The ECB's response to low inflation

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In the last half century central banks have come a long way in how they approach their macro-stabilisation functions. As recently as the late 1970s, views still diverged across advanced economy central banks as to the efficacy of monetary policy in delivering price stability. Some, such as the Bundesbank and the Swiss National Bank, were already committed to using monetary measures to control inflation. But others, such as the Federal Reserve and various European central banks, remained more pessimistic in their outlook, believing that monetary policy was an inefficient means to tame inflation and that other policies should be better employed.[1]

Illustrating this view, Fed Chairman William Miller observed in his first FOMC meeting in March 1978 that *"inflation is going to be left to the Federal Reserve and that's going to be bad news. An effective program to reduce the rate of inflation has to extend beyond monetary policy and needs to be complemented by programs designed to enhance competition and to correct structural problems".*[2] In this context of timidity about the effectiveness of policy, inflation expectations were allowed to de-anchor, opening the door to bouts of double-digit price rises. The outcome was a phase of so-called "stagflation", where both inflation and unemployment rose in tandem.

The policy lesson that emerged from this period was that sustainable growth could not be separated from price stability, and that price stability in turn depended on a credible and committed monetary policy. From late 1979 onwards – with Volcker's assumption of the Fed chairmanship – central banks converged towards this orientation and took ownership for fulfilling their inflation mandates. As their renewed commitment to control inflation became understood, inflation

[1] See Romer, C. and D. Romer (2013), "The Most Dangerous Idea in Federal Reserve History: Monetary Policy Doesn't Matter", American Economic Review: Papers & Proceedings 2013, 103(3): 55–60.

[2] Federal Open Market Committee meeting, Transcript, 21 March 1978.

rates fell steeply in a context of improved anchoring of inflation expectations. Central banks abandoned the self-absolving notion that price stability depended on other, non-monetary authorities.

As is well-known, the events that led to the 2008 crash confirmed that price stability is not a sufficient condition for macroeconomic stability. Yet it remains a necessary condition. And today in the euro area we face a situation where price stability is once more under threat – this time not through too high inflation, but through inflation remaining too low for too long.

In that context, the ECB has been engaged in an unprecedented expansion of its monetary policy toolkit to bring inflation back to its objective. Yet these measures have not been uncontroversial, and questions have been raised about their necessity. What I will discuss in my remarks today is *why* the ECB has been so determined to raise inflation, and *how* the measures it has adopted are contributing to that end. This requires that we first take a closer look at the ECB's objective.

1 The ECB's objective

The Treaty on the Functioning of the European Union establishes the ECB's primary objective as maintaining price stability. But unlike some other central banks, we have not been given a specific numerical inflation target by a legislature or ministry. To enhance accountability, in 1998 the ECB Governing Council decided that price stability should be defined in quantitative terms, as a year-on-year increase in the Harmonised Index of Consumer Prices for the euro area of below 2%, and that it should be maintained over the medium-term. Following a thorough evaluation of its monetary policy strategy in 2003, the Governing Council further clarified that, within this definition of price stability, it aims to maintain inflation rates "below, *but close to,* 2% over the medium-term".

In other words, since that clarification in 2003 the numerical range for the definition of price stability has been supplemented with *a focal point* at which the Governing Council aims, while the *temporal horizon* over which price stability has to be achieved has remained flexible. However, as inflation has consistently been ratcheting down to the bottom of the price stability range in the course of the past four years and our measures, as a consequence, have become more expansionary, how we interpret our objective and the relevant horizon for delivery have been called more into question. There have been two main issues raised.

First, some have asked *if the central bank should not be even more patient* in trying to bring inflation back to levels in the proximity of the upper ceiling of the price stability range.

In this line of thinking, low inflation today is predominantly being driven by global factors which will ultimately unwind if given sufficient time to work

through the economy. Due to inertia in the wage and price formation process, there is no particular risk of bouts of very low or even negative inflation feeding into sustained deflation. The central bank should therefore emphasise its medium-term orientation and extend the policy horizon until inflation returns to the desired level.

Second, others have queried whether it is justified for the ECB to be s*o attached to its focal point of below but close to 2% at all.*

Any rate of inflation between 0% and 2% would be equally consistent with our price stability definition, this argument goes. Indeed, when inflation is at the lower end of the range and conventional policy tools are close to exhausted, the costs of using unconventional measures to drive inflation up outweigh the benefits in terms of preparing the ground for higher inflation in a not so distant future. The central bank should thus not be obsessive about delivering on its aim of a close to 2% inflation rate.

Let me address each of these issues in turn.

2 How patient can a central bank be?

On the face of it, the argument that central banks can tolerate periods of too-low inflation is correct. Inflation can move temporarily below – or above – our aim without requiring an immediate policy response. That is the implication of our medium-term orientation, which gives the central bank discretion over whether to react to short-run macroeconomic fluctuations. Yet that discretion is always bounded by two factors: the *nature of the shocks hitting the economy;* and the *credibility of our objective* in the face of those shocks.

If the economy has been hit predominantly by demand shocks, there is no case for the central bank to delay policy action. Both economic activity and inflation will tend to move in the same direction, presenting the central bank with an unambiguous policy prescription, which is to make its monetary policy more accommodative for a negative shock, and less accommodative for a positive one. The medium term in this case is the shortest period in which we can realistically bring inflation back to our objective, which is equal to the length of the monetary transmission lag.

However, if inflation developments are being driven by supply shocks – say, a supply-side induced decline in oil prices – the policy horizon can be more flexible. As activity and inflation move in opposite directions, if the central bank acts to counter fluctuations in prices, it risks exacerbating deviations from steady state output growth. But if instead we extend the medium-term horizon and tolerate lower inflation for a temporary period, there is no contradiction: we can "look through" the shock and wait until its effect on inflation fades out.

Crucially, however, our ability to lengthen the medium-term horizon in this way depends on our objective remaining credible – and especially when the economy is hit by repeated one-sided shocks and inflation deviates from our objective systematically in the same direction for a prolonged period.

In such circumstances, the inflation process can become subject to short-term spells of inertial drift.[3] But if agents remain confident that below but close to 2% remains the orientation of policy, they will not factor past developments into their forward-looking price- and wage-setting behaviour, and inflation will return to our objective in the steady state. If on the other hand the determination to reach our inflation aim were to be questioned by the public, firms and households might start to look more at the track record of recent inflation and incorporate that in their behaviour – which technically would correspond to a permanent downward displacement of the Phillips curve. What began as a temporary period of low inflation could then become persistent.

In other words, if in a prolonged period of low inflation the central bank is so tolerant with its policy that the public loses faith in its ultimate inflation objective, it risks not just that expectations destabilise from its aim, but that the economy settles into a new regime of lower inflation, with both inflation and inflation expectations *re-anchoring towards the lower end of its price stability range.* Faced with such a risk, the policy horizon would immediately have to be shortened to re-establish our commitment and ensure that any outbreak of adaptive expectations was transient.[4]

So is this relevant for the euro area today? Certainly, we have faced a succession of one-sided global supply shocks since early 2013 and, with tangible intensity, since summer 2014 linked to the reversal of the commodities supercycle. This requires flexibility over the policy horizon.

In line with the rule-book that I just expounded, the ECB response was indeed measured in the early phase of rapid disinflation. Except for our announcement of forward guidance in summer 2013 and a restriction of the monetary policy corridor in November of that year – both measures intended to insulate our money market conditions from the volatility introduced by the dollar tantrum episode in late spring of that same year – our policy rates and non-standard measures were left unaltered until June 2014. We acknowledged that, in conditions of slow recovery, the unwinding of the previous strong contributions of energy prices to headline inflation would counsel patience.

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[3] Gordon, R. (2013), "The Phillips Curve is Alive and Well: Inflation and the NAIRU During the slow recovery", NBER Working Paper No. 19390, August 2013.

[4] For more on this point see Praet, P. (2015), "Price stability: a sinking will-o'-the-wisp?", intervention during a panel on "The elusive pursuit of inflation" at the IMF Spring Meetings Seminar, Washington, 16 April 2015.

Yet, as the recovery proved more subdued and vulnerable to outside shocks than we had expected, and the descent of inflation to the lower portion of the price stability range accelerated and became more entrenched, our attention shifted to a wide spectrum of inflation expectations. The risk was that, unlike in previous episodes of sharp oil price reversals, inflation expectations might lose their resilience, due to accumulating evidence that the return of headline inflation to our objective had been repeatedly put back.

Indeed, despite a first reduction in the deposit facility rate to a moderate negative level in June 2014, and the simultaneous announcement of a first series of targeted long-term operations designed to unblock the transmission mechanism, during the summer of 2014 long-term inflation expectations started a gradual decline to levels unseen since the start of monetary union. With unabsorbed slack continuing to hold back core inflation, the end point of convergence after the negative supply-side shocks would fade out of measurement remained unclear, as core inflation – not headline inflation – is a good predictor of headline inflation over the medium term.[5] As such, the importance of core inflation in determining long-term inflation expectations also appeared to be increasing. Without further decisive policy action, sized to a scale appropriate to arrest the process, a downward re-anchoring towards a lower inflation rate could not have been ruled out.

These considerations led the Governing Council to announce in January 2015 that the private-credit asset purchase programme that had already been decided over the previous summer would be expanded in magnitude to include sovereign securities. The programme has been re-scaled and re-designed in December 2015 and in March of this year.

3 The costs of too-low inflation

Let me move to the second question about our policy: even if a re-anchoring of expectations around levels in the lower portion of the price stability range were to take place, why is that fundamentally a problem? The answer to this has two parts. First are the costs that come from the level of inflation being too low, both in the steady state and when dealing with the legacies of the crisis. Second are the costs that arise from transitioning between different anchors for inflation, and especially when the original objective is not being fulfilled.

In terms of the costs of too-low inflation, there are three main issues, each of which we emphasised when we clarified our objective in 2003.

[5] ECB (2016), "The relationship between HICP inflation and HICP inflation excluding energy and food", Box 7, Economic Bulletin, Issue 2/2016.

First, in the presence of downward rigidities, delivering an inflation rate closer to 2% than to 0% supports product and labour market functioning.

On the product market side, it allows relative prices to adjust more easily across goods and services in response to shifts in aggregate supply and demand, which improves price signalling and resource allocation. At an average inflation rate of 2%, relative prices can realign around that level without producers necessarily needing to cut prices in nominal terms, whereas at lower inflation rates nominal downward rigidities are more likely to bite and hamper the adjustment process. On the labour market side, a 2% inflation rate provides an important margin of adjustment in the face of shocks. When demand falls and nominal wages are sticky rather than downwardly flexible, the unemployment cost is cushioned by the higher general rate of inflation, as this effectively lowers the real wages that firms have to pay.

In summary: the idea that nominal wage rigidities may be an insurance mechanism against deflation becoming endemic – just because it mechanically prevents prices from falling – is a partial equilibrium fallacy. In the face of declining prices, wage rigidities shift the burden of adjustment onto the scale of employment, as firms attempt to recover mark-ups which are being eroded by high labour costs measured in inflation-adjusted terms. The higher jobless rate which results from this labour shedding process exacerbates the downward pressure on the general price level and sets the conditions for this process to become self-feeding.

Second, following a similar logic, an inflation rate closer to 2% facilitates cross-regional adjustments in relative prices within a monetary union.

A higher "nominal bar" allows countries to reduce inflation relative to the euro area average without having to run up against downward rigidities or enter outright deflation. This was an important consideration when the Governing Council first decided to identify the focal point close to 2% within its price stability range. At the time, core economies, such as Germany and France, were seen as being systematically driven towards the floor of the range since other "catching-up" economies, such as Spain, were operating at high inflation rates and therefore pulling up the euro area average. Letting the average increase toward the upper limit of the range would, it was thought, facilitate the workings of those core economies which were adjusting their relative competitiveness position vis-à-vis other members.

Today we face similar heterogeneity in country-based inflation, but the positions of the core versus non-core economies have reversed. Several non-core economies have had to undergo large relative price corrections to reverse the intra-area imbalances accumulated in the boom period. At the same time, core economies have systematically operated at lower inflation rates, pulling down the euro area average against which non-core countries have to adjust. In those

conditions, ensuring that the "nominal bar" remains in line with our objective is essential to enable a smooth and expedited adjustment process. Indeed, as we remain mired in the legacies of the financial crisis, it is perhaps even more pressing today than it was in the early life of our currency union.

Third, an objective closer to 2% provides a crucial "safety margin" for monetary policy against running into the lower bound on policy rates, and thus provides more scope to use conventional instruments, rather than unconventional and still relatively untested measures, to respond to future shocks. This is because, for a given real interest rate, a higher inflation objective implies a higher nominal interest rate over the cycle.

Just as for relative price adjustments, this rationale is also perhaps more important today than when we established our aim. ECB estimates at that time suggested that, with an objective of 2%, the probability of interest rates reaching zero was close to zero.[6] We know now that this was likely an underestimate. Moreover, we assumed a real equilibrium interest rate of 2% on average, which may well be lower today given the evolution of the secular and cyclical forces since then.[7] In that context, if real rates were to continue their trend decline and inflation were to settle lower as well, nominal interest rates could well be considerably lower over future cycles. The central bank might then have to resort to unconventional measures more frequently to fulfil its mandate.

This reveals the implicit trade-off in the argument that central banks should not fight too-low inflation because the unconventional measures required to do so produce more costs than benefits. If central banks did not use such measures to raise inflation today, they would be more likely to have to use them tomorrow, by which time low inflation and sluggish growth would have interacted to cause an even deeper slump. By contrast, by acting decisively to defend our objective now, we ward off more severe macroeconomic imbalances and create the minimal conditions for macroeconomic normalisation, which in turn is a precondition for policy normalisation.

4 The costs of transitioning downwards

Alongside the costs of a low inflation regime, there are also costs associated with the transition process itself. Again there are three main issues.

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[6] Coenen, G. (2003), "Zero lower bound: is it a problem in the euro area?", ECB Working Paper Series No. 269, September 2003.

[7] For a fuller explanation of this point see Praet, P. (2015), "The low interest rate environment in the euro area", speech at a Pension Funds Conference organised by De Nederlandsche Bank in Bussum, 10 September 2015.

The first is the impact of unexpectedly low inflation on real interest rates and debt dynamics.

When interest rates have reached zero, a downward re-anchoring of inflation implies rising expected real interest rates. That is very problematic in current conditions since, with the economy still adjusting to pre-crisis investment misallocations, the real equilibrium interest rate is now at very low – possibly negative – levels. A fall in inflation would thus pull short-term real interest rates away from their market clearing levels. Saving and investment imbalances would then have to be resolved in another way, which in a market economy would take place through a fall in income levels, in turn compressing savings. In other words, in the environment we face today, the transition to lower inflation rates would risk the economy adjusting through recession.

A parallel drop in inflation and rise in real rates would also complicate the necessary workout of the debt overhang bequeathed by those pre-crisis excesses.[8] Lower-than-expected inflation implies that a higher share of firms' and households' income has to be diverted to debt service than was planned when the loan was taken out. That can in turn lead to a redistribution between borrowers and lenders, which may have negative demand effects due to their different propensities to consume and invest. Inflation turning out below expectations also more generally impedes the process of deleveraging which is required to reduce high debt levels.

Indeed, deleveraging can take place through two channels, which are both important: balance sheet deleveraging (i.e. debt repayment and write-offs) and macroeconomic deleveraging (i.e. growth and inflation). While it is sometimes argued that accommodative monetary policy delays the former, it also supports the latter. In fact, those economies where central banks have resorted to such policies earlier and more aggressively are also those that are most advanced with deleveraging. The reason is that by generating higher growth and inflation in line with their objectives they have been able to minimise the need for balance sheet deleveraging and the associated credit contraction. That has in turn contributed, in a virtuous circle, to a quicker elimination of slack and stronger nominal growth.

To illustrate, nominal GDP growth has contributed around 20 percentage points to both household and corporate debt reduction in the US, and almost 30 percentage points in the UK, compared with just 10 percentage points in the euro area.

Second – and more fundamentally – allowing inflation to re-anchor downwards comes with a high risk of credibility losses for the central bank, and especially when the objective is not being met.

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[8] See Kalemli-Özcan, S., L. Laeven and D. Moreno (2015), "Debt Overhang, Rollover Risk and Investment in Europe", mimeo.

Such losses create true welfare costs for society, as pointed out in the classical contributions by authors like Kydland and Prescott (1977) or Barro and Gordon (1983).[9] And in the current low inflation environment, it would have similarly adverse implications for our credibility as the admissions by some central bankers in the late 1970s that high inflation was an intractable problem and impervious to monetary policy action. We know from that era how costly this can be for central banks' ability to deliver long-term price stability. Disavowing the inflation aim in current conditions might also be perceived especially negatively by the public, for instance as revealing expectations of "secular stagnation" and associated weak price pressures.

Indeed, Eggertsson and Pugsley (2006) show that, in a fragile post-crisis situation where monetary policy is sustaining the recovery, any perception that the central bank is adopting greater tolerance towards a future regime of lower inflation can have very negative effects. Looking at the Great Depression period, they argue that the return of the US economy to recession in 1937 resulted from a perception that the Fed had abandoned its commitment to reflation, creating pessimistic expectations of future growth and inflation that fed into both expected and actual deflation. The economy then became caught in an equilibrium of "contractionary beliefs".[10]

Third, once central banks let inflation expectations drift away from their previous anchor and fail to counteract this through forceful policy action, there is no guarantee that expectations will naturally settle at another desirable level.

As Orphanides and Williams (2004) show, it is precisely by defending its inflation objective that the central bank facilitates the public in learning how to process the flow of information, and thereby influences the formation of inflation expectations.[11] Without such an orientation, expectations may continue to drift in the same direction, and a *re*-anchoring of inflation expectations may morph into an outright *de*-anchoring of inflation expectations with no visible end-point. In such conditions, monetary policy would face an uphill battle to preserve inflation rates compatible with any reasonable definition of price stability.

To see this, consider a simple Phillips curve framework that relates inflation to measures of economic slack. Accommodative monetary policy reduces the degree

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[9] Kydland, F. and E. Prescott (1977), "Rules rather than discretion: The inconsistency of optimal plans", Journal of Political Economy, 85, 473-490. Barro, R. and D. Gordon (1983), "Rules, discretion and reputation in a model of monetary policy", Journal of Monetary Economics, 12, 101-120.

[10] Eggertsson, G. and B. Pugsley (2006), "The Mistake of 1937: A General Equilibrium Analysis," Monetary and Economic Studies, Institute for Monetary and Economic Studies, Bank of Japan, vol. 24(S1), pages 151-190, December.

[11] Orphanides, A. and J. Williams (2004), "Imperfect Knowledge, Inflation Expectations, and Monetary Policy," NBER Chapters, in: The Inflation-Targeting Debate, pages 201-246 National Bureau of Economic Research, Inc.

of economic slack and thereby puts upward pressures on inflation – a move of the economy along a given Phillips curve. But when inflation expectations change, this is not the only dynamic pattern taking place. Instead, a change in inflation expectations alters the inflation rate to which the economy will gravitate when it reaches full employment. We can think of a decline in inflation expectations as a downward shift in the Phillips curve, leading to a lower intercept.

Clearly, this downward shift in the Phillips curve counteracts the reflationary impact that the accommodative monetary policy intends to achieve via the absorption of economic slack; and the downward impact may, in fact, dominate in certain conditions. In particular, if the relationship between inflation and slack is relatively weak – implying a flat slope of the Phillips curve – a given degree of monetary accommodation is less likely to trigger the upward momentum in prices necessary to compensate for falling inflation expectations. As a consequence, actual inflation may decline, even in situations where monetary policy has been successful in reducing slack.

The economy may then enter on a self-sustaining spiral: declining inflation expectations shift down the Phillips curve, which puts downward pressure on actual inflation, which in turn translates into a further decline in inflation expectations.

5 How the ECB's measures support price stability

So there is a strong rationale for *why* the ECB has acted to lift inflation back towards our objective. But *how* do our measures work towards achieving this?

As I mentioned above, the risks of a downward re-anchoring of inflation and inflation expectations led the Governing Council to expand its asset purchase programme (APP) in January 2015 and to rescale that programme in December 2015 and March 2016. The APP has been complemented by two further non-standard instruments: a series of targeted long-term refinancing operations (TLTROs) and a negative deposit facility rate (DFR), both of which were also adjusted at the December and March policy meetings. These measures form a mutually reinforcing policy package.

Our decision to respond to emerging shocks by rescaling these measures – rather than adopting new ones – has hinged on our confidence that they are effective in lifting inflation back towards our objective. This is based on two assumptions about the monetary transmission process: first, that our policy package has led to improved financial and borrowing conditions; and second, that improved financial and borrowing conditions have led and will lead to higher real activity, reduced economic slack and upward pressure on inflation.

We are confident in those assumptions because the mechanisms through which our policy measures should boost the economy are clear. Theory suggests they should ease financial conditions through a combination of supportive channels, contributing to a lower cost of debt finance, a lower cost of equity and a lower exchange rate, all of which contribute to raising consumption and investment.

First, via the portfolio rebalancing channel, the measures lower yields on a wide array of financial assets, implying a broad-based easing of financial conditions. The primary instrument in this regard is the APP, which compresses the term premia which are incorporated in risk-free interest rates and thereby encourages investors to move up in the maturity and risk ladder and shift to other, non-targeted asset classes. The negative DFR in turn discourages selling agents from hoarding the additional liquidity, speeding up the process of asset reallocation and reinforcing the downside pressure on the long end of the term structure of interest rates.

Second, via the direct pass-through channel, our package eases borrowing conditions in the real economy by easing banks' refinancing conditions and supporting non-financial corporates directly. This channel is perhaps most prominent in the case of the TLTROs, which through built-in incentive mechanisms ensures that the funding cost benefit is passed on to borrowers. It also applies to our purchases of ABS and covered bonds, which encourage banks to increase their supply of loans that can be securitised, and more recently our decision to start a corporate bond purchase programme. In addition, substitution effects induced by the TLTROs can result in a reduction in the supply of bank bonds, which translates into lower yield on bank bonds for the financial sector as a whole.

In parallel, portfolio rebalancing supports this direct pass-through channel, as lower term spreads on public securities encourage a shift in the composition of banks' portfolios toward other types of exposures with a higher risk-adjusted return, especially loans. The resulting increase in credit supply lowers its cost.

Third, via the signalling channel, the policy package triggers a downward revision of market expectations for future short-term interest rates, which aids portfolio rebalancing and direct pass-through effects by further flattening the risk-free curve. In the case of the DFR, our forward guidance that rates will stay at present or lower levels for an extended period of time – and beyond our net asset purchases – tilts downwards the probability distribution of the expected path of future rates. The signalling channel also helps stabilise inflation expectations, thereby preventing an unwarranted tightening in real long-term rates with negative effects on investment and consumption.

6 Impact on financial conditions

How do we know that these positive effects of our policy package are indeed occurring and that they are sufficiently powerful to achieve the desired outcomes? In terms of financial conditions, the evidence so far suggests that the impact of our policy has been substantial. Since June 2014, we have seen a broad-based easing in money market conditions, long-term government bond yields, corporate and bank bond yields, bank lending rates to firms and households, and the growth of money and credit.

Using a number of econometric techniques, we find that without our policy measures, financial conditions would be considerably tighter today. Event studies conducted by ECB staff give evidence about the central role of our policy package in the broader easing of financial conditions since June 2014[12]. A sizeable impact is estimated for long-term sovereign bonds – around 90% of the total fall in euro area yields. The spillovers to yields of other asset classes are significant, too, in the case of euro area financial and non-financial corporate bonds. While the stock market has overall underperformed in the period since June 2014, we estimate that without our measures stock prices would be notably lower.

On top of this, ECB analysis finds that our policy package has had a substantial direct effect on bank lending rates, as well as an indirect effect on lending conditions through their marked impact on long-term government bond yields.[13] This effect has been further reinforced by the beneficial impact of lower long-term yields on the macroeconomic outlook and hence on the macroeconomic risk embedded in lending rates. Counterfactual simulations by our staff attribute 40-60bps in the decline in bank lending rates to the indirect impact of the TLTROs and APP through this channel.[14]

We have also tested the effectiveness of our measures using more micro analysis, for instance by gauging how they have affected the behaviour of TLTRO borrowers relative to non-borrowers. This analysis shows that TLTRO borrowers have reduced their recourse to wholesale funding more than other banks, allowing them to lower their funding costs. This has in turn raised bank bond prices and, in combination with spillover effects from the APP, helped suppress the cost of financing for banks across euro area countries, benefiting banks regardless of their recourse to Eurosystem lending operations. The role of our measures as a driver of these developments is confirmed by banks' responses to the Bank Lending Survey (BLS).

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[12] For more on the methodology behind these estimations see ECB (2015), "The transmission of the ECB's recent non-standard monetary policy measures", Box 2, Economic Bulletin, Issue 7/2015.

[13] Altavilla C., G. Carboni and R. Motto (2015), "Asset purchase programmes and financial markets: lessons from the euro area", ECB Working Paper No. 1864.

[14] These estimates are based on a counterfactual simulation of lending rates using a panel BVAR of euro area banks and the long-run effect of lower government bond yields on NFC lending rates using a panel-error correction model, also estimated at bank level.

This funding improvement can in turn be seen in bank lending conditions: analysis of the bidding of banks in TLTROs shows that there has been a close relationship between participation in these operations and lending behaviour, especially in vulnerable countries. We find that banks located in vulnerable countries that have participated in TLTROs have lowered their lending rates by more than non-participants. This has resulted both from the lower financing costs elicited by the TLTRO, which has created scope for banks to reduce lending rates, and the increased lender competition for good credit it has spurred. These patterns are again confirmed by the responses to the BLS.[15]

Micro evidence confirms that the negative DFR has empowered the APP, too.[16] ECB staff research finds that bank balance sheet reactions to holdings of excess liquidity have changed as a result of this policy: for example, banks in less vulnerable euro area countries were found to have granted more loans to the real economy than would have been the case without negative rates. In addition, banks with large holdings of excess liquidity, in particular in less vulnerable Member States, were found to have rebalanced significantly more towards non-domestic euro area government bonds than in the absence of the negative DFR. This behaviour is likely to have contributed to a reduction in fragmentation and a more uniform transmission of monetary policy, in the past year or so.

In sum, relative to the counterfactual scenario, our policy package has had a tangible improvement in financial and borrowing conditions.

7 Impact on output and inflation

This improvement is a sign that our measures have cleared important hurdles on their way to supporting the macroeconomy. What we have not seen yet, however, is a significant recovery in the path of either headline or core inflation. This has led some observers to question whether the second leg of the transmission – from financial conditions to real activity and inflation – is still intact.

Of course, the fact that this easing has occurred concurrently with the economy receiving new shocks poses a fundamental identification problem. Or put another way, we have to be careful to avoid assessing monetary policy by "looking out the window".[17] This describes the process of eyeing where certain key variables are today compared with the beginning of the policy, and then concluding that

[15] ECB (2015), "The transmission of the ECB's recent non-standard monetary policy measures", Economic Bulletin, Issue 7/2015.

[16] Demiralp S., J. Eisenschmidt and T. Vlassopoulos (2016), "The impact of negative interest rates on bank balance sheets: Evidence from the euro area", ECB mimeo.

[17] Blinder, A. (1998), Central Banking in Theory and Practice, Cambridge: MIT Press.

the policy has succeeded or failed. But this is not how rigorous economic analysis is conducted. Given that the economy is never static, one always needs to assess a counterfactual scenario; what would have transpired without the policy action.

In that context counterfactual analysis has also helped us to measure the impact of our measures along another dimension: their macroeconomic propagation.

Our impact assessment on GDP and inflation spans a large and diverse suite of models, reflecting alternative modelling traditions, and capturing different transmission channels, in particular in relation to the impact of asset purchases. Some models mainly draw on empirical time-series methodologies, while others draw on (semi-)structural macro models, with an important role for financial frictions, and on macro-finance term structure models.

Intuitively, the various model assessments share the idea that the relevant variable in modelling the impact of the APP is the expected future path of central bank asset holdings (i.e. the evolution of the "stock" of assets) under the programme. In some models, the full path of the central bank portfolio enters the decision problem of economic agents upon announcement of the programme. This is consistent with empirical evidence from event studies which supports the view that financial markets respond on impact to the announcement of asset purchases, and even prior to the announcement when expectations of a programme build up.

At the same time, for robustness considerations some models have entertained the alternative assumption that asset purchase programmes affect the behaviour of economic agents only gradually. Such effects are compatible with a situation in which financial markets learn over time the implications of the central bank's asset purchases, or in which such purchases trigger changes in local liquidity conditions. A related distinction across those model assessments is how this expected future path of asset purchases is mapped into the macroeconomy. Many of these models include directly the quantity of central bank asset purchases, and embed mechanisms that allow the transmission of purchases to the economy and inflation. The remainder of the models indirectly back out the effect of asset purchases on the economy on the basis of a two-step approach.

The results from this comprehensive exercise suggest that, relative to the counterfactual scenario, our measures (excluding the March 2016 decisions) have provided significant support to output and inflation. In the absence of our policy package, inflation would have been negative in 2015. In 2016 it would have been at least half a percentage point lower than we forecast currently and around half a percentage point lower in 2017. The impact of the policy measures on euro area GDP is also sizeable (again excluding the March 2016 decisions). According to the staff assessment, our policy is contributing to raise euro area GDP by around 1.5% in the period 2015-18.

In sum, while this staff assessment must be qualified, the results of our counterfactual simulations show that the expected return of inflation to levels closer to our objective relies to a significant extent on continued monetary accommodation. If inflation has remained weak, it is not because policy has been ineffective, but rather because new shocks have hit the economy in the meantime. The scaling-up of our policy measures has hence been the appropriate response in the face of intensifying headwinds; indeed, had it not been for these measures, the economic environment would likely be considerably more troubling today.

If further adverse shocks were to materialise, our measures could be recalibrated once more commensurate with the strength of the headwind, also taking into account possible side-effects.

8 Conclusion

Decades of experience have confirmed the importance of price stability for macroeconomic stability and sustained economic growth. That is true both when inflation is too high and when it is too low. The prolonged period of low inflation we are in today has increased the risks that inflation misses might become persistent, which would be deeply damaging for the economy. This is why we have reacted so forcefully to secure our objective – and will continue to do so in the future if necessary.

The monetary policy package the ECB has adopted since June 2014 has been effective. It has led to a substantial easing of financial conditions, and this has in turn led to an improvement in both output and inflation relative to counterfactual scenarios. Arguments that our policy has not worked because inflation has remained subdued are misguided, since they do not take into account the series of shocks we have faced between mid-2014 and today.

That being said, we have consistently maintained that a strong and sustainable recovery from the crisis requires a comprehensive response that involves all economic policies. A return to higher structural growth and employment cannot depend on monetary policy.