

DEPARTMENT OF ECONOMICS

**One Money and Fifteen Needs
Inflation and Output Convergence
in the European Monetary Union**

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ONE MONEY AND FIFTEEN NEEDS

INFLATION AND OUTPUT CONVERGENCE IN THE EUROPEAN MONETARY UNION

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1. Introduction

In January 1999 the Economic and Monetary Union was established. The member countries abandoned their national currencies and adopted a common currency, the euro, and a common monetary policy.

Adopting a common currency is supposed to bring a number of advantages to the member states of a monetary union, such as deeper product and financial market integration, increased trade and capital flows and ultimately increased growth.

But by joining a monetary union, a country forgoes the ability to use domestic monetary policy to respond to country-specific macroeconomic disturbances. Monetary policy in a monetary union is the responsibility of the central monetary authority, in this case the European Central Bank (ECB). This central authority pursues monetary policy taking into account the overall situation in the union. Hence, for an individual country, the more its macroeconomic position is in line with the union's average, the less the costs for that country of belonging to the union. Put differently, the more similarity between the individual countries belonging to a monetary union, the easier the task of the union's central bank. One could even argue that the long run success and political viability of a monetary union depends on it.

In this paper we analyze whether the ECB's monetary policy has become more balanced towards the needs of the individual member states with the passage of time. We assume that the ECB's monetary policy stance is in line with a Taylor rule and based on the overall situation in the Euro area, more specifically on the Euro area inflation rate and the overall business cycle position in the area. This assumption is confirmed by many researchers (see e.g. Breuss, 2002; Fourçans and Vranceanu, 2002, Sauer and Sturm, 2003, Ulrich, 2003). The question therefore boils down to investigating whether inflation and business cycles have converged since the start of the monetary union.

We show that the ECB, if in existence in the 1990s, would have had an impossible task. This is because inflation and business cycles still strongly differed in that time, although convergence substantially increased in the run up to the monetary union. In this respect, the decade under EMU drastically differs from the preceding one. This being said, the evidence for a further improvement in the course of the first decade of the new millennium is mixed. This is because although inflation has further converged, business cycles have shown more divergence. If, however, we are willing to put weights on inflation and output gap (as it is the case with the Taylor-rule), we conclude that also over the course of the period under EMU there has been a further improvement. This is simply because the Taylor-rule, being a rule for the *nominal* interest rate, puts a higher weight on inflation convergence than on business cycle convergence. Looking at individual countries, we show the ECB's interest rate was the least fitted to the needs of Ireland, Greece, Spain and Portugal (too low) and Austria and Germany (too high).

The remainder of this paper is as follows. First we analyze to what extent the basic variables that drive the ECB's interest policy have converged or diverged since the beginning of the 1990s and over the last decade, after the monetary union was established. This is done for inflation (section 2) and output (section 3) consecutively. In section 4 we analyze for which countries the ECB's policy has been most (least) appropriate, given their domestic needs, and whether the appropriateness of the ECB's interest policy to the needs of the individual member states has changed over time. Finally, section 5 concludes.

Throughout the paper we use a consistent data set taken from OECD for the period 1990-2009. We use yearly data. Data for 2009 are estimations. We include Greece¹ for the whole period and do not include the latest newcomers Cyprus, Malta and Slovenia². This brings the number of included countries at twelve: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal and Spain.

¹ Greece became member in 2002.

² Cyprus and Malta joined in 2007, Slovenia in 2008.

2. Inflation convergence

Figure 1 shows the evolution of inflation and of various measures of inflation dispersion across the Euro area in the period 1990-2009.³ The two decades (1990-99 and 2000-2009) roughly coincide with the pre-EMU and the EMU period. Inflation is measured by the percentage change from the previous year of the harmonized consumer price index, the indicator for price stability used by the ECB. We consider the range, the un-weighted standard deviation and the un-weighted mean absolute deviation as measures of dispersion.

Figure 1

It is readily seen that, judged by whatever measure, the run up to the monetary union was accompanied by a continuous drastic fall in inflation dispersion, which reached a minimum in 1999. After the start of the monetary union, inflation dispersion across the Euro area, however, slightly *increased* again and remained somewhat higher for a number of years. Actually, it took until 2004 or later (depending on which measure), for inflation dispersion to be back at the 1999 level. Since then inflation dispersion has further come down, with a brief interruption in 2008, after which, in 2009, it is expected to revert to the 2007 level. Overall, the figure reveals that inflation dispersion has declined appreciably since the beginning of the 1990s and under EMU, with a temporary upsurge shortly after the common currency was adopted.

What explains this evolution of inflation dispersion? The drastic fall of inflation dispersion in the 1990s has been explained by the EU member countries aiming to fulfill the inflation convergence criterion laid down by the Maastricht Treaty. The increased dispersion shortly after the introduction of EMU has attracted the attention of many researchers. Several explanations co-exist. A first possible explanation is price *level* convergence. Countries with different price levels that start a monetary union may

³ All data are obtained from OECD Economic Outlook 84 database (November 2008).

experience high inflation divergence as a result of a process of price equalization across the union. All by all, the law of one price states that prices of similar tradable goods, when expressed in a common currency, will be equalized internationally. In a monetary union, prices are expressed in the same currency, which makes price comparison across borders even easier. If price level equalization operates, countries with lower initial price levels will exhibit higher inflation rates than countries with higher initial price levels. Price level equalization has been emphasized by the ECB as an explanation for inflation dispersion in a monetary union (ECB, 1999), and has been shown to be *part* of the explanation for increased inflation divergence after the start of the monetary union (see Rogers, 2002; Duarte, 2002; ECB, 2003, Honohan and Lane, 2003). The role of price level convergence has since then declined (Stravrev, 2008).

A second possible explanation for the observed evolution in inflation dispersion in the union relies to differences in productivity levels and related catching-up processes of productivity growth. This argument refers to the Balassa-Samuelson mechanism. Countries starting with relatively low productivity levels and experiencing high productivity growth due to a catching-up process will in general also experience higher inflation. The reason for this lies in the wage formation mechanism. Productivity growth differences between countries can often be traced back to differences in labor productivity in the tradable goods sector (industry). In the non-tradable goods sector (mostly services), where productivity increases are much smaller, the difference between countries are only minor. If the shares of labor and capital in value added remain constant over time, wage increases in the tradable goods sector will equal the sum of productivity growth in this sector and the rate of change of output prices (the latter being the same in all countries in the union). If also in the non-tradable goods sector labor and capital manage to keep their shares in value added unchanged, price increases in the non-tradable goods sector will equal the rate of change of wages in this sector minus the rate of growth of productivity. Finally, wage increases in the high-productivity tradable goods sector often serve as a benchmark for wage increases in the low-productivity non-tradable goods sector. The upshot of all this is that countries with the highest productivity growth will also experience the highest inflation (due to higher inflation in the non-tradable goods

sector). The Balassa-Samuelson mechanism as an explanation for inflation dispersion in the monetary union has been confirmed by Canzoneri et al. (2002), even if not all assumptions underlying it can be found to work in practice.

Different cyclical positions constitute the third explanation for inflation divergence. According to Marzinotto (s.d.) this is the main reason, catching-up processes explaining only 40% of inflation dispersion in the few years after the start of EMU. Statistically significant correlations between inflation and output gaps have been found by ECB (2003), Honohan and Lane (2003) and Balasz et al. (2004).

Honohan and Lane (2003) offer an interesting explanation for the increased inflation dispersion in the EMU in the period 1999-2003. This period was for the largest part characterized by a weakening euro. They argue that different exposure of member countries to international trade with non-euro nations gave them a different sensitivity to the weakness of the euro on international currency markets. Countries that import much from non-euro nations were more affected by the euro weakness, since they suffered more from increasing import prices. This argument should work symmetrically and implies euro appreciation to be accompanied by convergence of inflation, a prediction that is consistent with the increased inflation convergence after 2003 and especially in 2007-2008, when the euro appreciated considerably against the dollar. Note that Honohan and Lane's (2003) argument can be extended to include the different exposure of the EMU members to imported energy or other cost components such as basic food prices or raw materials.

Summing up, various explanations can be offered for the existence of inflation differential among the EMU members. These explanations relate to catching-up processes, differences in cyclical positions, import price increases combined with different exposure to non-euro countries, and differences in wages and productivity. Catching-up processes are by nature temporary, but the other explanations refer to long-lasting mechanisms. The implication of this insight is that inflation differentials will never be fully eliminated. Buseti et al. (2007) e.g. prove the existence of two stable

clusters in the period 1999-2004: a lower-inflation group comprising Germany, France, Belgium, Austria and Finland, and a higher-inflation one consisting of Spain, the Netherlands, Greece, Portugal and Ireland. Italy falls between the two. Stravrev (2008) shows that the remaining inflation dispersions are small but persistent, relating mainly to country-specific shocks (cost dispersions and diverging external positions) and not differences in the transmission of common shocks.

3. Business cycle synchronization

Interest rate setting of the ECB is not exclusively determined by its eagerness to fight inflation. In practice, output stabilization also turns out to be taken into consideration. This is consistent with the ECB's final target as defined in Article 105(1) of the EC Treaty:

The primary objective of the ESCB [European System of Central Banks] shall be to maintain price stability. Without prejudice to the objective of price stability, the ESCB shall support the general economic policies in the Community with a view to contributing to the objectives of the Community as laid down in Article 2.

Figure 2

In article 2 these general objectives are defined as, among other things, sustainable non-inflationary growth and a high level of employment.

Figure 2 therefore looks at the degree of convergence in business cycle positions across the euro zone. We use the output gap, defined as the difference between actual output and potential output as a percentage of potential output, to define whether a country experiences a boom (positive output gap) or a recession (negative output gap). Further, we use the same statistics as for inflation convergence to determine whether output gap dispersion has increased or decreased. As was the case with inflation, output gaps

increasingly converged in the run up to the monetary union. This increased synchronization of business cycles in the run up to the monetary union can partly be explained by the fiscal convergence induced by the Maastricht fiscal criterion (Darvas et al., 2005). The picture under the new regime of monetary union, however, is exactly the opposite of that observed for inflation. After a brief interruption in 1999-2000, output gap dispersion further decreased and was at its lowest level in 2003. Yet, from 2005 onwards dispersion again increased and by 2008 it was back at its pre-2000 level. Provisions for 2009 reveal a sharp recession, with the average value of the output gap reaching -2.87 (the lowest since the beginning of the 1990s), and an increase in all three measures of output dispersion as a result of the recent financial turmoil. All by all, the evolution of the output gap strongly differs from that observed for inflation. While, after an initial increase, there is some tendency for inflation dispersion to decrease, there is no such tendency for the output gap. On the contrary, output gap dispersion on average is higher in the period 2005-09 than in the preceding five-year period 2000-05. Hence, we conclude that monetary integration has not gone hand in hand with increased business cycle synchronization up till now⁴. This conclusion is shared by Gayer (2007) who finds besides a recurrent pattern of falling business cycle synchronization in early recovery phases in the member states, that the evidence for increased synchronization since the introduction of the euro (compared to the nineties) is sparse.

Several explanations can be put forward to explain the absence of business cycle convergence in the monetary union. They relate to differences in demand positions, e.g. as a result of differences in the fiscal stance. As shown by Pisani-Ferry et al. (2008) only a few member states have consistently run countercyclical fiscal policies since the euro was adopted, large member countries in particular having had a tendency to run procyclical ones.

An interesting explanation for the lack of business cycle convergence refers to the differentiated effect of the common monetary policy in combination with the observed

⁴ Ireland being a somewhat special case we also computed the relevant statistics excluding this country. This hardly affects the results.

dispersion of national inflation rates. One channel is the real interest rate effect. In a monetary union with a single (or converging) nominal interest rate, countries with differentiated inflation rates will face different real interest rates. High inflation countries will benefit from lower than average real rates. These real interest differentials can explain the absence of real convergence. More worrying, they tend to be self sustaining: countries with slow growth tend to have low inflation and hence, with a common nominal interest rate, higher real rates. This may exacerbate the growth differentials.

A second possible channel relates to the real exchange rate and international competitiveness. With a common nominal exchange rate, inflation differentials imply different real exchange rate movements. High inflation countries face a real appreciation and deterioration in international competitiveness, which may produce slower economic growth or recession. Low inflation countries are characterized by real depreciation and may experience an export boom. Together with the real interest rate channel, the real exchange rate mechanism may give rise to complicated boom-bust cycles (Honohan and Lane, 2003; European Commission, 2006).

4. ECB's interest setting and the needs of individual member countries.

With the information in mind that the member countries business cycles have not converged since the start of the monetary union, but that inflation after an initial period of increased dispersion has, we may now ask the question for which countries the ECB's interest rate setting has been most appropriate and whether on average the ECB's interest rate setting has been increasingly in line with the needs of the individual countries.

To answer these questions we assume that the ECB's interest policy can be described by a simple Taylor rule. As a first approximation we simply assume that inflation and business cycle stabilization *at the euro area level* constitute the two objectives of the ECB, without putting any weight on them. For an individual member state this gives rise to four different positions when compared to the euro area average. This is shown in

figure 3, with Belgium as an example. The horizontal axis measures a country's output gap deviation from the euro area, whereas the vertical axis measures its deviation of the inflation rate. The resulting four quadrants define four positions. In the north-east quadrant the interest rate set by the ECB is too low for the needs of the individual country, since both the higher than average inflation rate and the higher than average output gap require a higher domestic interest rate. The opposite is true for the south-west quadrant: here the ECB interest rate is set too high for the country concerned. The other quadrants have the advantage of the doubt, since they are characterized by a positive (negative) inflation differential and a negative (positive) output gap differential.

Figure 3 (a) – (b)

The evidence presented in figure 3 shows that for Belgium a large number of observations fall in the 'wrong' quadrants. This holds for the pre-EMU period (2 observations out of 10), as well as for the EMU-period (5 out of 10). Taking all countries together, about half of the observations are situated in the wrong quadrants. Apparently, there is no difference between the period before and after the introduction of the euro. Neither is there any indication of a move towards the 'good' quadrants as the years under EMU go by.

Besides the position in the various quadrants, we can also look at the deviation from the optimal point, i.e. the origin. This can be measured by looking at the sum of the output gap deviation and inflation deviation (both in absolute value). The results for this absolute deviation measure are shown in table 1, for the different countries and sub-periods. The results show that for all countries except Ireland, the absolute deviation is much lower in the first decade of the new millennium than in the last decade of the previous one. In other words, convergence has been much higher under EMU than before. Yet, when we split the last period into two five years periods, it is seen that six countries show a further improvement in the second sub-period as compared to the first.

Table 1

If we are willing to put weights on the central bank objectives we can go one step further. Taylor (1993) showed that the central bank sets the interest rate based on the deviation of the actual inflation rate from the target inflation rate and on the output gap. The desired interest rate is then given by:

$$r_{it}^* = \rho + \pi_{it} + \theta(\pi_{it} - \pi^*) + (1 - \theta)y_{it} \quad (1)$$

where r^* is the nominal desired short-term interest rate, ρ the equilibrium real interest rate, π the actual and π^* the target inflation rate; θ and $(1 - \theta)$ are the weights given to the inflation objective and the output objective, respectively and y is the output gap. The subscripts i and t are country and time indexes, respectively. Taylor further showed as good approximations that the inflation target and the equilibrium real interest rate both equal 2% and that the weights on inflation and output are equal ($\theta = 0.5$). Consequently, we get the following equation (in percent):

$$r_{it}^* = 1 + 1.5\pi_{it} + 0.5y_{it} \quad (2)$$

Applied to the monetary union, in determining the interest rate the ECB focuses on the euro area as a whole, i.e.

$$r_{EMU,t}^* = 1 + 1.5\pi_{EMU,t} + 0.5y_{EMU,t} \quad (3)$$

With equal weights for all member countries, this Taylor-based desired interest rate for the euro area can be compared with the desired Taylor-based interest rate for each individual member country, which gives the following result:

$$r_{i,t}^* - r_{EMU,t}^* = 1.5(\pi_{i,t} - \pi_{EMU,t}) + 0.5(y_{i,t} - y_{EMU,t}) \quad (4)$$

Figure 4 (a)-(c) shows the result of this computation. For each member country the average difference between the domestic Taylor-based interest rate and the Euro area Taylor-based interest rate is shown. The average ‘mismatch’ for different sub-periods are reported in table 2. It is readily seen that the period under EMU drastically differs from the preceding decade. For each country the average difference between the two Taylor interest rates is substantially lower in the second period. This is simply the mirror image of the higher convergence of inflation and output gaps in the decade 2000-09, compared to the previous decade 1990-99. Put differently, the ECB if in existence in the 1990s, would have had an impossible task. Furthermore, comparing the first five years under EMU with the last ones, there is now again a remarkable improvement. The explanation is that the Taylor-rule, being a rule for the *nominal* interest rate gives three times more weight to inflation than to the output gap.

Figure 4 (a)-(c)

Table 2

Looking at the individual countries, the results show that the ECB’s interest rate was on average too low for Ireland and Greece and, albeit to a lesser extent, for Spain and Portugal. The interest rate was, on average, too high for Germany and Austria. For the other countries the differences are on average smaller. The ECB’s desired interest rate on average corresponded most to the domestic needs of Italy.

Since a low average difference with the optimal interest rate can be the result of compensating high positive and negative values, we also report the average absolute difference with the optimal interest rate. This statistic confirms that over the entire period the deviations from the optimal interest rate were the largest in Ireland and Greece, and the smallest in Italy. It also shows that there were relatively high mismatches for the Netherlands and Finland.

5. Conclusions

In this paper we showed that the differences among the EMU member countries with respect to inflation and business cycle positions, make it difficult for the ECB to define an optimal interest rate that suits the needs of the individual states. This is the well-known 'one size fits all' problem that characterizes a monetary union. Looking at the entire period since the start of the monetary union (2000-09), the interest rate was on average too low for Ireland, Greece, Spain and Portugal and too high for Germany and Austria. Although, on average more in line with the domestic needs, there were also frequent mismatches for the Netherlands and Finland. The interest rate was the most adapted to Italy.

This being said, there are two qualifying remarks. The first is that compared to the pre-EMU decade (1990-99), the ECB's task is drastically easier. This is simply because the member states had not yet converged enough in this period, especially with respect to their inflation rates. The second remark concerns the tendency over time for the ECB's desired rate to become more in line with the needs of the members. This can be seen by comparing the 2005-09 period with the period 2000-04 and follows predominantly from the fact that inflation rates have increasingly converged. The same cannot be observed with respect to the output gaps, and it remains to be seen to what extent the recession will affect the member states' output gaps differently in the future.

The convergence of inflation rates has, however, definitely made the task of the ECB easier. Yet, also here there is no guarantee for the future. A positive observation is that the recent upsurge in inflation has not been accompanied by increasing inflation divergence. But, cyclical positions differ and there is no tendency for them to converge. Labor market institutions differ strongly and may give rise to different wage increases, even in the wake of a common shock. All these impact on inflation. Moreover, the euro appreciation which explains part of the inflation convergence is also an ending or reversing phenomenon. Finally, the inclusion of new member states, with

low price and productivity levels, and strongly different business cycles, may render the task of the ECB more difficult (see Moons & Van Poeck, 2008).

Table 1

Sum of output gap and inflation deviation (both absolute value)

	1990-99	2000-09	2000-04	2005-09
Austria	1,60	0,78	1,12	0,44
Belgium	1,47	0,91	0,83	1,00
Finland	4,67	1,53	1,24	1,83
France	1,37	0,60	0,57	0,64
Germany	1,37	1,04	0,97	1,10
Greece	8,70	2,65	2,94	2,35
Ireland	2,75	3,56	3,80	3,33
Italy	2,15	0,82	0,90	0,74
Luxembourg	3,33	1,65	1,45	1,84
Netherlands	2,25	1,83	2,17	1,49
Portugal	4,90	2,07	2,76	1,37
Spain	2,71	1,56	1,30	1,81
AVG	3,11	1,58	1,67	1,49

Table 2*Difference between domestic interest rate and Euro interest rate*

	1990-99	2000-09	2000-04	2005-09
Austria	-0,85	-0,44	-0,71	-0,17
Belgium	-1,12	0,32	-0,17	0,81
Finland	-2,25	-0,24	-0,47	0,00
France	-1,28	-0,24	-0,17	-0,30
Germany	-0,45	-0,65	-1,10	-0,20
Greece	11,89	1,92	1,53	2,30
Ireland	-0,79	1,79	3,76	-0,19
Italy	1,41	0,01	0,28	-0,25
Luxembourg	-0,63	1,12	1,11	1,13
Netherlands	-1,02	0,30	1,17	-0,56
Portugal	5,14	1,08	2,52	-0,36
Spain	1,68	1,24	1,45	1,03
AVG	0,98	0,52	0,77	0,27

Note: a minus (plus) sign indicates that the ECB interest rate is too high (low) for the country concerned.

Absolute difference between domestic interest rate and Euro interest rate

	1990-99	2000-09	2000-04	2005-09
Austria	0,91	0,54	0,81	0,26
Belgium	1,29	0,80	0,64	0,96
Finland	3,09	1,29	1,37	1,20
France	1,28	0,41	0,52	0,30
Germany	1,23	0,79	1,10	0,48
Greece	11,89	1,95	1,60	2,30
Ireland	2,17	2,91	3,76	2,06
Italy	1,45	0,38	0,48	0,28
Luxembourg	1,42	1,24	1,11	1,38
Netherlands	2,24	1,68	2,24	1,12
Portugal	5,14	1,56	2,52	0,60
Spain	1,81	1,35	1,45	1,24
AVG	2,83	1,24	1,47	1,01

Figure 1

Inflation in the Euro area (Euro12)

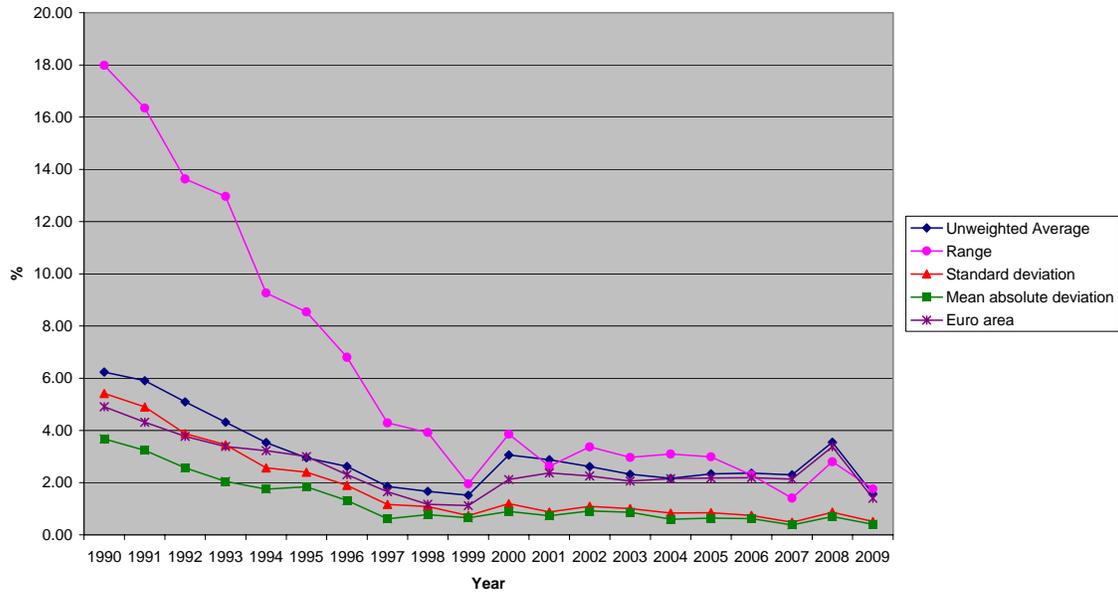


Figure 2

Output gaps in the Euro area

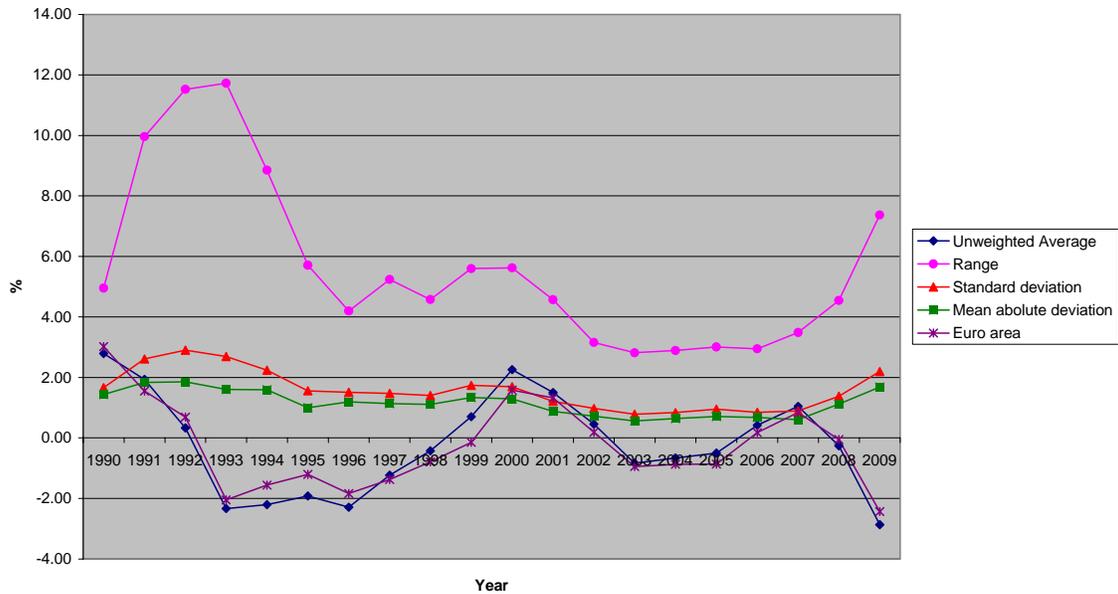


Figure 3(a)

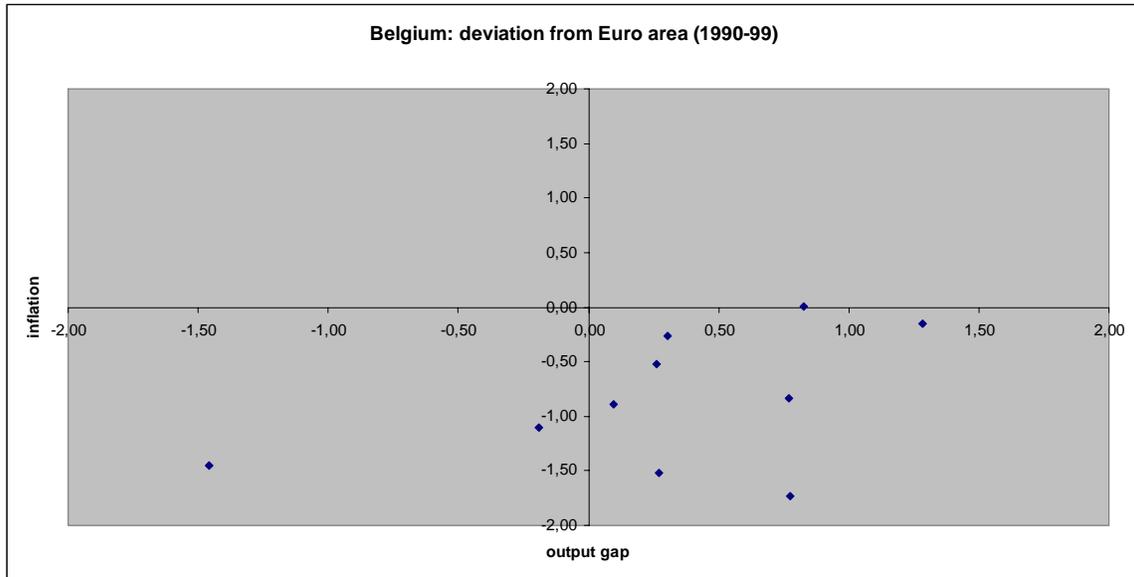


Figure 3(b)

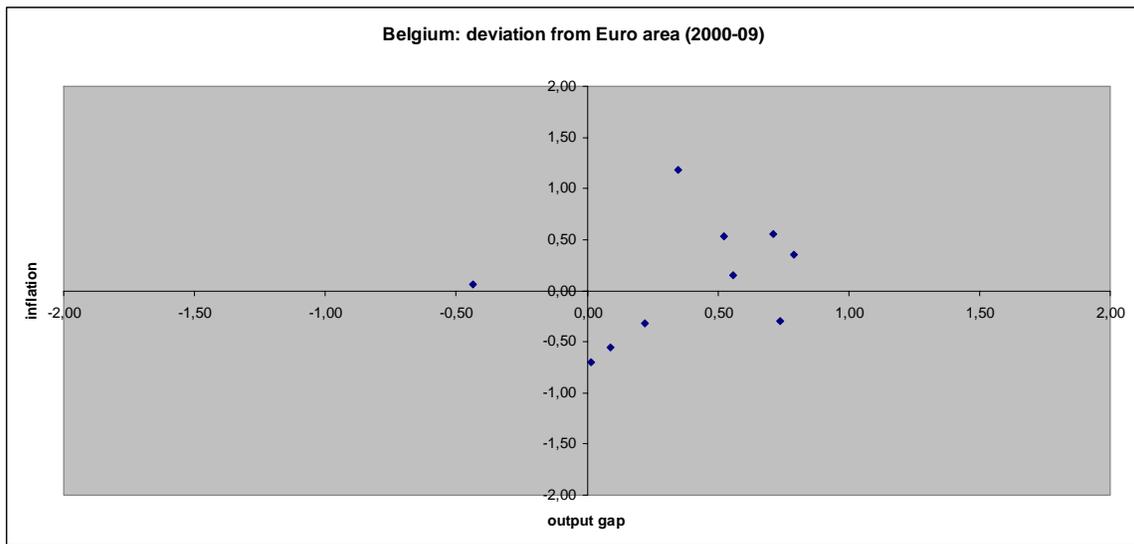


Figure 4(a)

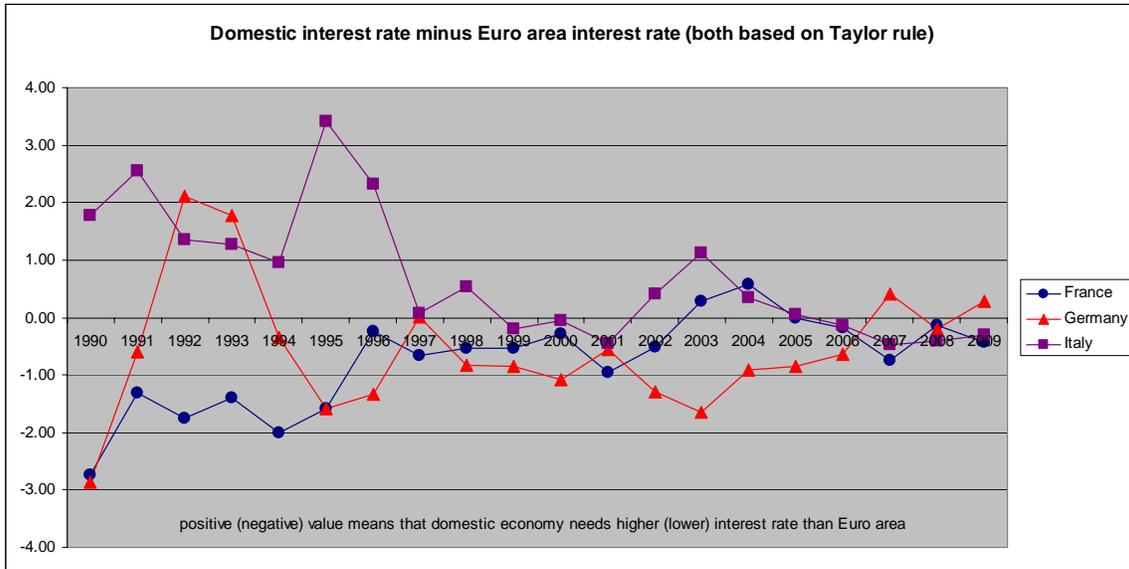


Figure 4(b)

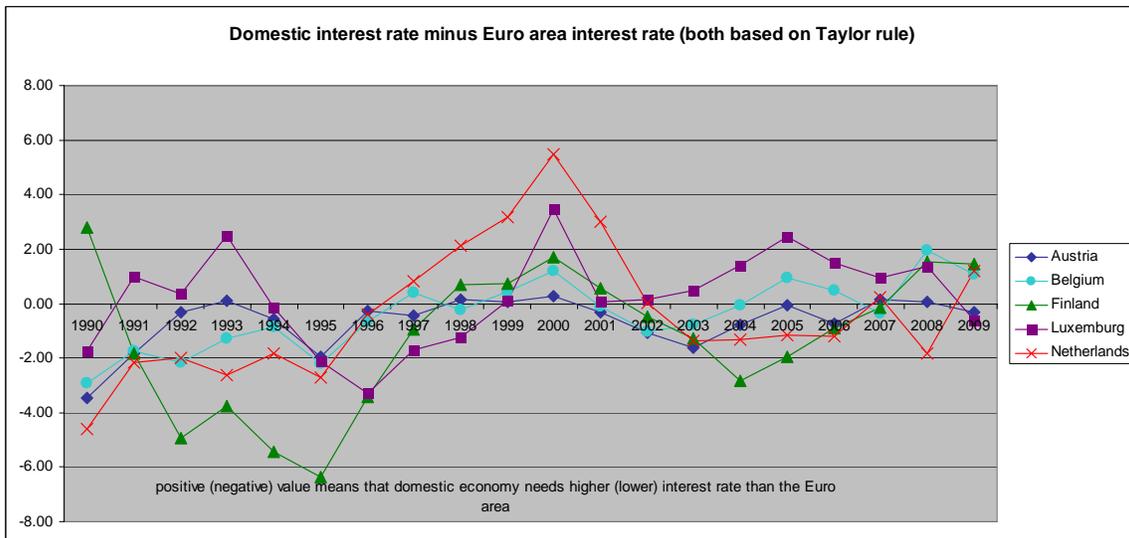
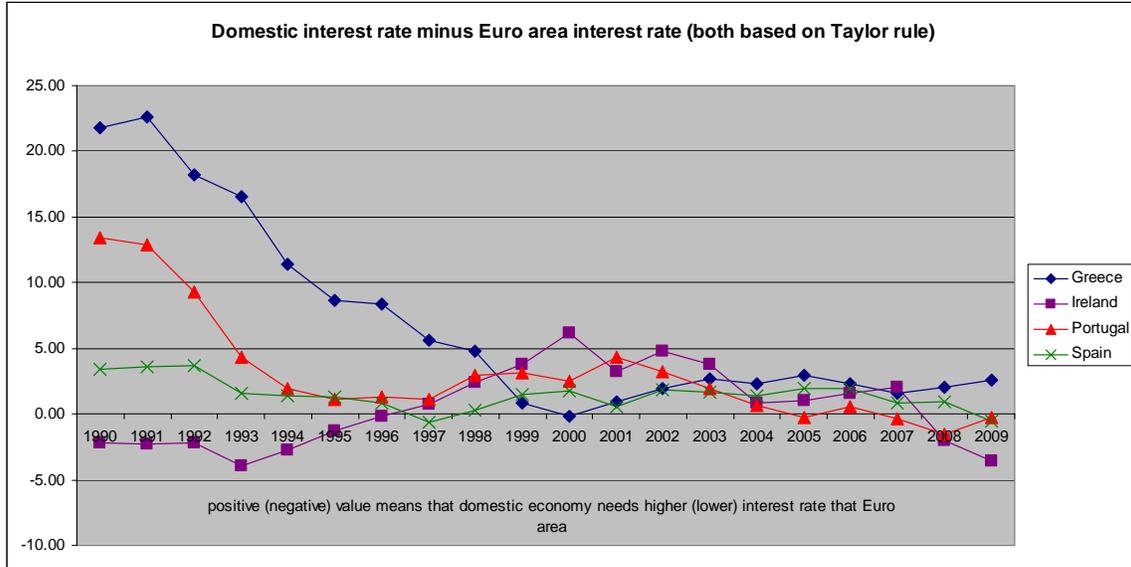


Figure 4(c)



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