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INFLATION PERCEPTIONS AND EXPECTATIONS AROUND EURO CHANGEOVER

Nataša Jemec

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Izdaja BANKA SLOVENIJE
Slovenska 35
1505 Ljubljana
telefon: 01/ 47 19 000
fax: 01/ 25 15 516

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ABSTRACT

The purpose of this analysis is to find out the relationship between actual inflation and its perceptions and expectations. We focus on Slovenia and compare it to some other European countries. Our two main findings, based on a graphical analysis, are, first, that people in usual circumstances perceive inflation rationally and second, that their perceptions and expectations become exaggerated in case of shocks, such as for example change of currency. Exaggerated perceptions during euro conversion are also confirmed by stationarity tests, as they indicate that changeover caused a gap between actual and perceived inflation in the first round of countries introducing euro. In the euro adoptions that followed also effective communication might have contributed to prevent the gap. Stationarity tests bring evidence that in times when perceptions are not submitted to shocks, inflation and perceptions display a significant co-movement. Furthermore, Granger causality tests also provide evidence of a certain relationship between actual inflation and its perceptions and expectations in Slovenia and the euro area. Inflation perceptions and expectations thus in non-exceptional circumstances represent one useful indicator to predict future inflation.

POVZETEK

Namen te analize je ugotoviti, kako se gibljejo anketne ocene zaznav inflacije in inflacijskih pričakovanj v primerjavi z inflacijo. Osredotočimo se na Slovenijo in jo primerjamo z nekaterimi evropskimi državami. Iz grafične analize je razvidno, da ljudje v običajnih razmerah racionalno dojemajo inflacijo. Dojemanja ljudi pa se do neke mere prilagajajo oziroma postanejo pretirana v primeru šokov, kot je recimo sprememba valute. Zadnjo trditev lahko podkrepimo tudi s testi stacionarnosti, ki nakazujejo, da je uvedba evra povzročila razmik med dejansko in zaznano inflacijo v prvi skupini držav, ki so spremenile svojo valuto. V prevzemih evra, ki so sledili, tega razmika ni zaznati, k čemur je prispevala tudi učinkovita komunikacija. Dodatno s testi stacionarnosti lahko potrdimo, da se v časih, ko zaznave inflacije niso podvržene šoku, te gibljejo skladno z inflacijo. Tudi testi Grangerjeve vzročnosti kažejo na povezavo med anketnimi ocenami zaznav inflacije in inflacijskih pričakovanj ter inflacijo v Sloveniji in evroobmočju. Anketne ocene zaznav inflacije in inflacijskih pričakovanj so torej v običajnih razmerah en izmed pokazateljev gibanja prihodnje inflacije.

¹ Nataša Jemec, Analysis and Research center of Bank of Slovenia (natasa.jemec@bsi.si). We are very grateful to Urban Sila, Aleš Delakorda, Damjan Kozamernik and all the participants of internal seminar where this paper was discussed for very useful comments and suggestions. The views expressed in this paper are those of the authors and do not necessarily reflect those of the Bank of Slovenia. All remaining errors in this paper are the sole responsibility of the author.

1 Introduction

According to the present monetary policy approach, aimed at maintaining price stability, central banks should be forward-looking, framing their policies today on the basis of inflation expectations of the future inflation rate over medium term. This approach among other things requires access to reliable and frequently reported data on inflationary expectations of the public. Furthermore, expectations about the future course of prices are important to decision-makers in many markets: for goods, services, labour, money, financial assets and currencies. Such information is of qualitative nature and is based on surveys, implemented by the European Commission.

So far most of the literature on inflation perceptions and expectations has been of descriptive nature and aimed at the euro changeover in 2002. We address this issue in a more formal, econometric setting and also investigate euro changeovers that followed the one in 2002. From graphical analysis we infer that conversion to euro is just a short-term shock on inflation perceptions and expectations and consequently might cause just a temporary increase in those two variables. Finally we also formally test the hypothesis that euro changeover causes a gap in measured and perceived inflation.

The purpose of this analysis is to find out how measured inflation and its perceptions and expectations are actually related, that is if those two qualitative indicators can actually give any indication of how actual inflation moves. First, a graphical analysis is presented, which shows that people in usual circumstances perceive inflation rationally and that their perceptions and expectations become exaggerated in the case of shocks, such as the change of currency. The fact that inflation perceptions become exaggerated is tested formally using stationarity tests. The conclusion is that the difference between quantified inflation perceptions and actual inflation is stationary for the period before the euro changeover. However, it is non-stationary for the whole period of data availability for the majority of the countries that have introduced euro in the first round. This provides an evidence that the euro changeover indeed caused a gap between actual and perceived inflation. For the countries that have adopted euro after 2002, no such gap is found. That could be the consequence of more effective communication and evidence from the first round, which showed only minor measured inflation changes. Finally we confirm that there exists a certain relationship between actual inflation and its perceptions and expectations with the Granger causality tests.

The remainder of the paper is organized as follows. A literature review on the disparity between perceptions and measured inflation is provided in the second section. The specific approaches employed in this paper are discussed in the third section, under four subsections: the description of data on inflation and inflation perceptions and expectations, graphical analysis of the data, quantification of the data and stationarity tests and Granger causality tests. Section four concludes.

2 Overview of the Literature on the Disparity Between Perceptions and Measured Inflation

Prices that have risen due to the euro cash changeover were especially prices in restaurants, cafes, hairdressers, repair and cleaning and recreational services. Nevertheless during the time of euro conversion the price increases for a number of items were unrelated to that event. For example variations in energy prices depend mainly on the international energy market

conditions. The energy price increase which started in late 2001 was similar in all the countries regardless of euro cash changeover. Food prices started to increase in 2001 due to bad harvests in parts of Europe in 2001. Later on the growth of food prices was also the result of increased foreign demand, especially from emerging economies of China and India. Additional impact on higher food prices came from increased production of bio-fuels, which reduced the land available for food production land. Both food and energy prices reached the peak in the middle of 2008. Prices also depend on the economic cycle. That is clearly reflected in their decline since the second half of 2008 which corresponds to the fall of economic activity. Furthermore, countries like Slovenia, Cyprus, Malta and Slovakia that have adopted euro after 2002 are in average less developed than countries that have changed their currency in the first round. That means that the real convergence process is still in progress and the consequence is also a higher inflation. Above mentioned variables are shown in Figure 1.

However much of the literature describes that the euro cash changeover caused inflation perceptions and expectations of people to become exaggerated. Studies trying to explain this movement can be put into three different groups.

The first group of studies relates to consumers that are disproportionately influenced by changes in the prices of the goods and services they buy most frequently. This hypothesis is plausible in general and even more so for a period like the changeover, when consumers have to become quickly familiar with many new prices.

The second group of studies examines the hypothesis that individuals are more heavily influenced by price increases than decreases, even if the two are simultaneous and of the same order of magnitude, or by exceptionally large changes of prices for specific goods, even if goods in question make up only a modest portion of the basket of consumer prices. Del Giovane and Sabbatini (2005) have found out in their study for Italy that an exceptionally high proportion of prices changed and there were large rises for some services. Study done by Deutsche Bundesbank (2004) showed that two effects may have disoriented German consumers: a sharp reduction in the proportion of attractive prices (easy for consumers to recognize and memorize because they end in familiar two-decimal-point figures) and a further diversification of prices for the same product. According to Banque Nationale de Belgique (2002) the adoption of the euro brought a return to decimal prices and the utilization of coins and cents in Belgium, accompanied by a sharp rise in the number of different prices for the same type of product. This has disoriented consumers and contributed to the divergence between perceived and officially measured inflation.

The third group of studies deals with experimental psychology. Here mechanisms that may have influenced individuals' perceptions of the inflationary effects of euro are explored. The study of Marques and Deheane (2004) based on a sample of Portuguese and Austrian students confirms the hypothesis of faster learning for more frequently purchased items. Additionally, the estimates of inflation made in national currency were more accurate than the estimates made in euros. Traut-Mattausch et al. (2004) found in the study of German citizens that individuals tend to overestimate the inflationary effect of the changeover. The higher their expectations about inflation were before the euro changeover, the more they overestimated the effect. Namely consumers were checking data confirming their expectations less accurately than data disapproving them. This mechanism is called "selective output correction". Also Kamletner et al. (2004) came to similar conclusions analyzing the sample of Austrian citizens. Van Raaij and Van Rijen (2003) used a sample of Dutch citizens to test the hypothesis that

consumers are subject to a money illusion effect when the euro price is lower in nominal terms than its equivalent in the old national currency. This effect induces consumers to underestimate the euro prices and consequently spend more. At the end of the month they figure out that they have spent more than they intended and blame that on an increase in prices (Del Giovane, Sabbatini, 2005).

As a reason for overestimation of inflation perceptions Aucremanne et al. (2005) mention the fact that HICP does not include the owner occupied housing, even though the purchase of houses constitutes a very important transaction of households. In recent years, house prices have risen substantially in many the euro area countries and this increase has been in general well above HICP inflation. In the euro area as a whole, residential property prices have for example increased in 2003 by 7% and in 2004 by 7.2%. Moreover, the price growth on the housing market has received extensive media coverage and consequently consumers might have become very sensitive to this price acceleration.

Eife and Coombs (2005) think that people's misperceptions could be avoided or at least to some extent reduced with an appropriate information campaign. In the 2002 a euro changeover clear and credible statement about what really happened to prices was missing. Media took a leading role in informing the public on euro's impact and their reports were often unbalanced and based on small and sometimes biased samples.

3 Empirical Analysis of Inflation Perceptions: Comparison of Slovenia to some Other European Countries

3.1 Data

Monthly data on inflation perceptions and expectations in EU are collected within the framework of the Joint Harmonised EU Programme of Business and Consumer Surveys². Relevant questions from the above mentioned survey are: *"How do you think that consumer prices have developed over the past 12 months?"* Respondents can choose among the following answers: (1) *risen a lot*, (2) *risen moderately*, (3) *risen slightly*, (4) *stayed about the same*, (5) *fallen* and (6) *don't know*. The balance statistic is calculated as the weighted proportion of respondents stating that prices have risen over the past twelve months, reduced by the weighted proportion of respondents stating that prices have fallen or remained unchanged over the same period. Denoting S_i (for $i=1, \dots, 5$) as the sample proportion choosing each of the five response categories stated above, the balance statistic is calculated as $(S_1+0.5S_2)-(0.5S_4+S_5)$.

The second question is: *"By comparison with the past 12 months, how do you expect that consumer prices will develop in the next 12 months?"*. Here the possible answers are: *"they will... (1) increase more rapidly, (2) increase at the same rate, (3) increase at a slower rate, (4) stay about the same, (5) fall, (6) don't know"*. The balance statistic is calculated in the same manner as for perceptions.

Time periods for data on inflation perceptions and expectations, collected by the European Commission differ among countries dealt with in our analysis. For Germany, Italy, the Netherlands, France, Greece, Denmark and United Kingdom series starts in 1985, for Spain

² URL: http://ec.europa.eu/economy_finance/db_indicators/surveys9185_en.htm.

and Portugal it starts in 1986, for Austria and Sweden³ in 1995, Slovenia in 1996, Slovakia in 1999, for Poland⁴ and Cyprus in 2001 and finally for Malta in 2002. The end of our observation period is represented by August 2009.

Consumer price developments are measured by Consumer Price Index (CPI) until December 1996 and since then by Harmonized Index of Consumer Prices (HICP)⁵. Both price indexes indicate the development of prices for a basket of typical goods and services composing household consumption. Eurostat is our source for monthly price data and in order to provide consistency with the survey statistics, we use percentage changes over the same month of the preceding year.

3.2 *Graphical Analysis*

For many European states data on inflation from 1985 on can be compared with those on inflation perceptions and expectations and we can see that perceptions and expectations mainly follow the disinflation trend. This shows that people perceive inflation rationally. Forsells and Kenny (2002) came to a conclusion that consumers' expectations are shown to provide a reasonably accurate predictor of inflation over the long-run. According to them consumers are shown to gradually adjust their expectations in order to "weed out" any systematic error. In what follows, a graphical analysis is applied to find out whether a shock, such as an introduction of a new currency, causes temporary or permanent divergence between actual inflation and inflation perceptions and expectations.

Two findings can be drawn from the graphical analysis of Slovenian data. First, prior to Slovenia's entry to the euro area, namely in the period 1996-2006, there was little sign of deviation in the trend between measured inflation and inflation perceptions. This trend differs from that in most euro area Member States where inflation perceptions rose sharply prior to the euro changeover. The aforementioned difference likely stems from the fact that prior to the adoption of the euro in Slovenia, Slovenian consumers were well informed about the single currency and about the price increases experienced in other euro area Member States linked to the euro conversion. Necessary trust was also bolstered by well organised campaigns to warn consumers about excessive price increases. At the beginning of 2007, following the exchange of tolar for euros, inflation perceptions rose. Similar divergent trends of actual and perceived inflation were also present in other euro area Member States during the conversion to euro. The notably sharp rise in inflation perceptions in Slovenia from summer 2007 on was likely a result of the actual increase of the overall level of prices, and notably of the prices of products, purchased most frequently - particularly food and energy. The latter might have influenced the inflation perceptions to a great extent as the growth of perceived inflation was significantly sharper than the rise of actual inflation. Nevertheless, inflation in Slovenia at that time was also to a large extent affected by both a booming domestic macroeconomic environment and a strong rise in commodity prices (Price Stability Report, October 2008). Domestic demand was very high, with output above its potential, and progressively feeding in sharp increases in nominal unit labor costs⁶. At the same time, both oil and non-oil

³ Denmark, United Kingdom and Sweden are used as control countries that have not yet adopted euro but are similar to countries that have changed their currency to euro in 2002.

⁴ Poland is added due to the fact that it is the biggest country of New Member States that entered EU in 2004 and has not adopted the euro yet.

⁵ Aucremanne et al. (2005) find that using CPI for the whole period does not influence the results.

⁶ Genorio and Tepina (2009) find that this macroeconomic cycle also significantly contributed to the food price inflation in Slovenia.

commodity prices have reached their highs in the middle of 2008. Perceptions have reached the peak at the beginning of 2008 and have been decreasing since then, largely due to the strong reversal in economic activity. These factors, representing simultaneous demand and supply shocks to inflation, have been the strongest contributors to the inflation rise, and have been unrelated to the event of euro changeover in Slovenia.⁷

Second, from the middle of 2005 until the end of 2006, inflation expectations in Slovenia continuously rose although actual inflation in the period was relatively stable. This movement was a consequence of the fact that consumers related euro to a growth in prices. At the beginning of 2007 inflation expectations decreased markedly. Growth in expected inflation was again on the rise from summer 2007 and was evidently the reflection of the sharp acceleration in certain HICP categories, particularly food, and at the same time of the gradual rise in overall inflation. Similar as inflation perceptions also inflation expectations reached the peak at the beginning of 2008 and are decreasing since then.

Since our interest lies in longer time periods, especially when describing the trends of disinflation, Slovenia is compared to some other European countries and not just the euro area⁸. All analysed European countries are divided into three groups, represented by countries which show similar developments of inflation perceptions and expectations. Graphical analysis is presented in Figure 2.

The first group is represented by Germany, Italy, Austria, the Netherlands and Slovenia. In those countries large deviation between actual inflation and inflation perceptions existed since the euro changeover until the middle of 2008 when inflation perceptions started to fall. The deviation between actual inflation and inflation expectations in this group was obvious only in the period before the conversion to euro. The latter is also true for Slovakia, taking into account that it introduced euro in January 2009, when inflation perceptions were falling here as in other European countries. Due to the size of the above mentioned countries similar characteristics are valid also for the whole euro area and European Union.

The second group of countries consists of France, Greece, Spain and Portugal. Here large deviations between actual inflation and inflation perceptions and expectations existed from the euro changeover in 2002 until the middle of 2008. Afterwards, both inflation perceptions and expectations started to fall.

The third group of countries is represented by Poland, Denmark, Sweden, United Kingdom, Cyprus and Malta. Typical for this group of countries is that a strong correlation between actual inflation and inflation perceptions and expectations exists. The group is rather heterogenous as Poland, Denmark, Sweden and United Kingdom have not adopted euro yet, while Cyprus and Malta have adopted euro in 2008.

From the graphical analysis we can conclude that conversion to a new currency causes only a temporary divergence between actual inflation and inflation perceptions and expectations. Our second important finding is that for some countries a perception of what is considered to be “perceived normal” inflation has changed since the 80’s. For Italy, France, Spain, Greece and Portugal a clear trend of disinflation can be seen, which is not followed by the fall in inflation perceptions and expectations. For those countries, inflation perceptions and expectations remain at the same level as before the process of disinflation, even though the actual inflation

⁷ IMAD (2007) evaluates the direct effect on prices due to the changeover at 0,24 p.p.

⁸ The euro area has only been a statistical construction prior to 1999, which is a relatively short time span.

is much lower. If inflation at the end of 80's in Greece used to be 20%, in Portugal 12%, and in Italy, France and Spain 9%, it is now at the level of around 2 or 3%.

3.3 Quantification of Data and Stationarity Tests

In this section, findings from graphical analysis are confronted to statistical tests. Aucremanne et al. (2005) is followed in order to check whether the gap between measured inflation and its perceptions actually occurred.

The first step needed is to quantify the data on inflation perceptions, which is performed using the method suggested by Aucremanne et al. (2005). An intuition behind this method is very similar to what is done implicitly in a graphical analysis. The original data is transformed by dividing inflation perceptions by the ratio of its standard deviation and the standard deviation of actual inflation.

$$\pi_{it}^p = \frac{B_{it}}{\frac{se(B_{it})}{se(\pi_{it})}}$$

Here π_{it}^p represents the transformed measure of perceived inflation, B_{it} the original inflation perceptions data, and $se(B_{it})$ and $se(\pi_{it})$ the standard deviation of the inflation perceptions and actual inflation, respectively. The advantage of this data transformation also lies in the fact that transformed survey data have the same standard deviation as observed inflation, meaning that those two variables are now more directly comparable. Furthermore, due to their equal standard deviation, their difference provides a meaningful measure of the perception gap.

Having quantified inflation perceptions data, stationarity tests for the difference between both inflation variables $D_{it} = \pi_{it}^p - \pi_{it}$ can be used. If the perceived inflation tracks actual inflation well, the difference should be stationary around a constant. The size of a constant itself is irrelevant, as the absolute level of the balance statistic is not meaningful.

The test of stationarity is first performed for the period before the euro changeover, meaning year 2002 for the first wave of euro introducing countries, year 2007 for Slovenia, 2008 for Cyprus and Malta and 2009 for Slovakia. Then according to the graphical analysis, the gap seems to have appeared. Rejection of the null hypothesis of the unit root test implies that perceived and actual inflation indeed co-moved in the pre-euro currency conversion period. In other words deviations of the difference from the stationarity were only temporary. This test also yields a measure of the persistence of differences between both inflation measures. Finding a stationary difference during this reference period is a prerequisite for addressing the question whether something particular happened in the following period. Non-stationarity in the reference period would mean there was no stable and simple relation between rescaled perceived inflation and actual inflation in the past and would thus make the issue of instability in the more recent subperiod irrelevant.

Next, the same test is performed for the entire period (pre- and post-euro changeover). Comparing the results of both tests allows us to check whether the inclusion of the more recent period affects the amplitude and the degree of persistence of the difference between perceived and measured inflation in a significant manner. In case a severe and persistent gap has occurred after the euro changeover, the difference between the transformed series of

perceived inflation and actual inflation would no longer be stationary over the entire period. For the entire sample, an identical data transformation as for the shorter sample needs to be used. In other words, the ratio of the two standard deviations continues to be based on the period before euro changeover. Using a ratio based on the entire period would to some extent accommodate the possible break and therefore induce a bias towards finding stability.

These tests are performed for the individual countries, since the euro area has only been a statistical construction prior to 1999. Augmented Dickey and Fuller (ADF) unit root test⁹ is used to test for stationarity and optimal lag length is obtained on the basis of the Schwarz Info Criterion (SIC). Under the null hypothesis the difference, D_{it} , is non-stationary, that is the series is assumed to have a unit root.

Results of the unit root tests for individual countries are presented in Table 1. We reject the null hypothesis at the level of significance of 10% (p-value should be less than 0,1) and in that case accept the fact that the difference between quantified perceived and actual inflation is stationary. The left panel of the Table presents results for the pre-euro conversion period, while the right panel presents results for the entire period of available data. At the level of the individual countries the results on rejection of the unit root for the pre-euro period at the 10% significance level, are mixed. We are not able to reject the unit root hypothesis for Austria, Germany and France. Non-stationarity in the reference period for those countries therefore means that there was no stable and simple relation between rescaled perceived inflation and actual inflation in the past and thus makes the issue of instability in the more recent subperiod irrelevant. For all the other euro area countries the null hypothesis for the pre-euro period can be rejected. Based on this evidence, we can accept the existence of a stable and simple relation between perceived and actual inflation for the pre-euro period in the majority of the countries. This means that, on average, consumers have relatively well assessed the level of inflation before the cash changeover and the deviations from the stable relationship between the quantified perceptions and headline inflation were relatively short-lived.

For the whole sample the null hypothesis of a unit root can only be rejected for the case of Portugal, Slovenia, Cyprus and Slovakia at 10% significance level. Comparing the results of both tests for the other euro area countries, shows us that the inclusion of the more recent period affects the amplitude and the degree of persistence of the difference between perceived and measured inflation in a significant manner. This finding provides an evidence in favor of a break in the relation between perceived and measured inflation in the majority of first wave euro introducing countries as opposed to the following entrants to the euro area.

To make sure that euro cash changeover was the main explanatory factor for the gap between perceived and officially measured inflation in the euro area countries in 2002, one needs to use a set of non-euro control countries for which similar data are available, we chose Denmark, Sweden and the UK. In principle, in these countries inflation perceptions should have not been affected by the 2002 euro changeover. This is in fact mainly proven by the data. During pre-euro changeover period unit root can be rejected for all the control countries at the 10% significance level. For the whole sample period, results are nearly unaffected by the inclusion of post-2002 period. Only for Denmark we can now not reject the unit root.

⁹ We need to be careful while using unit root tests since it is well known in the econometric literature that unit root tests have low power in short samples. This problem is potentially severe for our data, as for some countries we only have available data from the beginning of 21st century. Particularly, in the case of a short sample, the unit root test tends to fail rejecting the null hypothesis of a unit root even if it is not true.

However this presents evidence that euro cash changeover was the main explanatory factor behind the gap between perceived and actual inflation having taken place after euro changeover in 2002. Such a gap was prevented in the subsequent euro adoptions. This could be – among other factors – also attributed to a more effective communication approach undertaken in countries which have introduced euro at later stages.

We divide countries into four different groups according to stationarity tests and show their differences between perceived and measured inflation in Figure 3. The first group is presented by countries whose differences between perceived and measured inflation were stationary before euro conversion and non-stationary after the inclusion of post-euro period. The second group includes countries whose differences were non-stationary in both samples. The third group shows countries with stationary series in pre-euro and whole period. Finally the forth group presents control countries' differences between perceived and measured inflation that are supposed to be stationary in both samples and also are with the exception of Denmark difference, which becomes non-stationary in the whole period sample.

3.4 Granger Causality Tests

Granger causality test is applied to make sure that there is a certain relationship between actual inflation and its perceptions and expectations in Slovenia and the euro area. Granger causality tests check whether there is any kind of a relationship between the two variables. This relationship does not necessarily mean causality or direction of influence. It means that the first variable includes enough information to predict another variable. The null hypothesis that we test is that variable 1 does not Granger Cause variable 2. In other words the rejection of null hypothesis means that there is Granger causality between those two variables. All tests are performed using stationary variables, meaning that in principle first order differences of the original series need to be used. More specifically, the influence of monthly changes of actual inflation data on monthly changes of inflation perceptions and expectations and the influence of the latter two on each other is checked. All those tests are made with lags of 2, 6 and 12 months. Results are shown in the Table 2. We only report significant relations at the 10% significance (p-value less than 0,1).

Granger causality tests reveal rather strong relations between actual, perceived and expected inflation. The main findings for Slovenia and the euro area are that monthly changes of actual inflation Granger cause monthly changes of inflation perceptions and expectations. This result was expected since according to the questionnaire the indicator of perceived inflation should be entirely explained by the underlying consumer price inflation and indicator of expected inflation should be to some extent related to it in the area of stable inflation. Monthly changes of inflation perceptions in both areas influence to a certain extent monthly changes of actual inflation, while monthly changes of inflation expectations Granger cause monthly changes of actual inflation only in the euro area. A potential influence of inflation perceptions and expectations on inflation should be taken into account in the conduct of monetary policy. Finally, monthly changes of inflation perceptions and expectations to a certain extent mutually explain each other in the euro area. This is explained by experimental psychology literature, namely the influence of inflation expectations on inflation perceptions is suggested by Traut-Mattausch et al. (2004) and the influence of inflation perceptions on inflation expectations could be explained by rigidity of the human mind. For example if a person reports high inflation perceptions there is a tendency that he or she will also report high inflation expectations.

4 Conclusion

In recent years, a growing amount of literature has developed around the movement and use of inflation perceptions, but mostly the literature was of descriptive nature and aimed at the euro changeover in 2002. We address this issue in a more formal, econometric setting and also investigate euro changeovers that followed the one in 2002. From the graphical analysis we infer that conversion to euro is, if anything, just a shock on inflation perceptions and expectations and consequently might cause just a temporary increase in those two variables. We formally prove that the euro changeover caused a gap in measured and perceived inflation in countries that changed their currency in 2002. In our analysis we focus on Slovenia and use other European countries for comparison.

From the graphical analysis one can conclude that people in usual circumstances perceive inflation rationally and accordingly in the process of disinflation lower both their inflation perceptions and expectations. Perceptions and expectations of people become exaggerated in the case of shocks, such as a change of currency. Econometric evidence confirms the finding that the stationary relation between inflation perceptions and headline inflation breaks after the euro conversion for most euro area countries which have changed their currency into euro in 2002. The euro cash changeover thus seems to have been the triggering factor of the perception gap in the euro area countries that have adopted euro in the first round. For countries which have adopted the euro later, this break is not evident, except for Malta. This could mean that communication campaign was more effective in the second wave of euro-introducing countries, learning from the experience of the first ones (Eife and Coombs, 2005).

Granger causality tests indicate that monthly changes of actual inflation could influence monthly changes of inflation perceptions and expectations in both the euro area and in Slovenia. Monthly changes of inflation expectations in the euro area influence monthly changes of actual inflation with lag of 12 months, which could be an important indicator in the conduct of monetary policy. Finally, monthly changes of inflation perceptions and expectations mutually explain each other in the euro area.

Stationarity tests bring evidence that in times when perceptions are not submitted to shocks, inflation and perceptions display a significant co-movement. Furthermore, Granger causality tests also provide evidence of a certain relationship between actual inflation and its perceptions and expectations in Slovenia and the euro area. Inflation perceptions and expectations thus in non-exceptional circumstances represent one useful indicator to predict future inflation.

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Figure 1: Inflation, Food and Commodities, GDP Growth

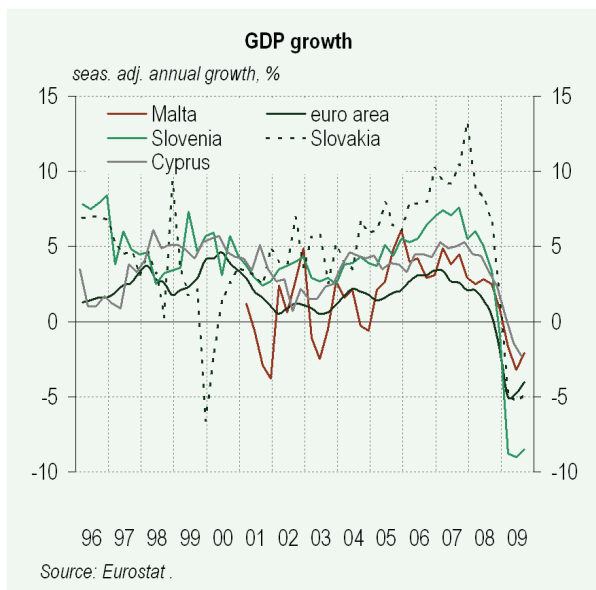
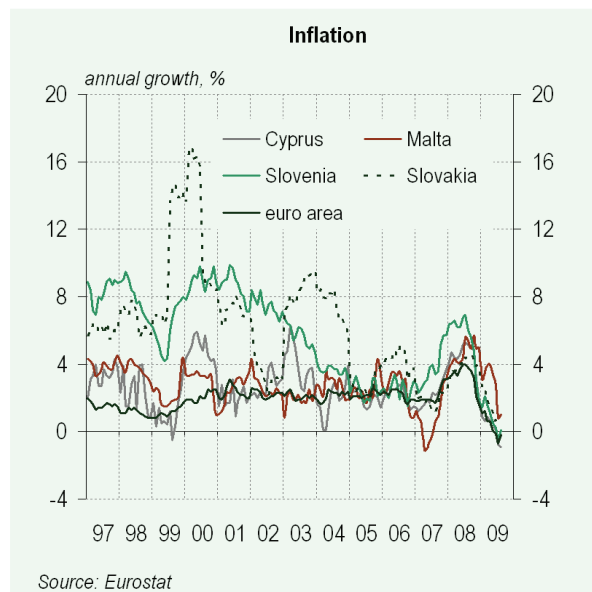
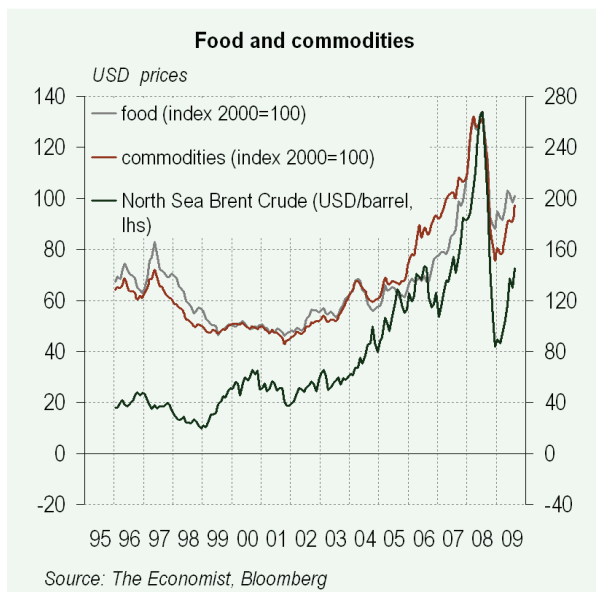
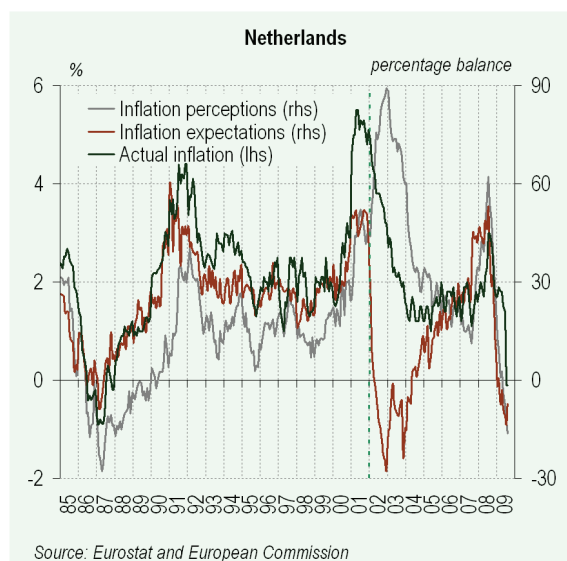
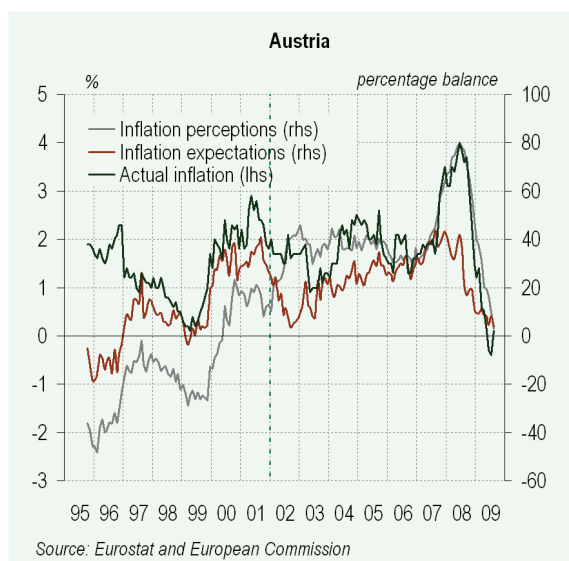
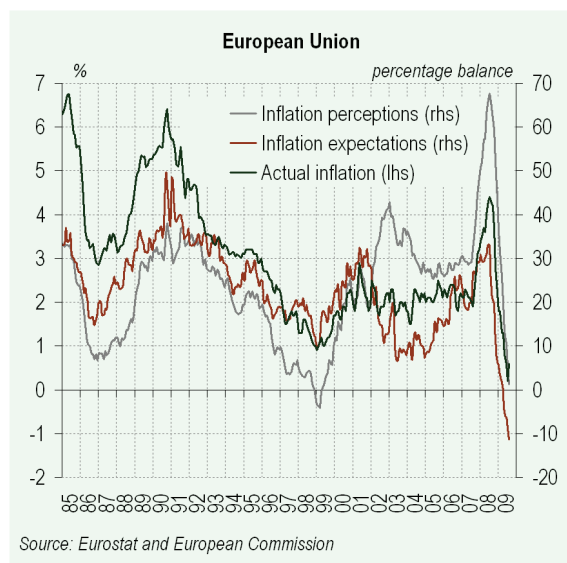
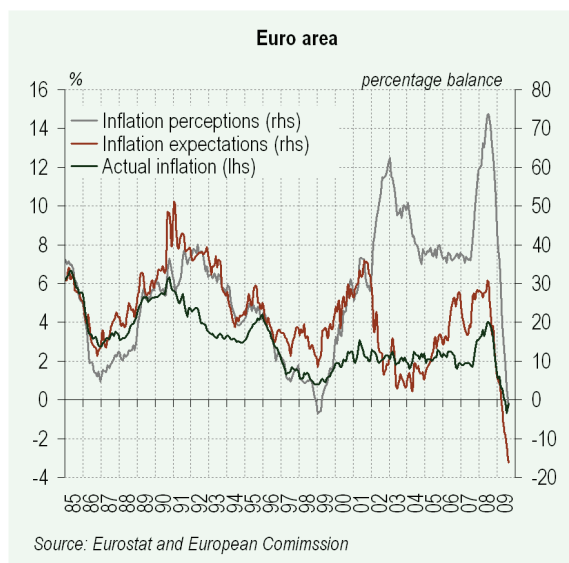
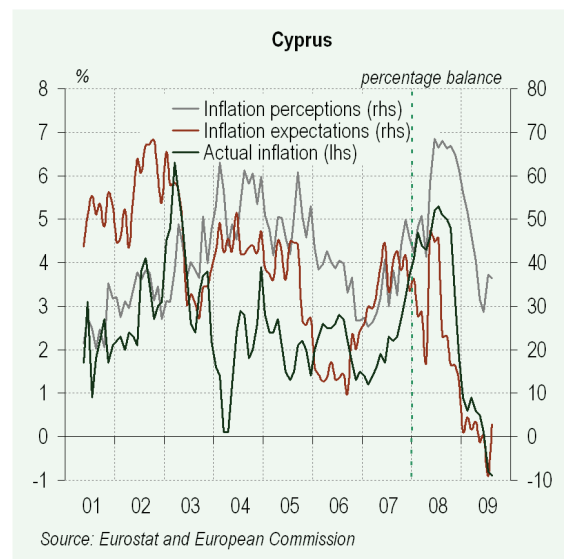
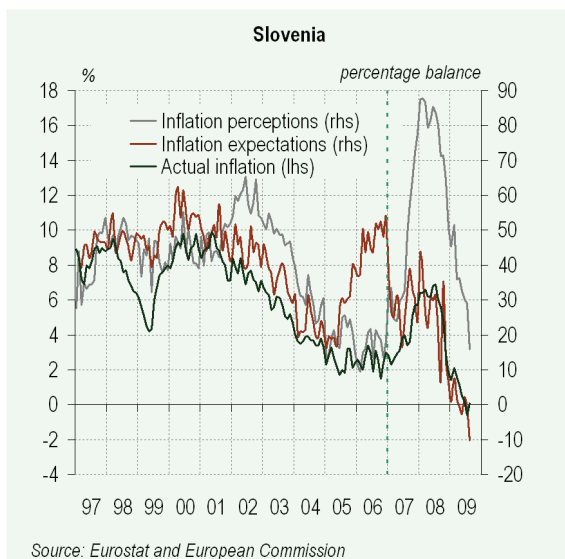
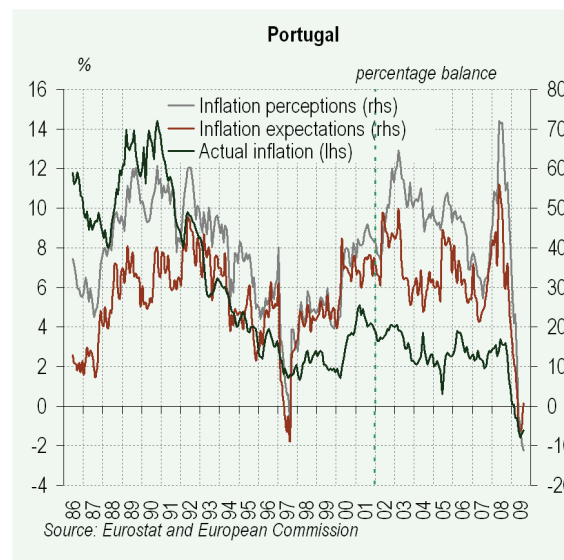
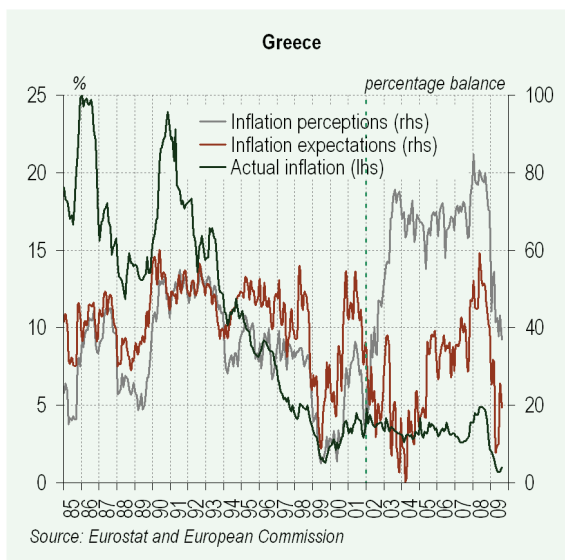
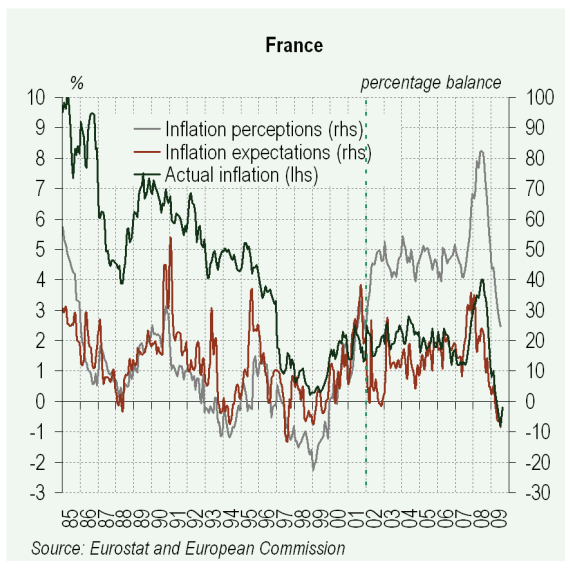
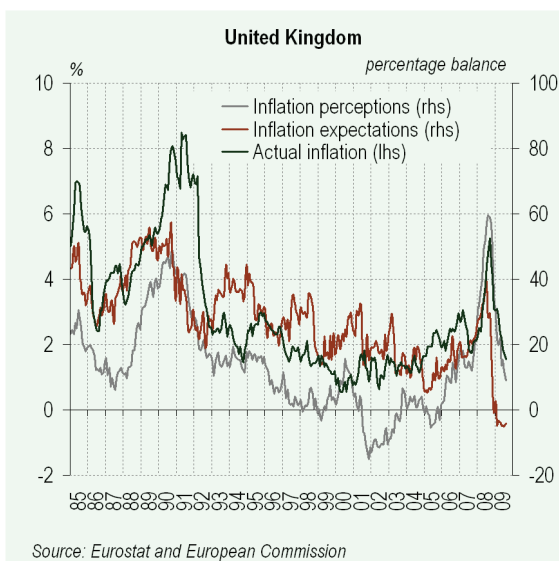
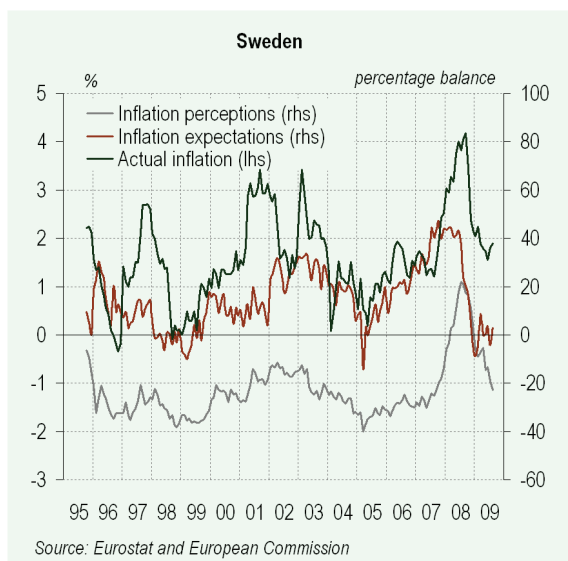
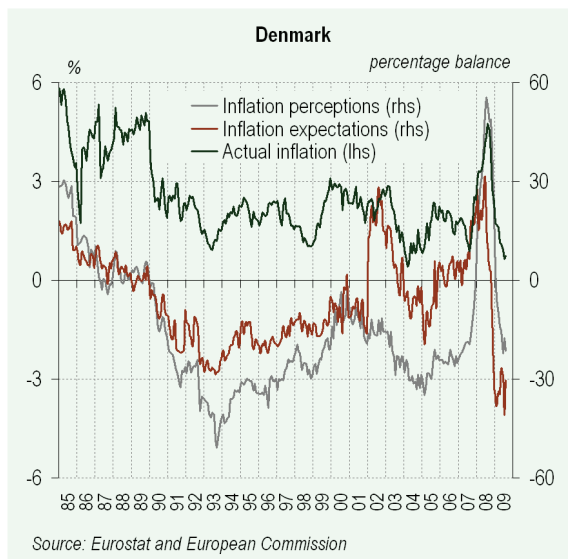
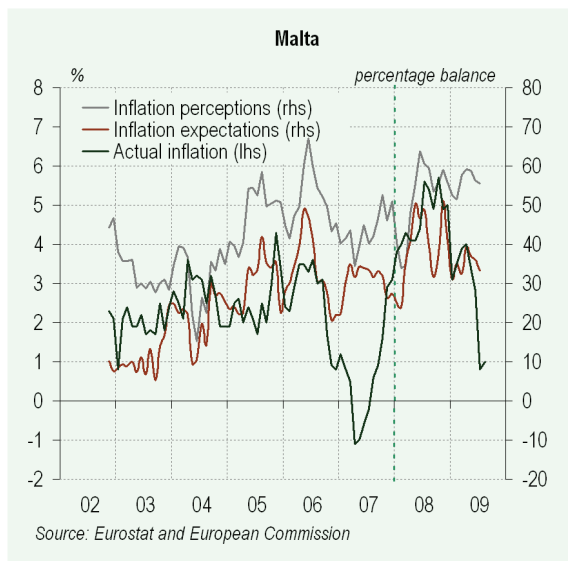


Figure 2: Actual, Perceived and Expected Inflation in Some European Countries







Note: Dashed vertical line represents the date of the euro changeover in respective countries

Figure 3: Differences Between Perceived and Measured Inflation

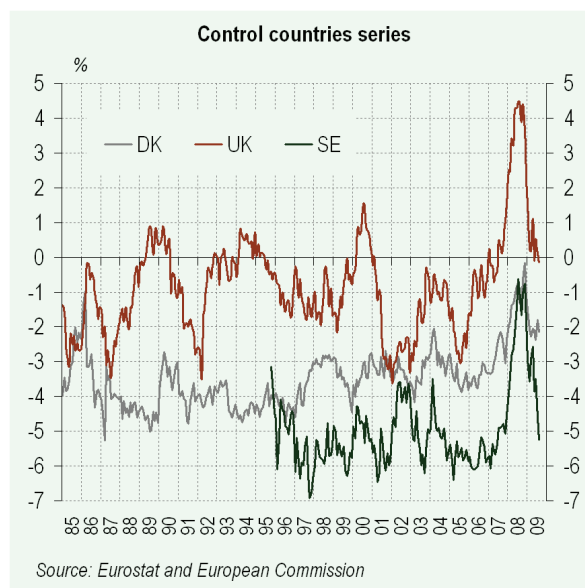
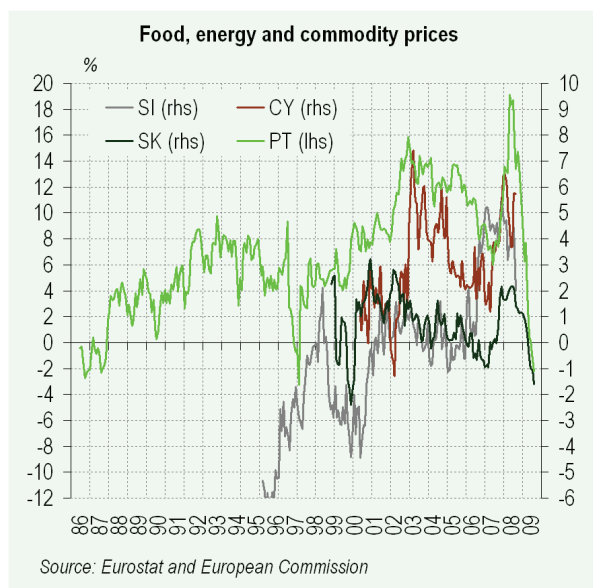
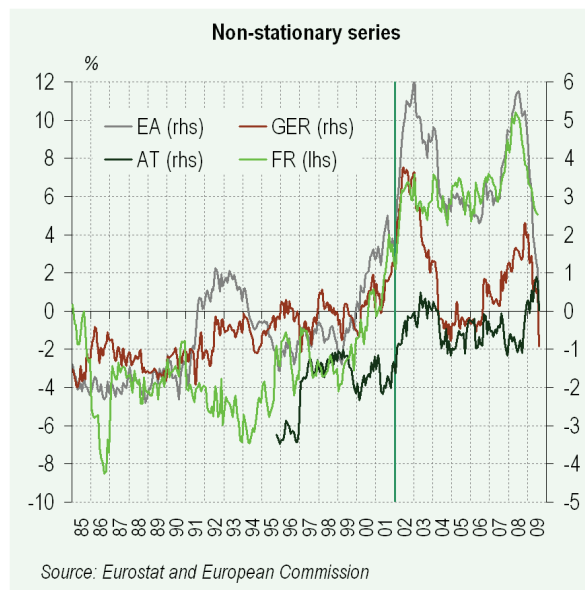
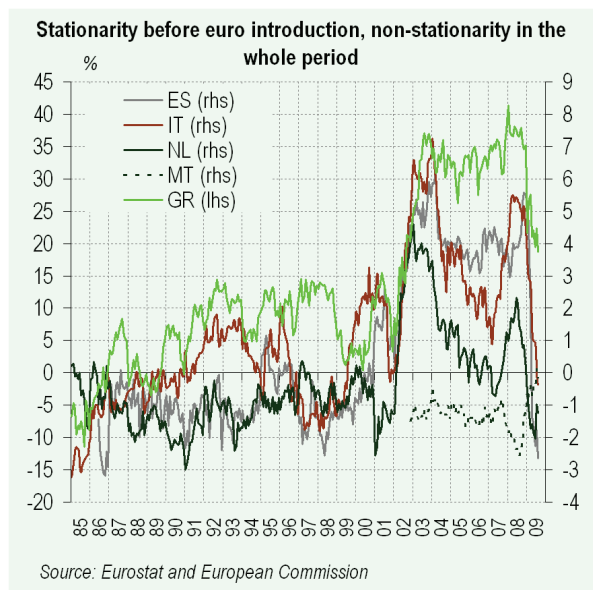


Table 1: Unit Root Tests at the Country Level Based on CPI (until 1996) and HICP (after 1996) Data (Re-scaled Survey Data)

Euro- Area countries				
	until euro changeover		whole period (until 2009.08)	
	P-values	Lag Length=0 (based on SIC max lag)	P-values	Lag Length=0 (based on SIC max lag)
Austria	0,2518	11	0,1044	13
Cyprus	0,0605	11	0,056	12
Germany	0,4283	14	0,2368	15
Spain	0,0029	14	0,3548	15
France	0,2347	14	0,7299	15
Greece	0,0678	14	0,4466	15
Italy	0,0343	14	0,1648	15
Malta	0,0074	10	0,4092	11
Netherlands	0,0018	14	0,1271	15
Portugal	0,0141	14	0,002	12
Slovakia	0,0111	12	0,0287	12
Slovenia	0,0094	12	0,0777	13
Non-Euro Area countries				
Denmark	0,0008	14	0,2779	15
Poland	(the series is too short)		0,002	12
Sweden	0,0004	11	0,0204	13
UK	0,0628	14	0,0456	15

Source: European Commission, Eurostat. Author's calculations.

Table 2: Results of the Granger Causality Tests for Slovenia and Euro Area

Null Hypothesis*	Country/Area	Lags	Obs	F-Statistic	P-values
Inflation does not Granger Cause inflation expectations	Euro Area	2	293	573,618	0,0036
		6	289	29,473	0,0084
		12	283	179,336	0,0494
	Slovenia	6	155	3,31932	0,0043
		12	149	205,918	0,0244
Inflation expectations do not Granger Cause inflation	Euro Area	12	283	1,69827	0,0673
Inflation does not Granger Cause inflation perceptions	Euro Area	2	293	203,357	5.00E-09
		6	289	911,084	4.00E-09
		12	283	376,171	0,00003
	Slovenia	2	159	682,985	0,0014
		6	155	24,586	0,0272
Inflation perceptions do not Granger Cause inflation	Euro Area	6	289	339,703	0,003
		12	283	301,221	0,0006
	Slovenia	6	155	18,475	0,094
		12	149	259,056	0,0042
Inflation perceptions do not Granger Cause inflation expectations	Euro Area	2	293	4,74997	0,0093
		6	289	2,04865	0,0595
Inflation expectations do not Granger Cause inflation perceptions	Euro Area	6	289	2,072	0,0567

* All data are expressed in monthly changes.

Note: Only statistically significant relations at the 10% significance are presented.

Source: European Commission, Eurostat. Author's calculations.