

## **Vítor Constâncio: Understanding inflation dynamics and monetary policy in a low inflation environment**

Remarks by Mr Vítor Constâncio, Vice-President of the European Central Bank, at the ECB Conference on “Challenges for Macroeconomic Policy in a Low Inflation Environment”, Frankfurt am Main, 5 November 2015.

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### **Introduction**

Ladies and gentlemen,

At the beginning of this Conference, I wish to extend a warm welcome to all participants, thanking everyone for collaborating with this ECB initiative. In my remarks today I will discuss a few issues related to understanding inflation dynamics, focusing on recent developments in euro area inflation and their implications for monetary policy. Several conference papers make important contributions both to the analysis of the causes and consequences of low inflation, and to the design of policy responses.

Understanding inflation dynamics is especially important today due to the very low inflation levels prevailing in many countries. Moreover, there are studies suggesting that in some countries the relationship between slack in the economy and inflation seems to have weakened recently.

If confirmed, this weakening of the link between the level of economic activity and inflation would have significant consequences for monetary policy. First, it has important implications for the sacrifice ratio: if inflation rises as a result of shocks not related to domestic slack, then the cost of bringing inflation down in terms of output loss would be higher. Second, if instead inflation becomes very low, monetary policy would have to stimulate economic activity more strongly and could lack effective instruments to do so, given the zero lower bound (ZLB) on nominal interest rates. In sum, a flatter slope of the Phillips curve would make controlling inflation either more costly or more difficult.

In this context, a surprising development is the emergence, of a “twin puzzle” after the Great Recession: first, “missing disinflation” from 2009 to 2011, and second, “excessive disinflation” after 2012, particularly in Europe.

During the Great Recession, inflation in advanced countries did not fall as much as a traditional Phillips curve predicted, given the severity and length of the recession. Just as puzzling, more recent global developments point in the opposite direction. Namely, despite the ongoing recovery, headline inflation rates in advanced economies remain well below target.

The seemingly weakened relationship between inflation and economic slack seems to have made interpreting and controlling inflation dynamics more difficult. I will try to convince you that if one looks deeper this is not necessarily the case. Ex-post, if we exploit all available information, we do have a consistent understanding of inflation developments after the financial crisis. And we can fruitfully build on this understanding when designing appropriate policy responses to the prevailing low inflation environment.

### **Prolonged low inflation: some puzzles**

Clearly, for headline inflation commodity, price shocks have played a significant role. But the two highlighted puzzles also apply to core inflation. Importantly, the trend for a weaker relationship with economic slack also applies to core inflation. Core inflation reflects mostly

domestic factors, as indirect effects from external developments are muted and take time to operate. That is why I consider it more useful to focus on core inflation dynamics for the purpose of discussing their consequences for monetary policy.

There is a vast literature on the first puzzle of the “missing disinflation”, which offers a variety of explanations, mostly with a reference to the US.

Two important aspects in particular are investigated by papers here at this conference. The paper by **Gilchrist, Schoenle, Sim, and Zakrajsek** (2015) emphasizes the role of higher mark-ups of liquidity-constrained firms. In particular it shows that facing financial distress in the absence of devaluation, firms in financially weak countries have an incentive to raise their prices to cope with liquidity shortfalls.

Another way of solving the “missing disinflation” puzzle is suggested in a paper by Coibion and Gorodnichenko (2015). Namely, these authors propose using household expectations from surveys to measure inflation expectations, explaining the rise in household inflation expectations in 2009 to 2011 by the increase in oil prices. **Coibion, Gorodnichenko and Kumar** (2015), will in turn, present at this conference relevant work on *firm* expectations. They find that firms’ average inflation expectations are systematically higher than those of professional forecasters and resemble those of households. They conclude that firms devote few resources to collecting and processing information about inflation. The paper by **Wiederholt** (2015) studies a New Keynesian model of sluggish and heterogeneous inflation expectations. It finds that the deflationary spiral in bad states of the world is less severe than in the models currently used for policy analysis.

Many of these approaches, besides solving the puzzle *a posteriori*, also provide new methods that promise to improve future inflation forecasting. The use of short-term unemployment<sup>1</sup> or household inflation expectations that are closer to those of economic agents are two examples of promising developments.

## Drivers of inflation in the euro area

Let us look at the euro area. We can identify two distinct periods of disinflation in the case of HICP excluding food and energy: the first from 2008 to 2010, and the second, starting in 2012. Searching for the drivers of these episodes, our experts used a Bayesian VAR<sup>2</sup> with HICP (excluding food and energy), real activity indicators, external and financial variables.

Each inflation dip had different origins: the first was mainly due to external factors (the fall in foreign demand, energy and food prices), while the second was predominantly driven by domestic sources in an environment of weak demand.

The fact remains that forecasters were not able to anticipate the disinflation of 2012. Not just the ECB but also the IMF, the Survey of Professional Forecasters, Consensus Economics, Euro Zone Barometer, OECD and the European Commission, all have systematically over-predicted both headline and core inflation at all horizons, especially since the second quarter of 2012. This is particularly surprising because forecasters *did* take into account the fall in economic activity in most euro area countries after 2011, which generated a significant gap between actual and potential output.

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<sup>1</sup> See in particular Ball and Mazumder (2014), who use a parsimonious Phillips curve for core US inflation, with only long-term inflation expectations (reduced in practice to a constant) and short-term unemployment. They get a good fit for 2000–14 and even for a long period that starts as early as 1985 (the beginning of the Great Moderation).

<sup>2</sup> The methodology is similar to Jarociński and Smets (2008), “House prices and the Stance of Monetary Policy”, Federal Reserve Bank of St. Louis Review, July/August, 90(4), pp. 339–65.

Yet, policy makers need more than just good inflation forecasts: we also need to understand the inflation process in order to better assess the role of monetary policy. We must also be able to explain our reasoning to the public, as the management of inflation expectations has become an important monetary policy channel.

Let me provide you some evidence on inflation expectations in the euro area.

### **Recent evolution of inflation expectations in the euro area**

Since 2005, there has been a broad degree of co-movement between survey-based (ECB Survey of Professional Forecasters, (ECB SPF)) and market-based measures of inflation expectations, although the latter have tended to fluctuate more widely. Both survey-based and market-based longer-term inflation expectations moved down, in 2009 and 2010, before they both increased again in 2011 and 2012, only to subsequently decline more substantially in 2013 and 2014, with a partial rebound so far in 2015. The scale of movements in market-based measures however, has been significantly larger than those from surveys – the ratio of the two scalings is four-to-one [4:1].

Focusing on the recent period, although both survey-based and market-based measures of inflation expectations declined over the period early-2013 to early-2015, and both have since rebounded somewhat, there have been significant differences in the magnitude of movements and in the changes in the slope of the inflation expectations curve. The market-based curve has tended to move by more both at the short- and long-end, whereas the survey-based curve has moved by less, particularly at the longer-end of the curve.

Considering first the shorter-end of the curve, the one-year forward in one year (i.e., two years ahead) market-based measure declined by 1.1 p.p. between January 2013 and January 2015 and rebounded by 0.6 p.p. by July 2015. In contrast, the same measure from the ECB SPF declined by 0.6 p.p. and has rebounded by 0.3 p.p. over the same periods.

Considering longer-term horizons, the one-year forward rate in four years (i.e. five years ahead) market-based measure declined by 0.7 p.p. between January 2013 and January 2015 and rebounded by 0.3 p.p. by July 2015. In contrast, the same measure from the ECB SPF declined by 0.21 p.p. and has rebounded by 0.09 p.p. over the same period.

The fall of market-based inflation expectations is also confirmed by options data. The daily option implied probability distributions of future inflation at different horizons from inflations caps and floors between 2009 and 2015 show that since mid-2014, the negative gap between expected inflation and the two percent reference level are statistically significant up to a seven-year horizon.

The SPF offers, not only a measure of inflation expectations, but also additional information on their drivers. A more direct analysis of the factors underlying longer-term inflation expectations is possible on the basis of the results of a special questionnaire sent to SPF respondents in 2013.

When asked what the main factors that drove their longer-term inflation expectations were, the largest number of respondents (81%) indicated that the ECB's price stability objective was the most significant factor. Six further main factors were also given, namely (in declining order of importance) trends in actual inflation (54%), financial market indicators (43%), trends in wage growth (38%), forecasts in other surveys (38%), trends in money and credit (38%) and fiscal indicators (19%). Other factors mentioned included economic activity and 'gap' measures (output and unemployment).

The evolution of the four main variable factors (actual inflation, market expectations, wage growth and other surveys) is broadly consistent with the actual movements in the SPF's five-year-ahead inflation expectations. In particular, the four broad movements, namely (i) the upswing in longer-term inflation expectations between 2005 and 2008, (ii) the decline between 2009 and 2010, (iii) the subsequent rebound in 2011–12; and (iv) the fall since

2013, appear to be in line with the factors cited by SPF respondents. Most recently, the analysis suggests that the decline in longer-term SPF expectations may reflect developments in actual HICP inflation, market-based measures of inflation expectations and wage growth.

A model-based analysis of the determinants of long-term market-based inflation expectations shows that the main determinants of the five-year implied forward inflation linked swap rate five years ahead (5y5y ILSR) are real GDP and monetary policy. Real GDP is estimated to provide an overall positive contribution of about +20bps. Monetary policy is proxied by the Eonia 1y1y rate (that gauges the market sentiment about future ECB policy interest rates) and the size of the Eurosystem balance sheet's assets. The latter reflects not only the Asset Purchase Programme (APP) but also all the other non-conventional monetary policy measures undertaken by the Eurosystem since the inception of the global financial crisis in August 2007.

In conclusion, recent evolutions of both survey-based and market-based measures tend to raise some concerns of a de-anchoring of long-term inflation expectations in euro area.

### **The Phillips curve as a vehicle to discuss inflation dynamics**

The current attention to the relationship between inflation and economic slack has led to an intense debate on the stability of the Phillips curve and its power to explain the twin puzzle.

An important consideration is that economic slack is a multidimensional concept that is not directly observable and choices must be made on how to estimate or measure it. The outcome is highly sensitive to the assumptions used for the decomposition of economic activity into trend and cycle. Usual measures of slack can vary substantially across methods and variables included, although they tend to agree on the timing of peaks and troughs.

The fact that economic activity is multidimensional suggests that there might be advantages in using multivariate dynamic models to estimate it. For instance, ECB staff uses a dynamic factor model that performs a trend/cycle decomposition of real activity and core inflation.<sup>3</sup> The model uses a single factor to capture common cyclical fluctuations and estimates the output gap as the deviation of output from its trend. Different modelling assumptions, such as different sets of real activity indicators and different specifications of the trend components of the variables, lead to different estimates of the output gap. These differences are economically very relevant, with some models estimating an output gap that was close to zero in 2014 on average, and others estimating remaining slack of as much as -6%.

One way to discriminate among different estimates of the output gap is to check their ability to forecast inflation. It turns out that the variants associated with a continuation of positive trend growth, implying a wider output gap, are the ones that produce better inflation forecasts. The best variant from this perspective implies that the output gap was as large as -6% in 2014.

Taking into account uncertainty over how to measure slack and inflation expectations, the Phillips curve is alive and well in the euro area. The dynamic factor model just discussed is not the only one that can explain the recent excessive disinflation. ECB staff has conducted a specification search with a hybrid New Keynesian Phillips Curve (NKPC), using different measures of slack and of inflation expectations, and also including import prices as a measure of external shocks. Several specifications are indeed able to track the recent disinflation quite well.

A related consideration is that the coefficients of the Phillips curve may not be stable. In particular, the slope of the Phillips curve might have changed over the period when we were

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<sup>3</sup> Jarocinski M. and Lenza, M., "Inflation forecasts in a Bayesian dynamic factor model of the euro area", ECB Working Paper forthcoming.

over-predicting inflation. For the euro area, the evidence from several new papers points to a relative steepening recently, *following the previous flattening*, (see e.g. Oinonen and Paloviita (2014), Riggi and Venditti (2015) and Foroni and Porqueddu (2015)). This development is especially marked in those countries which experienced deeper and longer recessions and made greater efforts to reform their product and labour markets.

Estimating the same specifications of Phillips curves over two samples, one stopping at 2012 Q1 (when we started systematically over-predicting inflation) and the other covering the full sample ending in 2014 Q4, one finds evidence of an increase in the slope estimate. Indeed, regime-switching estimates, accounting for parameter change due to state-dependency on various measures of the business cycle can help to explain the “excessive” disinflation since 2012.

How much time variation is there in the slope of the Phillips curve, and in which direction? Let us take an agnostic view on the origins of the time-variation and estimate a hybrid NKPC for the euro area with time-varying parameters, similar to that in Blanchard et al. (2015). Over the sample period running from 1999 Q1 to 2015 Q2, the slope of headline inflation had a general tendency to *decrease* until 2011, after which it *rebounded*. For core inflation the upward shift started earlier.

Similar results have been obtained also using the structural New Area Wide Model (NAWM). In the NAWM framework, the Phillips curve relates current inflation to expected future and realised past inflation, and to a marginal cost term capturing the pricing behaviour of firms. The slope coefficient is a function of several structural parameters controlling nominal and real rigidities.

Based on a rolling window estimation of the Phillips curve of the NAWM, there is evidence of an initial decline in the slope of the Phillips curve before the crisis, followed by a certain degree of steepening in the more recent period. Overall, the findings based on our structural model are consistent with the estimates from our time-varying parameters time series models.

### **Possible policy responses**

Let me now turn to discussing possible policy responses to low inflation in an environment of low nominal interest rates. This topic is investigated by several papers at the conference.

### **Forward guidance**

Since June 2013, the ECB has been providing forward guidance on the future path of the monetary policy interest rates, conditional on the outlook for price stability. In early 2014, the Governing Council “firmly reiterated” its forward guidance, explaining that “this expectation is based on an overall subdued outlook for inflation extending into the medium term”, among other factors. Hence, forward guidance can be included in the bundle of possible unconventional policy responses to a prolonged period of low inflation.

In essence, forward guidance works through an expectations’ channel: expected future short-term interest rates are a key element in the determination of long term interest rates, which in turn are essential drivers of saving, consumption and investment decisions.

As such, forward guidance can serve two main purposes. First, it can provide greater monetary policy accommodation when the policy rate reaches the ZLB, by providing assurance that the central bank will keep the policy rate at low levels for some time, and for a longer period than the public initially expected. Second, it may prevent market volatility from interfering with and hampering the transmission of monetary policy decisions. Hence, once the policy rate has reached the ZLB, the introduction of forward guidance and the commitment to keep the short-term interest rate at the lower bound for a prolonged period of time would transform the ZLB from a constraint into a deliberate monetary policy strategy.

An assessment of the macroeconomic implications of announcing a path of the policy rates can be obtained using structural DSGE models, which assign a crucial role to the agents' expectations about future developments of the main macroeconomic variables. In this respect, the paper by **Wiederholt** (2015), argues that forward guidance is less powerful when agents have dispersed information. Coenen and Warne (2014), using the New Area Wide Model (NAWM) developed at the ECB, show that with nominal interest rates at the ZLB forward guidance can mitigate the downside risks to price stability.

Yet other papers, such as the one by **McKay, Nakamura and Steinsson** (2015) presented at this conference are less sanguine about the power of forward guidance. When households face borrowing constraints, they cannot take advantage of future changes in interest rates. Moreover, even unconstrained households may increase precautionary savings in the face of uninsurable income risk, further tempering the effects of a reduction in long-term rates.

### **Unconventional monetary policy measures**

In recent years, central banks in the advanced economies have enacted various rounds of "Quantitative easing" (QE) policies, aimed at supporting economic activity – and, as a consequence, inflation dynamics – when short-term monetary policy rates have reached the ZLB.

In general terms, QE policies consist of asset purchases by the central bank and are expected to affect economic activity and inflation through a variety of channels. The increased demand for government bonds directly reduce their yield, driving investors towards alternative financial instruments and therefore generating spill-over effects to a broader range of assets. The latter would trigger a portfolio rebalancing effect, which would expand the private sector's spending capacity. More specifically, aggregate demand is expected to increase, reflecting the positive intertemporal substitution effect of lower interest rates onto households' and firms' consumption and investment decisions.

Moreover, an increase in the prices of financial and real assets would also have an expansionary effect on aggregate demand by directly increasing the wealth of holders. The banks' cost of funding is also expected to fall, contributing to easing credit supply conditions. Finally, lower yields in domestic currency-denominated assets are expected to trigger a depreciation of the domestic currency, which would provide support to exports and increase imported inflation. The latter effect, together with the expansion in aggregate demand and the augmented public's confidence in the central bank's ability to attain its objectives, should have a positive impact on inflation expectations.

The prolonged period of low inflation rates observed in the euro area since 2014 has prompted a number of unconventional monetary policy measures by the ECB. During 2014, two targeted longer-term refinancing operations (TLTROs) and an asset-backed securities (ABS) purchase programme were started. In January 2015 the ECB announced the launch of the APP, encompassing the existing programmes for ABS and covered bonds, as well as purchases in the secondary market of euro-denominated investment-grade securities issued by euro-area governments, agencies and European institutions. These unconventional monetary policy measures were introduced after the ECB policy rates had been repeatedly lowered.

The recent introduction of the APP has successfully improved financial and credit conditions in the euro area and contributed to supporting the normalisation of price stability, as well as the ongoing economic recovery.

Our new non-standard measures have resulted in higher equity and bond prices, improved lending conditions, and also a recovery in inflation expectations. Since June 2014 the transmission of policy rates to lending rates has improved considerably, with declines in lending rates becoming more pronounced as well as more widely distributed across euro area countries. Moreover, our quarterly bank lending survey confirms the improvements in

broader credit conditions since the introduction of our new non-standard measures. The survey, addressed to the senior loan officers of a representative sample of euro area banks, provides information on financing conditions in euro area credit markets and on banks' lending policies. Banks have consistently eased their credit standards for loans to non-financial corporations over the past year. The easing of credit standards stems, notably, from the lower cost of funds and balance sheet constraints, as well as from greater competition among banks. Both developments were clearly objectives of our measures, in particular of the TLTROs. Easier access to credit has been coupled with a consistent increase in firms' demand for loans. The general level of interest rates, according to the survey respondents, is contributing most to the recovery in loan demand.

Concerning inflation expectations, the declining trend I mentioned above has been reversed since January 2015. Both market-based and survey-based measures of longer-term inflation expectations have recovered from their lows.

The effects of the recent introduction of the APP on euro area economic activity and inflation can also be analysed through the lens of some structural DSGE models, like a variant of the model developed by Gertler and Karadi (2013). In this class of models, simulation results show that the APP should provide support to euro-area GDP growth over a three-year horizon, while the inflation rate should increase significantly in the same period (see Burlon et al. 2015, and Cova, Pagano and Pisani 2015).

### **Structural reforms**

Among the possible policy measures to be implemented in a low inflation environment, structural reforms in product and labour markets have been repeatedly advocated. While the long-run macroeconomic benefits of structural reforms are documented in the literature, their short-run macroeconomic effects are less clear during a recession associated with a financial crisis. Specifically, reforms could allow for an earlier exit from the ZLB if their short-term effects on inflation and economic activity are positive, or they could increase the duration of ZLB if their effects are negative.

Structural reforms in the product and labour market have a positive effect on permanent income, associated to the permanent expansion in aggregate supply. This increase in permanent income generates a positive wealth effect that favours a permanent increase in aggregate demand. However, when the economy is at the ZLB, a negative channel also appears: since nominal interest rates cannot be reduced, any fall in inflation translates into an increase of the real interest rate, generating contractionary effects. In particular, prices will fall if the initial surge in aggregate demand generated by the reforms is smaller than the expansion in aggregate supply. Eggertsson, Ferrero and Raffo (2014) show that, in the absence of physical capital accumulation, the fall in inflation and the lack of leeway to make further interest rate cuts render this type of reform contractionary in the short run, through an increase in the real interest rate. When the former demand effect prevails on the increase in aggregate supply, the reforms have expansionary short-term effects. In particular, Gerali, Notarpietro and Pisani (2015) show that reforms simultaneously implemented in the whole euro area can favour an earlier exit from the ZLB if they generate sufficiently large short-run inflationary effects through an increase in physical capital accumulation. The conference paper by **Arce, Hurtado and Thomas** (2015) develops a two-region model of the euro area with deleveraging, showing that a reform in a peripheral region which increases future output has always short-term expansionary effects on the domestic economy. However, depending on the presence of the ZLB, the reform may generate positive or negative spillovers on the core region.

### **Conclusions**

Let me conclude. Inflation dynamics since the Great Recession have shown signs of instability that have led to a sequence of systematic forecasting errors. The two puzzles of

“missing disinflation” and “excessive disinflation” triggered a surge of new research around the Phillips curve and its possible demise, which seems to have been prematurely foretold.

The Phillips curve seems to survive the recent reassessment and is still a valid tool of analysis in the euro area, meaning that a sustained recovery in inflation is conditional upon the increase in real activity and inflation expectations.

Even if policy interest rates reach their effective lower bound, monetary policy does not run out of ammunition. In particular central banks can use forward guidance and unconventional monetary policy measures in the form of “quantitative easing” in order to stimulate economic activity and bring inflation closer to the target. Such policies, however, cannot be a replacement for proper structural reform to the extent that it is needed.

The euro area and other advanced economies continue to face a complex challenge to overcome the legacy effects of the Great Recession. In our case, the challenge of too low inflation has been particularly acute but the use of a vast array of policy measures gives us hope that we achieve our medium-term objective of inflation close to 2%. The contribution of academic research has been relevant for the design of our policies. This conference is a good example of such contributions and I therefore wish you a very productive discussion.

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