Box 1

INFLATION IN THE EURO AREA AND THE UNITED STATES: AN ASSESSMENT BASED ON THE PHILLIPS CURVE

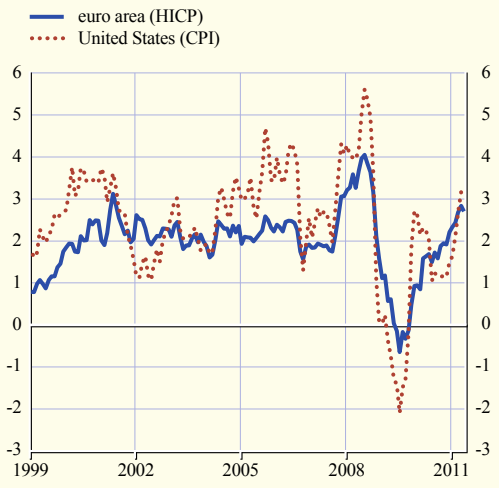
Inflation in the euro area and in the United States has in recent years been shaped very much by global commodity prices. At the same time, inflation developments differed because the ultimate impact of commodity prices varies across economies and because there are different degrees of domestic price pressures due to the economic situation. Against this background, this box uses a simple Phillips curve model to explain the different roles of some of the fundamental determinants of recent inflation developments, including inflation expectations, economic slack and commodity prices.

Recent developments in inflation and its main components

Headline inflation in the euro area and in the United States has followed similar patterns in recent years: from high rates in mid-2008 (4.0% in the euro area and more than 5.5% in the United States), inflation fell sharply to reach negative rates by mid-2009 (-0.6% in the euro area and around -2% in the United States). Since then, inflation has gained momentum in both the euro area and the United States, with inflation rates of around 3% in the spring of 2011 (see Chart A). Energy and food prices played a significant role in this acceleration of headline inflation, reflecting the surge in global commodity prices. In fact, just over 90% of the increase in inflation in both economies since the trough of July 2009 was due to the energy and food components, with the bulk (over 80%) stemming from energy. Excluding food and energy, inflation has likewise increased in both economies in the last few months, to around 1.5% (see Chart B).

Chart A Overall consumer price inflation

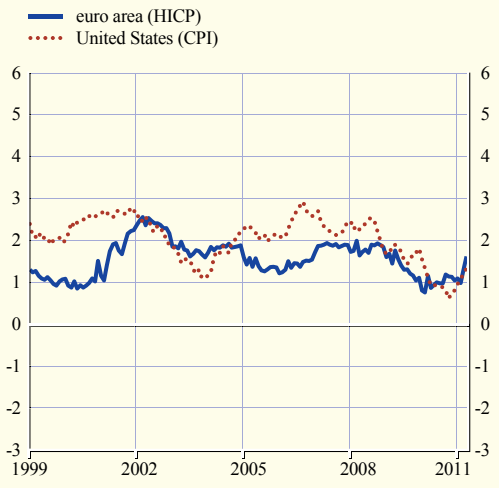
(year-on-year percentage changes)



Sources: Eurostat and US Bureau of Labor Statistics.
Note: Latest observation refers to April 2011 for the United States and to May 2011 for the euro area.

Chart B Consumer price inflation excluding energy and food

(year-on-year percentage changes)

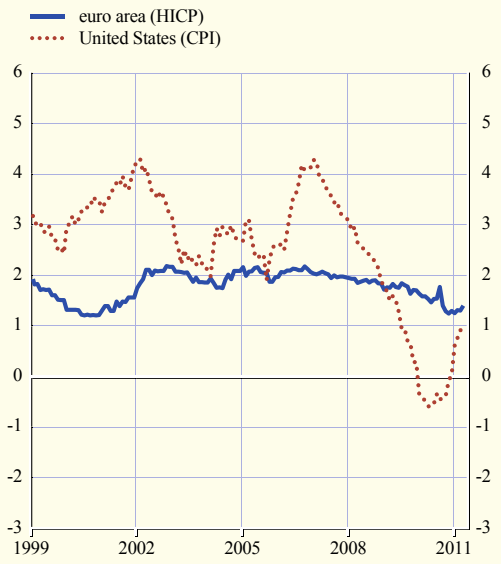


Sources: Eurostat and US Bureau of Labor Statistics.
Note: Latest observation refers to April 2011.

During 2008 and 2009, the declines in inflation rates excluding energy and food were considerably stronger in the United States than in the euro area. Housing rents contributed considerably to this difference (see Chart C). In the United States, the housing rent component of inflation has decreased markedly as a result of weak housing markets since 2007 and has only increased again in the last few months. By comparison, the rate of growth of euro area housing rents saw a far more moderate and gradual decline over the same period. The stronger impact of housing rent developments on US inflation is reinforced by its significant weight in the US consumer price index (CPI). Besides actual rents, the US CPI rent component also includes owner-occupied housing (estimated, using owner-occupier's rent equivalents). The combined weight of these components is 31% in the US CPI. The euro area HICP, by contrast, only covers actual rents with a weight of 6%.

Chart C Consumer price inflation – housing rents

(year-on-year percentage changes)



Sources: Eurostat and US Bureau of Labor Statistics.
Note: Latest observation refers to April 2011.

Assessment based on the Phillips curve

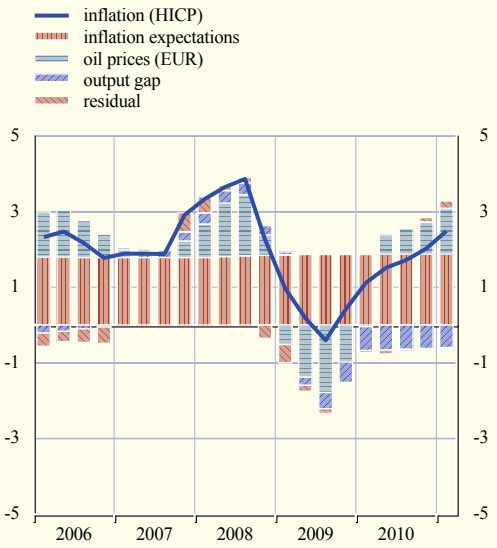
A crude but widely used tool for assessing the relative importance of different drivers of the overall inflationary process is the Phillips curve.[1] For the purpose of this box, headline inflation developments are modelled for the period since 1991, using a simple reduced-form specification including a number of explanatory factors: (i) survey measures of five-year inflation expectations to capture the mean of inflation; (ii) past inflation terms to capture persistence in the inflation process; (iii) the output gap as a measure of economic slack;[2] and (iv) oil price developments as a measure of supply-side influences. The estimates are mainly illustrative, and the assessment of inflation developments based thereon cannot replace a comprehensive analysis of the whole range of factors affecting inflation in the two economies. Indeed, specific factors such as those often influencing housing rents are not explicitly modelled in this framework and would implicitly enter the residual of the equation.

Charts D and E provide a decomposition of the impact that the different factors had in the United States and the euro area in the past years. The impact reflects a combination of the size of the coefficient that each factor has in the estimated relationship and the magnitude of the change in the factor itself. The decomposition confirms the strong impact of energy price developments on headline inflation in both economies. The impact is somewhat larger in the United States. That could be partly explained by the higher energy intensity of the US economy and the lower level of indirect taxes on fuel.[3] The results also suggest a somewhat stronger impact of the

1 See the box entitled "The links between economic activity and inflation in the euro area", *Monthly Bulletin*, ECB, September 2009.
2 For a discussion of various measures of economic slack, see the box entitled "A cross-check of output gap estimates for the euro area with other cyclical indicators" in this issue of the Monthly Bulletin.
3 See, for example, Barrell, R., Kirby, S. and Liadze, I., "The Oil Intensity of Output", *National Institute Economic Review*, No 205, National Institute of Economic and Social Research, July 2008.

Chart D Euro area inflation

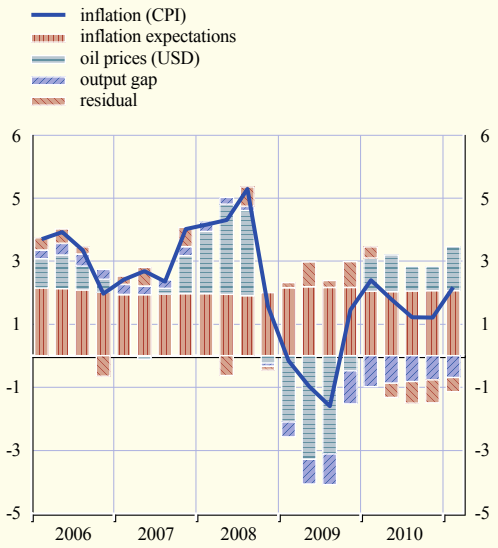
(year-on-year percentage changes and percentage change contributions)



Source: ECB calculations based on data from the Bureau of Labor Statistics, Consensus Economics and Thomson Reuters.
Note: Latest observation refers to the first quarter of 2011.

Chart E US inflation

(year-on-year percentage changes and percentage change contributions)



Source: ECB calculations based on data from the Bureau of Labor Statistics, Consensus Economics and Thomson Reuters.
Note: Latest observation refers to the first quarter of 2011.

output gap on inflation.[4] This reflects, first, that estimates of the output gap after the crisis in the United States are larger than in the euro area and, second, that the coefficient on the output gap is larger in the United States than in the euro area, implying that inflation appears to react more swiftly and strongly to changes in economic slack in the United States. Finally, the decomposition also shows the important role played by inflation expectations in anchoring inflation at close to 2% in both economies. However, the estimated coefficients in the equation also suggest some differences in the impact of inflation expectations and past periods of inflation in the two economies.[5] The coefficient on inflation expectations is stronger in the United States than in the euro area, while the coefficient on lagged inflation is higher in the euro area. That would suggest a higher persistence of inflation in the euro area than in the United States.[6]

Analysis of the residuals in this simple Philips curve framework also suggests that while euro area inflation was broadly in line with the estimates generated from the Phillips curve in 2010 and early 2011, it was slightly lower than would have been expected in the United States.

4 While the estimated results suggest some differences in the short-run impact of the output gap on inflation in the two economies, past inflation plays a more important role in the euro area in this specification, so that the effects of a shock to the output gap are longer-lasting there. If account is taken of this difference in the persistence of inflation in the two economic regions, the cumulative effect on inflation over several periods is fairly similar in the two economies.

5 Although the equations were estimated including past (or lagged) inflation and inflation expectations, the impact of past inflation was removed for presentational purposes in these charts by calculating the contributions of the other components recursively (i.e. by giving due consideration to the fact that past inflation reflected previous movements in the output gap, commodity prices and inflation expectations).

6 See, for example, Angeloni, I., Aucremanne, L., Ehrmann, M., Gali, J., Levin, A. and Smets, F., "Inflation persistence in the euro area: preliminary summary of findings", report presented at the conference on "Inflation Persistence in the Euro Area" hosted by the ECB in December 2004, and Barkbu, B., Cassino, V., Gosselin-Lotz, A. and Piscitelli, L., "The New Keynesian Phillips Curve in the United States and the euro area: aggregation bias, stability and robustness", *Working Paper Series*, No 285, Bank of England, December 2005.

The negative residual in the United States could partly be due, as discussed earlier, to the downward impact of developments in housing rents.

Overall, the analysis of the Phillips curve framework sheds some light on the question why inflation rates in the United States and the euro area react differently to similar shocks. While exact numerical results such as those shown in Charts D and E are model-specific, a general conclusion that can be derived from these kind of exercises is that US inflation reacts more strongly to movements in oil prices and the output gap than euro area inflation does. At the same time, the exercises confirm the higher persistence of inflation in the euro area and underline the importance for monetary policy to anchor inflation expectations in a manner which is compatible with price stability over the medium term.