



# ECFIN *Economic Brief*

ECONOMIC ANALYSIS FROM EUROPEAN COMMISSION'S DIRECTORATE GENERAL FOR ECONOMIC AND FINANCIAL AFFAIRS

## Monetary policy frameworks: gradual implementation of steadily evolving theory

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### The starting point: Monetary policy at the end of the 20<sup>th</sup> century

In the 1960s and early 1970s, monetary policy in many industrialised countries was influenced by the work of A.W. Phillips (1958) suggesting the existence of a long-run trade-off between unemployment and (wage) inflation (aka "Phillips curve") in the UK. Considering the preceding 25 years of US data, Paul Samuelson and Robert Solow (1960) estimated that inflation of 4-5% would be needed to bring the unemployment rate down to 3% in subsequent years but cautioned that this relationship might change over time.

**The collapse of the Bretton Woods system in the early 1970s allowed monetary authorities to attach a higher weight to the level of domestic economic activity relative to price stability under floating**

**exchange rate frameworks.** The resulting tolerance of higher inflation against the background of the 1973 oil price shock, however, led to a period of elevated inflation and high unemployment, also dubbed "The Great Inflation" (Mishkin (2006)).

**The high inflation reality was reflected in academic work at the time,** with Robert Lucas pointing out that: "[...] given that the structure of an econometric model consists of optimal decision rules of economic agents, and that optimal decision rules vary systematically with changes in the structure of series relevant to the decision maker, it follows that any change in policy will systematically alter the structure of econometric models" (Lucas (1976), p.41). The argument, which became known as Lucas critique, cautioned that setting policy based on relationships observed in historical data, such as those noted by A.W. Phillips, might lead to unintended consequences as economic agents

### Summary

*This Economic Brief reviews the main features of monetary policy frameworks implemented by the major central banks following the collapse of the Bretton Woods system of fixed exchange rates in the early 1970s. It discusses how these frameworks were affected by the academic views prevailing at the time and also (vice versa) how the experiences of monetary authorities were reflected in contemporary academic work. It shows that theory and practice of monetary policy conduct continuously influence each other and are thus closely interrelated. While some features of policy frameworks proved to be more persistent, some were rather short-lived. The emphasis on longer-term price stability clearly emerged as an essential feature of sound monetary policy and is currently reflected in the policy frameworks of all major central banks. At the same time, specific operational tools employed to deliver price stability continue to differ, also due to considerable differences in national economic and financial sector structures and associated policy challenges.*

adjust their behaviour with changing policy expectations.

**Subsequently, Kydland and Prescott (1977) showed that there is an inflationary bias to discretionary monetary policy** in an economy with rational expectations, if policymakers try to minimise deviations of both inflation and output from their targets taking inflation expectations as given. This is due to the fact that the socially optimal policy is in this case time-inconsistent as policymakers have at every point in time an incentive to deviate from the optimal policy path trying to exploit a perceived trade-off between "unexpectedly" higher inflation and unemployment. Moreover, as also confirmed by Barro and Gordon (1983) in an extended model including an explicit expectation formation mechanism, although average inflation exceeds the optimal rate in the discretionary (time-consistent) equilibrium, the unemployment rate is actually invariant to monetary policy, that is, monetary policy has no impact on real economic activity. The realisation concerning the crucial role of inflation expectations and risks related to "absolute" discretion led to the conclusion that monetary policy should be conducted in accordance with a fixed nominal anchor/simple policy rule.

**As a result, to bring increased inflation under control, the central banks of all G7 countries began to attach a higher weight to monetary developments in controlling inflation during the second half of the 1970s.** The German Bundesbank (as well as the Swiss National Bank (SNB)) officially introduced monetary targeting (MT) in late 1974, followed over the next two years by central banks in Australia, Canada, UK and France. Banca d'Italia attempted direct credit targeting during 1974-1984 before switching to M2 targeting in 1985 (Samarina (2012)). The US Fed began to report annual target growth ranges for the main monetary aggregates and bank credit in 1975 (although it regularly failed to meet these targets until the practice was discontinued in 2000)<sup>1</sup> while the Bank of Japan (BoJ) began to announce a quarterly forecast for money supply growth in 1978 (Beyer and Reichlin (eds.) (2008)). This approach was in line with the recommen-

dation put forward by Milton Friedman already in his 1967 presidential address at the meeting of the American Economic Association when he stated that: "I believe that a monetary total is the best currently available immediate guide or criterion for monetary policy" (Friedman (1968), p.15).

**MT was based on the quantity theory of money** postulating that in the long run there is a proportionate link between money growth and inflation, with money having a causal (active) role in this long-run relationship. As a result, monetary aggregates were perceived as intermediate targets essential for achieving the ultimate goal of price stability over the medium term (Papademos and Stark (eds.) (2010)). Money growth targets were generally set using the so-called quantity equation ( $M=PY/V$ ). This identity equates the stock of money (M) with the level of real economic activity (Y) multiplied by the corresponding price index (P) and divided by the "residual" measure of per-period turnover of the money stock (velocity (V)). Hence, to stabilise prices through the appropriate money supply, monetary targets had to be based on estimates of potential GDP (both its real and nominal component, with the latter de facto representing a short-term inflation target) and a velocity trend (Mishkin (2006)).

**Critically, demand for monetary aggregates often turned out to be too unstable for them to be used as a credible nominal anchor.** Throughout the 1980s and 1990s, financial systems expanded at a rapid pace thanks to deregulation and liberalisation of cross-border financial flows. The resulting development of new financial products and services meant that flows of money and capital became larger and more complex, making it difficult for central banks to control broad money supply and thus to meet precise monetary targets. Indeed, considering 35 countries that implemented MT over the period 1975-2009, Samarina (2012) finds that countries that experienced liberalisation, deregulation and dollarization in their financial systems were more likely to abandon MT.

**In addition, the longer-term relationship between money supply and price stability seems to have become less pronounced since the 1980s.** Estimating multivariate VARs including nominal income, inflation and broad monetary aggregates for the US and West Germany, Estrella and Mishkin (1996) found that in the period since October 1979, lagged measures of

<sup>1</sup> In addition, the Fed under the Chairman Paul Volcker adopted an operating procedure based on management of non-borrowed reserves in October 1979, which was discontinued in 1982.

broad money growth did not appear to be significant determinants of either nominal income or price developments in the two countries. They argued that in periods of low nominal income, inflation and broad money growth, the signal-to-noise ratio of monetary developments was likely to be low due to frequent shifts in velocity. This argument was supported by De Grauwe and Polan (2005) who examined 30-year (1969-99) averages of money (M1 and M2), consumer prices and output growth in more than 100 countries and found that in the sample of low money growth countries (lower than 15% p.a.), money growth did not appear to have a statistically significant impact either on inflation or on output growth.

**Exchange rate targeting was increasingly deployed throughout the 1980s (as under the post-WWII Bretton Woods system) to provide a firm nominal anchor for monetary policy.** While the strategy is mainly associated with emerging markets, a semi-pegged system with narrow exchange rate fluctuation margins (which were also the obligatory marginal intervention thresholds) called the Exchange Rate Mechanism (ERM) had also been introduced by the European Community in March 1979, to reduce exchange rate variability and achieve monetary stability in Europe. Fixed exchange rates were however susceptible to speculative attacks, either because the pegged exchange rates were not validated by domestic economic policies or, more particularly, when it became evident that the monetary policy of the central bank issuing the anchor currency was unlikely to be appropriate for the pegging countries. The most notorious episode of a successful attack on the fixed exchange rate of an advanced economy is probably the forced withdrawal of the pound sterling from the ERM on 16 September 1992 (Black Wednesday) after the Bank of England (BoE) had been unable to keep it above its agreed lower limit despite large FX market interventions. In August 1993, following a further wave of attacks on other ERM currencies, fluctuation margins in the ERM were expanded to  $\pm 15\%$  from  $\pm 2.25\%$  to counter continued speculation.

**In the early 1990s, national central banks started to switch to inflation targeting (IT)** which according to Svensson (1999a, p. 82-83) has the following three main characteristics: "1) an explicit quantitative inflation target, 2) a framework for policy decisions, inflation-forecast targeting, which uses an internal conditional inflation forecast as an intermediate target variable, and 3) a high degree of transparency and account-

ability." It should, however, be noted that all real-life inflation targeting regimes also attach some weight to the stability of the real economy, i.e. reduction in output variability (by having some flexibility regarding the time horizon under which their inflation targets should be met) and can thus be described as flexible IT, as compared to strict IT (sometimes also referred to as an "inflation nutter", following Mervyn King (1997)), which would exclusively focus on stabilising inflation (Svensson (1999a)).

**New Zealand was the first country to introduce an explicit inflation target in 1990, followed by Canada in 1991 and the UK in 1992.** Among the current euro area members, Finland and Spain followed an inflation targeting framework from 1993 and 1995 until their euro area accession in 1999 and Slovakia between 2005 and 2009 (Roger (2009)). Although the Bundesbank never officially adopted an inflation targeting framework, it is often argued (see e.g. Svensson (1999a)) that it de facto gave priority to price developments against the money-growth target whenever there was a conflict between the two. Nevertheless, the monetary authorities of the three largest world economies (i.e. US, euro area and Japan) continued to pursue policy strategies throughout the late 1990s and early 2000s that differed considerably from the flexible IT framework as defined above. Apart from lacking an explicit quantitative inflation target, the operating procedures of the Fed, the ECB and the BoJ (discussed in more detail in the next section) were based on broader frameworks going beyond pure forecast-targeting.

**The goal of price stability (together with maximum employment and moderate long-term interest rates) was set as the US Fed's legislative mandate already by the 1977 amendment to the Federal Reserve Act.**<sup>2</sup> However, the Fed did not adopt any quantitative definition of price stability until January 2012 when the Federal Open Market Committee (FOMC) announced that in its view: "[...] inflation at the rate of 2 percent [...] is most consistent over the longer run with the Federal Reserve's statutory mandate".<sup>3</sup>

<sup>2</sup> The amended Act states that the Fed "shall maintain long run growth of the monetary and credit aggregates commensurate with the economy's long run potential to increase production, so as to promote effectively the goals of maximum employment, stable prices, and moderate long-term interest rates."

<sup>3</sup> FOMC statement of long-run goals and policy strategy issued on 25 January 2012

Similarly, while the Bank of Japan Act, fully revised in 1997 (granting the BoJ legal independence), stipulates that "currency and monetary control by the BoJ shall be aimed at achieving price stability"<sup>4</sup>, the Policy Board of the Bank only introduced a "price stability goal in the medium to long term" in February 2012. This goal was judged to be "in a positive range of 2 percent or lower in terms of the year-on-year rate of change in the consumer price index (CPI)". It was initially set at 1% to be reviewed once a year in principle. In January 2013, the BoJ replaced the "goal" with a "price stability target" set as CPI inflation of 2% and decided to "pursue aggressive monetary easing" in order to achieve this target at the earliest possible time.<sup>5</sup>

With the creation of the euro area in 1999, the ECB began setting the single monetary policy for all participating Member States. According to EU law, its primary objective has since the outset been the maintenance of price stability in the medium term. The ECB policy strategy, which can neither be classified as pure inflation/price-level nor monetary targeting, has comprised a quantitative definition of price stability (as a year-on-year increase in the Harmonised Index of Consumer Prices (HICP) for the euro area of below 2% over the medium term<sup>6</sup>) and the analysis of the risks to price stability based on the so-called "two pillars": economic and monetary analysis. The former assesses short to medium-term determinants of price developments, concentrating on real activity and financial conditions in the economy. The latter focuses on a longer-term horizon, scrutinising monetary and credit developments in order to evaluate their implications for future inflation and economic growth.

## Apparent consensus on essential features of monetary policy frameworks in the run-up to the 2008/09 global financial crisis

During the period of the so-called "Great Moderation", which started around the mid-1980s, the variance of output and inflation declined in most industrial countries as they experienced a broadly

stable growth of output accompanied by relatively low consumer price inflation up to the global financial crisis in the late 2000s. This led a number of academics (see e.g. Mishkin (2006), or Goodfriend (2007)) to conclude that monetary policy frameworks prevalent during this period were in line with a universal set of features necessary to underpin sound monetary policy. Mishkin (2006) argued that monetary policy became so successful in taming consumer-price inflation because monetary authorities and governments in almost all countries accepted the following ideas: "1) there is no long-run trade-off between output (employment) and inflation; 2) expectations are critical to monetary policy outcomes; 3) inflation has high costs; 4) monetary policy is subject to the time-inconsistency problem; 5) central bank independence improve the efficacy of monetary policy; and 6) a strong nominal anchor is the key to producing good monetary policy outcomes" (Mishkin (2006), p.1).

Nevertheless, there remained crucial aspects of monetary policy on which views continued to diverge. With the hindsight of the 2008/09 global financial crisis, the most relevant of those open issues seems to have been the so called "lean-versus-clean" debate, that is, whether monetary policy should react asymmetrically to asset price bubbles as opposed to busts. Alan Greenspan, who served as Chairman of the US Fed from 1987 to 2006, was the most prominent advocate of the view that it was not evident that monetary policy could pre-empt the build-up of asset price bubbles without inducing a substantial contraction in economic activity (i.e. the outcome it was actually seeking to avoid). As a result, monetary policy should in his view rather mitigate the fallout from the burst of a bubble if and when it occurs (see e.g. Greenspan (2004)). On the other hand, research conducted at the Bank for International Settlements suggested that monetary policy should assign a greater weight to signs of emerging financial imbalances, as these imbalances contained critical additional information about the sustainability of the economic expansion (see e.g. Borio et al. (2003)).

Moreover, while there was a general consensus on the benefits of price stability, the overall approach to potential risks to price stability differed considerably across major central banks. Greenspan advocated the so-called risk-management approach to monetary policy. Under this doctrine, policy-makers should "consider not only the most likely future path of the economy but also the distribution of possi-

<sup>4</sup> <http://www.japaneselawtranslation.go.jp/law/>

<sup>5</sup> Quotes from the press releases issued by the BoJ on 14 February 2012 and 22 January 2013

<sup>6</sup> In May 2003, the ECB Governing Council clarified that, in the pursuit of price stability, it aims to maintain inflation rates below, but close to, 2% over the medium term.



ble outcomes about that path" (Greenspan (2004), p. 37). They should then make a judgment about costs and benefits of various possible outcomes under alternative policy choices to avoid especially adverse outcomes. Greenspan explained that, in 2003, such considerations led the Fed to adopt an easier policy stance that limited the risk of deflation in the aftermath of the bursting of the "dotcom bubble" even though such an outcome was not foreseen by the baseline forecasts. He argued that although seemingly discretionary and judgmental, the risk-management paradigm was better suited for policymaking than simple rules which cannot take into account significant and shifting uncertainties about the economic environment (Greenspan (2004)).

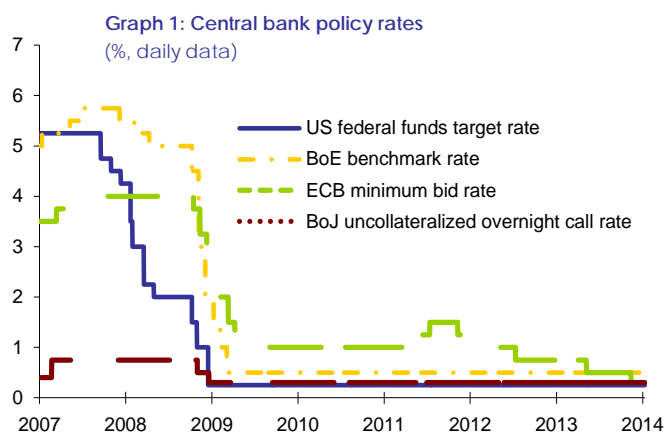
**On the other hand, the ECB relied on its second "monetary" pillar to identify medium-term risks to price stability.** As emphasised by former ECB Executive Board Member Jürgen Stark, the monetary analysis<sup>7</sup> was not conducted with the aim to detect financial imbalances but in order to exploit the long-term relationship between money and price developments. Nevertheless, the link between money and asset prices<sup>8</sup> provided complementary information about the role of money in the economy. As a result, in his view the ECB monetary policy strategy constituted "a suitable and a robust framework for an occasional, but appropriate "leaning against the wind" approach" (Stark (2011), p. 184). In fact, estimating the ECB monetary policy reaction function and running the counterfactual exercise without the contribution of the monetary pillar, Fahr et al. (2011) suggest that the euro area economy as a whole would have been more volatile in this case.

**Finally, in March 2006, the Bank of Japan introduced a new framework for the conduct of monetary policy** comprising two perspectives on examining economic activity and prices. Under the first perspective, the BoJ examines whether the outlook (deemed most likely) for economic activity and prices one to two years ahead follows a path of sustainable growth under price stability. Under the second perspective, the BoJ tries to identify potential risks beyond the forecast period in order to address the risk of low-probability but

large-damage events.<sup>9</sup> The second perspective thus resembles Greenspan's risk management approach.

## Monetary policy actions in response to the 2008/09 global financial crisis

**Following the September 2008 collapse of Lehman Brothers, all major central banks rapidly lowered their policy rates** as the ensuing global financial market turmoil had a major negative impact on economic activity and thus exerted downward pressure on price developments. In a coordinated move, the monetary authorities of Canada, the euro area, Sweden, Switzerland, the UK and the US announced reductions in their key policy interest rates on 8 October 2008 with the BoJ expressing support for this action.



**The US Fed had loosened its policy stance considerably already in the run-up to September 2008 escalation of the financial crisis,** bringing the target for the federal funds rate down from 5.25% in September 2007 to 2% in late April 2008. Subsequently, the target was further reduced to 1.5% in October, 1% in November and finally to 0%-0.25% in December 2008. The ECB, which had increased its key policy rate by 25bp to 4.25% in July 2008, started the rate-cutting cycle in October 2008 (by a 50bp cut in its key interest rates) gradually easing its policy stance until the interest rate on the main refinancing operations of the Eurosystem reached 1% in May 2009. The BoJ decided to lower its target for the uncollateralized overnight call rate to 0.3% in late October 2008 and to 0.1% in December 2008 after having kept it at 0.5% since Febru-

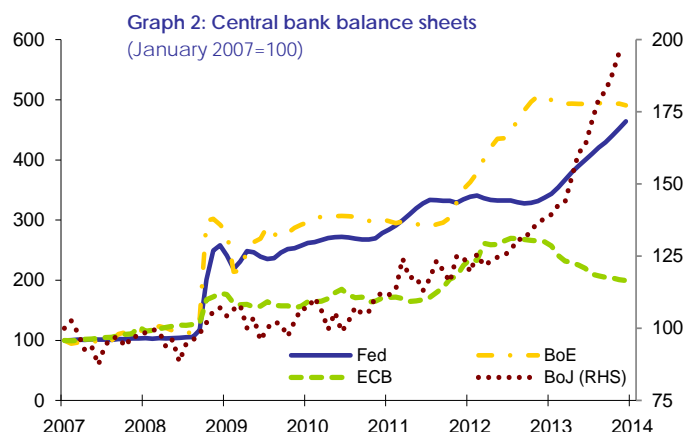
<sup>7</sup> The monetary analysis of the ECB comprises a broad set of tools and instruments which are continuously refined and expanded, with developments of the monetary aggregates, in particular the broad aggregate M3, including their components and counterparts, playing a central role.

<sup>8</sup> For example, Greiber and Setzer (2007) or Adalid and Detken (2007) show that there is a significantly positive relationship between broad money and future house price growth.

<sup>9</sup> Based on press release issued by the BoJ on 9 March 2006

ary 2007. Finally, the BoE cut its policy rate from 5% in early October 2008 to 0.5% in early March 2009.

**Apart from reducing their key policy rates, the US Fed, the ECB and the BoE rapidly expanded their balance sheets through various non-standard liquidity-providing measures** (which were, on a smaller scale and for a shorter duration, also deployed in Japan). The need for ample liquidity injections in the aftermath of financial market crises was substantiated by prior evidence that money multipliers collapse when a period of rapid monetary expansion is suddenly interrupted by a negative shock, such as an increase in risk aversion (the so-called "Minsky moment"<sup>10</sup>). In their seminal work in this field, Friedman and Schwartz (1963) documented the US experience with rapid demonetisation during the Great Depression. The money supply M2 collapsed by about one third between October 1929 and March 1933 as the result of the stock market crash in October 1929 and a series of banking crises in the early 1930s. At the same time, the monetary base remained essentially flat until 1932, suggesting that the Fed did not react to offset the monetary contraction, which led to a substantial decline in economic activity.



**The credit extended through Federal Reserve liquidity facilities increased from some USD 230 billion in early September 2008 to above 1.5 trillion in December 2008** before declining gradually to below USD 200 billion in December 2009. In addition, the FOMC announced in November 2008 that the Fed would purchase up to USD 100 billion in direct obliga-

tions of housing-related government-sponsored enterprises (GSEs) and up to USD 500 billion in mortgage-backed securities (MBS) backed by GSEs under the programme popularly known as "Quantitative Easing" (QE1). In March 2009, the FOMC decided to increase its total purchases of these securities to up to USD 1.45 trillion in 2009. Moreover, the FOMC also decided to purchase up to USD 300 billion of longer-term Treasury securities over the next six months.<sup>11</sup>

**In October 2008, the ECB decided to conduct all its EUR refinancing operations as fixed-rate tenders with full allotment at the policy rate.** At the same time, the list of assets accepted as eligible collateral at refinancing operations was extended. In addition, the ECB enhanced its USD liquidity providing operations against EUR-denominated eligible collateral by offering unlimited allotments under an extended maturity spectrum (up to 3 months) while Swiss Franc liquidity providing operations were also introduced (funded through FX swap lines with the US Fed and the SNB).<sup>12</sup> In May 2009, the maximum maturity of long-term refinancing operations was lengthened to 12 months and the Covered Bond Purchase Programme was announced to support longer-term funding of the banking sector. This set of bank-based non-standard measures is together referred to as "enhanced credit support" as they were designed to enhance the flow of credit above and beyond what could be achieved through policy interest rate reductions alone.<sup>13</sup>

**In the autumn of 2008, the BoE decided to offer extended-collateral long-term repos in greater size and at higher frequency and to further extend the range of eligible collateral.** In addition, the BoE also started to lend USD liquidity for up to 3 months under fixed-rate operations of unlimited size, funded through a swap facility with the US Fed (Cross et al. (2010)). Thereafter, between March and November 2009, the BoE authorized its Asset Purchase Facility (set up in early 2009) to acquire GBP 200 billion worth

<sup>10</sup> The term (named after an American economist Hyman Minsky (1919-1996) whose research focussed on inherent instability of financial markets) was coined by Paul McCulley of PIMCO in 1998 to describe the 1998 Russian financial crisis.

<sup>11</sup> Based on information available at the Fed web page: <http://www.federalreserve.gov/monetarypolicy/bst.htm>

<sup>12</sup> Starting in December 2007, the US Fed agreed temporary bilateral currency swap arrangements with 14 foreign central banks (including the ECB, the BoJ and the BoE) which were in some cases gradually expanded and extended. A temporary currency swap arrangement between the SNB and the ECB was agreed in October 2008 for 3 months and subsequently extended.

<sup>13</sup> Based on information available at the ECB web page: [http://www.ecb.europa.eu/press/key/date/2010/html/sp100618\\_2.en.html](http://www.ecb.europa.eu/press/key/date/2010/html/sp100618_2.en.html)

of assets, mostly medium and long-dated UK government bonds ("gilts"), financed by the creation of central bank reserves (aka "QE").<sup>14</sup>

**In October 2008, the BoJ decided to provide sufficient funds over the year-end at an early stage** while also extending the list of Japanese government bonds (JGBs) eligible for its repo operations and increasing the frequency and the size of its commercial paper repo operations. At the same time, it expanded its USD funds-supplying operations (funded through a swap line with the US Fed) by providing unlimited amounts at a fixed rate against pooled collateral.<sup>15</sup>

## Targeted asset purchases

**Beyond injecting liquidity into the financial system in order to avert excessive monetary contraction, large-scale asset purchases (LSAPs) have also been used to reduce long-term interest rates and thus to directly stimulate investment growth.**

Due to the so called "portfolio-balance" effect (PBE), the yield on purchased financial assets should fall and so induce the private sector (which is assumed not to be perfectly indifferent between these and other types of financial assets) to reshuffle its portfolio away from assets targeted by the CB. At the same time, through efficient markets trading away arbitrage opportunities, yields on all long-term financial assets should decline in parallel. In addition, LSAPs serve as a strong signalling and commitment device as they underscore the intention of the monetary authority to provide a prolonged monetary stimulus.

**However, as pointed out by Woodford (2012a), who offers a thorough discussion of the issue, the PBE should not arise according to the modern general-equilibrium theory of asset prices** which assumes that assets are valued solely based on their state-contingent pecuniary returns. As already shown by Wallace (1981) in his Modigliani-Miller theorem for open-market operations, under certain conditions (e.g. in a perfect foresight competitive equilibrium) consumption allocation and price level paths are ceteris paribus (in particular, holding fiscal policy constant) independent of government's (including the CB) portfolio size, suggesting that open market operations are de

facto "irrelevant" (this proposition is often also referred to as "Wallace neutrality").

**In November 2010, the FOMC announced a new asset purchase programme** (popularly known as "QE2") committing to purchase USD 600 billion in long-term Treasuries over the following eight months. Moreover, in September 2011, the FOMC decided to further extend the average maturity of its holdings of securities by purchasing USD 400 billion of Treasury securities with remaining maturities of 6 years to 30 years (by the end of June 2012) while at the same time selling an equal amount of Treasury securities with remaining maturities of up to 3 years (the so-called "Operation Twist"). Finally, in December 2012, the FOMC confirmed that to "maintain downward pressure on longer-term interest rates" it would continue purchasing additional agency MBS at a pace of USD 40 billion per month (as first announced in September 2012) and also purchase longer-term Treasury securities at a pace of USD 45 billion per month ("QE3"). The pace of these monthly purchases was lowered to USD 35 billion and USD 40 billion, respectively, from January 2014 ("tapering" of asset purchases).<sup>16</sup>

**Similarly, in October 2011 and February 2012, the BoE approved further asset purchases** of GBP 75 billion and GBP 50 billion respectively. In July 2012, the BoE announced the purchase of a further GBP 50 billion, bringing its total asset purchases to GBP 375 billion.<sup>17</sup> In addition, the BoE also introduced the Funding for Lending Scheme (FLS) in July 2012. The FLS was designed to incentivise banks and building societies to boost their lending to households and private non-financial corporations as both the price and quantity of funding provided under the scheme was linked to their lending performance.<sup>18</sup>

**During the sovereign debt crisis, which erupted in the euro area in spring 2010, the ECB introduced additional non-standard measures also involving asset purchases.**<sup>19</sup> To address the malfunctioning of debt securities markets and thus to restore the appropriate monetary policy transmission mechanism, the

<sup>16</sup> Based on FOMC press statements

<sup>17</sup> See footnote 14.

<sup>18</sup> Information about the FLS available at: <http://www.bankofengland.co.uk/markets/Pages/FLS/default.aspx>

<sup>19</sup> In addition, to support the liquidity situation of the euro area banking sector, two long-term refinancing operations with maturity of 3-years, together amounting to about 1 trillion euro, were conducted in late 2011 and early 2012.

<sup>14</sup> Information about QE implemented by the BoE available at: <http://www.bankofengland.co.uk/monetarypolicy/Pages/qe/default.aspx>

<sup>15</sup> Based on press releases issued by the BoJ in late 2008

Securities Market Programme (SMP) was set up in May 2010. Under the SMP, the Eurosystem purchased – on the secondary market - more than EUR 200 billion of debt securities from issuers in Ireland, Portugal, Greece, Spain and Italy, with the last purchases conducted in February 2012. The SMP was replaced by the Outright Monetary Transactions (OMT) scheme in September 2012, which seems to have contributed to the subsequent gradual financial market stabilisation in the euro area. The OMT scheme also involves purchases of sovereign bonds (with maturity of 1-3 years) by the Eurosystem on the secondary market but it is explicitly linked to policy conditionality via an appropriate European Stability Mechanism (ESM) macroeconomic adjustment programme including the possibility of primary market purchases by the ESM.<sup>20</sup> No purchases under this scheme have yet been conducted.

**Finally, in April 2013, the BoJ announced that in order to encourage "a further decline in interest rates across the yield curve" it decided to increase its holding of JGBs at an annual pace of about 50 trillion yen** while at the same time extending the average remaining maturity of its JGB purchases from slightly less than three years to about seven years (the so-called "quantitative and qualitative monetary easing"). In addition, the BoJ signalled that these operations would continue until the price stability target of 2% inflation was achieved in a stable manner.<sup>21</sup>

**Assessing the impact of the first two LSAP programmes conducted by the US Fed (QE1 and QE2) using an event-study methodology,** Krishnamurthy and Vising-Jorgensen (2011) find evidence that QE1 led to a significant broad-based decline in longer-term yields on domestic debt securities (which is in line with findings in Gagnon et al. (2011)). On the other hand, the impact of QE2 (which only involved Treasury purchases) is found to have been much smaller and disproportionately biased towards Treasuries and agency bonds relative to MBSs and corporate bonds. As a result, they conclude that in order to significantly affect returns on other than just safe assets, LSAPs should include a wider range of long-term debt securities (i.e. including higher-risk assets). However, Bauer (2012) shows that spreads between retail mortgage rates and

yields on MBS increased substantially after the LSAPs had been initiated, implying a limited pass-through from secondary to primary mortgage rates.

## Forward guidance regarding the future policy rates path as a monetary policy tool at the zero lower bound

**Already in the late 1990s, the apparent problems of Japan in coping with the consequences of the collapse in its property price bubble, which had started to unwind rapidly in 1991, shifted the attention of some academics to the challenge of conducting monetary policy at the zero lower bound (ZLB).** Krugman (1998) showed that an increase in high-powered money (monetary base) had little effect on broad aggregates in a situation when risk-free short-term nominal interest rates are at or near zero as banks are in this case indifferent between holding base money and other assets.<sup>22</sup> To get out of the "liquidity trap" the economy needs sufficiently negative real interest rates, hence higher inflation, to induce the investment growth necessary to close the negative output gap. There is thus a credibility (time-consistency) problem associated with a liquidity trap, as the central bank needs to convince economic agents that it will allow prices to rise sufficiently in the future, that is, "credibly promise to be irresponsible".

**Expanding Krugman's analysis, Eggertsson and Woodford (2003) show that open-market operations (OMOs) can only be effective at the ZLB if they also change expectations regarding future interest rate policy** or the path of total nominal government liabilities (the "irrelevance proposition"). In addition, Eggertsson (2006) argues that a central bank's inability to commit to future policy can result in excessive deflation if the natural rate of interest is temporarily negative. Hence, there is a so-called "deflation bias of discretionary policy" in a liquidity trap (in contrast to the inflation bias under a positive natural rate of interest highlighted by Kydland and Prescott (1977)).

**A number of central banks (e.g. the Reserve Bank of New Zealand in 1998, Norges Bank in 2005 or the Swedish Riksbank in 2007) started publishing their expected future policy rate path as part of**

<sup>20</sup> Based on information available at the ECB web page: [http://www.ecb.europa.eu/ecb/educational/facts/monp07/html/mp\\_011.en.html](http://www.ecb.europa.eu/ecb/educational/facts/monp07/html/mp_011.en.html)  
[http://www.ecb.europa.eu/press/pr/date/2013/html/pr130221\\_1.en.html](http://www.ecb.europa.eu/press/pr/date/2013/html/pr130221_1.en.html)

<sup>21</sup> Based on press release issued by the BoJ on 4 April 2013

<sup>22</sup> In his famous parable, Milton Friedman (1969) suggested that in order to avoid a liquidity trap the central bank could bypass financial intermediaries by "dropping money from a helicopter" to stimulate consumption.



**their overall macroeconomic projections**, using this communication channel to indicate/clarify their policy reaction function. This type of forward guidance (FG) regarding the future policy rate path, sometimes also referred to as "Delphic" (following Campbell et al. (2012)), should be distinguished from the forward guidance introduced at or close to the ZLB (aka "Odyssean" FG). The latter type of FG is issued with the intention to provide further monetary stimulus by signaling that the monetary stance might remain looser for a longer time period than currently expected or implied by its standard reaction function, thus inducing a reduction in longer-term rates (also known as "the policy duration effect" following Fujiki et al. (2001)).

**In April 1999, the Bank of Japan announced that the zero interest rate policy (adopted in February 1999) would continue "until deflationary concerns are dispelled".** The FG was lifted in August 2000 together with a rate hike but de facto reintroduced in March 2001, when monetary targeting<sup>23</sup> was introduced with the aim to remain in place "until the consumer price index (excluding perishables, on a nationwide statistics) registers stably a zero percent or an increase year on year". Finally, as still faced with ongoing deflation in consumer prices in October 2010, the BoJ clarified that: "The Bank will maintain the virtually zero interest rate policy until it judges [...] that price stability is in sight [...]".<sup>24</sup>

**The US Fed first issued an open-ended FG in August 2003 when the FOMC decided to keep its target for the federal funds rate at 1 percent** and in a related press statement highlighted that: "the Committee believes that policy accommodation can be maintained for a considerable period." Once it decided to raise its target for the federal funds rate by 25 basis points to 1¼ percent in June 2004, the FOMC signalled that in its view "policy accommodation can be removed at a pace that is likely to be measured" and then kept this wording in all successive press statements on the stance of monetary policy until November 2005.<sup>25</sup>

**The Fed's open-ended FG issued in December 2008 was later transformed into date-based and then into state-contingent FG.** In December 2008, together with its decision to establish a target range for the federal funds rate of 0 to 1/4 percent, the FOMC press statement signalled that: "the Committee anticipates that weak economic conditions are likely to warrant exceptionally low levels of the federal funds rate for some time." Moreover, following its August 2011 meeting, the FOMC specified that it expected these exceptionally low rates to be warranted "at least through mid-2013". This date-based FG was subsequently incrementally extended to "at least through mid-2015". However, in December 2012, the FOMC replaced the date-based with a state-contingent FG, introducing explicit thresholds for keeping the target range for the federal funds rate exceptionally low ("at least as long as the unemployment rate remains above 6½ percent, inflation between one and two years ahead is projected to be no more than a half percentage point above the Committee's 2 percent longer-run goal, and longer-term inflation expectations continue to be well anchored").<sup>26</sup>

**Breaking with its past practice of "no pre-commitment",** the ECB Governing Council provided increasingly specific hints regarding the future stance of monetary policy in the introductory statements following its rate-setting meetings since February 2013. Finally, in July 2013, it announced that: "The Governing Council expects the key ECB interest rates to remain at present or lower levels for an extended period of time. This expectation is based on the overall subdued outlook for inflation extending into the medium term, given the broad-based weakness in the real economy and subdued monetary dynamics."<sup>27</sup>

**State-contingent FG was provided by the Bank of England in August 2013** when its Monetary Policy Committee (MPC) announced its intention not to raise the Bank Rate from 0.5% (considered to be effectively its lower bound) "at least until the Labour Force Survey headline measure of the unemployment rate had fallen to a 'threshold' of 7%" (BoE (2013), p. 5). This FG was given subject to three conditions ("knockouts"): 1) CPI inflation 18 to 24 months ahead remaining below 2.5%; 2) medium-term inflation expectations remaining suffi-

<sup>23</sup> Between March 2001 and March 2006 the BoJ used outstanding current account balances at the BoJ instead of the uncollateralized overnight call rate as the main operating target for its money market operations under its policy of quantitative easing.

<sup>24</sup> Quotes from press releases issued by the BoJ on 11 August 2000, 19 March 2001 and 5 October 2010

<sup>25</sup> Quotes from FOMC press statements issued on 12 August 2003 and 30 June 2004

<sup>26</sup> Quotes from FOMC press statement issued on 16 December 2008, 9 August 2011, 13 September 2012 and 12 December 2012

<sup>27</sup> Quote from the ECB statement issued on 4 July 2013

ciently well anchored and 3) the stance of monetary policy not posing a significant threat to financial stability that cannot be contained by other mitigating policy actions (BoE (2013)).

**The credibility of these real-life versions of FG and their market impact, however, remain subject to debate.** In an event-study by Bernanke et al. (2004), policy statements issued by the BoJ from April 1998 to early 2004 turned out not to have a significant impact on near-term future policy expectations, in contrast to FOMC statements, in particular those explicitly focused on the likely future policy rate path, which had a large (and highly statistically significant) impact. Applying a similar event-study approach, Cambell et al. (2012) confirm that FOMC statements were able to change expectations about the future path of the federal funds rate beyond their impact on the current target rate, both before and after the onset of the financial crisis in summer of 2007. However, estimating the time-varying sensitivity of US Treasury yields to macroeconomic announcements, Swanson and Williams (2012) find that the sensitivity of intermediate maturity (1-2 years) yields only declined close to zero in late 2011, that is, following the introduction of the date-based FG in August 2011.

**Regarding the conclusions drawn by Cambell et al. (2012), Woodford (2012b) points out that it is not clear whether FOMC statements have affected market expectations by changing beliefs about the FOMC's reaction function or by changing beliefs about the economic outlook.** In his view, without an explicit commitment to set monetary policy in a history-dependent way, markets have no reason to change their expectations regarding the future policy rate path in response to a FG which does not commit monetary authorities to conduct policy differently from a forward-looking inflation-targeting central bank. He warns that if an announcement to extend the duration of FG is indeed interpreted as being driven by a weakening of the economic outlook, it will actually have a contractionary (instead of an expansionary) impact on aggregate demand.

**In addition, commenting on Bernanke et al. (2004), Svensson (2004) argued that raising private-sector expectations of the future price-level is likely to have a more significant impact on real interest rates at the ZLB than a further reduction in (already low) future short-term interest rate expectations.** This view was supported by Woodford (2012b)

who emphasised that his earlier academic work should not be interpreted as providing an argument in favour of a commitment to keep the policy rate at zero for a fixed period. In particular, the optimal commitment in the Eggertsson and Woodford (2003) model compensates subsequently for misses of the target due to the binding ZLB and thus fundamentally differs from existing real-life applications of FG.<sup>28</sup>

## Price-level versus inflation targeting

**Up to the mid-1990s, price-level targeting (PLT) was conventionally regarded (see e.g. Fischer (1995) or Bernanke and Mishkin (1997)) as implying higher short-term inflation (and thus output) volatility compared to inflation targeting.** This is due to the fact that higher/lower-than-targeted price changes must be offset by future monetary actions in the former case, while they are treated as by-gones in the latter case. On the other hand, by embodying an automatic error-correction mechanism, PLT is associated with reduced longer-term variability of the price level, which should facilitate inter-temporal decision-making. However, Svensson (1999b) shows that with backward-looking inflation expectations and at least moderate output persistence, PLT actually results in lower high-frequency inflation variability than IT (while output-gap variability is the same).

**Using a model with forward-looking price setting, Vestin (2006) confirmed that PLT can lead to a more favourable trade-off between inflation and output gap variability than IT.** If the private sector expects the central bank to counter above average-inflation with below-average inflation in the future, forward-looking agents automatically absorb a part of the cost-push shock in their price-setting behaviour. In addition, Aoki and Nikolov (2005) and Gorodnichenko and Shapiro (2007) argue that PLT is also superior to IT when the central bank is uncertain about the structure of the economy as it automatically corrects for past policy mistakes and thus helps to better anchor long-term inflation expectations.

**As far as the challenge of conducting monetary policy at the ZLB is concerned, Wolman (2005)**

<sup>28</sup> Numerical simulations presented in the paper indicate that the commitment to a fixed target path for the (output gap-adjusted) price level (given by the bank's long-run inflation target) represents a fairly good approximation of the optimal commitment.

shows that real distortions resulting from the ZLB are smaller under PLT than IT.<sup>29</sup> On the other hand, numerical simulations in Levin et al. (2010) reveal that the stabilisation properties of PLT deteriorate considerably if (instead of a natural rate shock of moderate size and persistence) the economy is hit by a large and persistent shock. This is because the optimal policy response in this case requires inflation to increase immediately in order to reduce the ex-ante real interest rate (not only after an initial phase of deflation as in the case of PLT).

**Moreover, Mishkin (2011) argues that PLT would be more difficult to communicate.** In his view, since an upward-trending price-level target (required both to limit the risk of deflations and to weaken the ZLB constraint) is a moving target, it is harder to explain than a constant inflation target. However, he acknowledges that: "the potential benefits of price-level targeting might prompt central banks to look into ways of effectively communicating a price-level target to the public." (Mishkin (2011), p. 94)

**Currently there is no monetary policy regime operating under explicit PLT.** In fact, the only historical precedence for explicit PLT appears to be Sweden during the 1930s (see e.g. Berg and Jonung (1998)). Nonetheless, both the ECB and the Fed actually define price stability in terms of an inflation rate over the medium term or longer-run. This could be interpreted as implying that their policy should also aim at achieving a price-level trend growth of about 2% (or somewhat less in the case of the ECB) over some medium/longer-term horizon. Former ECB president Jean-Claude Trichet indeed often underlined (see e.g. Trichet (2011a) or Trichet (2011b)) the ECB's track record of delivering price stability by highlighting the average annual inflation rate in the euro area since its creation in 1999. At the same time, neither of the two central banks explicitly refers to the gap between the current and the 2%-trend price level when explaining their policy stance.

**Finally, it should be noted that, although (apart from PLT) nominal GDP targeting (NGDPT) is sometimes also proposed as an alternative monetary policy regime that could prove particularly effective at the ZLB (see e.g. Romer (2011) or**

**Woodford (2012a)),<sup>30</sup> it does not appear to be a truly viable alternative, especially under more general circumstances.** The advantage of NGDPT compared to PLT at the ZLB is that its quantitative impact on inflation expectations is likely to be larger, as nominal GDP is more volatile and thus a higher nominal income growth would be needed to bring it back to its target growth path following a recession than in the case of PLT (see e.g. Romer (2013)). However, setting a sustainable NGDP growth path would be rather difficult, as in order not to result in excessive inflation, it necessitates real-time estimates of output gap and potential growth, which are notoriously unreliable (see e.g. Orphanides and van Norden (2002)). At the same time, NGDP data are only available quarterly, with a time lag and are subject to considerable revisions. As a result, NGDPT unavoidably implies less clarity about future price developments (i.e. higher uncertainty about future inflation) and could thus lead to de-anchoring of longer-term inflation expectations (see e.g. Goodhart et al. (2013)), undermining the capacity of monetary authorities to preserve price stability.

## Conclusions

**Drawing lessons from the period of elevated inflation in the 1970s, academic work at the time emphasised that for monetary policy to preserve its capacity to effectively (i.e. without generating excessive inflation volatility) react to fluctuations in real economic activity, it needed to remain credibly anchored.** From the mid-1970s, an increasing number of central banks began assigning a higher weight to monetary aggregates, exchange rates or inflation developments in their respective policy frameworks, which thus became better nominally anchored. Although specific operational strategies varied considerably across countries, while also continuously evolving, strong emphasis on preserving price stability has become widely accepted as an essential feature of sound monetary policy frameworks. This policy shift is often put forward as one of the main reasons for the relatively low variance of output and consumer-price inflation in most industrial countries lasting for more than 20 years starting in mid-1980s (aka the period of "Great Moderation"). At the same time, the reduced macroeconomic volatility also provided the conditions for an unprecedented expansion in credit, fuelling a

<sup>29</sup> For a more thorough discussion of benefits of price level path stability see e.g. Gaspar et al. (2007).

<sup>30</sup> While it has recently received increased attention again, a similar concept of GNP targeting was already widely discussed by academics in early 1980s (see e.g. Hall (1983)).

"liquidity glut", which resulted in unsustainable rise in asset prices leading to the global financial crisis in 2008/09.

**The 2008/09 global financial crisis and the subsequent sluggish economic recovery represented an unprecedented policy challenge for policy-makers in major advanced economies.** Bold and innovative monetary policy actions undertaken in recent years by all major central banks confirm that they remain open to innovation and do not shy away from breaking away with established practices if they consider such action to be necessary in order for them to fulfil their mandates. To the extent that some of these innovative measures are temporary, as they are linked specifically to current post-crisis conditions, their eventual withdrawal might also present new and unexpected challenges. Nevertheless, the emphasis on preserving price stability and the awareness that in the long-run there is unlikely to be a trade-off between the level of real economic activity and the rate of inflation continue to be essential features of monetary policy frameworks implemented by all major central banks. In fact, two major central banks (the US Fed and the Bank of Japan) only recently (in 2012) adopted specific quantitative definitions of price stability.

**In parallel, academic work in the area of monetary policy continues to assess recent policy developments in view of current economic and financial challenges.** Whereas the high inflation of the 1970s implied that research efforts at the time mainly focused on how to contain upward price pressures, the recent experience of Japan with a protracted period of deflation and the fact that all major central banks currently operate close to the ZLB naturally shifted the focus of academic attention to the challenge of conducting monetary policy in a "liquidity-trap-type" of circumstances. Although opinions continue to diverge, policy frameworks putting a higher weight on the evolution of the price level over the medium term might receive further close academic attention going forward as they theoretically appear to offer a way how to increase the effectiveness of monetary policy transmission at the current juncture while remaining in line with the well-established principle of sound monetary policy based on preservation of price stability. In addition, drawing lesson from the 2008/09 global financial crisis, the search for an appropriate level of "leaning against the wind" is likely to be reflected both in the academic work as well as in the actual conduct of monetary policy in the post-crisis period.

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