

Linkages of New EU Country Currencies to the Euro^{*}

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Abstract

Ten East European countries have participated in the European Union (EU) on May 1, 2004 and then two East European countries have participated in the EU on January 1, 2007. The new EU member countries have been proceeding with economic integration with the EU member countries. The economic integration should be accelerated after they joined the EU. The countries that have strong economic relations with each other usually tend to have willingness of stabilizing their exchange rates each other. In the case of the new EU member countries, some of them might have already stabilized the exchange rates against the euro in a process of joining the EU. Or some of them will try to stabilize the exchange rates against the euro after they join the EU. In addition, the new EU member countries are trying to join the euro area within several years. In order to join the euro area, the countries have to satisfy the convergence conditions. One of the convergence conditions is to stabilize their exchange rates in terms of the euro.

In this paper we investigate empirically how the new EU member countries have conducted the exchange rate policy against the euro in the process of joining the EU. For the purpose, we use the methodology of Frankel and Wei (1994) for sub-sample quarterly periods to investigate linkages of each of the currencies with the euro after a part of EU countries introduced the euro in 1999. We conduct the empirical analysis for not only all of the new EU member countries but also future EU member candidates (Croatia and Turkey) and the three countries (Denmark, Sweden, and the United Kingdom) that have been already the EU members but have not yet joined the euro area.

Keywords: euro, new EU member countries, exchange rate policy, linkage with the euro

JEL classification: F31, F33, F36

1. Introduction

The European Union (EU) has been undergoing enlargements since its first establishment. At the same time, EU countries have been joining the euro area since it started with the first six Member States. Ten East European countries (Czech Republic, Cyprus, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, and Slovenia) participated in the EU on May 1, 2004. They had the second eastern enlargement by joining Bulgaria and Romania to the EU on January 1, 2007. The EU is composed of 27 Member States. At the same time, Slovenia was allowed to introduce the euro as the first country of the EU enlargement in 2004 after eleven EU countries create the euro area and then Greece joined it in 2001.

The countries that have strong economic relationships with each other usually tend to have willingness of stabilizing their exchange rates to reduce their foreign exchange risks. Even though countries removed custom barriers, economic agents would keep facing trade barriers such as foreign exchange costs and foreign exchange risks. At first, the monetary authorities will tend to stabilize the exchange rates to a key currency in the region. In the case of the new EU member countries, some of them might have already stabilized the exchange rates against the euro in a process of joining the EU. Or some of them will try to stabilize the exchange rates against the euro after they join the EU. In addition, the new EU member countries are trying to join the euro area within several years. In order to join the euro area, the countries have to satisfy the economic convergence conditions under the ERM (Exchange Rate Mechanism) II. One of the economic convergence conditions is for ERM II countries to stabilize their exchange rates in terms of the euro.

In this paper we investigate empirically how the new EU member countries have conducted the exchange rate policy against the euro in the process of joining the EU. For the purpose, we use the methodology of Frankel and Wei (1994) for sub-sample quarterly periods from the 1st quarter of 1999 to the 1st quarter of 2007 to the euro after a part of EU countries introduced the euro in 1999. We conduct the empirical analysis for not only all of the new EU member countries but also future EU member candidates (Croatia and Turkey) and the three countries (Denmark, Sweden, and the United Kingdom) that have been already the EU members but have not yet joined the euro area.

This paper is composed of the following sections. Section 2 reviews the situation of East European currencies since the euro started in 1999. Section 3 explains our methodology to analyze the currency system empirically. Section 4 shows our analytical results. Section 5 investigates the convergence of interest rates differentials between East European countries and euro area to consider the relationship between the change of exchange rate system and the interest rate convergences. Section 6 remarks our conclusions.

2. Overviews of the East European currencies

We overview the latest trends of East European currencies vis-à-vis the euro. Figure 1 shows the monthly movements of East European currencies studied in this paper vis-à-vis the euro in a whole sample period from December 1998 to May 2007.¹ It indicates that most of them were very stable against the euro except for the Turkish lira and the Romanian leu. For the former, the Turkish government was

¹ We calculate every currency's index vis-à-vis the euro which equals to 1 on December 31, 1998 in order to compare their movement with each other.

negotiating to enter the EU. For the latter, Romania joined in the EU on the 1 January 2007. Figure 2 shows monthly movements of the East European currencies that have entered the EU since May 1, 2004. We found that most of them were fluctuating within a band of ± 20 percents except for the Slovenian tolar and the Lithuanian lita. Especially the Estonian kroon and the Cyprus pound were moving within a very narrow band. Although the Slovenian tolar were depreciated more than 20 percents compared with the end of 1998, it has almost fixed since their joining in the EU.

Next, we overview these countries' adopting exchange rate arrangements which they officially reported to the IMF. Table 1 shows their changes from December 1997 (before the starting of the euro) to June 2005 (after the EU enlargement). In December 1997 a half of the sampled countries were reported to adopt the currency pegged arrangements while the rest of them were reported to adopt the managed floating and independently floating arrangements. In January 1999 when the euro has just started, some of currency pegging countries moved to the currency board arrangement (the Estonian kroon, the Lithuanian lita, and the Bulgaria lev) and the other conventional fixed peg arrangements (the Maltese lira and the Latvian lat). Some of managed floating countries set their crawling bands (within 2.25 percents for the Polish zloty and within 12.5 percents for the Hungarian forint). In December 2003, some of the managed floating countries widened their band (within 15 percents for the Hungarian forint) or moved to independently floating (the Polish zloty and the Turkish lira). The fixed arrangement countries did not change their regimes. In June 2004 when the EU has enlarged to 25 countries, there were no changes in their exchange rate arrangements.

The ERM II was established as a new Exchange Rate Mechanism to succeed the old European Monetary System (EMS). It maintains the exchange rate stability between the euro and non-euro EU currencies.² Denmark and Greece initially participated in the ERM II while the UK did not join in the ERM II. After Greece adopted the euro in January 2001, Denmark was the only one participant. After the new EU member countries joined the European Union on May 1, 2004, they have joined the ERM II. On June 27, 2004, the Estonian kroon, the Lithuanian lita and the Slovenian tolar joined the ERM II.³ The levels of current fluctuation margins are +/- 2.25% for Denmark and +/- 15% for Estonia, Lithuania and Slovenia. On April 29, 2005, the Cyprus pound, the Latvian lats and the Maltese lira joined the ERM II. On November 25, 2005, the Slovak koruna joined the ERM II. Their standard fluctuation margins are +/- 15% vis-à-vis the euro, too.⁴

3. Methodology

According to the methodology of Frankel and Wei (1994) and Bénassy-Quéré and Coeuré (2000), we identify the exchange rate regimes of East European countries through an equation which relates the fluctuations of each East European currency to the fluctuation of three anchor currencies which include the euro (Euro in equation (1)), the US dollar (US in equation (1)), and the Sterling pound (UK in equation (1)) as follows:

² A central rate against the euro is defined for the currency of each country not participating in the euro area but participating in the exchange-rate mechanism if the country expresses a desire to participate in this system. There is one standard fluctuation band of 15% on either side of the central rate.

³ As Slovenia adopted the euro in 2007, the Slovenian tolar was removed from the ERM II.

⁴ Please see Appendix about the ERM II countries.

$$\dot{e}_{i/kt} = a_0 + a_1 \dot{e}_{Euro/kt} + a_2 \dot{e}_{US/kt} + a_3 \dot{e}_{UK/kt} + \varepsilon_t \quad (1)$$

where \dot{e}_{ik} is rates of change in exchange rates of currency i in terms of currency k .

In the above equation, a constant term a_0 is positive (negative) if the relevant currency regularly appreciates (or depreciates) against the other anchor currencies. The coefficients a_0, a_1, a_2 are interpreted as the co-movement weights of the three anchor currencies in an implicit basket peg system.

According to the estimated coefficients, we can classify the relevant currencies into the three types of actual exchange rate regime as follows:

1. If none of the coefficient is significant, then the exchange rate system is identified as a floating system.
2. If the coefficient a_1 (a_2) does not significantly differ from a unity whereas all others are not significant, then it is identified that the currency is pegged to the euro (the US dollar).
3. If various coefficients a_1, a_2, a_3 are significant and bound by zero and one, then the currency is pegged to a basket of euro, the US dollar and the UK pound.

While this method to identify the exchange rate regime is very simple to understand, it causes the serious problem how to decide a numeraire currency k . Basically, the numeraire currency k should be traded actively in the international foreign exchange market, and should not be linked strongly to each anchor currency nor each sampled currency. In the previous works, the Swiss francs and the SDR were often used as a numeraire currency.⁵

In this paper, we especially focus on the relationship between the euro and new

⁵ Takagi (1996) and others who analyzes the coefficients of Asian currencies use the Swiss francs, while Frankel et al., use a basket currencies as the numeraire (the SDR in Frankel and Wei, 1995; a basket of five major currencies weighted by GDPs in Frankel et al., 1999).

EU currencies, so we add the Japanese yen as one of the numeraire currency candidates. In order to decide the most desirable numeraire currency, we compare the correlation coefficients between each of the numeraire currency candidates and the anchor currencies, such as the euro, the US dollar and the Sterling pound, plus all of the sampled EU currencies.⁶ Table 2-a shows a correlation matrix between each of the numeraire currency candidates and three anchor currencies in equation (1). Among the three numeraire currencies, the Japanese yen had the smallest correlation coefficients with three anchor currencies. Table 2-b, 2-b and 2-c show correlation matrixes between each of three numeraire currencies and the explained variable currencies in equation (1). Most of the sampled European currencies had the smallest correlation with the Japanese yen. Accordingly, we choose the Japanese yen as a numeraire currency in the equation (1).

Then we estimate the following equation for all of the new EU member country (Poland, Czech, Slovakia, Hungary, Slovenia, Estonia, Latvia, Lithuania, Malta, Cyprus, Romania, and Bulgaria). In addition, we estimate it for potential participants into the EU (Croatia and Turkey). Moreover, we estimate some non-euro EU countries, which include Denmark, Sweden, and the United Kingdom for our concern.

$$\Delta \log e^{HOME/JPY} = a_0 + a_1 \Delta \log e^{EURO/JPY} + a_2 \Delta \log e^{USD/JPY} + a_3 \Delta \log e^{UK/JPY} + \varepsilon_t \quad (2)$$

All foreign exchange data are downloaded from Datastream. The whole sample

⁶ We use the Canadian dollar as a numeraire in order to calculate the correlation matrixes among all of the sampled currencies.

period is 1/1/1999 to 5/31/2007. We divide the whole sample period into some sub-sample quarterly periods and estimate the coefficients on the three anchor currencies for each of the sub-sample quarterly periods. The movements in the coefficients show how linkage of the currency to the three anchor currencies has been changing within the whole sample period.⁷ It implies how and when the monetary authorities have changed their exchange rate policy over time.

4. Analytical Results

Table 3 to Table 19 shows the analytical results for the 2004 enlargement EU country currencies, the 2007 enlargement EU countries plus the potential participants in the EU, and the non-euro area EU country currencies. And we focus on the coefficient on the euro and plot a graph of them in Figure 3 to Figure 19. A solid line in the figure represents estimates of the coefficients for each quarter of the sample period. Broken lines represent estimates plus or minus 2 times standard deviations of the coefficients. A band between the two broken lines means a statistically significant interval at about 95%. From the analytical results, we describe the feature of each of the currencies as follows.

(1) The 2004 enlargement EU countries

Polish zloty

Table 3 shows coefficients on the three anchor currencies for the Polish zloty, while figure 3 focuses on movements of the coefficients on the euro. The coefficients

⁷ If one of the estimated coefficients is significantly negative, we reestimate the equation without them.

on the euro and the US dollar are statistically significant by the 1st quarter of 2004. These results indicated that the Polish zloty had been pegged to both the euro and the US dollar. The coefficients on the US dollar were basically larger than the euro before the 3rd quarter of 2002. Since the 2nd quarter of 2004 the Polish zloty has been pegged to the euro only, and the coefficients on the euro were increasing gradually to close a unity. However, their levels of adjusted R-square were not so high. These results suggest that the Polish zloty has just started to peg to the euro, but their euro peg is not stable yet.

Czech koruna

Table 4 shows movements in the coefficient on the three anchor currencies for the Czech koruna while figure 4 focuses on movements of the coefficients on the euro. It is remarkable feature for the Czech koruna that all of the coefficients on the euro were statistically significant and high. Most of the coefficients were higher than 80 percents except for few cases. The coefficients on the US dollar were statistically significant in several periods but they were small. Since the 4th quarter of 2005, the coefficients on the euro have become close to a unity except for the 4th quarter of 2006. These results suggest that the monetary authority has tried to keep a euro peg system for a whole sample period.

Slovak koruna

Table 5 shows movements in the coefficient on the three anchor currencies for the Slovak koruna, while figure 5 focuses on movements of the coefficients on the euro. Most of the coefficients on the euro were statistically significant and are above

50 percents except in the 1st quarter of 1999. The coefficients on the US dollar were statistically significant in several periods. From the 3rd quarter of 2001 to the 2nd quarter of 2003, the coefficients were statistically significant and their levels were between 35 and 75 percents. However, since the 3rd quarter of 2003 only the coefficients on the euro have been statistically significant except in the 4th quarter of. These results suggest that the monetary authority has tried to keep a euro peg system.

Hungary forint

Table 6 shows movements of the coefficients on the three anchor currencies for the Hungary forint, while figure 6 focuses on movements of the coefficients on the euro. The Hungary forint had been pegged to both the euro and the US dollar until the 4th quarter of 2002. The coefficients on the euro were above 90 percents since the 1st quarter of 2000 except few cases. On the other hand, the coefficients on the US dollar gradually became smaller in size. The Hungary forint has been pegged only to the euro since the 1st quarter of 2003 except in the 4th quarter of 2004. These results suggest that the Hungarian monetary authority has changed their currency regime from euro-US dollar peg to euro peg since 2003.

Slovenia tolar

Table 7 shows movements of the coefficients on the three anchor currencies for the Slovenia tolar while figure 7 focuses on movements of the coefficients on the euro. The coefficients on the euro were statistically significant and close to a unity since the 3rd quarter of 1999. The coefficients on the US dollar were statistically

significant in several cases. However, they were under 5 percents except for the 1st quarter of 1999. The levels of adjusted R-squared also were close to 100 percents since the 2nd quarter of 2003. These results suggest that the Slovenia tolar has already been pegged to the euro since the 2nd quarter of 2003. As we noted earlier, Slovenia adopted the euro on January 1, 2007 as the first country of the 2004 EU enlargement.

Estonian kroon

Table 8 shows movement in coefficients on the three anchor currencies for the Estonian kroon while figure 8 focuses on movements of the coefficients on the euro. It is remarkable that the coefficients on the euro were close to a unity in all sub-sample periods. Furthermore, the coefficients on the euro have been a unity and the levels of the adjusted R-squared have been 100 percents since the 4th quarter of 2003. These results suggest that the Estonian kroon has been perfectly pegged to the euro since the 4th quarter of 2003.

Latvian lat

Table 9 shows movements of the coefficients on the three anchor currencies for the Latvian lat while figure 9 focuses on movements of the coefficients on the euro. The remarkable feature of the Latvian lat is that it had been pegged to three anchor currencies by the 4th quarter of 2004 (these results were consistent that they were reported to adopt SDR peg system). The coefficients of each currency were changing over the period. The coefficients on the euro had been below 25 percents and the coefficients on the US dollar were mostly above 50 percents by the 2nd quarter of

2001. Then, the coefficients on the euro have become above 30 percents while the coefficients on the US dollar have become below 50 percents since the 3rd quarter of 2001. The coefficients on the Sterling pound were around 10 to 15 percents in all sub-sample periods. Since the 1st quarter of 2005, the monetary authority has suddenly changed from SDR peg to euro peg.

Lithuanian lita

Table 10 shows movements of the coefficients on the three anchor currencies for the Lithuanian lita while figure 10 focuses on movements of the coefficients on the euro. The interesting feature of the Lithuanian lita is that it clearly changed from the US dollar peg to the euro peg in the 1st and 2nd quarters of 2002. The Lithuanian lita had been perfectly pegged to the US dollar by the 4th quarter of 2001. The coefficients on the US dollar were nearly a unity and the levels of the adjusted R-square were 100 percents. Then only in the 1st quarter of 2002, the Lithuanian monetary authority assigned the basket peg (the coefficients on the euro, the US dollar and the Sterling pound were 33 percents, 39 percents and 15 percents, respectively). Since the 2nd quarter of 2002, the coefficients on the euro have been almost a unity and the levels of the adjusted R-squared have been almost 100%. These results clearly indicate that the Lithuanian monetary authority has adopted the euro peg system since the 2nd quarter of 2002.

Maltese lira

Table 11 shows movements in coefficient on the three anchor currencies for the Maltese lira while figure 11 focuses on movements of the coefficients on the euro. It

is interesting that the Maltese lira has been gradually moved from a currency basket peg system of the three anchor currencies to euro peg system. The coefficients on three anchor currencies were changing over the period. The coefficients on the euro were around 50 percents while coefficients on the Sterling pound and the US dollar were around 25 percents by the 3rd quarter of 2002. Then, the coefficients on the euro rose above 70 percents while the coefficients on the US dollar declined below 15 percents and the coefficients on the Sterling pound declined below 20 percents. Finally the Maltese lira has been pegged only to the euro since the 2nd quarter of 2005.

Cyprus pound

Table 12 shows movements of the coefficients on the three anchor currencies for the Cyprus pound while figure 12 focuses on movements of the coefficients on the euro. The Cyprus pound pegged to both the euro and the US dollar by the 2nd quarter of 2000. Coefficients on the euro and the US dollar were almost 95 percents and 5 percents, respectively. Then, only the coefficients on the euro have been statistically significant and nearly a unity since the 4th quarter of 2001 except for few cases. The levels of the adjusted R-square were constantly close to 100 percents over time. These results suggest that the monetary authority has adopted the euro peg system since the 3rd quarter of 2003.

(2) The 2007 enlargement EU countries

Romanian leu

Table 13 shows movements of the coefficients on the three anchor currencies for

the Romanian leu while figure 13 focuses on movements of the coefficients on the euro. The Romania leu changed from US dollar peg system through a peg to a currency basket of the US dollar and the euro to a euro peg system in sequence. The coefficients on the US dollar were above 90 percents by the 4th quarter of 2002. Then the Romanian leu pegged to both the euro and the US dollar since the 2nd quarter of 2003. The coefficients on the euro and the US dollar were around 80 percents and around 20 percents, respectively. Since the 2nd quarter of 2005, the Romanian leu has been pegged only to the euro and the coefficients were close to a unity.

Bulgarian lev

Table 14 shows movements of the coefficients on the major the three currencies for the Bulgarian lev while figure 14 focuses on movements of the coefficients on the euro. The feature of the Bulgarian lev is that the coefficients on the euro were statistically significant and close to a unity in all sub-sample periods. The levels of the adjusted R-squared also were close to 100 percents in most of the sub-sample periods. The coefficients on the US dollar and the Sterling pound were statistically significant in several periods although they were very small. These results indicate that the Bulgarian monetary authority has kept their exchange rate pegged to the euro.

(3) potential participants into the EU

Croatian kuna

Table 15 shows movements of the coefficients on the three anchor currencies for

the Croatian kuna while figure 15 focuses on movements of the coefficients on the euro. The coefficients on the euro were statistically significant and mostly above 90. The coefficients on the US dollar and the sterling pound were significant in some periods. These results suggest that the monetary authority has tried to keep a euro peg system.

Turkish lira

Table 16 shows movements of the coefficients on the three anchor currencies for the Turkish lira while figure 16 focuses on movements of the coefficients on the euro. The Turkish lira has still kept the strong linkages to the US dollar. The coefficients on the US dollar were significant and above 50 percents throughout whole sample periods except for few cases. The coefficients on the euro were significant in some periods, but not constantly. Levels of the adjusted R-squared were relatively low compared with the other East European currencies. These results suggest that the exchange rate policy in Turkey has not been stable yet.

(4) Non-euro area EU countries

Danish krone

Denmark has joined the ERM II with fluctuation band are +/- 2.25% since 1999. The Denmark National Bank is conducting exchange rate targeting monetary policy under the ERM II. The Danish krone has officially announced to peg to the euro. Table 17 shows movements of the coefficients on the three anchor currencies for the Danish krone while figure 17 focuses on movements of the coefficients on the euro. The feature of the Danish krone is that the coefficients on the euro were statistically

significant and close to a unity. The levels of the adjusted R-squared were nearly 100 percents in most sub-sample periods. The coefficients on the US dollar were statistically significant in some periods although they were very small. These results suggest that the Denmark National Bank have actually pegged the Danish krone to the euro in the whole sample period.

Swedish krona

Table 18 shows movements of the coefficients on the three anchor currencies for the Swedish krona while figure 18 focuses on movements of the coefficients on the euro. The coefficients on the euro were significant in the whole sample period and were in a wide range between 46 percents to a unity. On one hand, the coefficients on the US dollar were statistically significant in a half of the whole period and were in a rage between 20 and 40 percents. The coefficients on the Sterling pound were statistically significant in some sub-sample periods although they were around 20 percents. The levels of the adjusted R-squared were between 40 and 90 percents. Since 1st quarter of 2004, only the coefficients on the euro have been significant and close to a unity. These results suggest that the monetary authority had changed from partially pegged to anchor currencies to the euro peg system since 2004.

Sterling pound

For analyzing the case of the Sterling pound, we use Swiss francs for an anchor currency instead of the Sterling pound. Table 19 shows movements of the coefficients on the three anchor currencies for the Sterling pound while figure 19 focuses on movements of the coefficients on the euro. The coefficients on the US

dollar were statistically significant in the whole sample period except for recent periods. The coefficients were between 20 and 60 percents. However, their levels were decreasing gradually. The coefficients on the euro were statistically significant in several periods and they were becoming larger. Some of the coefficients on the Swiss francs were significantly, but not constantly. The coefficients on the euro have been larger than those on the US dollar since the 4th quarter of 2001. These results suggest that the Sterling pound has been affected by the euro more than the US dollar recently. However, the linkages were relatively weaker because the levels of the adjusted R-squared were small in comparison with the other non-euro EU currencies.

(4) Summary

As we described above, we recognized that there were some differences in the exchange rate systems among the non-euro area countries. We summarize our analytical results for new EU member countries in Table 20. According to the estimated coefficients on equation (2), we classify four types of exchange rate system according to Bénassy-Quéré and Coeuré (2000). The four types of exchange rate system are classified as follows:

A. Rigid peg to a single currency

Only one of the estimated coefficients is statistically significant and its estimate is a unity.

B. Partial peg to a single currency

Only one of the estimated coefficients is statistically significant and its estimate is smaller than a unity.

C. Peg to a currency basket

Some of the estimated coefficients are statistically significant and a sum of the coefficients is close to a unity. There are four types of currency basket.

(a) Peg to a currency basket of US dollar/euro

The home currency is pegged to a currency basket of the US dollar and the euro.

The coefficient on the US dollar is larger than that on the euro.

(b) Peg to a currency basket of euro/US dollar

The home currency is pegged to a currency basket of the euro and the US dollar.

The coefficient on the euro is larger than that on the US dollar.

(c) Peg to a currency basket of euro/Sterling pound

The home currency is pegged to a currency basket of the euro and the Sterling pound. The coefficient on the euro is larger than that on the Sterling pound.

(d) Peg to a currency basket of euro/US dollar/ Sterling pound

The home currency is pegged to a currency basket of the euro, the US dollar, and the Sterling pound.

D. Free floating

None of the estimated coefficients are statistically significant.

Table 20 shows the changes in exchange rate systems of the 2004 enlargement EU countries during a period from 1999 to 2007.⁸ In 1999, a share of the partial peg to the euro was 30 percents, which was the highest among all exchange rate systems. The basket peg to dollar/euro and euro/dollar had the second highest share (17.5 percents). Total share of the peg to currency baskets was 67.5 percents. These

⁸ The result in 2007 is only for the 1st quarter of 2007

results indicate that most countries adopted a partial peg to the euro or a peg to currency baskets in 1999. A share of the unitary peg to the US dollar was 10 percents while a share of unitary peg to the euro was zero.

A share of the rigid peg to the euro started to increase gradually since 2000. It was 12.5 percents in 2000 and it becomes 70 percents in 2007. On one hand, a share of the rigid peg to the US dollar became 0 percents in 2002. A share of the partial peg to the euro also increased from 30 percents in 1999 to 45 percents in 2005, and then declined to 30 percents in 2007. The share of the peg to currency baskets decreased from 67.5 percents in 1999 to 0 percents in 2007. The total share of the rigid and partial peg on the euro was 100 percents in 2007.

These results suggest that the 2004 enlargement EU countries have changed their exchange rate systems from rigid or partial peg to the US dollar to the rigid or partial peg to the euro. Some countries immediately changed their past currency system to the euro peg system just before the participation into the EU in May 2004. As for the 2007 enlargement EU countries, the monetary authority in Bulgaria adopted a rigid or partial peg to the euro while the monetary authority in Romania have still kept a rigid or partial peg to the US dollar. As for the potential participants into the EU, the monetary authority in Croatia adopted a rigid or partial peg to the euro while the monetary authority in Turkey has still kept a rigid or partial peg to the US dollar. Lastly, we found that both the Danish krone and the Swedish krona have started to adopt a rigid peg to the euro since 2004.

The stronger linkage of the 2004 enlargement EU country currencies and the EU candidate currencies to the euro might have adverse effects on their economy under the current situation, where the euro has been appreciating against the US

dollar. Table 21 shows trade shares with the euro area countries and rest of the EU countries for each of the countries. Some of the 2004 enlargement EU countries, which include Czech, Hungary, Poland, Slovakia, and Slovenia, have more than a half of trade share with the euro area countries. On one hand, all of the 2004 enlargement EU countries have more than a half of trade share with rest of the EU25 countries. These indicate that both the new EU member countries and the EU candidate countries have strong trade relationship with the euro area countries. Under these circumstances, the countries could not take any advantages on their export to euro area countries, but also take disadvantage on their export to other non-euro-pegging neighbor countries and rest of the world if their currencies are completely pegged to the euro. Thus, the appreciation of the euro against the US dollar should weaken their international price competitiveness of their domestic products, while it should improve their terms of trade.

5. Convergence of interest rates

Next, we investigate whether interest rates in the new EU member countries have converged to those in the euro area in response to their changes of their exchange rate policies. In order to analyze how much the interest rate in the new EU member countries have converged to those in the euro area, we use three kinds of interest rates which include an overnight money market interest rate as a very short-term interest rate, a 3 month money market interest rate as a short-term interest rate, and a 10 year government bond yield as a long-term interest rate. We investigate how their interest rate differentials between each sampled country and

the euro area have decreased during a sample period from January 1999 to May 2007.⁹

5-1. Interest rate differentials

(1) Very short-term interest rate differentials

Figure 20 shows movements in monthly data of overnight interest rate differentials between the 2004 enlargement EU countries (Poland, Czech, Slovakia, Latvia, Lithuania, Cyprus, and Hungary) and the euro area. As for Poland, Hungary and Slovakia, the interest rate differentials between the countries and the euro area were above 5 percents in 1999. Especially, the interest differentials between Poland and the euro area were fluctuating between 10 to 20 percents during a period from 1999 to 2001. However they have been below 5 percents since December 2002. In 2007, the very short-term interest rate differentials have been below 2 percents except for Hungary and Latvia. These results suggest that the very short-term interest rates in the 2004 enlargement EU countries have recently converged to those in the euro area.

Figure 21 shows movements in monthly data of overnight interest rate differentials between the 2007 enlargement EU country (Romania) plus the future EU member candidates (Croatia and Turkey) and the euro area. We found that the interest rate differentials were far wider than those between the 2004 enlargement EU member countries and the euro area. In 2007, the very short-term interest rate differentials between Turkey and the euro area were still above 10 percents, while

⁹ We check monthly interest rate differentials here. Due to the constraint of data, we apply the month end rate for short-term and medium-term interest rate differentials and the monthly average rate for long-term government bond yield.

those between Romania and the euro area were narrowing and stayed below 5 percents. The very short-term interest rate differentials between Croatia and the euro area have been below 3 percents since 2005.

Figure 22 shows movements in monthly data of overnight interest rate differentials between the non-euro area EU countries (Denmark, United Kingdom, and Sweden) and the euro area. We found that the interest rate differentials between the United Kingdom and the euro area were almost within +/-3 percents band. On one hand, those between Denmark, Sweden, and the euro area were almost within +/-1 percent band in the whole sample period. Especially, the Denmark National Bank has to change its interest rates so as to keep the same level with the euro denominated interest rates for its exchange rate targeting under the ERM II. It shows that the very short-term interest differentials between these countries and the euro area have already converged into a narrow range regardless of their nonparticipation to the euro.

(2) Short-term interest rate differentials

Figure 23 shows movements in monthly data of 3 month money market interest rate differentials between the 2004 enlargement EU countries and the euro area. In 1999, most of them were fluctuating above 5 percents. However, the interest rate differentials have been below 5 percents except for Poland and Hungary since March 2000. The interest rate differentials between Poland and the euro area were gradually decreasing and have been below 5 percents since September 2002. In 2005, the interest rate differentials between Hungary and the euro area were to below 5 percents.

Figure 24 shows movements in monthly data of 3 month money market interest rate differentials between the 2007 enlargement EU countries plus the future EU member candidates and the euro area. Similar to the very short-term interest differentials, the short-term interest rate differentials between Romania and the euro and between Turkey and the euro area were still wide and stay around 20 percents in 2004, however those between Romania and the euro are came down to 5 percents in 2006. On the other hand, the interest rate differentials between Bulgaria and the euro area have been below 2 percents since 2003. The interest rate differentials between Croatia and the euro area have been below 5 percents since 2005.

Figure 25 shows movements in monthly data of 3 month money market interest rate differentials between the non-euro area EU countries and the euro area. The interest rate differentials between the United Kingdom and the euro area were below 3 percents and fluctuated. On one hand, the interest rate differentials between Denmark and the euro area and between Sweden and the euro area were within +/- 1.5 percents band during the whole sample period.

(3) Long-term interest rate differentials

Figure 26 shows movements in monthly data of the long-term (10 years) government bond yield differentials between the 2004 enlargement EU countries and euro area.¹⁰ We found that the long-term government bond yield differentials between the 2004 enlargement EU countries and the euro area have been below 5 percents since 2002. We can classify the 2004 enlargement EU countries into two

¹⁰There are some data constraints. For example, only a few government bonds has been issued in Estonia.

groups. One group includes the countries (Czech, Slovakia, Slovenia, Slovakia, Estonia, and Lithuania) whose interest rate differentials were below 0.5 percents in 2007. The other group includes the countries (Hungary, Poland, and Latvia) whose differentials were between 1 to 3 percents in 2007.

Figure 27 shows movements in monthly data of the long-term government bond yield differentials between the non-euro area EU countries and the euro area. The interest rate differentials between Denmark and euro area and between Sweden and euro area were within ± 0.5 percents band throughout the whole sample period. The interest differentials between the United Kingdom and the euro area were fluctuating almost between ± 1 percent band.

5-2. The relationship between the change of exchange rate system and the interest rate differentials

According to the analytical results in sections 4 and 5-1, we found that the interest rates in the 2004 enlargement EU countries have been converging to those while their exchange rate policies have been changing into pegging or targeting their home currencies to the euro. These results suggest that the interest rate convergences are related with their exchange rate regime switching. Regarding the very short-term and short-term interest rate differentials, the countries who have applied the euro-peg system have higher degrees of interest rate convergence than the other countries. For example, the interest rate differentials in Czech, Estonia, Latvia, Slovenia and Cyprus were within a narrower range than the others. In the case of Latvia, we found that the interest rate differentials were narrower as the

weights on the euro were larger than before.

On the other hand, the interest rate differentials in the countries who have applied US dollar peg system or peg to a currency basket of US dollar/euro in the early part of the sample period were wider than the others and outside range of ± 5 percents. However, their interest rates have converged with those in the euro area as they have changed their exchange rate policies from the US dollar peg system to the euro peg system. For example, the interest rate differentials between Lithuania and euro area have been moving within ± 5 percents range since April 2000 and moving within around ± 2 percents range since 2nd quarter of 2001. They have changed their exchange rate system from the US dollar peg system to the euro peg system since 4th quarter of 2001.

According to the analytical results on the long-term government bond yield differentials between the 2004 enlargement EU countries and the euro area, we found no clear relationship between the long-term interest rate convergences and the exchange rate regime switch for the 2004 enlargement EU countries.

In the case of Slovenia, that joined in the euro area on the 1 January 2007, the interest rate differentials in terms of 3 and 6 month inter-bank rate started to lower below 1 percent in the beginning of 2006 and have become almost same level with the euro since July 2006. Their long term interest rate differentials also were within very narrow range in 2006. These results suggest that their interest rates started to converge with the euro levels prior to joining in the euro area.

6. Conclusion

In this paper we investigated how the new EU member countries have conducted the exchange rate policy against the euro in the process of joining the EU empirically. Our results suggest that most of the new EU member countries have changed their exchange rate system to the euro peg system in recent years. It reflects a fact that they joined the EU. It is interesting that they tried to approach to the euro peg system in various ways. Some had already stabilized their currencies to the euro and then joined the EU. On the other hand, some switched from the US dollar peg system to the euro peg system suddenly just before joining the EU. Furthermore, some gradually changed the weights on the US dollar lower and the weights on the euro higher with keeping their currency basket peg system. These various experiences in the new EU countries will be very useful for East Asian countries to consider the process to switch their exchange rate system.

In addition, we investigated the convergences of their interest rates in the same sample period. As a result, we found that the very short-term and short-term interest rates differentials between the 2004 and 2007 enlargement new EU member countries and the euro area narrowed ahead of their joining in the EU. Thus, the exchange rate regime switching is consistent with the interest rate convergences in the new EU member countries.

However, the stronger linkages of the new EU currencies to the euro, or their interest rate convergence with the euro are might have adverse effects on their real economies under the current situation, where the euro has been strongly appreciating against the US dollar. The appreciation of the euro might weaken their international price competitiveness of domestic products while it should improve their terms of trade. In our further research, we will investigate how their real

economies are affected by their change of exchange rate systems.

References

- Bénassy-Quéré A. and B. Coeuré (2000) “Big and Small Currencies: the Regional Connection,” CEPII, *Document de travail*, no.2000-10.
- Frankel, J.A. and S.-J. Wei (1994) “Yen bloc or dollar bloc? Exchange rate policies of the East Asian economies,” in T. Ito and A. O. Krueger, eds., *Macroeconomic Linkage: Savings, Exchange Rates, and Capital Flows*, Chicago, University of Chicago Press, pp.295-355.
- Frankel, J.A. and S.-J. Wei (1995) “Emerging Currency Blocs,” in H. Genberg ed., Berlin, Springer, pp.111-143.
- Frankel, J.A., S. Schmukler and L. Serven (1999), “Verifiability: a Rationale for the Failure of Intermediate Exchange Rate Regimes,” mimeo
- Takagi, S. (1996), “The yen and its East Asian neighbors, 1980-95: cooperation or competition?” NBER working paper, No.5720.

Table 1. The East European countries' reported Exchange Rate Arrangements to IMF

	as of Dec 1997	as of Jan 1999	as of Dec 2003	as of Dec 2005
Polish zloty	Managed floating	Exchange rates within crawling bands(2.25%)	Independently floating	Independently floating
Hungarian forint	Managed floating	Exchange rates within crawling bands(12.5%)	Pegged exchange rates within horizontal bands (15%)	Pegged exchange rates within horizontal bands (15%)
Czech koruna	Managed floating	Managed floating *	Managed floating *	Managed floating *
Slovak koruna	Currency pegged to other composite	Managed floating *	Managed floating *	Pegged exchange rates within horizontal bands (15%)
Slovenian tolar	Managed floating	Managed floating *	Exchange rates within crawling bands(unannounced)	Pegged exchange rates within horizontal bands (15%)
Cyprus pound	Currency pegged to other composite	Pegged exchange rates within horizontal bands	Pegged exchange rates within horizontal bands	Pegged exchange rates within horizontal bands
Maltese lira	Currency pegged to other composite	Other conventional fixed peg arrangements	Other conventional fixed peg arrangements	Conventional pegged arrangement
Estonian kroon	Currency pegged to DM	Currency board arrangements	Currency board arrangements	Currency board arrangements
Latvian lat	Currency pegged to SDR	Other conventional fixed peg arrangements	Other conventional fixed peg arrangements	Conventional pegged arrangement
Lithuanian lita	Currency pegged to USD	Currency board arrangements	Currency board arrangements	Currency board arrangements
Bulgaria lev	Currency pegged to DM	Currency board arrangements	Currency board arrangements	Currency board arrangements
Turkish lira	Managed floating	Crawling pegs	Independently floating	Independently floating
Croatian kuna	Managed floating	Pegged exchange rates	Managed floating *	Managed floating *
Rumanian leu	Independently floating	Managed floating *	Exchange rates within crawling bands(unannounced)	Managed floating *

Source: Annual Report on Exchange Arrangements and Exchange Restrictions 2006, IMF

Managed floating * means Monaged floating with no predetermined path for the exchange rate.

Table 2. Correlation matrix between Sampled currencies and the candidates of numeraire

a. Correlation Matrix (explanatory variables)

	US dollar	euro	Sterling pound	Swiss francs
US dollar	1.000	0.411	0.524	0.339
Euro	0.411	1.000	0.740	0.864
Japanese yen	0.450	0.403	0.428	0.460
Swiss francs	0.339	0.864	0.670	1.000
Sterling pound	0.524	0.740	1.000	0.670
SDR	0.802	0.826	0.812	0.727

b. explained variable (new-EU currencies)

	Polish zloty	Hungarian forint	Czech koruna	Slovak koruna	Slovenian tolar	Cyprus pound	Maltese lira	Estonian kroon	Latvian lat	Lithuanian lita	Bulgarian lev
US dollar	0.384	0.339	0.364	0.383	0.411	0.416	0.544	0.409	0.693	0.554	0.418
Euro	0.574	0.820	0.867	0.688	0.964	0.996	0.955	0.994	0.823	0.762	0.997
Japanese yen	0.284	0.323	0.353	0.362	0.377	0.409	0.458	0.403	0.590	0.477	0.407
Swiss francs	0.477	0.694	0.747	0.660	0.826	0.864	0.837	0.856	0.734	0.701	0.861
Sterling pound	0.516	0.622	0.662	0.548	0.726	0.741	0.844	0.738	0.799	0.712	0.741
SDR	0.573	0.683	0.729	0.632	0.804	0.829	0.900	0.822	0.939	0.823	0.829

c. explained variable (future EU currencies)

	Turkish lira	Croatian kuna	Rumanian leu
US dollar	0.235	0.419	0.416
Euro	0.197	0.946	0.434
Japanese yen	0.101	0.393	0.297
Swiss francs	0.326	0.821	0.382
Sterling pound	0.163	0.705	0.453
SDR	0.239	0.798	0.529

d. explained variable (non-euro EU currencies)

	Danish krone	Swedish krona	Sterling pound
US dollar	0.414	0.372	0.524
Euro	0.998	0.856	0.740
Japanese yen	0.401	0.354	0.428
Swiss francs	0.862	0.735	0.670
Sterling pound	0.741	0.659	1.000
SDR	0.826	0.728	0.812

Autuor's calculation

Data: All foreign exchange data are from Datastream. Sample period is 1/1/1999 to 5/31/2007.

To calculate each correlation, we use the Canadian dollar as a numeraire.

Appendix: EU countries who join ERM II

Country	Date to join	Central rate (for 1 euro)	Fluctuation band
Denmark	1-Jan-99	7.46038	+/-2.25%
Estonia	27-Jun-04	15.6466	+/-15%
Lithuania	27-Jun-04	3.4528	+/-15%
Slovenia*	27-Jun-04	239.64	+/-15%
Cyprus	2-May-05	0.585274	+/-15%
Latvia	2-May-05	0.702804	+/-15%
Malta	2-May-05	0.4293	+/-15%
Slovakia	28-Nov-06	38.455000	+/-15%

Source: the portal site of the European Union

* Following Slovenia's accession to the euro area on 1 January 2007, Banka Slovenije is no longer party to the Agreement on ERM II.

Table 3. POLISH ZLOTY

	Constant	euro	US dollar	Sterling Pound	DW	Adj.R2
1999 : 1Q	0.1515 ** (0.0954)	0.4201 ** (0.1853)	0.6079 *** (0.1894)	- -	2.0208	0.6031
1999 : 2Q	-0.0787 (0.0392)	0.5365 *** (0.0771)	0.5077 *** (0.0871)	- -	1.9817	0.8207
1999 : 3Q	0.0774 (0.0704)	0.1057 (0.1429)	0.7076 *** (0.1556)	0.2319 (0.1892)	1.6157	0.6937
1999 : 4Q	-0.0403 (0.0684)	0.6471 *** (0.1807)	0.7204 *** (0.1926)	-0.2743 (0.2702)	1.8909	0.6587
2000 : 1Q	-0.0407 (0.0523)	0.5459 *** (0.0998)	0.5466 *** (0.1310)	-0.1495 (0.1385)	2.0148	0.7918
2000 : 2Q	0.0626 (0.1150)	0.3613 ** (0.1696)	0.4401 * (0.2543)	0.3296 (0.2346)	2.1967	0.4498
2000 : 3Q	0.0214 (0.0609)	0.3254 *** (0.1073)	0.7159 *** (0.1986)	0.0274 (0.1564)	1.7208	0.6326
2000 : 4Q	-0.0819 (0.0581)	0.4418 *** (0.0817)	0.7730 *** (0.1369)	- -	1.9189	0.6049
2001 : 1Q	-0.0953 (0.0593)	0.6376 *** (0.0943)	0.1717 (0.1328)	0.1124 (0.1426)	2.2824	0.7482
2001 : 2Q	-0.0547 (0.0546)	0.3422 *** (0.1071)	0.5037 *** (0.1458)	0.1428 (0.1513)	1.7728	0.6865
2001 : 3Q	0.0531 (0.1087)	0.0075 (0.2304)	1.4147 *** (0.2755)	-0.4090 (0.3790)	1.2916	0.4126
2001 : 4Q	-0.1283 ** (0.0528)	0.3540 ** (0.1377)	0.6514 *** (0.1319)	-0.1175 (0.1608)	2.2005	0.3970
2002 : 1Q	0.0520 (0.0702)	0.2366 (0.1758)	0.6188 *** (0.2427)	0.0433 (0.2791)	1.9115	0.4830
2002 : 2Q	0.0267 (0.0498)	0.5880 *** (0.1672)	0.9405 *** (0.1430)	-0.3530 (0.2327)	1.9415	0.7202
2002 : 3Q	0.0323 (0.0645)	0.3409 * (0.1923)	0.7055 *** (0.1186)	0.0119 (0.2246)	1.8967	0.5757
2002 : 4Q	-0.0620 (0.0481)	0.5257 *** (0.1639)	0.3162 ** (0.1281)	0.1074 (0.1561)	2.0518	0.5849
2003 : 1Q	0.1099 (0.0711)	0.1413 (0.2127)	0.6017 *** (0.1718)	0.2096 (0.2155)	2.1476	0.3743
2003 : 2Q	0.0016 (0.0821)	0.8079 *** (0.1898)	0.4291 ** (0.1822)	0.1371 (0.1836)	2.3623	0.4948
2003 : 3Q	0.0270 (0.0529)	0.8123 *** (0.1189)	0.1023 (0.1315)	0.1123 (0.1496)	1.8933	0.7025
2003 : 4Q	-0.0184 (0.0543)	0.3717 (0.1114)	0.4403 *** (0.1156)	- -	2.0732	0.4449
2004 : 1Q	0.0455 (0.0584)	0.3658 ** (0.1532)	0.3368 *** (0.1087)	0.4145 *** (0.1527)	1.5822	0.6533
2004 : 2Q	-0.0905 (0.0520)	0.6741 *** (0.1173)	0.0958 (0.0900)	0.0848 (0.1189)	2.1605	0.6384
2004 : 3Q	-0.0501 (0.0526)	0.8196 *** (0.1630)	0.1906 (0.1153)	0.0660 (0.1602)	2.2338	0.5650
2004 : 4Q	-0.1267 (0.0498)	0.6783 *** (0.1449)	0.0902 (0.1109)	0.1354 (0.1502)	1.9880	0.4871
2005 : 1Q	0.0082 (0.0814)	1.0222 *** (0.2906)	0.0922 (0.2830)	- -	2.1458	0.3696
2005 : 2Q	-0.0033 (0.0691)	0.6720 *** (0.1857)	-0.1014 (0.1676)	0.0425 (0.2397)	1.5344	0.2360
2005 : 3Q	-0.0007 (0.0007)	0.0662 (0.2490)	- -	0.7185 *** (0.2524)	2.4112	0.3031
2005 : 4Q	-0.0003 (0.0006)	0.9996 *** (0.2058)	0.0053 (0.1334)	0.0572 (0.2050)	1.9046	0.5725
2006 : 1Q	0.0003 (0.0006)	0.7587 *** (0.2058)	-0.1841 (0.1347)	0.3530 * (0.2035)	1.8406	0.5589
2006 : 2Q	0.0006 (0.0006)	0.8641 *** (0.2459)	-0.0971 (0.1234)	0.0841 (0.2252)	1.9726	0.4566
2006 : 3Q	-0.0002 (0.0006)	0.8744 *** (0.2337)	-0.0766 (0.1502)	0.3924 * (0.2119)	2.0650	0.6059
2006 : 4Q	-0.0006 (0.0004)	1.0322 *** (0.2207)	0.1839 (0.1115)	-0.0823 (0.1894)	2.1342	0.5424
2007 : 1Q	0.0001 (0.0004)	1.1020 *** (0.1988)	0.0022 (0.1407)	0.0176 (0.1449)	1.9387	0.8046

1. Calculated by authors. All foreign exchange data are from Datastream.

2. If the estimated coefficient is significantly negative, we re-estimate the equation without them. Standard errors are in parenthesis. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels.

Table 4. CZECH KORUNA

	Constant	euro	US dollar	Sterling Pound	DW	Adj.R2
1999 : 1Q	0.1415 ** (0.0685)	1.0523 *** (0.1628)	0.2415 (0.1729)	-0.2896 (0.2017)	1.5131	0.7555
1999 : 2Q	-0.0859 ** (0.0344)	0.9376 *** (0.0797)	-0.0475 (0.1035)	0.0941 (0.1139)	1.9692	0.8719
1999 : 3Q	-0.0320 (0.0387)	0.9187 *** (0.0786)	0.0770 (0.0856)	0.0119 (0.1041)	2.0978	0.9021
1999 : 4Q	0.0384 (0.0485)	0.7594 *** (0.1281)	-0.0346 (0.1366)	0.1466 (0.1916)	2.2366	0.7619
2000 : 1Q	0.0144 (0.0356)	0.8984 *** (0.0680)	0.1965 ** (0.0893)	-0.1042 (0.0944)	2.1856	0.9247
2000 : 2Q	-0.0258 (0.0326)	0.9349 *** (0.0481)	-0.0002 (0.0721)	0.0293 (0.0666)	1.8052	0.9273
2000 : 3Q	0.0063 (0.0249)	0.9158 *** (0.0438)	0.0330 (0.0811)	0.0128 (0.0638)	2.3055	0.9581
2000 : 4Q	-0.0204 (0.0434)	0.8426 *** (0.0732)	0.3064 *** (0.1133)	-0.0776 (0.0887)	2.0627	0.7918
2001 : 1Q	-0.0243 (0.0353)	0.9083 *** (0.0562)	0.1056 (0.0791)	-0.0578 (0.0850)	2.2327	0.9204
2001 : 2Q	-0.0306 (0.0259)	0.9248 *** (0.0507)	0.0566 (0.0691)	0.0259 (0.0716)	2.2934	0.9436
2001 : 3Q	-0.0163 (0.0299)	0.8347 *** (0.0633)	0.1775 ** (0.0757)	-0.0514 (0.1041)	1.9953	0.8818
2001 : 4Q	-0.0817 (0.0623)	0.9248 *** (0.1624)	0.1664 * (0.1556)	0.0496 (0.1897)	2.2696	0.5418
2002 : 1Q	-0.0314 (0.0438)	0.9394 *** (0.1098)	0.1625 (0.1515)	-0.0954 (0.1743)	2.0975	0.7963
2002 : 2Q	-0.1286 * (0.0674)	0.8830 ** (0.2265)	0.2264 (0.1937)	0.0295 (0.3151)	1.9309	0.5232
2002 : 3Q	0.0733 (0.0686)	0.5807 *** (0.2045)	0.1498 (0.1261)	0.3355 (0.2387)	1.7420	0.4693
2002 : 4Q	0.0397 (0.0413)	0.7079 *** (0.1407)	0.1417 (0.1099)	0.2410 * (0.1340)	1.6939	0.7231
2003 : 1Q	0.0160 (0.0522)	0.8915 ** (0.1561)	0.1081 (0.1261)	-0.0098 (0.1582)	2.2109	0.5390
2003 : 2Q	-0.0243 (0.0305)	0.9987 *** (0.0706)	0.0456 * (0.0678)	-0.0475 (0.0683)	1.9944	0.8355
2003 : 3Q	0.0200 (0.0460)	0.7811 *** (0.1041)	-	0.1614 (0.1224)	1.6453	0.7388
2003 : 4Q	0.0145 (0.0364)	0.9886 *** (0.0908)	0.0941 (0.1074)	-0.0044 (0.1268)	1.7960	0.8102
2004 : 1Q	0.0288 (0.0491)	0.9622 *** (0.1289)	-0.0709 (0.0915)	0.0075 (0.1286)	2.2351	0.7609
2004 : 2Q	-0.0504 (0.0502)	1.0177 *** (0.1131)	-0.0384 (0.0868)	0.0048 (0.1147)	2.0711	0.7486
2004 : 3Q	-0.0131 (0.0345)	0.9393 *** (0.1069)	-	0.1312 (0.1009)	1.7930	0.7853
2004 : 4Q	-0.0648 (0.0292)	0.8321 *** (0.0851)	-0.0198 *** (0.0651)	0.1035 (0.0882)	2.3608	0.7591
2005 : 1Q	-0.0205 (0.0404)	1.0551 *** (0.1441)	-	-0.0028 (0.1404)	2.2677	0.6945
2005 : 2Q	0.0137 (0.0407)	0.9281 *** (0.1095)	0.0217 (0.0989)	-0.1323 (0.1414)	1.7563	0.6402
2005 : 3Q	-0.0003 (0.0004)	0.8609 *** (0.1424)	-0.1044 (0.0726)	0.2166 ** (0.1356)	1.8466	0.7210
2005 : 4Q	-0.0003 (0.0003)	0.9577 *** (0.0919)	0.0279 (0.0596)	0.0526 (0.0915)	1.7596	0.8652
2006 : 1Q	-0.0003 (0.0004)	0.9494 *** (0.1337)	-0.1466 (0.0875)	0.2411 (0.1322)	2.0753	0.7891
2006 : 2Q	0.0000 (0.0003)	0.9557 *** (0.1263)	-0.0170 (0.0633)	0.0440 (0.1156)	2.4039	0.7997
2006 : 3Q	-0.0001 (0.0002)	0.9833 *** (0.0970)	-0.0562 (0.0624)	0.1033 (0.0880)	1.8871	0.8734
2006 : 4Q	-0.0004 (0.0003)	0.8524 *** (0.1665)	0.0681 (0.0841)	0.1661 (0.1429)	2.3187	0.6753
2007 : 1Q	0.0003 (0.0003)	0.9664 *** (0.1003)	-0.0052 (0.1070)	-	1.8365	0.8361

1. Calculated by authors. All foreign exchange data are from Datastream.

2. If the estimated coefficient is significantly negative, we re-estimate the equation without them. Standard errors are in parenthesis. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels.

Table 5. SLOVAK KORUNA

	Constant	euro	US dollar	Sterling Pound	DW	Adj.R2
1999 : 1Q	0.1919 * (0.0766)	0.3539 * (0.1820)	0.6855 *** (0.1934)	-0.1264 (0.2255)	2.3336	0.6512
1999 : 2Q	0.0270 (0.0936)	0.7679 *** (0.2170)	0.3495 (0.2816)	-0.3793 (0.3100)	2.5889	0.3137
1999 : 3Q	-0.0595 (0.0683)	0.5551 *** (0.1388)	0.2541 * (0.1511)	0.0450 (0.1838)	3.0268	0.6444
1999 : 4Q	-0.0292 (0.0523)	0.8813 *** (0.1382)	0.0079 (0.1473)	0.1579 (0.2067)	2.4432	0.7944
2000 : 1Q	-0.0029 (0.0609)	0.7484 *** (0.1163)	0.0036 (0.1526)	0.1362 (0.1614)	2.3773	0.7788
2000 : 2Q	0.0063 (0.0822)	0.5364 *** (0.1213)	0.1049 (0.1819)	0.4820 (0.1678)	2.4553	0.6550
2000 : 3Q	0.0544 (0.0618)	0.7880 *** (0.1090)	0.0460 (0.2017)	-0.0547 (0.1588)	2.3949	0.7097
2000 : 4Q	-0.0540 (0.0795)	0.6606 *** (0.1342)	0.2064 (0.2076)	-0.1716 (0.1625)	2.7100	0.3429
2001 : 1Q	0.0140 (0.0563)	0.6152 *** (0.0895)	0.1033 (0.1260)	0.2717 ** (0.1354)	2.4219	0.7896
2001 : 2Q	-0.0475 (0.0535)	0.7003 *** (0.1049)	0.2308 (0.1428)	0.1450 (0.1482)	2.5191	0.7799
2001 : 3Q	-0.0056 (0.1187)	0.8529 *** (0.2516)	0.7464 ** (0.3009)	-0.4579 (0.4139)	2.9083	0.3520
2001 : 4Q	-0.0158 (0.0591)	0.6373 *** (0.1540)	0.3665 ** (0.1476)	0.0025 (0.1799)	2.7060	0.4352
2002 : 1Q	-0.0258 (0.0561)	0.7486 *** (0.1240)	0.2869 ** (0.1384)	- -	2.8805	0.6915
2002 : 2Q	-0.0498 (0.0726)	0.1953 (0.2442)	0.4711 *** (0.2088)	0.4081 (0.3397)	2.5177	0.4935
2002 : 3Q	-0.0691 (0.0725)	0.7526 *** (0.1506)	0.3119 *** (0.1108)	- -	2.3887	0.4418
2002 : 4Q	-0.0310 (0.0539)	0.9683 *** (0.1838)	0.4263 *** (0.1436)	-0.2120 (0.1750)	2.1755	0.6446
2003 : 1Q	-0.0029 (0.0783)	0.9608 *** (0.2343)	0.3534 * (0.1892)	-0.2337 (0.2374)	2.7557	0.3409
2003 : 2Q	0.0132 (0.0705)	1.1452 *** (0.1630)	0.3364 ** (0.1566)	-0.1335 (0.1578)	2.9411	0.5820
2003 : 3Q	-0.0097 (0.0587)	0.7319 *** (0.1320)	0.0283 (0.1460)	0.2072 (0.1660)	2.5601	0.6342
2003 : 4Q	-0.0224 (0.0512)	0.8019 *** (0.1278)	0.1529 (0.1512)	-0.0545 (0.1785)	2.9295	0.5842
2004 : 1Q	-0.0102 (0.0881)	0.5276 ** (0.2312)	0.1441 (0.1640)	0.2573 (0.2305)	2.9139	0.4001
2004 : 2Q	-0.0079 (0.0549)	1.0470 *** (0.1238)	-0.0190 (0.0950)	0.0079 (0.1256)	2.6998	0.7296
2004 : 3Q	0.0059 (0.0368)	0.9483 *** (0.1142)	0.0651 (0.0808)	-0.0857 (0.1122)	2.5889	0.7026
2004 : 4Q	-0.0756 (0.0386)	0.5405 *** (0.1124)	0.0594 (0.0860)	0.2727 ** (0.1165)	2.6713	0.5893
2005 : 1Q	0.0163 (0.0493)	0.9013 *** (0.1756)	-0.0013 (0.0931)	0.2321 (0.1815)	1.6845	0.6222
2005 : 2Q	-0.0003 (0.0614)	0.8948 *** (0.1650)	0.0725 (0.1489)	-0.3201 (0.2131)	2.3476	0.3748
2005 : 3Q	0.0002 (0.0005)	0.9792 *** (0.1963)	-0.0601 (0.1000)	-0.0061 (0.1869)	2.1505	0.5494
2005 : 4Q	-0.0005 (0.0005)	0.5349 *** (0.1902)	0.0421 (0.1233)	0.0397 (0.1895)	2.4675	0.3146
2006 : 1Q	-0.0002 (0.0005)	0.7791 *** (0.1867)	-0.1008 (0.1222)	0.1488 (0.1846)	2.3909	0.5373
2006 : 2Q	0.0003 (0.0005)	0.6179 *** (0.1919)	-0.0670 (0.0963)	-0.0398 (0.1757)	2.3917	0.3343
2006 : 3Q	-0.0005 (0.0004)	0.5587 *** (0.1788)	0.1524 (0.1149)	0.0759 (0.1621)	2.1929	0.4779
2006 : 4Q	-0.0016 (0.0005)	0.5739 *** (0.2982)	0.3178 (0.1508)	-0.1450 (0.2560)	2.0524	0.1946
2007 : 1Q	-0.0006 (0.0009)	1.2404 *** (0.3837)	0.3697 (0.2716)	-0.3634 (0.2798)	2.3715	0.5218

1. Calculated by authors. All foreign exchange data are from Datastream.

2. If the estimated coefficient is significantly negative, we re-estimate the equation without them. Standard errors are in parenthesis. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels,

Table 6. HUNGARIAN FORINT

	Constant	euro	US dollar	Sterling Pound	DW	Adj.R2
1999 : 1Q	0.0829 (0.0553)	0.3934 *** (0.1074)	0.5019 *** (0.1098)	- -	2.1327	0.7762
1999 : 2Q	-0.0092 (0.0207)	0.6232 *** (0.0480)	0.2894 *** (0.0624)	0.1104 ** (0.0686)	2.2350	0.9430
1999 : 3Q	0.0330 * (0.0146)	0.7158 *** (0.0296)	0.3044 *** (0.0322)	-0.0130 (0.0392)	1.7807	0.9831
1999 : 4Q	0.0089 (0.0121)	0.7125 *** (0.0319)	0.3186 *** (0.0340)	-0.0257 (0.0477)	2.2399	0.9832
2000 : 1Q	0.0247 (0.0143)	0.9648 *** (0.0274)	0.0434 * (0.0359)	0.0034 (0.0380)	2.2881	0.9886
2000 : 2Q	0.0128 (0.0164)	0.9947 *** (0.0242)	0.0534 ** (0.0363)	-0.0090 (0.0335)	2.5443	0.9829
2000 : 3Q	0.0229 *** (0.0079)	0.9874 *** (0.0139)	0.0065 (0.0257)	-0.0073 (0.0202)	2.7820	0.9961
2000 : 4Q	0.0064 (0.0137)	0.9700 *** (0.0193)	0.0439 (0.0323)	- -	2.4077	0.9794
2001 : 1Q	0.0073 (0.0107)	1.0012 *** (0.0170)	-0.0141 (0.0239)	-0.0084 (0.0257)	2.8507	0.9933
2001 : 2Q	-0.1404 *** (0.0489)	0.9819 *** (0.0960)	-0.1037 (0.1306)	0.1362 (0.1355)	1.6402	0.8411
2001 : 3Q	0.0566 (0.1011)	0.8920 *** (0.1587)	0.2688 *** (0.1760)	- -	1.6820	0.4598
2001 : 4Q	-0.0680 (0.0441)	0.6534 *** (0.1150)	0.2775 *** (0.1102)	0.0222 (0.1343)	2.1638	0.5781
2002 : 1Q	-0.0075 (0.0358)	0.8852 *** (0.0897)	0.0443 * (0.1238)	0.0517 (0.1424)	2.0489	0.8466
2002 : 2Q	-0.0297 (0.0323)	0.9366 *** (0.1087)	0.2827 *** (0.0930)	-0.1305 (0.1512)	2.2355	0.8180
2002 : 3Q	-0.0129 (0.0463)	1.0362 *** (0.1381)	0.1695 * (0.0851)	-0.1256 (0.1612)	1.7508	0.6878
2002 : 4Q	-0.0497 * (0.0306)	0.9533 *** (0.1043)	0.0048 * (0.0815)	-0.0294 (0.0993)	1.7914	0.7889
2003 : 1Q	0.0625 (0.0663)	0.8312 *** (0.1984)	0.0438 (0.1602)	0.0212 (0.2009)	1.2853	0.3771
2003 : 2Q	0.1169 (0.0945)	1.0660 *** (0.2185)	0.0221 (0.2098)	-0.0470 (0.2114)	1.7686	0.3565
2003 : 3Q	-0.0631 (0.0438)	0.9107 *** (0.0986)	-0.0205 (0.1090)	0.0421 (0.1240)	1.7508	0.7762
2003 : 4Q	0.0453 (0.0884)	0.8902 *** (0.2205)	-0.1261 (0.2608)	0.0256 (0.3080)	2.1293	0.3085
2004 : 1Q	-0.0760 (0.0622)	0.9815 *** (0.1632)	0.0057 (0.1158)	-0.0031 (0.1627)	1.9160	0.6748
2004 : 2Q	0.0062 (0.0523)	0.8789 *** (0.1149)	- -	0.0193 (0.1150)	1.7591	0.6861
2004 : 3Q	-0.0228 (0.0435)	1.0028 *** (0.1348)	-0.0094 (0.0953)	0.0106 (0.1324)	1.7542	0.6768
2004 : 4Q	-0.0065 (0.0407)	0.8476 *** (0.1184)	-0.1044 (0.0906)	0.2715 ** (0.1227)	1.8554	0.6602
2005 : 1Q	0.0100 (0.0353)	1.0740 *** (0.0773)	- -	- -	2.0053	0.7528
2005 : 2Q	0.0039 (0.0426)	0.9475 *** (0.1146)	-0.0008 (0.1034)	-0.1042 (0.1480)	1.6594	0.6308
2005 : 3Q	0.0001 (0.0003)	1.0009 *** (0.1030)	-0.0592 (0.0525)	0.0410 (0.0981)	2.0217	0.8379
2005 : 4Q	0.0002 (0.0005)	0.9454 *** (0.1572)	-0.0230 (0.1019)	0.1211 (0.1566)	1.6832	0.6970
2006 : 1Q	0.0007 (0.0006)	0.9271 *** (0.1899)	- (0.0000)	0.1480 (0.1851)	1.7065	0.6293
2006 : 2Q	0.0012 (0.0007)	0.8878 *** (0.3003)	-0.1637 (0.1506)	0.2475 (0.2749)	1.9282	0.4363
2006 : 3Q	-0.0004 (0.0007)	0.7972 *** (0.2902)	0.1021 (0.1865)	0.3637 (0.2631)	1.7759	0.4914
2006 : 4Q	-0.0013 (0.0006)	1.2823 *** (0.3182)	0.1738 (0.1609)	-0.3408 (0.2732)	1.8214	0.3546
2007 : 1Q	-0.0003 (0.0006)	1.1496 *** (0.2676)	-0.0138 (0.1894)	0.0419 (0.1951)	2.1083	0.7157

1. Calculated by authors. All foreign exchange data are from Datastream.

2. If the estimated coefficient is significantly negative, we re-estimate the equation without them. Standard errors are in parenthesis. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels,

Table 7. SLOVENIAN TOLAR

	Constant	euro	US dollar	Sterling Pound	DW	Adj.R2
1999 : 1Q	0.0693 (0.0605)	0.5873 *** (0.1439)	0.3204 ** (0.1529)	0.2305 (0.1783)	2.7547	0.8260
1999 : 2Q	0.0596 (0.0491)	0.5971 *** (0.1138)	0.1774 (0.1477)	0.2242 (0.1626)	2.6397	0.7388
1999 : 3Q	-0.0080 (0.0314)	0.9411 *** (0.0637)	0.0945 (0.0693)	0.0005 (0.0843)	2.8611	0.9368
1999 : 4Q	0.0269 (0.0195)	0.8500 *** (0.0515)	0.0266 (0.0549)	0.1782 ** (0.0771)	2.2375	0.9653
2000 : 1Q	0.0342 *** (0.0067)	0.9953 *** (0.0128)	0.0083 (0.0168)	0.0040 (0.0177)	2.2182	0.9976
2000 : 2Q	0.0286 (0.0186)	0.9921 *** (0.0274)	-0.0237 (0.0411)	-0.0102 (0.0379)	2.6366	0.9763
2000 : 3Q	0.0142 (0.0343)	0.9751 *** (0.0605)	-0.0960 (0.1120)	0.0828 (0.0882)	2.9936	0.9318
2000 : 4Q	0.0300 *** (0.0095)	0.9979 *** (0.0160)	-0.0193 (0.0248)	0.0180 (0.0194)	2.8338	0.9905
2001 : 1Q	0.0165 ** (0.0098)	0.9936 *** (0.0156)	-0.0286 (0.0219)	0.0288 (0.0236)	2.4038	0.9944
2001 : 2Q	0.0174 * (0.0112)	0.9944 *** (0.0220)	0.0413 (0.0300)	-0.0309 (0.0311)	2.6622	0.9893
2001 : 3Q	0.0096 (0.0105)	0.9999 *** (0.0222)	0.0188 (0.0265)	-0.0170 (0.0365)	2.6783	0.9872
2001 : 4Q	-0.0072 (0.0196)	0.9876 *** (0.0511)	0.0435 (0.0489)	-0.0152 (0.0596)	2.5533	0.9227
2002 : 1Q	0.0358 (0.0351)	0.9461 *** (0.0876)	-	0.1058 (0.0998)	2.8304	0.8677
2002 : 2Q	0.0033 (0.0148)	1.0397 *** (0.0499)	0.0179 (0.0426)	-0.0297 (0.0694)	0.9482	0.9548
2002 : 3Q	0.0212 (0.0203)	1.0139 *** (0.0605)	0.0335 (0.0373)	-0.0941 (0.0707)	2.2062	0.9073
2002 : 4Q	0.0054 (0.0220)	0.8612 *** (0.0748)	-0.0080 (0.0584)	0.1068 (0.0712)	2.8786	0.8843
2003 : 1Q	0.0053 (0.0508)	0.9291 *** (0.1520)	0.1065 (0.1228)	0.0974 (0.1540)	2.4276	0.6206
2003 : 2Q	0.0124 *** (0.0030)	1.0013 *** (0.0070)	0.0222 *** (0.0068)	-0.0033 (0.0068)	2.4626	0.9982
2003 : 3Q	0.0091 * (0.0048)	1.0210 *** (0.0108)	0.0043 (0.0119)	-0.0144 (0.0136)	2.3474	0.9971
2003 : 4Q	0.0076 ** (0.0026)	0.9896 *** (0.0064)	0.0171 ** (0.0076)	0.0069 (0.0090)	2.0560	0.9988
2004 : 1Q	0.0103 ** (0.0046)	0.9914 *** (0.0119)	0.0007 (0.0085)	0.0097 (0.0119)	2.2398	0.9976
2004 : 2Q	0.0108 ** (0.0042)	1.0003 *** (0.0095)	0.0035 (0.0073)	0.0019 (0.0097)	2.3357	0.9977
2004 : 3Q	-0.0004 (0.0057)	0.9817 *** (0.0178)	0.0279 ** (0.0126)	-0.0111 (0.0175)	3.1099	0.9915
2004 : 4Q	-0.0051 (0.0038)	0.9923 *** (0.0111)	0.0231 *** (0.0085)	-0.0090 (0.0115)	2.5369	0.9958
2005 : 1Q	0.0021 (0.0045)	0.9688 *** (0.0162)	-0.0071 (0.0086)	0.0252 (0.0167)	2.7976	0.9938
2005 : 2Q	0.0037 (0.0115)	0.9107 *** (0.0310)	0.0322 (0.0279)	0.0412 (0.0400)	2.8005	0.9644
2005 : 3Q	0.0000 (0.0001)	0.9695 *** (0.0297)	0.0191 ** (0.0152)	0.0185 (0.0283)	3.0531	0.9844
2005 : 4Q	0.0000 (0.0001)	1.0044 *** (0.0192)	0.0269 * (0.0125)	-0.0280 (0.0191)	2.9746	0.9929
2006 : 1Q	0.0000 (0.0000)	1.0083 *** (0.0076)	-0.0081 (0.0050)	-0.0017 (0.0075)	3.0190	0.9990
2006 : 2Q	0.0000 (0.0002)	0.9166 *** (0.0649)	0.0175 (0.0326)	0.0637 (0.0594)	2.9315	0.9379
2006 : 3Q	0.0000 (0.0000)	1.0051 *** (0.0076)	-	0.0003 (0.0069)	2.9164	0.9990
2006 : 4Q	0.0000 (0.0000)	1.0030 *** (0.0040)	-0.0003 (0.0020)	-0.0028 (0.0035)	2.0746	0.9997
2007 : 1Q	0.0000 (0.0000)	1.0000 *** (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)	2.9904	1.0000

1. Calculated by authors. All foreign exchange data are from Datastream.

2. If the estimated coefficient is significantly negative, we re-estimate the equation without them. Standard errors are in parenthesis. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels,

Table 8. ESTONIAN KROON

	Constant	euro	US dollar	Sterling Pound	DW	Adj.R2
1999 : 1Q	0.0051 (0.0207)	0.9592 *** (0.0493)	0.0585 (0.0524)	0.0085 (0.0611)	2.9419	0.9726
1999 : 2Q	0.0003 (0.0210)	0.9723 *** (0.0486)	- -	0.0471 (0.0516)	2.8748	0.9508
1999 : 3Q	0.0064 (0.0161)	0.9874 *** (0.0327)	-0.0218 (0.0356)	0.0054 (0.0433)	2.9218	0.9815
1999 : 4Q	0.0057 (0.0197)	0.9566 *** (0.0519)	- -	0.0058 (0.0635)	2.9760	0.9621
2000 : 1Q	0.0015 (0.0070)	0.9856 *** (0.0134)	0.0372 ** (0.0176)	-0.0106 (0.0186)	2.9074	0.9973
2000 : 2Q	0.0003 (0.0090)	1.0222 *** (0.0133)	-0.0172 (0.0200)	-0.0010 (0.0184)	3.0539	0.9947
2000 : 3Q	-0.0012 (0.0039)	1.0043 *** (0.0068)	0.0044 (0.0126)	0.0040 (0.0099)	2.5828	0.9991
2000 : 4Q	0.0003 (0.0044)	0.9910 *** (0.0074)	-0.0184 (0.0114)	0.0190 ** (0.0089)	2.5812	0.9980
2001 : 1Q	0.0010 (0.0050)	1.0043 *** (0.0080)	0.0157 (0.0112)	-0.0144 (0.0121)	3.0040	0.9985
2001 : 2Q	0.0037 (0.0115)	0.9535 *** (0.0226)	0.0857 *** (0.0308)	-0.0197 (0.0320)	2.8567	0.9885
2001 : 3Q	-0.0015 (0.0052)	0.9936 *** (0.0081)	0.0098 ** (0.0090)	- -	3.0990	0.9968
2001 : 4Q	-0.0012 (0.0082)	1.0094 *** (0.0215)	-0.0254 (0.0206)	0.0103 (0.0251)	2.9488	0.9860
2002 : 1Q	-0.0016 (0.0107)	0.9897 *** (0.0267)	-0.0343 (0.0368)	0.0532 (0.0424)	3.0640	0.9859
2002 : 2Q	0.0003 (0.0078)	1.0119 *** (0.0263)	0.0068 (0.0225)	-0.0127 (0.0366)	2.8798	0.9865
2002 : 3Q	0.0010 (0.0109)	0.9493 *** (0.0324)	-0.0079 (0.0200)	0.0295 (0.0378)	2.9162	0.9722
2002 : 4Q	-0.0007 (0.0069)	0.9954 *** (0.0236)	-0.0159 (0.0185)	0.0100 (0.0225)	3.1072	0.9882
2003 : 1Q	0.0007 (0.0128)	0.9944 *** (0.0385)	0.0026 (0.0311)	-0.0255 (0.0390)	2.9916	0.9561
2003 : 2Q	-0.0011 (0.0060)	0.9964 *** (0.0139)	-0.0010 (0.0134)	-0.0037 (0.0135)	2.6666	0.9927
2003 : 3Q	-0.0001 (0.0041)	0.9971 *** (0.0092)	0.0019 (0.0101)	0.0047 (0.0115)	3.0039	0.9979
2003 : 4Q	0.0000 (0.0000)	1.0000 *** (0.0001)	0.0002 ** (0.0001)	0.0000 (0.0001)	2.9052	1.0000
2004 : 1Q	0.0000 (0.0000)	1.0001 *** (0.0001)	0.0000 (0.0001)	-0.0001 (0.0001)	3.0372	1.0000
2004 : 2Q	0.0000 (0.0000)	1.0000 *** (0.0000)	0.0000 (0.0000)	0.0000 (0.0001)	2.7254	1.0000
2004 : 3Q	0.0000 (0.0000)	1.0000 *** (0.0001)	0.0000 (0.0001)	0.0000 (0.0001)	3.0510	1.0000
2004 : 4Q	0.0000 (0.0000)	0.9999 *** (0.0001)	0.0001 (0.0001)	0.0000 (0.0001)	2.9826	1.0000
2005 : 1Q	0.0000 (0.0000)	1.0000 *** (0.0001)	0.0001 (0.0001)	-0.0001 (0.0002)	2.7440	1.0000
2005 : 2Q	0.0000 (0.0000)	0.9999 *** (0.0001)	0.0000 (0.0001)	0.0001 (0.0001)	2.8387	1.0000
2005 : 3Q	0.0000 (0.0000)	1.0001 *** (0.0001)	-0.0001 (0.0000)	-0.0001 (0.0001)	2.5393	1.0000
2005 : 4Q	0.0000 (0.0000)	1.0002 *** (0.0001)	0.0000 (0.0001)	-0.0002 (0.0001)	2.9397	1.0000
2006 : 1Q	0.0000 (0.0000)	1.0000 *** (0.0001)	-0.0001 (0.0001)	0.0000 (0.0001)	2.7650	1.0000
2006 : 2Q	0.0000 (0.0000)	1.0000 *** (0.0001)	0.0000 (0.0001)	0.0000 (0.0001)	3.0426	1.0000
2006 : 3Q	0.0000 (0.0000)	1.0001 *** (0.0001)	-0.0001 (0.0001)	0.0000 (0.0001)	2.7434	1.0000
2006 : 4Q	0.0000 (0.0000)	1.0002 *** (0.0002)	0.0002 (0.0001)	-0.0003 (0.0001)	2.5638	1.0000
2007 : 1Q	0.0000 (0.0000)	1.0000 *** (0.0001)	0.0001 (0.0001)	-0.0001 (0.0001)	3.0087	1.0000

1. Calculated by authors. All foreign exchange data are from Datastream.

2. If the estimated coefficient is significantly negative, we re-estimate the equation without them. Standard errors are in parenthesis. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels,

Table 9. LATVIAN LAT

	Constant	euro	US dollar	Sterling Pound	DW	Adj.R2
1999 : 1Q	0.0131 (0.0257)	0.2413 *** (0.0610)	0.5360 *** (0.0649)	0.1155 (0.0756)	1.9411	0.9418
1999 : 2Q	0.0097 (0.0164)	0.2415 *** (0.0380)	0.5766 *** (0.0494)	0.0739 (0.0544)	2.1141	0.9485
1999 : 3Q	-0.0039 (0.0090)	0.2881 *** (0.0183)	0.4353 *** (0.0199)	0.1391 *** (0.0243)	1.9547	0.9899
1999 : 4Q	-0.0048 (0.0146)	0.2319 ** (0.0386)	0.4669 *** (0.0411)	0.1791 *** (0.0577)	1.4937	0.9606
2000 : 1Q	-0.0087 (0.0184)	0.2368 *** (0.0351)	0.4688 *** (0.0461)	0.1245 ** (0.0488)	2.0192	0.9557
2000 : 2Q	0.0029 (0.0090)	0.2318 *** (0.0132)	0.5349 *** (0.0199)	0.0899 *** (0.0183)	1.8389	0.9872
2000 : 3Q	0.0125 * (0.0069)	0.2104 *** (0.0122)	0.5628 *** (0.0226)	0.0795 *** (0.0178)	2.2393	0.9883
2000 : 4Q	0.0138 (0.0090)	0.2191 *** (0.0152)	0.5102 *** (0.0235)	0.0937 *** (0.0184)	1.3594	0.9669
2001 : 1Q	-0.0081 (0.0108)	0.2468 ** (0.0171)	0.5444 *** (0.0241)	0.1086 *** (0.0259)	1.8494	0.9825
2001 : 2Q	-0.0079 (0.0103)	0.2497 *** (0.0202)	0.5463 *** (0.0275)	0.0833 *** (0.0285)	2.0734	0.9791
2001 : 3Q	0.0034 (0.0138)	0.2597 *** (0.0294)	0.4920 *** (0.0351)	0.1201 ** (0.0483)	1.9760	0.9568
2001 : 4Q	-0.0085 (0.0068)	0.2836 *** (0.0177)	0.4817 *** (0.0170)	0.0855 *** (0.0207)	1.7704	0.9738
2002 : 1Q	0.0026 (0.0144)	0.2898 *** (0.0361)	0.4850 *** (0.0499)	0.1201 ** (0.0574)	1.7731	0.9580
2002 : 2Q	0.0049 (0.0120)	0.3152 *** (0.0404)	0.4777 *** (0.0345)	0.1163 ** (0.0561)	1.6692	0.9622
2002 : 3Q	0.0006 (0.0103)	0.2922 *** (0.0306)	0.4643 *** (0.0188)	0.1205 *** (0.0357)	1.9343	0.9713
2002 : 4Q	-0.0094 (0.0125)	0.2727 *** (0.0426)	0.4760 *** (0.0333)	0.1052 *** (0.0406)	1.8408	0.9478
2003 : 1Q	-0.0041 (0.0103)	0.3262 *** (0.0309)	0.4793 *** (0.0250)	0.0613 * (0.0313)	1.8500	0.9557
2003 : 2Q	0.0024 (0.0092)	0.3375 *** (0.0212)	0.4546 *** (0.0204)	0.0955 *** (0.0205)	2.0013	0.9710
2003 : 3Q	-0.0037 (0.0108)	0.3078 *** (0.0244)	0.4243 *** (0.0270)	0.1473 *** (0.0307)	2.3824	0.9639
2003 : 4Q	-0.0072 (0.0071)	0.3664 *** (0.0178)	0.4373 *** (0.0210)	0.0673 *** (0.0249)	2.0076	0.9833
2004 : 1Q	-0.0001 (0.0049)	0.3442 *** (0.0128)	0.3877 *** (0.0091)	0.1428 ** (0.0127)	2.4494	0.9931
2004 : 2Q	-0.0009 (0.0089)	0.3342 *** (0.0201)	0.3884 *** (0.0155)	0.1140 *** (0.0204)	2.2084	0.9813
2004 : 3Q	0.0002 (0.0069)	0.3542 *** (0.0213)	0.3777 *** (0.0151)	0.1287 *** (0.0210)	2.6624	0.9773
2004 : 4Q	0.0015 (0.0089)	0.3556 *** (0.0258)	0.3977 *** (0.0198)	0.1487 *** (0.0268)	2.0997	0.9703
2005 : 1Q	-0.0012 (0.0053)	0.9535 *** (0.0189)	0.0032 (0.0100)	0.0090 (0.0195)	2.9328	0.9911
2005 : 2Q	0.0008 (0.0033)	0.9993 *** (0.0089)	0.0046 (0.0080)	-0.0175 (0.0115)	2.9232	0.9972
2005 : 3Q	0.0000 (0.0000)	0.9994 *** (0.0108)	0.0033 (0.0055)	-0.0124 (0.0103)	2.8039	0.9979
2005 : 4Q	0.0000 (0.0001)	0.9692 *** (0.0176)	-0.0137 (0.0114)	0.0257 (0.0176)	2.0522	0.9940
2006 : 1Q	0.0000 (0.0000)	1.0014 *** (0.0105)	-0.0046 (0.0069)	0.0043 (0.0104)	3.1925	0.9981
2006 : 2Q	0.0000 (0.0000)	1.0000 *** (0.0098)	-0.0042 (0.0049)	-0.0005 (0.0089)	2.7229	0.9986
2006 : 3Q	0.0000 (0.0000)	0.9924 *** (0.0108)	0.0042 (0.0069)	0.0070 (0.0098)	3.2512	0.9981
2006 : 4Q	0.0000 (0.0001)	0.9655 *** (0.0325)	-0.0070 (0.0164)	0.0015 (0.0279)	1.8398	0.9785
2007 : 1Q	0.0003 (0.0003)	0.8196 *** (0.1204)	0.0305 (0.0852)	0.0719 (0.0878)	2.1606	0.8851

1. Calculated by authors. All foreign exchange data are from Datastream.

2. If the estimated coefficient is significantly negative, we re-estimate the equation without them. Standard errors are in parenthesis. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels,

Table 10. LITHUANIAN LITA

	Constant	euro	US dollar	Sterling Pound	DW	Adj.R2
1999 : 1Q	0.0006 * (0.0023)	-0.0003 (0.0054)	1.0004 *** (0.0057)	-0.0018 (0.0067)	2.6474	0.9996
1999 : 2Q	0.0006 (0.0014)	-0.0022 (0.0033)	0.9967 *** (0.0043)	0.0036 (0.0047)	2.0109	0.9997
1999 : 3Q	-0.0010 (0.0019)	-0.0027 (0.0040)	0.9990 *** (0.0043)	0.0054 (0.0052)	1.9902	0.9997
1999 : 4Q	0.0009 (0.0014)	-0.0033 (0.0038)	0.9976 *** (0.0040)	0.0053 *** (0.0056)	2.0485	0.9997
2000 : 1Q	0.0002 (0.0019)	-0.0011 (0.0036)	1.0109 *** (0.0047)	-0.0012 * (0.0049)	2.0424	0.9996
2000 : 2Q	-0.0010 (0.0016)	0.0020 (0.0023)	0.9973 *** (0.0034)	0.0029 ** (0.0032)	1.9163	0.9997
2000 : 3Q	0.0004 (0.0014)	0.0029 (0.0025)	0.9972 *** (0.0046)	-0.0016 *** (0.0036)	2.0967	0.9995
2000 : 4Q	-0.0004 (0.0021)	-0.0012 (0.0035)	1.0089 *** (0.0054)	-0.0013 * (0.0042)	2.4881	0.9987
2001 : 1Q	-0.0003 (0.0021)	-0.0011 (0.0034)	0.9920 *** (0.0048)	0.0021 (0.0051)	2.2804	0.9993
2001 : 2Q	0.0002 (0.0022)	-0.0035 (0.0043)	1.0057 *** (0.0058)	0.0009 (0.0060)	2.1383	0.9992
2001 : 3Q	-0.0007 (0.0023)	0.0004 (0.0048)	1.0005 *** (0.0057)	0.0006 *** (0.0079)	3.1492	0.9993
2001 : 4Q	0.0000 (0.0034)	0.0133 (0.0088)	0.9994 *** (0.0084)	-0.0086 (0.0103)	2.5539	0.9964
2002 : 1Q	-0.0341 (0.0256)	0.3297 *** (0.0640)	0.3892 ** (0.0884)	0.1528 *** (0.1016)	1.7040	0.8735
2002 : 2Q	-0.0016 (0.0021)	0.9995 *** (0.0070)	0.0101 * (0.0060)	-0.0056 (0.0097)	2.7923	0.9990
2002 : 3Q	0.0002 (0.0025)	0.9946 *** (0.0075)	0.0010 (0.0046)	0.0025 (0.0087)	2.7748	0.9986
2002 : 4Q	-0.0002 (0.0020)	0.9952 *** (0.0070)	0.0028 (0.0054)	0.0033 (0.0066)	2.6347	0.9990
2003 : 1Q	-0.0003 (0.0030)	0.9912 *** (0.0089)	-0.0010 (0.0072)	0.0054 (0.0090)	3.0149	0.9977
2003 : 2Q	0.0002 (0.0018)	1.0079 *** (0.0042)	0.0069 * (0.0040)	-0.0061 (0.0040)	2.3090	0.9994
2003 : 3Q	-0.0003 (0.0015)	0.9999 *** (0.0024)	0.0017 (0.0034)	-	2.3059	0.9997
2003 : 4Q	0.0005 (0.0012)	0.9992 *** (0.0029)	-0.0055 (0.0035)	0.0043 (0.0041)	2.4320	0.9997
2004 : 1Q	-0.0002 (0.0015)	1.0004 *** (0.0039)	0.0061 * (0.0028)	0.0002 (0.0039)	2.8209	0.9997
2004 : 2Q	-0.0001 (0.0009)	0.9987 *** (0.0020)	-	0.0010 (0.0021)	2.8154	0.9999
2004 : 3Q	-0.0001 (0.0004)	1.0008 *** (0.0013)	0.0005 (0.0010)	-	2.6576	1.0000
2004 : 4Q	0.0002 (0.0012)	1.0012 *** (0.0036)	-0.0012 *** (0.0028)	0.0004 (0.0038)	3.0596	0.9995
2005 : 1Q	0.0001 (0.0003)	1.0020 *** (0.0012)	0.0017 *** (0.0006)	-0.0005 (0.0012)	2.7038	1.0000
2005 : 2Q	0.0000 (0.0003)	1.0007 *** (0.0009)	0.0013 (0.0008)	-0.0007 (0.0012)	2.9674	1.0000
2005 : 3Q	0.0000 (0.0000)	0.9978 *** (0.0016)	0.0001 (0.0008)	0.0011 (0.0015)	2.8793	1.0000
2005 : 4Q	0.0000 (0.0000)	1.0016 *** (0.0014)	-0.0004 (0.0009)	-0.0016 (0.0014)	2.5912	1.0000
2006 : 1Q	0.0000 (0.0000)	0.9994 *** (0.0015)	0.0002 (0.0010)	0.0004 (0.0015)	3.1269	1.0000
2006 : 2Q	0.0000 (0.0000)	0.9988 *** (0.0015)	0.0014 (0.0008)	-0.0003 (0.0014)	2.8261	1.0000
2006 : 3Q	0.0000 (0.0000)	0.9990 *** (0.0014)	0.0011 (0.0009)	0.0002 (0.0013)	2.6264	1.0000
2006 : 4Q	0.0000 (0.0000)	1.0002 *** (0.0008)	-0.0002 (0.0004)	0.0006 (0.0007)	2.7316	1.0000
2007 : 1Q	0.0000 (0.0000)	0.9994 *** (0.0006)	0.0002 (0.0004)	0.0003 (0.0004)	2.5617	1.0000

1. Calculated by authors. All foreign exchange data are from Datastream.

2. If the estimated coefficient is significantly negative, we re-estimate the equation without them. Standard errors are in parenthesis. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels,

Table 11. MALTESE LIRA

	Constant	euro	US dollar	Sterling Pound	DW	Adj.R2
1999 : 1Q	0.0046 (0.0109)	0.4891 *** (0.0260)	0.2231 *** (0.0276)	0.2757 *** (0.0322)	2.3936	0.9911
1999 : 2Q	0.0028 (0.0092)	0.5210 *** (0.0214)	0.2837 *** (0.0277)	0.2060 *** (0.0305)	2.7962	0.9877
1999 : 3Q	-0.0002 (0.0071)	0.5464 *** (0.0144)	0.2319 *** (0.0156)	0.2237 *** (0.0190)	1.9699	0.9957
1999 : 4Q	-0.0013 (0.0035)	0.5299 *** (0.0094)	0.2389 *** (0.0100)	0.2386 *** (0.0140)	2.5903	0.9984
2000 : 1Q	0.0017 (0.0031)	0.5210 *** (0.0059)	0.2515 *** (0.0077)	0.2327 *** (0.0081)	2.4400	0.9993
2000 : 2Q	-0.0004 (0.0053)	0.5124 *** (0.0079)	0.2662 *** (0.0118)	0.2392 *** (0.0109)	2.9046	0.9972
2000 : 3Q	0.0001 (0.0026)	0.5189 *** (0.0047)	0.2514 *** (0.0086)	0.2242 *** (0.0068)	2.6152	0.9993
2000 : 4Q	-0.0001 (0.0035)	0.5017 *** (0.0059)	0.2657 *** (0.0091)	0.2404 *** (0.0072)	2.7767	0.9977
2001 : 1Q	-0.0014 (0.0047)	0.5274 *** (0.0075)	0.2620 *** (0.0106)	0.2098 *** (0.0113)	2.8555	0.9979
2001 : 2Q	0.0016 (0.0044)	0.5059 *** (0.0086)	0.2602 *** (0.0117)	0.2229 *** (0.0122)	2.9747	0.9976
2001 : 3Q	0.0017 (0.0051)	0.5315 *** (0.0109)	0.2644 *** (0.0130)	0.2164 *** (0.0179)	2.6375	0.9957
2001 : 4Q	-0.0006 (0.0074)	0.5556 *** (0.0194)	0.2453 *** (0.0186)	0.2121 *** (0.0227)	2.6204	0.9820
2002 : 1Q	-0.0001 (0.0031)	0.5130 *** (0.0078)	0.2472 *** (0.0108)	0.2399 *** (0.0124)	2.9266	0.9984
2002 : 2Q	-0.0018 (0.0042)	0.4914 *** (0.0142)	0.2569 *** (0.0122)	0.2476 *** (0.0198)	2.7667	0.9956
2002 : 3Q	-0.0042 (0.0073)	0.5381 *** (0.0217)	0.2077 *** (0.0134)	0.2463 *** (0.0254)	1.7689	0.9862
2002 : 4Q	-0.0016 (0.0022)	0.6886 *** (0.0076)	0.1037 *** (0.0059)	0.2096 *** (0.0072)	2.7124	0.9987
2003 : 1Q	0.0002 ** (0.0029)	0.7143 *** (0.0087)	0.0906 *** (0.0070)	0.1986 *** (0.0088)	2.8491	0.9976
2003 : 2Q	-0.0003 (0.0027)	0.7273 *** (0.0062)	0.1043 *** (0.0059)	0.1772 *** (0.0060)	2.5290	0.9984
2003 : 3Q	-0.0008 (0.0029)	0.7382 *** (0.0065)	0.0836 *** (0.0071)	0.1750 *** (0.0081)	2.2237	0.9987
2003 : 4Q	-0.0042 (0.0087)	0.6924 *** (0.0217)	0.1405 *** (0.0257)	0.1915 *** (0.0303)	2.7239	0.9839
2004 : 1Q	-0.0002 (0.0028)	0.7239 *** (0.0073)	0.0820 *** (0.0052)	0.1963 *** (0.0073)	2.7014	0.9989
2004 : 2Q	0.0026 (0.0338)	0.5779 *** (0.0763)	0.1339 ** (0.0586)	0.3298 *** (0.0774)	3.0921	0.8550
2004 : 3Q	0.0002 (0.0030)	0.7249 *** (0.0092)	0.0932 *** (0.0065)	0.1823 *** (0.0090)	2.7175	0.9974
2004 : 4Q	-0.0038 (0.0034)	0.7178 *** (0.0100)	0.1022 *** (0.0076)	0.1769 *** (0.0104)	2.6162	0.9960
2005 : 1Q	0.0022 (0.0048)	0.7027 *** (0.0170)	0.0836 *** (0.0090)	0.1973 *** (0.0176)	2.8397	0.9923
2005 : 2Q	0.0012 (0.0074)	0.9035 *** (0.0199)	0.0271 (0.0180)	0.0452 * (0.0258)	2.2747	0.9847
2005 : 3Q	0.0000 (0.0003)	0.9661 *** (0.0966)	0.0331 (0.0492)	0.0354 (0.0919)	2.9920	0.8612
2005 : 4Q	0.0000 (0.0001)	1.0016 *** (0.0202)	0.0297 * (0.0131)	-0.0257 (0.0201)	2.8961	0.9922
2006 : 1Q	0.0000 (0.0000)	0.9993 *** (0.0037)	-0.0004 (0.0024)	0.0028 (0.0037)	3.2082	0.9998
2006 : 2Q	0.0000 (0.0000)	0.9972 *** (0.0043)	0.0018 (0.0021)	0.0033 (0.0039)	2.8418	0.9997
2006 : 3Q	0.0000 (0.0000)	0.9937 *** (0.0035)	0.0032 (0.0023)	0.0033 (0.0032)	2.8961	0.9998
2006 : 4Q	0.0000 (0.0000)	1.0004 *** (0.0059)	0.0007 (0.0030)	-0.0008 (0.0051)	3.0046	0.9993
2007 : 1Q	0.0000 (0.0000)	0.9997 *** (0.0040)	-0.0039 (0.0028)	0.0027 (0.0029)	2.7507	0.9999

1. Calculated by authors. All foreign exchange data are from Datastream.

2. If the estimated coefficient is significantly negative, we re-estimate the equation without them. Standard errors are in parenthesis. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels,

Table 12. CYPRUS POUND

	Constant	euro	US dollar	Sterling Pound	DW	Adj.R2
1999 : 1Q	-0.0026 ** (0.0028)	0.9603 *** (0.0066)	0.0471 *** (0.0070)	-0.0086 * (0.0082)	2.5000	0.9995
1999 : 2Q	-0.0002 (0.0032)	0.9520 *** (0.0074)	0.0646 *** (0.0096)	-0.0076 (0.0106)	2.7086	0.9988
1999 : 3Q	0.0011 (0.0039)	0.9510 *** (0.0079)	0.0452 *** (0.0086)	0.0001 (0.0104)	2.9299	0.9989
1999 : 4Q	-0.0011 (0.0039)	0.9515 *** (0.0102)	0.0437 ** (0.0109)	-0.0038 (0.0153)	2.8321	0.9985
2000 : 1Q	-0.0001 (0.0027)	0.9395 *** (0.0051)	0.0624 *** (0.0067)	-0.0001 ** (0.0071)	2.7001	0.9996
2000 : 2Q	-0.0010 (0.0046)	0.9381 *** (0.0068)	0.0542 ** (0.0103)	0.0061 * (0.0095)	3.2872	0.9985
2000 : 3Q	-0.0030 (0.0076)	0.9639 *** (0.0134)	- -	0.0154 (0.0166)	2.8291	0.9962
2000 : 4Q	0.0028 (0.0034)	0.9827 *** (0.0057)	0.0152 (0.0088)	-0.0017 (0.0069)	2.2208	0.9987
2001 : 1Q	0.0117 * (0.0062)	0.9801 *** (0.0099)	0.0023 (0.0139)	0.0168 (0.0149)	1.6439	0.9977
2001 : 2Q	-0.0103 (0.0059)	0.9859 *** (0.0115)	0.0227 ** (0.0157)	-0.0189 (0.0163)	2.4882	0.9970
2001 : 3Q	0.0019 (0.0062)	1.0174 *** (0.0131)	-0.0063 (0.0156)	-0.0122 (0.0215)	2.4234	0.9956
2001 : 4Q	0.0009 (0.0056)	0.9789 *** (0.0145)	0.0024 (0.0139)	0.0030 (0.0170)	1.7866	0.9932
2002 : 1Q	0.0028 (0.0074)	1.0236 *** (0.0185)	0.0029 (0.0255)	-0.0338 (0.0294)	2.2605	0.9931
2002 : 2Q	0.0015 (0.0094)	1.0044 *** (0.0317)	0.0488 * (0.0271)	-0.0157 (0.0441)	2.3229	0.9812
2002 : 3Q	-0.0146 (0.0100)	0.9575 *** (0.0298)	-0.0137 (0.0184)	0.0351 (0.0348)	2.9731	0.9767
2002 : 4Q	-0.0019 (0.0105)	1.0176 *** (0.0359)	0.0275 (0.0281)	-0.0159 (0.0342)	2.6033	0.9747
2003 : 1Q	0.0312 *** (0.0091)	1.0041 *** (0.0272)	0.0096 (0.0220)	-0.0141 (0.0276)	2.1126	0.9785
2003 : 2Q	0.0029 (0.0074)	0.9787 *** (0.0172)	- -	0.0017 (0.0142)	1.8566	0.9885
2003 : 3Q	-0.0053 (0.0086)	1.0031 *** (0.0141)	0.0027 (0.0198)	- -	2.0906	0.9907
2003 : 4Q	0.0046 (0.0059)	0.9846 *** (0.0147)	0.0096 * (0.0174)	0.0017 (0.0205)	2.2917	0.9934
2004 : 1Q	-0.0007 (0.0041)	1.0014 *** (0.0108)	0.0020 (0.0077)	-0.0049 (0.0108)	2.5200	0.9980
2004 : 2Q	-0.0131 * (0.0075)	1.0032 *** (0.0169)	-0.0002 (0.0129)	-0.0196 (0.0171)	2.3806	0.9925
2004 : 3Q	-0.0151 (0.0093)	1.0166 *** (0.0289)	-0.0297 (0.0204)	-0.0081 (0.0283)	2.1961	0.9787
2004 : 4Q	0.0092 (0.0059)	0.9867 *** (0.0172)	0.0127 *** (0.0132)	-0.0002 (0.0178)	2.4780	0.9898
2005 : 1Q	0.0138 (0.0101)	1.0200 *** (0.0360)	-0.0075 (0.0191)	0.0232 (0.0373)	2.6793	0.9727
2005 : 2Q	-0.0286 (0.0107)	0.9961 *** (0.0288)	0.0217 (0.0260)	-0.0077 (0.0371)	1.9162	0.9722
2005 : 3Q	0.0000 (0.0000)	0.9825 *** (0.0098)	0.0009 (0.0050)	0.0115 (0.0093)	2.8174	0.9983
2005 : 4Q	0.0000 (0.0000)	0.9930 *** (0.0087)	-0.0028 (0.0057)	-0.0008 (0.0087)	2.6014	0.9985
2006 : 1Q	0.0001 (0.0000)	0.9882 *** (0.0103)	-0.0039 (0.0068)	0.0132 (0.0102)	2.5727	0.9981
2006 : 2Q	0.0000 (0.0001)	1.0117 *** (0.0361)	0.0265 (0.0181)	-0.0175 (0.0331)	3.0028	0.9808
2006 : 3Q	0.0000 (0.0000)	1.0108 *** (0.0129)	-0.0003 (0.0083)	-0.0084 (0.0117)	1.9989	0.9972
2006 : 4Q	0.0000 (0.0000)	1.0162 *** (0.0168)	-0.0061 (0.0085)	-0.0189 (0.0144)	2.1574	0.9945
2007 : 1Q	0.0001 (0.0000)	1.0204 *** (0.0174)	-0.0035 (0.0123)	-0.0135 (0.0127)	2.6102	0.9977

1. Calculated by authors. All foreign exchange data are from Datastream.

2. If the estimated coefficient is significantly negative, we re-estimate the equation without them. Standard errors are in parenthesis. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels,

Table 13. ROMANIAN LEU

	Constant	euro	US dollar	Sterling Pound	DW	Adj.R2
1999 : 1Q	0.4567 (0.2592)	- -	0.7649 (0.6588)	-0.0755 (0.6387)	1.5020	0.0615
1999 : 2Q	0.0919 * (0.0777)	0.2757 (0.1800)	1.1599 *** (0.2336)	-0.3490 (0.2572)	1.3883	0.5541
1999 : 3Q	0.0639 (0.0199)	0.0160 (0.0405)	1.0013 *** (0.0441)	-0.0243 (0.0536)	2.3183	0.9647
1999 : 4Q	0.1605 *** (0.0382)	0.0327 (0.1008)	1.1129 *** (0.1075)	-0.1985 (0.1508)	1.6815	0.8101
2000 : 1Q	0.1036 ** (0.0271)	-0.0503 (0.0516)	0.9802 *** (0.0678)	0.0500 (0.0717)	2.3468	0.9218
2000 : 2Q	0.1413 * (0.0108)	0.0357 (0.0149)	0.9920 *** (0.0198)	- -	2.5952	0.9866
2000 : 3Q	0.1928 *** (0.0148)	-0.0055 (0.0262)	1.0191 *** (0.0484)	0.0210 (0.0381)	2.2519	0.9491
2000 : 4Q	0.1072 *** (0.0098)	-0.0049 (0.0166)	0.9581 *** (0.0257)	0.0389 (0.0201)	2.3498	0.9711
2001 : 1Q	0.0934 (0.0114)	-0.0101 (0.0181)	0.9817 *** (0.0255)	0.0135 (0.0274)	2.7910	0.9815
2001 : 2Q	0.0867 *** (0.0106)	-0.0163 (0.0208)	1.0292 *** (0.0283)	0.0147 (0.0293)	2.7177	0.9825
2001 : 3Q	0.0696 ** (0.0112)	0.0148 (0.0237)	0.9807 *** (0.0283)	-0.0136 (0.0390)	1.8435	0.9814
2001 : 4Q	0.0560 ** (0.0281)	-0.0263 (0.0733)	0.9298 *** (0.0703)	0.0590 (0.0857)	1.7539	0.7794
2002 : 1Q	0.0513 (0.0491)	0.2046 (0.1228)	0.8712 *** (0.1695)	0.0956 (0.1950)	2.0857	0.7708
2002 : 2Q	0.0403 (0.0253)	0.2060 ** (0.0850)	0.9657 *** (0.0727)	-0.0789 (0.1183)	2.4359	0.9121
2002 : 3Q	-0.0137 (0.0297)	-0.0036 (0.0884)	0.8457 *** (0.0545)	0.1329 (0.1032)	2.0661	0.8847
2002 : 4Q	0.0223 ** (0.0260)	-0.0155 (0.0885)	0.9552 *** (0.0692)	-0.0272 (0.0843)	2.1488	0.8615
2003 : 1Q	-0.0029 (0.0407)	0.1951 (0.1217)	0.6064 *** (0.0983)	0.0973 (0.1233)	1.9899	0.6205
2003 : 2Q	0.0411 (0.0375)	0.8352 *** (0.0868)	0.1721 ** (0.0833)	-0.0415 (0.0840)	2.5774	0.7288
2003 : 3Q	0.0288 (0.0370)	0.7170 *** (0.0832)	0.3134 *** (0.0920)	-0.0675 (0.1046)	2.3194	0.7861
2003 : 4Q	0.0949 (0.0358)	1.0798 *** (0.0894)	0.1173 (0.1057)	-0.0835 (0.1249)	1.8733	0.8274
2004 : 1Q	0.0100 (0.0392)	0.7573 *** (0.1029)	0.1486 ** (0.0730)	0.1225 (0.1026)	1.7025	0.8190
2004 : 2Q	-0.0114 (0.0283)	0.8907 *** (0.0637)	0.1462 *** (0.0489)	-0.0277 (0.0646)	2.3130	0.8980
2004 : 3Q	0.0153 (0.0329)	0.9029 *** (0.1019)	-0.0558 (0.0721)	0.1025 (0.1001)	2.9263	0.7732
2004 : 4Q	-0.1351 (0.1811)	0.3004 (0.5273)	0.4483 (0.4035)	0.0123 (0.5465)	2.7735	0.0162
2005 : 1Q	-0.0824 (0.1599)	0.4997 (0.5693)	-0.1479 (0.3018)	0.8363 (0.5883)	1.9699	0.1273
2005 : 2Q	-0.0316 (0.0255)	1.0305 *** (0.0686)	-0.0067 (0.0619)	-0.0027 (0.0885)	2.1440	0.8651
2005 : 3Q	-0.0002 (0.0009)	1.0596 *** (0.3427)	-0.1797 (0.1746)	0.1448 (0.3262)	2.1081	0.3322
2005 : 4Q	0.0005 (0.0004)	0.6976 *** (0.1366)	-0.0486 (0.0886)	0.3553 ** (0.1361)	1.9338	0.7419
2006 : 1Q	-0.0007 (0.0004)	1.0225 *** (0.1317)	-0.0199 (0.0862)	0.0201 (0.1302)	1.9530	0.7750
2006 : 2Q	0.0002 (0.0006)	0.8718 *** (0.2507)	-0.0434 (0.1258)	0.0581 (0.2295)	2.2668	0.4490
2006 : 3Q	-0.0001 (0.0004)	0.8698 *** (0.1484)	-0.0467 (0.0953)	0.2076 (0.1345)	2.2865	0.7413
2006 : 4Q	-0.0005 (0.0003)	1.3348 *** (0.1839)	-0.0080 (0.0930)	-0.1071 (0.1579)	1.6664	0.6937
2007 : 1Q	-0.0001 (0.0003)	1.0285 *** (0.1529)	-0.0292 (0.1083)	0.0604 (0.1115)	2.0283	0.8648

1. Calculated by authors. All foreign exchange data are from Datastream.

2. If the estimated coefficient is significantly negative, we re-estimate the equation without them. Standard errors are in parenthesis. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels,

Table 14. BULGARIAN LEV

	Constant	euro	US dollar	Sterling Pound	DW	Adj.R2
1999 : 1Q	-0.0063 * (0.0044)	0.9892 *** (0.0105)	0.0132 (0.0111)	-0.0015 (0.0130)	2.2082	0.9987
1999 : 2Q	0.0018 (0.0069)	1.0006 *** (0.0161)	0.0243 (0.0209)	-0.0205 (0.0230)	1.4991	0.9943
1999 : 3Q	0.0000 (0.0043)	0.9914 *** (0.0086)	0.0085 (0.0094)	-0.0028 (0.0114)	1.8618	0.9987
1999 : 4Q	0.0007 (0.0029)	1.0078 *** (0.0077)	-0.0050 (0.0083)	-0.0060 (0.0116)	1.7707	0.9992
2000 : 1Q	-0.0008 (0.0061)	0.9751 *** (0.0117)	0.0057 (0.0154)	-0.0035 (0.0163)	2.1935	0.9978
2000 : 2Q	-0.0003 (0.0035)	0.9890 *** (0.0052)	-0.0015 (0.0078)	0.0009 (0.0072)	2.2611	0.9992
2000 : 3Q	0.0007 (0.0047)	0.9936 *** (0.0084)	-0.0201 (0.0155)	0.0151 (0.0122)	2.1415	0.9986
2000 : 4Q	0.0052 (0.0096)	0.9717 *** (0.0163)	0.0298 * (0.0252)	0.0091 (0.0197)	1.9978	0.9898
2001 : 1Q	-0.0095 (0.0072)	0.9888 *** (0.0114)	-0.0034 (0.0161)	-0.0156 (0.0173)	2.0792	0.9969
2001 : 2Q	0.0021 (0.0041)	0.9829 *** (0.0081)	0.0068 (0.0110)	-0.0015 (0.0114)	2.1230	0.9985
2001 : 3Q	-0.0006 (0.0041)	0.9908 *** (0.0088)	0.0052 (0.0105)	-0.0001 (0.0144)	2.1093	0.9980
2001 : 4Q	0.0000 (0.0028)	0.9946 *** (0.0074)	0.0160 ** (0.0071)	-0.0065 (0.0087)	2.0377	0.9983
2002 : 1Q	0.0031 (0.0061)	0.9167 *** (0.0153)	0.0013 (0.0212)	0.0613 ** (0.0243)	1.7297	0.9949
2002 : 2Q	-0.0027 (0.0066)	0.9513 *** (0.0221)	-0.0037 (0.0189)	0.0384 (0.0308)	1.7398	0.9899
2002 : 3Q	-0.0035 (0.0049)	0.9640 *** (0.0146)	0.0159 * (0.0090)	0.0047 (0.0170)	1.9922	0.9943
2002 : 4Q	0.0133 (0.0101)	0.9735 *** (0.0343)	0.0442 (0.0268)	-0.0155 (0.0326)	0.7292	0.9756
2003 : 1Q	-0.0179 (0.0108)	0.9447 *** (0.0323)	0.0452 * (0.0261)	0.0133 (0.0327)	1.9982	0.9688
2003 : 2Q	-0.0039 (0.0040)	0.9904 *** (0.0077)	0.0029 (0.0076)	-	2.5255	0.9967
2003 : 3Q	0.0002 (0.0019)	1.0000 *** (0.0043)	0.0099 * (0.0048)	-0.0004 (0.0054)	2.3584	0.9995
2003 : 4Q	-0.0007 (0.0150)	0.9242 *** (0.0375)	0.0566 (0.0443)	0.0182 (0.0523)	2.9377	0.9567
2004 : 1Q	-0.0077 * (0.0042)	0.9965 *** (0.0109)	0.0081 (0.0077)	0.0049 (0.0109)	1.3714	0.9980
2004 : 2Q	0.0068 (0.0072)	1.0022 *** (0.0162)	-0.0035 (0.0124)	-0.0063 (0.0164)	2.1841	0.9932
2004 : 3Q	-0.0007 (0.0075)	0.9748 *** (0.0233)	0.0297 ** (0.0165)	-0.0016 (0.0229)	2.9280	0.9856
2004 : 4Q	-0.0018 (0.0019)	0.9939 *** (0.0054)	0.0113 *** (0.0041)	-0.0050 (0.0056)	2.8742	0.9990
2005 : 1Q	0.0004 (0.0013)	1.0040 *** (0.0045)	0.0017 (0.0024)	-0.0066 (0.0046)	2.8478	0.9995
2005 : 2Q	0.0010 (0.0052)	0.9954 *** (0.0139)	0.0102 (0.0125)	0.0043 (0.0179)	2.1178	0.9934
2005 : 3Q	0.0000 (0.0000)	0.9893 *** (0.0055)	0.0031 ** (0.0028)	0.0024 (0.0052)	2.8730	0.9995
2005 : 4Q	0.0000 (0.0000)	1.0003 *** (0.0057)	0.0042 (0.0037)	0.0006 (0.0056)	2.9300	0.9994
2006 : 1Q	0.0000 (0.0000)	1.0022 *** (0.0052)	-0.0020 (0.0034)	-0.0026 (0.0051)	2.9506	0.9995
2006 : 2Q	0.0000 (0.0000)	0.9971 *** (0.0105)	-0.0047 (0.0053)	0.0069 (0.0096)	2.7960	0.9983
2006 : 3Q	0.0000 (0.0001)	1.0443 *** (0.0244)	0.0059 (0.0157)	-0.0296 (0.0221)	2.9489	0.9905
2006 : 4Q	0.0000 (0.0000)	1.0092 *** (0.0058)	-0.0040 (0.0029)	-0.0102 (0.0050)	2.9613	0.9993
2007 : 1Q	0.0000 (0.0000)	0.9855 *** (0.0143)	0.0029 (0.0101)	0.0128 (0.0104)	3.1532	0.9984

1. Calculated by authors. All foreign exchange data are from Datastream.

2. If the estimated coefficient is significantly negative, we re-estimate the equation without them. Standard errors are in parenthesis. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels,

Table 15. CROATIAN KUNA

	Constant	euro	US dollar	Sterling Pound	DW	Adj.R2
1999 : 1Q	0.0680 * (0.0325)	0.9993 *** (0.0773)	0.1215 (0.0822)	-0.1172 (0.0958)	3.1289	0.9325
1999 : 2Q	0.0052 (0.0175)	0.9296 *** (0.0405)	0.0680 (0.0526)	-0.0052 (0.0579)	2.0238	0.9629
1999 : 3Q	0.0007 (0.0098)	0.9618 *** (0.0199)	0.0217 (0.0217)	0.0253 (0.0264)	2.8058	0.9933
1999 : 4Q	0.0089 (0.0084)	1.0124 *** (0.0223)	0.0354 (0.0238)	-0.0513 (0.0333)	2.6945	0.9933
2000 : 1Q	0.0128 (0.0151)	1.0161 *** (0.0220)	-0.0008 (0.0311)	-	2.4005	0.9880
2000 : 2Q	-0.0237 * (0.0156)	0.9528 *** (0.0230)	0.0608 * (0.0345)	0.0034 (0.0318)	2.5871	0.9836
2000 : 3Q	-0.0165 (0.0126)	0.9694 *** (0.0222)	0.0643 ** (0.0411)	0.0023 (0.0323)	2.6883	0.9902
2000 : 4Q	0.0168 (0.0204)	0.9858 *** (0.0344)	0.1111 ** (0.0532)	-0.0405 (0.0416)	2.8183	0.9565
2001 : 1Q	0.0155 (0.0222)	0.9804 *** (0.0353)	-0.0153 (0.0497)	0.0469 (0.0533)	1.5739	0.9723
2001 : 2Q	-0.0655 *** (0.0230)	0.9524 *** (0.0451)	0.0894 (0.0614)	-0.0221 (0.0637)	1.2186	0.9555
2001 : 3Q	0.0339 (0.0665)	0.8053 *** (0.1409)	0.0178 (0.1685)	0.1235 (0.2318)	1.6531	0.5988
2001 : 4Q	-0.0448 (0.0364)	0.7490 *** (0.0950)	-0.0100 (0.0910)	0.1873 * (0.1109)	1.8331	0.7292
2002 : 1Q	0.0116 (0.0334)	0.9495 *** (0.0833)	-	0.0468 (0.0949)	1.9097	0.8701
2002 : 2Q	-0.0249 (0.0230)	1.1333 *** (0.0775)	0.1406 ** (0.0662)	-0.1658 (0.1078)	2.4653	0.9074
2002 : 3Q	0.0060 (0.0194)	0.9847 *** (0.0404)	0.0175 (0.0297)	-	2.0566	0.9180
2002 : 4Q	0.0254 (0.0221)	1.0055 *** (0.0753)	-0.0182 (0.0588)	0.0390 (0.0717)	2.1706	0.8978
2003 : 1Q	0.0407 (0.0269)	0.9629 *** (0.0806)	0.0997 (0.0651)	-0.0924 (0.0816)	2.1664	0.8173
2003 : 2Q	-0.0472 * (0.0274)	0.9196 *** (0.0634)	0.1796 *** (0.0609)	-0.0967 (0.0614)	1.5152	0.8482
2003 : 3Q	0.0002 (0.0269)	0.9788 *** (0.0443)	0.1004 (0.0623)	-	2.0441	0.9173
2003 : 4Q	0.0078 (0.0202)	0.9875 *** (0.0504)	0.1148 * (0.0596)	-0.0808 (0.0704)	1.8801	0.9270
2004 : 1Q	-0.0373 (0.0290)	1.0050 *** (0.0761)	0.0494 (0.0540)	-0.0464 (0.0759)	1.8589	0.9058
2004 : 2Q	-0.0260 (0.0299)	0.9974 *** (0.0674)	-0.0539 (0.0518)	0.1028 (0.0684)	2.0183	0.9027
2004 : 3Q	0.0464 (0.0290)	1.0155 *** (0.0898)	-0.0514 (0.0635)	0.0179 (0.0883)	2.1641	0.8278
2004 : 4Q	0.0189 (0.0354)	0.8637 *** (0.1032)	-0.0699 (0.0790)	0.1194 (0.1069)	2.0827	0.6849
2005 : 1Q	-0.0415 (0.0288)	0.8137 *** (0.1027)	0.0652 (0.0544)	0.0784 (0.1061)	1.8649	0.7741
2005 : 2Q	-0.0223 (0.0130)	1.0098 *** (0.0348)	0.0012 (0.0314)	0.0182 (0.0450)	2.2174	0.9611
2005 : 3Q	0.0002 (0.0002)	0.9062 *** (0.0665)	0.0327 (0.0339)	0.0187 (0.0633)	2.1211	0.9187
2005 : 4Q	-0.0001 (0.0002)	0.8022 *** (0.0669)	0.0276 (0.0434)	0.0680 (0.0667)	2.0490	0.9000
2006 : 1Q	-0.0001 (0.0002)	0.7591 *** (0.0571)	0.0297 (0.0374)	0.2116 *** (0.0565)	2.4367	0.9424
2006 : 2Q	-0.0003 (0.0003)	0.9595 *** (0.1353)	0.0814 (0.0679)	-0.0797 (0.1238)	2.6958	0.7533
2006 : 3Q	0.0003 (0.0002)	1.0624 *** (0.0870)	0.0550 (0.0559)	-	2.1833	0.8768
2006 : 4Q	-0.0001 (0.0002)	0.9624 *** (0.1068)	-	-0.0113 (0.0903)	1.6519	0.8017
2007 : 1Q	0.0001 (0.0001)	0.9320 *** (0.0575)	0.0555 (0.0407)	-0.0136 (0.0420)	1.9287	0.9731

1. Calculated by authors. All foreign exchange data are from Datastream.

2. If the estimated coefficient is significantly negative, we re-estimate the equation without them. Standard errors are in parenthesis. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels,

Table 16. TURKISH LIRA

	Constant	euro	US dollar	Sterling Pound	DW	Adj.R2
1999 : 1Q	0.1982 *** (0.0457)	0.5027 *** (0.1086)	0.5309 *** (0.1154)	-0.0223 (0.1346)	2.5551	0.8668
1999 : 2Q	0.1612 *** (0.0161)	0.4464 *** (0.0372)	0.6029 *** (0.0483)	-0.0151 (0.0532)	2.4669	0.9633
1999 : 3Q	0.1652 *** (0.0160)	0.4638 *** (0.0326)	0.4887 *** (0.0355)	0.0142 (0.0431)	2.6652	0.9758
1999 : 4Q	0.1952 *** (0.0218)	0.5471 *** (0.0574)	0.5023 *** (0.0612)	-0.0365 (0.0859)	2.4840	0.9426
2000 : 1Q	0.0961 *** (0.0118)	0.4147 *** (0.0226)	0.5319 *** (0.0296)	0.0644 ** (0.0313)	2.7339	0.9880
2000 : 2Q	0.0773 (0.0093)	0.3856 *** (0.0137)	0.5949 *** (0.0206)	0.0190 (0.0190)	2.4940	0.9904
2000 : 3Q	0.0610 ** (0.0083)	0.3967 *** (0.0146)	0.6390 *** (0.0271)	-0.0113 (0.0213)	2.6102	0.9898
2000 : 4Q	0.0482 ** (0.0138)	0.3699 *** (0.0233)	0.6582 *** (0.0360)	-0.0042 (0.0282)	2.4833	0.9515
2001 : 1Q	0.6917 (0.7292)	2.3345 ** (1.1596)	1.3995 (1.6329)	-2.6507 (1.7544)	1.5870	0.0431
2001 : 2Q	0.2923 (0.3208)	-0.3613 (0.6291)	1.7491 ** (0.8565)	-0.0173 (0.8884)	1.6760	0.0712
2001 : 3Q	0.2751 (0.2542)	0.3839 (0.5388)	1.6653 ** (0.6444)	-0.2108 (0.8864)	2.1167	0.2169
2001 : 4Q	-0.0706 (0.1582)	-0.2719 (0.4126)	1.4471 *** (0.3953)	-0.2202 (0.4818)	2.1516	0.1502
2002 : 1Q	-0.1347 (0.1212)	-0.3855 (0.3035)	0.7633 ** (0.4189)	0.3097 (0.4819)	2.0709	0.1598
2002 : 2Q	0.0959 (0.1658)	-0.3844 (0.5573)	2.0821 *** (0.4765)	-0.3198 (0.7753)	1.9244	0.4027
2002 : 3Q	0.0612 (0.1200)	0.2913 (0.3576)	1.1198 *** (0.2205)	-0.2781 (0.4175)	2.3814	0.3803
2002 : 4Q	0.0162 (0.1099)	0.2036 (0.3744)	0.8370 ** (0.2925)	-0.2205 (0.3564)	1.4042	0.1847
2003 : 1Q	0.1136 (0.1823)	0.5862 (0.5458)	1.3194 *** (0.4408)	-0.9200 (0.5529)	2.8804	0.0976
2003 : 2Q	-0.3070 ** (0.1017)	0.0153 (0.2350)	1.2899 *** (0.2257)	-0.2441 (0.2274)	2.5717	0.3708
2003 : 3Q	-0.0062 (0.0914)	0.0483 (0.2055)	0.7826 *** (0.2273)	-0.0155 (0.2585)	2.4494	0.2079
2003 : 4Q	0.0441 (0.0985)	0.5795 ** (0.2458)	0.9278 *** (0.2906)	-0.1512 (0.3432)	1.8349	0.4117
2004 : 1Q	-0.1237 * (0.0776)	0.4415 ** (0.2038)	0.6304 *** (0.1446)	-0.0618 (0.2032)	2.3168	0.3901
2004 : 2Q	0.1570 (0.1004)	0.3652 (0.1738)	0.3003 * (0.1669)	-	0.0000	0.8050
2004 : 3Q	0.0428 (0.0713)	0.7035 *** (0.2211)	0.3509 ** (0.1563)	-0.1530 (0.2172)	1.7249	0.3002
2004 : 4Q	-0.0902 (0.0539)	0.1961 (0.1570)	0.2867 ** (0.1201)	0.3522 ** (0.1627)	1.7577	0.4074
2005 : 1Q	-0.0568 (0.0956)	0.4140 (0.3402)	0.0897 (0.1804)	0.0751 (0.3516)	1.9715	0.0584
2005 : 2Q	-0.0832 (0.0818)	0.5418 ** (0.2200)	0.3607 * (0.1985)	0.0572 (0.2840)	1.5771	0.2560
2005 : 3Q	0.0001 (0.0006)	0.3332 (0.2129)	0.6426 *** (0.1085)	0.0050 (0.2027)	2.2044	0.5626
2005 : 4Q	0.0001 (0.0004)	0.3907 (0.1275)	0.9073 *** (0.0827)	-0.1752 (0.1270)	2.0545	0.7489
2006 : 1Q	0.0002 (0.0005)	0.6749 (0.1675)	0.4699 *** (0.1097)	-0.1893 *** (0.1657)	1.7310	0.5932
2006 : 2Q	0.0028 (0.0020)	0.1679 (0.8144)	0.4221 (0.4086)	-0.1661 (0.7456)	2.3680	-0.0258
2006 : 3Q	-0.0007 (0.0012)	0.0788 (0.5006)	0.0712 (0.3217)	0.6953 (0.4539)	1.9930	0.1073
2006 : 4Q	-0.0009 (0.0007)	0.6704 * (0.3676)	1.0462 *** (0.1858)	-0.4509 (0.3155)	2.1994	0.4150
2007 : 1Q	-0.0003 (0.0006)	0.4541 * (0.2731)	0.7533 *** (0.1933)	0.1634 (0.1991)	2.2332	0.7451

1. Calculated by authors. All foreign exchange data are from Datastream.

2. If the estimated coefficient is significantly negative, we re-estimate the equation without them. Standard errors are in parenthesis. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels,

Table 17. DANISH KRONE

	Constant	euro	US dollar	Sterling Pound	DW	Adj.R2
1999 : 1Q	-0.0112 (0.0069)	1.0173 *** (0.0164)	-0.0188 *** (0.0174)	-0.0039 (0.0203)	2.5280	0.9968
1999 : 2Q	-0.0026 (0.0063)	0.9893 *** (0.0146)	0.0109 (0.0190)	0.0064 (0.0209)	2.2459	0.9953
1999 : 3Q	0.0028 (0.0058)	0.9989 *** (0.0117)	0.0002 (0.0128)	0.0057 (0.0156)	1.8677	0.9977
1999 : 4Q	0.0025 (0.0027)	0.9940 *** (0.0071)	- -	0.0009 (0.0087)	2.7772	0.9993
2000 : 1Q	0.0018 (0.0070)	0.9869 *** (0.0134)	0.0476 *** (0.0176)	-0.0080 (0.0186)	2.6780	0.9973
2000 : 2Q	0.0039 (0.0122)	0.9945 *** (0.0180)	0.0241 (0.0271)	0.0024 (0.0250)	2.9018	0.9903
2000 : 3Q	0.0005 (0.0036)	0.9954 *** (0.0063)	-0.0020 (0.0117)	0.0100 (0.0092)	2.2414	0.9992
2000 : 4Q	-0.0002 (0.0045)	0.9891 *** (0.0076)	0.0031 (0.0118)	0.0075 * (0.0092)	2.3660	0.9978
2001 : 1Q	0.0008 (0.0064)	0.9768 *** (0.0102)	-0.0043 (0.0144)	0.0225 (0.0154)	3.1135	0.9976
2001 : 2Q	-0.0014 (0.0212)	0.9344 *** (0.0416)	0.1451 ** (0.0566)	0.0044 (0.0587)	2.4884	0.9641
2001 : 3Q	-0.0030 (0.0023)	0.9928 *** (0.0049)	0.0117 * (0.0059)	-0.0055 (0.0081)	2.0583	0.9994
2001 : 4Q	0.0014 (0.0032)	0.9947 *** (0.0082)	0.0136 * (0.0079)	0.0010 (0.0096)	1.3433	0.9979
2002 : 1Q	0.0003 (0.0021)	0.9795 *** (0.0053)	0.0173 ** (0.0074)	0.0006 (0.0085)	2.4688	0.9994
2002 : 2Q	-0.0019 (0.0024)	0.9814 *** (0.0080)	-0.0048 (0.0068)	0.0170 (0.0111)	1.9639	0.9987
2002 : 3Q	-0.0007 (0.0016)	0.9988 *** (0.0048)	0.0056 * (0.0030)	-0.0088 (0.0057)	2.0256	0.9994
2002 : 4Q	-0.0004 (0.0016)	0.9936 *** (0.0056)	0.0034 (0.0044)	0.0022 (0.0053)	2.5550	0.9993
2003 : 1Q	0.0000 (0.0023)	1.0020 *** (0.0067)	0.0015 (0.0054)	-0.0076 (0.0068)	1.9465	0.9987
2003 : 2Q	0.0008 ** (0.0010)	0.9955 *** (0.0023)	-0.0030 (0.0022)	0.0063 * (0.0022)	1.7443	0.9998
2003 : 3Q	-0.0006 (0.0026)	1.0066 *** (0.0058)	0.0002 (0.0064)	-0.0099 (0.0073)	2.1495	0.9992
2003 : 4Q	0.0029 (0.0020)	0.9975 *** (0.0049)	0.0134 ** (0.0058)	-0.0063 (0.0068)	1.8632	0.9993
2004 : 1Q	-0.0003 (0.0013)	1.0017 *** (0.0033)	-0.0008 (0.0023)	-0.0036 (0.0033)	1.8862	0.9998
2004 : 2Q	-0.0025 (0.0017)	1.0013 *** (0.0039)	0.0015 (0.0030)	-0.0025 (0.0040)	1.8046	0.9996
2004 : 3Q	0.0016 (0.0016)	0.9950 *** (0.0049)	0.0015 (0.0035)	0.0018 (0.0048)	2.2467	0.9994
2004 : 4Q	-0.0010 (0.0022)	0.9958 *** (0.0063)	0.0034 (0.0048)	-0.0023 (0.0065)	1.8954	0.9986
2005 : 1Q	0.0026 (0.0019)	1.0001 *** (0.0068)	0.0051 (0.0036)	-0.0034 (0.0070)	1.6836	0.9989
2005 : 2Q	0.0011 (0.0022)	0.9937 *** (0.0059)	0.0053 (0.0053)	-0.0027 (0.0076)	1.5117	0.9988
2005 : 3Q	-0.0001 (0.0003)	0.7162 *** (0.1055)	0.1521 (0.1070)	0.0000 (0.0000)	0.0000	0.0024
2005 : 4Q	0.0000 (0.0000)	0.9885 *** (0.0071)	-0.0047 (0.0046)	0.0160 ** (0.0071)	1.3792	0.9991
2006 : 1Q	0.0000 (0.0000)	0.9988 *** (0.0063)	0.0013 (0.0041)	-0.0001 (0.0062)	1.9255	0.9993
2006 : 2Q	0.0000 (0.0000)	0.9846 *** (0.0065)	-0.0030 (0.0033)	0.0165 *** (0.0060)	2.3726	0.9994
2006 : 3Q	0.0000 (0.0000)	0.9987 *** (0.0042)	-0.0002 (0.0027)	0.0020 (0.0038)	1.7063	0.9997
2006 : 4Q	0.0000 (0.0000)	0.9779 *** (0.0090)	-0.0022 (0.0046)	0.0176 ** (0.0078)	2.3334	0.9984
2007 : 1Q	0.0000 (0.0000)	0.9867 *** (0.0065)	0.0022 (0.0046)	0.0059 (0.0047)	1.9753	0.9997

1. Calculated by authors. All foreign exchange data are from Datastream.

2. If the estimated coefficient is significantly negative, we re-estimate the equation without them. Standard errors are in parenthesis. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels,

Table 18. SWEDISH KRONA

	Constant	euro	US dollar	Sterling Pound	DW	Adj.R2
1999 : 1Q	-0.0638 (0.0523)	0.5842 *** (0.1243)	0.2758 * (0.1320)	0.0397 (0.1539)	1.2084	0.7995
1999 : 2Q	-0.0023 (0.0309)	0.7858 *** (0.0715)	0.3128 *** (0.0928)	-0.1100 (0.1021)	1.7687	0.8808
1999 : 3Q	-0.0207 (0.0272)	0.6428 *** (0.0553)	0.3055 *** (0.0602)	0.0537 (0.0732)	1.5522	0.9412
1999 : 4Q	-0.0074 (0.0371)	0.6914 *** (0.0979)	0.3159 *** (0.1044)	0.0646 (0.1464)	2.1332	0.8722
2000 : 1Q	-0.0388 (0.0363)	0.7821 *** (0.0693)	0.0895 (0.0910)	-0.0115 (0.0962)	1.8055	0.9025
2000 : 2Q	0.0239 (0.0480)	0.6650 *** (0.0708)	0.3240 *** (0.1062)	0.0178 (0.0980)	1.7969	0.8255
2000 : 3Q	0.0508 (0.0371)	0.6985 *** (0.0654)	0.1844 (0.1210)	0.1891 ** (0.0953)	1.6379	0.9038
2000 : 4Q	0.0425 (0.0481)	0.8025 *** (0.0812)	-0.0221 (0.1257)	0.1644 * (0.0984)	2.1513	0.7632
2001 : 1Q	0.0636 (0.0525)	0.9371 *** (0.0835)	0.2289 ** (0.1176)	-0.1648 (0.1263)	2.0911	0.8446
2001 : 2Q	0.0303 (0.0576)	0.7450 *** (0.1131)	0.1345 (0.1539)	0.1325 (0.1597)	1.7889	0.7456
2001 : 3Q	0.0651 (0.0556)	1.0199 *** (0.1178)	0.2499 * (0.1409)	-0.1997 (0.1937)	1.3219	0.7341
2001 : 4Q	-0.0416 (0.0607)	0.4606 *** (0.1582)	0.3575 ** (0.1516)	0.2000 (0.1848)	1.6741	0.4092
2002 : 1Q	-0.0434 (0.0385)	1.0340 *** (0.0964)	0.2596 * (0.1331)	-0.2496 (0.1531)	1.9721	0.8497
2002 : 2Q	-0.0433 (0.0465)	0.9119 *** (0.1563)	0.3701 ** (0.1337)	-0.2071 (0.2174)	2.0642	0.6753
2002 : 3Q	0.0219 (0.0551)	1.0389 *** (0.1144)	0.2719 *** (0.0842)	-	1.6327	0.6807
2002 : 4Q	-0.0199 (0.0362)	0.7777 *** (0.1232)	0.1127 (0.0962)	0.2034 * (0.1172)	1.9465	0.7762
2003 : 1Q	0.0051 (0.0384)	0.7950 *** (0.1151)	0.2180 ** (0.0929)	0.0274 (0.1166)	1.9393	0.6892
2003 : 2Q	-0.0142 (0.0254)	0.8778 *** (0.0586)	0.0974 * (0.0563)	0.0679 (0.0567)	1.4980	0.2011
2003 : 3Q	-0.0215 (0.0469)	0.7778 *** (0.1054)	-0.1396 (0.1166)	0.2592 * (0.1326)	1.9611	0.7416
2003 : 4Q	0.0020 (0.0391)	0.9627 *** (0.0974)	0.0133 (0.1152)	-0.1266 (0.1361)	2.2807	0.7267
2004 : 1Q	0.0222 (0.0357)	1.1035 *** (0.0937)	0.0254 (0.0665)	-0.0122 (0.0934)	2.0477	0.8893
2004 : 2Q	-0.0288 (0.0301)	0.8417 *** (0.0679)	-0.0580 (0.0521)	0.0323 (0.0688)	1.9242	0.8530
2004 : 3Q	-0.0210 (0.0193)	1.0201 *** (0.0600)	-0.0377 (0.0424)	-0.0775 (0.0590)	1.7848	0.9042
2004 : 4Q	0.0034 (0.0362)	1.0995 *** (0.1052)	-	-0.1151 (0.1032)	1.9464	0.7197
2005 : 1Q	0.0175 (0.0233)	0.9307 *** (0.0828)	-0.0629 (0.0439)	0.0171 (0.0856)	2.4068	0.8388
2005 : 2Q	0.0524 (0.0309)	0.9778 *** (0.0828)	-	-0.0582 (0.1032)	1.5625	0.7823
2005 : 3Q	-0.0002 (0.0005)	0.6986 *** (0.1715)	0.2518 (0.1738)	0.0000 (0.0000)	2.2889	0.5790
2005 : 4Q	0.0001 (0.0004)	1.0426 *** (0.1413)	0.0480 (0.0916)	-0.1072 (0.1408)	1.9618	0.7086
2006 : 1Q	0.0001 (0.0003)	1.0023 *** (0.1162)	-0.1170 (0.0761)	0.1684 (0.1149)	2.2195	0.8327
2006 : 2Q	-0.0003 (0.0003)	1.1506 *** (0.0595)	-0.0781 (0.0552)	-	2.1018	0.8709
2006 : 3Q	0.0001 (0.0003)	1.1770 *** (0.1236)	-	-0.1215 (0.1170)	1.9828	0.8022
2006 : 4Q	-0.0004 (0.0003)	0.9183 *** (0.1800)	-0.0815 (0.0910)	0.0782 (0.1545)	1.8929	0.5855
2007 : 1Q	0.0005 (0.0004)	1.1796 *** (0.1469)	-	-0.0480 (0.1164)	2.0956	0.8618

1. Calculated by authors. All foreign exchange data are from Datastream.

2. If the estimated coefficient is significantly negative, we re-estimate the equation without them. Standard errors are in parenthesis. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels,

Table 19. STERLING POUND

	Constant	euro	US dollar	Swiss francs	DW	Adj.R2
1999 : 1Q	-0.0073 (0.0432)	0.1783 (0.2014)	0.5505 *** (0.0862)	0.2572 (0.1641)	1.7844	0.8778
1999 : 2Q	-0.0050 (0.0380)	-0.1205 (0.2647)	0.5780 *** (0.0859)	0.5152 (0.2672)	1.9881	0.8094
1999 : 3Q	-0.0301 (0.0470)	0.2846 (0.5392)	0.4774 *** (0.0969)	0.1709 (0.5001)	1.7273	0.8112
1999 : 4Q	-0.0057 (0.0322)	0.4611 ** (0.2571)	0.4109 *** (0.0748)	0.0244 (0.2455)	2.1253	0.8547
2000 : 1Q	-0.0108 (0.0476)	-0.0301 (0.3369)	0.5362 *** (0.0980)	0.4911 (0.3278)	1.9990	0.8346
2000 : 2Q	0.0917 (0.0609)	-0.1142 (0.2333)	0.5449 *** (0.1189)	0.4729 * (0.2584)	1.8566	0.6591
2000 : 3Q	-0.0172 (0.0499)	0.4879 *** (0.1728)	0.6792 *** (0.1397)	-0.0497 (0.1862)	1.5363	0.7639
2000 : 4Q	0.0423 (0.0619)	0.0611 (0.2651)	0.5639 *** (0.1447)	0.4577 (0.2892)	1.9828	0.5175
2001 : 1Q	0.0138 (0.0520)	-0.0062 (0.2413)	0.4149 *** (0.1046)	0.4687 * (0.2623)	2.3777	0.7269
2001 : 2Q	-0.0152 (0.0456)	0.1338 (0.2779)	0.5520 *** (0.1017)	0.3588 (0.2961)	1.9143	0.7823
2001 : 3Q	-0.0250 (0.0363)	0.5346 *** (0.0980)	0.5225 *** (0.0627)	-0.1465 (0.0936)	1.9661	0.7934
2001 : 4Q	-0.0197 (0.0413)	0.5916 *** (0.0780)	0.3099 ** (0.0957)	-	1.5439	0.5724
2002 : 1Q	0.0231 (0.0324)	0.2947 * (0.1679)	0.6111 *** (0.0805)	0.0069 (0.1729)	1.8334	0.8255
2002 : 2Q	-0.0075 (0.0269)	0.2799 (0.1772)	0.4913 *** (0.0498)	0.2512 (0.1616)	1.4932	0.8549
2002 : 3Q	-0.0413 (0.0344)	0.2193 (0.1763)	0.3466 *** (0.0553)	0.4117 ** (0.1648)	2.0446	0.7395
2002 : 4Q	0.0232 (0.0388)	0.3543 (0.3137)	0.3461 *** (0.1010)	0.2646 (0.2729)	2.0484	0.6912
2003 : 1Q	0.0694 (0.0413)	0.6680 *** (0.0931)	0.4546 *** (0.0839)	-	1.9496	0.6660
2003 : 2Q	-0.0298 (0.0586)	0.4319 ** (0.2150)	0.5440 *** (0.1118)	0.1801 (0.2214)	2.1277	0.5570
2003 : 3Q	0.0149 (0.0446)	0.7074 *** (0.1922)	0.3096 *** (0.1042)	-0.1704 (0.1829)	1.5379	0.6471
2003 : 4Q	-0.0728 ** (0.0359)	0.1408 (0.2409)	0.6233 *** (0.0766)	0.2320 (0.1857)	2.0328	0.7614
2004 : 1Q	-0.0731 * (0.0479)	0.9694 *** (0.2366)	0.1262 (0.0902)	-0.1283 (0.2365)	1.8867	0.7324
2004 : 2Q	0.0071 (0.0559)	0.3545 (0.2755)	0.2418 ** (0.0962)	0.2384 (0.2217)	1.8710	0.5953
2004 : 3Q	0.0195 (0.0422)	0.5141 (0.3174)	0.2259 ** (0.0932)	0.2008 (0.2695)	2.4078	0.6143
2004 : 4Q	0.0044 (0.0421)	0.6783 ** (0.2618)	0.2557 ** (0.0963)	-0.1819 (0.2127)	1.5451	0.5094
2005 : 1Q	-0.0308 (0.0345)	0.4654 * (0.2443)	0.2140 *** (0.0725)	0.2305 (0.2076)	2.1423	0.6645
2005 : 2Q	0.0159 (0.0358)	0.0121 (0.2287)	0.2665 *** (0.0846)	0.4382 * (0.2289)	1.8857	0.5007
2005 : 3Q	0.0001 (0.0003)	0.5276 *** (0.2822)	0.0454 (0.0733)	0.2571 (0.2473)	1.6579	0.6792
2005 : 4Q	0.0002 (0.0004)	0.3122 (0.2502)	0.2368 *** (0.0769)	0.5028 *** (0.2410)	1.7171	0.7413
2006 : 1Q	0.0000 (0.0004)	0.1310 (0.2697)	0.2276 *** (0.0836)	0.6032 *** (0.2388)	2.1041	0.7476
2006 : 2Q	-0.0001 (0.0003)	0.4286 ** (0.1837)	0.0634 (0.0681)	0.4696 (0.1623)	2.0557	0.7706
2006 : 3Q	-0.0003 (0.0003)	1.1014 *** (0.2571)	0.0144 (0.0940)	-0.2020 (0.2122)	1.4761	0.7043
2006 : 4Q	-0.0002 (0.0003)	0.7153 *** (0.2163)	0.1493 (0.0785)	0.1930 (0.1874)	1.9733	0.6989
2007 : 1Q	0.0001 (0.0004)	0.7203 *** (0.2293)	0.1988 (0.1224)	0.3429 (0.2161)	1.9425	0.8570

1. Calculated by authors. All foreign exchange data are from Datastream.

2. If the estimated coefficient is significantly negative, we re-estimate the equation without them. Standard errors are in parenthesis. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels,

Table 20. Classified currency regimes of 10 new EU member East European countries
(% of currency regimes under review)

	1999	2000	2001	2002	2003	2004	2005	2006	2007
Rigid peg on a single currency ($a_i=1, i=1,2,3$)									
US dollar (a_2)	10	10	10	0.0	0.0	0.0	0.0	0.0	0.0
euro (a_1)	0	12.5	17.5	25.0	30.0	35.0	42.5	60.0	70.0
Sterling pound (a_3)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Partial peg on a single currency ($1 > a_i > 0, i=1,2,3$)									
US dollar (a_2)	2.5	2.5	2.5	5	2.5	0.0	2.5	0.0	0.0
euro (a_1)	30	30	20	17.5	30	30.0	45.0	37.5	30.0
Sterling pound (a_3)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Peg on a basket (a_1 and/or a_2 and/or $a_3 > 0$)									
dollar/euro ($a_2 > a_1$)	17.5	7.5	5	5	0	0.0	2.5	0.0	0.0
dollar/pound ($a_2 > a_3$)	0	0	0	0	0	0.0	0.0	0.0	0.0
euro/dollar ($a_1 > a_2$)	17.5	12.5	22.5	25	17.5	10.0	2.5	2.5	0.0
euro/pound ($a_1 > a_3$)	2.5	5	2.5	2.5	0	2.5	2.5	0.0	0.0
euro/dollar/pound	20	20	20	22.5	20	22.5	2.5	0.0	0.0
Free floating (otherwise)	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	100.0	100.0	100.0	102.5	100.0	100.0	100.0	100.0	100.0

Author's calculations

We assign the coefficients which are estimated significantly under the level of 10% and count the number of currency regimes by year. Each number shows the percent of share of currency regimes assigned by 10 new EU member East European countries.

The result of 2007 is calculated only by 1st quarter.

Figure 1. The movement of Sampled East European currencies v.s. euro (monthly)

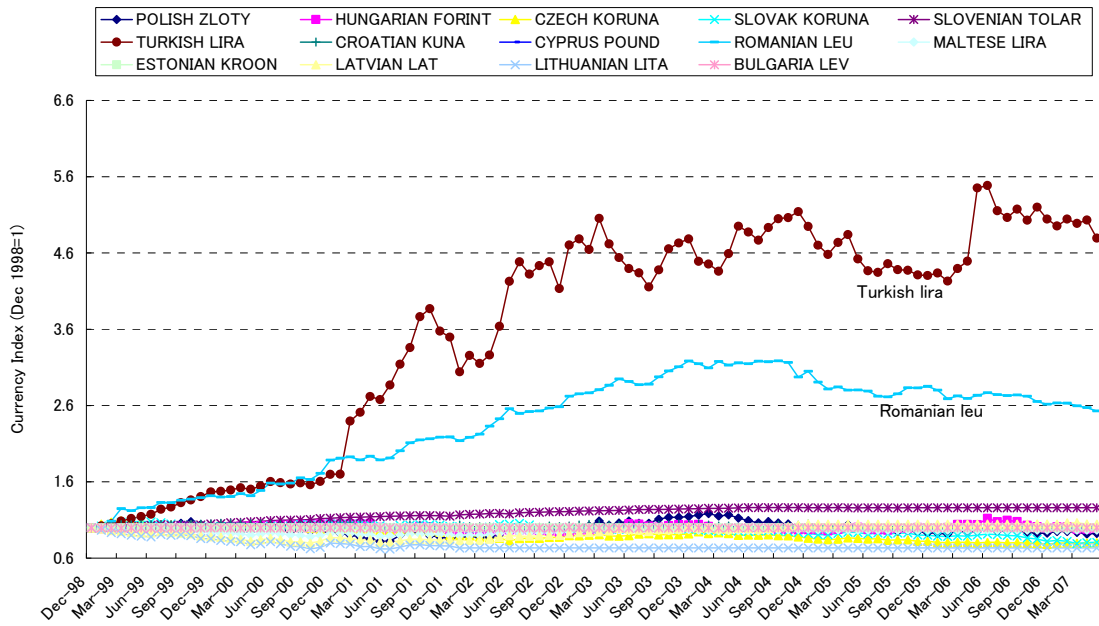


Figure 2. The movement of 10 new EU currencies v.s. euro (monthly)

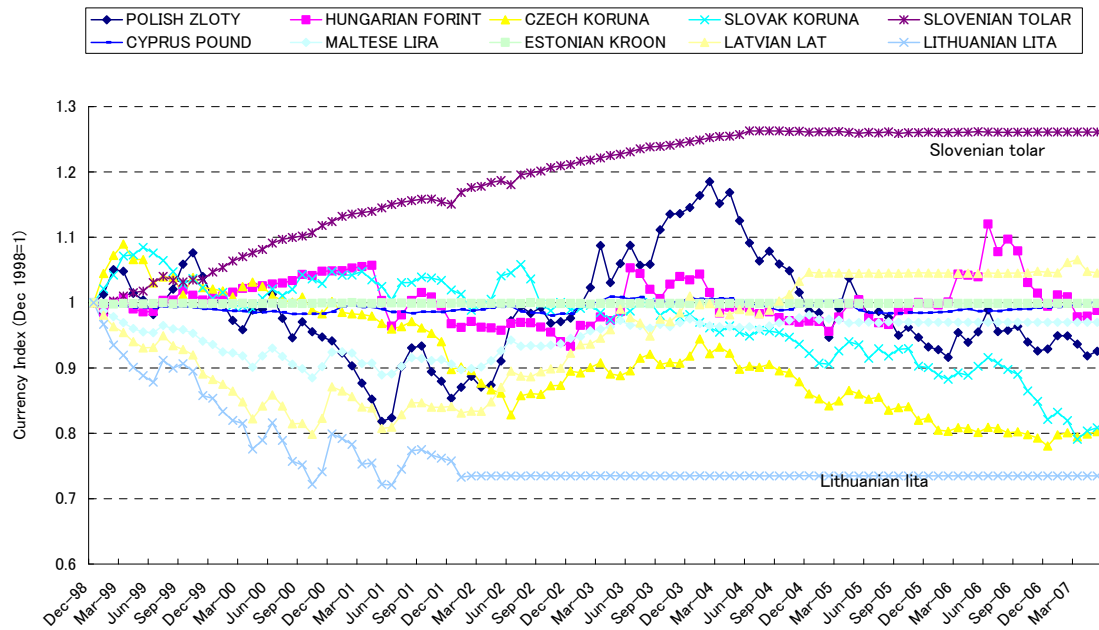


Figure 3. The euro coefficient of Polish zloty

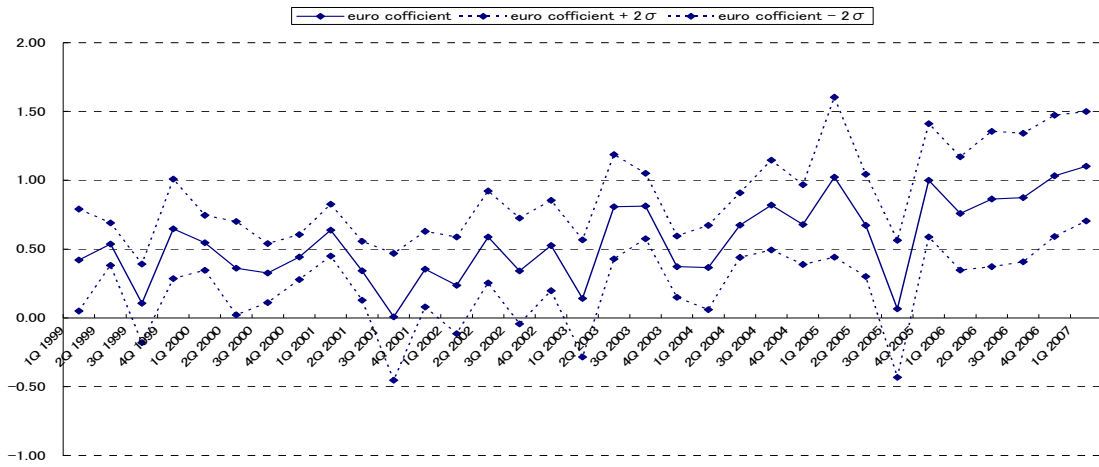


Figure 4. The euro coefficient of Czech koruna

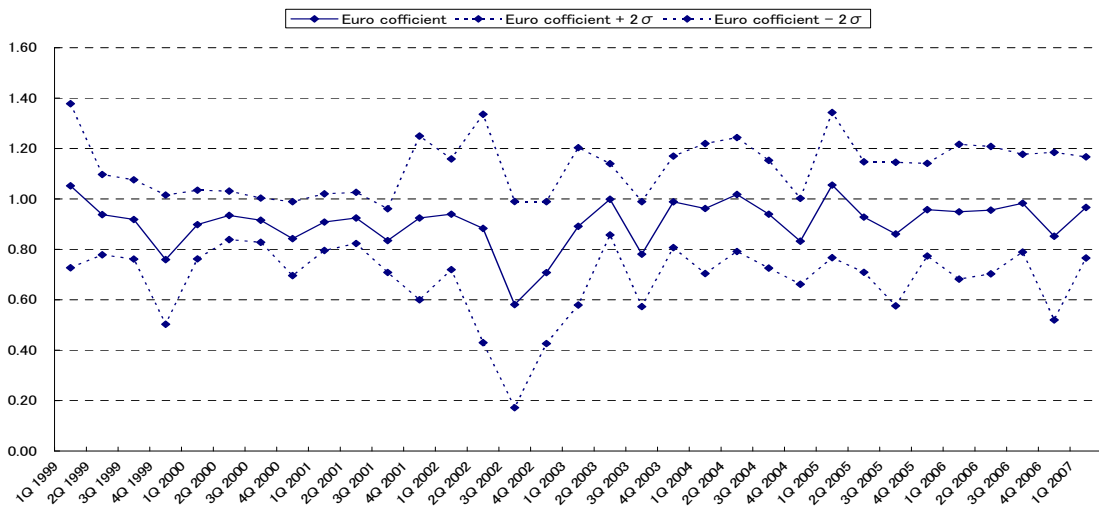


Figure 5. The euro coefficient of Slovak koruna

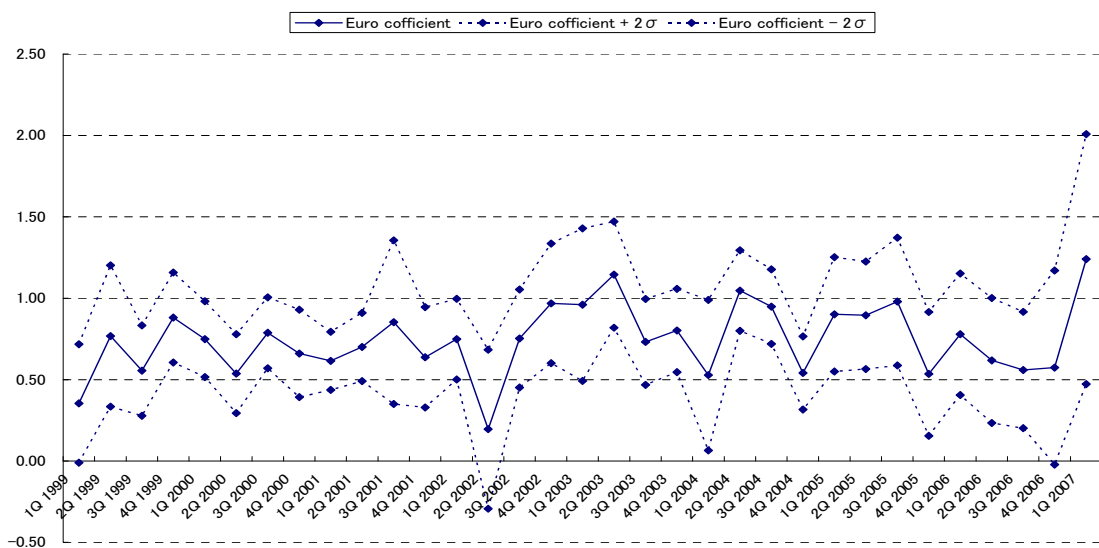


Figure 6. The euro coefficient of Hungarian forint

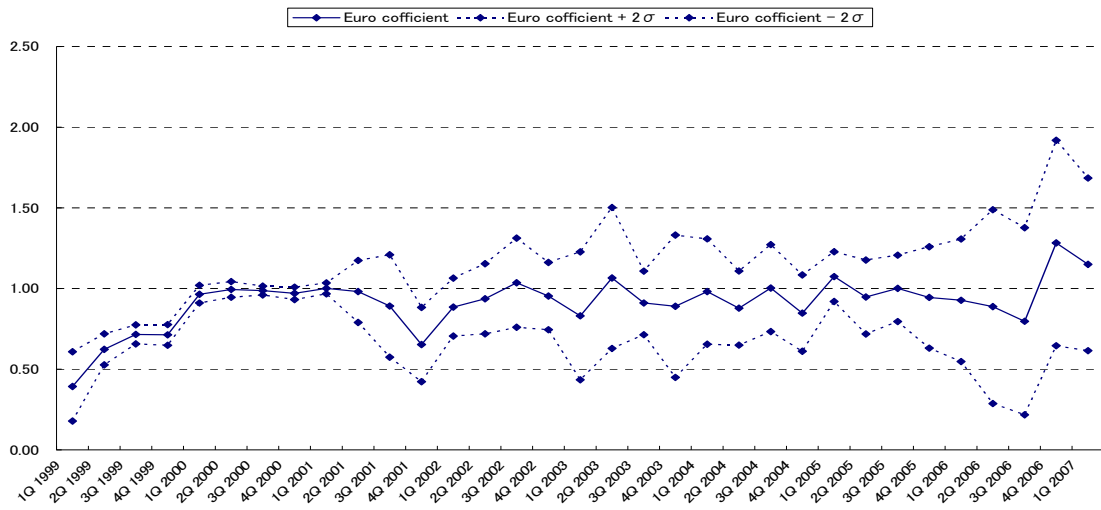


Figure 7. The euro coefficient of Slovenian tolar

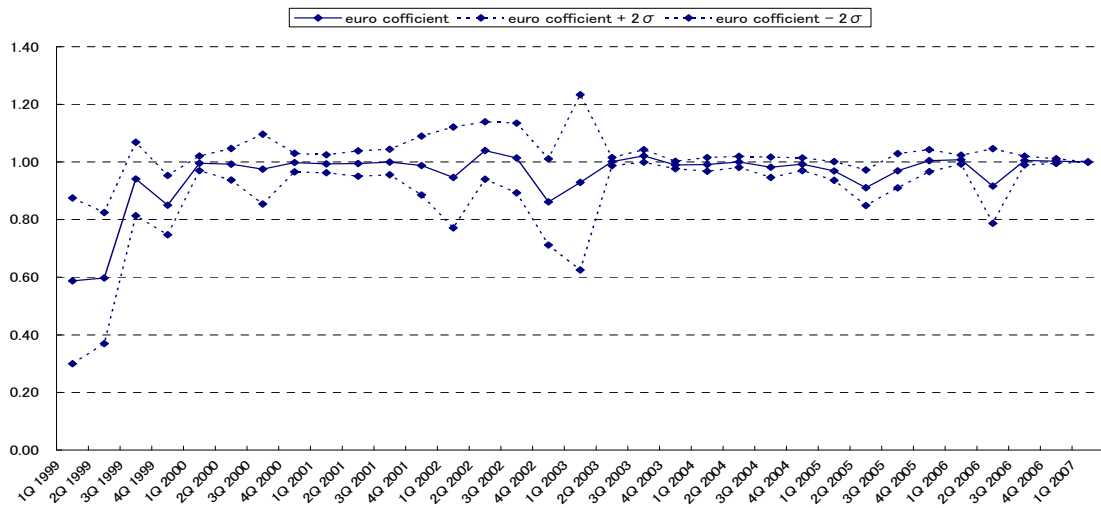


Figure 8. The euro coefficient of Estonian kroon

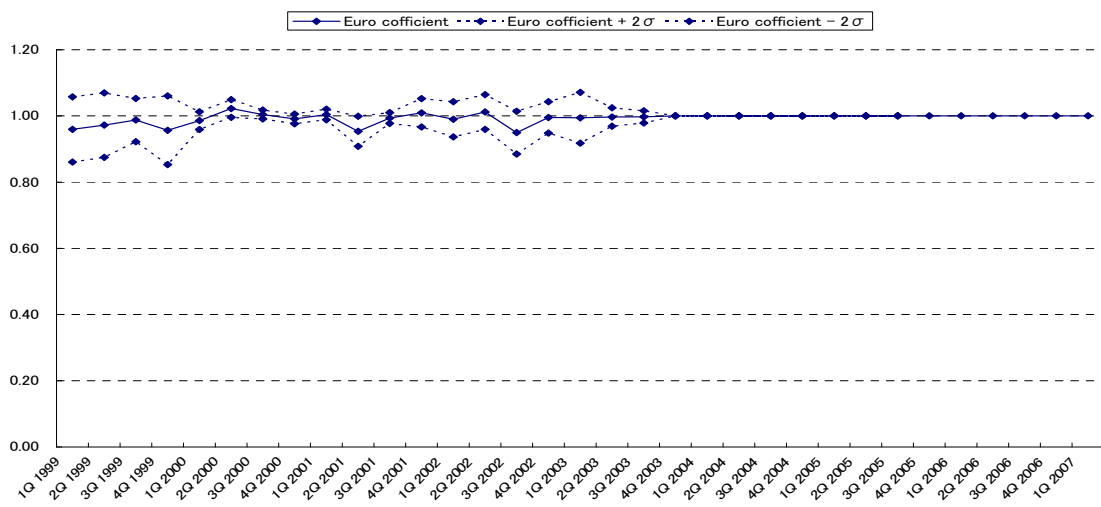


Figure 9. The euro coefficient of Latvian lat

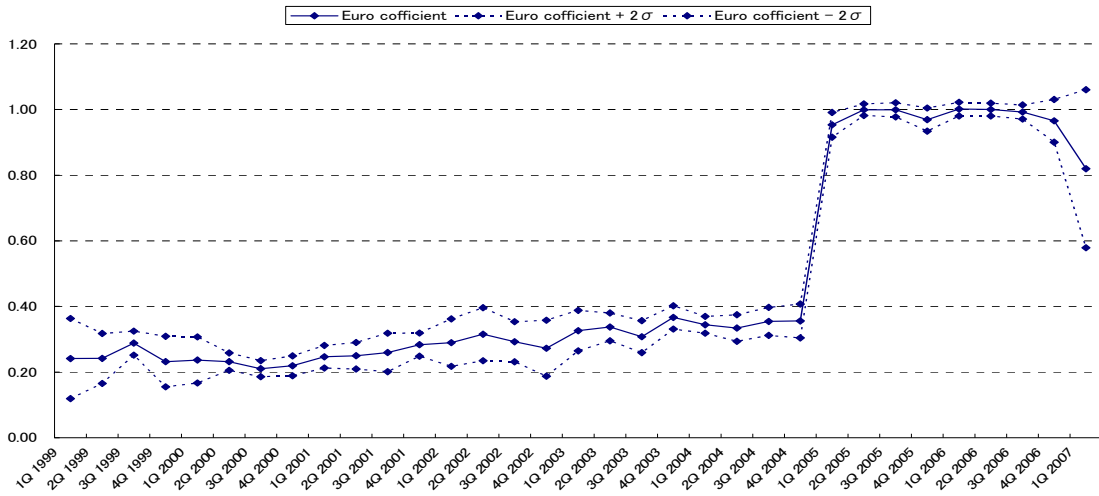


Figure 10. The euro coefficient of Lithuanian lita

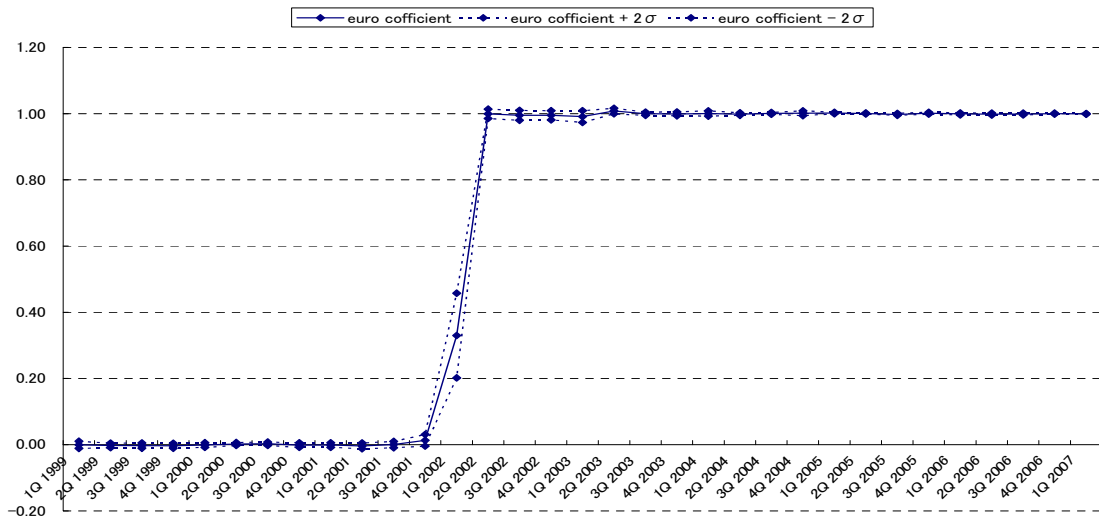


Figure 11. The euro coefficient of Maltese lira

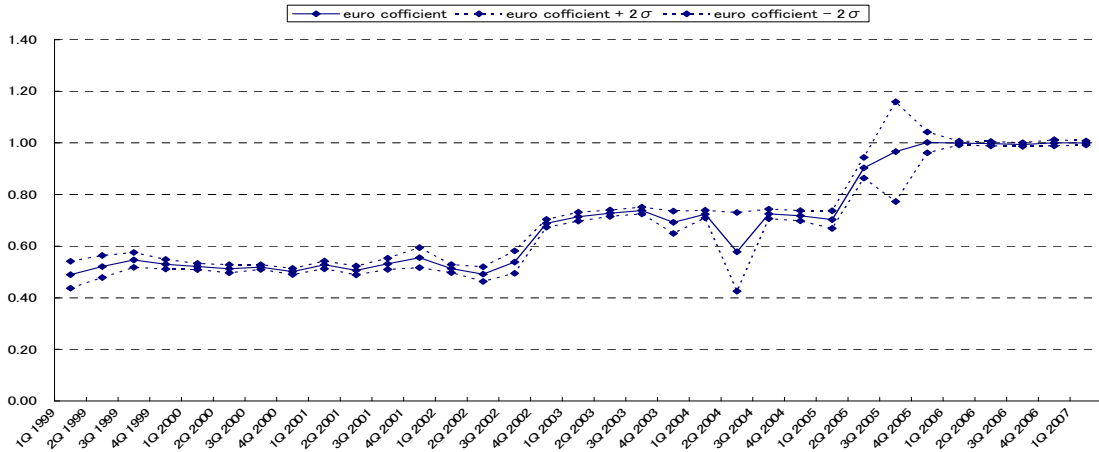


Figure 12. The euro coefficient of Cyprus pound

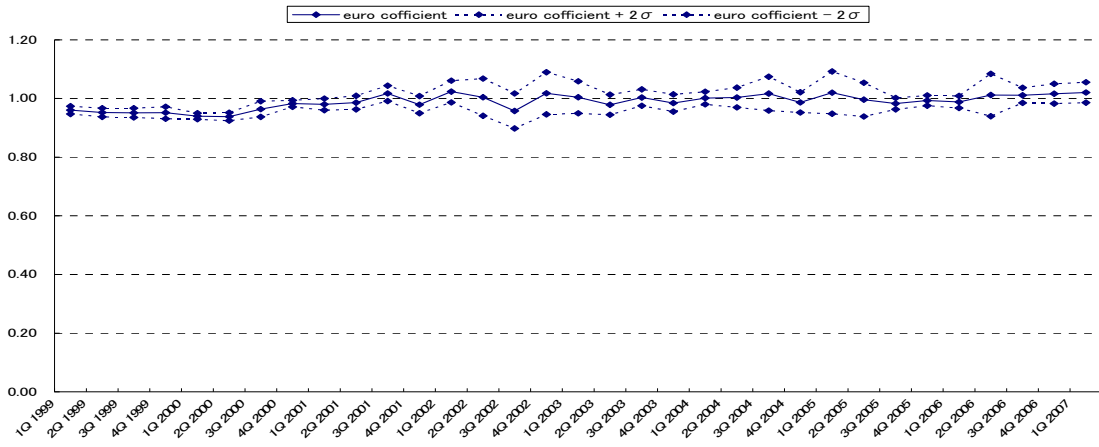


Figure 13. The euro coefficient of Romanian leu

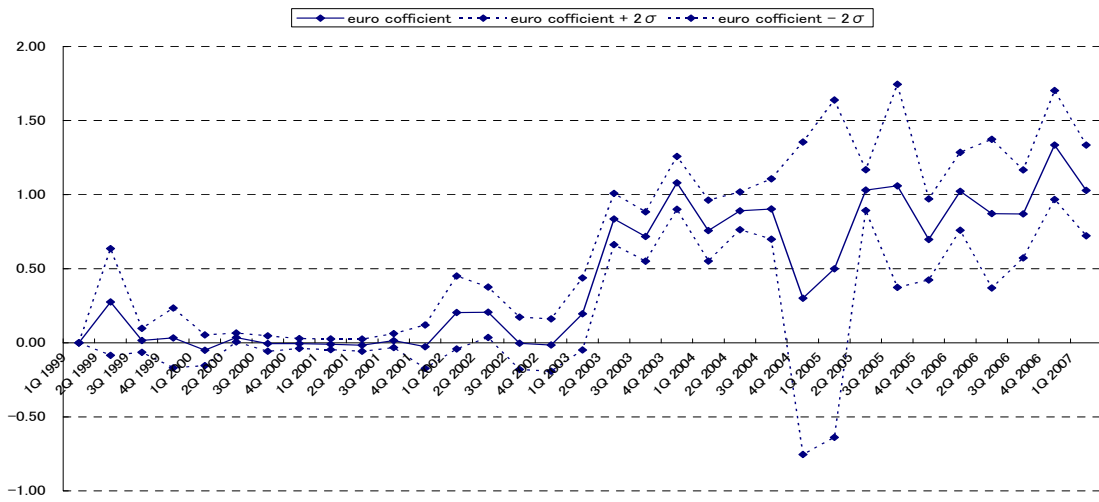


Figure 14. The euro coefficient of Bulgarian lev

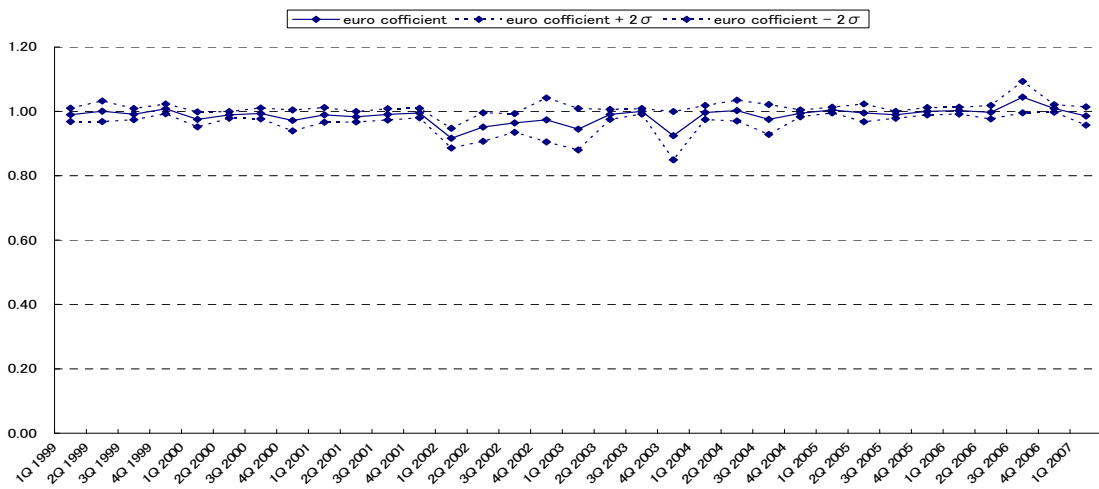


Figure 17. The euro coefficient of Danish krone

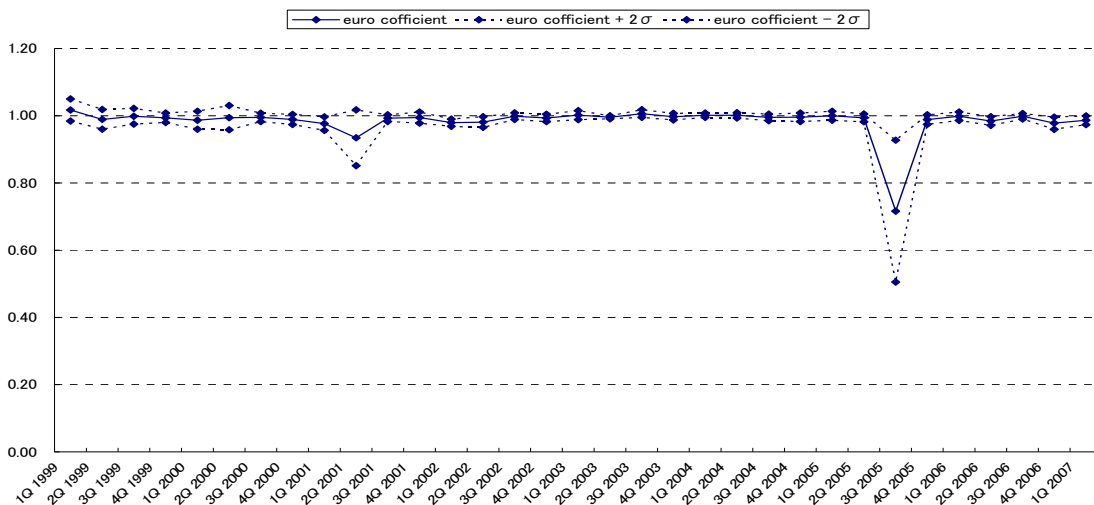


Figure 15. The euro coefficient of Croatian kuna

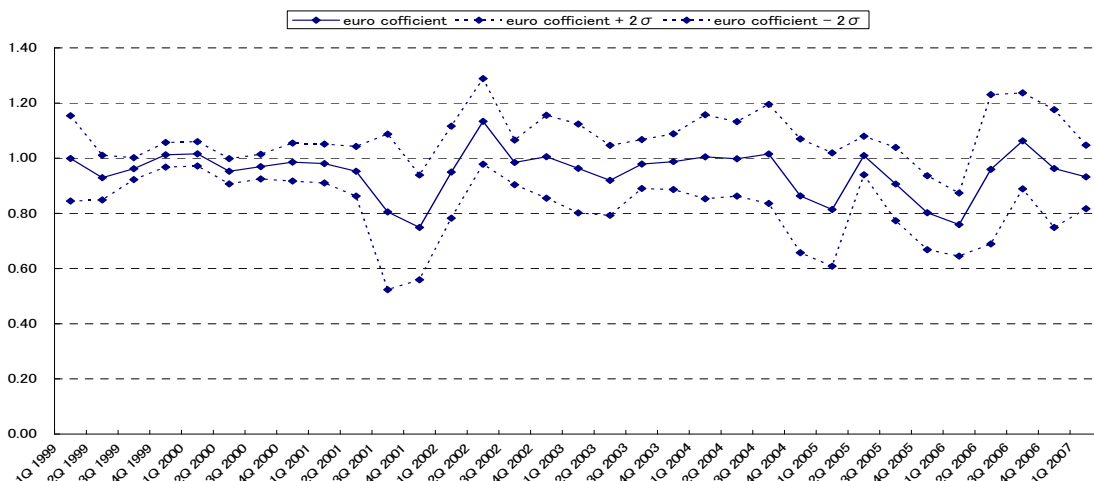


Figure 16. The euro coefficient of Turkish lira

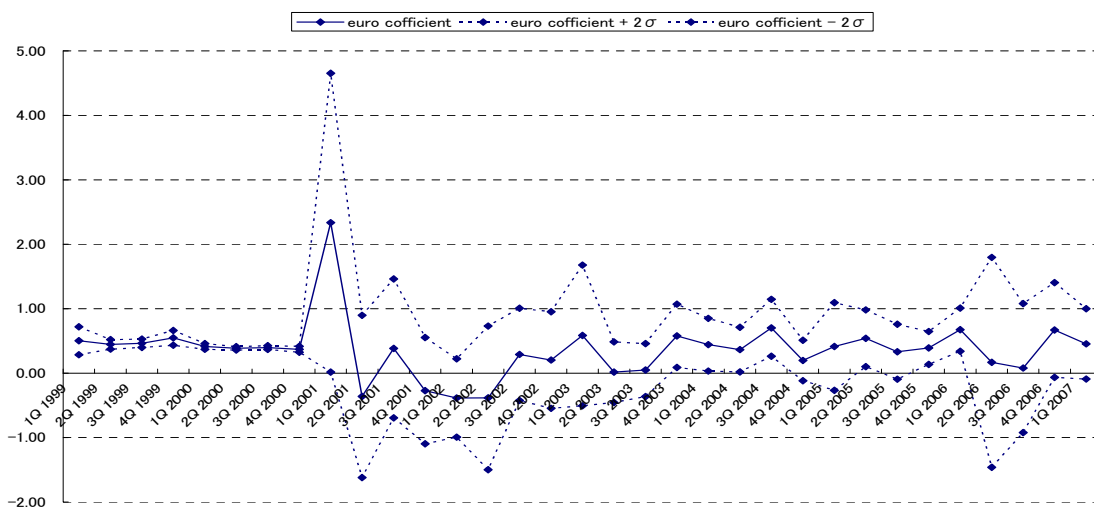


Figure 17. The euro coefficient of Danish krone

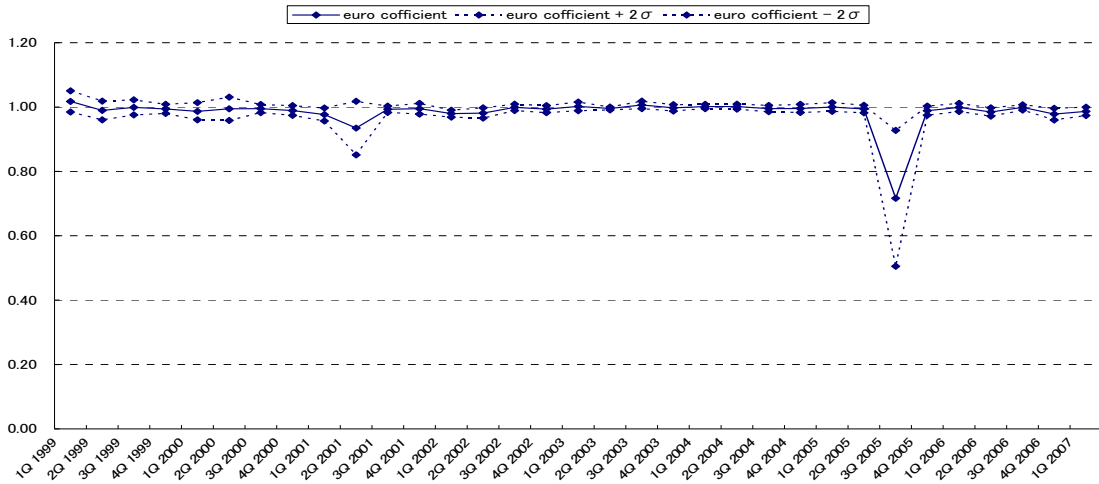


Figure 18. The euro coefficient of Swedish krona

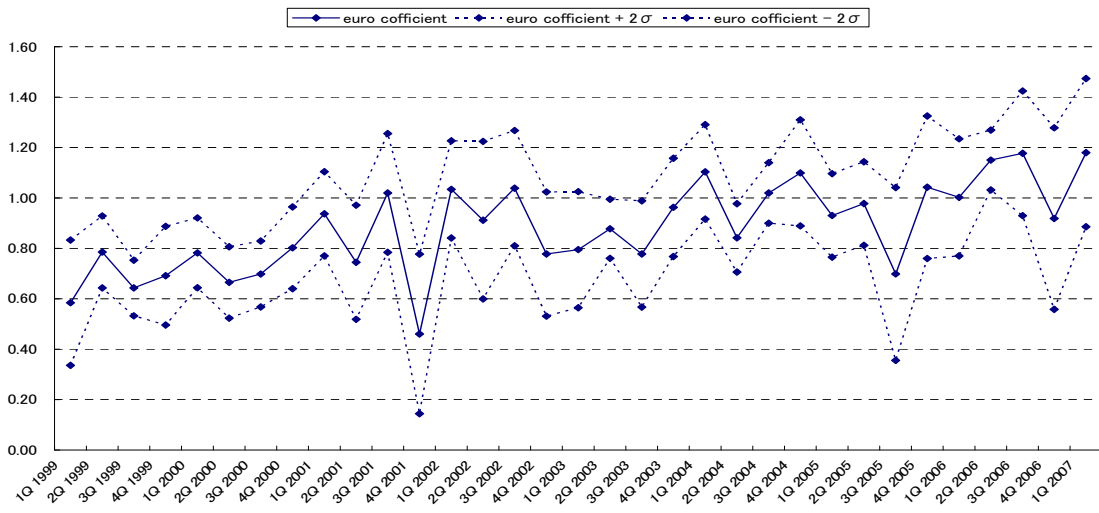


Figure 19. The euro coefficient of Sterling pound

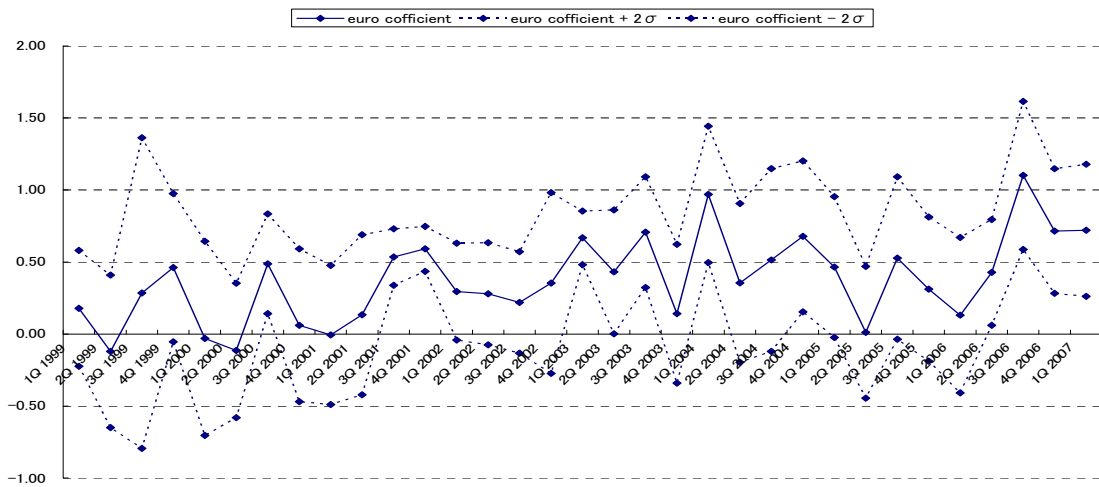
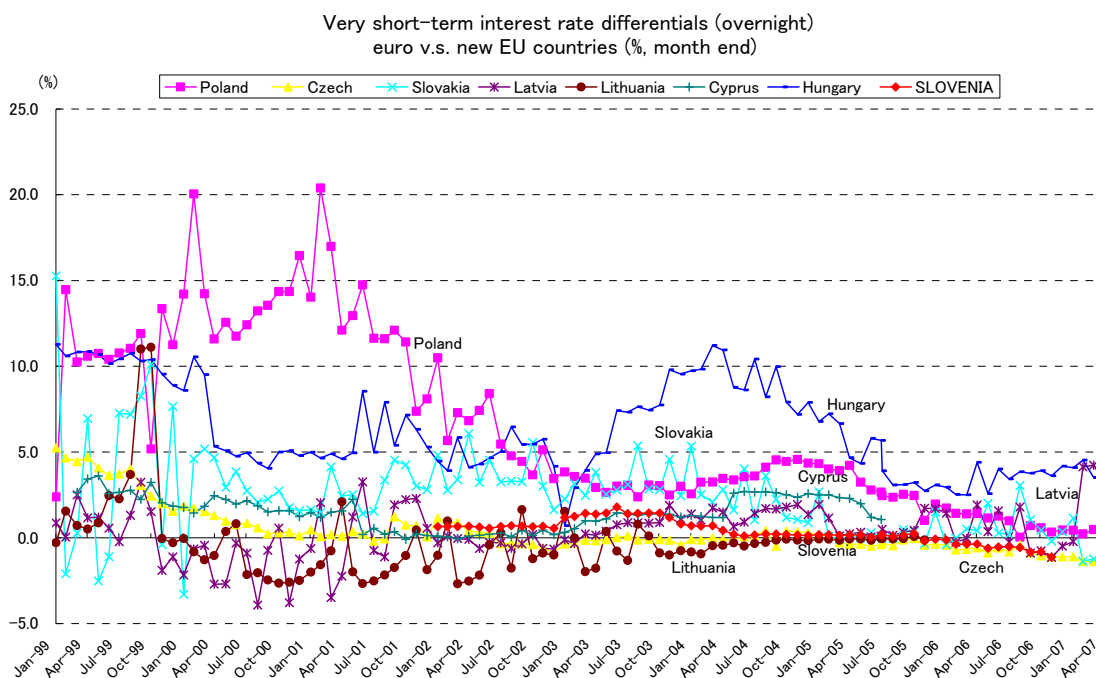
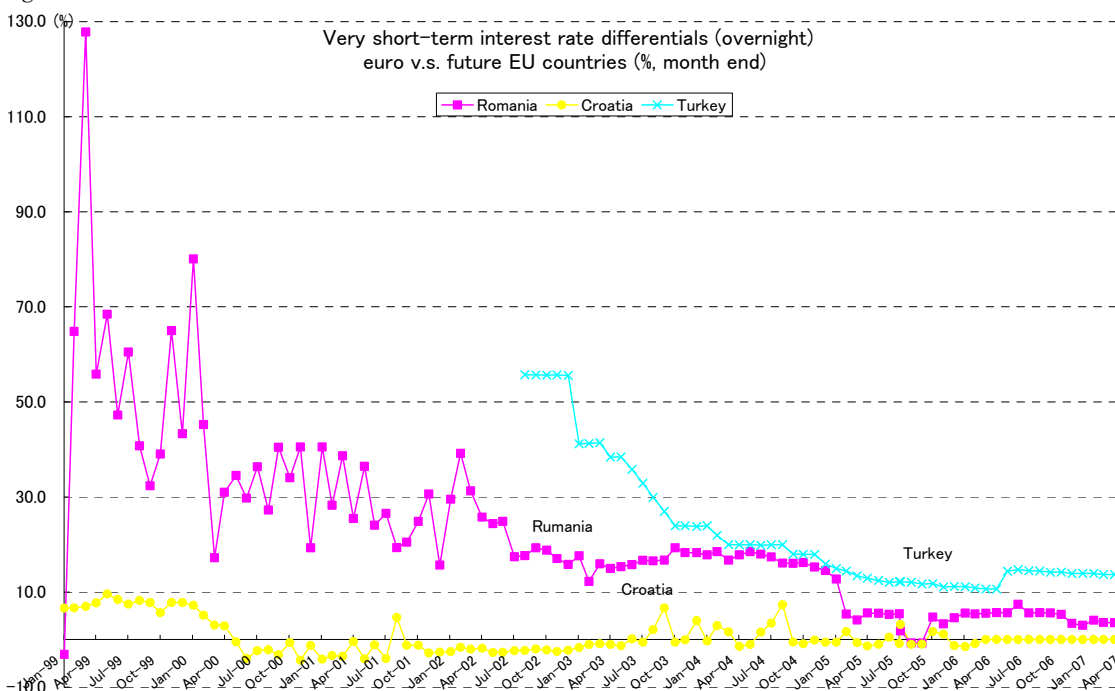


Figure 20



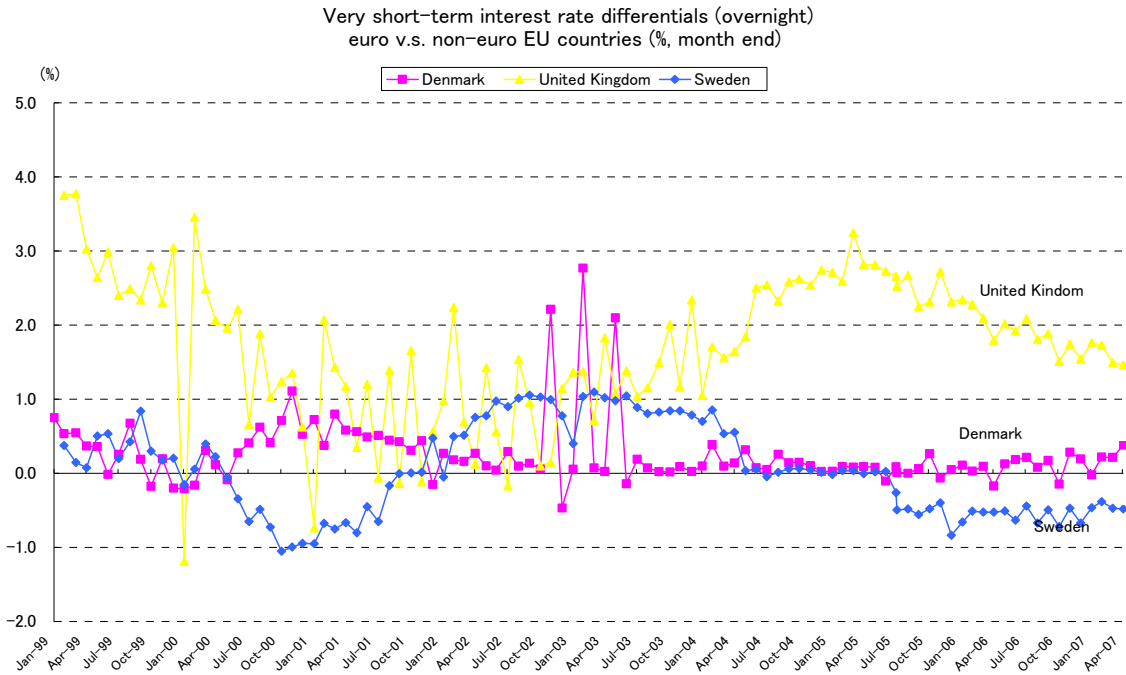
Source: Datastream and each country's central bank HP
 Short-term interest rate differential = each country's inter-bank overnight interest rate – euro overnight interest

Figure 21



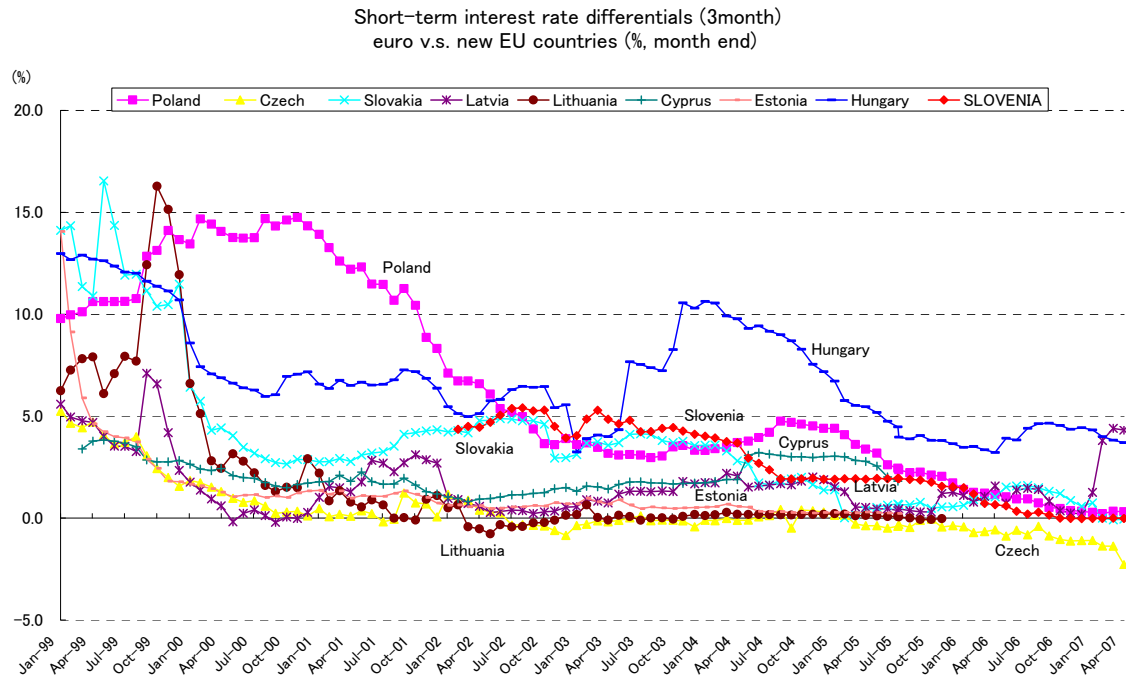
Source: Datastream and each country's central bank HP
 Short-term interest rate differential = each country's inter-bank overnight interest rate – euro overnight interest

Figure 22



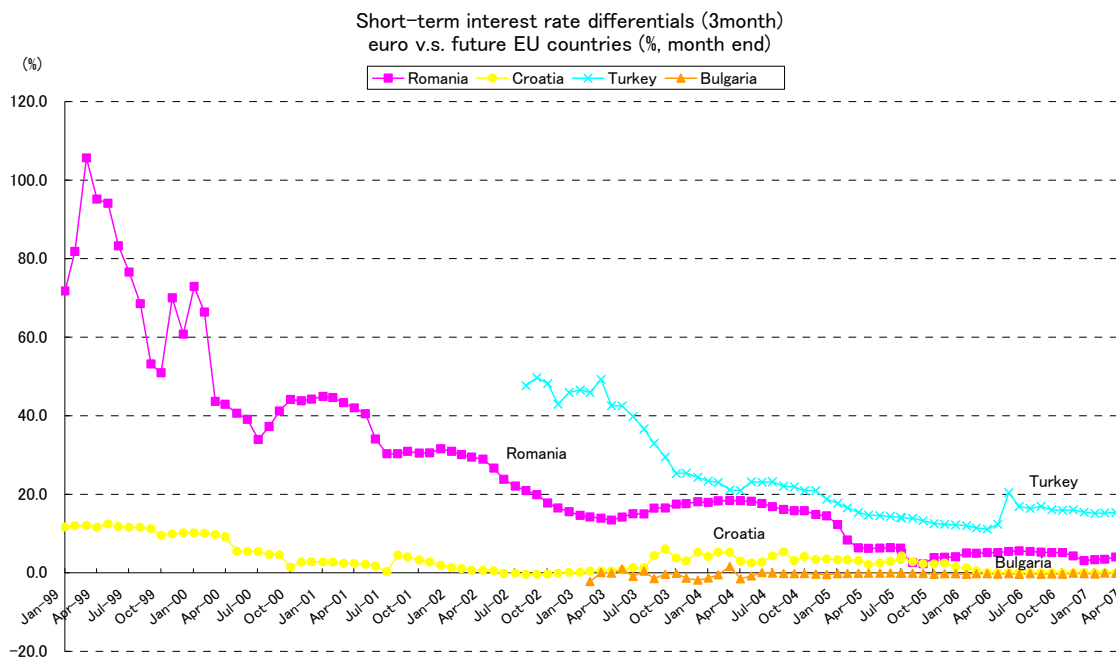
Source: Datastream and each country's central bank HP
 Short-term interest rate differential = each country's inter-bank overnight interest rate – euro overnight interest

Figure 23



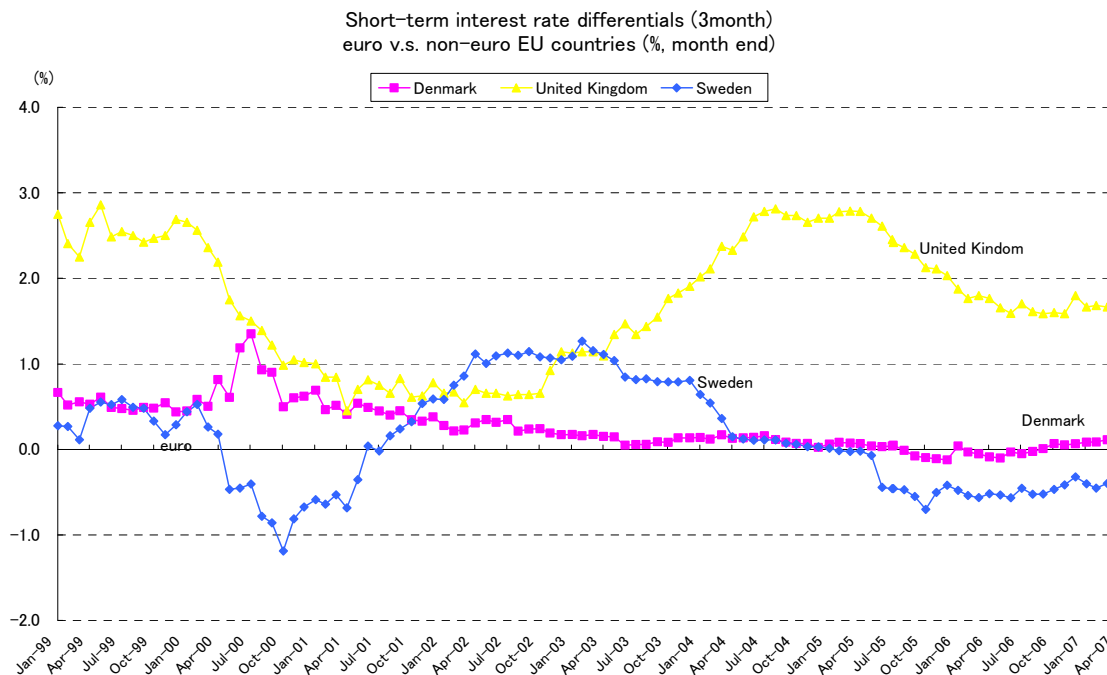
Source: Datastream and each country's central bank HP
 Medium-term interest rate differential = each country's 3month inter-bank interest rate – euro 3month money market interest rate

Figure 24



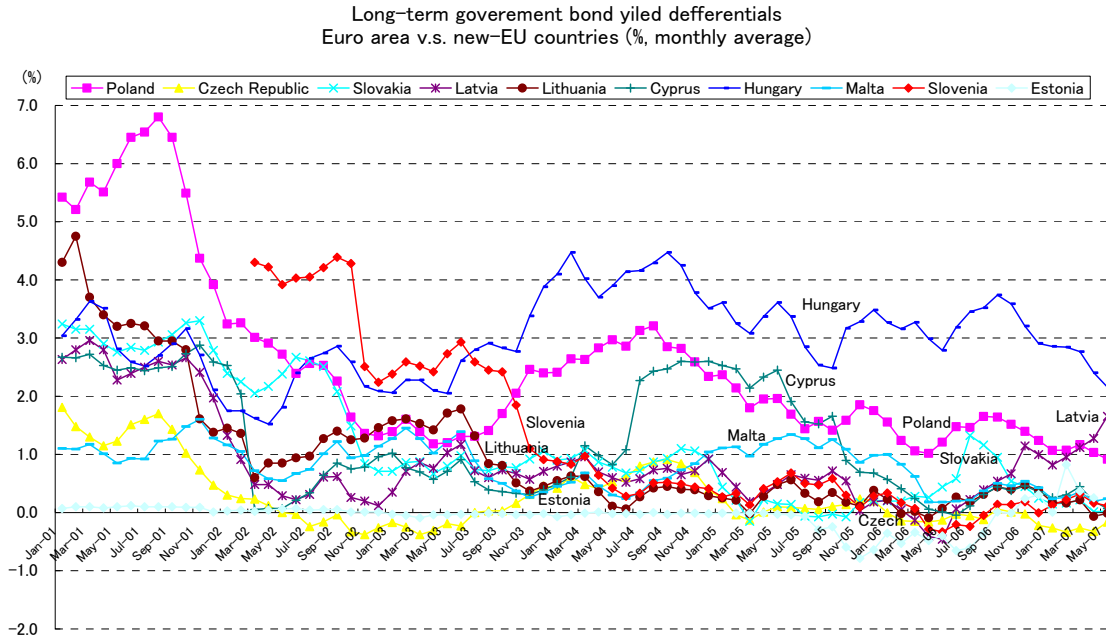
Source: Datastream and each county's central bank HP
 Medium-term interest rate differential = each country's 3month inter-bank interest rate – euro 3month money market interest rate

Figure 25



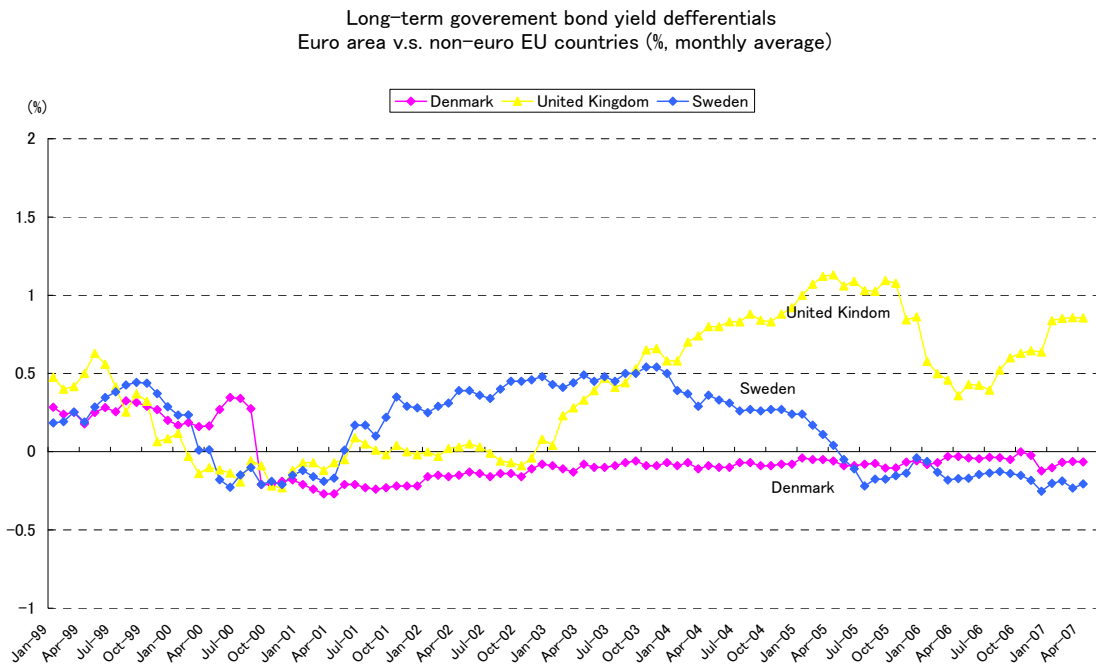
Source: Datastream and each county's central bank HP
 Medium-term interest rate differential = each country's 3month inter-bank interest rate – euro 3month money market interest rate

Figure 26



Source: ECB Monthly Bulletin
 Long-term Government bond yield differential = each country's 10-year government bond yield – euro area 10-year government bond yield

Figure 27



Source: Datastream and each country's central bank HP
 Long-term Government bond yield differential = each country's 10-year government bond yield – euro area 10-year government bond yield