries.

Upper triangle of Table 4 reports correlation of output growth between new EU countries plus Croatia and Serbia, while lower triangle reports correlation in inflation between the same countries. It can be noticed that coefficients are mostly large in both negative and positive correlations. Looking at output growth correlation between the countries, the clear trend cannot be distinguished. Some of them have more positive and some more negative correlations. However, it is important to mention that Cyprus, Poland and Estonia output growths are mostly uncorrelated with other countries. On the other hand, output growths of Lithuania, Slovenia, Hungary, Slovakia and Serbia have mostly positive correlations. As far as inflation correlation is concerned, again some clear trend cannot be recognized. Exception is Croatia with only one positive correlation of inflation which it has with Slovenia. Furthermore, Slovenia and Cyprus are the ones that are mostly uncorrelated with other countries. However, Lithuania, Czech Republic, Estonia, Latvia, Poland and Bulgaria have mainly positive correlations of inflation with the rest. Generally, Serbia is not different from the other countries as far as correlations of inflation and output growth from Table 4 were observed.

If one would look at the Serbia's coefficients from Table 2, Table 3 and Table 4 it could be concluded that they are generally not different from the majority of EU countries. This is very important fact if it is to be looked at feasibility of early euro adoption in Serbia. That is why, by looking at the data in its pure form, it can be concluded that Serbia's inflation and output growth follow the similar pattern as majority of recent EU members. Moreover, inflation and output growth of recent EU members move closer towards old EU member states.

So far analysis included the data in its pure form. Correlations of inflation and output growth between entrants, with addition of Croatia and Serbia, among themselves were discussed. Furthermore, correlations of inflation and output growth were observed between

these countries and leaders. The following chapter deals with the same data, but in this case estimated by the econometric model in order to draw conclusion about movements in business cycles between the same countries that were analyzed so far.

Vector Autoregressive model

Theoretical background

Vector Autoregressive (VAR) model is usually used to forecast systems of interrelated time series[14] and in analysis of dynamic impacts of random disturbances on system of variables. VAR model treats every endogenous variable in the particular system as function of that system's lagged endogenous variables. The fact that all variables are endogenous and that all of them are lagged, which means that they are predetermined, makes VAR very useful econometric model. VAR is superior compared to structural equation systems in forecasting and analyzing macroeconomic activity and observing the impacts of policy changes and external shocks to domestic economy. That is why VAR model is used in this analysis. Furthermore, VAR is simple model as each equation has the same number of regressors and each equation is estimated separately by Ordinary Least Squares (OLS). OLS gives consistent estimates because lagged values are the only ones that appear on the right hand side of the equation.

[14] Time series is single occurrence of random effect.

In the business cycle analysis I am using two –by –two Vector Autoregressive (VAR) model with Cholesky decomposition. Two variables used in this analysis are GDP growth and GDP deflator which are in first log differences and seasonally adjusted. The series is stationary, I(O), which means that variances, covariances and autocovariances of series do not depend on time. First of all, before doing any estimation, the number of lags in Vector Autoregressive model is determined. For estimating optimal number of lags the Sims likelihood ratio test can be used. However, in most analysis of this type, usually the optimal length of lags is two. That is why lag length two is used in all VAR model estimations in my further analysis. Furthermore, tests for unit root are conducted. The null hypothesis that there is unit root cannot be rejected at usual significance levels for GDP growth and GDP deflator, with exception of Poland's GDP deflator. The results of unit root test can be seen in Table 5 that can be found in Appendix.

I am using simple VAR model in analysis of correlation of business cycles. Horvath and Rátfai (2004) and Korhonen and Fidrmuc (2001) are among the ones that use short- run or long- run structural VAR models in order to see correlation of supply and demand shocks that are affecting one country. After estimating two –by two VAR model with Cholesky decomposition -with seasonally adjusted first log differenced GDP growth and GDP deflator, two lags, I(O)- the residuals of the given VAR estimates are taken. Residual for each country is correlated with another country's residual. The correlation of these residuals across the countries gives the coefficients that are shown in the tables below. In this way the coefficients that show how much correlation of business cycles between the countries is obtained. Based on these coefficients it is possible to draw conclusions about movement of business cycles between leaders and entrants, with addition of Serbia and Croatia, and furthermore between entrans by themselves. I use simple VAR instead of short- run and long- run structural VAR models because I assume that GDP growth and GDP deflator carry information about supply

and demand shocks by themselves. I believe that it cannot be surely said that shocks are either long- run or short- run. Moreover, this model best suites the analysis of correlated time series as well as random disturbances effect. Correlations of business cycles among recent and old EU members with addition of Serbia and Croatia are investigated by estimating simple VAR model. Theoretical representation of VAR model is based on EViews User Guide 4.0 notation and Greene (2002). This representation can be shown in the best manner by the following equation:

$$y_t = A_1 y_{t-1} + A_2 y_{t-2} + \ldots + A_n y_{t-n} + Bx_t + \varepsilon_t$$

Where y_t represents vector of endogenous variables and x_t represents vector of endogenous variables. A_1, A_2, …, A_n and B are the matrices of the coefficients that are about to be estimated. Finally, ε_t is vector of shocks uncorrelated with their lagged values, as well as with all variables that appear on the right- hand side.

Applying it to the analysis that is used in this text it would look like this:

$$GDP_t = a_{11}GDP_{t-1} + a_{12}DEF_{t-1} + b_{11}GDP_{t-2} + b_{12}DEF_{t-2} + c_1 + \varepsilon_{1t}$$

$$DEF_t = a_{21}GDP_{t-1} + a_{22}DEF_{t-1} + b_{21}GDP_{t-2} + b_{22}DEF_{t-2} + c_2 + \varepsilon_{2t}$$

In these two equations GDP represents GDP growth, and DEF represents GDP deflator. Both of these variables are endogenous. The only exogenous variable in these equations is c, which represents constant.

VAR model estimation results

Table 6 shows correlation between residuals of first log differenced GDP deflator parameters estimated by simple Vector Autoregressive model. The correlation is measured between the same countries that appeared in Table 2 and Table3 with exclusion of Poland due to the non-stationary nature of its inflation parameter. If it is to be looked at Table 6, one can notice that there is mostly asymmetry in business cycles between entrants, with addition of Croatia and Serbia, and leaders. All of countries from the left side of the Table 6 are uncorrelated with Germany, except Czech Republic and Serbia. It is interesting that Estonia, Lithuania and Romania have very high correlation coefficients with Sweden. One more high correlation coefficient can be observed between Serbia and Denmark. However, general trend in business cycles looking at inflation residuals can be distinguished, which is that most of the countries are uncorrelated with leaders. The same pattern can be seen in case of Serbia, which proves the point that its business cycles, as far as inflation residuals are observed, are not much different from the new entrants'.

Table 6
Correlation of business cycles, looking at VAR model estimation of GDP deflator

	Germany	**Austria**	**France**	**Italy**	**UK**	**Sweden**	**Denmark**	**EU**
Cyprus	-0.035	0.184	-0.050	-0.196	-0.065	0.052	0.111	-0.014
Czech R.	0.044	-0.096	0.069	-0.023	0.091	0.114	0.127	0.196
Estonia	-0.047	-0.229	0.070	-0.002	0.128	0.419	-0.185	0.083
Hungary	-0.153	-0.423	0.126	0.240	-0.063	0.223	-0.022	-0.300
Latvia	-0.313	-0.171	0.011	-0.141	0.110	-0.002	0.250	0.188
Lithuania	-0.147	-0.204	0.190	0.004	0.257	0.437	0.223	-0.026
Malta	-0.250	0.003	0.103	-0.009	-0.372	-0.073	0.179	-0.186
Slovakia	-0.208	-0.288	-0.023	0.152	-0.216	-0.127	0.116	-0.022
Slovenia	-0.152	0.069	-0.301	-0.009	-0.020	-0.086	-0.016	-0.219
Romania	-0.250	-0.268	-0.290	0.111	-0.057	0.453	0.078	-0.127
Croatia	-0.068	0.068	0.337	-0.079	-0.015	-0.046	-0.012	-0.167
Bulgaria	-0.045	-0.122	0.245	-0.060	-0.462	0.013	0.275	0.242
Serbia	0.310	0.210	-0.220	-0.032	-0.249	-0.096	0.522	0.166

Note: All variables are in first log differences. All coefficients are rounded on three decimal places. The data is adjusted for the seasonality. Hungary, Romania, Bulgaria and Serbia have fewer observations compared to other countries. The table does not include Poland due to the unit root test results.

Table 7
Correlation of business cycles, looking at VAR model estimation of GDP growth

	Germany	**Austria**	**France**	**Italy**	**UK**	**Sweden**	**Denmark**	**EU**
Cyprus	0.061	0.016	0.030	-0.017	0.143	-0.355	0.005	0.265
Czech R.	-0.080	0.026	-0.097	-0.067	-0.020	0.005	-0.132	-0.136
Estonia	0.282	-0.093	-0.059	0.150	0.034	0.525	0.095	0.341
Hungary	0.302	0.454	0.113	0.284	0.338	-0.070	0.484	0.495
Latvia	0.259	0.100	0.082	0.254	-0.193	0.015	0.249	0.216
Lithuania	-0.136	0.201	-0.074	-0.126	0.216	-0.071	-0.208	0.094
Malta	0.287	0.241	0.368	0.240	0.009	0.178	0.063	0.032
Poland	0.172	-0.020	0.158	0.346	0.342	0.016	0.145	0.092
Slovakia	0.105	-0.050	-0.179	-0.188	0.076	-0.241	-0.036	0.045
Slovenia	0.185	0.242	0.162	0.116	0.040	0.364	0.337	0.213
Romania	-0.275	-0.022	-0.273	-0.164	-0.091	0.120	-0.206	0.029
Croatia	0.023	0.005	-0.084	0.137	-0.015	0.520	-0.113	0.006
Serbia	-0.167	0.509	0.208	-0.073	-0.350	0.287	0.113	0.018
Bulgaria	-0.054	0.254	0.076	-0.053	-0.282	-0.021	0.233	-0.288

Note: All variables are in first log differences. All coefficients are rounded on three decimal places. The data is adjusted for the seasonality. Hungary, Romania, Bulgaria and Serbia have fewer observations compared to other countries.

Table 7 shows correlation between residuals of first log differenced GDP growth parameters estimated by simple Vector Autoregressive model. Similarly as before, the correlation is measured between the same countries that appeared in Tables 2 and 3. The situation is very different form the one that appeared when inflation residuals were compared. Generally, most of the countries are positively correlated with leaders. Moreover, most of the coefficients are high. Estonia and Croatia have very high correlation coefficients with Sweden. Hungary's GDP growth is highly correlated with Austria, Denmark and EU. Finally, Serbia has very high correlation coefficient with Austria. This situation can be partly explained by the fact that there is huge Serbian population living in Austria and that Serbia largely depends on remittances from Austria. The fact that the countries in this analysis have mainly positive correlation coefficients with entrants, when residuals of output growth are observed, implies that there is enough symmetry in business cycles between them. Moreover, Serbia is again not much different from any of the entrants.

Table 8

Correlations of business cycles among new EU members with addition of Croatia and Serbia

	Cyprus	**Czech R..**	**Estonia**	**Latvia**	**Lithuania**	**Malta**	**Poland**	**Slovakia**	**Slovenia**	**Croatia**	**Hungary**	**Romania**	**Bulgaria**	**Serbia**
Cyprus	1	0.347	0.280	-0.219	-0.253	-0.109	-	0.326	0.090	-0.077	-0.472	-0.030	-0.108	0.240
Czech R.	0.095	1	0.236	-0.140	0.082	-0.187	-	0.213	0.120	-0.062	0.054	0.096	0.058	0.128
Estonia	-0.175	-0.298	1	0.147	-0.035	-0.085	-	0.056	-0.178	-0.086	-0.086	-0.013	0.255	-0.068
Latvia	-0.079	-0.347	0.501	1	0.471	0.185	-	-0.355	-0.210	-0.064	0.154	0.220	0.455	0.225
Lithuania	-0.085	0.372	0.003	0.107	1	0.061	-	-0.274	-0.228	-0.002	0.574	0.208	0.068	0.197
Malta	-0.026	-0.047	0.076	0.303	0.053	1	-	0.246	-0.027	-0.200	0.269	0.342	0.125	-0.024
Poland	0.279	0.238	0.037	-0.053	-0.040	-0.131	1	-	-	-	-	-	-	-
Slovakia	0.256	0.264	0.021	0.266	0.408	0.324	0.011	1	-0.059	-0.278	0.039	0.302	0.014	0.027
Slovenia	-0.114	-0.021	0.132	0.254	-0.045	0.221	0.165	-0.005	1	0.205	-0.001	-0.022	0.004	0.166
Croatia	-0.393	-0.011	0.638	0.109	0.169	0.317	0.075	-0.116	0.210	1	-0.008	-0.468	0.193	-0.043
Hungary	0.320	-0.128	-0.118	0.206	0.200	-0.095	0.165	0.065	0.258	-0.092	1	0.409	-0.320	-0.151
Romania	-0.460	0.252	0.097	-0.309	0.181	-0.235	0.234	-0.089	0.131	0.391	-0.165	1	-0.192	-0.118
Bulgaria	-0.255	0.003	0.044	0.034	0.053	-0.146	-0.264	0.051	-0.207	-0.105	0.576	0.034	1	0.212
Serbia	0.206	0.336	0.065	0.120	0.048	0.025	-0.018	0.126	0.239	0.162	0.389	0.251	0.108	1

Note: Upper triangle shows correlation of business cycles based on inflation and lower triangle based on GDP growth. All variables are in first log differences. All coefficients are rounded on three decimal places. The data is adjusted for the seasonality. Hungary, Romania, Bulgaria and Serbia have fewer observations compared to other countries. The upper triangle of the table does not include Poland due to the unit root test results

Finally, the analysis finishes with Table 8 which shows correlation of business cycles based on inflation and output growth residuals estimated by simple VAR model. The countries that are included in this table are new EU members plus Croatia and Serbia. By looking at lower triangle of Table 8 one can notice that most correlation coefficients are positive, which means that business cycles are symmetrical among most of the countries, based on output residuals. However, Cyprus is exception as it is only country that has mainly negative correlation coefficients with rest of the countries. Czech Republic's coefficients are half positive and half negative. All other countries' business cycles are mostly symmetrical among each other. Serbia is the country that has only one negative coefficient with Poland and other coefficients are positive and quite high. It is worth to mention that there is very high symmetry in business cycles between Estonia and Latvia, Estonia and Croatia, Lithuania and Slovakia and Hungary and Bulgaria. In the upper triangle of Table 8 analysis is based on inflation residuals. Poland was left out from this analysis due to non-stationary nature of its inflation parameter. Compared to the lower triangle of Table 8, there are still more positive correlation coefficients than negative ones in upper triangle, but to much less extent. Again, Cyprus has mostly negative correlation coefficients with other countries, but this time there are also Croatia, Estonia and Slovenia with the same characteristics as Cyprus. High symmetry in business cycles can be seen between Latvia and Lithuania, Latvia and Bulgaria, Lithuania and Hungary and Romania and Hungary. Serbia has mostly positive correlation coefficients with other countries and these coefficients are high enough.

From Table 8 it can be concluded that new EU members have similar business cycles in general. This implies that recent EU members are following the same path and somehow adjusting their business cycles to be closer with each other. Moreover, Croatia and Serbia, as countries that see their future in EU, have symmetry in business cycles with the entrants. In

case of Serbia, this information is valuable if adoption of Euro is to be considered in the close future as Serbia would not be in disadvantage compared to recent EU members.

If Serbia would intensify its negotiations with EU, I am sure that there would be much more symmetry in business cycles with new, as well as with old EU countries. Early unilateral adoption of Euro would make correlations of business cycles with EU countries more intensified.

Conclusion

This thesis looks at if Serbia should early unilaterally adopt Euro as official currency before entering European Union. I came to the conclusion that at this moment, it would be beneficial for Serbia to early unilaterally adopt Euro. This conclusion is based on many different facts. First of all, it should be noted that due to numerous hyperinflations in the past citizens of Serbia lost their trust in legal tender, Dinar. That is why there is very high reliance on Euro at the present. Moreover, Serbia is very much connected to EU by having the most of its exports going towards EU and the same percentage of imports coming from EU. My conclusion has support in the fact that there is contradiction between Maastricht criteria as three nominal targets should be fulfilled at the same time. By early unilateral adoption of Euro this contradiction can be avoided. In Chapter 4 advantages and disadvantages of euroization were discussed. As a result of this discussion the conclusion was reached that it depends from country to country if euroization will bring more advantages or disadvantages. Each country should weight costs and benefits against each other than decide if it should undertake euroization process. Looking at the case of Serbia at this moment, and knowing that it is going to join EU in the recent future, I think that in case of early euroization there would be more advantages than disadvantages.

The research about business cycles was made including countries that joined European Union at 2004, the ones that joined in 2007 plus Croatia and Serbia. Moreover, old EU members' business cycles are compared to recent EU members' ones. Simple Vector Autoregressive model was used in this analysis. Even though, the data for Serbia does not cover too long time period, the conclusion is reached that Serbia's business cycles are not much different from other recent EU members'. Its output growth and inflation are moving together with majority of recent EU members' ones, too. Thus, there is enough support for the

idea that Serbia should consider early unilaterally adoption of Euro as official currency before entering EU. This research can be base for further analysis concerning the topics about euroization and can serve as suggestion for other countries in the region to think about this topic with more careful consideration.

References

Backé, Peter and Wójcik, Cezary (2002): "Unilateral Euroization: A Suitable Road Towards Joining the Euro For Central and Eastern European EU Accession Countries?". Paper prepared for National Bank of Estonia's book on 10th anniversary of introduction of currency board arrangement in Estonia.

Bratkowski, Andrzej and Rostowski, Jacek (2002): "The EU attitude to unilateral euroization: Misunderstandings, real concerns and sub –optimal admission criteria". Economics of Transition, Vol. 10, pp. 445-468.

Buiter, H Willem (April 2004): "To Purgatory and Beyond: When and Should the Accession Countries From Central and Eastern Europe Become Full Members of EMU". Centre for Economic Policy Research, Discussion Paper Series, No. 4342.

Calmuc, Rodica (2007): "The Choice of Exchange Rate Regimes: Implications for the Central and Eastern European Countries". Central European University, Economics Department, Master of Arts Thesis Work, Budapest.

Dabrowski, Marek and Rostowski, Jacek (2000): "The Eastern Enlargement of the EU", Kluwer Academic Publishers, Boston/ Dordrecht/ London.

Dvorski, Sandra, Scheiber Thomas and Stix Helmut (2007): "Euroization in Central, Eastern and Southeastern Europe- First Results from the New OeNB Euro Survey". Oesterreichische Nationalbank, Focus on European Economic Integration 1/08, pp. 48-60.

Eichengreen (2008): “When to dollarize”. Journal of Money, Credit and Banking, Vol. 34, No. 1, pp. 1-24.

Enoch, Charles and Gulde, Anne- Marie (December 1998): “Are Currency Boards a Cure for All Monetary Problems”. Finance & Development, Vol. 34, No. 4, pp. 40-43.

European Central Bank (May 2008): “The Maastricht Convergence Criteria and Optimal Monetary Policy for the EMU Accession Countries”. Working Paper Series, No. 896.

EViews user guide 4.0 (2002). Quantitative Micro Software, LLC.

Filáček, Jan, Horváth, Roman and Skopera Michal (November 2006): “Monetary Policy before Euro Adoption: Challenges for EU New Members”. William Davidson Institute Working Paper, No. 853.

Frankel, A. Jeffrey and Rose, K. Andrew (1998): “The Endogeneity of the Optimum Currency Area Criteria”. The Economic Journal, Vol. 108, No. 449, pp. 1009-1025.

Greene, H. William (2002): “Econometric Analysis”, Fifth Edition, Prentice Hall.

Heikensten, Lars (November 2003): “Euro entry before reforms or reforms before Euro entry?”. Speech at the Frankfurt European banking Congress. Bank for International Settlements Review 53.

Horvath, Julius (2003): “Optimum currency area theory: A selective review”. Bank of Finland, Institute for Economies in Transition, BOFIT. No. 15.

Horvath, Julius and Rátfai, Attila (February 2004): “Supply and demand shocks in accession countries to the European Monetary Union”. Journal of Comparative Economics, pp.1-10.

Korhonen, Likka and Fidrmuc, Jarko (2001): “Similarity of Supply and Demand Shocks Between the Euro area and the Accession Countries”. Focus on Transition. pp.26-42.

Mundell, A. Robert (1963): “Capital Mobility and Stabilization Policy under Fixed and Flexible Exchange Rates”. The Canadian journal of Economics and Political Science, Vol. 29, No. 4, pp. 475-485.

Mundell, A. Robert (1961): “Optimum Currency Areas”. The American Economic Review, Vol. 51, No. 4, pp.657-665.

Nuti, D. Mario (2002): “Costs and Benefits of Unilateral Euroization in Central Eastern Europe”. Economics of Transition, Vol. 10, pp. 419-444.

Nuti, D. Mario (October 2000): “The Costs and Benefits of Euro- isation in Central- Eastern Europe Before or Instead of EMU Membership”. William Davidson Institute Working Paper 340.

Obstfeld, M. and Rogoff, K. (1996): “Foundations of International Macroeconomics”. MIT press.

Petkova, Ivana (2007): “The Issue on Euroization”. Part of research project of the author on Exchange Rate Regimes and Monetary Policy Adjustments in South Eastern Europe in the Context of EU Integration, with Collegium Budapest.

Rogoff, S. Kenneth, Husain, M. Aasim, Mody, Ashoka, Brooks, Robin and Oomes, Nienke (December 2003): “Evolution and Performance of Exchange Rate Regimes”, International Monetary Fund, IMF Working Paper No. 03/243.

Rostowski, Jacek (August 1999): “Adopting the Euro”. Personal view, Financial Times.

Saker, Neil and Westphal, Andreas (2005): “Euroization in Serbia: Macroeconomic, Prudential and Policy Implications”, International Monetary Fund, IMF Country Report No. 05/232.

Statistical Bulletin (2004), National Bank of Serbia.

Statistical Bulletin (2006), National Bank of Serbia.

Statistical Bulletin (2008), National Bank of Serbia.

Appendix

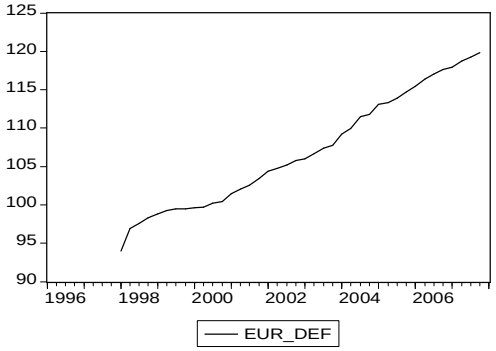
Table 5

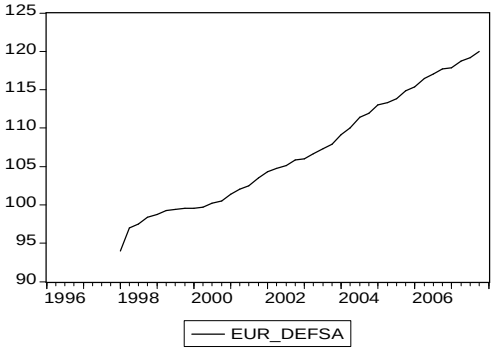
Unit root test

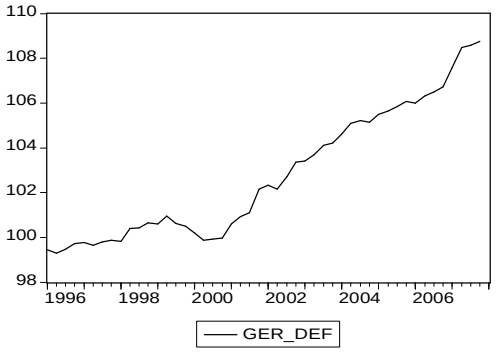
	GDP deflator			GDP volume		
	t-statistic	1% Critic. val.	Prob.	t-statistic	1% Critical val.	Prob.
Cyprus	1.186674	-3.596616	0.9976	0.643885	-3.592462	0.9894
Czech R.	-2.403931	-3.596616	0.1468	0.962676	-3.592462	0.9954
Estonia	1.492151	-3.588509	0.9990	0.389394	-3.592462	0.9802
Hungary	-2.257874	-3.615588	0.1904	2.125736	-3.621023	0.9999
Latvia	2.164396	-3.592462	0.9999	1.550967	-3.592462	0.9992
Lithuania	2.551746	-3.592462	1.0000	1.936050	-3.592462	0.9998
Malta	-0.559596	-3.588509	0.8691	-1.399301	-3.592462	0.5738
Poland	-4.552154	-3.588509	0.0007	1.064981	-3.600987	0.9965
Slovakia	-1.449761	-3.592462	0.5491	7.513715	-3.588509	1.0000
Slovenia	-0.696406	-3.592462	0.8369	3.684652	-3.588509	1.0000
Bulgaria	3.081232	-3.788030	1.0000	3.879657	-3.808546	1.0000
Romania	-0.211833	-3.632900	0.9277	1.961794	-3.646342	0.9998
Croatia	0.462487	-3.600987	0.9833	3.662684	-3.605593	1.0000
Serbia	-2.814506	-3.808546	0.0740	3.064538	-3.737853	1.0000
Germany	1.786648	-3.577723	0.9996	-0.079547	-3.581152	0.9455
Austria	5.093779	-3.600987	1.0000	-0.301240	-3.605593	0.9158
France	1.377005	-3.596616	0.9986	-0.624139	-3.577723	0.8552
Italy	0.525184	-3.581152	0.9859	-1.282815	-3.584743	0.6295
UK	0.983522	-3.581152	0.9958	0.895311	-3.581152	0.9946
Sweden	1.414968	-3.592462	0.9988	-0.184640	-3.610453	0.9321
Denmark	0.670583	-3.592462	0.9901	-0.202996	-3.600987	0.9300
EU	-0.325162	-3.610453	0.9118	-0.216995	-3.610453	0.9278

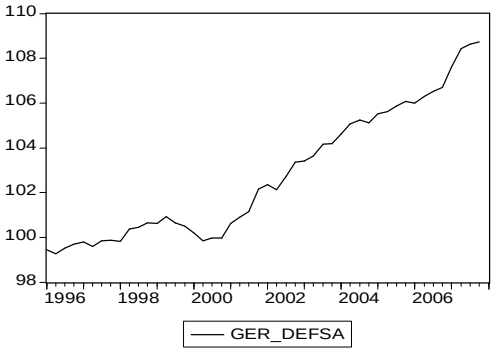
All variables are measured in log differences

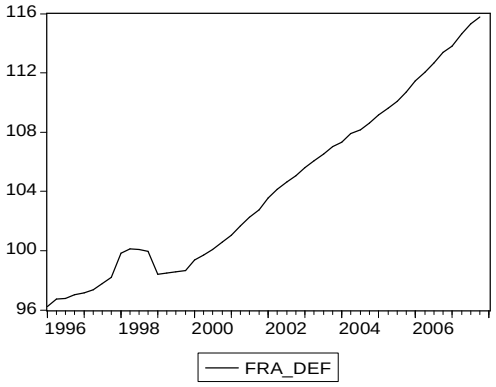
Graphs of GDP deflator for each country separately (from the left side before adjusting for seasonality and from the right side after adjusting for seasonality):

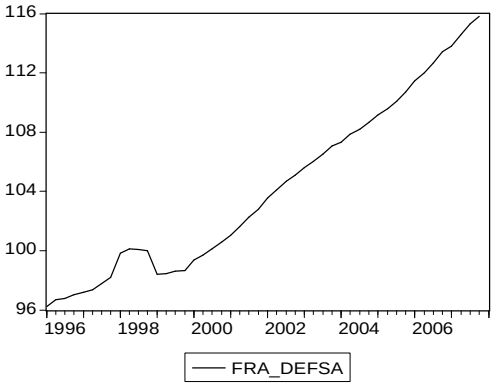


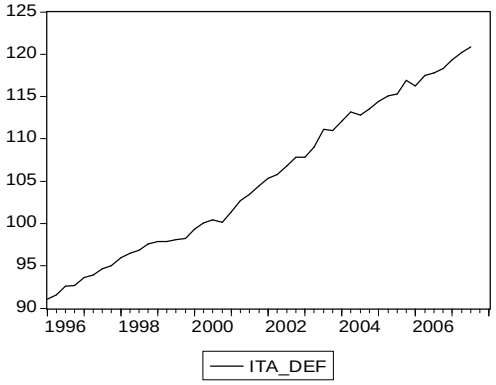


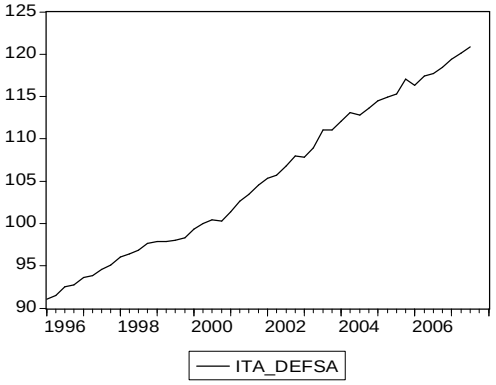


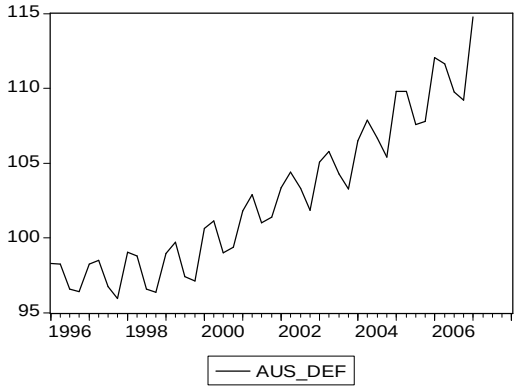


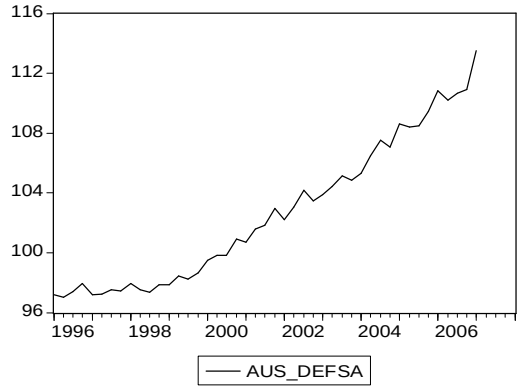


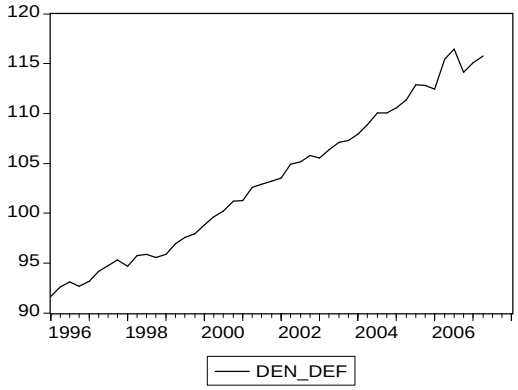


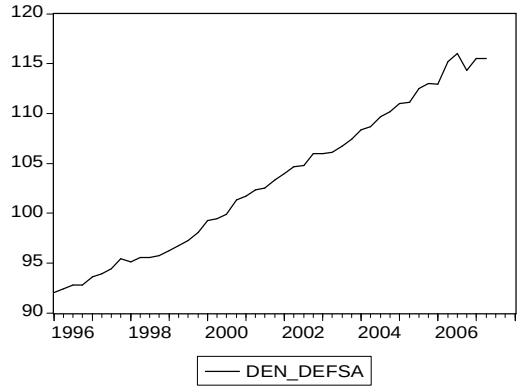


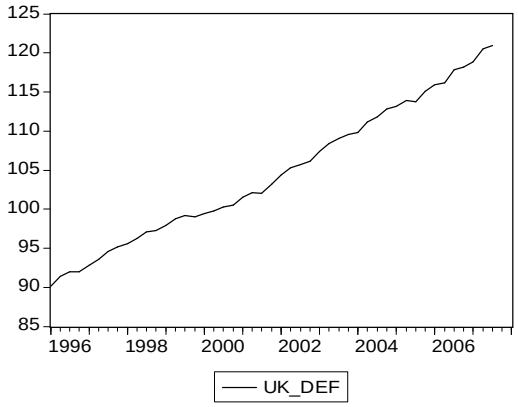


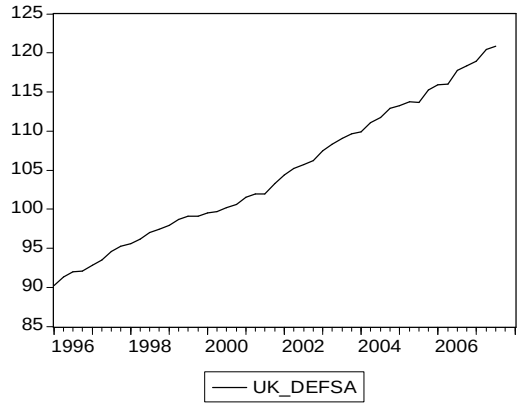


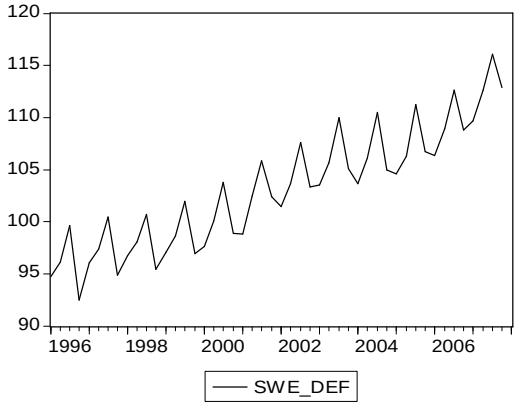


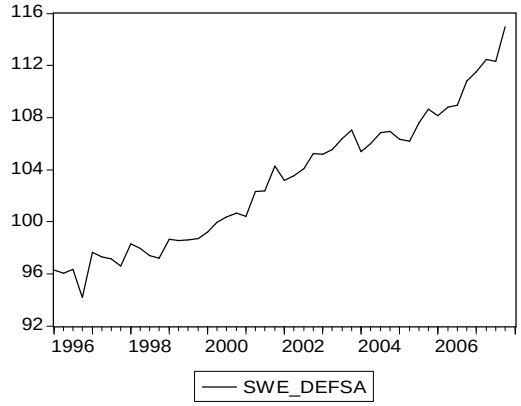


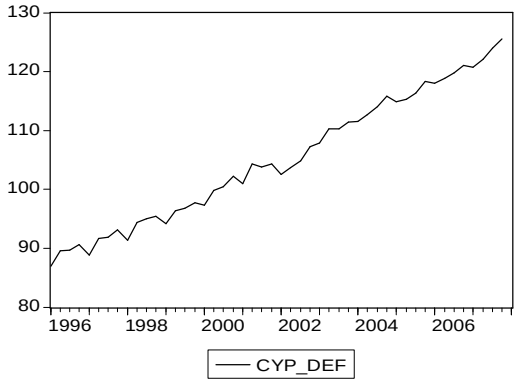


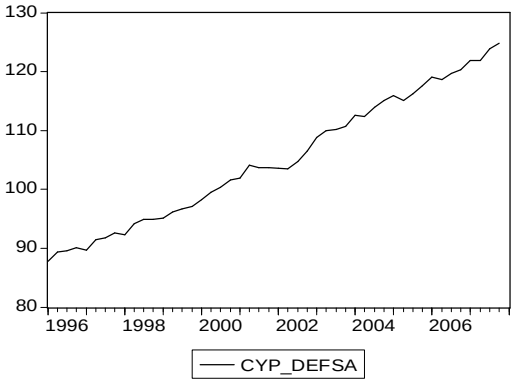


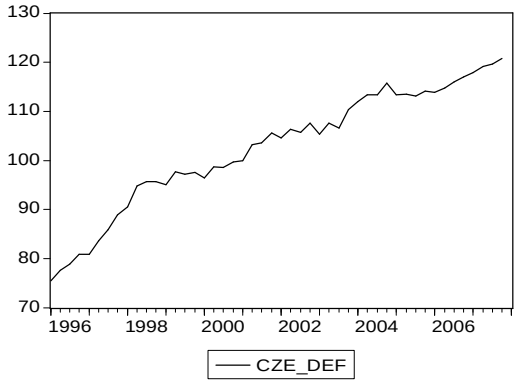


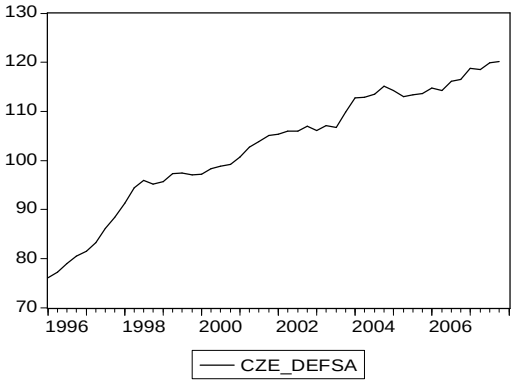


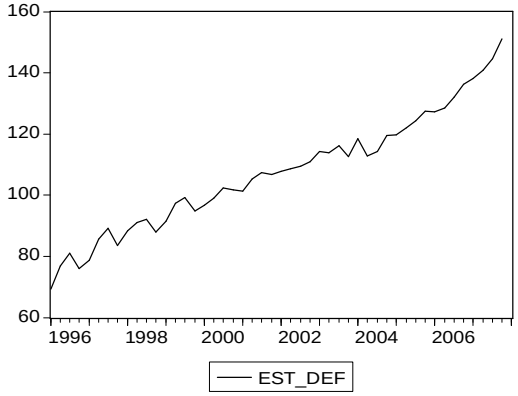


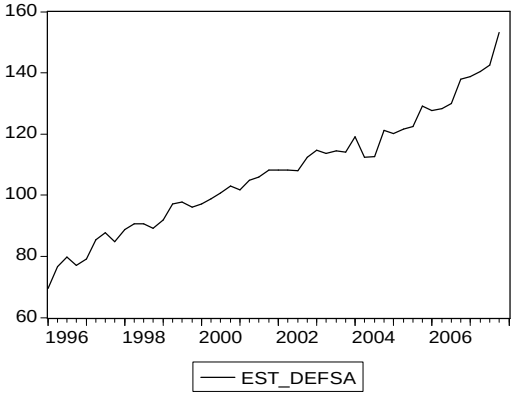


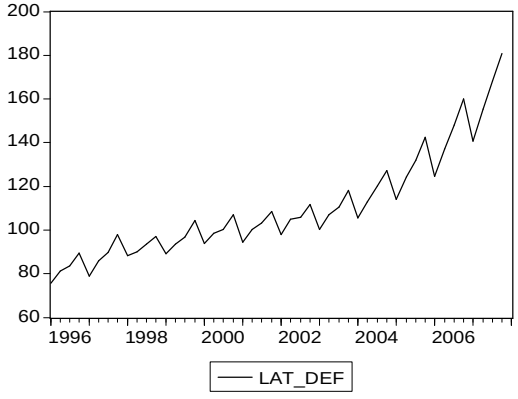


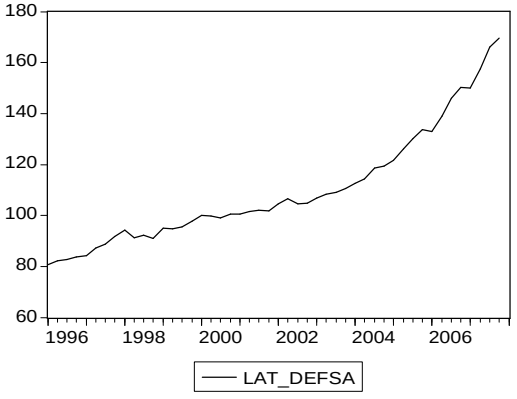


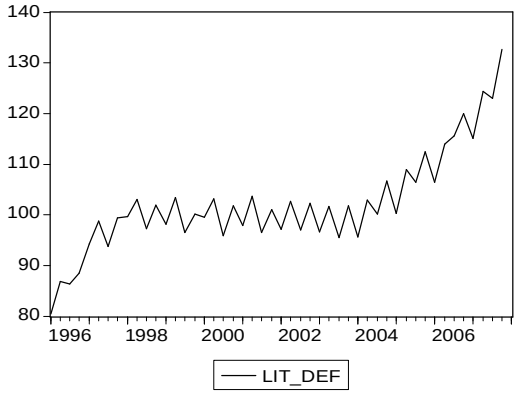


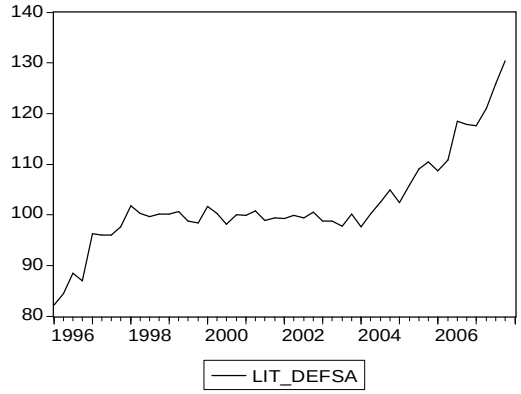


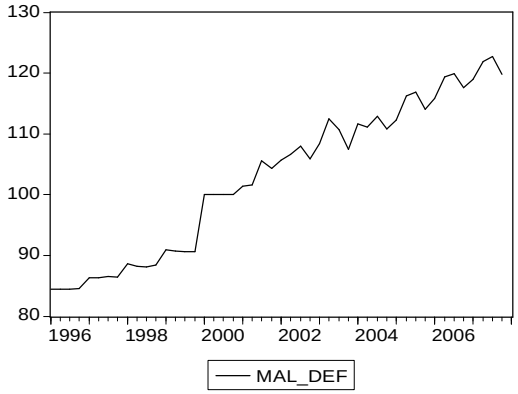


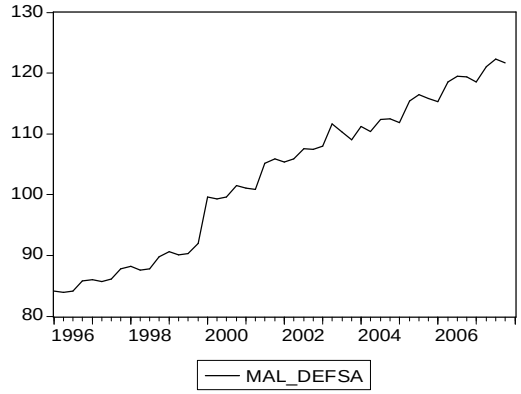


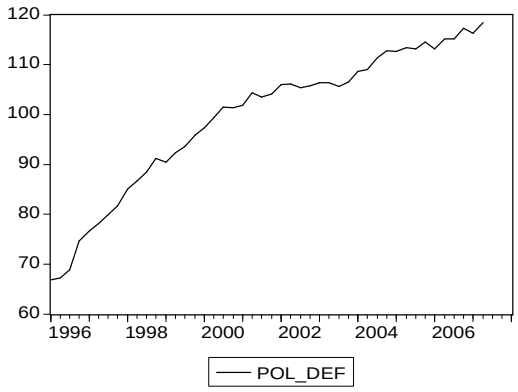


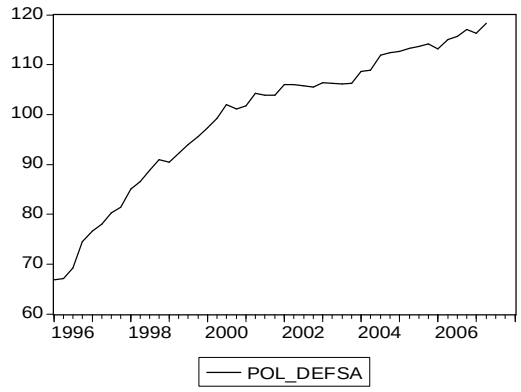


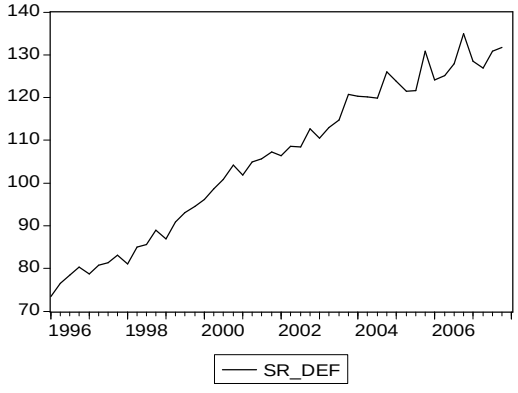


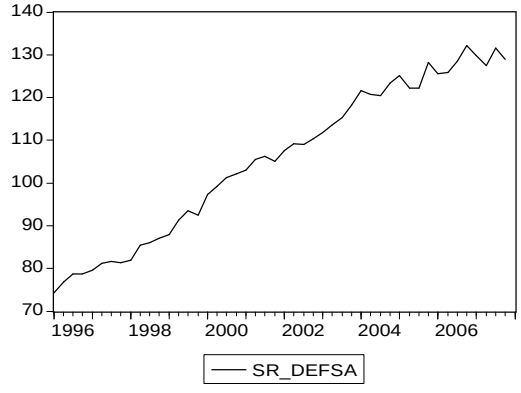


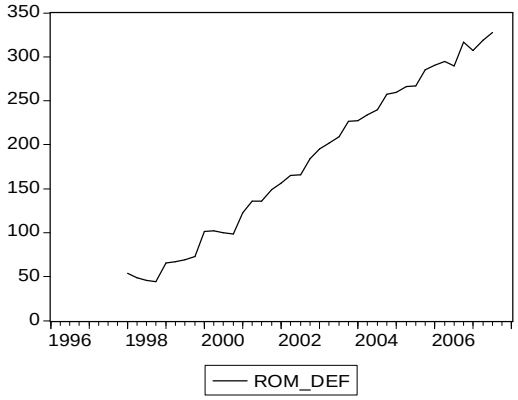


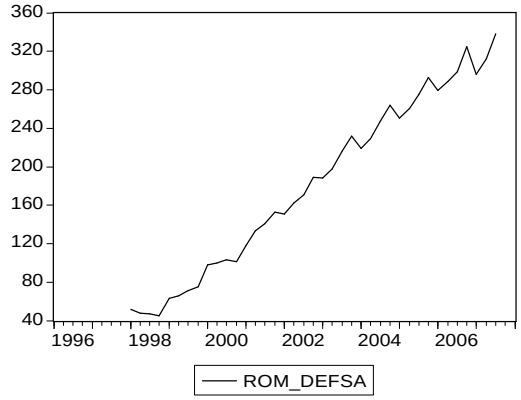


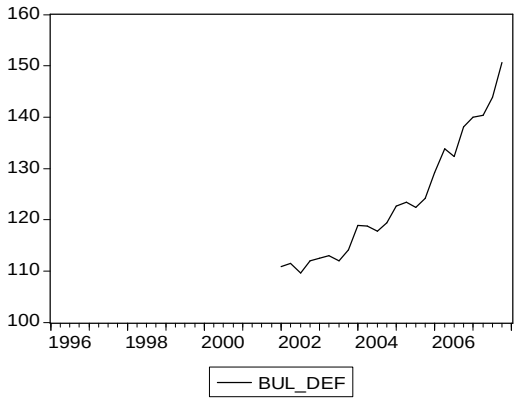


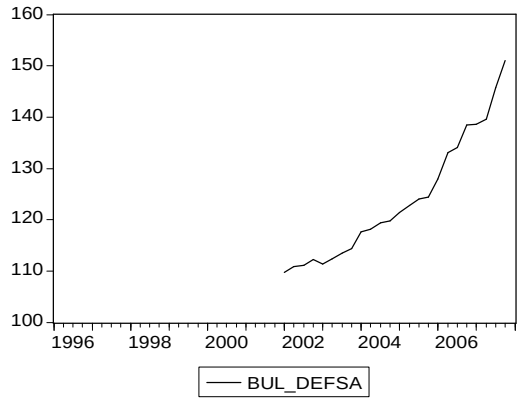


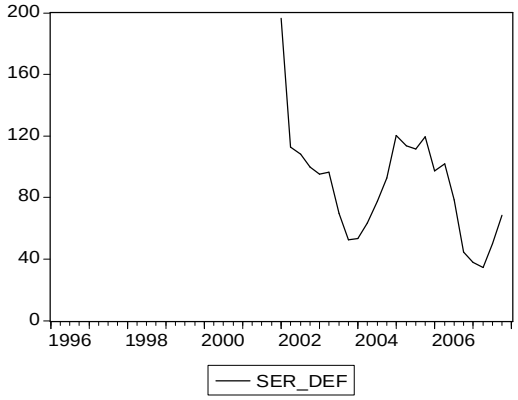


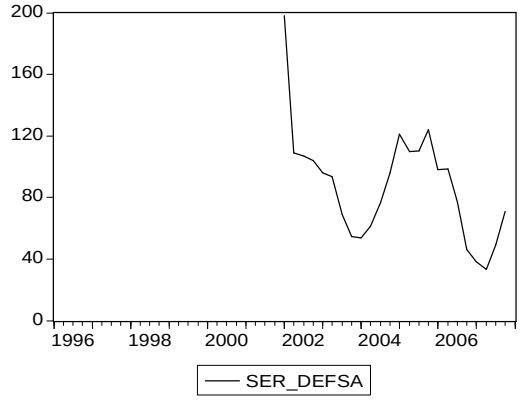


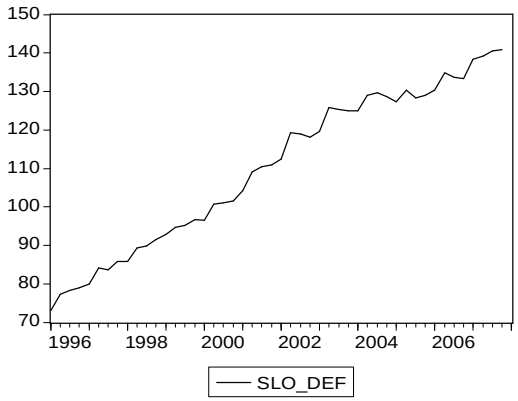


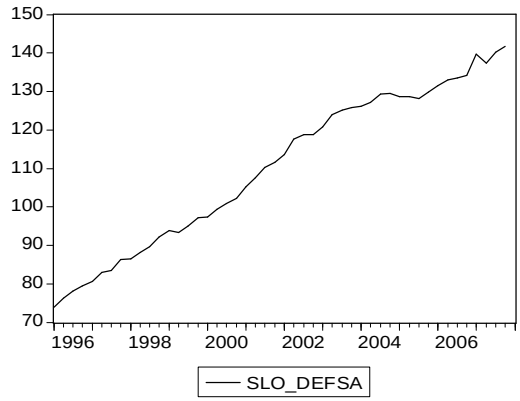


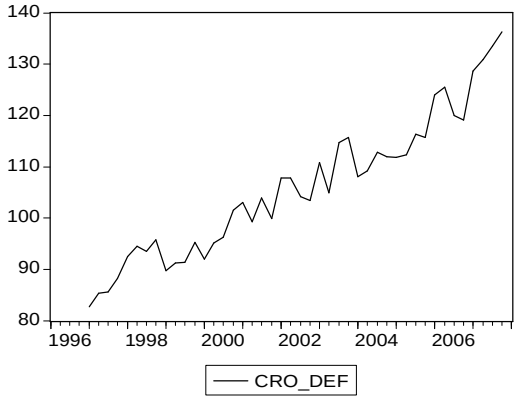


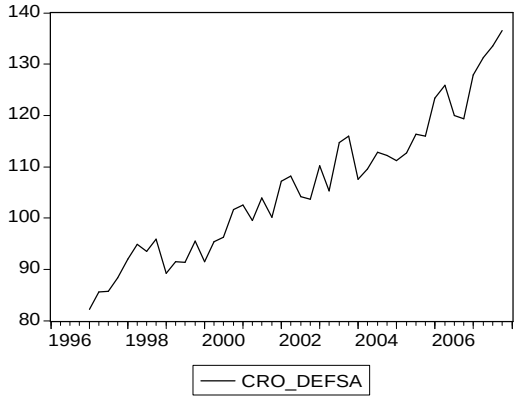


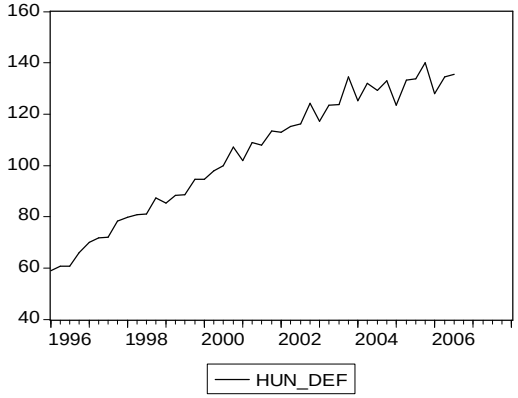


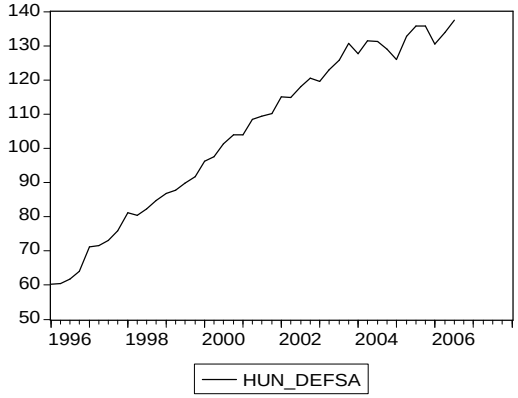












Graphs of GDP growth for each country separately (from the left side before adjusting for seasonality and from the right side after adjusting for seasonality):