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In 2005 all ECB publications will feature a motif taken from the €50 banknote.

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Abstract

This paper shows that inflation in industrialized countries is largely a global phenomenon. First, inflations of (22) OECD countries have a common factor that alone account for nearly 70% of their variance. This large variance share that is associated to Global Inflation is not only due to the trend components of inflation (up from 1960 to 1980 and down thereafter) but also to fluctuations at business cycle frequencies. Second, Global Inflation is, consistently with standard models of inflation, a function of real developments at short horizons and monetary developments at longer horizons. Third, there is a very robust "error correction mechanism" that brings national inflation rates back to Global Inflation. This model consistently beats the previous benchmarks used to forecast inflation 1 to 8 quarters ahead across samples and countries.

Key Words: Ination, common factor, international business cycle, OECD countries

JEL classification: E31, E37, F42

Non-technical summary

The paper aims at checking the hypothesis that inflation is a global phenomenon, and understanding the common economic forces which have been driving inflation in the OECD since 1960. We proceed in four sequential steps. We start by estimating a measure of Global Inflation using the quarterly inflation series of 22 OECD countries. Subsequently, we discuss the possible determinants of the estimated Global inflation. Then we study the joint dynamics of national and Global Inflation by: (i) assuming that the common factor representation captures a long run relationship between national and global inflations, and (ii) estimating an Error Correction type model for national inflations. Finally we check whether it is possible to exploit the commonality across inflation processes to improve the inflation forecast upon existing benchmarks, and we also provide new insights on inflation persistence.

Our main results can be summarized as follows.

First the intuition that inflation is global is decidedly confirmed by the data. We indeed show that a simple average of 22 OECD countries inflation accounts for 70 % of the variance of inflation in these countries between 1960 and 2003. The qualitative result is not only robust to different sample periods, but is also independent of whether the analysis is performed on the inflation processes or on their de-trended measures. In fact, we find that the variance explained by a simple average of the 22 de-trended inflations is about 36 percent on average, indicating that a common Global factor is an important source of variability for inflation also at higher frequencies.

Second, we document how global inflation can be described as a function of essentially (global) real developments at short horizons and (global) monetary developments at longer horizons, thus confirming the validity of a Global augmented Phillips curve. This result is important because it provides support for analyzing inflation directly at the global level and because it confirms that the 70% of inflation variance that is global depends on both real and monetary developments.

Third, Global Inflation is an attractor of national inflation, in that national deviations from the common factor are reverted. The evidence is again uniform and robust across different sample periods and different countries. We also document differences in the impact of Global Inflation across countries and find, for instance, that countries that have experienced stronger commitment to price stability (e.g. Germany) are less affected than those with weaker inflation discipline (e.g. Italy). Interestingly and perhaps more importantly, this kind of "Error Correction Mechanism" helps in predicting national inflation of nearly all OECD countries at various horizons and over several samples. As a result, our forecasting model of inflation consistently outperforms state of the art forecasting models such as the AR(p), the standard Factor AR(p) and the Random Walk models of inflation. These results designate our Global Inflation model as a potential new standard for forecasting inflation in OECD countries.

Finally, the potential importance of the global component of inflation led us to reconsider also the current debate on inflation persistence. In particular, conditional on the assumption of a common mean of inflation, the persistence of the idiosyncratic components is hardly different from zero from a statistical point of view over most of the considered sample. This result shows that what is left in national inflations after accounting for their common aspects has had very little structure over the last 45 years. Moreover, even when taken globally, inflation is less persistent than it used to be.

"We are [. . .] very much dependent on the global evolution. We have an idea of the global evolution, but there are risks at the global level that we have to take into account."

(Jean-Claude Trichet, 2 December 2004 press conference, Frankfurt)

1 Introduction

The idea that national macroeconomic developments depend on international conditions is not new. Only recently however we are starting to get measures of this dependence. For instance, Forni and Reichlin (2001) show that the share of the European common component in the variance decomposition of European regional output is larger than the national component. Kose, Otrok and Whiteman (2003), KOW thereafter, find that the world common component to expenditure time series of 60 countries explains between one fourth and one third of the variance of these series in OECD countries. As KOW put it:

> "[...] Understanding the sources of international economic fluctuations is important both for developing business cycle models and making policy".

A similar result is obtained in Canova et al. (2004), who demonstrate the presence of a significant world cycle using G7 data and show that country specific indicators play a much smaller role while no evidence of the existence of a Euro specific cycle nor of its emergence in the late 1990s is found.

By definition, the main risk of ignoring international developments is to overrate the importance of domestic developments. And these include domestic macroeconomic policies.

Surprisingly, the studies of global macroeconomic developments have mostly focused on the real business cycle. However, the fluctuations of inflation have been strikingly similar around the world. All OECD countries have experienced long term swings in the level of inflation. Inflation has progressively risen in the 1960s and 1970s before it declined in the 1980's. Inflation has further declined in the early to mid-1990's and has since then remained low and stable.

One formal representation of these long term shifts in inflation focuses on the occurrence of breaks in the mean of inflation. State of the art break tests indicate that inflation series admit two or three breaks in their means since 1960 in every OECD countries. What is remarkable is that breaks in the mean of inflation cluster within three relatively short periods: between 1968 and 1972, between 1982 and 1984 and between 1991 and 1993 (Table 1 of Corvoisier and Mojon, 2004). The coincidence of these sharp changes to the inflation process suggests that they may have common causes.

Levin and Piger (2004) note that the 1990's disinflation coincide with changes in the monetary policy regimes, most notably the spreading of inflation targeting. Rogoff (2003) also acknowledges the merits of central banks tighter focus on price stability in the effectiveness of disinflation. He however wonders whether there could be some other common causes underlying disinflation, indicating the respective role of improved monetary policy, sounder fiscal policies, acceleration of productivity, deregulation and globalization as possible causes. His main conclusion is that no factor alone seems to fully explain the progress that the world has made in containing inflation.

In our opinion the previous studies on the topic suffer from at least two drawbacks. First, they restrict their analyses to the post 1980 disinflation, hence disregarding the possibility that the previous phase, i.e. the acceleration of inflation between 1960 and 1980, was also very much a shared experience of most countries of the world (McKinnon, 1982). Second, they focus strictly on the downward trend or on downward breaks of the inflation process, while, as we show in this paper, there is more than sufficient evidence of co-movements of inflation at the business cycle frequencies as well.

The paper aims at checking the hypothesis that inflation is a global phenomenon, and understanding the common economic forces which have been driving inflation in OECD countries. We proceed in four sequential steps. We start by estimating a measure of Global Inflation using the quarterly inflation series of 22 OECD countries (Section 2). Subsequently, we discuss the possible determinants of the estimated Global inflation (Section 3). Then we study the joint dynamics of national and Global Inflation by: (i) assuming that the common factor representation captures a long run relationship between national and global inflations, and (ii) estimating an Error Correction type model for national inflations. Finally we check whether it is possible to exploit the commonality across inflation processes to improve the inflation forecast upon existing benchmarks, and we also provide new insights on inflation persistence (Section 4).

Our main results can be summarized as follows.

First the intuition that inflation is global is decidedly confirmed by the data. We indeed show that a simple average of 22 OECD countries inflation accounts for 70 % of the variance of inflation in these countries between 1960 and 2003. The qualitative result is not only robust to different sample periods, but is also independent of whether the analysis is performed on the inflation processes or on their de-trended measures. In fact, we find that the variance explained by a simple average of the 22 de-trended inflations is about 36 percent on average, indicating that a common Global factor is an important source of variability for inflation also at higher frequencies.

Second, we document how global inflation can be described as a function of essentially (global) real developments at short horizons and (global) monetary developments at longer horizons, thus confirming the validity of a Global augmented Phillips curve à la Gerlach (2003). This result is important because it provides support for analyzing inflation directly at the global level and because it confirms that the 70% of inflation variance that is global depends on both real and monetary developments.

Third, Global Inflation is an attractor of national inflation, in that national deviations from the common factor are reverted. The evidence is again uniform and robust across different sample periods and different countries. We also document differences in the impact of Global Inflation across countries and find, for instance, that countries that have experienced stronger commitment to price stability (e.g. Germany) are less affected than those with weaker inflation discipline (e.g. Italy). Interestingly and perhaps more importantly, this kind of "Error Correction Mechanism" helps in predicting national inflation of nearly all OECD countries at various horizons and over several samples. As a result, our forecasting model of inflation consistently outperforms $AR(p)$, standard Factor $AR(p)$ and Random Walk models of inflation as well as augmented Phillips curve models à la Gerlach (2003). To the best of our knowledge[1], these results designate our Global Inflation model as a potential new standard for forecasting inflation in OECD countries.

Finally, the potential importance of the global component of inflation led us to reconsider also the current debate on inflation persistence. In particular, conditional on the assumption of a common mean of inflation, the persistence of the idiosyncratic components is hardly different from zero from a statistical point of view over most of the considered sample. This result shows that what is left in national inflations after accounting for their common aspects has had very little structure over the last 40 years. Moreover, even when taken globally, inflation is less persistent than it used to be.

As a final remark, we shall note that the economic and econometric arguments we use in this paper do not claim to drain all the reasons why inflation could be driven by Global outcomes, nor pretend to be exhaustive on the empirical investigation of our findings. We are confident, however, that our results may provide a good starting point for exploring the hypothesis that inflation should –to some extent– be modelled as a global rather than a local phenomenon.

2 Inflation as a global phenomenon

In an integrated world economy, inflationary and deflationary shocks do not spread across countries thanks to exchange rate adjustments. The nominal exchange rate should compensate for accumulated inflation differentials. Analyses of exchange rates have however showed that fundamentals explain at best a small fraction of the exchange rate fluctuations (Flood and Rose, 1995). Recently, Reinhart and Rogoff (2003) challenged the common wisdom that exchange rates have been flexible since the break up of Bretton Woods. They show that since 1971, effective floating exchange rates have been the exception rather than the rule. Only 4% of their country-year observations correspond to effective floating exchange rates. They relate this low number to some sort of broad "fear of floating" among policy makers (Calvo and Reinhart,

[1]For recent systematic comparisons of forecasting models of inflation see Stock and Watson (1999, 2003), Banerjee et al (2003) and Banerjee and Marcellino (2002).

1998). Actually, McKinnon (1982) already made the point that the US loose monetary policy of the 1970's may have spread to other countries because their monetary authorities could only partially sterilize the increase in the central banks' foreign exchange reserves that resulted from their attempts to limit the depreciation of the dollar.

Now, if the key adjustment mechanism which can isolate an economy from foreign shocks to prices is not functioning, then inflation might be determined, at least to some extent, at an international level, increase.[2] Moreover, even if exchange rates partially adjust for accumulated inflation differentials, there are other reasons for co-movement of inflation across countries, some of them being relevant for the trend component of inflation, others for inflation fluctuations at business cycle or higher frequencies.

The trend component of inflation might reflect the objective of the central bank and this objective is not defined in vacuum. There could be some international pressures among or on top of monetary authorities. These "peer pressures" can arise through several channels. For example, the continuous exchange of views among Central Banks through official meetings, conferences and publications can lead to such a peer pressure. Hence, the dominant approach on the best monetary policy practise, being it good or bad, may be reflected in the level of inflation throughout the world. The spread of Inflation Targeting monetary policy strategy in the early 1990's is perhaps a more striking example of the potential power of this "peer pressure" channel. Another channel could potentially be identified with the endogenous equilibrium mechanisms that make a community of central banks (or of groups of central bank watchers) converge to relative rather than absolute benchmarks of success. Typically, performing badly on the inflation record is more tolerable when others perform badly as well. Empirical studies on fiscal policy have shown, for instance, that the fiscal discipline of US's states tend to be correlated with the one of neighboring states, about which, arguably, the electorate are better informed (Besley and Case, 1995).

[2]Along the same line of argument, the Gold Standard is usually associated to a more uniform inflation performance than the current era in part because of the generalized peg to gold (e.g. Bordo et al. 2003 and references cited therein).

Beyond the trend of inflation, it is a fact that countries are also subject to common shocks. Many scholars associate the 1970's great inflation to the two oil shocks of 1973 and 1979 and several also consider that the mid-1980's disinflation is linked to the 1986 counter oil shock. In the short run, the changes in the price of commodities, which are traded worldwide, have a systematic effect on the price of raw materials and energy that make up a significant share of consumer price indices. In addition, New Keynesian have showed that, in a number of OECD countries, Phillips curves models of inflation is not rejected by the data. Therefore, the findings of KOW and others on the co-movement in national business cycles should imply, through Phillips curve effects, co-movement of national inflation rates as well.

2.1 Estimating Global Inflation

In what follows, we briefly describe and compare results for four alternative measures of Global Inflation, namely:

1. a cross-country average,
2. the aggregate OECD inflation, published by the OECD,
3. a measure based on static factor analysis, and
4. a measure based on dynamic factor analysis.

Results reported in subsequent sections are mainly based on the simplest and most intuitive measure, the cross-country average.

The "average" measure is the simple average of the year on year inflation rates of the 22 countries that have been members of the OECD for most of the sample period 1961:2–2004:4.[3] The aggregate OECD inflation is a weighted average of all OECD countries' inflation, where the weights are proportional to GDP. Regarding the common factor analysis, we opted for a parsimonious approximate factor representation (see e.g. Forni et al., 2000; Stock and Watson, 2002) which decomposes inflation rates for the pool of countries as

$$\underset{n\times 1}{\Pi_t} = \underset{n\times 1}{\Lambda} \underset{1\times 1}{f_t} + \underset{n\times 1}{\varepsilon_t} \tag{1}$$

[3]The 8 OECD countries that we do not include in our sample are Mexico, Korea, Turkey, the Czech Republic, Hungary, Poland and the Slovak Republic and Iceland.

where the first term captures the effect of a common factor (f_t), to which each country responds differently through Λ, whereas the last term refers to the idiosyncratic dynamics which captures the components generated by shocks whose effects remain local. Our specification in the dynamic case assumes the common factor to be an AR(1) process, e.g.

$$f_t = af_{t-1} + u_t. \tag{2}$$

We assume orthogonality between f_t and ε_t, and normality of the error terms, with $\varepsilon_t \sim N(0, R)$, and $u_t \sim N(0, Q)$.

Estimation of (1)-(2) is obtained using the Expectation Maximization (EM) algorithm (Doz, Giannone and Reichlin, 2004). Data have been previously demeaned and standardized to have unit variance before estimating f_t.[4] The raw data are the CPI indices that are available quarterly from the OECD main economic indicators database from 1960 onward. Our analysis focuses on quarterly year-on-year (y-o-y) inflation rates, which, by construction, have no seasonal pattern.

Figure 1 reports the four measures of Global Inflation.[5] Three observations are in order. First, the "average" and the factor model measures are almost identical, while the OECD aggregate deviates from the other 3 series, especially in the second half of the 1980's. Second, the fluctuations and trends in the Global Inflation reflect the major events of the last 45 years. All measures are characterized by two trends, up from 1960 until the late-1970s (associated with the two oil shocks and the decline in OECD productivity) and down thereafter (reflecting tight monetary policies and the debt crisis), and, five or six cycles along the way. Given that both the 1970's Great Inflation and the subsequent tight monetary policy have been observed in most countries, the trend components of Global Inflation perhaps should not come as a surprise. As a matter of fact, Corvoiser and Mojon (2005) show that breaks in the mean of inflation largely coincide through out the OECD: around 1970, around 1982 and, to a lesser extent, around 1992.

[4]MATLAB codes developed by D. Giannone have been adapted and used here.
[5]The OECD aggregate and the "average" have been de-meaned and standardized for the figure.

To gauge the extent to which the inflation in individual countries are related to Global Inflation, Figure 2 report the inflation series of the G7 and of the Euro area with their projections on the common factor. Visual inspection reveals not only that the trend is captured accurately, but also that the most relevant cyclical movements are indeed common.

2.2 Descriptive statistics

Table 1 reports the share of the variance of national inflation series that is explained Global inflation[6] for each of the four measures introduced in the previous section : the simple cross-country average, the OECD aggregate inflation, the first static common factor and the first dynamic common factor. In each case, the national idiosyncratic variance is the complement to one of the figures reported in the table. The last column also shows the share of the variance explained by the second dynamic factor. Finally, the table also reports the variance decomposition exercise for the euro area inflation rate.

First, all measures of Global inflation explain more than two thirds of national inflation rates fluctuations on average. The co-movement of inflation is decidedly large. By way of comparison, we find that the global business cycle accounts "only" for about one third of the variance of industrial production growth in OECD countries.[7] It is also clear that the second common factor of the inflation series explains only a very limited share of the variance of national inflation series, on average. We consider this fraction small enough that we can model national inflation rates with one common factor only. We also note that the OECD aggregate inflation under performs the other three measures. We conjecture that this is because this aggregate includes countries that are not in our sample. Moreover, within our sample of countries, we also found that averages that are weighted by country size under perform the factors and the simple unweighted average (not reported).

Table 1 ranks (the column 'average' being the reference) the countries by increasing share of the inflation variance that is explained by the common factor. Only five countries

[6] This share is defined as $\lambda_i^2 var(f_t)/var(\pi_{it})$. It is equivalent to the R-square of a regression of the national inflation rate on Gloabl Inflation and a constant.

[7] A similar proportion has been found by KOW and used to document the importance of a common world real factor

have less than 60 % of this variance explained by Global Inflation. Four of these five countries, Greece being the exception, are usually seen as low inflation economies. We also note that the ranking of the countries has little to do with geography. In particular, the fact that the non-European countries are spread through out the distribution cast doubt on the argument that Global Inflation among OECD countries is just a reflection that a majority of these countries are located in Europe.[8]

Because this variance decomposition may simply reflect common trends in the inflation series, we now explore how much of the business cycle fluctuations in inflation are correlated across countries. In Table 2 we report (again ranked taking the column 'average' as reference) estimates of the share of de-trended inflation that is associated to a common factor. The national inflation series were detrended using Baxter and King (1999) band pass filter, which extracts cycles of length comprised between 6 and 32 quarters long with a truncation of 12 lags. These cyclical components of inflation are then used for extracting the common factor at business cycles frequencies. Again, the share of national inflation variance that is common is very large by any standard with mean and median of the order of 36 percent.[9]

The co-movement of inflation is not only due to the trend component associated with the 1970's great inflation and the coincidence of the countries's inflations gradual acceleration up to 1980 and the gradual disinflation that followed. Global Inflation actually explains a large share of the inflation variance also in countries like Switzerland and Germany, that is countries where the 1970's inflation have been much smaller than in the average of OECD countries. A comparison of the ranking of countries in Tables 1 and 2 indicates that, across different methods, the rank is roughly preserved. Moreover, in relative terms, Global Inflation seems to matter more at business cycle frequencies for low-inflation countries, where the share of variance explained by Global Inflation is among the lowest when we don't remove the trend

[8]We actually estimated another measure of Global Inflation using a sample of six countries evenly split across time zones: Canada, US, UK, the euro area, Japan and Australia. We obtain a even higher median (0.79) and mean (0. 77) share of inflation variance that is explaned by Global Inflation. This result reinforces our conjecture that the comovement of national inflation rates does not necessarily reflect only European economic developments.

[9]These results hold for other detrending methods such as the HP fitler or the first differenc filter of inflation.

(Table 1), and just below the average when we do remove it (Table 2). Finally, notice also that in some countries with low inflation discipline (e.g. Spain and Portugal) the common factor of de-trended inflation does not have any explanatory power for local inflation developments, whereas the non de-trended measure explains between 70 and 80 percent of their total variances.

To complete our description of Global Inflation, we have computed its cross-correlation with national inflation series at several leads and lags. This exercise is useful in figuring out whether inflation tends to lag or lead Global Inflation in some of the countries. Results (not reported, but available upon request) show that almost no country is markedly leading or lagging Global developments. This allows us to discard the possibility that one particular country has been systematically leading the rest of the OECD countries and that, if this country had been large enough, our focus on Global Inflation mistakenly would have picked up the leadership of the country in terms of inflation dynamics.

3 What is driving Global Inflation?

Given the finding that Global Inflation explains a substantial proportion of the local inflation variance, this section tackles the sources of global inflation. It is indeed crucial to understand what causes this process and to gain some insights into what the global factor is really capturing. To determine whether, when and by how much Global Inflation may be linked to oil, real or monetary shock or a combination of these and perhaps other shocks, we evaluate the predictive power of a set of standard inflation determinants. We proceed with a Bayesian model selection analysis which is particularly suited to select relevant regressors among a wide pool of candidate explanatory variables.

In what follows, therefore, we first explain the methodology used to select the best predictors for Global Inflation and then present the results.

3.1 Methodology

Under the Bayesian model selection procedure, we search over several possible model specifications according to the explanatory variables used (e.g. George and McCulloch, 1993 and Koop, 2003). Generally speaking, the problem in building a multiple linear regression model is the selection of predictors to include. The basic model considered here is of the form

$$\pi_{t+h} = a(L)\pi_t + b(L)x_t + \varepsilon_{t+h} \tag{3}$$

where, π_t is our measure of global inflation and x_t represents a set of K possible predictors over three horizons $h = 1, 4, 8$. Thus we are searching for those explanatory variables which have the highest predictive power at different prediction horizons, while considering all possible combination of covariates in the model.

Given that we dispose of a set of K potential explanatory variables (predictors), the problem is to find the *best* model which only include a subset of selected covariates. Therefore, the comparison must be done among 2^K models. When K is a relatively high number the computational requirements for usual procedures (e.g. AIC or BIC) are also high. In our case, as discussed below, K is greater than 11, giving at least 2048 models to evaluate. We use a Bayesian Model averaging approach as discussed in Koop (2003) and Fernandez et al. (2001), where the "promising" subset of predictors is identified as those with the highest posterior probability. The latter is the frequency with which these variables appear in the search procedure of the algorithm used. The algorithm is the Markov Chain Monte Carlo Model Composition (MC^3) (Madigan and York, 1995), which draws samples from the posterior distribution of the 2^K models.

The concept of Bayesian Model averaging can be simply described using the rules of probability. Denote with M_k, $(k = 1, ..., K)$, our K different models, each characterized by a prior for the parameter vector $p(\theta_k \mid M_k)$, the likelihood $p(y \mid \theta_k, M_k)$ and the posterior $p(\theta_k \mid y, M_k)$. Using Bayes theorem, the posterior model probabilities, $p(M_k \mid y)$, can be obtained and used to assess the degree of support for model M_k.[10] From the comparison of all the models a ranking of the best predictors can be obtained. In our case, the likelihood, the prior and the posterior of parameters, as well as the search algorithm are the same as in Koop (2003, pp.265-278).

[10] In formulae, it is

$$p(M_k \mid y) = \frac{p(y \mid M_k)\, p(M_k)}{p(y)}$$

where $p(M_k)$ is the prior model probability, i.e. our prior subjective support for the model, and $p(y \mid M_k)$ is the marginal likelihood, i.e. what the data should look like under model M_k before seeing the data iteself. The previous formula is just the Bayes theorem applied to the model.

Using the procedure outlined above, we calculate and report the posterior probability of the variable, calculated as the proportion of models drawn by the MC^3 algorithm which contain the corresponding predictor, the average estimate of their effect (b) as well as of their posterior standard deviation. The posterior probability of the variable can be used as a diagnostic to determine whether a given predictor plays an important role in explaining global inflation developments. It is comparable to a Granger causality test in a multivariate setting, where variables are simultaneously included and optimally chosen.

In the final step, we use a selection of the most frequent predictors of inflation as obtained from the previous Bayesian procedure to estimate a VAR model where the endogenous variables are the Global inflation and its selected determinants. The main purpose of this exercise is to decompose the variance of Global Inflation as explained by each determinant.

3.2 Results

We limit our analysis to a number of variables commonly argued to affect inflation. Among these, a first group of explanatory variables are defined and computed as "common factors" across the sample of countries for Industrial Production, Nominal Wages, Short-Term Interest Rates, Long-term Interest Rates, the Yield Curve, Nominal and Real Money. Although not exhaustive, these variables include the most likely determinants of inflation. Money and the short-term interest rate are associated with monetary policy, either as instruments or as operating targets. The long-term interest rate is particularly interesting given that it reflects long run inflation expectations. Wage inflation is a central link in propagating inflation shocks into persistent changes. Finally, industrial production is included to evaluate a potential Phillips curve. We choose industrial production because it is the most readily available indicator of the business cycle that goes back to 1960 for all 22 countries that are in our sample.

For each variable, we extract a common factor in a similar way as we had done for inflation. We therefore build measures of the world industrial production growth rate (W_IP), the world nominal wages inflation (W_Wage), the world unit labour cost growth rate(W_ULC), the world import prices inflation (W_MDP), the world monetary aggregate growth rate (W_M3), the world money market, long-term interest rates and yield curve levels (W_MMR, W_Bond, W_YC). For wages and interest rates, we distinguish between the global/world common components that can be constructed back to the 1960's, which, due to data unavailability, is computed on the basis of a sub-set of countries, and a more comprehensive measure that is available only from the 1980's onward. The results that we report below correspond to the definition of these global indicators as simple cross-country averages. These averages of the variables explain usually between 1/3 (e.g. for industrial production) and 1/2 (e.g. for interest rates) of the variance of national time series on average across countries.[11]

We also check whether global inflation depends on genuine world shocks such as commodity prices and the US fiscal deficit and the US stock market price. The latter appears a priori relevant mostly for the fixed exchange rate regime that prevailed before 1973. The fiscal expansions of the country whose currency was the anchor of the exchange rate system can be expected to have inflationary effects throughout the world.

The results of the Bayesian selection algorithm are shown in Table 3. The *prob* column gives the probability that the variable is significant, b gives the elasticity of global inflation vis-à-vis the variable and the last column gives the standard error of b. Several findings are worth emphasizing.

First, global real activity (W_IP) and wage inflation (W_Wage) have a positive "effect" on Global Inflation developments. We note that the effect of W_IP is the most significant at 1 quarter horizon and that it has declined in the last 20 years. Wages appear relevant especially at 4 quarters horizon. These effects tend to validate the existence of a Phillips curve at the Global level with, potentially, an important role the labor markets developments. Again, their effect is somewhat blurred in the second sub-sample.

Second, indicators of monetary policy, the common component of money growth (W_M3), the short term interest rate (W_STI) and the yield curve (W_YC), acquire a greater predictive power at 4 and 8 steps ahead forecasts. Regarding signs, it is worth stressing that the sign of

[11]Results using the dynamic factor or the existing OECD aggregates to compute the "Global" explanatory variables of inflation are quite similar to the ones reported here. The exact figures are available from the authors upon request.

the effects of short-term interest rates on Global Inflation is negative both for the full sample and for the last 20 years. This is consistent with a causality that goes from monetary policy stance to inflation.

Turning now to the genuine common variables, we note further that indicators of the US fiscal (lack of) discipline are not very successful in forecasting Global Inflation, except for the US fiscal deficit indicator in the first sub-sample. The sign of its effect is positive but never significant. The evidence for oil and commodity price is mixed as it tends to vary across forecast horizons and sub-samples. Moreover, their sign is not always positive nor significant.

To conclude our description of the determinants of Global Inflation, we report measures of the share of Global Inflation explained by the different variables within a multi-variate VAR. We include in the VAR the variables that are most often significant in predicting inflation as was shown in Table 3. These variables are W_IP, the Oil price, W_wages, W_MMR, W_Bond and W_M3.

Table 4 reports the share of Global Inflation variance that is explained by each of these variables after controlling for the other variables in the list. The estimation results are again suggesting that it is more difficult to identify the determinants of inflation in the last 2 decades than for the 1960's and the 1970's. We note in particular a drop in the variance explained by industrial production and interest rates while wages are informative about inflation only for the full sample. In the second sub-sample none of the variables seem to bear marginal explanatory power on global inflation. This result may be due to collinearity among the inflation determinants for that period. It may also reflect the improvement in the conduct of economic policy which may have neutralized the shocks in the second part of the sample (Boivin and Giannoni, 2003; Clarida, Gali and Gertler, 2000) or at least, did not itself create shocks (Mojon, 2004).

Overall, the findings reported in this section demonstrate a robust sensitiveness of Global Inflation to real and monetary determinants when measured at the global level. This reinforces the view that, possibly, economists working on inflation may need to reconsider the relevance of closed economy models of inflation. As a matter of fact, in a majority of OECD countries, reduced form models of the type we estimated for Global Inflation are unable to obtain significant coefficients for any variables beyond the own lags of inflation itself (Corvoisier and Mojon, 2005). From this perspective, our results for Global Inflation are good news because they show that there exist one level of aggregation at which the determinants of inflation dictated by theory are indeed significant. Finally, the response of Global Inflation to both real determinants –at short horizons– and monetary determinants –at longer horizon– invite central banks to monitor both categories of inflation determinants. This surveillance, however, should be done not only at the level of countries, but also more globally to account for the spillover of these determinants across countries.

4 The Dynamics of National and Global Inflation

In this section, we describe the impact of Global Inflation on national inflation rates. We show that Global Inflation behaves as an attractor of the national inflation rates. This mechanism is important both for practical purposes and to guide our understanding of the inflation process.

4.1 Global Inflation is "attractive"

If we take Eq. (1) as a long run relationship between national inflations and the common factor, then it is almost natural to set up an "Error Correction Mechanism" to specify the behavior of the short run inflation dynamics.

Algebraically, it is possible to think of the following assumptions to derive a simple ECM representation:

$$\pi_t = \beta_0 + \beta_1 \pi_{t-1} + \gamma x_t + \eta_t \tag{4}$$

where for the x variables a factor representation holds:

$$x_t = \lambda_0 f_t + \lambda_1 f_{t-1} + \omega_t$$

If we assume that the factor representation captures a long run relationship, then a simple algebra conveniently derives the short-run dynamics for the first difference of inflation as a function of the "cointegration relation". Specifically, if we subtract π_{t-1} from both side of (4), then add and subtract $\gamma\lambda_0 f_{t-1}$ on the right-hand side and finally add and subtract $\gamma\left(\lambda_0+\lambda_1\right)f_{t-1}$ again on the right-hand side we obtain

$$\Delta\pi_t = \alpha_0 + \alpha_2\left(\pi_{t-1} - kf_{t-1}\right) + \alpha_3\Delta f_t + \varepsilon_t$$

where the new parameters are combination of the old ones and $k = \gamma\left(\lambda_0+\lambda_1\right)/\left(1-\beta_1\right)$ is the long run multiplier of π_t with respect to x_t.

A more general representation can be shown to hold. For our purposes, and restricting the analysis to a parsimonious specification with only one lag for the Error correction term, we will be analyzing the following specification (now for each country i):

$$\Delta\pi_{i,t} = \alpha_{i,0} + \alpha_{i,1}\left(L\right)\Delta\pi_{i,t-1} + \alpha_{i,2}\left(\pi_{i,t-1} - \lambda_i f_{t-1}\right) + \alpha_{i,3}\left(L\right)\Delta f_t + \varepsilon_{i,t} \quad (5)$$

where Δ is the first difference operator, $\alpha_{i,j}\left(L\right)$ are polynomial in the lag operator L, $\pi_{i,t}$ is national inflation, f_t is the common factor and λ_i is the factor loading of country i, which provides the extent of the adjustment to a deviation from the common "equilibrium" of national inflations.

Equation (5) has been estimated for every country over the sample 1961:2-2004:4 with 4 lags for both $\Delta\pi_{i,t-1}$ and Δf_t. In practical terms, (5) is estimated in two steps, by first performing the standard common factor analysis and then plugging in (5) the idiosyncratic term $\left(\pi_{i,t-1} - \lambda_i f_{t-1}\right)$ and the first difference of the factor Δf_t.

The estimation results are reported in Table 5. In the first column we show the estimates of λ_i, which is both the loading and the average long term response of national inflation to Global Inflation. As expected, this response to Global Inflation is lower in countries with a tight commitment to price stability, like Switzerland (CH) and Germany (DE), and higher in countries that experienced the largest inflation fluctuations over the sample period (Portugal, Italy, Spain among others).

The estimates of α_2 and their t-statistics are shown in the other columns of Table 5. Consistently with our intuition, it is clear that for all countries and, with exception of a few countries, for all sample periods, there is a mechanism that pull back inflation towards Global

Inflation. As national inflations exceeds Global Inflation today, they will be forced to decrease at some point in future.

We find that the robustness of this mechanism across countries and sample periods is astonishing. This is why, in the next section, we further test the relevance of our Global Inflation Error correction model by evaluating its performance in forecasting inflation.

4.2 A new benchmark for forecasting inflation?

A well documented results in the forecasting literature is that reliable leading indicators of inflation are scarce. For example, Stock and Watson (1999, 2003), Banerjee et al (2003) and Banerjee and Marcellino (2002) all conclude that, while some leading indicators of inflation outperform the forecasts based on simple AR(p) models of inflation in some countries and for some sample periods, none has yet emerged that systematically beat the AR(p) (typically AR(2) of level inflation).

Given the results of the previous subsection, a forecast version of (5) can be obtained using a specification similar to Stock and Watson (1999):

$$\pi_{i,t+h}^{h} - \pi_{i,t} = \alpha_{i,0} + \alpha_{i,1}(L)\Delta\pi_{i,t} + \alpha_{i,2}(\pi_{i,t} - \lambda_i f_t) + \alpha_{i,3}(L)\Delta f_t + \varepsilon_{i,t+h} \tag{6}$$

where $\pi_{i,t}^{h} = (400/h)\ln(P_t/P_{t-h})$ is the h-period annualized inflation in the price level P_t and $\pi_{i,t} = (100)\ln(P_t/P_{t-4})$ is the y-o-y quarterly inflation rate.[12] As before, the estimation here must be performed in two steps, but at each time we compute the common factor and the idiosyncratic terms using the information up to t and then forecast h periods ahead.

At least four natural competitors arise to assess the forecasting performance of (6). The first is an augmented AR with the common factor (FAR):

$$\pi_{i,t+h}^{h} - \pi_{i,t} = \alpha_{i,0} + \alpha_{i,1}(L)\Delta\pi_{i,t} + \alpha_{i,3}(L)\Delta f_t + \varepsilon_{i,t+h} \tag{7}$$

The second is an AR of the form

$$\pi_{i,t+h}^{h} - \pi_{i,t} = \alpha_{i,0} + \alpha_{i,1}(L)\Delta\pi_{i,t} + \varepsilon_{i,t+h} \tag{8}$$

[12] For a detailed discussion of this specification, see Stock and Watson (1999).

The third is a Random Walk (RW)

$$\pi_{i,t+h}^{h} - \pi_{i,t} = \varepsilon_{it+h} \tag{9}$$

A fourth benchmark can be considered along the lines of Stock and Watson (1999), Nicoletti-Altimari (2000) and Gerlach (2003) by simply setting an augmented Phillips curve model where the first difference of inflation depends on its own lags and on the lags of the growth rates of industrial production, oil price and M3.[13]

Specifically, it is

$$\begin{aligned} \pi_{i,t+h}^{h} - \pi_{i,t} &= \alpha_{i,0} + \alpha_{i,1}(L)\,\Delta\pi_{i,t} + \alpha_{i,2}(L)\,\Delta IP_{it} \\ &\quad + \alpha_{i,3}(L)\,\Delta M3_{it} + \alpha_{i,4}(L)\,\Delta Oil_{t} + \varepsilon_{i,t+h} \end{aligned}$$

Tables 6a-6c report the RMSE of our preferred specification (6) relative to the RMSE of the four competing models. The experiment is conducted in a "real time" framework with all models reestimated at each step using only information up to time t and by optimally choosing the lag length. The evaluation and comparison are made over three forecasting periods, 1965-2003, 1985-95 and post 1995, and for eight forecasting horizons (quarters). We report results at three horizon (1, 4 and 8 quarters). Clearly, our specification is preferred in a forecasting sense if the reported statistic is lower than one.

Results show that our model outperforms the competing models in forecasting inflation on average, across forecast horizon, over evaluation periods, and for the majority of the countries. Improvements are of the order of up to 25% with respect to the augmented Phillips curve specification, 14% percent with respect to the RW and up to 10% with respect to the standard AR or factor augmented AR. Our specification seems to perform particularly better on forecast horizons greater than 1 and over the last 10-20 years of observations. Hence, while the information pooling associated to a standard FAR or by an AR (possibly augmented with Phillips curve arguments) is useful in short term predictions, it is the information contained in the error correction mechanism that helps the most in forecasting medium and long run.

[13] A more systematic analysis of the forecasting performance of the Global Inflation model is underway in a separate paper.

Moreover, these conclusions are consistent both with the fact that the Global Inflation works as an anchor for national inflations and with a somewhat expected greater commonality among inflations from the 1990's (e.g. Rogoff (2003)).

Our preliminary conclusion, then, is that a simple parsimonious extension of a standard AR model, where we consider the attraction role of the Global Inflation, outperform the AR(p) model, which has been considered so far as the most robust predictor of inflation. The results confirm also the importance of exploiting the international links and commonalities as advocated by the recent empirical Factor-Model literature. What makes our contribution particularly valuable is the interpretation of the factor representation as a long-run relationship that parsimoniously allows for the use of an Error Correction Mechanism which, in turn, seems to help in forecasting future developments of national inflation. The latter result, which holds across countries, samples periods and forecasting horizons, is obliviously one of the main contributions of our current research. Irrespective of whether we can formulate a "convincing" structural model of the pull-back of national inflation toward Global Inflation, our simple model has the potential features of a new benchmark for forecasting inflation.

4.3 A new perspective on the persistence of inflation

The potential importance of the global component of inflation leads us to reconsider the current debate on inflation persistence. Two main conclusions emerge from the recent studies on inflation persistence. First, empirical estimates of inflation persistence fall considerably when statistically significant shifts or breaks in the mean of inflation are accounted for. Robalo Marques (2004), among others, has recently argued that the mean of inflation plays a crucial role in the definition of persistence and that any estimate of persistence should be seen conditional on a given assumption for the mean of inflation.

Second, the question of what drives the break in the mean has not received a clear answer yet. In some countries, there is a clear link between changes in the mean of inflation and changes in the monetary policy regime. Bilke (2004) makes a convincing case that breaks in French inflation are indeed driven by a change in the monetary regime. Levin and Piger (2004) show how a break in the mean over the 90's is common among countries that adopted inflation targeting. However, Ball and Sheridan (2004) argue that the stabilization of inflation is not limited to OECD countries that adopted inflation targeting. Rogoff (2004) show that the disinflation of the last 20 years is a general feature of the world, including emerging and less developed economies. Beyond the breaks (and potential changes in monetary policy regime) of the early 1990's, Corvoisier and Mojon (2004) stress that previous waves of breaks have typically been accompanied by changes in the mean of nominal variables. This brings some support to the view that breaks in the mean of inflation characterize changes in monetary policy regimes.

What then should we make of the fact that national inflations appear to largely depend on global factors? To answer this question, this section analyses separately the persistence of the global and of the national inflations.

Both evidence on the importance of the mean of inflation and of common patterns in possible breaks in the mean are consistent with the view that inflation is a global phenomenon. Therefore, consistently with our findings, we propose to consider our measure of global inflation as a common long run mean. It turns out that most of the inflation series of 22 OECD countries exhibit little persistence once we control for the dependence of the national inflation processes on Global Inflation. To appreciate this result, consider Figures 4 and 5, where we report time varying estimates of persistence (mean and 95% confidence bands) of the idiosyncratic components of inflation of G7 and the euro area (Fig. 4), and of the Global Inflation (Fig. 5). Persistence is measured in terms of the sum of autoregressive coefficients using a univariate $AR(p)$ process for each inflation series:

$$\pi_t = \mu_t + \sum_{j=1}^{p} \alpha_{jt}\pi_{t-j} + \varepsilon_t$$

where ε_t is a serially uncorrelated heteroschedastic error term and p is chosen optimally. If we re-write the process as

$$\pi_t = \mu_t + \rho_t\pi_{t-1} + \sum_{j=1}^{p-1} \phi_{jt}\Delta\pi_{t-j} + \varepsilon_t \tag{10}$$

then $\rho_t \equiv \sum_{j=1}^{p} \alpha_{jt}$ is our "preferred" measure of persistence (e.g. Andrews and Chen, 1994). We have estimated Eq. (10) using the Bayesian simulation smoother of DeJong and Shepard

(1995) with relatively vague prior information. The "confidence" interval used to measure the uncertainty around the persistence mean is a 95% Highest Posterior Density Interval (e.g. Koop, 2003, p. 43).

As it is clear from Figure 4, idiosyncratic components exhibit on average a persistence not higher than 0.5-0.6, which means that, in the countries considered here, a temporary shock to inflation is on average absorbed in 7-8 quarters at most. On the other hand, the persistence of global inflation is on average higher than those of country inflations, and then it decreases to a comparable mean level in the last part of the sample. Figures 4-5 also show that inflation persistence might have not been stable over time. The question of stability is relevant from an econometric point of view because any measure of persistence of a time-varying structure is upward biased if time variation is not accounted for.

Some aspects of the findings are worth emphasizing. First, the general uncertainty around the measure of persistence is increasing over time. This is in line with the recent literature on inflation persistence (e.g. O'Reilly and Whelan, 2004). Second, US inflation has lost structure in the last part of the sample with respect to the first part, which suggests that deviations of US inflation from Global Inflation fluctuations have become less interpretable than they used to be. Notice, however, that with the exception of UK and perhaps Germany, where persistence has been positively stable over time, for most countries ρ_t is centered around zero over the *entire* sample, meaning that what is left in national inflations after accounting for their common component might not have much structure to be explained. This aspect is possibly related to the 'attractive' characteristic of Global Inflation and to the different degrees of attraction across countries. From some preliminary time-varying estimation of the matrix of coefficients through which countries load the common factor in Eq. (1), this seems indeed to be the case. The loading λ_i, the relative importance of Global Inflation for national inflation, is indeed increasing for countries like United States and Canada, i.e., countries for which we observe a clear decline in the persistence mean. Finally, inflation persistence has been commonly decreasing in mean since 1980's to values which are clearly below one (Fig. 5). Although the increasing uncertainty does not allow us to make more precise probability statements, this decline in the persistence of Global Inflation in the last decade may suggest that the current monetary policy framework has had a certain impact on the persistence of inflation.

5 Conclusions

In this paper, we have shown that the inflation of the OECD countries have moved together over the last 45 years. This comovement accounts for 70 % of the variability of country inflation, on average. Moreover, deviations of individual countries inflation from Global Inflation are not persistent, and, even when taken globally, inflation is less persistent than it used to be. Also, there is a powerful and robust "error correction mechanism" that brings national inflation rates back toward the level of their long term projection on Global Inflation. As a first practical application of the idea of Global Inflation, we present a fairly parsimonious model of inflation forecast. The preliminary findings suggest that the new specification beats standard competitors.

The main open question is to assess whether these results reflect some sort of statistical "return to the mean" phenomenon or whether some deeper endogenous economic adjustments are at work. For example, some determinants of inflation are Global: the price of commodities is the same for all countries; KOW have shown that there is a global business cycle; Last but not least, monetary and financial conditions may spill-over across countries. Such spill overs are, in theory, less likely when exchange rates are floating. However, Reinhart and Rogoff (2002) have shown that, in spite of the break up of Bretton Woods, very few pure floating exchange rates regimes have been observed. Moreover, while it is hard to show in the data, our experience as central bankers convince us that monetary policy concepts are effectively spreading among central banks. In some periods, bad monetary policy strategies are dominating for a majority of countries. At other times, good strategies appear dominant.

We show that Global Inflation indeed responds to commodity prices, the global business cycle and the growth of the global liquidity. We further qualify that real developments are more relevant at short horizons and monetary developments matter at longer horizons.

The paper has got two important policy implications. First, given the importance of Global Inflation for local inflation, the nature of Global Inflation brings support to the monetary policy strategies that give importance both to real and monetary developments in their assessment of inflationary pressures. Second, there may be a powerful externality between country inflation records. Even if some countries were clearly less affected by Global Inflation than others, none, not even Switzerland, can claim to have been completely immune from Global Inflation shocks.

Future research to which the authors will contribute should follow mainly three directions. The first one is to extend the sample of countries and regions to emerging markets, and assess the importance of Global, regional and local mechanisms which help explaining inflation developments. The second one is to explore more systematically the forecasting performance of the Global Inflation Error Correction Model, and compare it with the performance of other univariate and multivariate specifications, across other samples and cross sections of countries. Finally, we should try to gain insights on the nature of the shocks that drive Global Inflation and their transmission to country inflations. To this respect, our general supposition is that to a large extent the results reported in this paper may reflect the importance for central bankers of exchanging views and cooperating in the design of their monetary policy concepts. Paraphrasing the conclusion of the 1848 Communist Manifesto we would like to invite

"*central bankers of all countries: unite!*".

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Data source and transformation

Definition	Source	Transformation
Consummer price indices	OECD Main Economic Indicators	y-o-y growth rates
Hourly earnings	OECD Main Economic Indicators	y-o-y growth rates
Industrial production	IMF International Financial Statistics	y-o-y growth rates
Short-term interest rate (3-month)	OECD Economic outlook	level
Long-term interest rate (10-year)	OECD Economic outlook	level
Commodity prices	Bridge/Commodity Research Bureau; Spot market price index: All commodities; www.freelunch.com	y-o-y growth rates
Oil price	Fed St Louis Oil price: Domestic West Texas Intermediate	y-o-y growth rates
US government fiscal deficit	Net lending or net borrowing (-); Table 3.2. Federal Government Current Receipts and Expenditures; Bureau of economic analysis	level
US government consumption	Quarterly National Account of the Bureau of Economic Analysis	y-o-y growth rates
United States stock price	S&P Stock Price Index: 500 Composite, (Index 1941-43=10, Monthly Average);Standard & Poors: Security Price Index Record	y-o-y growth rates
Broad money (M3)	euro area countries (Eurostat Balance sheet items); Canada, Denmark, Sweden and United Kingddom (OECD MEI); Australi, Japan, New Zeland, Norway Switzerland and United States (OECD Economic Outlook); for Austria, Belgium, Finland, France, Germany, Ireland, Netherlands, Portugal, Spain data where back dated before 1970, for Greece before 1980, for Canada before 1967, for New Zeland before 1965, for the United Kingdom before 1962 with y-o-y growth rates of "Claims on other resident sector" of the IMF IFS.	y-o-y growth rates

Table 1. Share of inflation variance explained by alternative measures of Global Inflation

	Average	OECD	Static factor	Dynamic factors	
				first	second
Australia	0.73	0.68	0.73	0.74	0.05
Austria	0.68	0.33	0.64	0.63	0.12
Belgium	0.83	0.55	0.83	0.82	0.03
Canada	0.82	0.74	0.84	0.84	0.02
Denmark	0.71	0.44	0.71	0.71	0.01
Finland	0.81	0.55	0.81	0.80	0.02
France	0.88	0.70	0.92	0.92	0.00
Germany	0.59	0.27	0.53	0.52	0.14
Greece	0.39	0.60	0.37	0.37	0.27
Ireland	0.85	0.61	0.89	0.89	0.00
Italy	0.85	0.79	0.89	0.89	0.04
Japan	0.53	0.20	0.48	0.47	0.25
Luxembourg	0.77	0.50	0.78	0.78	0.02
Netherlands	0.56	0.20	0.54	0.54	0.30
New Zeland	0.60	0.59	0.62	0.62	0.12
Norway	0.66	0.56	0.67	0.67	0.02
Portugal	0.61	0.58	0.63	0.63	0.12
Spain	0.73	0.54	0.74	0.75	0.03
Sweden	0.73	0.62	0.71	0.71	0.03
Switzerland	0.43	0.15	0.35	0.34	0.18
United Kindom	0.77	0.62	0.77	0.77	0.00
United States	0.68	0.67	0.69	0.69	0.01
mean	0.69	0.52	0.69	0.69	0.08
median	0.72	0.57	0.71	0.71	0.03
euro area	0.95	0.75	0.96	0.96	0.01

Note: 1961:2-2004:4. The euro area aggregate inflation is not included in the pool of 22 countries used to estimate Global Inflation.

Table 2. Share of detrended inflation variance explained by alternative measures of Global Inflation

	Average	OECD	Static factor	Dynamic factor
Australia	0.42	0.17	0.43	0.43
Austria	0.35	0.14	0.30	0.29
Belgium	0.63	0.36	0.73	0.74
Canada	0.36	0.25	0.34	0.35
Denmark	0.32	0.14	0.28	0.26
Finland	0.38	0.22	0.36	0.38
France	0.61	0.50	0.74	0.73
Germany	0.31	0.10	0.29	0.29
Greece	0.26	0.09	0.20	0.21
Ireland	0.57	0.27	0.62	0.63
Italy	0.63	0.37	0.70	0.68
Japan	0.54	0.30	0.54	0.53
Luxembourg	0.42	0.13	0.47	0.49
Netherlands	0.32	0.18	0.35	0.36
New Zeland	0.12	0.09	0.09	0.09
Norway	0.09	0.00	0.05	0.05
Portugal	0.04	0.00	0.04	0.03
Spain	0.26	0.14	0.18	0.18
Sweden	0.11	0.00	0.04	0.04
Switzerland	0.41	0.14	0.35	0.36
United Kindom	0.41	0.31	0.41	0.41
United States	0.43	0.44	0.47	0.46
mean	0.36	0.20	0.36	0.36
median	0.37	0.16	0.35	0.36
euro area	0.83	0.39	0.84	0.83

Note: 1961:2-2004:4. The inflation series are detrended by applying the band pass filter of Baxter and King (1999).The euro area aggregate inflation is not included in the pool of 22 countries used to estimate Global Inflation.

Table 3. BMA Posterior probabilities and estimates, dependent variable is Global Inflation

1 step ahead	1961-2004			1961-1980			1981-2004		
	prob.	b	std of b	prob.	b	std of b	prob.	b	std of b
own	**1.00**	**0.86**	**0.05**	**1.00**	**0.77**	**0.12**	**1.00**	**0.93**	**0.07**
W_IP	**1.00**	**0.07**	**0.02**	**0.94**	**0.09**	**0.04**	0.33	0.01	0.02
W_Wages	**0.98**	**0.12**	**0.04**	**0.97**	**0.16**	**0.07**	0.17	0.03	0.09
W_STI	0.12	0.00	0.02	0.14	-0.01	0.07	0.10	0.00	0.01
W_YC	**0.79**	-0.10	0.08	**0.25**	-0.05	0.12	0.08	0.00	0.02
W_M3	**0.32**	0.01	0.02	0.12	0.00	0.02	0.11	0.00	0.02
Com. Price	**0.95**	0.00	0.00	**0.94**	0.01	0.01	0.09	0.00	0.00
Oil price	0.09	0.00	0.00	0.12	0.00	0.01	0.10	0.00	0.00
US stock price	0.08	0.00	0.00	**0.27**	0.00	0.01	0.08	0.00	0.00
US fiscal deficit	0.10	0.00	0.00	0.22	0.00	0.01	0.15	0.00	0.00
US gov. cons.	0.08	0.00	0.00	0.11	0.00	0.01	0.09	0.00	0.01
4 steps ahead	1961-2004			1961-1980			1981-2004		
	prob.	b	std of b	prob.	b	std of b	prob.	b	std of b
own	**1.00**	**0.40**	**0.08**	0.08	0.00	0.04	**1.00**	**0.86**	**0.14**
W_IP	**0.98**	**0.11**	**0.04**	**0.99**	**0.18**	**0.06**	0.10	0.00	0.01
W_Wages	**1.00**	**0.33**	**0.07**	**1.00**	**0.45**	**0.07**	0.11	0.02	0.10
W_STI	0.14	-0.01	0.04	0.12	-0.01	0.09	0.21	-0.02	0.06
W_YC	0.33	-0.07	0.12	0.11	0.00	0.10	0.12	0.01	0.05
W_M3	**1.00**	0.25	0.04	**1.00**	**0.19**	**0.05**	**0.44**	0.05	0.07
Com. Price	**1.00**	0.01	0.00	**1.00**	0.05	0.01	0.10	0.00	0.00
Oil price	0.07	0.00	0.01	**0.94**	-0.18	0.08	**0.73**	-0.04	0.03
US stock price	0.07	0.00	0.00	0.47	0.01	0.01	0.08	0.00	0.00
US fiscal deficit	0.23	0.00	0.00	0.30	0.00	0.01	**0.77**	0.00	0.00
US gov. cons.	0.07	0.00	0.01	0.09	0.00	0.01	0.10	0.00	0.01
8 steps ahead	1961-2004			1961-1980			1981-2004		
	prob.	b	std of b	prob.	b	std of b	prob.	b	std of b
own	**0.66**	0.24	0.20	0.17	0.02	0.09	**1.00**	**0.72**	**0.12**
W_IP	0.50	-0.05	0.06	0.23	-0.02	0.06	0.08	0.00	0.01
W_Wages	**0.63**	0.20	0.18	**0.51**	0.09	0.12	0.10	-0.02	0.09
W_STI	0.23	-0.03	0.08	**1.00**	**1.38**	**0.37**	0.15	-0.02	0.06
W_YC	0.14	0.02	0.08	**1.00**	**2.77**	**0.53**	0.18	0.02	0.07
W_M3	**1.00**	**0.52**	**0.05**	**1.00**	**0.42**	**0.07**	**0.99**	**0.21**	**0.07**
Com. Price	**1.00**	0.01	0.00	**0.99**	0.05	0.02	0.15	0.00	0.00
Oil price	**0.53**	-0.04	0.04	**0.99**	**-0.69**	**0.19**	**1.00**	**-0.12**	**0.02**
US stock price	0.15	0.00	0.00	**0.87**	**-0.04**	**0.02**	0.10	0.00	0.00
US fiscal deficit	**0.75**	0.00	0.00	0.15	0.00	0.01	**0.99**	0.00	0.00
US gov. cons.	**0.61**	-0.04	0.04	0.20	-0.01	0.03	0.21	-0.01	0.02

Note: the three columns report probability that the variable in column help predict Global Inflation, the coefficient of that variable and its standard deviation. Probabilities supperior to 0.5 and significant coefficients are in bold charaters.

Table 4. Variance decomposition of Global Inflation

Horizon	Std Error	Own lags	W_IP	COM P	W_Wage	W_M3	W_Bond	W_MMR
1960-2003								
4	0.90	83	3	7	2	1	2	2
8	1.49	57	2	14	11	8	6	2
12	1.91	39	5	12	22	14	5	2
16	2.15	31	4	10	29	18	4	3
20	2.35	27	4	8	33	20	4	4
1960-1980								
4	0.78	65	0	18	0	2	3	10
8	1.52	24	7	25	5	20	14	5
12	2.03	14	13	17	7	28	15	6
16	2.20	12	12	15	8	30	17	6
20	2.42	10	12	14	7	28	24	6
1981-2003								
4	0.64	87	6	0	2	3	2	0
8	0.87	81	4	0	6	5	3	1
12	0.97	77	4	1	7	7	3	2
16	1.05	75	4	0	7	10	2	2
20	1.12	72	4	0	7	13	2	2

Notes: Entries are percentage of the variance of global inflation accounted for by variation in the column variable at horizons ranging from 4 to 20 quarters. The VAR includes all seven variables in the ordering of the columns.

Table 5. ECM between national inflation and Global Inflation

	1960_2004		1960_2004		1960-1980		1981-2004		1990-2004	
	lambda	stderr	alpha 2	t-stat	alpha 2	t-stat	alpha 2	t-stat	alpha 2	t-stat
Australia	1.04	0.04	-0.14	-3.62	-0.22	-1.27	-0.16	-2.65	-0.42	-3.27
Austria	0.49	0.03	-0.35	-3.29	-0.44	-3.37	-0.13	-2.36	-0.27	-2.93
Belgium	0.75	0.03	-0.14	-3.17	-0.11	-1.79	-0.14	-2.46	-0.47	-2.63
Canada	0.84	0.03	-0.23	-4.34	-0.26	-2.91	-0.39	-5.23	-0.33	-3.07
Denmark	0.88	0.04	-0.31	-3.92	-0.51	-2.80	-0.14	-1.89	-0.46	-3.16
Finland	1.13	0.04	-0.17	-3.23	-0.26	-2.90	-0.18	-2.18	-0.24	-3.04
France	1.03	0.03	-0.16	-3.35	-0.20	-2.81	-0.11	-2.14	-0.11	-1.03
Germany	0.38	0.03	-0.14	-3.79	-0.30	-3.50	-0.07	-2.04	-0.31	-3.57
Greece	1.58	0.13	-0.08	-3.17	-0.20	-1.49	-0.07	-2.14	-0.19	-3.01
Ireland	1.48	0.05	-0.17	-4.34	-0.67	-4.79	-0.09	-1.56	-0.11	-2.86
Italy	1.53	0.04	-0.19	-4.10	-0.15	-2.54	-0.11	-2.46	-0.13	-2.05
Japan	0.87	0.07	-0.08	-2.40	-0.12	-1.34	-0.20	-3.68	-0.26	-3.10
Luxembourg	0.68	0.03	-0.17	-4.44	-0.21	-2.81	-0.09	-2.08	-0.28	-3.24
Netherlands	0.51	0.04	-0.11	-2.74	-0.21	-2.90	-0.07	-2.06	-0.21	-3.81
Norway	0.79	0.04	-0.19	-3.85	-0.36	-2.67	-0.18	-2.74	-0.27	-2.04
New Zeland	1.26	0.07	-0.11	-2.30	-0.19	-2.93	-0.11	-2.05	-0.34	-3.91
Portugal	2.06	0.11	-0.17	-2.74	-0.34	-2.93	-0.22	-4.38	-0.47	-3.97
Spain	0.91	0.04	-0.21	-2.84	-0.53	-3.41	-0.14	-1.62	-0.56	-2.74
Sweden	1.38	0.06	-0.18	-3.26	-0.25	-3.18	-0.47	-3.92	-0.32	-2.39
Switzerland	0.41	0.04	-0.12	-2.74	-0.15	-1.72	-0.09	-2.25	-0.42	-3.81
United Kindom	1.30	0.06	-0.16	-3.93	-0.48	-3.64	-0.16	-2.50	-0.32	-3.70
United States	0.70	0.04	-0.11	-3.07	-0.21	-4.22	-0.28	-3.63	-0.77	-4.27
Euro area	0.97	0.02	-0.18	-3.23	-0.27	-2.63	-0.09	-2.43	-0.14	-2.35

Note: lambda is the coefficient of projection of national inflation on global inflation. Alpha is the estimated coefficient of the error correction term. The dependant variable is the first difference of the national inflation rate.

Table 6a. RMSE of the Global Inflation model (4) relative to standard benchmarks (1980-2004)

	1 step ahead forecast				4 steps ahead forecast				8 steps ahead forecast			
	RW	AR	FAR	PHIL	RW	AR	FAR	PHIL	RW	AR	FAR	PHIL
Euro area	0.81	1.03	0.99	n.a.	1.04	0.98	0.91	n.a.	0.86	0.89	0.87	n.a.
Australia	0.90	1.08	0.99	0.94	1.08	1.09	1.00	0.84	1.11	1.09	1.04	0.89
Austria	0.68	1.04	1.01	0.99	0.77	0.84	0.89	0.88	0.74	0.82	0.89	0.87
Belgium	0.68	0.99	0.98	0.88	0.65	0.75	0.72	0.55	0.65	0.75	0.76	0.46
Canada	0.82	0.97	0.98	0.93	0.89	0.83	0.87	0.81	0.88	0.82	0.84	0.83
Denmark	0.93	1.21	1.12	0.88	1.40	1.34	1.18	0.82	1.32	1.24	1.19	0.94
Finland	0.80	1.05	1.02	0.86	1.29	1.23	1.19	0.90	1.27	1.32	1.37	1.00
France	0.83	1.02	1.01	0.86	1.07	0.97	0.95	0.78	0.95	0.91	0.90	0.78
Germany	0.80	1.00	0.99	0.77	0.88	0.88	0.86	0.51	0.82	0.86	0.82	0.45
Greece	0.70	1.03	1.01	0.79	0.88	0.88	0.83	0.59	0.85	0.82	0.78	0.62
Ireland	0.92	1.14	1.12	1.04	0.98	1.02	1.02	0.89	0.96	1.01	1.04	0.97
Italy	0.90	1.00	0.97	0.85	0.94	0.79	0.75	0.56	0.74	0.69	0.70	0.58
Japan	0.84	1.10	1.01	0.92	1.31	1.41	1.16	0.80	1.58	1.88	1.61	1.10
Luxembourg	0.84	0.97	0.96	0.88	0.85	0.81	0.81	0.64	0.66	0.69	0.72	0.55
Netherlands	0.57	1.01	1.00	0.98	0.97	0.96	1.08	0.97	1.01	1.07	1.21	1.10
New Zeland	1.01	1.01	1.00	0.94	1.00	0.96	0.95	0.90	0.94	0.87	0.87	0.81
Norway	0.73	1.04	1.04	0.86	0.79	0.82	0.84	0.64	0.68	0.69	0.73	0.57
Portugal	0.78	0.99	0.94	0.83	0.81	0.75	0.69	0.62	0.57	0.53	0.51	0.45
Spain	0.65	1.02	1.01	0.91	0.93	1.06	1.08	0.89	1.06	1.19	1.30	1.16
Sweden	0.69	0.99	0.99	0.90	0.79	0.82	0.89	0.78	0.75	0.75	0.80	0.78
Switzerland	0.75	0.98	0.97	0.94	0.80	0.82	0.77	0.72	0.83	0.85	0.74	0.81
United Kingdom	0.91	1.19	1.16	1.04	1.63	1.54	1.48	1.36	1.70	1.69	1.61	1.58
United States	0.74	0.98	0.99	0.96	1.05	0.91	0.96	0.82	0.96	0.87	0.94	0.85
median	0.80	1.02	1.00	0.91	0.94	0.91	0.91	0.81	0.88	0.87	0.87	0.82
mean	0.80	1.04	1.01	0.91	0.99	0.98	0.95	0.78	0.95	0.97	0.97	0.82

Note: ratio of the root mean square error of the Global inflation model forecast to the one obtained with a random walk model (equation (9) in the main text), an AR(4) (equation (8) in the main text), a factor augmented AR(4) (equation (7) in the main text) and a Phillips augmented with commodity prices and money (equation (6) in the main text). Evaluation period: 1980-2004.

Table 6b. RMSE of the Global Inflation model (4) relative to standard benchmarks (1980-1995)

	1 step ahead forecast				4 steps ahead forecast				8 steps ahead forecast			
	RW	AR	FAR	PHIL	RW	AR	FAR	PHIL	RW	AR	FAR	PHIL
Euro area	0.82	1.03	0.99	n.a.	1.04	0.97	0.90	n.a.	0.87	0.89	0.87	n.a.
Australia	0.97	1.14	1.00	0.94	1.16	1.17	1.04	0.91	1.21	1.18	1.10	0.99
Austria	0.69	1.05	1.01	1.00	0.74	0.84	0.89	0.95	0.74	0.83	0.91	0.92
Belgium	0.69	1.00	0.97	0.84	0.59	0.69	0.68	0.54	0.60	0.72	0.72	0.45
Canada	0.92	0.96	0.98	0.97	0.85	0.79	0.83	0.86	0.82	0.78	0.81	0.82
Denmark	1.01	1.24	1.16	0.96	1.39	1.31	1.20	0.90	1.32	1.24	1.21	1.05
Finland	0.80	1.03	1.04	0.85	1.30	1.23	1.24	0.95	1.27	1.33	1.43	1.03
France	0.88	1.00	1.01	0.87	1.06	0.95	0.94	0.87	0.94	0.91	0.90	0.85
Germany	0.83	1.00	0.99	0.77	0.88	0.88	0.86	0.56	0.83	0.86	0.82	0.50
Greece	0.69	1.02	1.01	0.78	0.86	0.87	0.82	0.59	0.86	0.83	0.79	0.64
Ireland	0.90	1.13	1.11	1.10	0.93	0.97	0.98	0.99	0.90	0.95	0.99	1.00
Italy	0.89	0.98	0.97	0.89	0.93	0.76	0.74	0.60	0.70	0.64	0.65	0.58
Japan	0.84	1.08	1.01	0.90	1.34	1.47	1.24	0.85	1.65	2.02	1.73	1.25
Luxembourg	0.85	0.95	0.95	0.87	0.78	0.75	0.77	0.61	0.57	0.61	0.64	0.51
Netherlands	0.63	1.01	1.01	0.97	0.97	0.98	1.11	1.03	1.03	1.10	1.25	1.19
New Zeland	1.03	1.01	1.00	0.97	1.00	0.96	0.95	0.94	0.94	0.87	0.87	0.84
Norway	0.73	1.06	1.05	0.86	0.76	0.78	0.81	0.62	0.64	0.66	0.70	0.56
Portugal	0.81	0.98	0.92	0.84	0.77	0.72	0.66	0.63	0.53	0.49	0.47	0.43
Spain	0.65	1.03	1.02	0.90	0.90	1.06	1.10	0.91	1.07	1.21	1.35	1.25
Sweden	0.68	0.98	0.97	0.90	0.69	0.72	0.79	0.74	0.62	0.62	0.67	0.70
Switzerland	0.78	0.97	0.96	0.96	0.73	0.75	0.71	0.74	0.77	0.80	0.68	0.83
United Kingdom	0.93	1.21	1.18	1.09	1.68	1.56	1.51	1.50	1.69	1.69	1.64	1.74
United States	0.79	0.96	0.99	0.97	1.04	0.90	0.96	0.93	0.94	0.86	0.93	0.91
median	0.82	1.01	1.00	0.90	0.93	0.90	0.90	0.87	0.87	0.86	0.87	0.85
mean	0.82	1.04	1.01	0.92	0.97	0.96	0.94	0.83	0.94	0.96	0.96	0.87

Note: ratio of the root mean square error of the Global inflation model forecast to the one obtained with a random walk model (equation (9) in the main text), an AR(4) (equation (8) in the main text), a factor augmented AR(4) (equation (7) in the main text) and a Phillips augmented with commodity prices and money (equation (6) in the main text). Evaluation period: 1980-2004.

Table 6c. RMSE of the Global Inflation model (4) relative to standard benchmarks (1995-2004)

	1 step ahead forecast				4 steps ahead forecast				8 steps ahead forecast			
	RW	AR	FAR	PHIL	RW	AR	FAR	PHIL	RW	AR	FAR	PHIL
Euro area	0.77	1.05	1.00	0.94	0.71	0.86	0.78	0.55	0.52	0.66	0.66	0.42
Australia	0.77	0.94	0.96	0.93	0.82	0.81	0.84	0.64	0.68	0.74	0.74	0.55
Austria	0.66	0.97	0.96	0.89	0.43	0.67	0.70	0.60	0.38	0.59	0.64	0.55
Belgium	0.65	0.98	0.98	0.96	0.64	0.84	0.75	0.57	0.64	0.79	0.73	0.52
Canada	0.73	1.00	0.99	0.88	0.95	0.98	0.94	0.70	1.24	1.16	1.03	0.77
Denmark	0.73	1.11	0.99	0.69	1.15	1.46	0.88	0.47	0.79	0.99	0.69	0.29
Finland	0.80	1.12	0.96	0.88	0.87	1.05	0.86	0.66	0.75	0.90	0.74	0.63
France	0.73	1.05	1.00	0.84	0.70	0.84	0.76	0.46	0.60	0.70	0.69	0.39
Germany	0.69	0.99	0.97	0.81	0.69	0.80	0.80	0.32	0.77	0.82	0.82	0.25
Greece	0.78	1.09	0.99	0.90	0.93	0.81	0.75	0.61	0.74	0.67	0.67	0.50
Ireland	1.00	1.20	1.17	0.88	1.30	1.32	1.26	0.68	1.55	1.54	1.50	0.87
Italy	0.98	1.21	0.96	0.70	0.88	0.94	0.76	0.37	0.68	0.81	0.78	0.41
Japan	0.85	1.14	0.99	0.98	1.05	1.13	0.87	0.65	0.78	0.82	0.69	0.45
Luxembourg	0.80	1.06	1.01	0.94	1.20	1.15	1.04	0.72	1.44	1.25	1.10	0.67
Netherlands	0.54	1.01	1.00	0.99	0.36	0.57	0.60	0.53	0.33	0.53	0.57	0.53
Norway	0.83	0.99	0.99	0.71	0.85	0.88	0.95	0.52	0.78	0.75	0.83	0.43
New Zeland	0.72	1.00	0.98	0.87	0.85	0.94	0.83	0.61	0.80	0.81	0.64	0.46
Portugal	0.64	1.12	1.08	0.77	1.14	1.55	1.31	0.49	1.01	1.25	1.10	0.42
Spain	0.66	1.00	0.98	0.98	1.11	1.02	0.96	0.73	0.72	0.75	0.77	0.55
Sweden	0.83	1.09	1.14	0.96	1.13	1.17	1.26	0.78	1.29	1.33	1.56	0.78
Switzerland	0.67	1.04	1.01	0.88	0.93	1.25	1.07	0.59	0.87	1.22	1.19	0.59
United Kindom	0.81	1.09	1.05	0.82	1.16	1.40	1.08	0.67	1.45	1.39	1.04	0.58
United States	0.68	1.00	1.00	0.94	0.75	0.85	0.84	0.56	0.74	0.88	0.80	0.55
median	0.73	1.05	0.99	0.88	0.88	0.94	0.86	0.60	0.77	0.82	0.77	0.53
mean	0.75	1.05	1.01	0.88	0.90	1.01	0.91	0.59	0.85	0.93	0.87	0.53

Note: ratio of the root mean square error of the Global inflation model forecast to the one obtained with a random walk model (equation (9) in the main text), an AR(4) (equation (8) in the main text), a factor augmented AR(4) (equation (7) in the main text) and a Phillips augmented with commodity prices and money (equation (6) in the main text). Evaluation period: 1980-2004.

Figure 1: Measures of Global Inflation

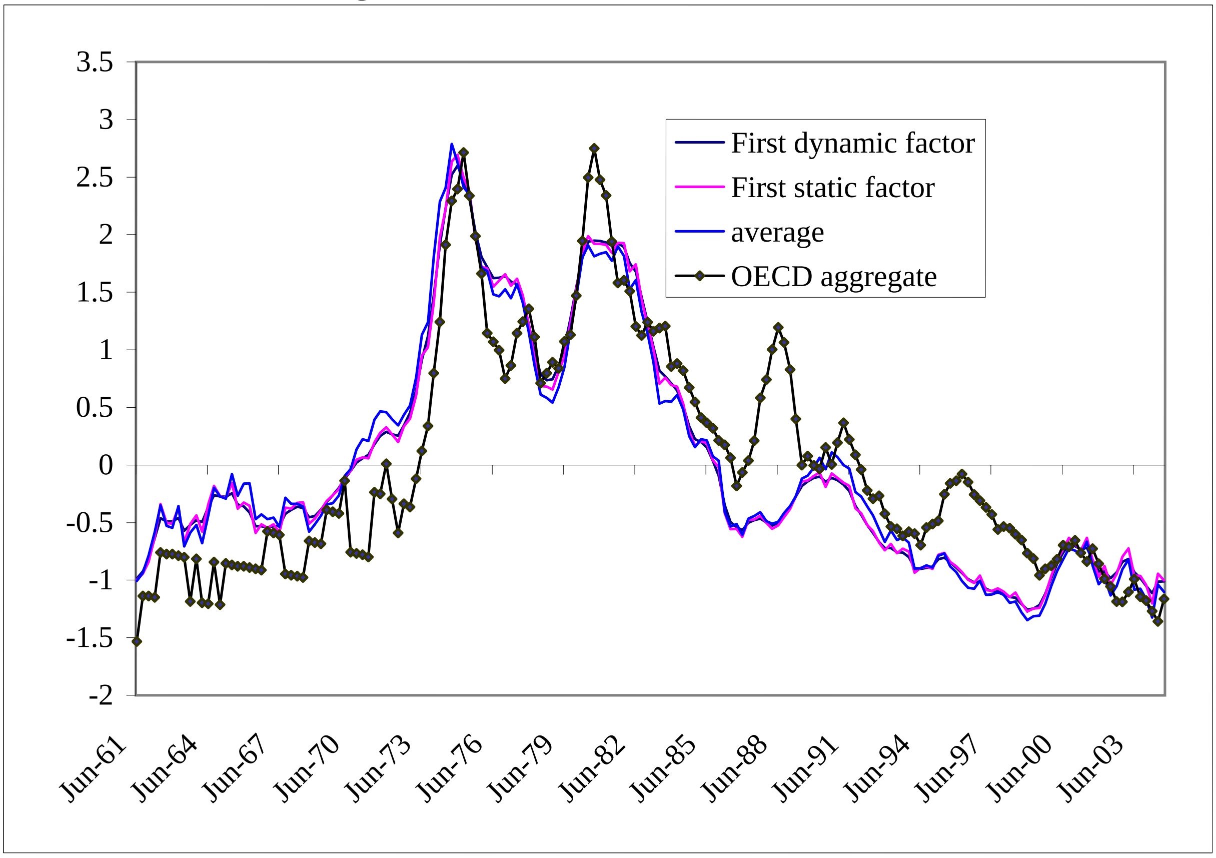


Figure 2a : G7 and euro area inflation and their projection on Global Inflation

United States, Japan, Canada and United Kingdom (1965-2004)

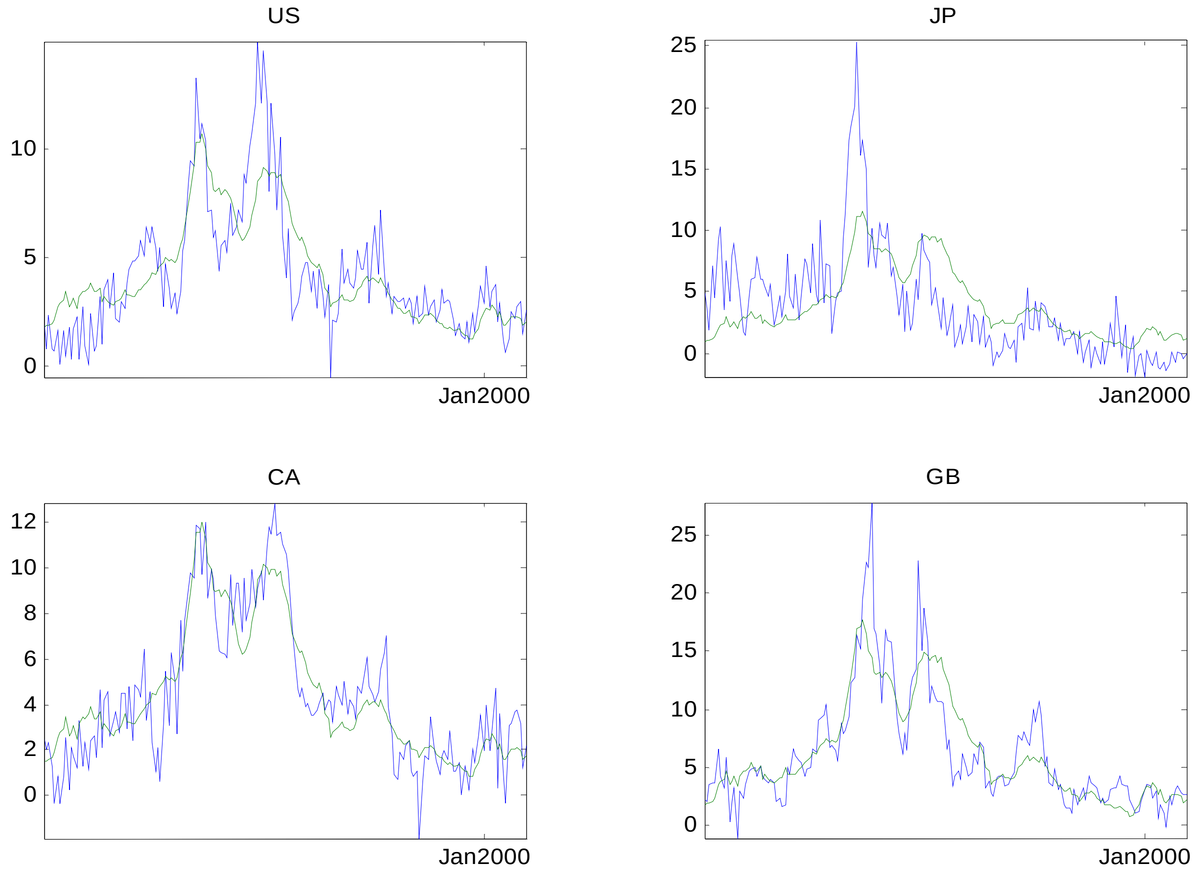


Figure 2b : G7 and euro area inflation and their projection on Global Inflation

United States, Japan, Canada and United Kingdom (1965-2004)

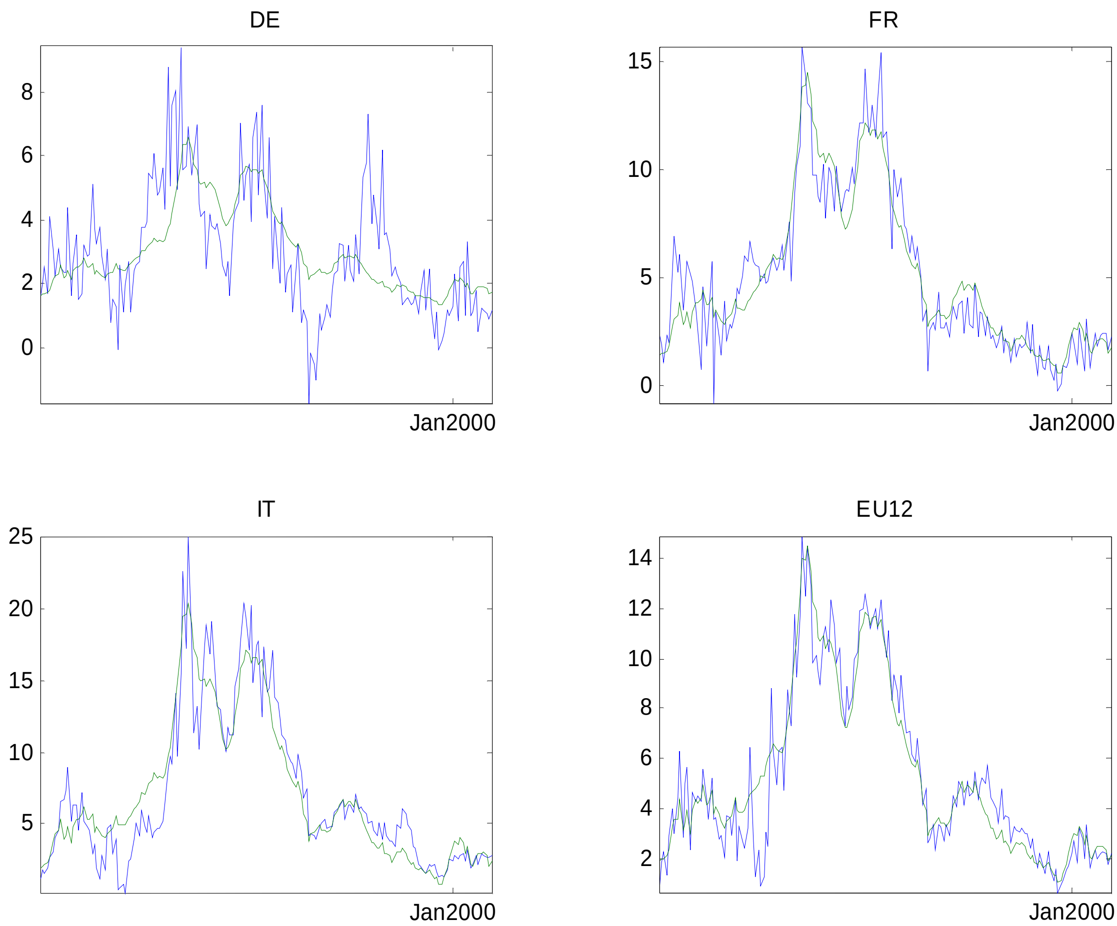


Figure 3: Measures of Global de-trended Inflation

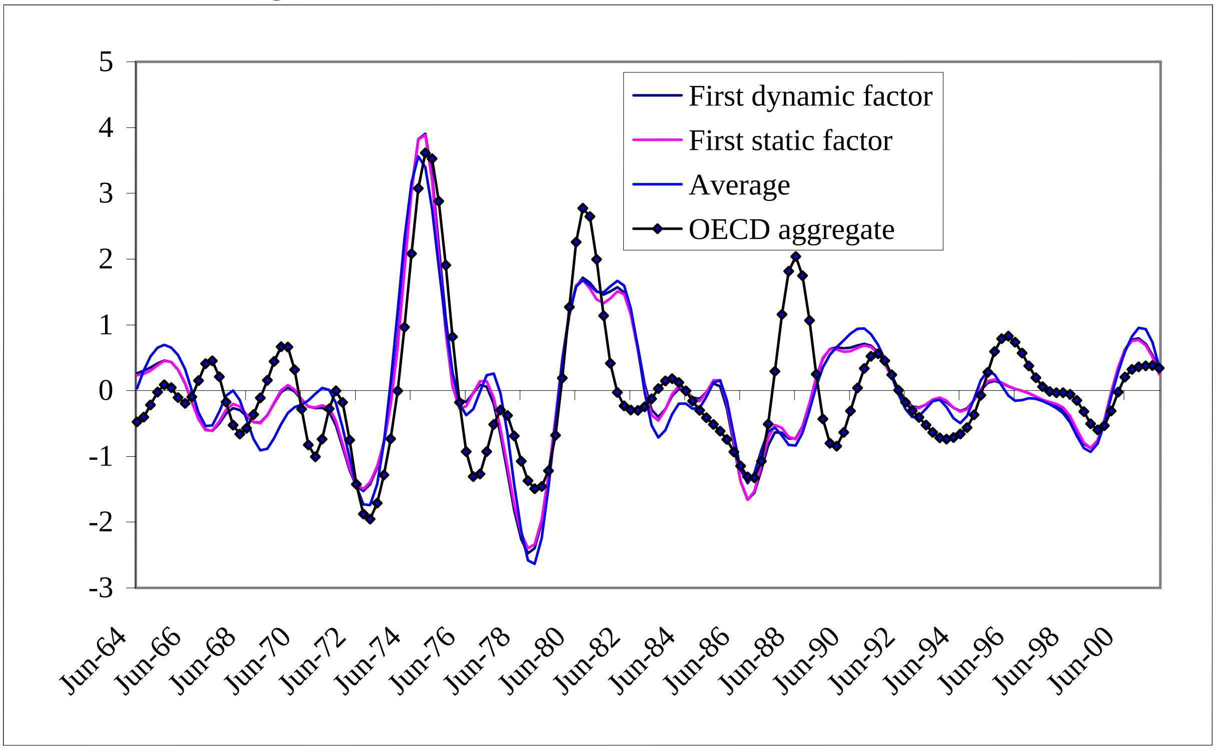
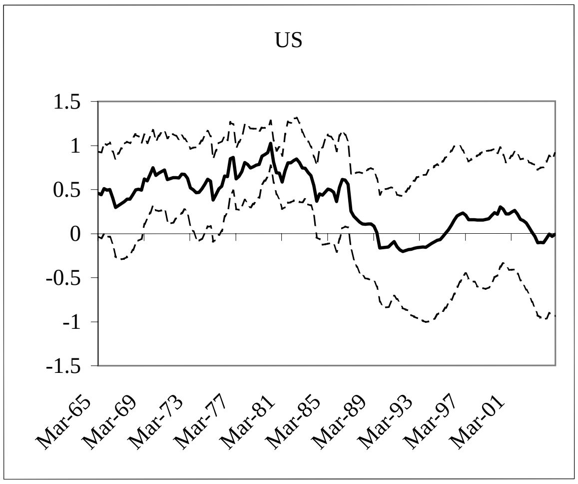
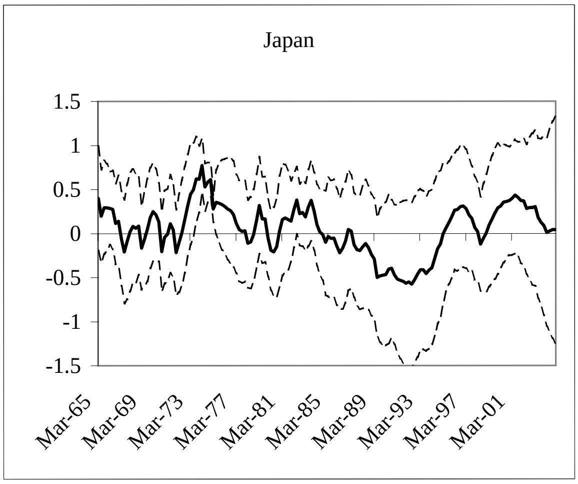
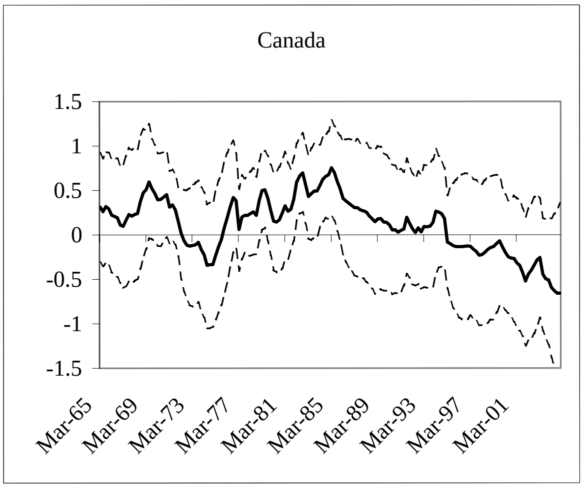


Figure 4a: Persistence in the G7 countries and the euro area

United States, Japan, Canada and United Kingdom (1965-2004)







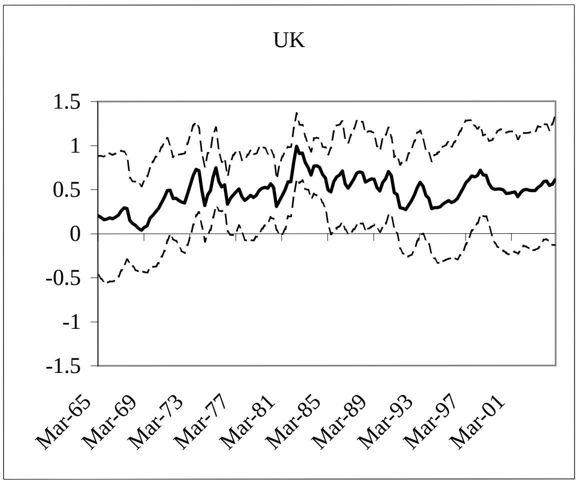


Figure 4b: Persistence in the G7 countries and the euro area

Germany, France, Italy and euro area (1965-2004)

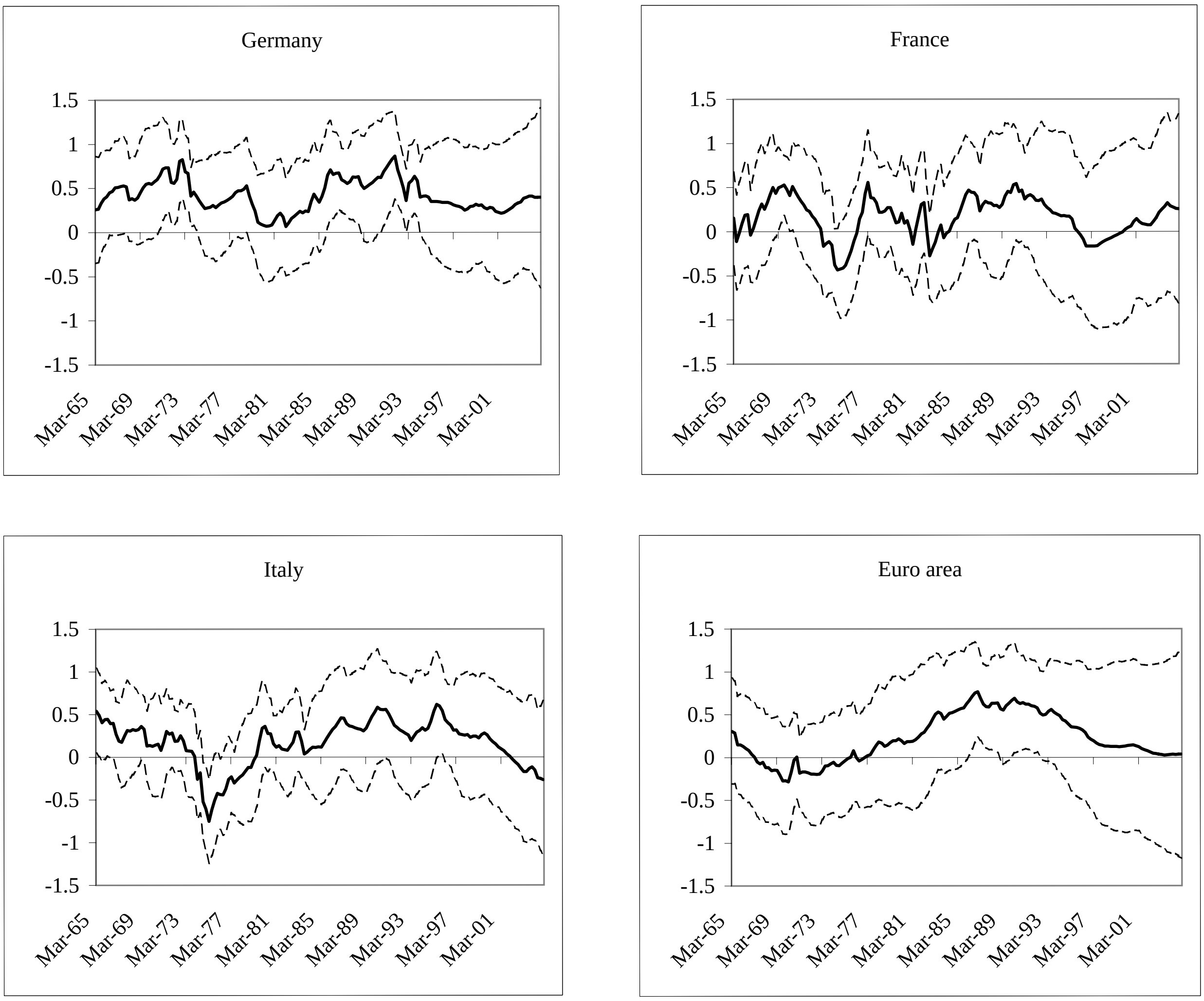


Figure 5: Persistence of Global inflation

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