Chapter 5

Exchange Rate and Economic Shocks in Accession Countries

Annex

1. Introduction

During the last years, different studies have focused on the effects of the accession of Central and Eastern European Countries to the European Monetary Union. Nowadays, the Accession countries have no choice: once they are take part of the European Union, their goal is to join the euro. In fact, after they accede to the EU in 2005, they will have to consider their timetables for joining the Monetary Union and they will likely be participating in ERM II as soon as possible. This period will be a time of high vulnerability to financial instability. As they will have only limited exchange rate flexibility in a context of full capital mobility, they will probably experience high capital inflows that will produce an important financial crisis that will seriously damage the dynamics of their integration to the European Union.

Recent works by Begg *et al.* (2003), Eichengren (2003) and Eichengreen *et al.* (2003), among others, have considered this issue and provided relevant policy suggestions that would be further considered. However, although this is a key aspect, much of the academic debate around the European Monetary Union enlargement has also focused on two other general aspects (Lättemäe, 2003):

- One of them is closely related to the analysis of capital flows and currency crisis in the Accession countries. In fact, the aim of several works is related to the choice of appropriate monetary regimes in Accession countries prior EU accession - for example, Bénassy-Quéré and Lahrèche-Révil (2000) analysed whether the Accession countries have an incentive to use the euro as a monetary anchor and Schoors (2002) if they should adopt the euro before or after the accession -. Summarising, this

kind of literature seeks to identify "the best" strategy for accession countries in their road to Monetary Union under the potential pressure of large capital flows.

- The second one is related with the analysis of whether the benefits of joining the euro would overcome the associated costs (see, for example, Andreff, 2001). In this sense, while the Accession countries are expected to gain in the long run from the benefits of joining the euro, the loss of monetary policy may create problems in the near term. In fact, the costs of participating in Monetary Union depend to a certain extent on the similarity between business cycles in the euro area and acceding countries. Only a few studies have considered this issue. One of the reasons may relay on the shortage and instability of economic data-series in Accession countries. In fact, as Fidrmuc (2001) states, some of these studies review periods of seven years or less, implying that only a single business cycle is covered by the available data when the available time period needed to establish such synchronization should be higher to provide reliable results.

In this paper, we would only focus on a partial analysis of the problems that Accession countries are facing in their road to the Monetary Union[4]. In particular, the objective of this paper is to assess if the recent economic evolution of this countries and their expected developments for the next years put them in a better or a worst position to join the euro. In this sense it extends previous works in four directions. First, it uses longer time series; In fact, the availability of data for the period 2000-2002 provides useful information to test if the slowdown of the EU economy has changed the similarity of business cycles between countries in the euro area and the Accession countries. Second, it compares the most recent evolution of the Accession countries with the situation of Euro area countries in the years before to the currency unification and with the situation of the three European Union countries that have not joined Monetary Union: Denmark, Sweden and United Kingdom. Special attention is also paid to the evolution of country groups. Third, three different structural VAR models are applied in order to check the sensibility of the results to the considered econometric methodology. And, last, the paper also tries to shed some light on whether the symmetry of shocks has increased over time.

The rest of the paper is structured in two sections: first, the second section focuses on the evolution of Accession countries exchange rates in their transition towards the euro; and next, in the last section the main findings of the OCA literature for the Accession countries are described and the degree of cyclical synchronicity and shock symmetry between the Accession countries and the Euro Zone is analysed in order to assess if the recent economic evolution of these countries have put them in a better or a worst position to enter the Economic and Monetary Union.

[4] A more general analysis involving topics such as fiscal imbalances, the need of monitoring Accession countries banking systems, implications for labour markets or the ECB design after the accession can be found in Eichengreen (2002) and Eichengreen and Ghironi (2001).

2. Exchange rates and the transition to the euro

Nowadays, the Accession countries use different exchange rate regimes, nearly covering the whole spectrum from fixed exchange rates to free floating. In fact, in the early nineties, at the beginning of their transition period they opted for different exchange rate regimes (see table 1). Although most of them chose some kind of fixed arrangement, others like Slovenia opted for more flexible solutions. During the following years, most of them have moved in the direction towards more flexible exchange rate arrangements. For example, the Czech Republic and Poland have fully flexible exchange rates. However, this fact points to a certain contradiction, as these movements are just in the opposite direction than the supposed entry into the euro.

TABLE 1

In this context, a first possibility to assess the position of the Accession countries[5] to join the euro consists in analysing the evolution of their exchange rate variability in their transition towards the euro (this line of reasoning would be related with the Maastricht criteria regarding exchange rates). With this aim, we have calculated the usual measure of exchange rate variability: the standard deviation of the first differences of logarithms of the monthly exchange rate between each country and the euro area. These values for exchange rate volatility for the period 1994-2002 are shown in table 2.

TABLE 2

As we can see from this table, the countries with the lowest levels of volatility are Estonia and Slovenia while the ones with the highest levels of volatility are the Czech Republic and Poland. Of course, these results are clearly related with their different exchange rate systems.

But, is this volatility too high? In order to establish a benchmark, the values of the exchange rate variability against the euro for Euro area countries[6] between 1985 and 1998 and for Denmark, Sweden and the United Kingdom for two different periods: 1985-1998 and 1994-2002 are also shown in table 2. As we can see from this table, as a group, the Accession countries have a higher volatility than non-Monetary Union countries for the same period and than Euro area countries during the years before the adoption of the euro. However, if we look at the values for individual countries, we can see how the values for the Accession countries are not far away from the values of some Euro area countries such as Italy or Finland[7].

[5] Malta and Cyprus are not included in the analysis due to data restrictions.
[6] Austria, Greece, Ireland, Luxembourg and Portugal are not included in the analysis to keep homogeneity with later sections, where they are excluded due to data restrictions.
[7] However, it is important to take into account that exchange rate variability of some Euro area countries for this period is "abnormally" high due to the speculative attacks of 1992-1995.

Moreover, if we look at the evolution of the exchange rate volatility during the last years (see table 3), we can see how, in general, it has decreased. This reduction has been more relevant in Slovenia and Hungary, but also in the Czech Republic, where the exchange rate system has changed from fixed to free floating.

TABLE 3

Summarising, not all the Accession countries are in the same position in their transition from their exchange rates systems towards the euro and although some of them have moved in the direction towards more flexible exchange rate arrangements (which is in part a certain contradiction?, the exchange rate volatility towards the euro has not increased substantially. Moreover, exchange rate volatility for the Accession countries is not far away from the values of some Euro area countries such as Italy or Finland[8]. In any case, it is important to take into account that until they join the EU, there are no restrictions on the choice of the exchange rate regime although once they enter; they will not be given the possibility to opt-out. For these reason, a key issue during the next months is to design an effective strategy for accession countries in their road to Monetary Union taking into account but also the peculiarities of each of these countries. However, it is also important to take into account that ERM-II may be fully compatible with most current exchange rate regimes, from currency boards to relatively wide bands. The problem is that, as a fixed but adjustable regime, the transition period will be a time of high vulnerability to financial instability taking into account the potential pressure of large capital flows. In this context, as Begg *et al.* (2003) point out, the dangerous combination of high capital mobility and an intermediate exchange rate peg could be avoided if Accession countries were to unilaterally adopt the euro without becoming full members of the euro area. This makes sense for countries that are seeking fast entry into the euro area, and which have achieved fiscal responsibility, price stability and a sound banking sector, but the Maastricht Treaty avoids this possibility. Taking this into account, the risk of experiencing currency crisis is real. However, if the accession economies continue to internationalize their banking systems and efficient monitoring mechanisms are implemented, the danger of such banking problems should be reduced considerably (Eichengreen and Ghironi, 2001).

3. Are the Accession countries ready for the euro? The optimum currency areas approach

3.1. Introduction

In the previous section, the choice of appropriate monetary regime in accession countries prior EU accession has been analysed but another key issue for the Accession countries is related with the analysis benefits and costs of joining the euro. The starting point to consider this issue is the Theory of Optimum Currency Areas (OCA). The seminal contribution of Mundell (1961), followed by McKinnon (1963) and Kenen (1969), among others, put the basis for the rest of studies. These initial works were placed in the intense debate during the sixties and mid-seventies about fixed versus flexible exchange rates. Their objective was to

[8] See footnote 7.

identify the criteria that determine whether a country should join a currency area or not. The strategy consisted in identifying the main benefits and costs that an individual country would experience joining a currency area. If for every participant, benefits overweight costs, then the currency area is said to be optimal. The intensification of the European Monetary Integration process has brought up to date the main ideas of these contributions to analyse the potential benefits and risks of the Monetary Union. In this sense, while there exists a certain consensus on Monetary Union positive economic effects -especially at a microeconomic level (De Grauwe, 1997)- which can be summarised as direct and indirect benefits of transaction costs reduction, less uncertainty and more transparency in price determination mechanisms, there is no agreement on potential costs.

Obviously, the main cost of joining a currency area is the loss of monetary policy instruments at a national level (e.g. the exchange rate) as stabilisation mechanisms against macroeconomic disturbances that only affect one country of the area or affect them in different manners. As these kind of macroeconomic disturbances, known as "asymmetric shocks", cannot be dealt by a common monetary policy, alternative adjustment mechanisms are needed to achieve macroeconomic stabilisation.

Taking as a starting point the contributions of the sixties, different modern studies have tried to identify empirically the main adjustment mechanisms alternative to the exchange rate in Euro area countries. The analysis of other currency areas (mainly, the United States and Canada) has shown the relevance of factor mobility, fiscal federalism and wages and prices flexibility. However, the peculiarities of the Accession countries make difficult the consideration of this approach. In fact, a difference between more recent studies and the traditional view is the interest about what will happen with asymmetric shocks once the currency area is established.

This is the most usual approach in the different studies that have considered the Accession situation. The empirical evidence found by these previous works[9], can be summarised as follows: During the nineties, economic cycles in most acceding countries have been highly correlated with the euro-area cycle and Slovenia, Hungary and Estonia were the best-positioned countries. Indeed, correlation of business cycles in several of the Accession countries appears to be higher than for some of the smaller EU countries. Therefore, the picture seems to be quite positive. However, how has the last economic downturn changed this situation? This issue is considered in the next section.

3.2. Cyclical synchronicity between the Accession countries and Euro area countries

As it has been previously mentioned, cyclical synchronicity is a positive indicator for monetary union as it indicates that the single monetary policy will be broadly appropriate for all union members.

[9] An extensive review of this literature can be found in Fidrmuc and Korhonen (2003).

However, before presenting the results of our analysis of cyclical synchronicity, when comparing economic developments of these countries with those in the Euro area, one has to take into account that the Accession countries economies are involved in a transformation process that lead to a high number of structural changes in their economies. Moreover, data quality for some of the Accession countries before these years cannot be comparable to that in EU-15 countries. For this reason, the time period considered for the analysis here starts at 1993 (or 1995) and the countries considered are the following: Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovak Republic and Slovenia[10]. Regarding EU countries, we take into account both, Monetary Union and Non-Monetary Union countries[11], with the exceptions of Austria, Greece, Ireland, Luxembourg and Portugal which are not included in the analysis due to data restrictions. The calculations in this section use quarterly data obtained from the OECD Main Economic Indicators, the IMF International Financial Statistics and the European Central Bank data set and different national sources.

We first examine some descriptive statistics on GDP growth and inflation of the EU countries and the Accession countries. As shown in figure 1, average inflation and growth during 1994.II-2002.IV was significantly higher in the Accession countries than in the Euro area (the only exception is the Czech Republic). The differences between the Accession countries and Euro area countries –as an aggregate- are quite higher than between EU countries and Euro area aggregates between 1985.II and 1998.IV. The plot of the standard deviation of growth and inflation also provides a similar picture. The fluctuation of inflation and growth rates was higher in the Accession countries than in EU countries. These results provide evidence that there are considerable differences in the business cycles between the Accession countries and EU countries.

In the literature studying business cycles synchronicity, early contributions examined the correlations across countries of output movements and argued that countries whose GDP tended to move together experienced relatively symmetrical disturbances (see, for example, Cohen and Wyplosz 1989).

Using quarterly data from 1996.I to 2002.IV, we have followed a similar approach. We have calculated the correlation coefficients among the GDP and CPI year-on-year growth rates for each country and the Euro area aggregate[12]. In order to establish a benchmark, these correlation coefficients have also been calculated for Non-Monetary Union countries (Denmark, Sweden and the United Kingdom) for the same period and, also, for the European Union countries before adopting the euro (1986.I-1998.IV). Both sets of results are shown in the first two columns of table 4.

TABLE 4

[10] As it has been previously mentioned, Malta and Cyprus are not included in the analysis due to data restrictions.
[11] In the analysis in the following sections, it is important to take into account that the values of the correlation coefficients for Non-Monetary Union countries are increased due to the "Denmark effect". During the considered period, monetary policy in Denmark has strongly followed the Euro area policy. However, this is not the case for Sweden or the United Kingdom.
[12] Different lags and leads have also been considered. The results are available from the authors on request.

From these results, it seems clear than, in average, the Accession countries business cycle is less synchronised with the Euro area aggregate than Monetary Union members before adopting the euro, but also than Non-Monetary Union countries. The only exception is Slovenia.

However, these values are averages for the whole period and it is important to know whether the pattern is changing. In order to analyse the evolution of business cycle synchronicity we have followed two different approaches: First, we have split the considered time periods into different sub periods and second, we have computed the correlations over successive intervals of five years (a five-year 'rolling window'). The results for the different sub periods are shown in the last four columns of table 2 while the results for the rolling windows are shown in figures 2A and 2B.

FIGURES 2A AND 2B

If we look at changes in the correlations between the first sub period (1996.1-1999.4) and the second sub period (2000.1-2002.4), there is a clear increase in the values of the Czech Republic, Estonia and the Slovenia, while the situation has worsened for Hungary, Lithuania, and the Slovak Republic. However, as an average, the results are still below the values of other EU countries and the analysis of figure 2A show that the situation has worsened during the last years for nearly all countries. However, the results for Euro area countries suggest that business cycle synchronicity with Accession countries could increase in the years before adopting the euro as it happened with countries such as Italy or Spain (see figure 2B).

A different way to analyse business cycle synchronicity is related to the analysis of cyclical deviations. Once the cyclical components have been estimated using the Hodrick-Prescott filter, the correlation coefficients among these components for each country and the Euro area aggregate have also been calculated in a similar way to the previous analysis. The results are shown in table 5 and figures 3A and 3B.

TABLE 5

FIGURES 3A AND 3B

Using this different definition of the business cycle synchronicity, the results are quite similar although they provide a more pessimistic picture of the situation of the Accession countries. In fact, when looking at the analysis by sub periods or to the rolling windows, it seems that the situation has much more worsened during the most recent years.

Summarising, it seems that the economic slowdown of 2000 to 2002 has affected the synchronisation of the Accession countries with the Euro Zone. However, these differences between countries and time periods can

arise either from differences in shocks that they have experienced, or either from differences in the responses to these shocks. The above correlation analysis cannot discriminate between the two aspects. For example, in for some countries, the second period lower correlations can be due to a strong discipline among the considered countries in terms of monetary policy (a self-imposed restriction on adjustment mechanisms) instead of an increase of asymmetric shocks. This issue is considered in the following sections.

3.3. Demand and supply shocks: The Bayoumi and Eichengreen (1992) model

In order to distinguish if the differences in business cycles synchronicity between countries and time periods arise either from differences in shocks or either from differences in the responses to these shocks, a different econometric methodology should be applied.

There have different attempts to distinguish disturbances from other components of observed output movements (see, for example, Caporale 1993 or Stockman, 1998). However, in this context, the methodology proposed by Bayoumi and Eichengreen (1992, 1996), extending the work by Blanchard and Quah (1989) has become the standard. The main assumption of their model is that there are two kinds of shocks: shocks that affect the demand curve (for example, due to monetary or fiscal policy changes) and shocks that affect the supply curve (for example, technological changes). From the model, it is also clear that demand and supply shocks have different effects on output and prices. In fact, it implies that while supply shocks have permanent effects on the level of output, demand shocks only have temporary effects, while both have permanent effects on the level of prices.

These assumptions can easily be introduced in a structural bivariate VAR on output and prices to obtain the series of demand and supply shocks. The starting point of their model is the following:

$$\begin{bmatrix} \Delta Y_t \\ \Delta P_t \end{bmatrix} = \sum_{i=0}^{\infty} \begin{bmatrix} a_{11i} & a_{12i} \\ a_{21i} & a_{22i} \end{bmatrix} \cdot \begin{bmatrix} \varepsilon_{dt} \\ \varepsilon_{st} \end{bmatrix}, \qquad (1)$$

where ΔY_t and ΔP_t represent, respectively, changes in the logarithm of output and prices at time t, ε_{dt} and ε_{st} represent supply and demand shocks and a_{kji} represent each of the elements of the impulse-response function to shocks.

The identification restriction is based on the previously stated assumption about the effects of the shocks. As output data is in first differences, this implies that cumulative effects of demand shocks on output must be zero:

$$\sum_{i=0}^{\infty} a_{11i} = 0 . \qquad (2)$$

The model defined by equations (1) and (2) also implies that the bivariate endogenous vector can be explained by lagged values of every variable. If B_i represents the value of model coefficients, the model to be estimated is the following:

$$\begin{bmatrix} \Delta Y_t \\ \Delta P_t \end{bmatrix} = B_1 \cdot \begin{bmatrix} \Delta Y_{t-1} \\ \Delta P_{t-1} \end{bmatrix} + B_2 \cdot \begin{bmatrix} \Delta Y_{t-2} \\ \Delta P_{t-2} \end{bmatrix} + \ldots + \begin{bmatrix} e_{yt} \\ e_{pt} \end{bmatrix}, \tag{3}$$

where e_{yt} and e_{pt} are the residuals of every VAR equation. Equation (3) can be also expressed as:

$$\begin{bmatrix} \Delta Y_t \\ \Delta P_t \end{bmatrix} = (I - B(L))^{-1} \cdot \begin{bmatrix} e_{yt} \\ e_{pt} \end{bmatrix} = (I + B(L) + B(L)^2 + \ldots) \cdot \begin{bmatrix} e_{yt} \\ e_{pt} \end{bmatrix}, \tag{4}$$

and in an equivalent manner:

$$\begin{bmatrix} \Delta Y_t \\ \Delta P_t \end{bmatrix} = \sum_{i=0}^{\infty} \begin{bmatrix} d_{11i} & d_{12i} \\ d_{21i} & d_{22i} \end{bmatrix} \cdot \begin{bmatrix} e_{yt} \\ e_{pt} \end{bmatrix}. \tag{5}$$

Putting together equations (1) and (5):

$$\sum_{i=0}^{\infty} \begin{bmatrix} d_{11i} & d_{12i} \\ d_{21i} & d_{22i} \end{bmatrix} \cdot \begin{bmatrix} e_{yt} \\ e_{pt} \end{bmatrix} = \sum_{i=0}^{\infty} L^i \cdot \begin{bmatrix} a_{11i} & a_{12i} \\ a_{21i} & a_{22i} \end{bmatrix} \cdot \begin{bmatrix} \varepsilon_{dt} \\ \varepsilon_{st} \end{bmatrix}, \tag{6}$$

a matrix, denoted by c, can be found that relates demand and supply shocks with the residuals from the VAR model.

$$\begin{bmatrix} e_{yt} \\ e_{pt} \end{bmatrix} = \left[\sum_{i=0}^{\infty} \begin{bmatrix} d_{11i} & d_{12i} \\ d_{21i} & d_{22i} \end{bmatrix}^{-1} \cdot \sum_{i=0}^{\infty} L^i \cdot \begin{bmatrix} a_{11i} & a_{12i} \\ a_{21i} & a_{22i} \end{bmatrix} \right] \cdot \begin{bmatrix} \varepsilon_{dt} \\ \varepsilon_{st} \end{bmatrix} = c \cdot \begin{bmatrix} \varepsilon_{dt} \\ \varepsilon_{st} \end{bmatrix}. \tag{7}$$

From (7) it seems clear that in the *2x2* considered model, four restrictions are needed to define uniquely the four elements of matrix c. Two of these restrictions are simple normalisations that define the variances of shocks ε_{dt} and ε_{st}. The usual convention in VAR models consists of imposing the two variances equal to one, which together with the assumption of orthogonality define the third restriction $c'c=\Sigma$, where Σ is the covariance matrix of the residuals e_y and e_p. The final restriction that permits matrix c to be uniquely defined comes from Economic Theory and has been previously defined in equation (2). In terms of the model introducing (2) in (7), it follows that:

$$\sum_{i=0}^{\infty}\begin{bmatrix} d_{11i} & d_{12i} \\ d_{21i} & d_{22i} \end{bmatrix}.\begin{bmatrix} c_{11} & c_{12} \\ c_{21} & c_{22} \end{bmatrix}=\begin{bmatrix} 0 & . \\ . & . \end{bmatrix}, \qquad (8)$$

and the resolution of this system permits us to estimate the series of demand and supply shocks from residuals of the estimated VAR.

We have estimated this VAR model using quarterly data on GDP and consumer prices series from 1995.1 to 2002.4 for the considered Accession countries and the Euro area aggregates and for EU countries from 1986.1 to 1998.4. In all cases, the number of lags introduced in VAR models has been set to four as the Schwartz information criterion has indicated this was the optimal lag in most cases. In this sense, the identification scheme has been homogenous for every country.

Table 6 shows the values of the correlation coefficients measuring the relationship between demand and supply shocks in the Euro area with the rest of countries. The first column shows the value of the correlation coefficients for the whole period while the second refers to the period 1997.1-1997.4 and the third refers to the most recent period 2000.1-2002.4. Results for the Euro area and Non-Monetary Union countries for the period 1988.1-1998.4 (and 1988.1-1992.4 and 1993.1-1998.4) are also shown to compare the situation of the Accession countries with the situation of EU countries before the adoption of the euro. We have also calculated the correlations between demand and supply shocks over successive intervals of three years. The results are shown in figures 4A and 4B.

TABLE 6

FIGURES 4A AND 4B

In terms of demand shocks, and looking at the period 1998.1-2002.4, four countries (out of eight) have negative correlations with the Euro zone: Estonia, Hungary, Lithuania and Slovenia. In terms of supply shocks, and for the same period, two countries have negative correlations: Latvia and Lithuania. The average values of the correlation coefficients for demand and supply shocks for the Accession countries are clearly lower than the ones by Non-Monetary Union countries in the same period and the ones by Euro area countries before adopting the euro.

When looking at the different sub periods, the most interesting result is that, in terms of demand shocks, correlations have decreased in nearly all considered countries except Hungary. It seems that the economic slowdown has increased the heterogeneity of demand shocks. However, except in Poland and Latvia, the correlations in terms of supply shocks have clearly increased. This result shows that in the more recent years asymmetric shocks are related to factors controllable by national governments (demand) while those related

to non controllable factors tended to decrease (supply), which can be interpreted as good news for the Accession countries.

However, one of the shortcomings of the Bayoumi and Eichengreen model is that it ignores the potential role of policy in creating shocks (see for example, Chamie et al., 1994, Erkel-Rousse and Mélitz, 1995 or Artis, 2003). This possibility would be considered in the following section

3.4. Extensions of the basic model: The potential role of policy in creating shocks

Later applications of structural VAR models in the spirit of Blanchard and Quah (1989) – the starting point of the Bayoumi and Eichengreen model - have developed this technique by recognising that two different types of demand shock were potentially important:

- Real demand shocks, resulting for example from increases in private sector spending or government expenditure; and

- Nominal demand shocks, resulting from shocks to the stance of monetary policy or from shocks arising in foreign exchange markets.

There have been different proposals on how to disentangle these shocks using a variety of identification restrictions. In this paper, two alternative specifications that allow for monetary policy influences are considered: The first one includes in the previous specification the evolution of real interest rates while the second includes the evolution of real exchange rates. In both cases, further restrictions are required in order to identify real demand, nominal demand and supply shocks from the residuals from these trivariate VAR models.

In the first case, the proposed structural VAR model consists from three variables: real GDP growth rate, variations in the real interest rate and the inflation rate. Following the identification scheme proposed by Artis (2003), the structural shocks are identified as follows:

- Nominal (ε_{mt}) and Real (ε_{dt})demand shocks do not affect the long run level of output (ΔY_t)
- Nominal demand shocks (ε_{mt}) do not have any permanent effect on real interest rates (ΔR_t)

These assumptions are summarised in the following equation:

$$\begin{bmatrix} \Delta Y_t \\ \Delta R_t \\ \Delta P_t \end{bmatrix} = \sum_{i=0}^{\infty} \begin{bmatrix} a_{11i} & 0 & 0 \\ a_{21i} & a_{22i} & 0 \\ a_{31}i & a_{32i} & a_{33i} \end{bmatrix} \cdot \begin{bmatrix} \varepsilon_{st} \\ \varepsilon_{dt} \\ \varepsilon_{mt} \end{bmatrix}, \qquad (9)$$

In the second case, the proposed structural VAR model consists from three variables: real GDP growth rate, variations in the real effective exchange rate[13] and the inflation rate. Following the identification scheme proposed by Clarida and Galí (1994) and also used in this context by Lättemäe (2003), the structural shocks are identified as follows:

- Nominal (ε_{mt}) and Real (ε_{dt})demand shocks do not affect the long run level of output (ΔY_t)
- Nominal demand shocks (ε_{mt}) do not affect the long-run level of real effective exchange rate (ΔQ_t)

These assumptions are summarised in the following equation:

$$\begin{bmatrix} \Delta Y_t \\ \Delta Q_t \\ \Delta P_t \end{bmatrix} = \sum_{i=0}^{\infty} \begin{bmatrix} a_{11i} & 0 & 0 \\ a_{21i} & a_{22i} & 0 \\ a_{31}i & a_{32i} & a_{33i} \end{bmatrix} \cdot \begin{bmatrix} \varepsilon_{st} \\ \varepsilon_{dt} \\ \varepsilon_{mt} \end{bmatrix}, \qquad (10)$$

We have estimated VAR models using both sets of variables and identifying restrictions using quarterly data on GDP, real interest rates or real exchange rates and consumer prices series from 1995.1 to 2002.4 for the considered the Accession countries and the Euro area aggregates and from 1986.1 to 1998.4 for EU countries. In all cases, the number of lags introduced in VAR models has been set to four as the Schwartz information criterion has indicated this was the optimal lag in most cases. In this sense, the identification scheme has been homogenous for every country.

Table 7 and figures 5A and 5B show the correlation of real demand shocks, supply shocks and monetary shocks (as unexplained real interest rate disturbances). In terms of demand shocks, most correlations are lower, as should be expected when an additional source of shocks have been identified. However, the Accession countries retain quite high correlations in terms of real demand shocks related to other countries (for example, the Czech Republic, Hungary or Poland). The correlations for monetary shocks are also quite high for the Accession countries.

TABLE 7

FIGURES 5A and 5B

Table 8 and figures 6A and 6B show the correlation of real demand shocks, supply shocks and monetary shocks (but now as unexplained real exchange rate disturbances). Again, in terms of demand shocks, most

[13] Due to data restrictions, Estonia, Latvia, Lithuania, and Slovenia would not be included in the analysis.

correlations are lower, but the Accession countries retain quite high correlations in terms of real demand shocks related to other countries.

TABLE 8

FIGURES 6A and 6B

The main findings of the correlation analysis in this section can be summarized as follows: Similarly to previous studies (Fidmruc and Korhonen, 2001 or Lättemäe, 2003), the structural shocks (both supply and real demand shocks) are more asymmetric in candidate countries than in current Monetary Union members. However, there are some countries that are more ready to adopt the euro from this perspective. For example, if we look at supply shocks, the values of the correlation coefficients for Hungary, Poland, the Check Republic and Estonia are quite high. And, in terms of real demand shocks at the most recent years, only Latvia, the Slovak Republic and Slovenia show negative values of the correlation coefficients.

Some interesting results emerge also from the analysis of symmetries in monetary shocks when using the real interest rate specification. It seems that monetary shocks in most candidate countries are more correlated with Euro area countries than supply shocks or real demand shocks. This result, also found by Lättemäe (2003) for the Baltic countries, is especially interesting taking into account the actual differences between the exchange rates systems and levels of financial integration. Moreover, it shows that monetary policies in accession countries are closely influenced by monetary conditions in the euro area. If this is the case, then the costs of loosing monetary independence when joining the euro would be reduced.

In any case, and taking into account that, in average, correlations are still far away from the values of the Euro area countries, the flexibility of real sector and labour markets will be essential for the sustainability of joining the euro.

3.5 Final remarks

To conclude, there are some issues that should be taken into account when interpreting the previous results from a policy point of view:

- First of all, and according to Lucas (1976) critique, changes in economic policy could lead to changes in economic structure, which makes difficult the possibility of analysing ex ante policies, based on ex post data. Moreover, in the context of OCA literature, Frankel and Rose (1996) claimed that OCA criteria may be endogenous. According to these authors, a monetary union will cause more trade and this would increase the degree of business cycle synchronicity. Also, there is the fact that,

once it is established, there will be a single monetary policy, which would increase the degree of integration of participating countries. Ex-post correlations would be higher than ex-ante correlations.

- A second issue is related with the problem of "sufficiency" (Artis, 2003). The main findings of this paper rely on cross-correlations of shocks but "However, there is nothing in the relevant theory to establish what is a 'satisfactory value' for a cross-correlation. This is the problem of sufficiency" (Artis, 2003, p. 25). In this paper, we have compared the values of the correlations of the Accession with Euro area aggregates with the values of these correlations for Non-Monetary Union countries and with the values between EU countries before adopting the euro. We have seen than, in most cases, the values for the Accession were lower than the other, but are they lower enough to indicate that most shocks have been asymmetric?

- And, last but not least, it is important to stress again that the analysis in this paper is a partial analysis: We have focused on the analysis of exchange rate variability and the role of asymmetric shocks in the light of the probable accession to the Monetary Union of some Central and Eastern Europe countries. However, these economies also face other problems in their road to the Monetary Union. One of the most important ones is related with the probability of financial crisis under large capital inflows, but as we have pointed out previously, if the Acountries continue to internationalize their banking systems and efficient monitoring mechanisms are implemented, the danger of such banking problems should be reduced considerably (Eichengreen and Ghironi, 2001).

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TABLES AND FIGURES

Table 1. Official exchange rate regimes since 1994

Czech Republic		Estonia		Hungary		Latvia	
1994-1996	Basket Peg 65% DEM, 35% USD Band +- 0.5%	1992 -	Currency board Ecu/Euro	1994-1996	Crawling peg 70% ECU, 30% USD Band +-2.25%	1994-	Fixed Peg SDR* Band +-1%
1996-1997	Basket Peg 65% DEM, 35% USD Band +- 7.5%			1997-1999	Crawling peg 70% DEM, 30% USD Band +-2.25%		
1997-2001	Managed float			2000-2001	Crawling peg 100% Euro Band +-15%		
2001-	Free float			2001-	Fixed Peg Euro Band +-15%		

Lithuania		Poland		Slovenia		Slovak Republic	
1994-2002	Currency board USD	1994-1995	Crawling peg 45% USD, 35% DEM, 10% GBP, % FF, 5% SF Band +-1%	1994-	Managed Floating	1994-1996	Basket peg 60% DEM, 40% USD Band +-1,5%
2002-	Currency board Euro	1995-1998	Crawling peg 45% USD, 35% DEM, 10% GBP, % FF, 5% SF Band +-7%			1997-1998	Basket peg 60% DEM, 40% USD Band +-7%
		1998-1999	Crawling peg 45% USD, 35% DEM, 10% GBP, % FF, 5% SF Band +-10%			1998-	Managed floating
		1999-2000	Crawling peg 45% USD, 55% EUR Band +-7%				
		2000-	Free float				

Source: Frömmel and Schobert (2003) and IMF, Exchange Rate Arrangements and Restrictions, various issues.

* SDR is a basket of currencies, including the USD, the Euro, the Yen and the Pound Sterling.

Table 2. Exchange rate volatility

	Volatility 1994-2002		Volatility 1985-1998
Accession countries	**0.015**	**Euro area countries**	**0.009**
Czech Republic	0.023	Belgium	0.004
Estonia	0.000	Finland	0.015
Hungary	0.016	France	0.005
Latvia	0.013	Germany	0.005
Lithuania	0.021	Italy	0.022
Poland	0.025	Netherlands	0.005
Slovak Republic	0.013	Spain	0.010
Slovenia	0.006		
Non Monetary Union	**0.011**	**Non Monetary Union**	**0.012**
Denmark	0.003	Denmark	0.005
Sweden	0.015	Sweden	0.016
United Kingdom	0.015	United Kingdom	0.016

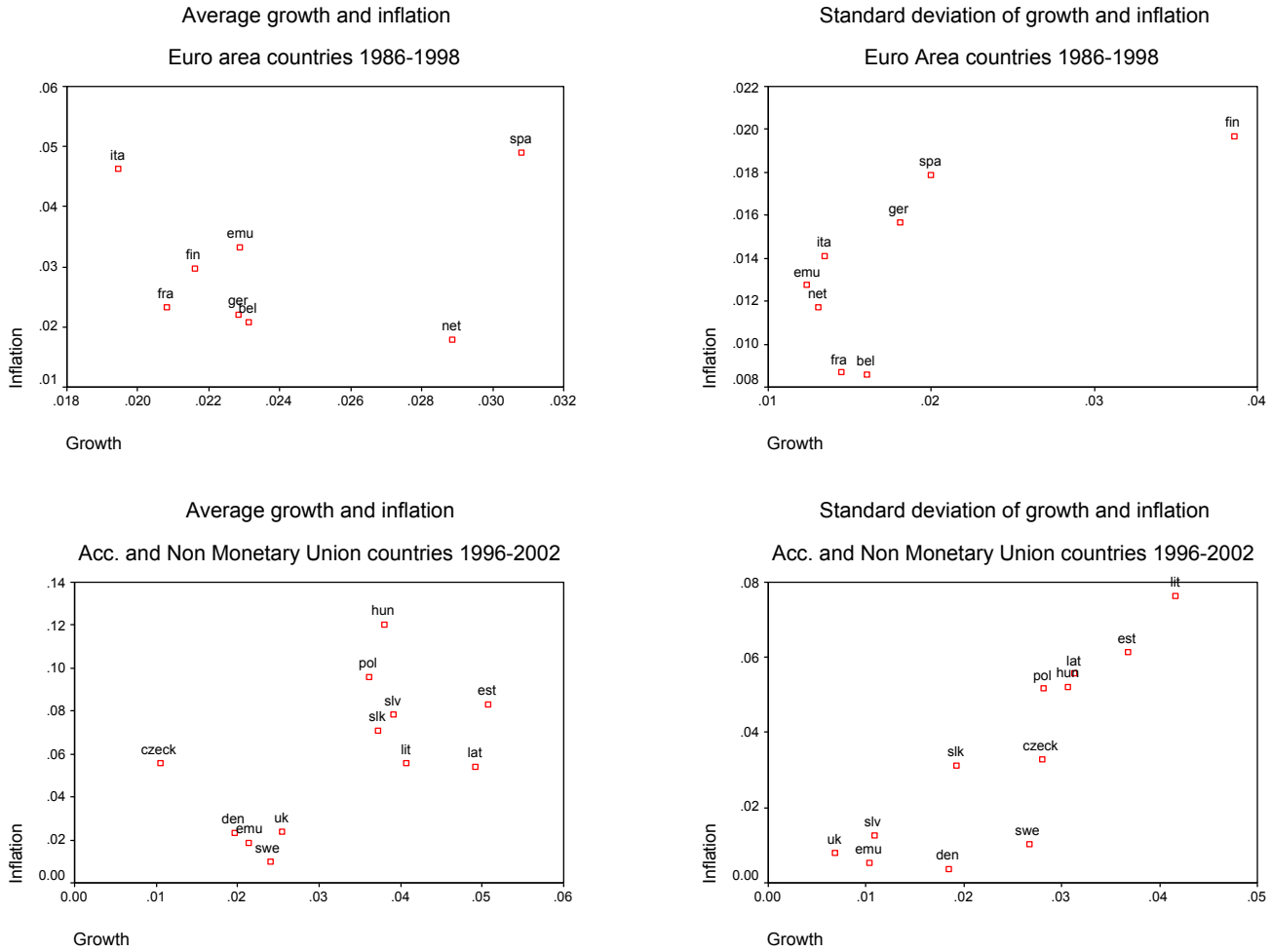
Source: Own calculations from IMF Financial Statistics average monthly exchange rates.

Table 3. Evolution of exchange rate volatility

	Volatility 1994-2002	Volatility 1994-1998	Volatility 1999-2002
Accession countries	**0.015**	**0.015**	**0.013**
Czech Republic	0.023	0.028	0.015
Estonia	0.000	0.000	0.000
Hungary	0.016	0.015	0.011
Latvia	0.013	0.010	0.017
Lithuania	0.021	0.019	0.022
Poland	0.025	0.023	0.026
Slovak Republic	0.013	0.012	0.013
Slovenia	0.006	0.008	0.003
Non Monetary Union	**0.011**	**0.011**	**0.010**
Denmark	0.003	0.004	0.001
Sweden	0.015	0.015	0.013
United Kingdom	0.015	0.015	0.016

Source: Own calculations from IMF Financial Statistics average monthly exchange rates.

Figure 1. Growth and inflation in Euro area, Non-Monetary Union and Accession countries



Note: Axis scales are different in both sets of figures. Please note that the axis ranges in the bottom figures are higher than the ranges for the top ones.

Table 4. Correlation coefficients with Euro area - growth rates

	1996.1-2002.4		1996.1-1999.4		2000.1-2002.4	
	y	p	y	p	Y	p
Czech Republic	0.11	-0.15	-0.31	0.32	0.48	0.41
Estonia	0.18	0.18	0.22	0.86	0.65	0.71
Hungary	-0.07	-0.01	0.51	0.91	-0.36	0.25
Latvia	0.17	0.19	0.32	0.95	0.26	0.15
Lithuania	-0.27	0.20	-0.06	0.92	-0.65	0.36
Poland	0.55	-0.04	0.11	0.92	0.81	-0.07
Slovak Republic	-0.28	-0.16	-0.18	-0.28	-0.82	-0.26
Slovenia	0.48	0.58	0.31	0.78	0.63	0.31
Denmark	0.45	0.30	0.32	0.04	0.45	-0.28
Sweden	0.43	0.67	0.66	0.33	0.33	0.62
United Kingdom	0.76	-0.20	0.37	0.05	0.95	-0.14
Accession countries	0.11	0.10	0.11	0.67	0.13	0.23
Non-Monetary Union	0.55	0.26	0.45	0.14	0.58	0.07

	1986.1-1998.4		1986.1-1992.4		1993.1-1998.4	
	y	p	y	p	y	p
Belgium	0.86	0.73	0.86	0.87	0.88	0.83
Finland	0.46	0.83	0.69	0.70	0.89	0.20
France	0.92	0.91	0.90	0.72	0.92	0.87
Germany	0.68	0.37	0.33	0.42	0.92	0.83
Italy	0.86	0.89	0.80	0.83	0.88	0.83
Netherlands	0.62	0.04	0.56	0.52	0.87	0.56
Spain	0.84	0.78	0.74	0.25	0.92	0.91
Denmark	-	-	-	-	0.34	-0.45
Sweden	-	-	-	-	0.63	0.86
United Kingdom	-	-	-	-	0.44	-0.68
Euro area	0.75	0.65	0.70	0.61	0.90	0.72
Non-Monetary Union	-	-	-	-	0.47	-0.09

y: GDP
p: Prices

Figure 2A. Five years rolling window correlation coefficients with Euro area - growth rates 1996.1-2002.4

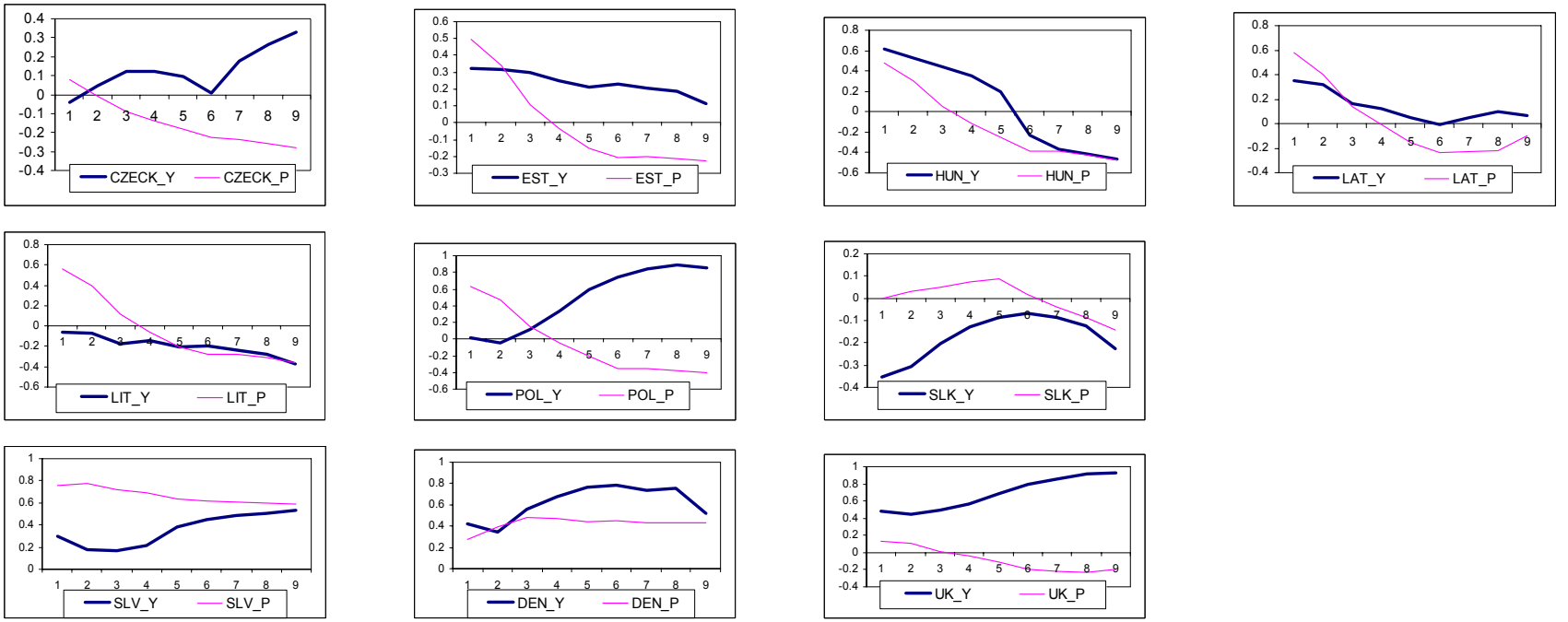
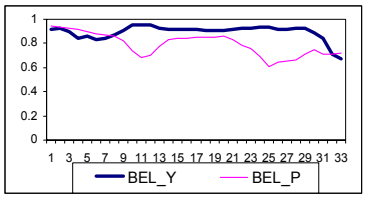
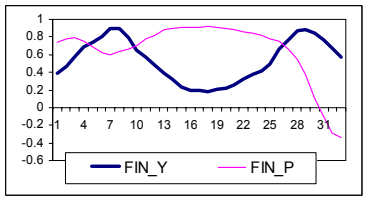
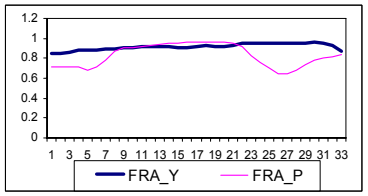
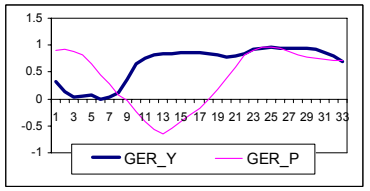


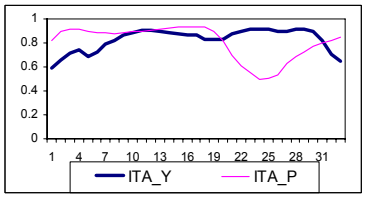
Figure 2B. Five years rolling window correlation coefficients with Euro area - growth rates 1986.1-1998.4

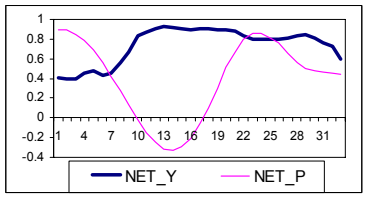


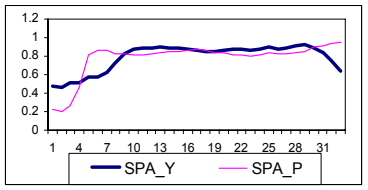


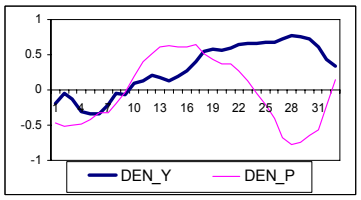


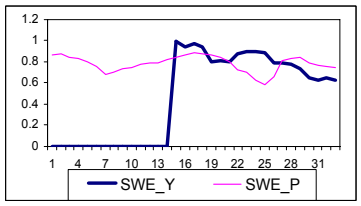












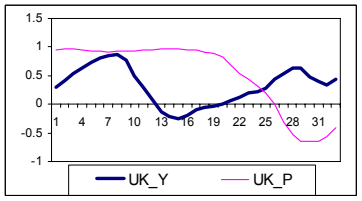


Table 5. Correlation coefficients with Euro area - cyclical deviations

	1996.1-2002.4		1996.1-1999.4		2000.1-2002.4	
	y	p	y	p	y	p
Czech Republic	0.14	-0.29	0.09	-0.30	0.17	-0.24
Estonia	-0.18	-0.16	0.02	-0.26	-0.28	0.23
Hungary	-0.29	-0.22	0.18	-0.15	-0.47	-0.30
Latvia	-0.10	-0.07	-0.06	-0.15	-0.23	-0.02
Lithuania	-0.55	-0.30	-0.37	-0.26	-0.84	-0.42
Poland	0.22	-0.33	0.22	-0.04	0.30	-0.63
Slovak Republic	-0.20	0.02	-0.08	0.41	-0.24	-0.61
Slovenia	0.46	0.82	-0.01	0.81	0.82	0.86
Denmark	0.45	0.31	0.49	0.50	0.49	0.01
Sweden	0.14	0.83	0.10	0.77	0.17	0.94
United Kingdom	0.64	-0.31	0.40	-0.30	0.90	-0.36
Accession countries	-0.06	-0.07	0.00	0.01	-0.10	-0.14
Non Monetary Union	0.41	0.28	0.33	0.32	0.52	0.20

	1986.1-1998.4		1986.1-1992.4		1993.1-1998.4	
	y	p	y	p	y	p
Belgium	0.86	0.86	0.90	0.92	0.80	0.70
Finland	0.55	0.62	0.34	0.82	0.88	-0.07
France	0.91	0.78	0.88	0.86	0.91	0.73
Germany	0.66	0.55	0.62	0.53	0.84	0.68
Italy	0.82	0.74	0.77	0.91	0.82	0.72
Netherlands	0.78	0.64	0.74	0.69	0.81	0.38
Spain	0.85	0.73	0.78	0.78	0.88	0.82
Denmark	-	-	-	-	0.77	0.38
Sweden	-	-	-	-	0.04	0.57
United Kingdom	-	-	-	-	0.80	-0.65
Euro area	0.78	0.70	0.72	0.79	0.85	0.57
Non-Monetary Union	-	-	-	-	0.54	0.10

y: GDP
p: Prices

Figure 3A. Five years rolling window correlation coefficients with Euro area – cyclical deviations 1996.1-2002.4

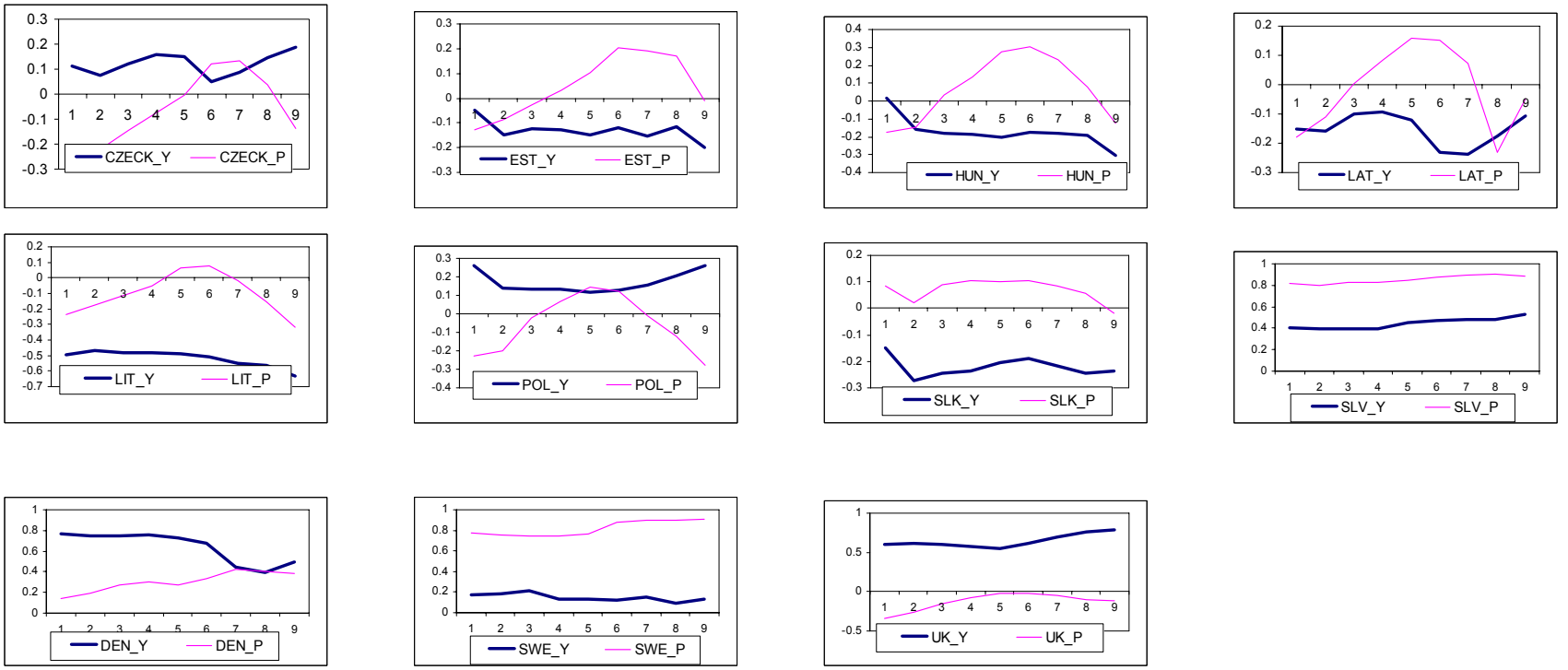
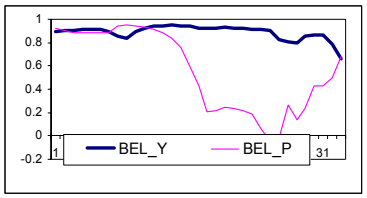
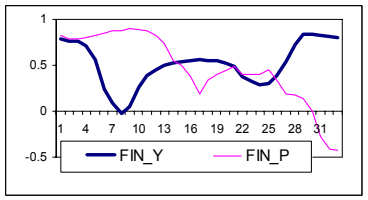
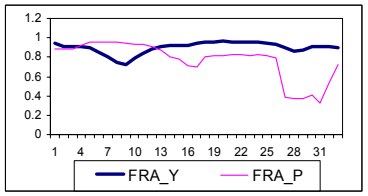
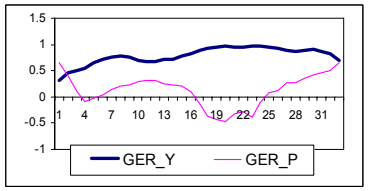


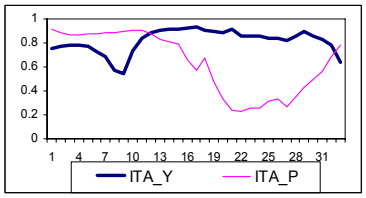
Figure 3B. Five years rolling window correlation coefficients with Euro area - growth rates 1986.1-1998.4

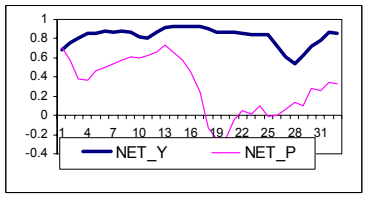


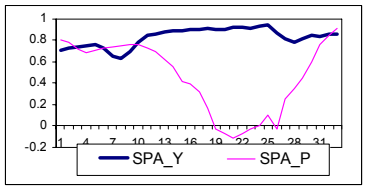


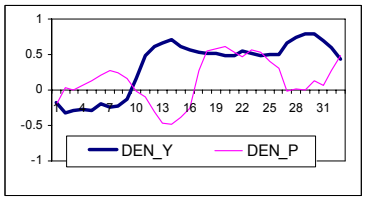


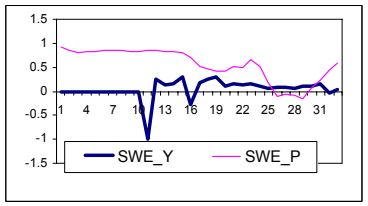












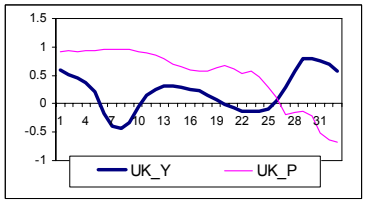


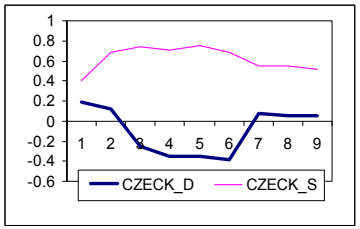
Table 6. Correlation coefficients with Euro area - SVAR real GDP and inflation

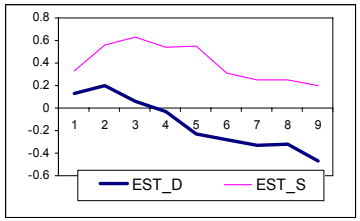
	1998.1-2002.4		1998.1-2000.4		2001.1-2002.4	
	d	s	d	s	d	s
Czech Republic	0.20	0.34	0.19	0.40	0.21	0.39
Estonia	-0.06	0.33	0.13	0.34	-0.51	0.31
Hungary	-0.09	0.45	-0.29	0.32	0.53	0.65
Latvia	0.36	-0.10	0.29	0.06	0.49	-0.17
Lithuania	-0.49	-0.07	-0.45	-0.09	-0.66	-0.02
Poland	0.41	0.40	0.53	0.52	0.22	0.29
Slovak Republic	0.26	0.03	0.32	0.01	0.13	0.10
Slovenia	-0.05	0.07	-0.14	-0.06	0.16	0.18
Denmark	0.20	0.35	0.50	0.07	-0.25	0.70
Sweden	0.25	0.18	0.13	-0.10	0.40	0.71
United Kingdom	0.15	0.23	0.05	0.40	0.30	0.05
Accession countries	0.07	0.18	0.07	0.19	0.07	0.22
Non Monetary Union	0.20	0.26	0.23	0.13	0.15	0.49

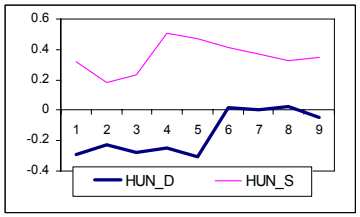
	1988.1-1998.4		1988.1-1992.4		1993.1-1998.4	
	d	s	d	s	d	s
Belgium	0.56	0.53	0.63	0.59	0.47	0.53
Finland	0.43	0.06	0.34	0.05	0.50	0.02
France	0.74	0.60	0.84	0.58	0.63	0.70
Germany	0.48	0.34	0.49	0.21	0.53	0.57
Italy	0.48	0.46	0.60	0.40	0.37	0.58
Netherlands	0.14	0.28	-0.04	0.14	0.29	0.54
Spain	0.30	0.46	0.00	0.52	0.74	0.40
Denmark	-	-	-	-	0.29	-0.04
Sweden	-	-	-	-	0.31	0.19
United Kingdom	-	-	-	-	0.36	0.37
Euro area	0.45	0.39	0.41	0.36	0.50	0.48
Non Monetary Union	-	-	-	-	0.32	0.17

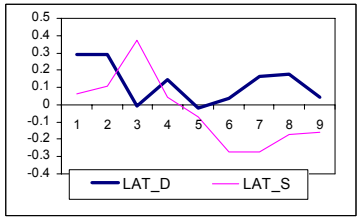
d: Demand shocks
s: Supply shocks

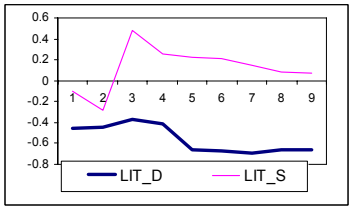
Figure 4A. Three years rolling window correlation coefficients with Euro area - SVAR real GDP and inflation 1998.1-2002.4

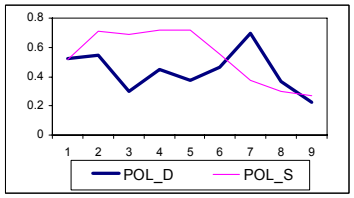


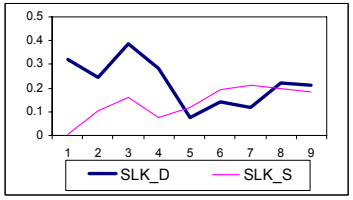


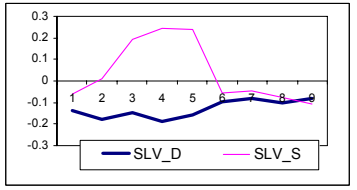


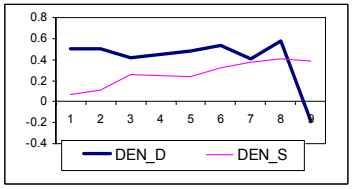


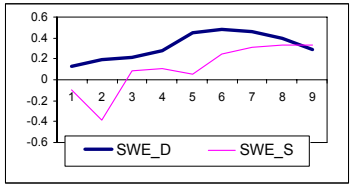












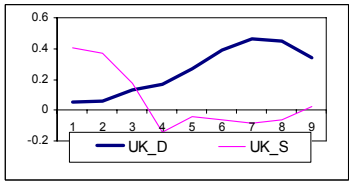
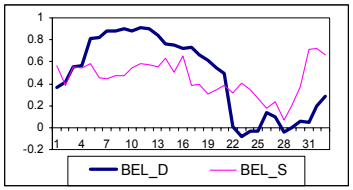
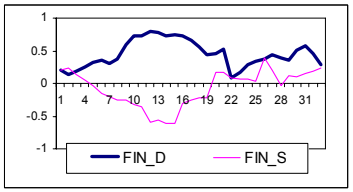
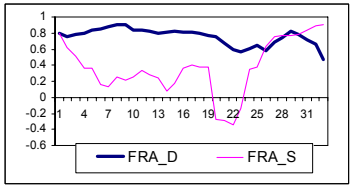
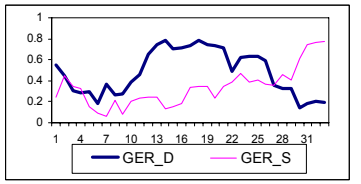


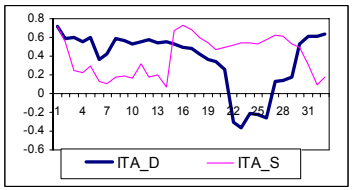
Figure 4B. Three years rolling window correlation coefficients with Euro area - SVAR real GDP and inflation 1988.1-1998.4

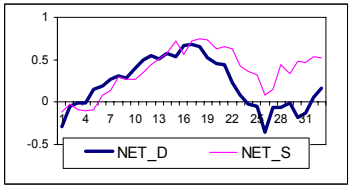


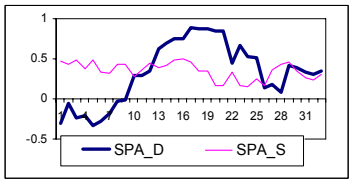


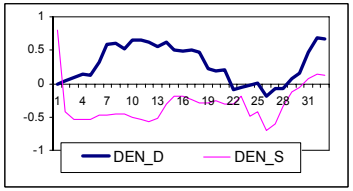


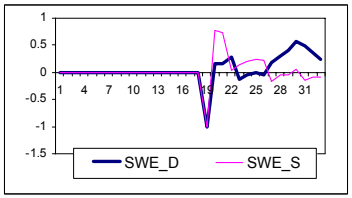












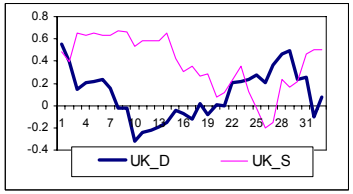


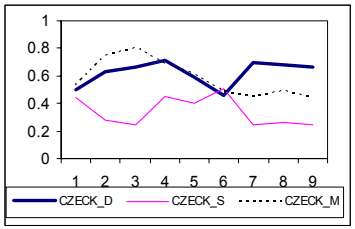
Table 7. Correlation coefficients with Euro area - SVAR Real GDP, Real interest rates and inflation

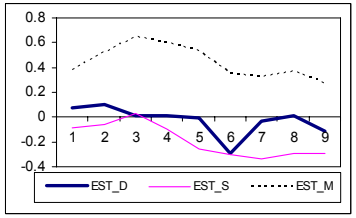
	1998.1-2002.4			1998.1-2000.4			2001.1-2002.4		
	d	s	m	d	s	m	d	s	m
Czech Republic	0.54	0.23	0.41	0.50	0.45	0.53	0.60	0.28	0.27
Estonia	0.10	-0.06	0.39	0.08	-0.09	0.38	0.21	-0.16	0.36
Hungary	0.24	-0.29	0.41	-0.07	-0.46	0.13	0.53	0.12	0.78
Latvia	-0.07	0.12	0.18	0.27	0.16	0.40	-0.24	0.08	0.16
Lithuania	0.12	-0.22	0.06	0.06	-0.20	0.09	0.27	-0.46	0.00
Poland	0.30	0.50	0.43	-0.21	0.58	0.53	0.70	0.30	0.29
Slovak Republic	-0.09	0.44	0.24	0.05	0.59	0.27	-0.30	-0.06	0.12
Slovenia	0.09	-0.22	0.17	0.29	-0.16	0.04	-0.46	-0.44	0.24
Denmark	0.28	0.40	0.37	-0.02	0.53	0.15	0.43	0.20	0.53
Sweden	-0.23	0.25	0.12	-0.83	0.11	-0.15	-0.05	0.43	0.69
United Kingdom	-0.02	0.19	0.14	0.37	-0.26	0.32	-0.81	0.65	-0.15
Accession countries	0.15	0.06	0.29	0.12	0.11	0.30	0.16	-0.04	0.28
Non Monetary Union	0.01	0.28	0.21	-0.16	0.13	0.11	-0.14	0.43	0.35

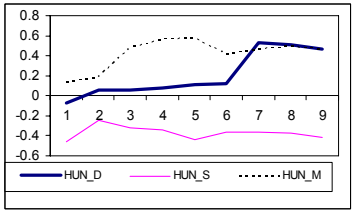
	1988.1-1998.4			1988.1-1992.4			1993.1-1998.4		
	d	s	m	d	s	m	d	s	m
Belgium	0.30	0.54	0.48	0.39	0.51	0.53	0.30	0.60	0.46
Finland	0.36	0.31	0.13	0.48	0.25	0.18	0.24	0.38	0.06
France	0.32	0.46	0.38	0.34	0.56	0.44	0.33	0.37	0.39
Germany	0.25	0.55	0.41	0.05	0.58	0.35	0.50	0.54	0.59
Italy	0.17	0.35	0.28	0.20	0.49	0.25	0.09	0.22	0.36
Netherlands	-0.07	0.01	0.29	-0.17	-0.19	0.09	0.08	0.40	0.74
Spain	0.32	0.29	0.36	0.34	0.03	0.39	0.32	0.76	0.39
Denmark	-	-	-	-	-	-	0.25	0.47	0.24
Sweden	-	-	-	-	-	-	-0.09	0.07	0.06
United Kingdom	-	-	-	-	-	-	0.28	0.21	0.41
Euro area	0.24	0.36	0.33	0.23	0.32	0.32	0.27	0.47	0.43
Non Monetary Union	-	-	-	-	-	-	0.15	0.25	0.24

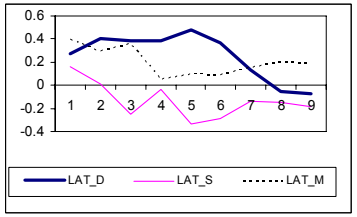
d: "Real" demand shocks
s: Supply shocks
m: Monetary shocks

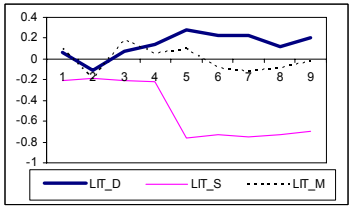
Figure 5A. Three years rolling window correlation coefficients with Euro area - SVAR Real GDP, Real interest rates and inflation 1998.1-2002.4

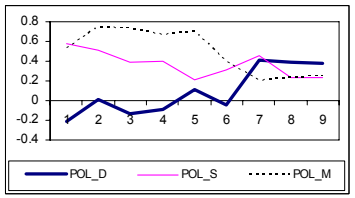


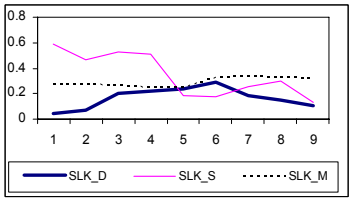


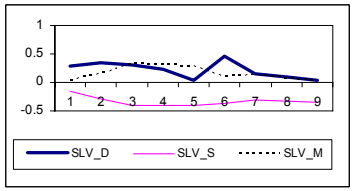


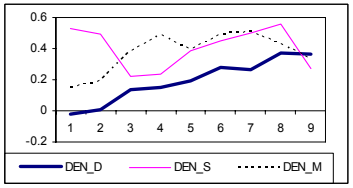


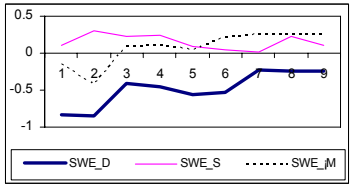












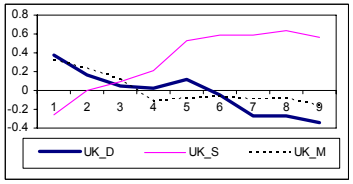


Figure 5B. Three years rolling window correlation coefficients with Euro area - SVAR Real GDP, Real interest rates and inflation 1988.1-1998.4

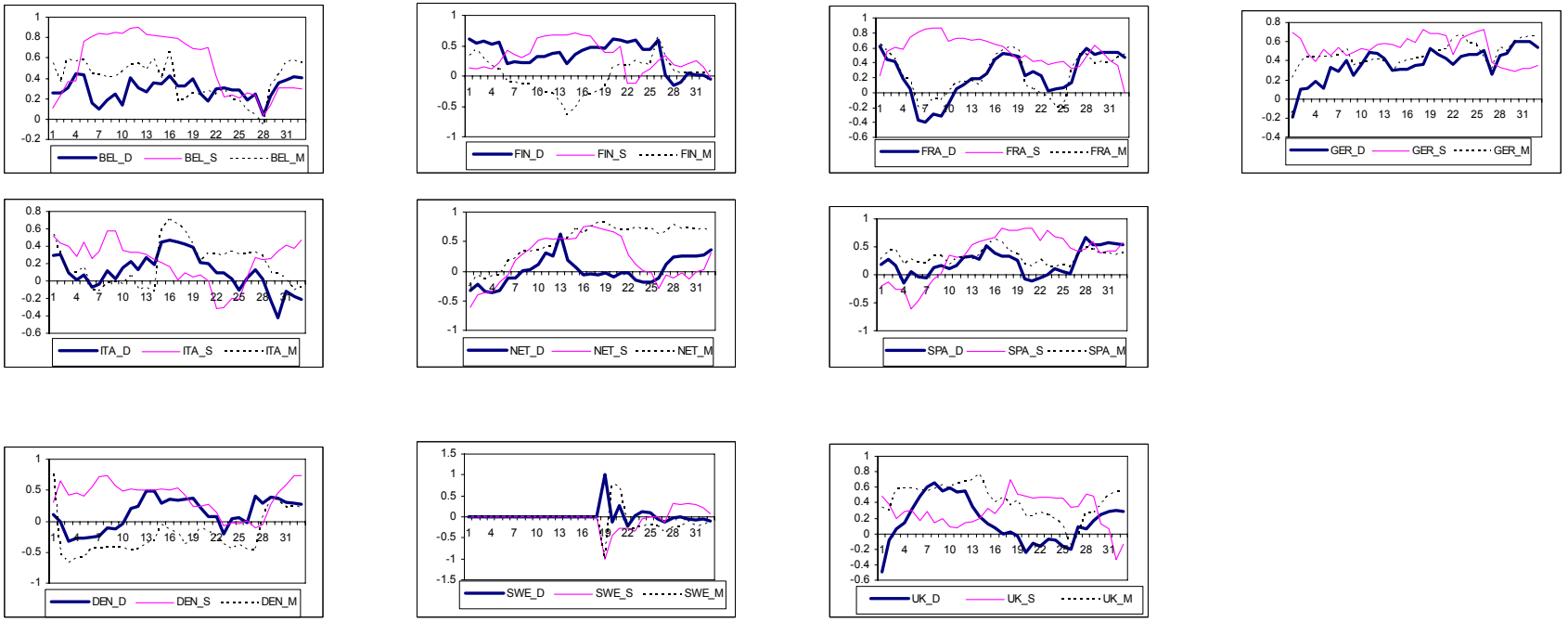


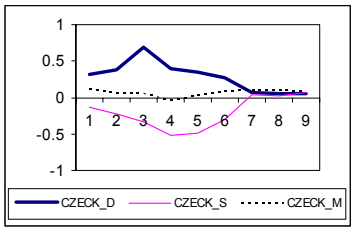
Table 8. Correlation coefficients with Euro area - SVAR Real GDP, Real Exchange Rate and Inflation

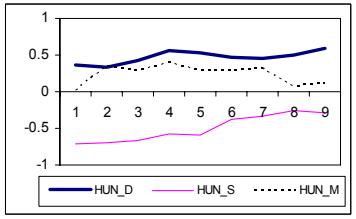
	1998.1-2002.4			1998.1-2000.4			2001.1-2002.4		
	d	s	m	d	s	m	d	s	m
Czech Republic	0.17	0.14	0.09	0.31	-0.13	0.12	0.09	0.52	-0.05
Hungary	0.52	-0.45	0.05	0.37	-0.72	0.01	0.68	0.48	-0.08
Poland	0.22	0.03	-0.03	0.35	-0.03	0.01	0.10	0.16	-0.17
Slovak Republic	0.02	-0.08	0.10	-0.16	-0.12	0.20	0.32	0.09	-0.02
Denmark	0.16	0.27	0.78	-0.18	0.42	0.69	0.52	0.23	0.77
Sweden	0.46	-0.19	-0.13	0.29	-0.23	-0.04	0.63	-0.27	-0.02
United Kingdom	0.19	-0.21	-0.33	0.34	-0.23	0.11	0.03	-0.31	-0.57
Accession countries	0.23	-0.09	0.05	0.22	-0.25	0.09	0.30	0.31	-0.08
Non Monetary Union	0.27	-0.04	0.11	0.15	-0.01	0.25	0.39	-0.12	0.06

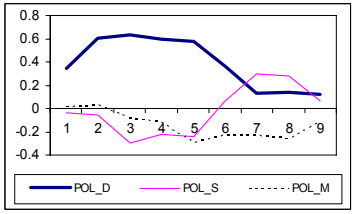
	1988.1-1998.4			1988.1-1992.4			1993.1-1998.4		
	d	s	m	d	s	m	d	s	m
Belgium	0.54	0.59	0.69	0.54	0.59	0.75	0.59	0.54	0.69
Finland	-0.01	0.25	0.19	-0.05	0.11	0.27	-0.03	0.44	0.13
France	0.62	0.60	0.60	0.58	0.74	0.62	0.76	0.35	0.59
Germany	0.40	0.53	0.47	0.35	0.65	0.65	0.51	0.39	0.38
Italy	0.40	0.34	0.24	0.30	0.17	0.42	0.56	0.52	0.14
Netherlands	0.32	0.06	0.69	0.19	0.06	0.78	0.57	-0.07	0.61
Spain	0.39	0.26	0.28	0.44	0.01	0.13	0.35	0.69	0.41
Denmark	-	-	-	-	-	-	-0.08	0.25	0.69
Sweden	-	-	-	-	-	-	0.45	0.31	0.20
United Kingdom							0.37	-0.02	-0.50
Euro area	0.38	0.37	0.45	0.34	0.33	0.52	0.47	0.41	0.42
Non Monetary Union	-	-	-	-	-	-	0.24	0.18	0.13

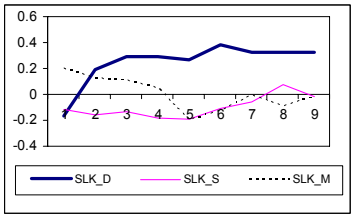
d: “Real” demand shocks
s: Supply shocks
m: Monetary shocks

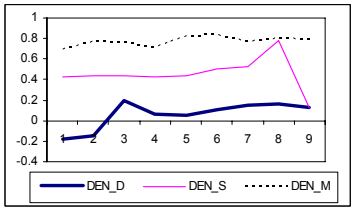
Figure 6A. Three years rolling window correlation coefficients with Euro area - SVAR Real GDP, Real Exchange Rate and Inflation 1998.1-2002.4

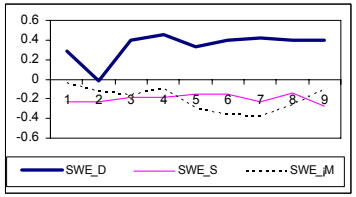












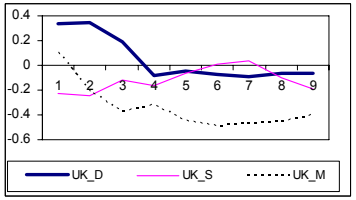


Figure 6B. Three years rolling window correlation coefficients with Euro area - SVAR Real GDP, Real Exchange Rate and Inflation 1988.1-1998.4