BANK FOR INTERNATIONAL SETTLEMENTS

BIS Working Papers

No 582

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by Jonathan Kearns

Monetary and Economic Department

September 2016

JEL classification: C53, E31, E37

Keywords: Global inflation, inflation forecasts, survey forecasts

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This publication is available on the BIS website (www.bis.org).

ISSN 1020-0959 (print)
ISSN 1682-7678 (online)

Global inflation forecasts[1]

Jonathan Kearns[2]

Abstract

Inflation co-moves across countries and several papers have shown that lags of this common inflation can help to forecast country inflation. This paper constructs forecasts of common (or 'global') inflation using survey forecasts of country inflation. These forecasts of global inflation have predictive power for global inflation at a medium horizon (12 months) but not at a longer horizon. Global inflation forecasts, and forecast errors, are correlated with survey forecasts and errors of oil and food prices, and global GDP growth, but not financial variables. For some countries, forecasts of global inflation improve the accuracy of forecasting regressions that include survey forecasts of country inflation. In-sample fit and out-of-sample forecasting exercises suggest that forecasts of global inflation generally contain more information for forecasting country inflation than do lags of global inflation. However, for most countries, lagged or forecast global inflation does not improve the accuracy of survey forecasts of country inflation. Whatever information global inflation may include about country inflation, for most countries it seems that survey forecasts of country inflation have historically already incorporated that information.

Keywords: Global inflation, inflation forecasts, survey forecasts

JEL classification: C53, E31, E37

[1] Thanks to Raphael Auer, Andy Filardo, Aaron Mehrotra, and James Yetman and to seminar participants at the Bank for International Settlements and European Central Bank for helpful comments. The views presented here are solely those of the author and do not necessarily represent those of the Bank for International Settlements.

[2] Bank for International Settlements. Email: jonathan.kearns@bis.org.

1. Global inflation

It is well documented that inflation co-moves across countries, and a growing literature has shown that country inflation tends to revert toward the rate of global inflation. Importantly, this means that global inflation can help to forecast country inflation (see for example Ciccarelli and Mojon 2010, Hakkio 2009, Ferroni and Mojon 2015, and Duncan and Moarinez-Garcia 2015). With inflation seemingly increasingly difficult to model in many economies, as the relationship between inflation and measures of domestic slack weakens, this is an important finding. This global contribution to domestic inflation has attracted significant central bank attention (see for example Carney 2015, Draghi 2015 and Jordan 2015).

Given the apparent importance of global inflation, it is natural to ask: is global inflation forecastable? Moreover, if it is, do those forecasts help to forecast country inflation? This paper addresses these two important questions. It further contributes to the literature that has used global inflation to forecast country inflation by using survey-based forecasts of country inflation for a wide panel of countries, in contrast to univariate models that have been used in much of the existing literature.

Even at a country level, it is difficult to forecast inflation using a model of its determinants given uncertainty about the nature of, and changes in, the structural relationships. The usual difficulties with accurately measuring the underlying determinants add to these challenges. At a global level, this is potentially even more complex given the differences in the inflation process across countries and the challenges of collating comparable data. For this reason, this paper uses survey forecasts of country inflation to produce a forecast of global inflation. Using survey forecasts to produce the global forecast is a promising approach given Faust and Wright (2013) find that subjective forecasts generally outperform model forecasts (at least for the United States).

The usefulness of global inflation forecasts for understanding global inflation dynamics and forecasting country inflation depends on why inflation co-moves across countries and so what additional information they contain. One obvious driver of global inflation is common shocks, most notably changes in the prices of oil and food. In particular, oil and food prices may have a significant common effect on country inflation if central banks see them as temporary shocks and so do not offset them. More generally, similarities in central banks' framework for monetary policy and the way they respond to global and common shocks, can result in co-movement of inflation across countries as argued by Rogoff (2003). In particular, countries with fixed exchange rates are likely to have greater co-movement of their inflation as the exchange rate cannot cushion domestic prices from external shocks.

Co-movement in inflation could also result from a global business cycle driven by common real shocks, such as productivity, or even financial spillovers. However, co-movement in countries' own economic growth, and transmission of external demand shocks through trade in goods and services, do not appear to be able to explain all of the co-movement in prices. Henricksen, Kydland and Sustek (2013) and Wang and Wen (2007) both show that nominal variables are more correlated across countries than is real output. In addition, Pain, Koske and Sollie (2008) find that the impact on domestic prices of import prices is larger than the share of imports in domestic demand, suggesting the impact of global inflation on domestic inflation is more than a purely mechanical link. Global prices seemingly put pressure on the prices of domestically produced items. There is some evidence that country inflation responds to global output gaps, suggesting that pricing power is influenced by external slack (see Bianchi and Civelli 2015, and Borio and Filardo 2007) although this is not conclusive (for example, Ihrig et al 2010).

Overall, it is not clear how much of the co-movement in country inflation is attributable to each of these possible drivers. Indeed, Neely and Rapach (2011) find that the share of country inflation explained by a world factor relates to a wide range of factors, including: openness to trade, institutional quality, financial development, average real GDP per capita, average inflation, inflation volatility, and central bank independence. Some of this information may already be contained in forecasts of domestic inflation based on the usual drivers, such as labour market slack, wage growth and import prices. However, global inflation may also contain amorphous information, such as difficult to quantify common shocks or the pressure placed on domestic price setters by the threat of external competition. Hence, global inflation outcomes and forecasts may help to forecast domestic inflation.

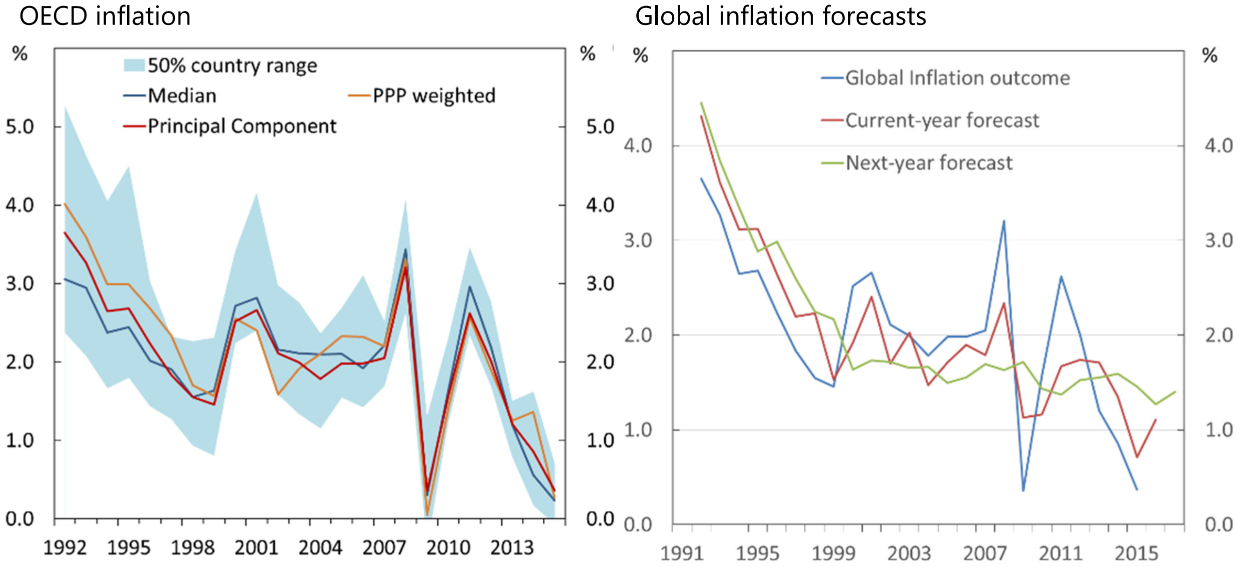
The outline of this paper is as follows. Section 2 presents the construction of the measures of global inflation forecasts and outcomes, and forecast errors. Section 3 further explores the relationship that global inflation forecasts and outcomes have with the forecasts and outcomes of a selection of probable drivers of global inflation for which forecasts are available, in particular oil and food prices and the global business cycle. Section 4 examines the accuracy of the survey-based forecasts of global inflation, and whether they can improve the accuracy of survey forecasts of country inflation.

2. Aggregating country inflation and forecasts

The co-movement of inflation across OECD economies is readily apparent over the past two decades. The range of country inflation rates in the left-panel of Graph 1 demonstrates that even after the common structural decline in inflation in the early 1990s, cyclical movements in inflation have coincided across countries. The past decade has seen sharp swings in inflation that have been reflected in most countries' inflation rates, not only with the financial crisis but also with recent very low rates of inflation. Further, the range of inflation rates has seemingly narrowed over time, suggesting that the common drivers of country inflation rates may be increasing in influence. (The narrowing in the range of inflation is even more striking for a larger group of 54 countries, as shown in Appendix Graph C1.)

In much of the existing literature, global inflation has been measured as a common factor of country inflation rates, most simply as a static factor derived using principal components analysis. Ciccarelli and Mojon (2010) and others have found that weighted measures of global inflation, such as PPP weighted aggregate inflation, generally underperform statistical measures such as principal components, or even unweighted averages. In this paper, global inflation, $\pi_{g,t}$, is constructed as the first principal component of the matrix of demeaned and standardised country inflation rates, Π_t (see Stock and Watson 2002 for details on this now standard technique). Countries' inflation rates are the sum of a global component ($\Lambda\pi_{g,t}$) and a country-specific orthogonal component, given by the vector ε_t, as shown in Equation (1). The parameter vector Λ contains the sensitivity of each countries' inflation rate to global inflation.

Graph 1



Note: Based on 21 OECD countries given in Table A1. Series in right hand panel are first principal components. The principal component measures are reflated with the mean and standard deviation of the median inflation rate for comparison purposes.

$$\Pi_t = \Lambda \pi_{g,t} + \varepsilon_t \tag{1}$$

The panel of countries used to construct global inflation is 21 OECD economies (those for which forecasts are available, as listed in Appendix A) over the period 1992 to 2015. The country inflation rates are annual average rates for headline CPI inflation, as this is the measure covered by the forecasts used in this paper. Over the period, the first principal component (referred to as the 'first factor' for brevity) explains about half of the variance in country inflation rates. This proportion is similar to that found with quarterly year-ended inflation (Ferroni and Mojon 2015). Various robustness exercises are shown in the paper and Appendix using alternative weighting schemes of PPP and equal weights to construct the global inflation measure.

Just as global inflation is measured as the first principal component of country inflation rates, forecast global inflation is constructed here as the first principal component of surveyed forecasts of inflation rates in each country.[3] For the matrix of j-year forecasts, F_t^j, (where $j = 1{,}2$) the global inflation forecast is given by $f_{g,t}^j$ (Equation (2)). The forecasts used are Consensus Economics surveys of private sector forecasts, taken in January for annual average inflation in the current calendar year and next calendar year (see Appendix B for further details on the forecasts used in this paper). Consensus forecasts are well suited to this exercise as they are available for a long period for large number of countries (54 countries are used in this study) and are measured at the same time and on the same basis for most countries.

$$F_t^j = \Psi f_{g,t}^j + \epsilon_t \tag{2}$$

For comparison purposes, global inflation forecast errors are calculated in an equivalent manner from the individual country forecast errors $(\pi_{c,t+j} - f_{c,t}^j)$. Note, this is not the forecast error of global inflation, which would be the difference between

[3] Friedrich (2014) has also used the first principal component of country inflation forecasts as a forecast of global inflation, but in the context of a global Philips Curve.

forecast and realised global inflation $(\pi_{g,t+j} - f^{j}_{g,t})$, but is the common component of individual country forecast errors. As such, it can show the importance of global shocks to forecast errors for individual countries.

The right-hand panel of Graph 1 shows the forecasts for global inflation at one- and two-year horizons. It is clear from the graph that current-year forecasts of global inflation picked the direction of larger moves in inflation, such as the early 2000s pick-up and large cycle around the financial crisis, although they have underestimated the full amplitude of the global inflation cycle. In contrast, next-year forecasts are very stable and do not clearly pick cycles in global inflation.

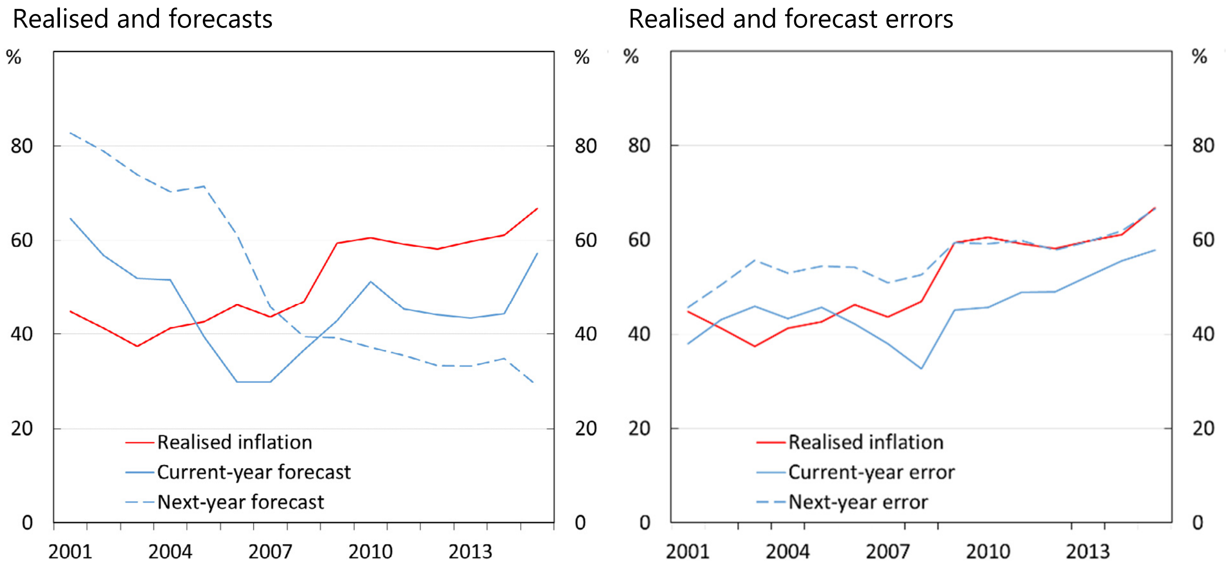
The narrowing of the range of country inflation rates seen in Graph 1 suggests that the global drivers of inflation might have become more important over time, as Borio and Filardo (2007) and others have suggested. Graph 2 shows the share of the variance explained by the first factor using 10-year rolling windows. Over the first 10 years (1992–2001) the first factor accounted for 40 per cent of the variance in country inflation rates, but by the last 10 years (2005–2015) this had increased to 60 per cent. Most of this increase occurs when the financial crisis episode enters the sample, and so it remains to be seen whether this was a one-off highly correlated shock, or represents a permanent increase in the importance of global determinants of inflation. The increase in co-movement is not confined to the OECD countries used to construct this measure of global inflation. Using a much broader measure of global inflation constructed from 54 countries' inflation rates, but over a shorter sample period from 1996, the share of the variance accounted for by global inflation has also trended higher (see Appendix Graph C3).

The share of country variance accounted for by a common factor can also be calculated for the forecasts of country inflation rates and the country forecast errors. For current-year and next-year forecasts, the share of variance explained by a common factor declined substantially from the early samples. In the early samples, the structural decline in inflation represents a large part of the movement in forecasts given they display less year-to-year movement than realised inflation (left-hand panel of Graph 2). In the later samples, this share of the variance was smaller for forecasts than for realised inflation (40 per cent versus 60 per cent). In contrast, the share of the variance in country inflation forecast errors explained by a common factor trended higher over the period, broadly in line with the increase in the share for realised inflation (right-hand panel of Graph 2). At least more recently, when the structural decline in inflation does not cloud the interpretation, the lower share of the variance of forecasts explained by a common factor than for realised inflation (and forecast errors) could indicate that forecasts do not fully reflect the contributors to co-movement of inflation across countries.

Some countries are seemingly more sensitive to global inflation than others, as shown by a regression of individual countries' inflation on the measure of global inflation (ie Equation (1)). The left-hand panel of Graph 3 orders the 21 OECD economies used to construct global inflation by the R^2 from these regressions. Countries in the euro area, who had a common exchange rate and monetary policy for much of the sample period, tend to have a higher share explained. In contrast, the inflation rates of a few lower income OECD economies, as well as Norway and Japan, have with little relationship with global inflation.

The inflation rates of the economies not in the OECD sample do not have as strong a relationship with global inflation, as seen in the right-hand panel of Graph 3. The average R^2 for these other countries from a regression of country inflation on global inflation is just 0.14, substantially less than the 0.52 for OECD economies. In part, this reflects that their inflation rates are not used in the construction of the global inflation measure. When global inflation is constructed with all 54 countries used in this study, the average R^2 from a regression of country inflation on this broader measure of global inflation is much higher at 0.27, but that for the OECD economies is still higher at 0.40. The global inflation forecast error series constructed using all 54 countries continues to have a much stronger relationship with the forecast errors of the 21 OECD economies than the other 33 economies (average R^2 of 0.43 for the OECD economies versus 0.20 for the others, see Appendix Graph C2). For this reason, this paper follows much of the existing literature and constructs global inflation using OECD economies.

Share of country inflation explained by single common component — Graph 2



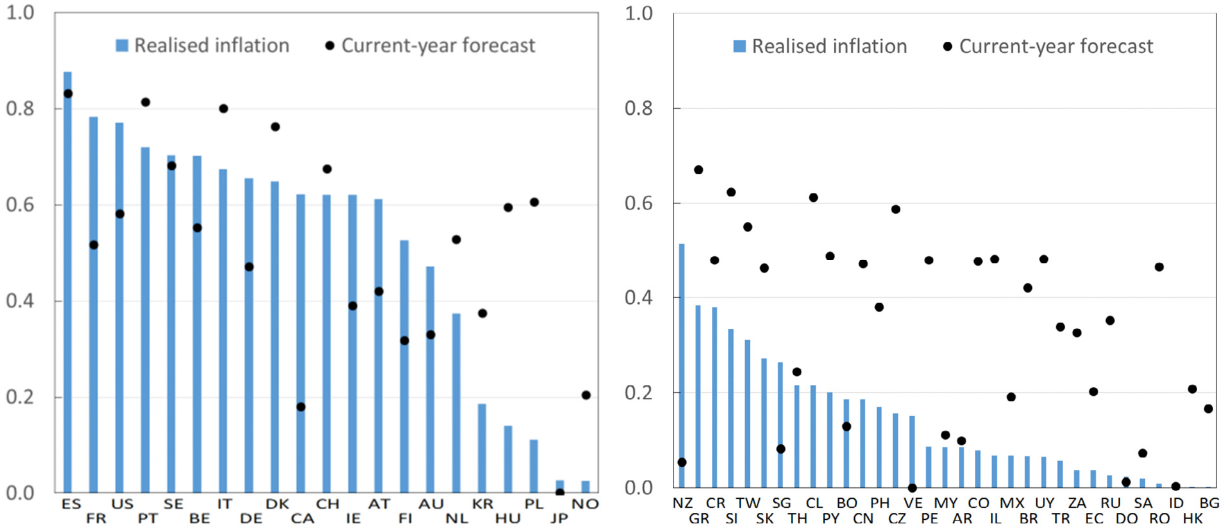
Notes: Share of variance explained by the first principal component; 10-year rolling windows ending in the year shown.

Forecasts of country inflation also have a strong relationship with the global inflation forecast. However, across countries, the strength of this this relationship only weakly reflects the strength of the relationship between realised inflation and global inflation. For the OECD economies, the average R^2 from a regression of the country inflation forecast on the global forecast is 0.51. Countries with domestic inflation rates more closely related to global inflation generally have forecasts more closely tied to the global forecast, but the connection is not overwhelming (Graph 3). For countries such as Canada and France for which inflation is strongly related to global inflation, forecast inflation has a much weaker connection to forecast global inflation. Yet for Hungary and Poland, where realised inflation has little relationship with global inflation, the forecasts of country inflation do have a strong correlation with forecasts of global inflation. Both realised and forecast inflation in Japan has no correlation with global inflation.

For those countries not in the global measure, their forecasts are more highly correlated with forecast global inflation than would be expected given the weaker relationship their realised inflation rate has with global inflation. For the current (next) year forecasts, the average R^2 from a regression of the country inflation forecast on the global forecast is 0.33 (0.56), in contrast to the 0.51 (0.64) for OECD economies.

Fit from country inflation (forecasts) regressed on global inflation (forecasts) Graph 3

OECD economies | Other economies

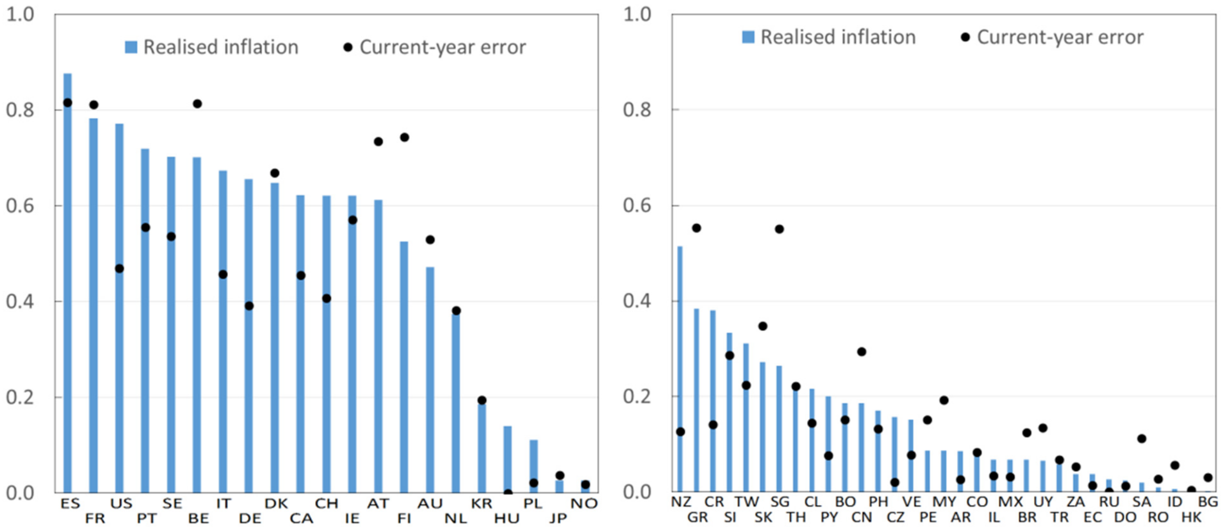


Notes: R2 from a regression of country inflation (inflation forecast) on global inflation (global inflation forecast).

In contrast to the pattern for forecasts, the correlation of country forecast errors with the global forecast error more closely mirrors the strength of the correlation for realised inflation (Graph 4). Countries with high correlation of realised inflation with global inflation also have a high correlation of forecast errors with global forecast errors. Similarly, just as the economies not in the global measure have a low correlation of realised inflation with global inflation they also have a low correlation of forecast errors with global forecast errors (the average R^2 for these economies is 0.14, in contrast to 0.46 for the OECD countries).

Fit from country inflation (forecast errors) regressed on global inflation (errors) Graph 4

OECD economies | Other economies



Notes: R2 from a regression of country inflation (inflation forecast) on global inflation.

3. Understanding global inflation forecasts

As discussed above, there are many reasons why inflation may co-move across countries. This section looks at a few of the more common possible explanations, in particular those for which there are forecasts comparable to those for inflation. Realised global inflation is regressed on realisations for global GDP growth, oil price inflation, food price inflation, changes in the US dollar and changes in the short-term US interest rate. Equivalent regressions are run also for forecasts and forecast errors. The forecasts for GDP growth, oil prices, the US dollar and US interest rate are all sourced from Consensus and so are made at the same time and under the same conditions as the inflation forecasts. The food price forecasts are from the IMF, as Consensus does not survey food prices, and are from the WEO prior to the Consensus survey so they reflect the information that Consensus participants would have had at the time of the inflation forecast survey. Appendix B has more detail on the forecasts.

It is important to note that where these regressions estimate contemporaneous relationships they should be interpreted as correlations rather than causal relationships. Inflation is obviously endogenously determined with these other major macro variables. Since global inflation by construction has zero mean and unitary standard deviation, the explanatory variables are similarly standardised so that the magnitudes of the regression coefficients are comparable. Given the limited length of the sample, bivariate regressions are estimated to examine if there is a lagging relationship between the variables (these are reported in Appendix Table C1), and then multivariate regressions to test whether the bivariate results hold up in the presence of other variables.

The global business cycle may be a significant driver of global inflation for a number of reasons. Most notably, shocks to demand, or supply, in any particular country can spill over to prices in other countries through trade channels if these are not fully offset by exchange rate movements. Price pressures in one region can also influence prices in another through implicit competition, say the potential to change suppliers, even if there is no direct trade. To the extent that demand for assets is correlated with aggregate demand, international capital flows could also lead to a spillover of price pressures.

Realised inflation is found to be positively correlated with global GDP growth (measured in the same way as global inflation, as the first principal component of country GDP growth rates). Consistent with the time that it takes for developments in the real economy to affect prices, global inflation is found to have a stronger relationship with the first lag of global GDP growth and so the lag is included in the multivariate regressions.

Not surprisingly, global inflation has a strong contemporaneous relationship with oil price inflation (coefficient 0.61, R^2 of 0.37, in Table C1). Pass-through from oil prices to inflation is faster than for real activity, with the lag of changes in the oil price not significantly related to global inflation. Food price inflation also has a strong and contemporaneous relationship with and global inflation. Contemporaneous oil and food price inflation are included in the multivariate regression.

The US dollar exchange rate could affect global inflation given its prominent role as a unit of account in international trade. The currency of denomination of imports can influence the extent of pass-through of shocks to import prices (see Gopinath 2015 and references in that paper). In addition, the oil and food prices used in the preceding regressions are in US dollars while global inflation is an aggregate of country inflation measured in local currency terms. Movements in key commodity prices, such as oil, often also coincide with changes in the US exchange rate. Changes in the US dollar exchange rate could then be related to local currency inflation rates for oil and food prices and so have an impact on global inflation.

The lagged change in the US dollar rate is included in the multivariate regressions as it has a slightly larger coefficient in the bivariate regression than the contemporaneous change (both are significant although strangely negative, implying that foreign currency depreciation is associated with lower global inflation).

Global financial conditions may also influence global demand and so global inflation. The three-month US Treasury bill rate is used to proxy global financial conditions given its prominence, and the central role of the US dollar in the global financial system. The lagged US interest rate has a stronger relationship with realised global inflation (although it is not statistically significant) and so it is included in the multivariate regressions.

In the regression of realised global inflation, three explanatory variables – global GDP growth, oil prices and food prices – are all statistically significant, and together account for 80% of the variance in global inflation. It is surprising that the strongest relationship is with food price inflation and this coefficient is double that on oil. The average weight on food and non-alcoholic beverages in the CPI of OECD economies is not large, at only around 14 per cent and this would include a substantial amount of domestic non-traded costs including labour. While the average weight of energy is smaller at just under 9 per cent, energy also has an indirect effect on the CPI as a production input. The strong relationship of food price inflation with global inflation is also surprising given that changes in food prices are usually associated with supply shocks rather than demand shocks and so are unlikely to proxy for price pressures for non-food CPI components. It is also notable that global GDP growth has a larger, and more significant, coefficient than the oil price, indicating that the relationship of global inflation is stronger with real drivers than the oil price, which garners substantial attention. This is consistent with the finding of Borio and Filardo (2007) that global output gaps have a large effect on country inflation.

Global inflation relationships

Table 1

	Realised inflation		Current-year inflation forecast		Next-year inflation forecast		Current-year forecast error		Next-year forecast error	
Lagged Global GDP	0.37**	0.35***	0.46**	0.48***	0.83***	0.87***	0.12	0.03	0.01	0.12
Oil price	0.28*	0.25*	0.30	0.26	0.22	0.51**	0.32*	0.37**	0.25	0.25
Food price	0.53***	0.51***	0.24	0.08	0.20	0.24	0.75***	0.69***	0.66***	0.62***
Lagged US dollar	0.09		0.28		0.55**		-0.05		0.05	
Lagged US interest rate	-0.01		0.16		0.18		-0.20		0.15	
R^2	0.81	0.80	0.60	0.52	0.69	0.53	0.77	0.74	0.74	0.73

Notes: Models contain a constant; Newey-West heteroscedasticity and autocorrelation consistent standard errors; ***,** and * indicate statistically different from zero at the 1, 5 and 10 per cent significance level. Sample 1995-2015, 21 countries as listed in Appendix A. To reflect information timing the following forms of the explanatory variables are used: for realised inflation, the realised value of the explanatory variable; for the current-year inflation forecast, the current-year forecast of the explanatory variable and the lagged realised value of the explanatory variable; for the next-year inflation forecast, both contemporaneous and lagged forecasts of the explanatory variable; for the current-year forecast error, the contemporaneous forecast error of the explanatory variable; and for the next-year forecast error, the contemporaneous and lagged forecast errors of the explanatory variable.

Forecasts of oil and food prices do not have a strong relationship with global inflation forecasts, with the exception of the oil price forecast and next-year inflation forecast. Given realised inflation has a strong relationship with these commodity prices, this raises the question of whether the global inflation forecast sufficiently incorporates expected commodity price movements, or perhaps this result reflects the relatively poor predictive accuracy of oil and food price forecasts. In contrast, unexpected developments in food prices and oil prices (for the current-year) do have a strong relationship with global inflation forecast errors, as does the food price for the next year.

4. Forecast performance

As discussed in Section 2, the survey forecasts of global inflation appear to contain information about future movements in global inflation. This section investigates the forecasting content more formally by examining the out-of-sample forecast performance and in-sample contribution to fit from global inflation. The analysis uses Equation (3) where global inflation at time $t + j$ is regressed on the j-horizon forecast of global inflation (for $j = 1{,}2$ years) from time t and/or the time t global inflation rate.

$$\pi_{g,t+j} = c + \beta_1 f_{g,t}^{j} + \beta_2 \pi_{g,t} + \epsilon_t \quad (3)$$

The rolling regressions used for the out-of-sample forecasting exercise use the survey-based forecasts and lagged inflation data that were both available at the time the forecast would have been made. As these data are typically not revised it is akin to a real-time forecasting exercise. This approach provides a good test of the predictive content of global inflation.

Global inflation is persistent. With no forecasts in the model, the coefficient on the first lag is 0.4, is statistically significant, and is able to account for around one-fifth of the variation in the series (Table 2, column (i)). However, the persistence is limited. In the regression for next-year inflation, lagged global inflation (which is a two-period lag) is not statistically significant.

The forecasts of global inflation have greater in-sample explanatory power than lagged global inflation. For the current year, the survey based forecast is highly significant and can account for almost two-thirds of the variance in global inflation (column (ii)). However, the coefficient on the forecast is less than one indicating that the survey-based forecast contains some noise. When both the forecast and lag are included, the lag is not significant (and even has a negative sign) and the forecast remains highly significant. For next-year inflation, the forecast is again highly significant and explains around one-quarter of the variance in global inflation. Given the results in Table 1 suggested that forecasts of global inflation may not sufficiently incorporate oil and food price forecasts, global inflation may be more accurately predicted by including forecasts of oil and food prices along with the survey-based global inflation forecast. Table C2 provides some evidence that this may be the case, although it is worth noting that in the sample up to 2001 (when the out-of-sample forecasting exercise begins) global GDP and oil price forecasts were not significant. To avoid the risk of over-fitting, and look-ahead bias, the inflation forecasting exercise that follows is restricted to use only the global inflation forecast and not forecasts of global GDP, oil price inflation and food price inflation.

Models of global inflation Table 2

	Current-year global inflation			Next-year global inflation		
	(i)	(ii)	(iii)	(i)	(ii)	(iii)
Lagged global inflation	0.41*		-0.29	0.30		-0.06
Global inflation forecast		0.55***	0.72***		0.32***	0.35**
R^2	0.21	0.63	0.67	0.16	0.26	0.26

Notes: Results from Equation (3). Newey-West heteroscedasticity and autocorrelation consistent standard errors are used; ***,** and * indicate statistically different from zero at the 1, 5 and 10 per cent significance level. Dependent variable is first principal component measure of global inflation from 21 OECD economies. Sample is 1992-2015. For the regression of next-year global inflation, the lag is two years so that it reflects information that would be known for forecasting. A constant is included but not shown.

As discussed in Section 2, there was a structural decline in global inflation in the early 1990s. While the survey forecasts lagged the decline, and did not anticipate the lower inflation, this will still boost the in-sample fit of these forecasts. A stronger test of the forecasts predictive content is then provided by examining their performance out-of-sample. For the out-of-sample tests, the three models in Table 2 are run recursively from an initial sample of ten years (1992-2001) with forecasts produced for current-year and next-year inflation, and the sample then extended by one year at a time and forecasts generated, until the end of the sample in 2015. Table 3 reports the mean-absolute-error (MAE) and root-mean-squared-error (RMSE) of these forecasts. For current-year global inflation, the MAE and RMSE are both noticeably lower for the predictions that include the global inflation forecast than those based on lagged global inflation alone.

Since the model containing both the lag of global inflation and the global inflation forecast nests the other two models, a Diebold-Mariano test cannot be used to test the statistical significance of the difference in the forecasts. Instead, the adjusted Mean-Square-Prediction-Error (MSPE) test of Clark and West (2007) is used to test whether the difference in the forecasting performance of the models is statistically significant (Table 3). For current-year global inflation, this test rejects the hypothesis that the model with just lagged global inflation (model (i)) has equal forecasting accuracy to the model with both lagged global inflation and the survey-based forecast of global inflation (model (iii)). However, it is not possible to reject the hypothesis that the model with just the survey global forecast (model (ii)) has equal predictive accuracy to the model with both this variable and the lag of global inflation. This indicates that, for current-year inflation, including the survey global forecast significantly improves on forecasting with just a lag of global inflation. But removing the lagged realised rate does not deteriorate the forecast accuracy. For next-year inflation it is not possible to reject the hypothesis that the models have equal forecasting accuracy.

Given global inflation is forecastable, can its forecast improve forecasts of country inflation? Ciccarelli and Mojon (2010) and others have found that the reversion of country inflation toward global inflation implies that including lagged global inflation can improve the accuracy of forecasts of country inflation. However, these papers have compared the forecasts using lagged global inflation to forecasts from standard univariate models not subjective forecasts, which are frequently more accurate (see Faust and Wright 2013). The remainder of this section examines the contribution that forecasts and lags of global inflation can make to survey-based forecasts of country inflation.

Accuracy of global inflation forecasts Table 3

	Current-year global inflation		Next-year global inflation	
Model specification:	MAE	RMSE	MAE	RMSE
(i) lagged global inflation	0.46	0.69	0.55	0.70
(ii) global forecast	0.33	0.45	0.47	0.63
(iii) global forecast and lagged global inflation	0.34	0.44	0.57	0.71
	Adjusted MSPE test statistic		Adjusted MSPE test statistic	
Model (i) vs Model (iii)	1.53*		0.26	
Model (ii) vs Model (iii)	0.79		-0.81	

Notes: MAE = Mean Absolute Error, RMSE = Root-Mean Squared Error, Adjusted-MSPE = Adjusted Mean-Squared Prediction Error (from Clark and West (2007)); Newey-West heteroscedasticity and autocorrelation consistent standard errors for the next-year adjusted MSPE test statistic; ***,** and * indicate statistically different from zero at the 1, 5 and 10 per cent significance level. Dependent variable is first principal component measure of global inflation from 21 OECD economies. Sample starts in 1992 with recursive out-of-sample forecasts from 2002 to 2015.

To assess the contribution that global inflation outturns and forecasts can make to explaining and forecasting country inflation Equations (4) to (6) are estimated,

$$\pi_{c,t+j} = c + \pi_{c,t} + \pi_{g,t} + \varepsilon_{c,t} \quad (4)$$

$$\pi_{c,t+j} = c + f_{c,t}^{j} + \pi_{g,t} + \epsilon_{c,t} \quad (5)$$

$$\pi_{c,t+j} = c + f_{c,t}^{j} + f_{g,t}^{j} + \varepsilon_{c,t} \quad (6)$$

where $\pi_{c,t+j}$ is country-*c* inflation at time *t+j*, $f_{c,t}^{j}$ is the *j*-horizon forecast of country-*c* inflation at time *t* (for $j = 1,2$ years), π_{gt} is realised global inflation and $f_{g,t}^{j}$ is the *j*-horizon forecast of global inflation at time *t*. The contribution of global inflation is assessed in two ways: the statistical significance of the lag of realised global inflation (π_{gt}) or the forecast of global inflation $(f_{g,t}^{j})$ in the full sample (1992-2015); and, the relative out-of-sample forecast performance of these three models versus variants that exclude the realised or forecast global inflation and so include only the domestic variable.

For each of the 21 OECD economies used to construct the global inflation measures, the significance of global inflation and relative forecast performance are shown in Table 7 for current-year inflation in the top half of the table and next-year inflation in the bottom half.

As a starting benchmark, in an autoregressive model of country inflation (Equation (4)), lagged global inflation only improves the fit in only one country (Australia) and does not statistically improve forecast accuracy in any countries.[4] This result contrasts with studies such as Ciccarelli and Mojon (2010) that have found that adding lagged global inflation improves simple inflation models. The weaker finding here likely reflects several factors: the smoother measure of country inflation (year-average rather than the year-ended rates more commonly used); the shorter sample period, from 1992, than used in other papers; and the more recent end of sample. As

[4] Similarly, Medel, Pedersen and Pincheira (2014) find lagged global inflation only provides meaningful improvement in forecast accuracy for a handful out of 31 OECD economies for a host of autoregressive models.

shown below, the significance of lagged global inflation has declined in the past few years.

Lagged global inflation and forecast global inflation contribute more in the models containing the survey forecast of domestic inflation (Equations (5) and (6)). For current-year inflation, for six countries lagged global inflation is statistically significant in-sample (third row), while for seven countries forecast global inflation is statistically significant (fifth row). For the majority of those countries, the coefficient on global inflation or its forecast is negative implying that when global inflation is high, country inflation is actually lower than domestic survey forecasts imply. Indeed, lagged or forecast global inflation is highly significant and negatively signed for Australia, Canada and Norway, three economies whose substantial commodity exports mean that their exchange rates are typically positively correlated with commodity prices, providing some offset to the inflationary impetus from commodity price movements that contributes to global inflation.

The out-of-sample country inflation forecasts suggest that forecast global inflation slightly outperforms lagged global inflation, although for both the contribution to forecast accuracy is minimal. The out-of-sample are produced iteratively from an initial sample of 1992-2001. Because the models are nested, the Clark-West adjusted-MSPE test is used to test whether the forecasting performance is statistically different. For current-year inflation, for only two countries (Australia and Norway) the model containing lagged global inflation produces statistically more accurate forecasts than the model without (fourth row of Table 7). For four countries (Australia, France, Italy and Norway), the model containing forecast global inflation produces statistically more accurate forecasts than the model excluding this global measure (sixth row).

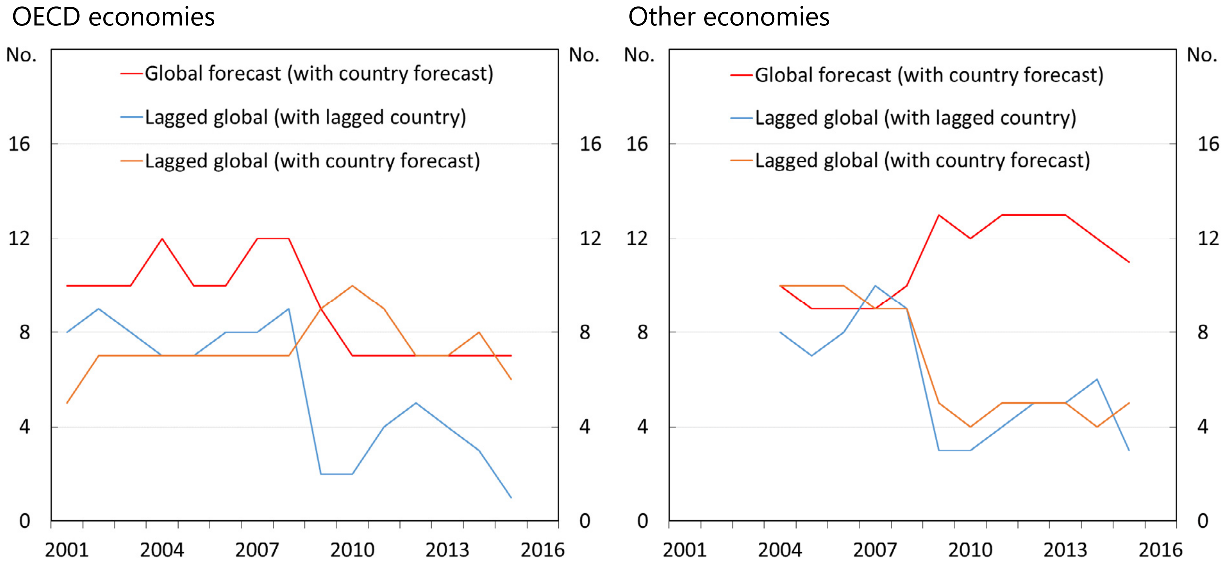
For next-year forecasts of country inflation (the bottom half of Table 7) the results are similar to those of current-year inflation, although slightly more favourable to lagged global inflation. Lagged global inflation is significant in-sample for five (three) countries when combined with lagged (forecast) domestic inflation. The forecast of global inflation is significant for eight countries (when combined with the survey forecast of domestic inflation). The countries with a significant role for global inflation mostly differ from those for current-year inflation. Out-of-sample, lagged and forecast global inflation statistically improve forecast accuracy in only one to three countries. Given the test is performed for 21 countries, this strike rate is only just above what would be expected from a purely random relationship. Overall, for next-year inflation, global inflation or its forecast cannot improve on survey forecasts of country inflation.

The channels through which global inflation influences country inflation are quite general and so this measure of global inflation may also contain information for inflation in other countries. To assess this, the same tests performed for the 21 OECD economies are repeated for 33 other countries for which Consensus forecasts are available. A few of these are OECD economies, which were not included in the global measure because of a year of missing forecasts, but most of these other countries are emerging markets. For many of these countries Consensus forecasts are not available as far back as 1992 and so a shorter sample is used (the list of countries and their start date is contained in Appendix Table A2). The results of the in-sample significance of forecast or realised global inflation and out-of-sample forecasts are contained in Tables 8a and 8b. The results are broadly similar to those for the OECD economies. For current-year inflation, for 11 countries the forecast of global inflation is significant (fifth row) and for eight the test rejects that the forecasting performance is not improved by the inclusion of the global inflation forecast (sixth row). However, the lag of global inflation does not provide as much assistance in forecasting inflation, it is significant for only three and five countries and improves forecasts for only three and four out of 33 countries.

For next-year inflation, the forecast of global inflation appears to contain information helpful for forecasting inflation in many of these countries. The forecast of global inflation is significant in-sample in 18 of the 33 countries, and it improves the out-of-sample forecast accuracy in ten of them. In six countries (Argentina, Brazil, Bulgaria, Greece, Russia and Slovakia) the forecast of global inflation is both significant in-sample and improves forecast accuracy out-of-sample. Again, lagged global inflation is less beneficial, improving the forecast in only four and five countries.

The results on forecast accuracy using realised and forecast global inflation are robust to alternative measurement of the global inflation and forecast (see Appendix Table C4). In general, the results already presented are very similar to those when the global forecasts are instead weighted using the principal component weights from realised inflation (rather than the principal component weights from the forecasts themselves) or alternatively using equal weights on each country. Slightly fewer countries experience an improvement in forecast accuracy and in-sample fit when global inflation is constructed using PPP weights.

Significance of global inflation in forecasting equations — Graph 5



Notes: Number of countries with significant coefficient on lagged or forecast global inflation in the forecasting equation that also includes forecast or lagged country inflation; rolling ten-year sample ends in the year shown.

In contrast to the evidence earlier that the co-movement of inflation has increased over time, in rolling regressions lagged and forecast global inflation is generally significant in fewer country forecasting regressions over the full sample than in shorter samples (Graph 5). For OECD economies, the number of countries in which lagged global inflation is significant (when combined with lagged domestic inflation) has declined markedly since 2008 from around eight to only one. The number of countries for which forecast global inflation is significant has also declined a little. For

Contribution of global inflation to the accuracy of forecasts of country inflation: OECD economies

Table 7

	AT	AU	BE	CA	CH	DE	DK	ES	FI	FR	HU	IE	IT	JP	KR	NL	NO	PL	PT	SE	US
Forecasts of current-year inflation [1]																					
Model: *lagged* global inflation & *lagged* domestic inflation – Equation (4)																					
t-stat on lagged global	1.0	-2.2**	0.9	-1.7	-1.0	0.7	-0.9	-0.8	-0.8	0.5	-0.6	-0.9	0.0	-0.7	1.3	1.7	-0.2	-0.1	-1.5	0.5	-0.3
Test of forecast accuracy [2]	-0.4	1.3	-0.5	1.2	0.7	-1.2	-0.1	-0.5	-0.1	-1.1	-0.4	-0.3	-1.1	-1.4	-0.2	1.0	-1.9	0.0	-0.6	-1.1	0.1
Model: *lagged* global inflation & *forecast* domestic inflation – Equation (5)																					
t-stat on lagged global	0.0	-3.3***	-1.1	-3.3***	-1.6	0.8	-2.1**	-1.0	-1.4	-2.0*	-0.7	-1.4	0.1	-1.8*	0.9	-0.5	-4.1***	0.8	-0.9	-1.1	-0.6
Test of forecast accuracy [2]	-0.5	2.4**	0.8	0.8	0.4	-1.1	0.8	-1.0	1.1	1.1	0.6	1.0	-1.4	1.0	0.1	-0.5	2.1**	0.4	-0.8	-0.5	0.5
Model: *forecast* global inflation & *forecast* domestic inflation – Equation (6)																					
t-stat on forecast global	1.4	-3.0***	1.0	-2.6**	-0.8	2.6**	-2.0*	0.2	0.0	-1.5	0.5	0.0	3.3***	-0.7	1.3	-1.8*	-2.7**	0.9	1.0	-0.7	-1.1
Test of forecast accuracy [2]	-0.8	1.8**	-1.5	1.3	0.1	0.9	-0.4	-1.0	-0.7	1.4*	-0.5	-0.8	1.5*	-0.5	0.8	0.1	3.8**	0.1	-0.7	-1.1	0.7
Forecasts of next-year inflation [1]																					
Model: *lagged* global inflation & *lagged* domestic inflation – Equation (4)																					
t-stat on lagged global	2.9***	-0.9	1.6	-2.5**	0.2	3.1***	-1.1	0.0	-0.3	1.4	0.1	-0.3	0.3	0.9	1.2	1.1	0.0	2.0*	-2.3**	-0.3	0.8
Test of forecast accuracy [2]	0.6	0.5	1.5*	0.9	-2.4	0.2	-1.0	-1.5	-1.6	-0.6	-1.1	-0.3	-1.1	-1.5	-0.3	0.4	-1.2	2.9**	1.4*	-1.2	-0.4
Model: *lagged* global inflation & *forecast* domestic inflation – Equation (5)																					
t-stat on lagged global	0.7	-0.6	-0.1	-1.2	2.1*	1.0	-1.7	-1.3	-0.4	0.7	0.9	-2.4**	-0.1	-1.0	0.7	0.0	-0.2	0.7	-2.5**	0.5	-1.2
Test of forecast accuracy [2]	-0.8	0.9	-1.1	-0.7	3.1**	-0.1	1.5*	-0.4	-2.0	-0.3	-1.1	1.2	-1.0	-1.0	-0.9	-0.5	-0.8	-0.3	0.1	-0.5	-0.8
Model: *forecast* global inflation & *forecast* domestic inflation – Equation (6)																					
t-stat on forecast global	2.0*	-0.7	0.8	-1.8*	3.3***	1.7	-1.4	-0.9	0.8	0.8	2.0*	-1.4	0.8	-1.3	3.0***	0.1	-3.5***	3.4***	-3.9***	0.6	-0.8
Test of forecast accuracy [2]	0.9	-1.0	-0.4	0.7	0.7	0.2	0.9	-1.4	-1.6	-1.4	-1.4	0.1	-0.2	-1.2	0.5	-0.2	-0.7	0.7	1.4*	-0.7	-0.5

[1] Newey-West heteroscedasticity and autocorrelation consistent standard errors; ***,** and * indicate statistically different from zero at the 1, 5 and 10 per cent significance level, sample is 1992–2015. [2] Test statistic on the adjusted mean squared prediction error (MSPE) where the null is that the two models have equal MSPE and the alternative is that the model containing lagged or forecast global inflation has a lower MSPE than the model containing only the domestic variable (either lagged domestic inflation or the domestic forecast).

Contribution of global inflation to the accuracy of forecasts of country inflation: other economies

Table 8a

	AR	BO	BR	BG	CL	CN	CO	CR	CZ	DO	EC	GR	HK	ID	IL	MY	MX
Forecasts of current-year inflation																	
Model: *lagged* global inflation & *lagged* domestic inflation – Equation (4)																	
t-stat on lagged global	-0.5	-0.9	1.7*	1.7	-1.5	0.7	-0.3	-0.1	1.1	0.2	-0.4	-1.3	-0.2	-0.4	1.2	0.9	0.6
Test of forecast accuracy [2]	-2.1	0.8	1.6*	1.1	1.4*	-1.2	-0.9	-1.3	0.1	-1.7	-1.2	-0.1	-2.3	-2.0	0.4	-0.5	-1.1
Model: *lagged* global inflation & *forecast* domestic inflation – Equation (5)																	
t-stat on lagged global	-1.5	-1.0	1.8*	-1.2	-3.0***	-1.8*	0.1	0.8	0.1	-0.5	-1.7	-0.8	-3.7***	-0.4	1.8*	0.2	0.5
Test of forecast accuracy [2]	-0.4	0.0	2.0**	0.7	2.8**	0.9	-1.0	-1.1	-1.5	0.9	2.3**	-0.7	1.6*	-1.6	0.9	-0.6	-1.3
Model: *forecast* global inflation & *forecast* domestic inflation – Equation (6)																	
t-stat on forecast global	-2.4**	1.7*	2.2**	-2.1*	0.7	0.1	1.4	3.9***	1.1	0.4	-2.2**	1.0	-2.4**	1.0	0.8	1.7*	1.0
Test of forecast accuracy [2]	2.5**	0.3	4.7**	2.7**	0.2	-0.5	0.8	1.3*	0.3	0.8	1.2	-0.1	2.8**	1.2	-0.9	1.0	5.4**
Forecasts of next-year inflation																	
Model: *lagged* global inflation & *lagged* domestic inflation – Equation (4)																	
t-stat on lagged global	-0.4	1.5	2.3**	1.2	0.3	2.0*	0.1	0.7	0.3	0.8	0.2	0.3	0.4	-0.4	1.2	1.4	0.9
Test of forecast accuracy [2]	-2.7	1.0	3.1**	2.0**	-0.8	-0.1	-0.7	-0.8	-0.8	0.0	0.9	-0.5	-0.8	-3.8	-0.3	-0.5	3.6**
Model: *lagged* global inflation & *forecast* domestic inflation – Equation (5)																	
t-stat on lagged global	0.0	1.1	2.3**	0.8	-1.5	-0.3	0.8	1.3	0.1	1.1	-1.6	0.3	0.4	-0.3	1.0	1.1	0.6
Test of forecast accuracy [2]	-2.1	-0.1	3.4**	-0.5	-0.2	-0.8	-1.1	0.5	-1.0	2.3**	1.7**	-0.1	0.1	-3.9	0.2	-1.8	2.1**
Model: *forecast* global inflation & *forecast* domestic inflation – Equation (6)																	
t-stat on forecast global	-2.2**	1.6	2.9***	2.0*	-0.5	0.1	7.4***	2.2**	3.8***	-0.4	-0.8	-3.5***	-0.1	0.7	2.9***	6.1***	0.9
Test of forecast accuracy [2]	4.9**	0.3	3.9**	1.7**	-1.0	-1.6	1.2	0.2	0.5	-3.4	1.3*	1.7**	-0.8	-1.7	0.3	1.0	2.2**

[1] Newey-West heteroscedasticity and autocorrelation consistent standard errors; ***,** and * indicate statistically different from zero at the 1, 5 and 10 per cent significance level, sample is 1992–2015. [2] Test statistic on the adjusted mean squared prediction error (MSPE) where the null is that the two models have equal MSPE and the alternative is that the model containing lagged or forecast global inflation has a lower MSPE than the model containing only the domestic variable (either lagged domestic inflation or the domestic forecast).

Contribution of global inflation to the accuracy of forecasts of country inflation: other economies

Table 8b

	NZ	PY	PE	PH	RO	RU	SA	SG	SK	SI	ZA	TW	TH	TR	UY	VE
Forecasts of current-year inflation																
Model: *lagged* global inflation & *lagged* domestic inflation – Equation (4)																
t-stat on lagged global	-1.0	0.1	-0.2	0.6	1.2	-0.4	-2.7**	-0.4	0.9	1.2	4.1***	0.7	0.1	1.4	0.7	-0.2
Test of forecast accuracy [2]	0.5	-1.3	-0.9	-0.6	-0.3	-0.5	1.3*	-1.6	0.0	0.4	1.0	-1.0	-1.6	-1.9	-1.0	-0.9
Model: *lagged* global inflation & *forecast* domestic inflation – Equation (5)																
t-stat on lagged global	0.6	0.0	-1.1	-0.2	0.0	-0.5	-0.5	-0.7	-0.9	0.7	1.2	0.4	-0.5	0.5	1.1	0.7
Test of forecast accuracy [2]	-1.2	-1.1	-0.5	-0.2	-1.2	-0.2	-1.0	-0.7	0.2	-0.9	-0.8	0.0	0.4	-1.3	-0.6	-0.8
Model: *forecast* global inflation & *forecast* domestic inflation – Equation (6)																
t-stat on forecast global	1.1	3.1***	1.0	1.1	-0.1	1.0	0.6	-0.6	-0.3	4.7***	0.4	1.4	0.5	2.3**	1.2	0.4
Test of forecast accuracy [2]	1.0	1.4*	0.9	0.0	-2.4	1.2	-1.9	-1.0	-2.5	1.2	-1.2	1.2	-0.3	1.2	1.6*	-0.3
Forecasts of next-year inflation																
Model: *lagged* global inflation & *lagged* domestic inflation – Equation (4)																
t-stat on lagged global	-1.3	1.3	1.9*	0.2	1.0	-0.1	-2.0*	-0.2	0.0	1.4	2.5**	1.8*	0.8	2.7**	1.2	0.4
Test of forecast accuracy [2]	0.5	0.7	2.4**	-0.7	-0.1	-1.0	0.0	-1.6	-1.2	1.0	2.1**	0.8	-0.5	-1.9	-1.0	-0.7
Model: *lagged* global inflation & *forecast* domestic inflation – Equation (5)																
t-stat on lagged global	-1.0	1.8*	-0.5	-0.8	0.7	0.3	-0.3	0.0	-2.1*	0.2	0.9	1.6	1.1	0.5	1.0	0.3
Test of forecast accuracy [2]	0.6	0.4	-1.0	-0.1	-0.1	-1.8	0.7	-1.1	1.0	-2.2	0.5	1.2	-0.7	1.0	-0.6	-0.7
Model: *forecast* global inflation & *forecast* domestic inflation – Equation (6)																
t-stat on forecast global	-0.9	0.0	2.3**	2.3**	2.0*	2.3**	-1.9*	0.3	-2.9***	0.1	1.4	3.5***	2.6**	3.9***	0.1	0.2
Test of forecast accuracy [2]	0.5	-1.3	-0.9	1.1	-1.1	2.0**	1.1	-1.1	1.3*	-0.1	0.7	1.3	1.4*	1.9**	-0.4	-0.7

[1] Newey-West heteroscedasticity and autocorrelation consistent standard errors; ***,** and * indicate statistically different from zero at the 1, 5 and 10 per cent significance level, sample is 1992–2015. [2] Test statistic on the adjusted mean squared prediction error (MSPE) where the null is that the two models have equal MSPE and the alternative is that the model containing lagged or forecast global inflation has a lower MSPE than the model containing only the domestic variable (either lagged domestic inflation or the domestic forecast).

the other economies, lagged global inflation is significant in fewer countries' forecasting regression following the onset of the financial crisis period, but if anything forecast global inflation is significant in more countries' regressions. This reinforces the results in Tables 8a and 8b that for the non-OECD group of countries, forecasts of global inflation help explain country inflation better than do lags of global inflation.

5. Conclusion

There is a significant global, or common, component to countries' inflation. This paper shows that forecasts of this global inflation can be constructed as the common component of survey forecasts of country inflation. These forecasts have a good predictive content for global inflation over the coming year, but are not able to forecast inflation at a longer horizon.

Global inflation is related to global GDP growth, food and oil prices. These relationships mostly carry through to global inflation forecasts and global inflation forecast errors. Forecasts of global inflation have a strong relationship with forecasts of global GDP growth. However, there is some evidence that forecasts of global inflation may underweight forecasts of food and oil prices. The evidence on forecast errors indicates that unforeseen shocks to global GDP and to food and oil prices are reflected in global inflation forecasts errors, confirming the importance of these variables in the global co-movement of inflation. Given the relatively low weight of tradable food in OECD CPI baskets, the relationship between global inflation and food price inflation is found to be surprisingly strong for both realised inflation and forecast errors.

The predictive information in forecasts of global inflation provides some improvement in forecasts of inflation for some OECD countries as well as for some emerging market economies. In general, forecasts of global inflation improve forecasts of country inflation more than does lagged global inflation, highlighting the merits of the global inflation forecast. Indeed, the benefit of lagged global inflation in forecasting country inflation appears to have diminished in recent years. The limited benefit of lagged or forecast global inflation when added to survey forecasts of country inflation suggests that whatever information global inflation may include about country inflation, much of it has historically been incorporated in survey forecasts of country inflation.[5]

[5] This is broadly consistent with Mikolajun and Lodge (2016) who conclude that the forecasting ability of global inflation for country inflation only reflects its ability to pick up slow moving trends and so there is no reason to include global inflation.

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Appendix A: Country samples

Countries included in the OECD Global Inflation Measures — Table A1

Country	Code
Austria	AT
Australia	AU
Belgium	BE
Canada	CA
Switzerland	CH
Germany	DE
Denmark	DK
Spain	ES
Finland	FI
France	FR
Hungary	HU
Ireland	IE
Italy	IT
Japan	JP
Korea	KR
Netherlands	NL
Norway	NO
Poland	PL
Portugal	PT
Sweden	SE
United States	US

Countries not included in the OECD Global Inflation Measures Table A2

Country	Code	Sample start
Argentina	AR	1995
Bolivia	BO	1995
Brazil	BR	1992
Bulgaria	BG	1996
Chile	CL	1995
China	CN	1996
Colombia	CO	1995
Costa Rica	CR	1995
Czech Republic	CZ	1996
Dominican Republic	DO	1995
Ecuador	EC	1995
Greece	GR	1995
Hong Kong SAR	HK	1992
Indonesia	ID	1992
Israel	IL	1996
Malaysia	MY	1992
Mexico	MX	1992
New Zealand	NZ	1992
Paraguay	PY	1995
Peru	PE	1995
Philippines	PH	1996
Romania	RO	1996
Russia	RU	1996
Saudi Arabia	SA	1996
Singapore	SG	1992
Slovakia (Slovak Republic)	SK	1996
Slovenia	SI	1996
South Africa	ZA	1995
Taiwan	TW	1991
Thailand	TH	1992
Turkey	TR	1996
Uruguay	UY	1995
Venezuela	VE	1995

Note: Brazil, Mexico and New Zealand each have one missing year of forecasts; Mexico and New Zealand are excluded from the OECD global measure of inflation because of this missing data.

Appendix B: Forecast data

Consensus economics surveys private sector economists each month for a range of variables. The forecasts are for the current and next years. This paper only uses the forecasts surveyed in January to avoid overlapping observations. The January forecasts have the advantage that they do not cover a period for which some of the data have been realised (as the forecasts later in the year do) and they have a longer effective forecast horizon than the surveys later in the year. The Consensus forecasts are the average of individual forecasts. While median forecasts may be more robust to outlying forecasts, the available dataset of median forecasts was not sufficiently long enough or broad enough for the analysis used in this paper.

Inflation forecasts

The consensus definition for annual CPI inflation differs for some countries: for most countries it is measured as the percentage change in the average level of the CPI index in each calendar year (year-average inflation). However, for countries in Latin America and Russia, CPI inflation is measured as the change in the CPI index from December over the preceding December (year-ended inflation). The measures of realised inflation used in this paper are consistent with the definition used in the Consensus forecasts for each country.

Oil price, US dollar and interest rate forecasts

Unlike the inflation and GDP forecasts, which are for year-average outcomes, the Consensus forecasts for the price of oil, US dollar exchange rate and US short-term interest rate are forecasts of the value at a point in time; for the January forecasts, the value at the end of April in the current year and the end of January next year. For these three variables, year-average forecasts are constructed by interpolating between the value on the survey date and the two forecasts, and holding the value constant after the final forecast (as shown for the oil price in the left panel of Graph B1, with the resulting year-average forecasts shown in the right panel). An alternative approach would be to extrapolate beyond the last forecast using the rate of change between the forecasts for April and January. However, in practice, the forecasts for April and January tend to be similar and so the next-year forecasts are very similar when constructed using extrapolation or holding the value constant beyond the last forecast.

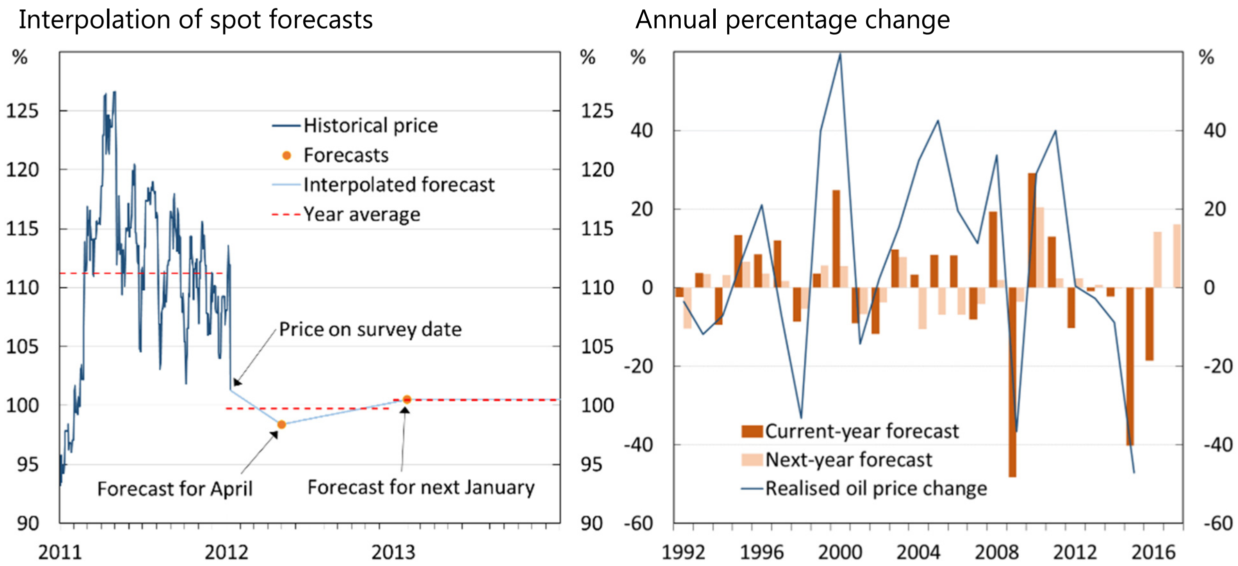
Because these year-average forecasts are from an interpolated daily series, it would be possible to lag these variables to account for the delay in their pass-through to CPI inflation. However, employing phase shift of 1 to 3 quarters in the year averaging did not increase systematically or significantly the correlation of global inflation with the oil price, US dollar or US interest rate.[6]

The US dollar percentage change forecast is an unweighted-average of the percentage change forecasts for the bilateral US dollar exchange rate with the

[6] For example, a phase shift of one quarter would have the 2014 oil price inflation calculated as the average oil price from October 2013 to September 2014 over the average in the preceding twelve months.

Japanese yen, British pound and Canadian dollar. Consensus forecast do not cover the euro until 1999 and did not cover the Deutsche mark or other European currencies before that. A four-currency average that includes the euro after 1999 is very similar to the three-country average used, suggesting that forecasts for the pound, yen and Canadian dollar largely reflect anticipated movements in the US dollar more broadly, and so the three-country average used is a good proxy for expected movements in the US dollar.

Construction of oil price forecasts — Graph B1



Food price forecasts

Consensus economics does not include forecasts of food prices. Instead, forecasts are obtained from the IMF World Economic Outlook (WEO) / Commodities database. The forecasts are annual averages. The forecasts published in the October WEO are used, as forecasters would know these when they are surveyed by Consensus in January. Currently three years of IMF food price forecasts published on their website contain an error (their forecasts and realised values are identical for the three years) are replaced with forecasts from an AR(1) model.

Appendix C: Further results

Bivariate relationships with global inflation — Table C1

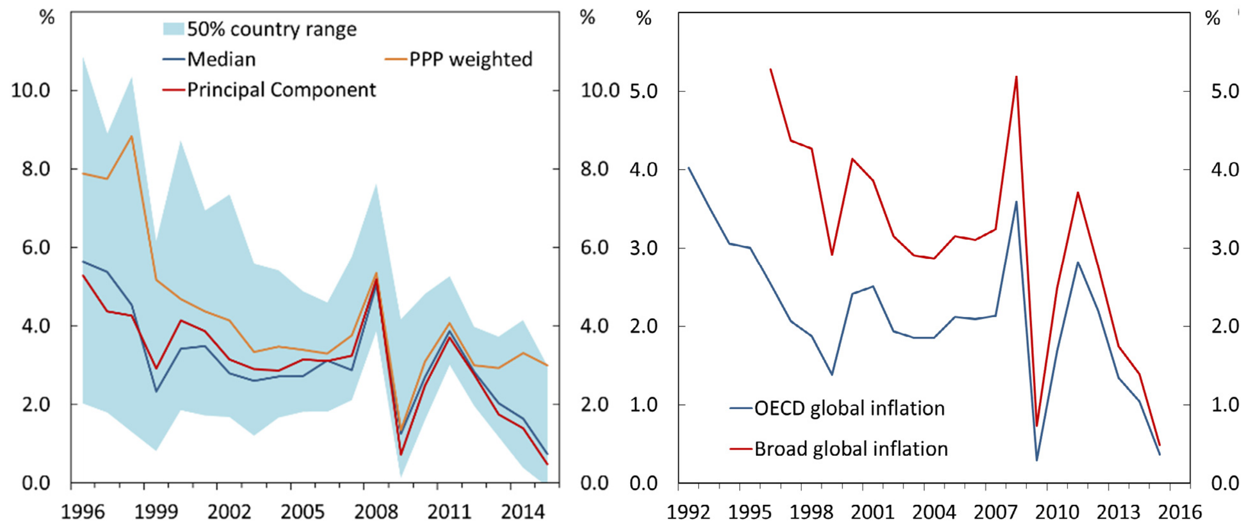
	Realised inflation		Current-year inflation forecast		Next-year inflation forecast		Current-year forecast error		Next-year forecast error	
Global GDP										
Contemporaneous	0.38*		0.62***		0.54**		0.08		0.19	
Lagged		0.48**		0.51***		0.44**		--		0.47**
R^2	0.14	0.24	0.39	0.38	0.29	0.26	0.01	--	0.04	0.22
Oil price inflation										
Contemporaneous	0.61***		0.44**		0.15		0.56***		0.66***	
Lagged		0.39		0.27		0.20		--		0.56**
R^2	0.37	0.13	0.19	0.08	0.02	0.04	0.32	--	0.43	0.30
Food price inflation										
Contemporaneous	0.76***		0.21		-0.11		0.60***		0.22	
Lagged		0.14		0.08		-0.13		--		-0.04
R^2	0.58	0.01	0.04	0.01	0.01	0.02	0.36	--	0.05	0.00
US dollar appreciation										
Contemporaneous	-0.44**		-0.13		-0.08		0.01		-0.45**	
Lagged		-0.50**		-0.18		0.21		--		-0.24
R^2	0.20	0.20	0.02	0.04	0.01	0.05	0.00	--	0.20	0.06
US interest rate change										
Contemporaneous	-0.12		0.15		-0.17		-0.31		-0.18	
Lagged		0.34		0.35*		0.22		--		0.28
R^2	0.01	0.13	0.02	0.18	0.03	0.06	0.10	--	0.03	0.08

Notes: ***,** and * indicate statistically different from zero at the 1, 5 and 10 per cent significance level. Sample 1995-2015, 27 countries as listed in Appendix A. To reflect information timing the following forms of the explanatory variable are used: for realised inflation, the realised value; for the current-year inflation forecast, the current-year forecast and the lagged realised value; for the next-year inflation forecast, both contemporaneous and lagged forecasts; for the current-year forecast error, the contemporaneous forecast error; and for the next-year forecast error, the contemporaneous and lagged forecast errors.

Graph C1

Inflation in 54 countries

Global inflation measures



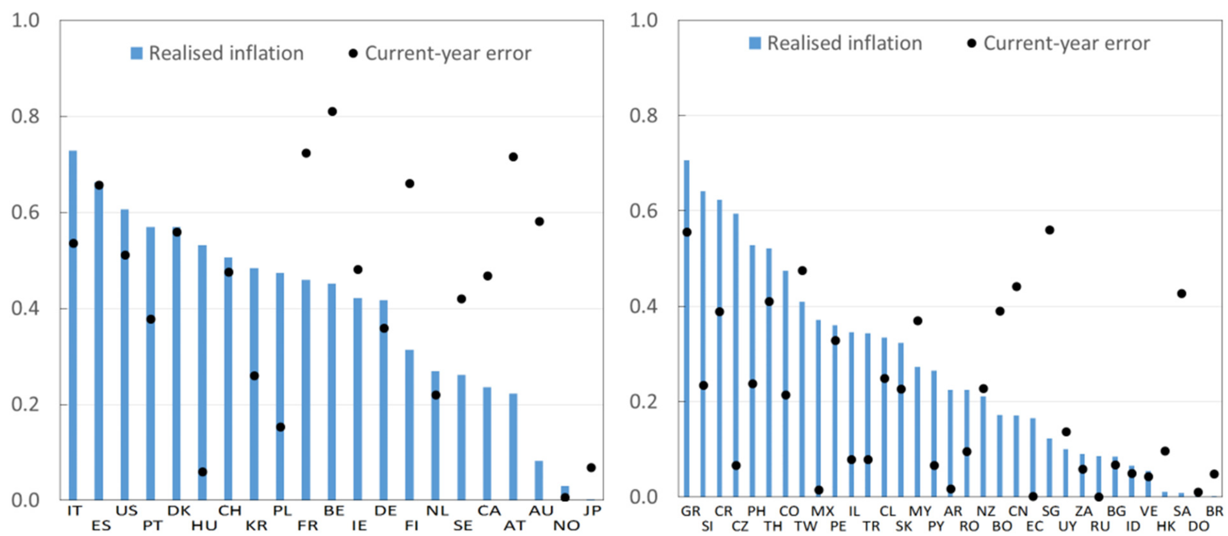
Note: Left hand panel shows inflation range and measures constructed from all 54 countries listed in Tables A1 and A2. The right hand panel compares the first principal component from these 54 countries' inflation rates against that derived from the 21 OECD economies.

Fit from country inflation (forecast errors) regressed on broad measure of global inflation (errors)

Graph C2

Countries in OECD measure

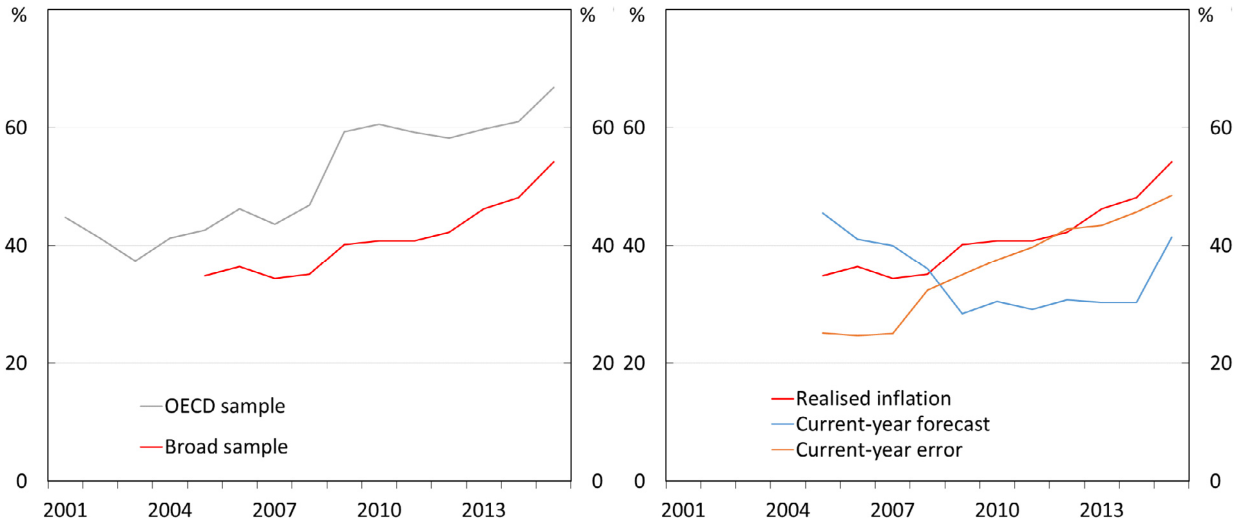
Countries not in OECD measure



Notes: R^2 from a regression of country inflation (current-year inflation forecast error) on a broad measure of global inflation (global inflation forecast error) that is derived as the principal component from all 54 economies over the sample 1996–2015.

Share of country inflation explained by single common component — Graph C3

Realised inflation | Broad sample: inflation, forecasts and errors



Notes: Share of variance explained by the first principal component; 10-year rolling windows ending in the year shown; OECD sample refers to the principal component from the 21 OECD economies as used in the main text; the broad sample refers to the principal component measures of global inflation, forecasts and errors that are derived from all 54 economies.

Models of global inflation including GDP and commodity price forecasts — Table C2

	Current-year global inflation					Next-year global inflation				
	(i)	(ii)	(iii)	(iv)	(v)	(i)	(ii)	(iii)	(iv)	(v)
Global inflation forecast	0.55***	0.48***	0.48***	0.46***	0.42***	0.32***	0.27***	0.32***	0.26***	0.26***
Global GDP forecast		0.19**			0.04		0.16			0.00
Oil price forecast			0.01***		0.01***			0.00		0.00
Food Price forecast				0.05***	0.03***				0.07***	0.07**
R^2	0.63	0.70	0.77	0.72	0.82	0.26	0.30	0.26	0.45	0.45

Notes: Results from the regression: $\pi_{g,t+j} = c + \beta_1 f^{j}_{g,t} + \beta_2 f^{global\ GDP\ growth}_{g,t} + \beta_3 f^{oil\ price\ inflation}_{g,t} + \beta_2 f^{food\ price\ inflation}_{g,t} + \epsilon_t$. Newey-West heteroscedasticity and autocorrelation consistent standard errors are used; ***,** and * indicate statistically different from zero at the 1, 5 and 10 per cent significance level. Dependent variable is first principal component measure of global inflation from 21 OECD economies. Sample is 1992-2015. For the regression of next-year global inflation, the lag is two years so that it reflects information that would be known for forecasting. A constant is included but not shown.

Accuracy of global inflation forecasts with GDP and commodity price forecasts

Table C3

	Current-year global inflation		Next-year global inflation	
Model specification:	MAE	RMSE	MAE	RMSE
(i) global forecast	0.33	0.45	0.47	0.63
(ii) global forecast and global GDP forecast	0.35	0.45	0.55	0.73
(iii) global forecast and oil price forecast	0.27	0.34	0.47	0.64
(iv) global forecast and food price forecast	0.32	0.42	0.50	0.60
(v) global forecast and GDP, oil and food price forecasts	0.30	0.36	0.63	0.78

	Adjusted MSPE test statistic	Adjusted MSPE test statistic
Model (ii) vs Model (i)	0.47	-0.94
Model (iii) vs Model (i)	1.73**	-0.66
Model (iv) vs Model (i)	1.50*	1.37*
Model (v) vs Model (i)	1.64*	0.13

Notes: Newey-West heteroscedasticity and autocorrelation consistent standard errors for the next-year adjusted MSPE test statistic; ***,** and * indicate statistically different from zero at the 1, 5 and 10 per cent significance level. Dependent variable is first principal component measure of global inflation from 21 OECD economies. Sample starts in 1992 with recursive out-of-sample forecasts from 2002 to 2015.

Alternative weighting of global inflation: Number of countries with statistical significance [1]

Table C4

	OECD countries				Other countries				Total			
	PC	PC (CPI)	PPP	Equal	PC	PC (CPI)	PPP	Equal	PC	PC (CPI)	PPP	Equal
Forecasts of current-year inflation												
Model: *lagged* global inflation & *lagged* domestic inflation – Equation (4)												
t-stat on lagged global	1	1	3	1	3	3	4	2	4	4	7	3
Test of forecast accuracy [2]	0	0	2	0	3	3	0	3	3	3	2	3
Model: *lagged* global inflation & *forecast* domestic inflation – Equation (5)												
t-stat on lagged global	6	6	8	7	5	5	3	4	11	11	11	11
Test of forecast accuracy [2]	2	2	4	2	4	4	1	4	6	6	5	6
Model: *forecast* global inflation & *forecast* domestic inflation – Equation (6)												
t-stat on forecast global	7	6	4	7	11	11	11	9	18	17	15	16
Test of forecast accuracy [2]	4	2	1	3	8	9	6	9	12	11	7	12
Forecasts of next-year inflation												
Model: *lagged* global inflation & *lagged* domestic inflation – Equation (4)												
t-stat on lagged global	5	5	3	5	7	7	4	6	12	12	7	11
Test of forecast accuracy [2]	3	3	2	2	5	5	4	6	8	8	6	8
Model: *lagged* global inflation & *forecast* domestic inflation – Equation (5)												
t-stat on lagged global	3	3	5	3	3	3	3	2	6	6	8	5
Test of forecast accuracy [2]	2	2	1	2	4	4	3	5	6	6	4	7
Model: *forecast* global inflation & *forecast* domestic inflation – Equation (6)												
t-stat on forecast global	8	9	5	8	18	18	19	18	26	27	24	26
Test of forecast accuracy [2]	1	1	0	1	10	10	11	8	11	11	11	9

[1] Reproduces the results for Tables 7 and 8 with alternative weighting schemes used to construct global inflation. Weighting schemes: PC = Principal component; PC (CPI) = principal component weights from realised CPI; PPP = Purchasing Power Parity; Equal = equal weighting on each country. Each entry is a count of the number of countries with a statistically significant coefficient on global inflation (t-stat) or test statistic on the adjusted mean squared prediction error (MSPE) where the null is that the two models have equal MSPE and the alternative is that the model containing lagged or forecast global inflation has a lower MSPE than the model containing only the domestic variable (either lagged domestic inflation or the domestic forecast).

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