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A simple inflation indicator for the euro zone

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Abstract

This paper proposes and estimates an inflation indicator for the European Monetary Union (EMU). This indicator is set up so that it is contemporarily not affected by the changes in price differentials among EMU countries. The results show that the Monetary Union Index of Consumer Prices (MUICP), which is the inflation measure that the European Central Bank (ECB) takes as a reference for monetary policy purposes, could be understating the value of the inflation in the euro zone. It is also concluded that regional peculiarities are fundamental in the evolution of prices in the different EMU countries.

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1. Introduction

Since January 1999 a broad spectrum of European countries have a common currency: the euro. The European Monetary Union (EMU) is constituted by 12 countries (Belgium, Germany, Greece, Spain, France, Ireland, Italy, the Netherlands, Austria, Portugal, Finland and Luxembourg) each with its economic peculiarities but all of them with a common monetary policy conducted by the European Central Bank (ECB). The Treaty on European Union assigns the Eurosystem the primary objective of maintaining price stability in the euro area. The ECB has quantified this objective in terms of the Monetary Union Index of Consumer Prices (MUICP), which on a medium term should have an annual increase of below 2%.

In this context, with a common monetary policy focussing on price stability and with a very specific inflation objective, there has recently been a great interest in establishing good indicators of inflation in the euro area as alternatives to the MUICP. Efforts have mainly been devoted to the construction of reliable inflation indicators, and in particular to the setting up of what is usually known as core inflation indexes whose evolution is not distorted by transitory changes in the relative prices of goods that are unrelated to the medium-run objectives of central bankers (see, for example, Cristadoro et al., 2001, Bagliano et al., 2002 and Vega and Wynne, 2003).

The aim of this work is to propose a simple indicator of inflation in the euro zone from a different perspective. The idea is that a good inflation indicator of a monetary region should not be affected by asymmetric shocks in prices in different union members nor by the idyosincratic effects of a common shock. A good euro zone inflation indicator should not be affected by changes in price differentials between countries. Taking this as a point of departure, a decomposition of the price variations in each country into two components is suggested, one common to all the countries and the other idiosyncratic. The common component is the inflation indicator proposed in this work. Its advantage is that it is very simple to estimate and interpret.

In addition to this introduction the article contains three other sections. The second section describes the statistical framework in which the inflation indicator is defined. The third section presents the empirical results. The paper ends with a section of conclusions.

2. A very simple framework for the analysis of inflation in the EMU

The approach to the problem of inflation measurement is purely statistical and very simple. In a monetary region like the euro zone, let us assume that the variations in prices of the goods in each country j at a moment t, denominated by $\pi_{jt} = \nabla Ln(P_{jt}) = Ln(P_{jt}) - Ln(P_{jt-1})$, have two components, one common to all the countries in the monetary region and the other idiosyncratic. The common component, denoted by π_t^*, measures the generalized rise in all the prices of goods denominated in euros. The idiosyncratic component, denoted by π_{jt}^{**}, reflects the specific evolution of prices in each country, due for example to asymmetric shocks in the prices of one or several goods or to the idiosyncratic effects of a common shock. Thus:

$$\pi_{jt} = \pi_t^* + \pi_{jt}^{**} \quad \forall j = 1,\ldots,n \tag{1}$$

Both components are relevant from an economic policy perspective. π_t^*, as a measure of the generalized rise in all the prices of goods denominated in euros, can be a good inflation indicator for monetary policy purposes. π_{jt}^{**}, as it reflects the specific evolution of prices in each country, permits to analyse which part of the changes in prices in each country is independent of the ECB monetary policy.

π_t^* and π_{jt}^{**} are unobservable, but identification strategies can be proposed for both components. In this work we propose a very simple identification strategy: if π_t^* and π_{jt}^{**} are assumed to be orthogonal, π_t^* will also be orthogonal to $d_{jit} = \pi_{jt} - \pi_{it} = \pi_{jt}^{**} - \pi_{it}^{**} \quad j \neq i \quad j,i = 1,\ldots,n$. It is important to point out that $d_{jit} = \pi_{jt} - \pi_{it}$, which is observable, only contains information on idiosyncratic movements of prices in the different countries. So, for instance, an autonomous shock in the prices of a country, *j*, would not be reflected in π_t^* but they would in π_{jt}^{**}, which would cause a variation in $d_{jit} = \pi_{jt} - \pi_{it}$. This suggests that a measurement of π_t^* can be constructed, exploiting its independence of the observable components $d_{jit} = \pi_{jt} - \pi_{it}$.

A proposal for the identification of the common component

We propose an identification strategy for the common component π_t^* based on the information contained in π_{jt}:

$$\pi_t^* = \sum_{j=1}^{n} \alpha_j \pi_{jt} \quad \text{where} \quad \sum_{j=1}^{n} \alpha_j = 1 \quad j = 1, 2, \ldots, n \quad t = 1, 2, \ldots, T$$

Such that:

$$Cov\left[\nabla \pi_t^*\left(\nabla \pi_{jt} - \nabla \pi_{it}\right)\right] = 0 \quad \forall j \neq i \quad j,i = 1, 2, \ldots, n \quad t = 1, 2, \ldots, T \qquad (2)$$

The orthogonality conditions are imposed in the first differences given the non stationary character usually presented by the variation rates of prices in the different countries (see, for example, Ribba, 2003, Marques el al., 2002, Freeman, 1998, Mishkin, 1984, and Schwert,1987).

Note that equation (2) gives (n-1)x(n-1) orthogonality conditions, (n-1)x(n-2) of them being redundant. So that (2) can be expressed as:

$$Cov\left[\nabla \pi_t^*\left(\nabla \pi_{1t} - \nabla \pi_{it}\right)\right] = 0 \quad \forall i = 2, 3, \ldots, n \quad t = 1, 2, \ldots, T \qquad (3)$$

The variations in π_t^* are contemporarily independent of the variations in $(\pi_{1t} - \pi_{it})$ which are a function of the price differentials in the different countries. It is in this sense that π_t^* is independent of the price differentials between countries and constitutes the common component.

One advantage of this way of identifying π_t^* is that its estimation becomes very simple. The weights can be estimated by Least Squares from the following regression model:

$$\nabla \pi_{1t} = \alpha_2\left(\nabla \pi_{1t} - \nabla \pi_{2t}\right) + \alpha_3\left(\nabla \pi_{1t} - \nabla \pi_{3t}\right) + \ldots + \alpha_n\left(\nabla \pi_{1t} - \nabla \pi_{nt}\right) + u_t \qquad (4)$$

in which $\nabla \pi_t^* = u_t$ y $\nabla \pi_{jt}^{**} = \nabla \pi_{jt} - \nabla \pi_t^* \quad j = 1, 2, \ldots, n \quad t = 1, 2, \ldots, T$.

Once the common component has been identified it can be of interest to decompose the mean value of $\pi_{jt}\,(\overline{\pi}_j)$ into two components, the mean value of the common component and the mean value of the idiosyncratic component. From (1):

$$\overline{\pi}_j = \overline{\pi}^* + \overline{\pi}_j^{**} \quad \forall j = 1, \ldots, n \tag{5}$$

It is also possible to analyse which part of the variance of $\nabla \pi_{jt}$ comes from the common component and which part comes from the idiosyncratic one. Taking equations (1) and (2) we can break down the variance of $\nabla \pi_{jt}$ into two components, one related to the changes in $\nabla \pi_{jt}^{**} = \nabla \pi_{jt} - \nabla \pi_t^*$ and another to the changes in $\nabla \pi_t^*$. So that:

$$\mathrm{var}\left(\nabla \pi_{jt}\right) = \mathrm{var}\left(\nabla \pi_{jt} - \nabla \pi_t^*\right) + \mathrm{var}\left(\nabla \pi_t^*\right) \tag{6}$$

3. The empirical analysis

The data employed in the analysis come from the Eurostat database and cover the period between January 1999, the time at which the EMU was officially constituted, and August, 2004. Two possible price indicators were considered for each country: the Harmonized Index of Consumer Prices (HICP), and the component “All items excluding energy and unprocessed food” from the HICP (HICPEEUF), which is usually used as a core inflation indicator. To minimize the effect of seasonality we have used year-on-year variation rates, defined as: $\nabla_{12} Ln(HICP_{jt}) = Ln(HICP_{jt}) - Ln(HICP_{jt-12})$ and $\nabla_{12} Ln(HICPEEUF_{jt}) = Ln(HICPEEUF_{jt}) - Ln(HICPEEUF_{jt-12})$.

Figures 1 and 2 show the evolution of these rates. The different evolution of these inflation measurements suggests the existence of important idiosyncratic factors in the determination of prices in each country in the euro zone. Another element worth pointing out is the non stationary character of the series, which, as already indicated, has been taken into account in the formulation of the theoretical framework in the previous section. Unit roots tests are presented in the Appendix for the series $\nabla_{12} Ln(HICP_{jt})$ and $\nabla_{12} Ln(HICPEEUF_{jt})$ which show their I(1) character.

The HICP's of the EMU member countries are aggregated to set up an inflation indicator for the whole of the euro zone, the MUICP. In this indicator each country has a weight obtained from the share of each country's household final monetary consumption in the relevant total. The MUICP plays a key role in the design of the monetary policy of the euro area by the ECB, which has defined its objective of price stability as an annual increase in the MUICP of below 2% to be maintained over the medium term. Similarly to the MUICP, another aggregate inflation indicator for the euro area is obtained from the HICPEEUF of each country. The HICPEEUF of the euro zone is frequently used as an indicator of the core inflation in that monetary area.

Given the decisive role they play in the monitoring and control of EMU prices, it would seem to be relevant to analyse if the MUICP and the HICPEEUF of the euro zone inflations could constitute measures of the common component described in the previous section, which reflects the generalized rise in all the prices of goods denominated in euros. It is easy to verify that they could not. Table 1 presents, as an illustration, the correlation coefficients between the variations in $\nabla_{12} Ln(MUICP)$ and the variations in some of the differentials between countries in $\nabla_{12} Ln\left(HICP_{jt}\right)$. It also presents the correlation coefficients between the variations in $\nabla_{12} Ln(HICPEEUF)$ of the euro area and the variations in some of the differentials between countries in $\nabla_{12} Ln\left(HICPEEUF_{jt}\right)$. It can be seen that many of the correlations exceed 0.25 in absolute value, which suggests that neither the MUICP nor the HICPEEUF of the euro zone are independent of the price differentials between countries, so that any idiosyncratic shock in the prices of any country affects those indicators.

Table 2 shows the results of the estimation of equation (4), from which the weights of each country in the common component are obtained. The equation has been estimated both with HICP and HICPEEUF data. For a large number of countries the weights were not statistically significant at usual significance levels, neither individually nor jointly[1], so that restricted estimations of equation (4) are also presented. Also, as data starting from 1999 was being used, structural change tests were carried out in the weights in January 2001, when Greece was incorporated into the EMU. The results show that, either with the HICP data or with those of the HICPEEUF, the hypothesis of the absence of a structural change cannot be rejected[2].

[1] With the HICP data a Wald test was carried out of the hypothesis of joint significance of the weights of Belgium, Greece, Spain, France, Ireland, Luxembourg, Austria and Finland obtaining a p-value of 0.577. For the HICPEEUF data a test was made for the weights of Greece, Spain, Luxembourg, Austria and Portugal obtaining a p-value of 0.165.

[2] With the HICP data the p-value obtained was 0.621 and with the HICPEEUF data it was 0.587.

Figure 3 shows the evolution of $\nabla_{12} Ln(MUICP)$ and of the estimated common component of the HICP's, obtained both from the restricted and from the unrestricted estimations of equation (4). Likewise, Figure 4 presents the evolution of the $\nabla_{12} Ln(HICPEEUF)$ of the euro zone together with its corresponding common components. In both cases it can be observed that there are no great differences between the common component calculated from the unrestricted and restricted models.

As can be seen, in both cases the common components are almost always above $\nabla_{12} Ln(MUICP)$ and $\nabla_{12} Ln(HICPEEUF)$ of the euro zone, which suggests that these measurements could be underestimating the inflation of the euro area. To be specific, the average of $\nabla_{12} Ln(MUICP)$ for the period considered is 20% lower than that of the corresponding common components[3] and that of the $\nabla_{12} Ln(HICPEEUF)$ of the euro zone is 15% lower[4].

It is also useful to calculate for each country, from equation (5), the contribution of its corresponding idiosyncratic component to the average of $\nabla_{12} Ln(HICP)$ and of $\nabla_{12} Ln(HICPEEUF)$, shown in Table 3. It should be highlighted the importance of the idiosyncratic components in usual inflation measures. Especially notable is the case of Germany, with a negative contribution to the average of the idiosyncratic component, and that of Ireland with a positive contribution.

[3] The average of $\nabla_{12} Ln(MUICP)$ is 0.020 and for both common components 0.025.

[4] The average of $\nabla_{12} Ln(HICPEEUF)$ of the euro-zone is 0.017 compared to 0.020 for both common components.

It is also of interest to use the equation (6) to break down the variances of the variations in $\nabla_{12} Ln(HICP)$ and in $\nabla_{12} Ln(HICPEEUF)$ for each country in that part related to the common component and that related to the idiosyncratic component. The results are shown in Table 4[5]. It can again be seen that the idiosyncratic components have a great weight in the variance of the inflation measurements based on the HICP or on the HICPEEUF, exceeding 55% for all countries. For the euro area, the variations in the common component are only responsible for 42-43% of the variations in inflation measured with the MUICP or with the HICPEEUF, which is evidence on the limitations of these variables as measurements of the common component.

4. Conclusions

The aim of this work has been to propose a simple inflation indicator for the euro zone. An inflation indicator was set up with changes contemporarily orthogonal to the variations in the inflation differentials between countries. In this sense, the inflation indicator constructed is not affected by the effects of asymmetric shocks in prices in the different countries. Its objective is to reflect the generalized rise in all the prices of goods denominated in euros.

The variations in the prices of the different countries can be broken down into two components: the common component, which is the inflation indicator proposed, and the idiosyncratic component. With data from the 12 EMU countries, both components were estimated and compared with two other current euro area inflation measurements (MUICP and HICPEEUF). It was concluded that the MUICP, which is the indicator that

[5] Note that the estimated variances for the variations in the common component are the same in the

the ECB takes as a reference for its monetary policy, could be understating the true rate of inflation in the euro zone. To be specific, for the period between 1999 and 2004, this undervaluation could be around 20%. The same happened with the HICPEEUF.

Another relevant conclusion is that the idiosyncratic components have a great weight in the usual inflation measurements used in each of the different countries in the euro zone, both in terms of the average and in terms of the variance. This suggests that, in spite of the unified monetary policy, regional peculiarities continue to be fundamental in the evolution of prices in the different EMU countries.

unrestricted and restricted equations.

Table 1

Correlation coefficients between the variations in $\nabla_{12} Ln(MUICP)$ and in $\nabla_{12} Ln(HICPEEUF)$ of the euro area and the variations in some of the differentials between countries in $\nabla_{12} Ln(HICP_j)$ and in $\nabla_{12} Ln(HICPEEUF_j)$

	Differential with respect to Germany		Differential with respect to Portugal	
	MUICP	HICPEEUF of the euro area	MUICP	HICPEEUF of the euro area
Germany	--	--	-0.60	-0.45
Portugal	0.60	0.45	--	--
The Netherlands	0.49	0.53	-0.12	0.14
Italy	0.40	0.49	-0.28	-0.35
Ireland	0.26	0.49	-0.33	0.12
Austria	0.26	0.38	-0.41	-0.04
Greece	0.25	0.37	-0.36	-0.07
Spain	0.13	0.09	-0.53	-0.38
Finland	0.17	0.51	-0.47	0.07
France	0.05	0.51	-0.61	-0.04
Belgium	-0.01	0.15	-0.41	-0.15
Luxembourg	-0.07	0.38	-0.45	0.10

Note: MUICP: Monetary Union Index of Consumer Prices; HICPEEUF: All items excluding energy and unprocessed food from the Harmonized Index of Consumer Prices.

Table 2
Estimated weights

	Based on HICP		Based on HICPEEUF	
	Unrestricted	Restricted	Unrestricted	Restricted
Germany	0.241(*)	0.186(*)	0.177(*)	0.209(*)
	(0.066)	(0.049)	(0.047)	(0.048)
Portugal	0.225(*)	0.214(*)	0.042	--
	(0.080)	(0.073)	(0.048)	
The Netherlands	0.190(*)	0.196(*)	0.089(*)	0.103(*)
	(0.055)	(0.044)	(0.042)	(0.032)
Italy	0.454(*)	0.404(*)	0.108(*)	0.150(*)
	(0.085)	(0.069)	(0.056)	(0.058)
Ireland	0.089	--	0.074(*)	0.096(*)
	(0.077)		(0.051)	(0.049)
Austria	-0.063	--	0.035	--
	(0.080)		(0.057)	
Greece	0.043	--	0.022	--
	(0.052)		(0.035)	
Spain	-0.124	--	0.059	--
	(0.102)		(0.055)	
Finland	0.025	--	0.115(*)	0.150(*)
	(0.058)		(0.081)	(0.083)
France	-0.097	--	0.220(*)	0.240(*)
	(0.074)		(0.069)	(0.063)
Belgium	0.027	--	0.046(*)	0.052(*)
	(0.031)		(0.021)	(0.018)
Luxembourg	-0.010	--	0.013	--
	(0.021)		(0.012)	
Standard Error $\nabla \pi_t^*$	0.0014	0.0014	0.00095	0.00095

Note: In parentheses robust standard errors as proposed by Newey-West. HICP: Harmonized Index of Consumer Prices. HICPEEUF: All items excluding energy and unprocessed food from the HICP. (*) Significant at the 5% level.

Table 3

Descomposition of the mean

	Based on HICP		Based on HICPEEUF	
	Mean $\nabla_{12} Ln(HICP)$	Mean π^{**}	Mean $\nabla_{12} Ln(HICPEEUF)$	Mean π^{**}
Germany	0.013	-0.012 (-92%)	0.009	-0.11 (-122.2%)
Portugal	0.031	0.006 (19.4%)	0.032	0.012 (37,5%)
The Netherlands	0.029	0.004 (13.8%)	0.020	0.000 (0%)
Italy	0.024	-0.001 (-4.1%)	0.022	0.002 (9.1%)
Ireland	0.038	0.013 (34.2%)	0.038	0.018 (47.4%)
Austria	0.016	-0.009 (-56.3%)	0.015	-0.005 (-33.3%)
Greece	0.031	0.006 (19.4%)	0.030	0.010 (33.3%)
Spain	0.030	0.005 (16.6%)	0.028	0.008 (28.6%)
Finland	0.018	-0.007 (-38.9%)	0.017	-0.003 (-17,6%)
France	0.017	-0.008 (-47.1%)	0.016	-0.004 (-25%)
Belgium	0.018	-0.007 (-38.9%)	0.016	-0.004 (-25%)
Luxembourg	0.024	-0.001 (-4.2%)	0.023	0.003 (13%)

Note: HICP: Harmonized Index of Consumer Prices. HICPEEUF: All items excluding energy and unprocessed food from the HICP. π^{**}: Idiosyncratic component. Numbers in parentheses are $\left(\frac{\pi^{**}}{\nabla_{12} Ln(HICP)} - 1\right) \times 100$ and $\left(\frac{\pi^{**}}{\nabla_{12} Ln(HICPEEUF)} - 1\right) \times 100$ respectively.

Table 4
Descomposition of variance
(%)

	Variations in the $\nabla_{12} Ln(HICP)$		Variations in the $\nabla_{12} Ln(HICPEEUF)$	
	Common component	Idiosyncratic component	Common component	Idiosyncratic component
Germany	19.82	80.18	14.60	85.40
Portugal	20.15	79.85	12.37	87.63
Netherlands	17.78	82.22	10.39	89.61
Italy	33.52	66.48	13.03	86.97
Ireland	14.37	85.63	8.64	91.36
Austria	23.41	76.59	13.17	86.83
Greece	12.47	87.53	7.77	92.23
Spain	18.64	81.36	10.90	89.10
Finland	18.75	81.25	21.38	78.62
France	23.96	76.04	29.18	70.82
Belgium	7.08	92.92	4.16	95.84
Luxembourg	4.31	95.69	3.33	96.67
Euro-zone	42.17	57.83	43.28	56.72

Note: HICP: Harmonized Index of Consumer Prices. HICPEEUF: All items excluding energy and unprocessed food from the HICP

Appendix

Table A.1

Unit Root Test

$$\pi_{jt} = \nabla_{12} Ln\left(HICP_{jt}\right)$$

	Lag=3		Lag=12	
	ADF	PP	ADF	PP
Germany	-2.23	-2.52	-1.98	-2.44
Portugal	-1.63	-1.52	-1.22	-1.71
The Netherlands	-1.28	-1.04	-1.77	-1.44
Italy	-1.90	-2.40	-1.94	-2.33
Ireland	-2.24	-1.72	-2.09	-1.85
Austria	-1.89	-1.92	-1.91	-1.90
Greece	-2.14	-2.25	-2.50	-2.51
Spain	-2.69	-2.98(*)	-2.63	-2.85
Finland	-1.14	-1.07	-1.87	-1.30
France	-2.07	-2.23	-1.58	-1.99
Belgium	-2.53	-2.89	-2.53	-3.13(*)
Luxembourg	-2.10	-2.56	-2.19	-2.63
MUICP	-2.29	-2.52	-2.22	-2.41

Note: Intercept is included. ADF: Augmented Dickey Fuller Unit Root Test; PP: Phillips Perron Unit Root Test . (*) Significant at the 5% level. MUICP: Monetary Union Index of Consumer Prices. HICP: Harmonized Index of Consumer Prices.

Tabla A.2.

Unit Root Test

$$\pi_{jt} = \nabla_{12} Ln\left(HICPEEUF_{jt}\right)$$

	Lag=3		Lag=12	
	ADF	PP	ADF	PP
Germany	-1.29	-1.21	-1.38	-1.61
Portugal	-1.20	-1.25	-1.15	-1.15
The Netherlands	-1.54	-1.03	-1.66	-1.48
Italy	-1.43	-2.14	-1.50	-2.45
Ireland	-1.82	-1.31	-1.82	-1.31
Austria	-1.72	-1.64	-1.42	-1.78
Greece	-2.23	-2.14	-3.15(*)	-2.54
Spain	-1.59	-2.22	-1.81	-2.17
Finland	-0.39	-0.16	-1.24	-0.51
France	-0.25	-0.40	-0.77	-0.49
Belgium	-1.56	-3.45(*)	-1.52	-4.27(*)
Luxembourg	-1.20	-1.25	-1.73	-2.78
HICPEEUF Eurozone	-0.76	-0.85	-1.13	-1.16

Note: Intercept is included. ADF: Augmented Dickey Fuller Unit Root Test; PP: Phillips Perron Unit Root Test . (*) Significant at the 5% level. HICPEEUF: All items excluding energy and unprocessed food from the Harmonized Index of Consumer Prices.

References

Bagliano, F.C., R. Golinelli and C. Morana, 2002, “Core Inflation in the Euro Area”, Applied Economics Letters, 9(6), 353-357.

Cristadoro, R., M. Forni, L. Reichlin and G. Veronese, 2001, “A Core Inflation Index for the Euro Area”, CEPR Discussion Paper, nº 3097.

Freeman, D.G., 1998, “Do core inflation measures help forecast inflation?”, Economics Letters 58 (2), 143-147.

Marques, C.R., P.D. Neves and A.G. da Silva, 2002, “Why should central banks avoid the use of underlying inflation indicator?”, Economics Letters 75 (1), 17-23.

Mishkin, F.S, 1984, “Is the fisher effect for real?. A reexamination of the relationship between inflation and interest rates”, Journal of Monetary Economics 30, 195-215.

Ribba, A., 2003, “Permanent-transitory decompositions and traditional measures of core inflation”, Economics Letters 81 (1), 109-116.

Schwert, G.W., 1987, “Effects of model specification on test for unit roots in macroeconomic data”, Journal of Monetary Eonomics 20, 73-103.

Vega, J.L. and M.A. Wynne, 2003, “A first assessment of some measures of core inflation for the euro area”, German Economic Review, 4(3), 269-306

Figure 1

$$\pi_{jt} = \nabla_{12} Ln\left(HICP_{jt}\right)$$

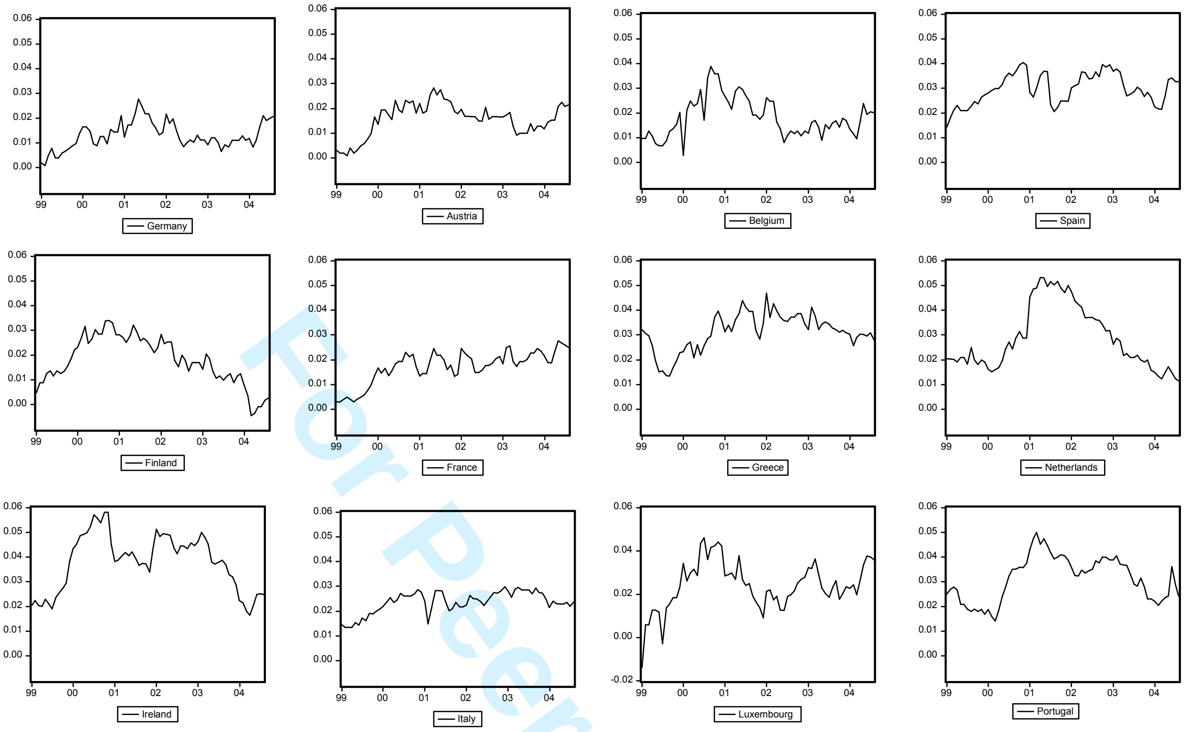


Figure 2

$$\pi_{jt} = \nabla_{12} Ln\left(HICPEEUF_{jt}\right)$$

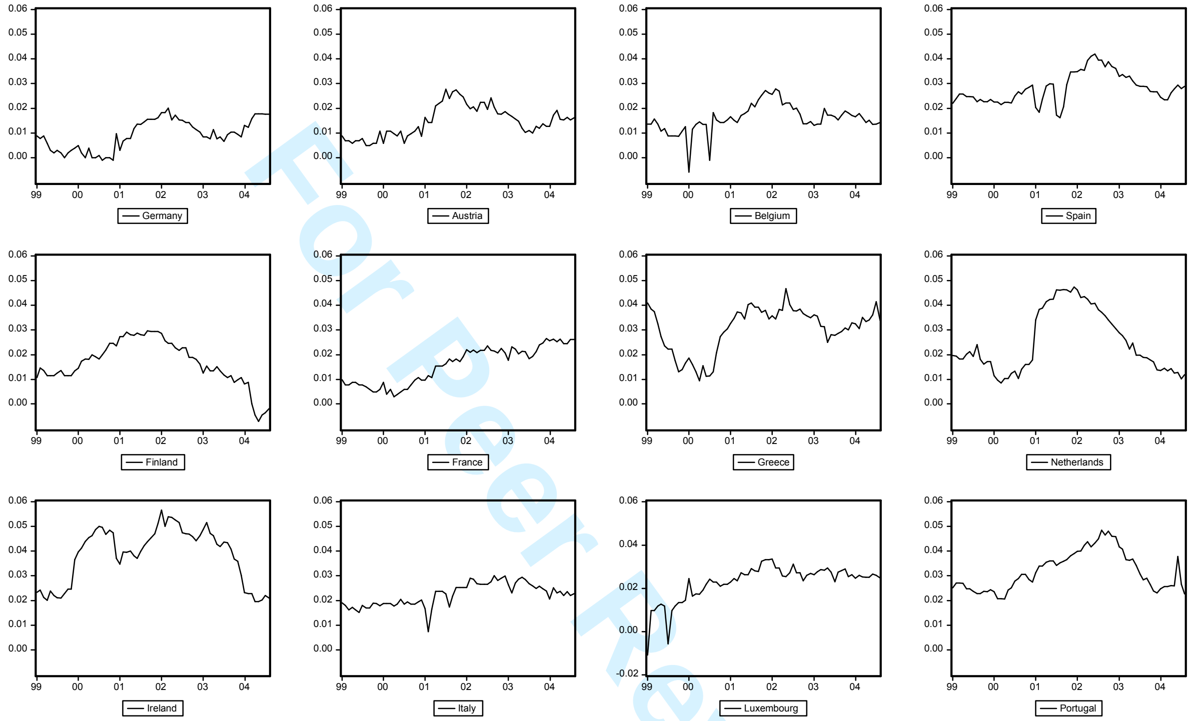


Figure 3

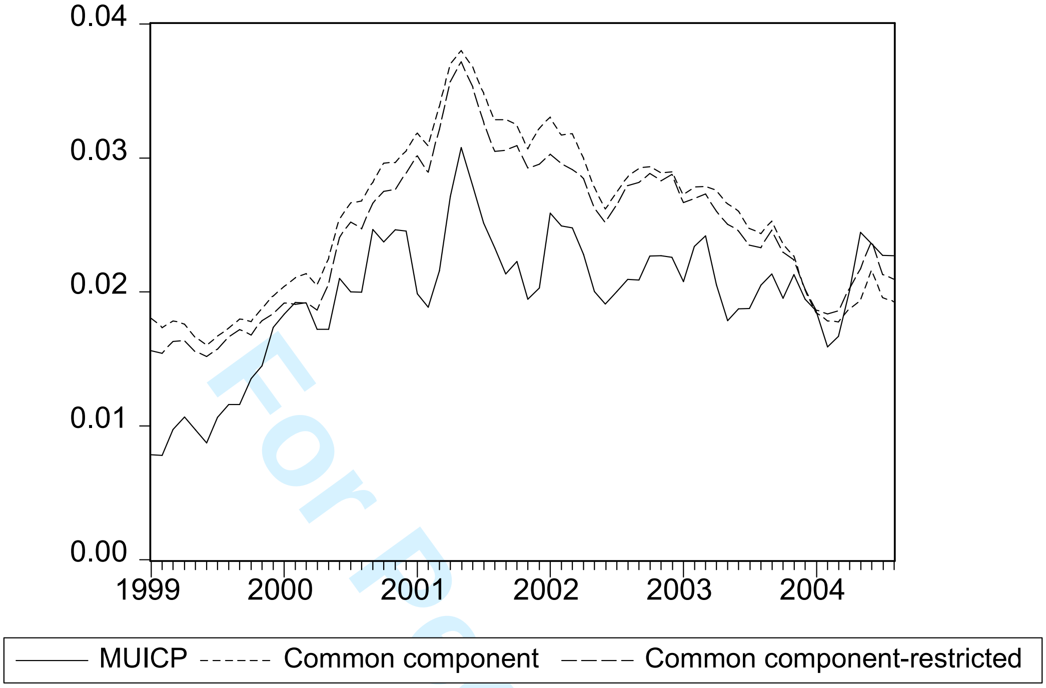
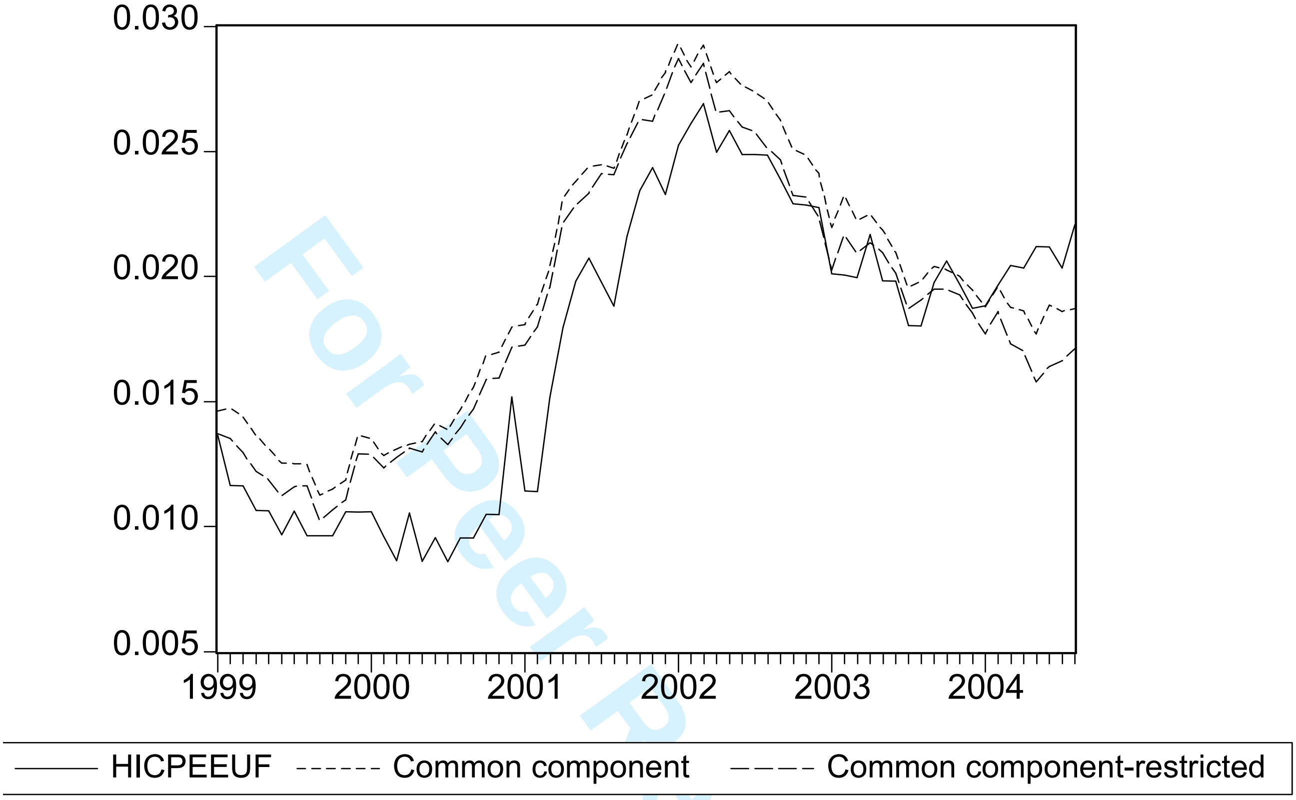

0.04
0.03
0.02
0.01
0.00
1999
2000
2001
2002
2003
2004
MUICP
Common component
Common component-restricted

Figure 4


0.030
0.025
0.020
0.015
0.010
0.005
1999
2000
2001
2002
2003
2004
HICPEEUF
Common component
Common component-restricted

A simple inflation indicator for the euro zone

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Abstract

This paper proposes and estimates an inflation indicator for the European Monetary Union (EMU). This indicator is set up so that it is contemporarily not affected by the changes in price differentials among EMU countries. The results show that the Monetary Union Index of Consumer Prices (MUICP), which is the inflation measure that the European Central Bank (ECB) takes as a reference for monetary policy purposes, could be understating the value of the inflation in the euro zone. It is also concluded that regional peculiarities are fundamental in the evolution of prices in the different EMU countries.

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1. Introduction

Since January 1999 a broad spectrum of European countries have a common currency: the euro. The European Monetary Union (EMU) is constituted by 12 countries (Belgium, Germany, Greece, Spain, France, Ireland, Italy, the Netherlands, Austria, Portugal, Finland and Luxembourg) each with its economic peculiarities but all of them with a common monetary policy conducted by the European Central Bank (ECB). The Treaty on European Union assigns the Eurosystem the primary objective of maintaining price stability in the euro area. The ECB has quantified this objective in terms of the Monetary Union Index of Consumer Prices (MUICP), which on a medium term should have an annual increase of below 2%.

In this context, with a common monetary policy focussing on price stability and with a very specific inflation objective, there has recently been a great interest in establishing good indicators of inflation in the euro area as alternatives to the MUICP. Efforts have mainly been devoted to the construction of reliable inflation indicators, and in particular to the setting up of what is usually known as core inflation indexes whose evolution is not distorted by transitory changes in the relative prices of goods that are unrelated to the medium-run objectives of central bankers (see, for example, Quah and Vahey, 1995, Bjornland, 2001, Bagliano et al., 2002, Bagliano and Morana, 2003, Vega and Wynne, 2003, Marques et al. 2003 and Cristadoro et al., 2005).

The aim of this work is to propose a simple indicator of inflation in the euro zone from a different perspective. The idea is that a good inflation indicator of a monetary region should not be affected by asymmetric shocks in prices in different union members nor by the idyosincratic effects of a common shock. A good euro zone inflation indicator should not be affected by changes in price differentials between countries. Taking this as a point of departure, a decomposition of the price variations in each country into two components is suggested, one common to all the countries and the other idiosyncratic. The common component is the inflation indicator proposed in this work. Its advantage is that it is very simple to estimate and interpret.

In addition to this introduction the article contains three other sections. The second section describes the statistical framework in which the inflation indicator is defined. The third section presents the empirical results. The paper ends with a section of conclusions.

2. A very simple framework for the analysis of inflation in the EMU

The approach to the problem of inflation measurement is purely statistical and very simple. In a monetary region like the euro zone, let us assume that the variations in prices of the goods in each country *j* at a moment *t*, denominated by $\pi_{jt} = \nabla Ln\left(P_{jt}\right) = Ln\left(P_{jt}\right) - Ln\left(P_{j(t-1)}\right)$, have two components, one common to all the countries in the monetary region and the other idiosyncratic. The common component, denoted by π_t^*, measures the generalized rise in all the prices of goods denominated in euros. The idiosyncratic component, denoted by π_{jt}^{**}, reflects the specific evolution of prices in each country, due for example to asymmetric shocks in the prices of one or several goods or to the idiosyncratic effects of a common shock. Thus:

$$\pi_{jt} = \pi_t^* + \pi_{jt}^{**} \quad \forall j = 1,\ldots,n \tag{1}$$

Both components are relevant from an economic policy perspective. π_t^*, as a measure of the generalized rise in all the prices of goods denominated in euros, can be a good inflation indicator for monetary policy purposes. π_{jt}^{**}, as it reflects the specific evolution of prices in each country, permits to analyse which part of the changes in prices in each country is independent of the ECB monetary policy.

π_t^* and π_{jt}^{**} are unobservable, but identification strategies can be proposed for both components. In this work we propose a very simple identification strategy: if π_t^* and π_{jt}^{**} are assumed to be orthogonal, π_t^* will also be orthogonal to $d_{jit} = \pi_{jt} - \pi_{it} = \pi_{jt}^{**} - \pi_{it}^{**} \quad j \neq i \quad j,i = 1,\ldots,n$. It is important to point out that $d_{jit} = \pi_{jt} - \pi_{it}$, which is observable, only contains information on idiosyncratic movements of prices in the different countries. So, for instance, an autonomous shock in the prices of a country, *j*, would not be reflected in π_t^* but they would in π_{jt}^{**}, which would cause a variation in $d_{jit} = \pi_{jt} - \pi_{it}$. This suggests that a measurement of π_t^* can be constructed, exploiting its independence of the observable components $d_{jit} = \pi_{jt} - \pi_{it}$.

A proposal for the identification of the common component

We propose an identification strategy for the common component π_t^* based on the information contained in π_{jt}:

$$\pi_t^* = \sum_{j=1}^{n} \alpha_j \pi_{jt} \text{ where } \sum_{j=1}^{n} \alpha_j = 1 \quad j = 1, 2, \ldots, n \quad t = 1, 2, \ldots, T$$

Such that:

$$Cov\left[\nabla \pi_t^* \left(\nabla \pi_{jt} - \nabla \pi_{it}\right)\right] = 0 \quad \forall j \neq i \quad j, i = 1, 2, \ldots, n \quad t = 1, 2, \ldots, T \qquad (2)$$

The orthogonality conditions are imposed in the first differences given the non stationary character usually presented by the variation rates of prices in the different countries (see, for example, Charemza el al. 2005, Ribba, 2003, Marques et al. 2003, Marques el al., 2002, Freeman, 1998, Mishkin, 1984, and Schwert,1987).

Note that equation (2) gives (n-1)x(n-1) orthogonality conditions, (n-1)x(n-2) of them being redundant. So that (2) can be expressed as:

$$Cov\left[\nabla \pi_t^* \left(\nabla \pi_{1t} - \nabla \pi_{it}\right)\right] = 0 \quad \forall i = 2, 3, \ldots, n \quad t = 1, 2, \ldots, T \qquad (3)$$

The variations in π_t^* are contemporarily uncorrelated with the variations in $(\pi_{1t} - \pi_{it})$ which are a function of the price differentials in the different countries. It is in this sense that π_t^* is independent of the price differentials between countries and constitutes the common component.

One advantage of this way of identifying π_t^* is that its estimation becomes very simple. The weights can be estimated by Least Squares from the following regression model:

$$\nabla \pi_{1t} = \alpha_2\left(\nabla \pi_{1t} - \nabla \pi_{2t}\right) + \alpha_3\left(\nabla \pi_{1t} - \nabla \pi_{3t}\right) + \ldots + \alpha_n\left(\nabla \pi_{1t} - \nabla \pi_{nt}\right) + u_t \qquad (4)$$

in which $\nabla \pi_t^* = u_t$ and $\nabla \pi_{jt}^{**} = \nabla \pi_{jt} - \nabla \pi_t^*$ $j = 1, 2, \ldots, n$ $t = 1, 2, \ldots, T$.

Once the common component has been identified it can be of interest to decompose the mean value of π_{jt} $(\overline{\pi}_j)$ into two components, the mean value of the common component and the mean value of the idiosyncratic component. From (1):

$$\overline{\pi}_j = \overline{\pi}^* + \overline{\pi}_j^{**} \quad \forall j = 1, \ldots, n \qquad (5)$$

It is also possible to analyse which part of the variance of $\nabla \pi_{jt}$ comes from the common component and which part comes from the idiosyncratic one. Taking equations (1) and (2) we can break down the variance of $\nabla \pi_{jt}$ into two components, one related to the changes in $\nabla \pi_{jt}^{**} = \nabla \pi_{jt} - \nabla \pi_t^*$ and another to the changes in $\nabla \pi_t^*$. So that:

$$\mathrm{var}\left(\nabla \pi_{jt}\right) = \mathrm{var}\left(\nabla \pi_{jt} - \nabla \pi_t^*\right) + \mathrm{var}\left(\nabla \pi_t^*\right) \qquad (6)$$

3. The empirical analysis

The data employed in the analysis come from the Eurostat database and cover the period between January 1999, the time at which the EMU was officially constituted, and August, 2004. Two possible price indicators were considered for each country: the Harmonized Index of Consumer Prices (HICP), and the component “All items excluding energy and unprocessed food" from the HICP (HICPEEUF), which is usually used as a core inflation indicator. To minimize the effect of seasonality we have used year-on-year variation rates, defined as: $\nabla_{12} Ln\left(HICP_{jt}\right) = Ln\left(HICP_{jt}\right) - Ln\left(HICP_{j(t-12)}\right)$

and $\nabla_{12} Ln\left(HICPEEUF_{jt}\right) = Ln\left(HICPEEUF_{jt}\right) - Ln\left(HICPEEUF_{j(t-12)}\right)$.

Figures 1 and 2 show the evolution of these rates. The different evolution of these inflation measurements suggests the existence of important idiosyncratic factors in the determination of prices in each country in the euro zone. Another element worth pointing out is the non stationary character of the series, which, as already indicated, has been taken into account in the formulation of the theoretical framework in the previous section. Unit roots tests are presented in the Appendix for the series $\nabla_{12} Ln\left(HICP_{jt}\right)$ and $\nabla_{12} Ln\left(HICPEEUF_{jt}\right)$ which show their I(1) character.

The HICP's of the EMU member countries are aggregated to set up an inflation indicator for the whole of the euro zone, the MUICP. In this indicator each country has a weight obtained from the share of each country's household final monetary consumption in the relevant total. The MUICP plays a key role in the design of the monetary policy of the euro area by the ECB, which has defined its objective of price stability as an annual increase in the MUICP of below 2% to be maintained over the medium term. Similarly to the MUICP, another aggregate inflation indicator for the euro area is obtained from the HICPEEUF of each country. The HICPEEUF of the euro zone is frequently used as an indicator of the core inflation in that monetary area.

Given the decisive role they play in the monitoring and control of EMU prices, it would seem to be relevant to analyse if the MUICP and the HICPEEUF of the euro zone inflations could constitute measures of the common component described in the previous section, which reflects the generalized rise in all the prices of goods denominated in euros. It is easy to verify that they could not. Table 1 presents, as an illustration, the correlation coefficients between the variations in $\nabla_{12} Ln(MUICP)$ and the variations in some of the differentials between countries in $\nabla_{12} Ln\left(HICP_{jt}\right)$. It also presents the correlation coefficients between the variations in $\nabla_{12} Ln(HICPEEUF)$ of the euro area and the variations in some of the differentials between countries in $\nabla_{12} Ln\left(HICPEEUF_{jt}\right)$. It can be seen that many of the correlations exceed 0.25 in absolute value and are statistically significant at the 5% level, which suggests that neither the MUICP nor the HICPEEUF of the euro zone are uncorrelated with the price differentials between countries, so that any idiosyncratic shock in the prices of any country affects those indicators.

Table 2 shows the results of the estimation of equation (4), from which the weights of each country in the common component are obtained. The equation has been estimated both with HICP and HICPEEUF data. For a large number of countries the weights were not statistically significant at usual significance levels, neither individually nor jointly[1], so that restricted estimations of equation (4) are also presented. Also, as data starting from 1999 was being used, structural change tests were carried out in the weights in January 2001, when Greece was incorporated into the EMU. The results show that,

[1] With the HICP data a Wald test was carried out of the hypothesis of joint significance of the weights of Belgium, Greece, Spain, France, Ireland, Luxembourg, Austria and Finland obtaining a p-value of 0.577. For the HICPEEUF data a test was made for the weights of Greece, Spain, Luxembourg, Austria and Portugal obtaining a p-value of 0.165.

either with the HICP data or with those of the HICPEEUF, the hypothesis of the absence of a structural change cannot be rejected[2].

Figure 3 shows the evolution of $\nabla_{12} Ln(MUICP)$ and of the estimated common component of the HICP's, obtained both from the restricted and from the unrestricted estimations of equation (4). Likewise, Figure 4 presents the evolution of the $\nabla_{12} Ln(HICPEEUF)$ of the euro zone together with its corresponding common components. In both cases it can be observed that there are no great differences between the common component calculated from the unrestricted and restricted models.

As can be seen, in both cases the common components are almost always above $\nabla_{12} Ln(MUICP)$ and $\nabla_{12} Ln(HICPEEUF)$ of the euro zone, which suggests that these measurements could be underestimating the inflation of the euro area. To be specific, the average of $\nabla_{12} Ln(MUICP)$ for the period considered is 20% lower than that of the corresponding common components[3] and that of the $\nabla_{12} Ln(HICPEEUF)$ of the euro zone is 15% lower[4].

It is also useful to calculate for each country, from equation (5), the contribution of its corresponding idiosyncratic component to the average of $\nabla_{12} Ln(HICP)$ and of $\nabla_{12} Ln(HICPEEUF)$, shown in Table 3. It should be highlighted the importance of the idiosyncratic components in usual inflation measures. Especially notable is the case of

[2] With the HICP data the p-value obtained was 0.621 and with the HICPEEUF data it was 0.587.

[3] The average of $\nabla_{12} Ln(MUICP)$ is 0.020 and for both common components 0.025.

[4] The average of $\nabla_{12} Ln(HICPEEUF)$ of the euro-zone is 0.017 compared to 0.020 for both common components.

Germany, with a negative contribution to the average of the idiosyncratic component, and that of Ireland with a positive contribution.

It is also of interest to use the equation (6) to break down the variances of the variations in $\nabla_{12} Ln(HICP)$ and in $\nabla_{12} Ln(HICPEEUF)$ for each country in that part related to the common component and that related to the idiosyncratic component. The results are shown in Table 4[5]. It can again be seen that the idiosyncratic components have a great weight in the variance of the inflation measurements based on the HICP or on the HICPEEUF, exceeding 55% for all countries. For the euro area, the variations in the common component are only responsible for 42-43% of the variations in inflation measured with the MUICP or with the HICPEEUF, which is evidence on the limitations of these variables as measurements of the common component.

4. Conclusions

The aim of this work has been to propose a simple inflation indicator for the euro zone. An inflation indicator was set up with changes contemporarily orthogonal to the variations in the inflation differentials between countries. In this sense, the inflation indicator constructed is not affected by the effects of asymmetric shocks in prices in the different countries. Its objective is to reflect the generalized rise in all the prices of goods denominated in euros.

The variations in the prices of the different countries can be broken down into two components: the common component, which is the inflation indicator proposed, and the idiosyncratic component. With data from the 12 EMU countries, both components were estimated and compared with two other current euro area inflation measurements (MUICP and HICPEEUF). It was concluded that the MUICP, which is the indicator that the ECB takes as a reference for its monetary policy, could be understating the true rate of inflation in the euro zone. To be specific, for the period between 1999 and 2004, this undervaluation could be around 20%. The same happened with the HICPEEUF.

Another relevant conclusion is that the idiosyncratic components have a great weight in the usual inflation measurements used in each of the different countries in the euro zone, both in terms of the average and in terms of the variance. This suggests that, in spite of the unified monetary policy, regional peculiarities continue to be fundamental in the evolution of prices in the different EMU countries.

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[5] Note that the estimated variances for the variations in the common component are the same in the unrestricted and restricted equations.

Table 1

Correlation coefficients between the variations in $\nabla_{12} Ln(MUICP)$ and in $\nabla_{12} Ln(HICPEEUF)$ of the euro area and the variations in some of the differentials between countries in $\nabla_{12} Ln\left(HICP_j\right)$ and in $\nabla_{12} Ln\left(HICPEEUF_j\right)$

	Differential with respect to Germany		Differential with respect to Portugal	
	MUICP	HICPEEUF of the euro area	MUICP	HICPEEUF of the euro area
Germany	--	--	-0.60*	-0.45*
Portugal	0.60*	0.45*	--	--
The Netherlands	0.49*	0.53*	-0.12	0.14
Italy	0.40*	0.49*	-0.2*8	-0.35
Ireland	0.26*	0.49*	-0.33*	0.12
Austria	0.26*	0.38*	-0.41*	-0.04
Greece	0.25*	0.37*	-0.36*	-0.07
Spain	0.13	0.09	-0.53*	-0.38*
Finland	0.17	0.51*	-0.47*	0.07
France	0.05	0.51*	-0.61*	-0.04
Belgium	-0.01	0.15	-0.41*	-0.15
Luxembourg	-0.07	0.38*	-0.45*	0.10

Note: MUICP: Monetary Union Index of Consumer Prices; HICPEEUF: All items excluding energy and unprocessed food from the Harmonized Index of Consumer Prices. (*) Significant at the 5% level.

Table 2
Estimated weights

	Based on HICP		Based on HICPEEUF	
	Unrestricted	Restricted	Unrestricted	Restricted
Germany	0.241(*)	0.186(*)	0.177(*)	0.209(*)
	(0.066)	(0.049)	(0.047)	(0.048)
Portugal	0.225(*)	0.214(*)	0.042	--
	(0.080)	(0.073)	(0.048)	
The Netherlands	0.190(*)	0.196(*)	0.089(*)	0.103(*)
	(0.055)	(0.044)	(0.042)	(0.032)
Italy	0.454(*)	0.404(*)	0.108(*)	0.150(*)
	(0.085)	(0.069)	(0.056)	(0.058)
Ireland	0.089	--	0.074(*)	0.096(*)
	(0.077)		(0.051)	(0.049)
Austria	-0.063	--	0.035	--
	(0.080)		(0.057)	
Greece	0.043	--	0.022	--
	(0.052)		(0.035)	
Spain	-0.124	--	0.059	--
	(0.102)		(0.055)	
Finland	0.025	--	0.115(*)	0.150(*)
	(0.058)		(0.081)	(0.083)
France	-0.097	--	0.220(*)	0.240(*)
	(0.074)		(0.069)	(0.063)
Belgium	0.027	--	0.046(*)	0.052(*)
	(0.031)		(0.021)	(0.018)
Luxembourg	-0.010	--	0.013	--
	(0.021)		(0.012)	
Standard Error $\nabla \pi_t^*$	0.0014	0.0014	0.00095	0.00095

Note: In parentheses robust standard errors as proposed by Newey-West. HICP: Harmonized Index of Consumer Prices. HICPEEUF: All items excluding energy and unprocessed food from the HICP. (*) Significant at the 5% level.

Table 3

Descomposition of the mean

	Based on HICP		Based on HICPEEUF	
	Mean $\nabla_{12} Ln(HICP)$	Mean π^{**}	Mean $\nabla_{12} Ln(HICPEEUF)$	Mean π^{**}
Germany	0.013	-0.012 (-92%)	0.009	-0.11 (-122.2%)
Portugal	0.031	0.006 (19.4%)	0.032	0.012 (37,5%)
The Netherlands	0.029	0.004 (13.8%)	0.020	0.000 (0%)
Italy	0.024	-0.001 (-4.1%)	0.022	0.002 (9.1%)
Ireland	0.038	0.013 (34.2%)	0.038	0.018 (47.4%)
Austria	0.016	-0.009 (-56.3%)	0.015	-0.005 (-33.3%)
Greece	0.031	0.006 (19.4%)	0.030	0.010 (33.3%)
Spain	0.030	0.005 (16.6%)	0.028	0.008 (28.6%)
Finland	0.018	-0.007 (-38.9%)	0.017	-0.003 (-17,6%)
France	0.017	-0.008 (-47.1%)	0.016	-0.004 (-25%)
Belgium	0.018	-0.007 (-38.9%)	0.016	-0.004 (-25%)
Luxembourg	0.024	-0.001 (-4.2%)	0.023	0.003 (13%)

Note: HICP: Harmonized Index of Consumer Prices. HICPEEUF: All items excluding energy and unprocessed food from the HICP. π^{**}: Idiosyncratic component. Numbers in parentheses are $\left(\frac{\pi^{**}}{\nabla_{12} Ln(HICP)} - 1\right) \times 100$ and $\left(\frac{\pi^{**}}{\nabla_{12} Ln(HICPEEUF)} - 1\right) \times 100$ respectively.

Table 4
Descomposition of variance
(%)

	Variations in the $\nabla_{12} Ln(HICP)$		Variations in the $\nabla_{12} Ln(HICPEEUF)$	
	Common component	Idiosyncratic component	Common component	Idiosyncratic component
Germany	19.82	80.18	14.60	85.40
Portugal	20.15	79.85	12.37	87.63
Netherlands	17.78	82.22	10.39	89.61
Italy	33.52	66.48	13.03	86.97
Ireland	14.37	85.63	8.64	91.36
Austria	23.41	76.59	13.17	86.83
Greece	12.47	87.53	7.77	92.23
Spain	18.64	81.36	10.90	89.10
Finland	18.75	81.25	21.38	78.62
France	23.96	76.04	29.18	70.82
Belgium	7.08	92.92	4.16	95.84
Luxembourg	4.31	95.69	3.33	96.67
Euro-zone	42.17	57.83	43.28	56.72

Note: HICP: Harmonized Index of Consumer Prices. HICPEEUF: All items excluding energy and unprocessed food from the HICP

Appendix

Table A.1

Unit Root Test

$$\pi_{jt} = \nabla_{12} Ln\left(HICP_{jt}\right)$$

	Lag=3				Lag=12			
	ADF		PP		ADF		PP	
	(I)	(II)	(I)	(II)	(I)	(II)	(I)	(II)
Germany	-2.23	-0.01	-2.52	-0.14	-1.98	0.18	-2.44	-0.01
Portugal	-1.63	-0.57	-1.52	-0.53	-1.22	-0.17	-1.71	-0.56
The Netherlands	-1.28	-0.66	-1.04	-0.50	-1.77	-0.65	-1.44	-0.63
Italy	-1.90	0.14	-2.40	0.04	-1.94	0.29	-2.33	0.15
Ireland	-2.24	-0.46	-1.72	-0.40	-2.09	0.01	-1.85	-0.43
Austria	-1.89	-0.02	-1.92	0.04	-1.91	0.06	-1.90	-0.01
Greece	-2.14	-0.72	-2.25	-0.73	-2.50	-0.60	-2.51	-0.73
Spain	-2.69	0.30	-2.98(*)	0.07	-2.63	0.43	-2.85	0.19
Finland	-1.14	-0.07	-1.07	-0.66	-1.87	-0.77	-1.30	-0.70
France	-2.07	0.21	-2.23	0.13	-1.58	0.64	-1.99	0.52
Belgium	-2.53	-0.40	-2.89	-0.59	-2.53	-0.32	-3.13(*)	-0.53
Luxembourg	-2.10	-0.09	-2.56	-0.29	-2.19	0.10	-2.63	-0.35
MUICP	-2.29	0.40	-2.52	0.22	-2.22	0.48	-2.41	0.44

Note: (I) In the model $\nabla\pi_{jt} = \alpha + \nu\pi_{j(t-1)} + u_{jt}$ the hypothesis $\nu = 0$ is tested.

(II)) In the model $\nabla\pi_{jt} = \nu\pi_{j(t-1)} + u_{jt}$ the hypothesis $\nu = 0$ is tested.

ADF: Augmented Dickey Fuller Unit Root Test

PP: Phillips Perron Unit Root Test

MUICP: Monetary Union Index of Consumer Prices. HICP: Harmonized Index of Consumer Prices.

(*) Significant at the 5% level.

Tabla A.2.

Unit Root Test

$$\pi_{jt} = \nabla_{12} Ln\left(HICPEEUF_{jt}\right)$$

	Lag=3				Lag=12			
	ADF		PP		ADF		PP	
	(I)	(II)	(I)	(II)	(I)	(II)	(I)	(II)
Germany	-1.29	-0.31	-1.21	-0.21	-1.38	-0.22	-1.61	-0.44
Portugal	-1.20	-0.37	-1.25	-0.40	-1.15	-0.41	-1.15	-0.43
The Netherlands	-1.54	-0.73	-1.03	-0.60	-1.66	-0.53	-1.48	-0.75
Italy	-1.43	-0.14	-2.14	-0.23	-1.50	-0.09	-2.45	-0.16
Ireland	-1.82	-0.47	-1.31	-0.43	-1.82	0.17	-1.31	-0.47
Austria	-1.72	-0.35	-1.64	-0.27	-1.42	-0.15	-1.78	-0.30
Greece	-2.23	-0.95	-2.14	-0.99	-3.15(*)	-0.83	-2.54	-1.01
Spain	-1.59	0.14	-2.22	-0.12	-1.81	0.29	-2.17	0.01
Finland	-0.39	-0.66	-0.16	-0.66	-1.24	-0.89	-0.51	-0.74
France	-0.25	1.26	-0.40	1.23	-0.77	0.41	-0.49	1.14
Belgium	-1.56	-0.47	-3.45(*)	-0.70	-1.52	-0.26	-4.27(*)	-0.75
Luxembourg	-1.20	0.20	-1.25	-0.14	-1.73	0.21	-2.78	-0.07
HICPEEUF Eurozone	-0.76	0.51	-0.85	0.48	-1.13	0.50	-1.16	0.20

Note: (I) In the model $\nabla\pi_{jt} = \alpha + \nu\pi_{j(t-1)} + u_{jt}$ the hypothesis $\nu = 0$ is tested.

(II)) In the model $\nabla\pi_{jt} = \nu\pi_{j(t-1)} + u_{jt}$ the hypothesis $\nu = 0$ is tested.

ADF: Augmented Dickey Fuller Unit Root Test

PP: Phillips Perron Unit Root Test

HICPEEUF: All items excluding energy and unprocessed food from the Harmonized Index of Consumer Prices.

(*) Significant at the 5% level.

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References

Bagliano, F.C., Golinelli, R. and Morana, C. (2002) Core inflation in the Euro Area, *Applied Economics Letters*, **9** (6), 353-357.

Bagliano, F.C. and Morana, C. (2003) Measuring US core inflation: A common trends approach, *Journal of Macroeconomics,* **25** (3), 197-212.

Bjornland, H.C. (2001) Identifying domestic and imported core inflation, *Applied Economics*, **33** (14), 1819-1831.

Charemza, W.W., Hristova, D. and Burridge, P. (2005) Is inflation stationary?, *Applied Economics*, **37**, 901-903.

Cristadoro, R., Forni, M., Reichlin, L. and Veronese, G. (2005) A core inflation indicator for the Euro Area, *Journal of Money, Credit and Banking*, **37** (3), 539-560.

Freeman, D.G. (1998) Do core inflation measures help forecast inflation?, *Economics Letters* **58** (2), 143-147.

Marques, C.R., Neves, P.D. and da Silva, A.G. (2002) Why should central banks avoid the use of underlying inflation indicator?, *Economics Letters*, **75** (1), 17-23.

Marques, C.R., Neves, P.D. and Sarmento, L.M. (2003) Evaluating core inflation indicators, *Economic Modelling*, **20**, 765-775.

Mishkin, F.S. (1984) Is the fisher effect for real?. A reexamination of the relationship between inflation and interest rates, *Journal of Monetary Economics* **30**, 195-215.

Quah, D. and Vahey, S.P. (1995) Measuring core inflation, *Economic Journal*, **105**, 1130-1144.

Ribba, A. (2003) Permanent-transitory decompositions and traditional measures of core inflation, *Economics Letters* **81** (1), 109-116.

Schwert, G.W. (1987) Effects of model specification on test for unit roots in macroeconomic data, *Journal of Monetary Eonomics* **20**, 73-103.

Vega, J.L. and Wynne, M.A. (2003) A first assessment of some measures of core inflation for the euro area, *German Economic Review*, **4** (3), 269-306.

Figure 1

$$\pi_{jt} = \nabla_{12} Ln\left(HICP_{jt}\right)$$

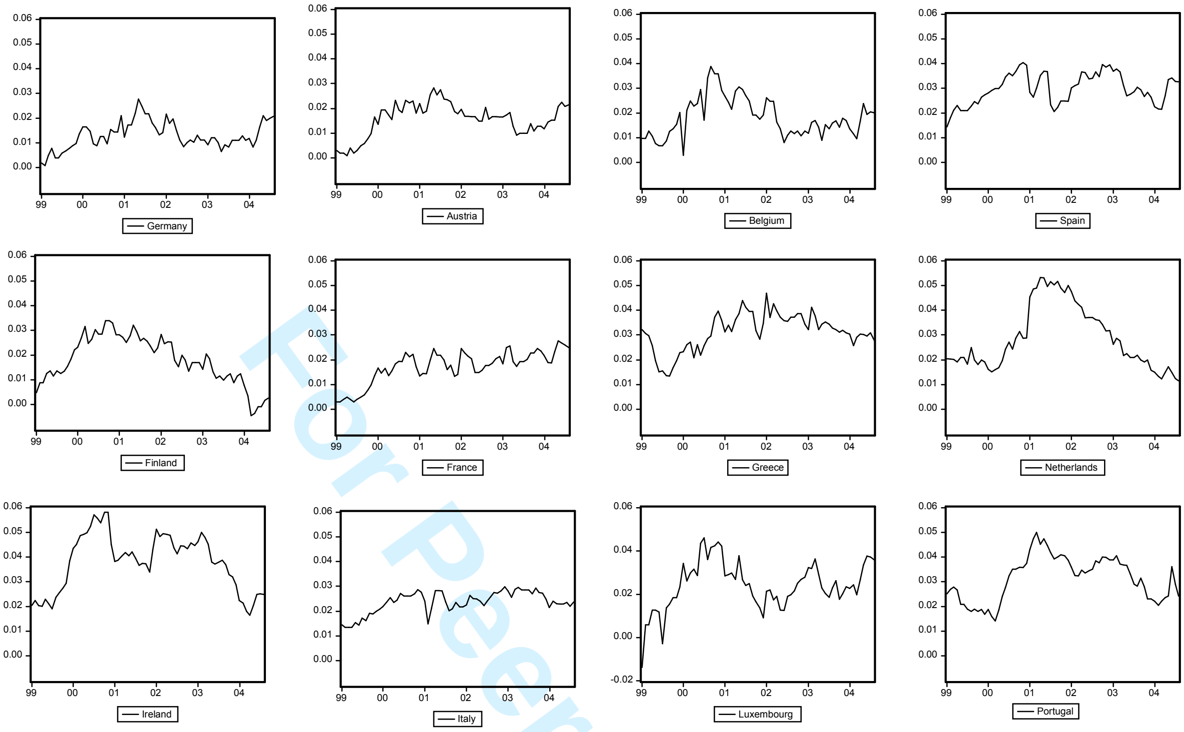


Figure 2

$$\pi_{jt} = \nabla_{12} Ln\left(HICPEEUF_{jt}\right)$$

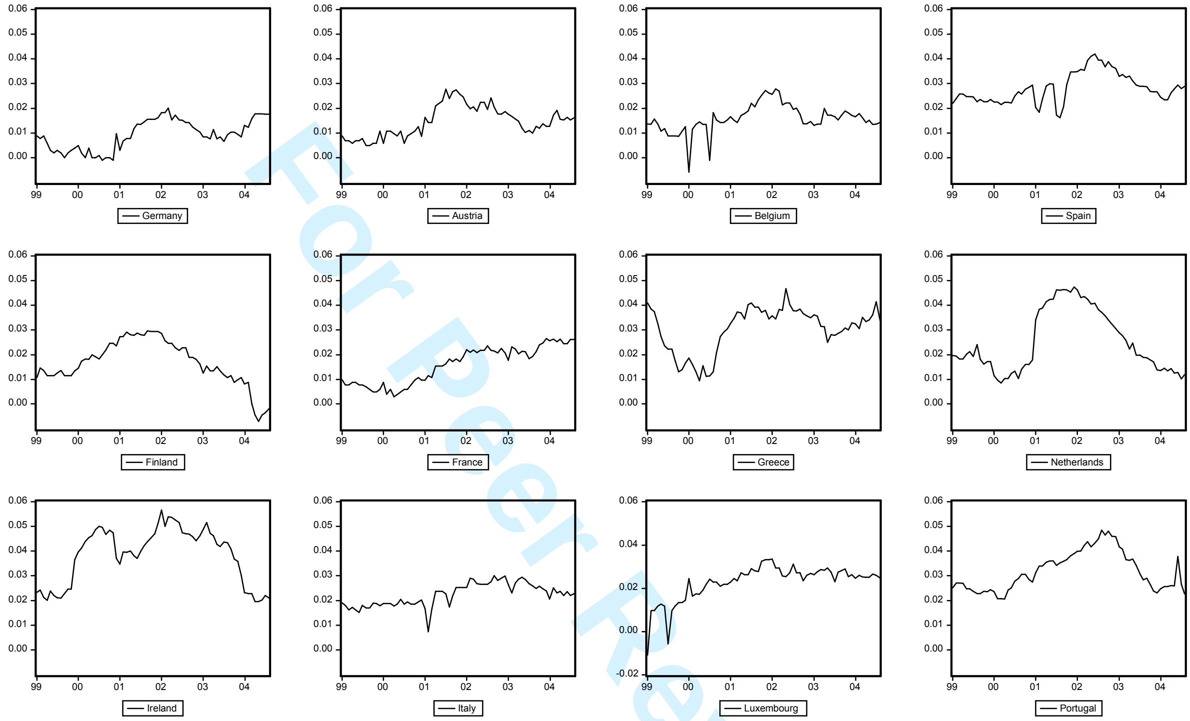


Figure 3

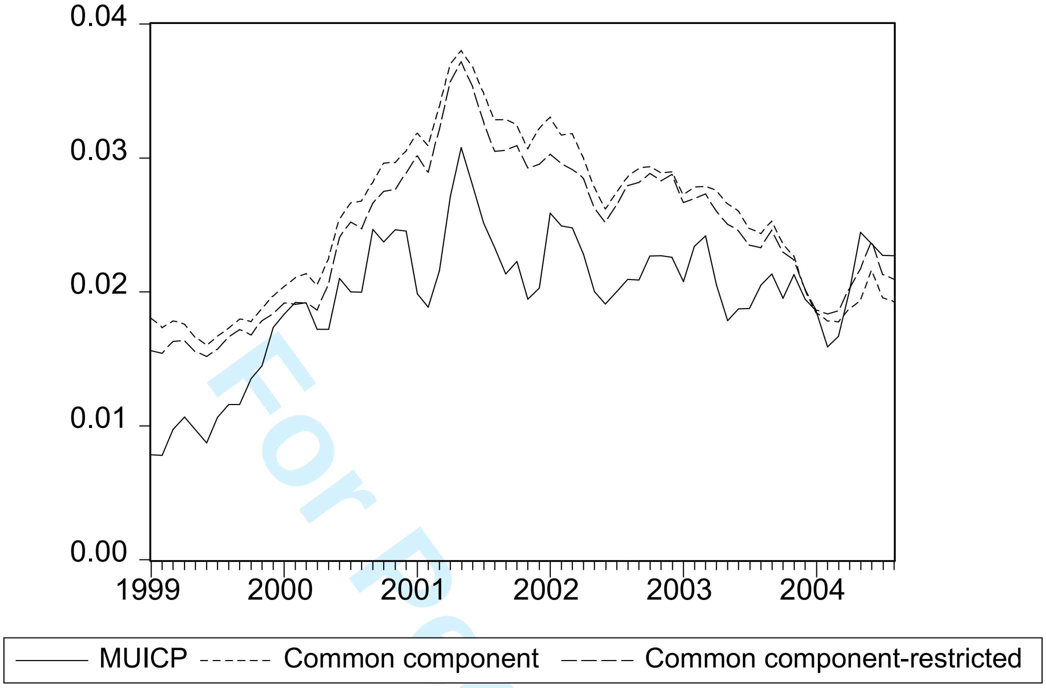
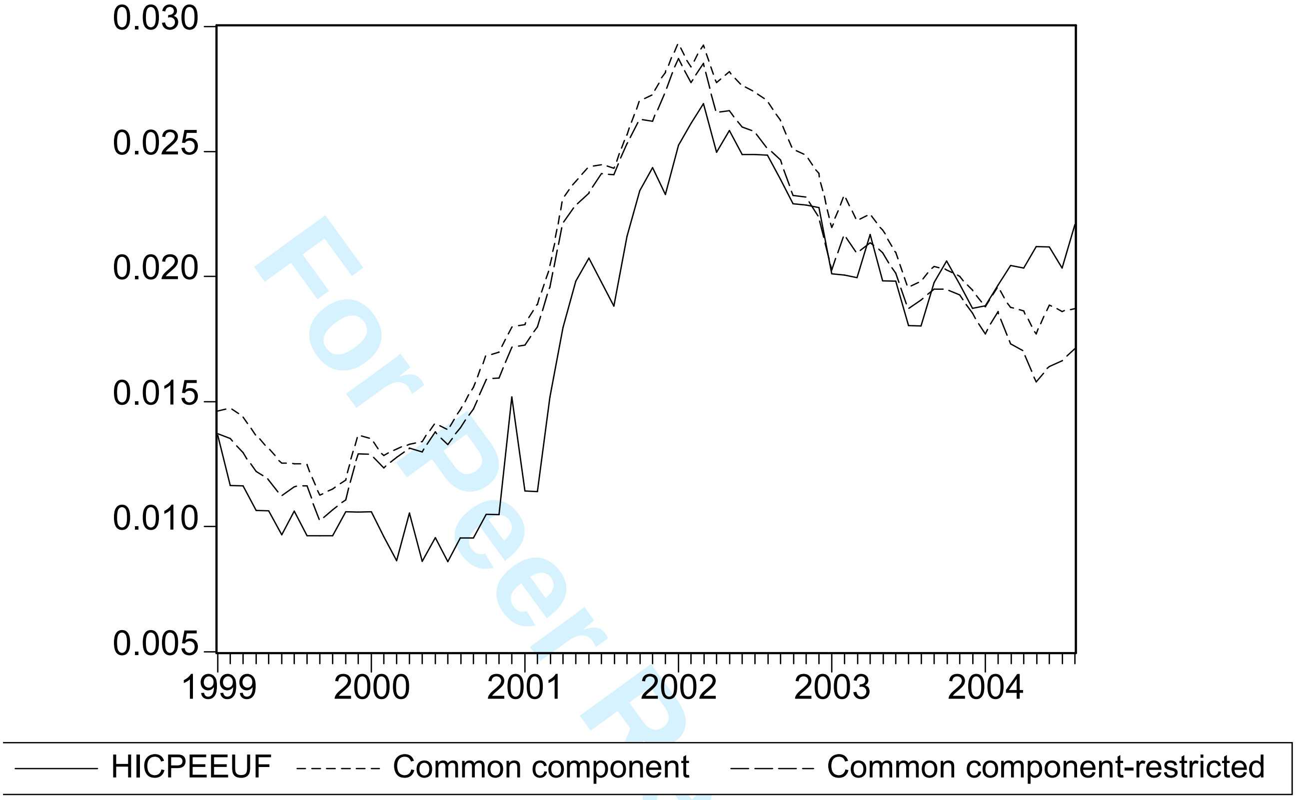

0.04
0.03
0.02
0.01
0.00
1999
2000
2001
2002
2003
2004
MUICP
Common component
Common component-restricted

Figure 4


0.030
0.025
0.020
0.015
0.010
0.005
1999
2000
2001
2002
2003
2004
HICPEEUF
Common component
Common component-restricted