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# Monetary Policy During the Pandemic: Fit for Purpose?


Policy Department for Economic, Scientific and Quality of Life Policies
Directorate-General for Internal Policies
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**Abstract**

This contribution reviews the ECB measures since the start of the COVID-19 crisis, i.e. the extension of APP and the introduction of PEPP. We show that APP announcements have helped steer inflation expectations upward. We also show that PEPP has alleviated fragmentation risk. Finally, we show that since the mid-2000s, ECB measures have had real effects on euro area unemployment rates, nominal effects on inflation rates and financial effects on banking stability.

This paper was provided by the Policy Department for Economic, Scientific and Quality of Life Policies at the request of the committee on Economic and Monetary Affairs (ECON) ahead of the Monetary Dialogue with the ECB President on 18 March 2021.

This document was requested by the European Parliament's committee on Economic and Monetary Affairs (ECON).

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| | |
|---|---|
| **APP** | Asset purchase programme |
| **ECB** | European Central Bank |
| **EONIA** | Euro overnight index average |
| **EP** | European Parliament |
| **EU** | European Union |
| **GDP** | Gross domestic product |
| **HICP** | Harmonised index of consumer prices |
| **LTRO** | Longer term refinancing operations |
| **OMT** | Outright monetary transactions |
| **PEPP** | Pandemic emergency purchase programme |
| **PELTRO** | Pandemic emergency longer term refinancing operations |
| **PSPP** | Public securities purchase programme |
| **QE** | Quantitative easing |
| **SMP** | Securities market programme |
| **TLTRO** | Targeted longer-term refinancing operations |
| **VAR** | Vector autoregression |
| **ZLB** | Zero lower bound |

# EXECUTIVE SUMMARY


- **This contribution reviews the different policy measures introduced by the ECB since the inception of the COVID-19 crisis in Europe, mainly the extension of APP measures and the development of PEPP measures.**
- APP and PEPP have had distinct objectives in comparison with former policies. APP has been oriented towards inflation expectations while PEPP has been oriented towards the mitigation of financial fragmentation.
- We analyse the effects of APP announcements (including asset purchase flows) on inflation expectations and show that they help steer expectations upward.
- We also analyse the impact of PEPP on sovereign spreads and show that PEPP has had heterogeneous effects that have alleviated fragmentation risk: PEPP has had an impact on the sovereign spreads of the most fragile economies during the pandemic (e.g. Italy) and no impact on the least fragile (e.g. the Netherlands).
- However, sovereign spreads have not completely vanished, making monetary policy transmission not fully homogeneous across countries.
- We also show that overall macroeconomic effects have been in line with expected outcomes since the mid-2000s: ECB monetary policy measures have had real effects on euro area unemployment rates, nominal effects on inflation rates and financial effects on banking stability.
- We conclude that an increase in the size of the PEPP program may be useful only in case financial risks re-emerge. Meanwhile, we argue that an ECB decision to cap the sovereign spreads during the COVID-19 crisis would alleviate the crisis burden on the most fragile economies in the euro area, where sovereign spreads remained the highest.

# 1. INTRODUCTION

The outbreak of the COVID-19 pandemic has led central banks to take several decisions to deal with the economic and financial consequences of the crisis. In the euro area, the ECB took its first decisions on 12 March 2020, when euro area countries started to take lockdown measures.[1] As the policy rate was already at the zero lower bound (ZLB), the ECB resorted to non-standard measures. It has notably consisted in amplifying existing measures such as asset purchases (under the asset purchase programme [APP]) and liquidity provision (through the longer-term refinancing operations [LTRO] and the targeted longer-term refinancing operations [TLTRO]). These measures have been supplemented by new measures specifically dedicated to alleviate the consequences of the pandemic. Even if all those measures have contributed to increasing the accommodative stance of monetary policy, some of them have also had distinct objectives. The latter needs a proper assessment as regards their fit towards those specific objectives.

The aim of this paper is not only to illustrate the macroeconomic effect of the accommodative stance of monetary policy but also to document the respective effects of two specific measures: the APP and the PEPP. The first one – the APP – aims at ensuring a *highly* accommodative monetary policy stance in order to weigh on inflation expectations and reach the inflation target. The role of the PEPP is to avoid disruption in the transmission of monetary policy across euro area countries and to that end, it aims at limiting the sovereign spreads. It is therefore important to assess whether those measures have attained their targets.

The APP was announced in January 2015, when the euro area was struggling to get out the double-dip recession and the inflation rate was far below the 2% target.[2] Under the APP, the ECB adopted quantitative easing (QE) measures as was done earlier by the Federal Reserve, the Bank of England and the Bank of Japan. The recovery led the ECB to progressively slow down and then stop net purchases as of January 2019.[3] However, in September 2019, the Governing Council decided to reactivate the programme from November 2019, as there were signs that economic activity slowed down and with the inflation rate still not sufficiently converged to the inflation target. In March 2020, the euro area faced a new negative shock, which required to amplify the accommodative stance of monetary policy, through asset purchases.

Even if all euro area countries were hit by the pandemic, its diffusion was not uniform, with some countries hit harder and more rapidly than the other. The first consequences of the COVID-19 crisis were on the health systems. The implementation of lockdown measures was meant as the only way to slow down the spread of the virus. The higher the intensity of these measures, the stronger the expected economic impact on households and firms' revenues, hence the higher required fiscal support. Lockdown measures have therefore led to large increases in public debts and to the resurgence of sovereign risk in some fragile countries. As the shock was exogenous to euro area countries and fiscal policy was necessarily the main policy tool to tackle the crisis, it was important for countries to keep fiscal leeway. However, the possible increase in sovereign yields would have compromised the ability of countries to implement the required policies. Consequently, in order to dampen sovereign risk in the absence of fiscal federalism, the ECB has had to make sure that these sovereign spreads would remain contained. This is why the PEPP was announced on 18 March 2020 and then further extended twice in 2020.

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1 Local measures have been taken in Italy and Germany from the end of February but global lockdown measures have been first announced by Italy on 10 March 2020, followed closely by Spain (14 March) and France (17 March).

2 In 2014, the annual inflation stood at 0.4% in the euro area.

3 Maintaining, still, reinvestments of the principal payments from maturing securities.

The COVID-19 crisis had already led to a surge of theoretical and empirical literature on its macroeconomic effects. Regarding the impact of central banks' response to the crisis, Rebucci et al. (2020) assess the impact of QE decisions taken by a large set of advanced and emerging central banks in March and April 2020. Their results suggest that QE has not lost effectiveness and that it has been associated with reduction in sovereign bond yields and exchange rate depreciations. However, their analysis suggests that the announcement of the PEPP has not triggered a significant decrease in the sovereign yield in the euro area, which is also confirmed by Bernoth et al. (2020). It may yet be noticed that the principal aim of this programme was not to weigh on the benchmark euro area yield but to decrease sovereign spreads. Besides, the allocation of weekly purchases across country markets was the main channel through which the ECB expected to influence spreads. In that way, the PEPP differs from the OMT (outright monetary transactions) announcement, as the effect of the PEPP was not intended to result only from a pure signalling effect. Finally, Ortmans and Tripier (2020) do not show a direct effect of ECB decisions on spreads but rather suggest that they have mitigated the financial stress stemming from the diffusion of the pandemic. They show that the publication of daily figures on the number of COVID-19 cases increased the sovereign spread before the ECB decisions but that this effect has then progressively been muted after the ECB's decisions.

The rest of the paper is organised as follows. We first review the decisions taken by the ECB during the crisis and then provide a first macroeconomic assessment of their effectiveness. Finally, we specifically assess the impact of APP announcements with an event-study and the effect of the PEPP on sovereign spreads. All empirical assessments point to the consistency of outcomes with policy objectives.

## 2. A LARGE SET OF EXPANSIONARY MEASURES

The ECB has rapidly reacted to the outbreak of the pandemic and the upsurge of downside risks for economic activity and financial stability. As the monetary policy rate was already at the ZLB since March 2016,[4] the ECB resorted to balance sheet policies and reiterated forward guidance announcements.[5] The first measures were announced on 12 March 2020, followed by additional decisions on 18 March and 30 April. The ECB has extended its toolkit to deal with the ongoing crisis, which resulted in a sharp increase of the Eurosystem's balance sheet. From February 2020 to the end of January 2021, total assets have increased by more than EUR 2.3 trillion (Figure 1) representing 19.4% of 2019 GDP. By way of comparison, the size of the Federal Reserve balance sheet has increased by USD 3.1 trillion (14.5% of 2019 US GDP).

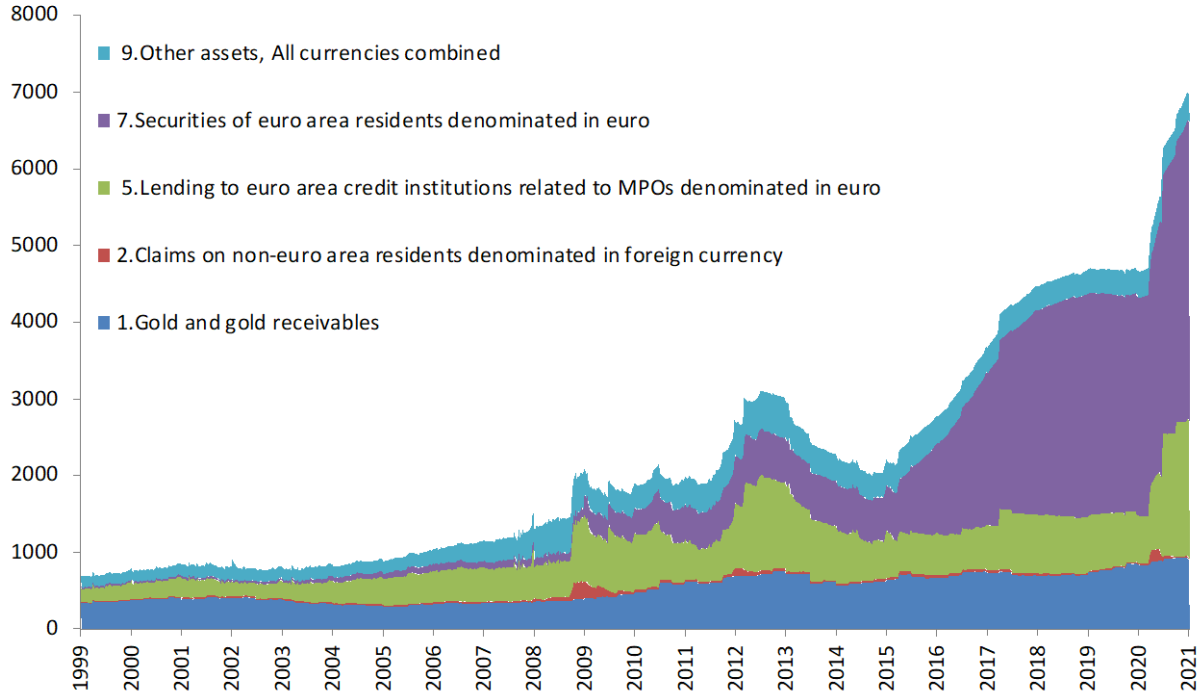
Balance sheet policies implemented by the ECB entail asset purchases (labelled securities held for monetary purposes in Figure 1) and liquidity operations (lending to euro area credit institutions related to monetary policy operations). The first decision was to add an additional envelope of EUR 120 billion to be used until end-2020 under the APP (Table 1).[6] The PEPP was launched soon after, on 18 March 2020. It was first calibrated to EUR 750 billion with a deadline fixed for the end of 2020. In June 2020 and December 2020, the envelope was raised by EUR 600 billion and EUR 500 billion, respectively, to finally reach EUR 1.85 trillion. The horizon was also extended to June 2021 and March 2022, respectively. By end-January 2021, EUR 810 billion out of EUR 1.85 trillion of assets have been purchased. As explained in Blot et al. (2020), even if APP and PEPP consist in asset purchases – mainly public securities – they pursue different objectives. While the APP was implemented to provide the needed expansionary monetary policy to "ensure price stability", the PEPP aimed to address the risk of fragmentation related to a surge of sovereign spreads in some countries. The first objective of the APP is therefore to provide additional stimulus and weigh on overall financing conditions in order to reach the inflation target. The rationale given to the PEPP suggests an implicit objective of spread targeting among euro area countries.

[4] This is indeed the case for the interest rate on main refinancing operations. The interest on deposit facilities, which is the driving rate for the overnight interest rate in a context of excess liquidity, was set to zero in July 2012 and is even negative since June 2014.

[5] The following statement was announced for the first time on 12 September 2019 and systematically reaffirmed at each Governing Council meeting since then: "The Governing Council expects the key ECB interest rates to remain at their present or lower levels until it has seen the inflation outlook robustly converge to a level sufficiently close to, but below, 2% within its projection horizon, and such convergence has been consistently reflected in underlying inflation dynamics."

[6] Looking at effective net purchases, the additional envelope was used in full until the end of 2020, with frontloading in the first months of the pandemic. The additional envelope came on top of the EUR 20 billion net purchases per month that started in November 2019.

Figure 1: Total assets of the Eurosystem, EUR billion




Source: ECB.

Regarding liquidity measures, the first decisions – on 12 March 2020 – consisted in easing the conditions applied to TLTRO III and providing liquidity to the credit institutions through additional LTROs. The conditions applied to TLTRO III were further eased in April and December 2020. Furthermore, on 30 April 2020, seven monthly refinancing operations were announced under the pandemic emergency long-term refinancing operations (PELTRO). These operations were settled from May to December 2020, with maturities between 8 and 16 months. In December 2020, it was also decided to offer four additional PELTRO operations between March and December 2021, with one-year maturities.

On 7 April 2020, the ECB adopted a package of temporary collateral easing measures that include valuation haircuts of 20%, extensions of the additional credit claims framework, waiver to accept Greek bonds as collateral and other temporary measures. The duration of these measures was extended until June 2022. Furthermore, on 22 April 2020, the ECB decided to grandfather (until September 2021) the collateral eligibility of marketable assets used in Eurosystem's credit operations that fall below minimum credit quality requirements.

Table 1: Main policy decisions taken by the ECB during the pandemic

| | Asset purchases | | Liquidity operations | |
|---|---|---|---|---|
| | APP | PEPP | TLTRO | LTRO / PELTRO |
| **12 March 2020** | Additional EUR 120 billion envelope until December 2020. | | Reduction of interest rate applied to new operations (as low as -0.75%), recalibration of the terms. | Additional LTROs. |
| **18 March 2020** | | Creation of the PEPP with a total envelope of EUR 750 billion until December 2020. | | |
| **30 April 2020** | | | Reduction of interest rate applied to new operations (as low as -1%), recalibration of the terms. | Creation of the PELTRO. |
| **4 June 2020** | | Increase and extended deadline for the envelope: EUR 600 billion until June 2021. | | |
| **10 December 2020** | | Increase and extended deadline for the envelope: EUR 500 billion until March 2022. | Extension of the reduced interest rate period, recalibration of the terms and additional operations. | Additional PELTRO operations. |

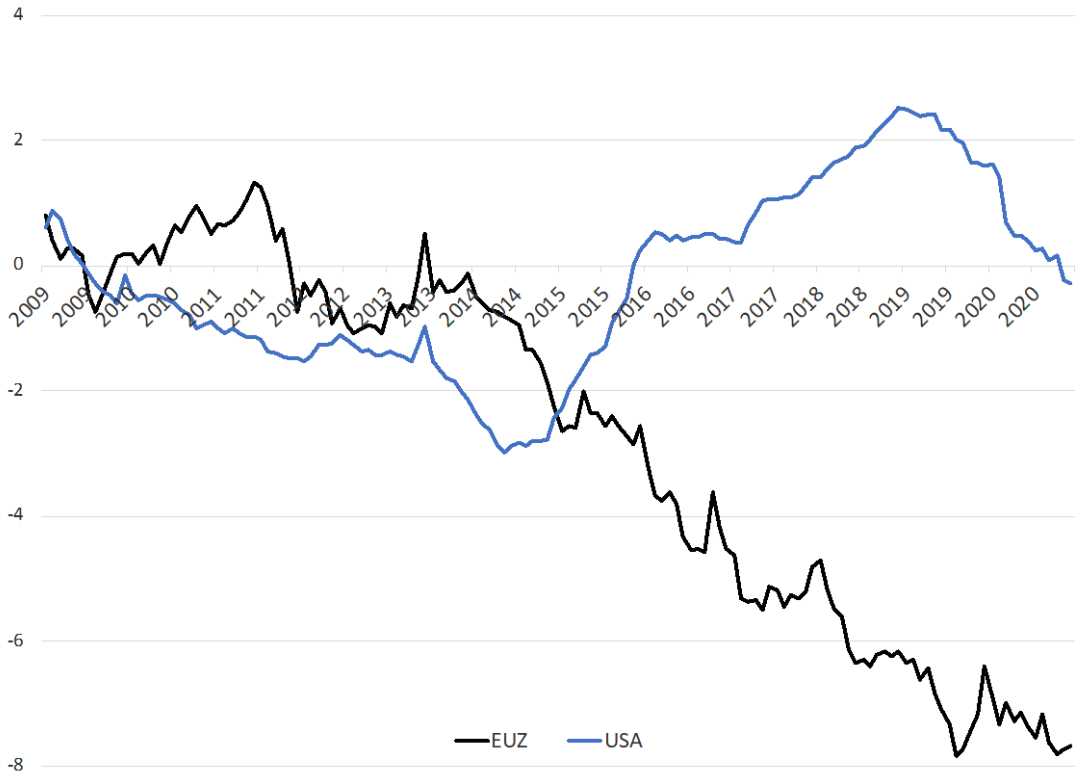
Source: ECB.

Note: The table summarises the main policy decisions taken by the ECB during the crisis. It focuses on decisions related to asset purchases and liquidity operations. It overlooks decisions regarding the announcements on the reinvestment policy of principal payments from maturing securities purchased under the APP, forward guidance announcements, on collateral and provision of foreign exchange liquidity through swap line arrangements.

Even if the aim of those measures are different and complementary, they all contribute to making the stance of monetary policy expansionary in the euro area. As the policy rate is stuck at the ZLB, it does not provide a reliable information on this stance. To account for non-standard measures, which mainly influence interest rates along the term structure of interest rates and above the overnight interest rate,

shadow rates have been computed.[7] Based on the yield curve, they provide an assessment of the overnight interest rate, which is consistent with all measures: asset purchases, liquidity and forward guidance. Despite the uncertainty surrounding those measures, the shadow rate was close to -8% in December 2020 (Figure 2). Compared to the United States, the shadow rate is much lower for the ECB. However, the Federal Reserve had started to phase out unconventional measures in 2015 and the shadow rate estimated had returned to a positive territory. Measures taken by the Federal Reserve in 2020 have also contributed to easing the monetary stance for the United States as highlighted by the 1.9 percentage point decrease of the shadow, compared to a reduction of 1.3 percentage points in the euro area.

Figure 2: Monetary stance measured by the shadow rate, in %




Source: Wu and Xia (2016), retrieved from Eikon Datastream.

[7] See Wu and Xia (2016).

# 3. ECB MONETARY POLICY EFFECTS: A MACROECONOMIC VIEW

There have been only a few attempts at estimating the macroeconomic impact of unconventional monetary policy shocks since the global financial crisis.[8] The first reason is that unconventional policy decisions mainly aim at banking and financial stability, via asset price transmission. The second one relates to the difficulty of identifying monetary policy shocks with time series (see Miranda-Aggripino and Ricco, forthcoming): disentangling the unexpected monetary policy shock from the monetary policy decision requires to clearly identify the information that the policy decision has conveyed on the state of the economy. The third reason relates to the difficulty of identifying the monetary instrument when unconventional decisions are taken. In this situation, central bankers do not modify directly a policy rate. Rather, they modify the allocation and/or the size of their balance sheet to influence long-run interest rates as well as bond and stock prices.

Most attempts at discussing the macroeconomic impact of unconventional monetary policies have used the central bank balance sheet as the main driver of policy decisions. However, a change in the balance sheet can reflect other shifts in the economy, e.g. outputs or uncertainty. It is therefore important to isolate the exogenous part of the balance sheet so that one can then identify as a pure shock to the economy. While this latter statement is not specific to balance sheet shocks and it is shared with all other kinds of shocks, the macroeconomic literature on the determinants of central bank balance sheets is much less developed than that on the determinants of interest rates. In the latter case, the list of possible determinants is well circumscribed and some sign restrictions can unfold from well-known theoretical frameworks. In contrast, the macroeconomics of central bank balance sheet remains an open research field. Last, most quantitative easing measures decided by central banks since the global financial crisis have been publicly announced in advance: as for the ECB, it stated the amount of bonds it would be purchasing every month. Consequently, from 2015 onwards, the change in the balance sheet is mainly mechanical and results from the announced flow of assets purchase. Besides, from the end of 2008 to 2014, the size of the balance sheet was mainly driven by liquidity needs of credit institutions in the euro area and not necessarily related to the willingness of the ECB to expand monetary policy. Actually, these announcements do not correspond to *unexpected* shocks to the euro area economy.

Boeckx et al. (2017) study a vector autoregression (VAR) model of the euro area and identify central bank balance sheet shocks by introducing some zero restrictions on the instantaneous impact of unconventional monetary shock on output, prices and the policy rate (hence separating unconventional from conventional policy decisions). They also introduce sign restrictions on the instantaneous impact of the unconventional policy shock on interest rate spreads and on an indicator of financial instability (both with a negative sign). They finally assume a positive impact of the shock on the central bank balance sheet. They showed that between 2007 and 2014, unconventional monetary policy shocks produce higher output and inflation and may therefore help stabilise the macroeconomy.

In contrast with Boeckx et al. (2017), Lhuissier and Nguyen (2021) dismiss zero and sign restrictions and prefer to proxy unexpected variations in ECB balance sheet by relying on surveys conducted by Reuters and Bloomberg ahead of Governing Council meetings. Therefore, they highlight the difference between the expectations, not only on the size of the asset purchases but also on their pace, and the realisations. Their estimation period goes from 2015 to 2019. Results point to a weak impact of unconventional policy shocks on industrial output and on inflation (impulse response functions are weakly statistically significant) and contrast with those of Boeckx et al. (2017).

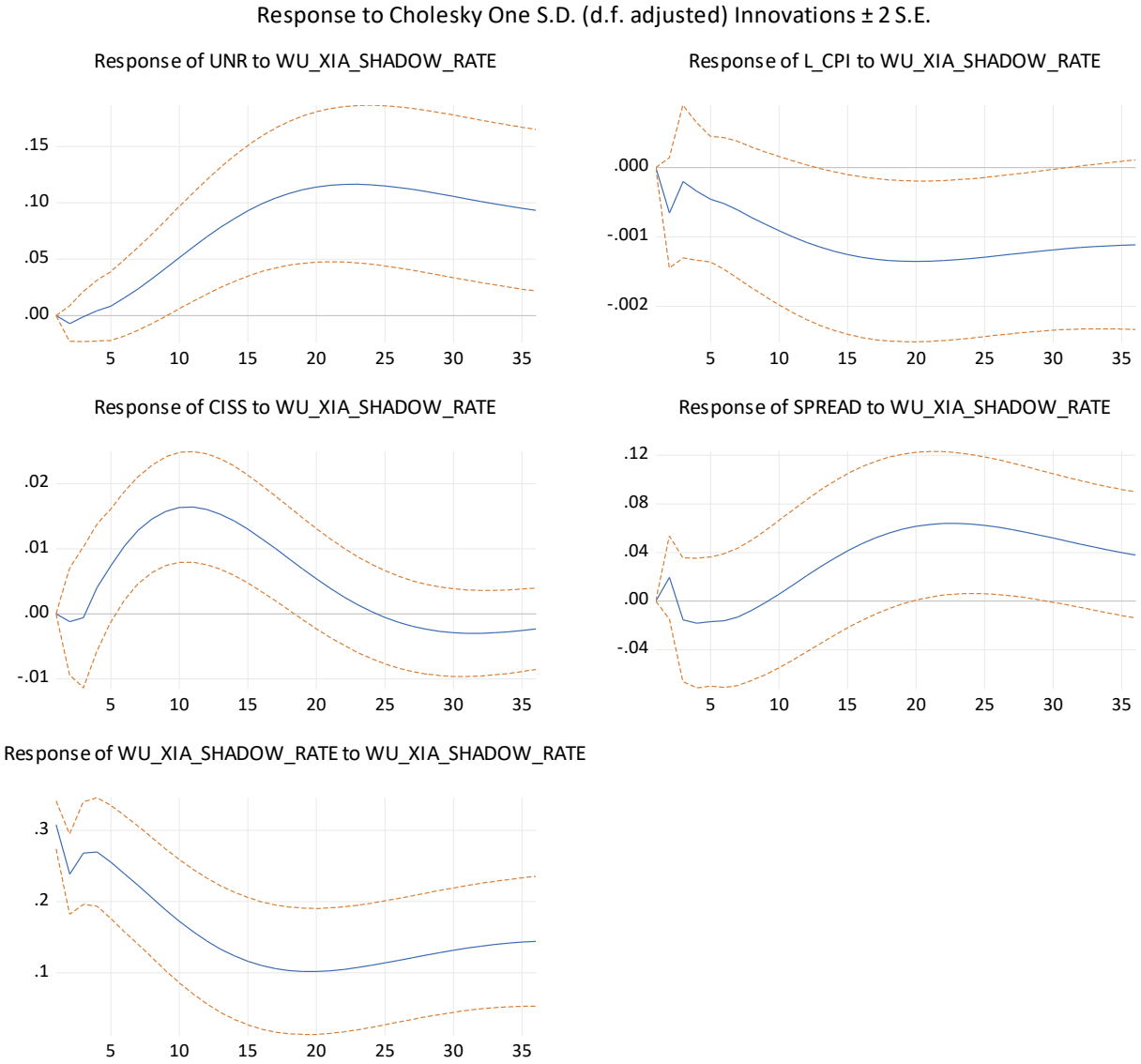
[8] We abstract from event study here for, by construction, they do not convey information on the macroeconomy beyond a few days.

In complement to these two studies, we estimate another model in which we use a shadow rate as the instrument of monetary policy. The shadow rate calculates the artificial policy rate that prevails under the ZLB after the term structure of interest rates is introduced and reflects the unconventional measures that have been undertaken by the central bank. While new unconventional decisions do not shift the actual policy rate (at the ZLB), they may decrease long-term interest rates. The decline in long-term rates can be partly attributed to the short run policy decisions via the term structure and can be embedded in the shadow rate.

We estimate a VAR model (without restrictions) including: the unemployment rate (to estimate the real effect of monetary policy), the consumer price index (in log), the composite index of systematic stress (CISS), the spread between ten-year public bonds and the EONIA (the latter two variables to estimate the impact of monetary policy on financial stability) and the shadow rate. Monetary policy shocks are identified as the residuals of the shadow rate. Data come from Datastream, except the CISS (ECB) and the shadow rate (Wu and Xia, 2016). Data are monthly and go from January 2007 to December 2020. Results (reported in Figure 3) confirm that a positive shock to the shadow rate produces a real effect (unemployment increases), a nominal effect (CPI decreases) and a financial stability effect (the CISS and the spread tend to increase). However, it takes time for these macroeconomic effects to unfold. The respective impacts of monetary policy on the unemployment (upper-left impulse response function) and the inflation (upper-right impulse response function) rates are significant after almost a year. On the financial side, monetary policy has a rapid impact on financial instability, modifying the indicator after 6 months (middle-left impulse response function), whereas the impact on sovereign spreads (middle-right response function) takes almost 2 years to spread out.

All in all, these results point to the effectiveness of ECB policies since 2007 (shadow rates decline quite substantially, see Figure 2) to alleviate the crisis and boost inflation, while preserving financial stability. Monetary policy effectiveness does not mean that monetary policy has been powerful enough though. According to our results, a 1 percentage point unexpected drop in the shadow rate would have decreased the unemployment rate and increased inflation in the euro area by 0.3 percentage points each.

Figure 3: Impulse response functions – VAR model




Sources: Eikon Datastream, ECB, Wu website, own computations.

NB: These results show the impact of a *restrictive* monetary policy. The effects of an accommodative policy are symmetric.

# 4. ASSESSING THE EFFECT OF ASSET PURCHASES

As mentioned in ECB communications, the measures taken aim at providing a highly accommodative monetary policy stance. Yet, the use of balance sheet policies enables to tackle several objectives as they provide a larger toolkit compared to the standard policy rate decisions. The TLTRO, for instance, aims at supporting credit to households and firms. Regarding asset purchases, the ECB has also intervened on several markets: public securities, covered bond markets, asset-backed markets and corporate securities. However, most of asset purchases are concentrated on sovereign markets, through two programmes: the public sector purchase programme (PSPP), which is part of the APP, and the PEPP, introduced during the pandemic. While the APP aims at providing favourable financing conditions to promote price stability, the role of PEPP is mainly to ensure a homogeneous transmission of monetary policy across countries and implicitly to counter financial risk on sovereign yields and is then closer to the objectives of the securities market programme (SMP), implemented from 2010, and to the OMT, announced in September 2012. Implicitly, it is therefore geared toward a reduction of spreads. As those policies aim at different objectives, it is worth assessing whether APP and PEPP have effectively attained their objectives.

## 4.1. Does the APP influence inflation expectations?

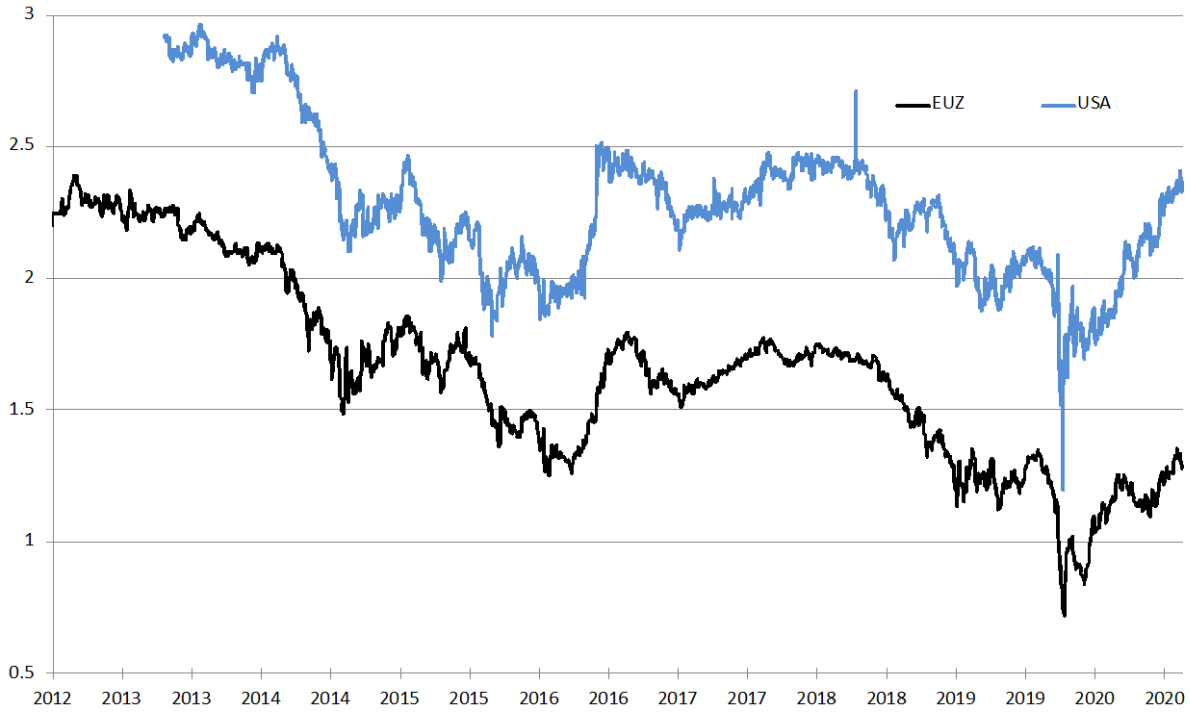
The role of APP is to provide a highly accommodative monetary policy stance in line with the primary objective of price stability in the euro area. As emphasized with the VAR model, it seems that those decisions have been effective at the macroeconomic level. We complement this analysis by focusing on the effect of APP announcement on market-based inflation expectations. Compared to the macroeconomic analysis, we aim to provide a high-frequency analysis of the APP decisions. Do announcements related to APP influence market perception of the effect of monetary policy? To that end, we focus on the 5-year on 5-year inflation rate, which is an indicator of long-term inflation, scrutinised by the ECB to assess its ability to anchor inflation expectations.

Inflation expectations play at least two important roles in central banking. First, as important inputs into price and wage setting, they provide a summary statistic of where inflation is likely to be headed. Second, if inflation expectations are well anchored, central banks can affect inflation through inflation expectations (Scharnagl and Stapf, 2015). The ability of a central bank to affect inflation expectations is therefore a direct measure of central bank credibility.

The central bank can influence inflation through the traditional channel of interest rates but also through expectations about future inflation. With the interest rate reaching the ZLB, central banks are now resorting to unconventional monetary policy tools. Signalling and reputation effects have hence become indispensable tools for influencing inflation (Coibion et al., 2020). In turn, the increase in the ECB's balance sheet size through asset purchase may also affect confidence and thus inflation expectations via a signalling channel (Borio and Disyatat, 2010) and van den End and Pattipeilohy, 2017)

In this context, the implementation of the APP is designed to influence inflation expectations. Specifically, its expansions which were announced in January 2015 and in September 2019 were aimed at guiding inflation expectations toward a future path consistent with the ECB's mandate of an inflation rate below, but close to, 2%. However, since the start of 2014, inflation expectations have fallen well below 2%, indicating that the ECB may have lost its ability to influence inflation expectations (Figure 4).

Figure 4: Market-based expected inflation, in %




Source: Eikon Datastream.

Market-based measures of inflation may help to assess the effectiveness of ECB policy measures (such as the APP) through an event study. Compared to other studies, not only do we assess the impact of announcements, but we also consider the effect of changes in the flow of purchases which are announced.

## Methodology

Our event study analysis assesses the effect of ECB's monetary policy announcements on anticipated inflation, using a simple ordinary least squares estimation. Specifically, we estimate the following equation with daily data over the period 1 January 2013 – 31 December 2020.

$$\Delta\pi_t^e = \alpha + \beta_1 . ME_t + \beta_2 . \Delta VIX_t + \beta_3 . \Delta IR_t + \beta_{.3} NSMP_t + \mu_t$$

$\pi_t^e$ is our dependent variable of interest (i.e. inflation expectation proxied by 5-year on 5-year inflation rate in first difference). The VIX is the volatility index for the euro area and we employ it to control for periods of heightened volatility in euro area financial markets. The variable *IR* stands for interbank interest rate (*EONIA*). The variable ME is a specific event dummy associated with the announcement of the APP in a first step, and with the amount of purchases announced for each APP in a second step. The vector NSMP contains the event dummies related with other ECB monetary policy announcements, while $\alpha$ is a constant term.

An event study assumes high frequency daily or intraday data. Regarding inflation expectations, we obtain daily data from DataStream. This methodology allows us to consider the time window of the

monetary event. It should be noted that this event window does not distinguish between the effect of the press release and the effect of the press conference, as both occur on the same day.[9]

## Results

First, we analyse the effect of APP announcements on expected inflation (Table 2). In the first regression (column 1), we estimate the impact of APP announcements only, controlling for the first difference of the VIX index and the first difference of the EONIA rate. Our event study shows a positive and significant relationship in which an APP announcement is associated with an increase in the variation of expected inflation of 0.022 percentage points. If the expected rate of inflation before the APP announcement was 1.5%, it would increase to 1.52% after the announcement. This is not a major increase. Yet, it is positive and significant and it is therefore consistent with the APP objective.

Second, we use the information content communicated by the ECB related to the APP. The implementation of APP can be considered as a flow-based strategy since the ECB announces a quantitative target for the monthly purchases. Those decisions provide therefore an additional information to the market and the role of this information can be assessed with the event study identification strategy. In the second step, we study the effect of announcements of APP amounts on expected inflation. The results are displayed in (Table 3) where the first regression is the same as in (Table 2) except that we consider the announcement of the amount of purchases. We find a positive and significant relationship in which a monthly increase of EUR 10 billion of APP leads to an increase in the variation of expected inflation of 0.006 percentage points.

Table 2: Event study analysis on APP decisions (1 day window)

| | Every day of observation | | ECB meeting days | |
|---|---|---|---|---|
| Variables | Expected infl. | Expected infl. | Expected infl. | Expected infl. |
| APP | 0.0221** | 0.0224** | 0.0206* | 0.0200* |
| | (0.0104) | (0.0109) | (0.0112) | (0.0118) |
| 1.TLTRO | | -0.00300 | | 0.00377 |
| | | (0.0141) | | (0.0198) |
| 1.PEPP | | -0.00263 | | -0.00286 |
| | | (0.0249) | | (0.0265) |
| D.vix | -0.00154*** | -0.00154*** | -0.00178*** | -0.00176** |
| | (0.000324) | (0.000324) | (0.000668) | (0.000673) |
| D.eonia | 0.0191** | 0.0190* | 0.473* | 0.493* |
| | (0.00974) | (0.00974) | (0.274) | (0.273) |
| Constant | -0.000569 | -0.000562 | -0.000240 | -0.000191 |
| | (0.000375) | (0.000373) | (0.00260) | (0.00235) |
| Observations | 2,087 | 2,087 | 73 | 73 |
| R-squared | 0.032 | 0.032 | 0.158 | 0.160 |

Source: Authors' estimations.

[9] The ECB announces the policy decision in a press release published at 13h45. It is then followed by a press conference that begins at 14h30 where the ECB President reads a statement and conducts a Q&A session. The ECB press conference statement provides a rational for the policy decision and presents an outlook of the future course of monetary policy. See Altavilla et al. (2019) for a discussion on the importance of the communication timing of the ECB.

The robustness of these results is checked across different specifications in Tables 2 and 3. In columns 2 and 4 we control for other ECB announcements of unconventional monetary policy measures such as TLTRO and PEPP on inflation expectations. In addition, in columns 3 and 4 we regress our expected inflation data on a sub-sample with only the days of monetary policy meetings. We find that the results are significant and robust to these different specifications. We therefore conclude that APP announcements have been effective at improving the anchoring of inflation expectations and that not only do market participants react to the decision to implement an asset purchase policy but they also react to the information related to the flow of monthly purchases. This result is found for all APP decisions and does not only lean on the decisions taken during the pandemic, but it suggests that the decision taken on the 12 March 2020 to increase the monthly flow of purchases of public securities had a significant impact on market-based long-term inflation rates.

Table 3: Event study analysis on APP decisions (1 day window)

| | Every day of observation | | ECB meeting days | |
|---|---|---|---|---|
| Variables | Expected infl. | Expected infl. | Expected infl. | Expected infl. |
| APP_flow | 0.000590*** | 0.000647*** | 0.000553** | 0.000581** |
| | (0.000219) | (0.000231) | (0.000214) | (0.000251) |
| 1.TLTRO | | -0.0128 | | -0.00655 |
| | | (0.0168) | | (0.0214) |
| 1.PEPP | | -0.00265 | | -0.00330 |
| | | (0.0249) | | (0.0263) |
| D.vix | -0.00155*** | -0.00156*** | -0.00188*** | -0.00190*** |
| | (0.000323) | (0.000323) | (0.000526) | (0.000540) |
| D.eonia | 0.0190* | 0.0187* | 0.454* | 0.420* |
| | (0.00971) | (0.00969) | (0.255) | (0.250) |
| Constant | -0.000555 | -0.000542 | 9.48e-05 | 0.000350 |
| | (0.000375) | (0.000373) | (0.00256) | (0.00236) |
| Observations | 2,087 | 2,087 | 73 | 73 |
| R-squared | 0.034 | 0.035 | 0.191 | 0.194 |

Source: Authors' estimations.

## 4.2. Does the PEPP influence sovereign spreads?

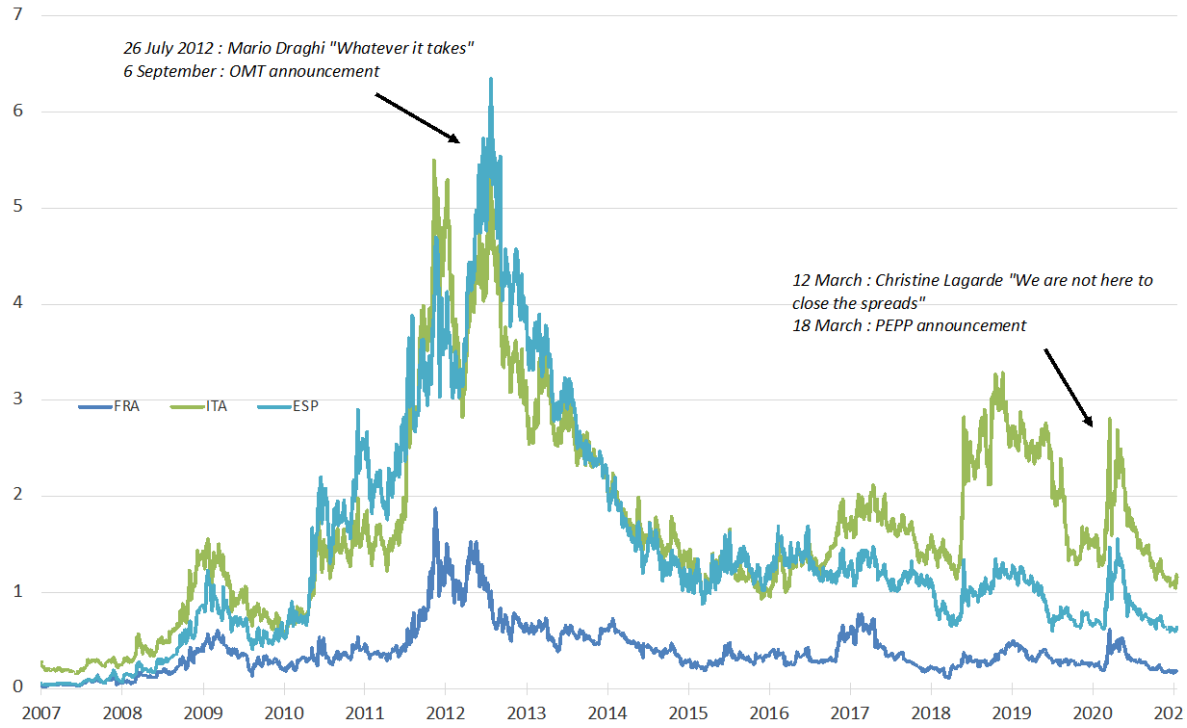
It may first be noticed that the PEPP was not announced during a scheduled meeting of the Governing Council but a few days later. When it was decided, it was simply announced with a press release indicating the total envelope of the program and stipulating that purchases would be conducted in a "flexible manner over time, across asset classes and among jurisdictions". The message was therefore that deviations to the capital key would be tolerated.[10] The aim was to avoid fragmentation risk, e.g. the risk that monetary easing is not equally transmitted in some countries because of a rise in the sovereign spread. As claimed by Christine Lagarde on 30 April 2020 : "we will use any and all flexibility that we have in accordance with our mandate in order to make sure that our monetary policy is

[10] Under the PSPP, the cross-country allocation of purchases are indeed expected to be realised according to the countries' respective share of the ECB capital.

properly transmitted to all jurisdictions". After the 4 June 2020 meeting, she reaffirmed that "First of all, it [the PEPP] has a backstop function (…). It is intended and it has demonstrated its capacity to deal with short-term market stress. It has the capacity to address the risk of market fragmentation".

It seems that this objective was well understood by financial markets (Figure 5) as was the case in 2012 when Mario Draghi invoked the famous "whatever it takes" and announced the OMT a few weeks later.[11] The outbreak of the pandemic and the expectation that it would bring governments to resort to necessary and significant fiscal measures has led to the resurgence of sovereign risk, notably for countries with a high level of debt and those first hit by the pandemic. It was notably the case in Italy. From mid-February to 11 March 2020, the spread on the Italian sovereign yield had risen by 0.6 percentage points, reaching 195 basis points. It jumped to a record level of 280 basis point after the declaration of Christine Lagarde on 12 March 2020 saying "we are not here to close spreads". The announcement of the PEPP changed the market sentiment and sent the signal that the ECB was actually preoccupied by the spreads. On 26 March 2020, the Italian spread had dropped to 1.6%.

Figure 5: Sovereign spread in the euro area, in percentage points




Source: Eikon Datastream.

Contrary to the OMT, the PEPP does not boil down only to an announcement effect. By declaring that purchases would be conducted in a flexible manner, it clearly said that weekly operations would be adjusted in case of rising turmoil in sovereign markets. Thus, the effect of the PEPP may be distinct and stronger than the effect of the OMT. In that regard, the PEPP is closer to the SMP.[12] The main difference stems from the announcement of a total envelope, which was adjusted during the year.

[11] See Altavilla et al. (2016) for an analysis of the effect of these decisions.

[12] See for instance Szczerbowicz (2015), Eser and Schwaab (2016) and Ghysels et al. (2017) for analyses on the effectiveness of the SMP.

The effective breakdown of purchases under the PEPP does show neither a strong departure from the capital key (Table 4) nor a high volatility. The share of Belgian securities ranged from 3.5% and 3.7% for instance. Regarding securities issued by Germany, it ranged from 25.1% to 27.1% while the German share in the ECB capital key is 26.4%. The main variance in those purchases concerns France and Italy. After the launch of the PEPP, it seems that the Eurosystem has purchased a higher proportion of Italian sovereign securities. The share accounted for 21.6% against a capital key of 17%. It has then progressively converged to the capital key. The adjustment was mainly realised on French securities since the share of purchases was well below the French capital key. Besides, it may be noticed that those figures, provided for 2- or 3-month periods may hide a higher variance on a weekly basis.

Table 4: Breakdown of public sector securities under the PEPP

| | Mar-May | Jun-Jul | Aug-Sep | Oct-Nov | Dec-Jan | **Cumul. Mar-Jan** | **Capital Key*** |
|---|---|---|---|---|---|---|---|
| **Austria** | 2.8 | 2.8 | 2.9 | 3.0 | 3.0 | **2.9** | **2.9** |
| **Belgium** | 3.7 | 3.5 | 3.7 | 3.7 | 3.7 | **3.7** | **3.6** |
| **Cyprus** | 0.3 | 0.2 | 0.2 | 0.2 | 0.2 | **0.2** | **0.2** |
| **Germany** | 27.1 | 25.1 | 26.5 | 27.0 | 26.9 | **26.4** | **26.4** |
| **Estonia** | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | **0.0** | **0.3** |
| **Spain** | 13.0 | 12.9 | 12.3 | 12.2 | 12.2 | **12.6** | **12.0** |
| **Finland** | 1.9 | 1.8 | 1.8 | 1.9 | 1.9 | **1.8** | **1.8** |
| **France** | 13.7 | 19.5 | 20.5 | 20.9 | 20.8 | **18.7** | **20.4** |
| **Greece** | 2.7 | 2.9 | 2.5 | 2.5 | 2.5 | **2.7** | **2.5** |
| **Ireland** | 1.7 | 1.6 | 1.7 | 1.7 | 1.7 | **1.7** | **1.7** |
| **Italy** | 21.6 | 19.6 | 18.0 | 17.4 | 17.4 | **19.1** | **17.0** |
| **Lithuania** | 0.6 | 0.3 | 0.3 | 0.1 | 0.1 | **0.3** | **0.6** |
| **Luxembourg** | 0.3 | 0.2 | 0.2 | 0.2 | 0.1 | **0.2** | **0.3** |
| **Latvia** | 0.2 | 0.2 | 0.0 | 0.1 | 0.0 | **0.1** | **0.4** |
| **Malta** | 0.1 | 0.0 | 0.1 | 0.0 | 0.0 | **0.0** | **0.1** |
| **Netherlands** | 6.0 | 5.6 | 5.9 | 6.0 | 6.0 | **5.9** | **5.8** |
| **Portugal** | 2.4 | 2.5 | 2.4 | 2.4 | 2.4 | **2.4** | **2.4** |
| **Slovenia** | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | **0.5** | **0.5** |
| **Slovakia** | 1.3 | 0.8 | 0.5 | 0.3 | 0.6 | **0.8** | **1.1** |
| **Total** | 100 | 100 | 100 | 100 | 100 | **100** | **100** |

Source: ECB.

*: It must be noted that even countries which are not in the euro area have subscribed to the ECB capital. Capital keys are here adjusted to account only for countries in the Eurosystem.

Detailed data on those weekly operations are not provided by the ECB. However, the total amount of purchases under the PEPP is known so that it is possible to test whether the PEPP has been effective at reducing spreads in the euro area. However, we need to account for potential endogeneity problems

since purchases may also depend on financial stress and on rising spreads. As PEPP aims at avoiding fragmentation, the ECB may decide to increase the weekly purchase of securities for which stress has resurfaced. Consequently, we cannot test directly the following equation:

$$spread_{i,t} = \alpha_i + pepp_t$$

Where the spread is the difference at the end of week (t) between the sovereign yield in country (i) and the German sovereign yield: $spread_{i,t} = sov\_yield_i - sov\_yield_{deu}$.

We resort to a two-step approach where we first estimate the relationship between weekly purchases and an indicator of sovereign stress.[13] The residual from this first-stage equation can then be used as a proxy of PEPP exogenous shocks, which is used in the second-stage equation to assess its impact on the sovereign spread of each country. As we have weekly data, we also consider that PEPP decisions in week (t) depend on sovereign stress in the previous week. The indicator of sovereign stress is simply the first component of a principal component analysis estimated over 10 sovereign yields.[14] The first-stage and second stage equations are:

$$pepp_t = \theta + \rho.pepp_{t-1} + \beta_1.pca\_spread_{t-1} + \beta_2.pca\_spread_{t-2} + \gamma.VIX_t + \epsilon_t^{pepp}$$

$$spread_{i,t} = \alpha_i + \beta_i \epsilon_t^{pepp} + \theta.X_t$$

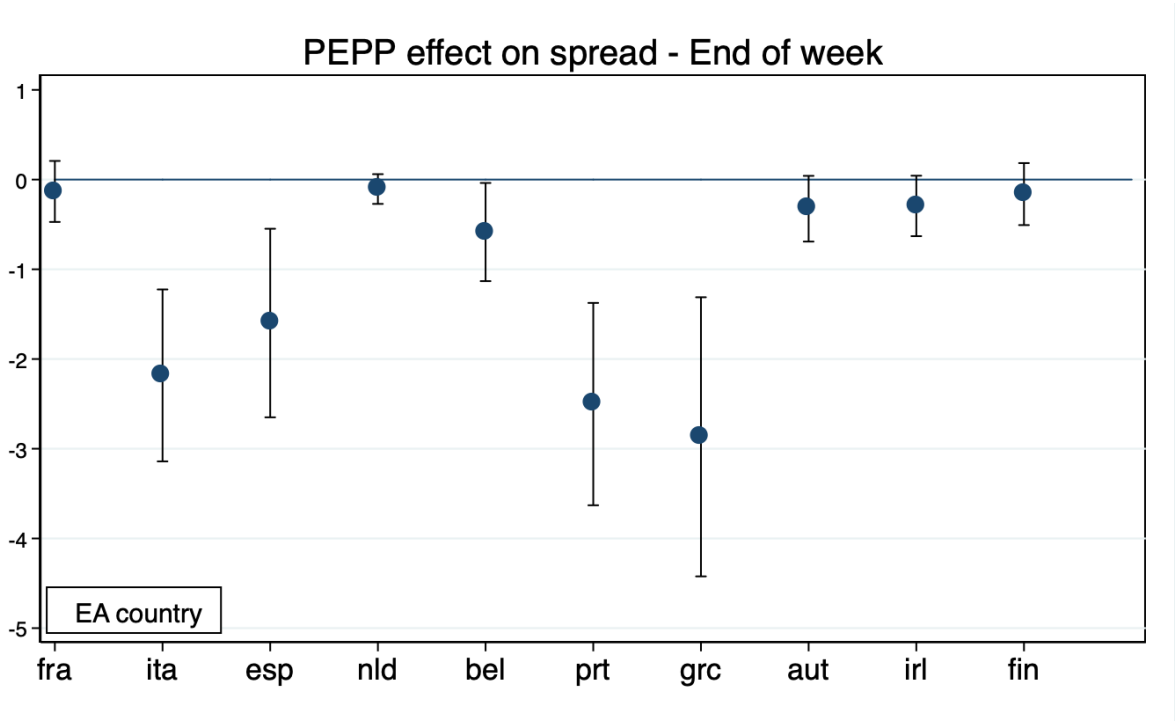
With *pepp* expressed in logarithm and *X* a vector of controls including two lags of the spread, an indicator of financial stress (the VIX) and the lagged value of *pepp*.

The result of the second-stage equation for each sovereign yield are displayed by Figure 6 and shows a significant response, at the 5% percent level, of the Italian, Spanish, Belgian, Portuguese and Greek spreads at the end of the week to the PEPP. Other sovereign spreads do not react significantly to the decision to increase the weekly purchase of public securities under the PEPP. We show in the appendix that the reduction of spreads is also effective the week after and if we consider an alternative measure of the sovereign stress in the first-stage equation.

[13] See Blot et al. (2020b) for a similar approach.

[14] France, Italy, Spain, the Netherlands, Belgium, Portugal, Greece, Austria, Ireland and Finland.

Figure 6: Reaction of sovereign spreads to PEPP, in basis points




Source: Authors' estimation.

These results show that PEPP seems to be an effective instrument to reduce spreads, notably for countries that can be considered at risk, since it has no effect on the sovereign spread of France, the Netherlands and Austria for instance. But for those countries, the financial stress was limited.

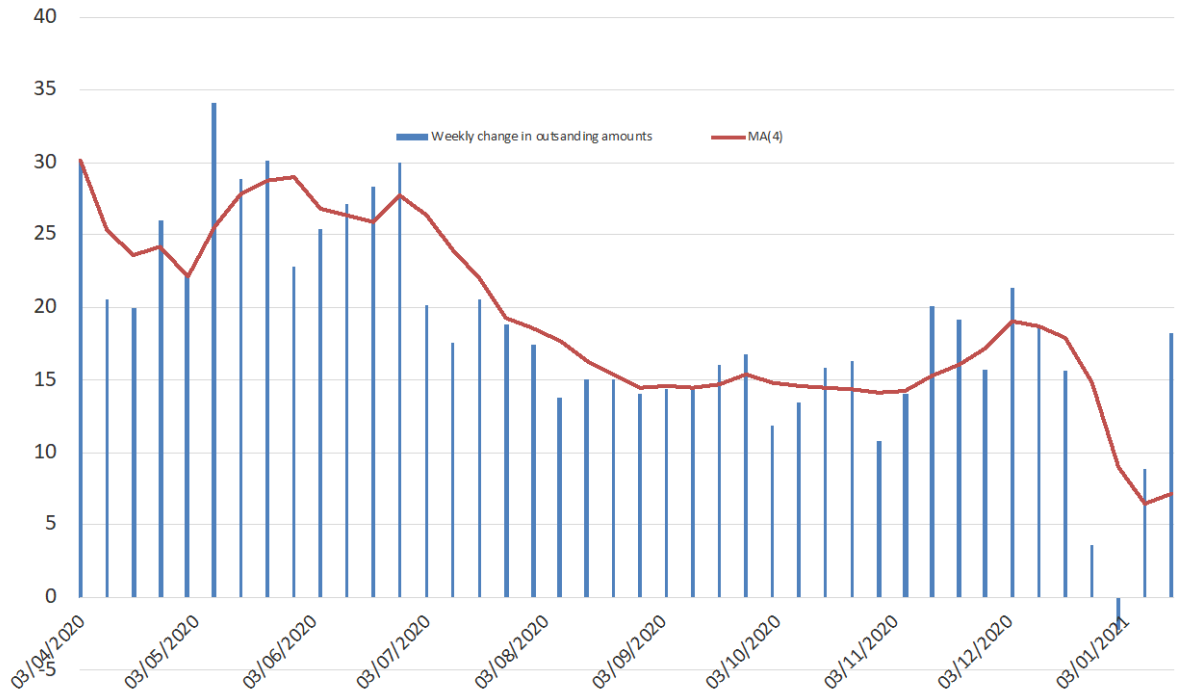
# 5. CONCLUSION

This contribution has reviewed the different policy measures introduced by the ECB since the inception of the COVID-19 crisis in Europe, mainly the extension of APP and the introduction of PEPP. APP and PEPP have had distinct objectives in comparison with former policies. APP has been oriented towards inflation expectations while PEPP has been oriented towards sovereign spreads. Consequently, we analyse the effects of APP announcements (including asset purchases flows) on inflation expectations and show that they help steer expectations upward. We also analyse the impact of PEPP on sovereign spreads and show that PEPP has had heterogeneous effects that have alleviated fragmentation risk: PEPP has had an impact on the sovereign spreads of the most fragile economies during the pandemic (e.g. Italy) and no impact on the least fragile (e.g. the Netherlands). Finally, the contribution has also shown that overall macroeconomic effects have been in line with expected outcomes since the mid-2000s: monetary policy measures have had real effects on euro area unemployment rates, nominal effects on inflation rates and financial effects on banking stability.

In the absence of a common fiscal policy and Eurobonds, it is important that euro area members preserve their ability to use their fiscal policy to deal with the health, social and economic consequences of the pandemic. In this respect, it is worth noticing that at the end of December 2020, central banks purchases were in line with the initial envelope: EUR 750 billion. An increase in the size of the program may be useful only in case financial risks re-emerge. Weekly purchases have been high at the beginning of the crisis and have decreased after (Figure 7). However, sovereign spreads have not completely vanished, making monetary policy transmission not fully homogeneous across countries. By the end of January 2021, the Italian sovereign yield was still more than 1 percentage point above the German sovereign yield, increasing the relative fiscal cost of emergency measures taken by the Italian government to deal with the crisis.[15] Italian yields may well be at record low levels, even below US yields. However, in comparison with German bunds, at record *lower* levels, it may not be fair to penalise Italy in the context of this exogenous shock since it puts a drag on the ability to finance health expenditures or to provide help to agents hit by lockdown measures. Instead of announcing a total envelope, the ECB could cap domestic spreads for the time of the crisis to eliminate fragmentation risk and ensure financial stability. As claimed by Christine Lagarde on 19 March 2020: "fiscal policies must be front and centre in this response. Monetary policy has a vital role to play in tandem." Capping spreads would be a good way to reconcile actions with words.

[15] The total impact is reduced since the Bank of Italy holds more than 20% of Italian debt and therefore may redistribute the payments received on this debt to the government.

Figure 7: Weekly purchases of public securities under PEPP, in EUR billion




Source: ECB.

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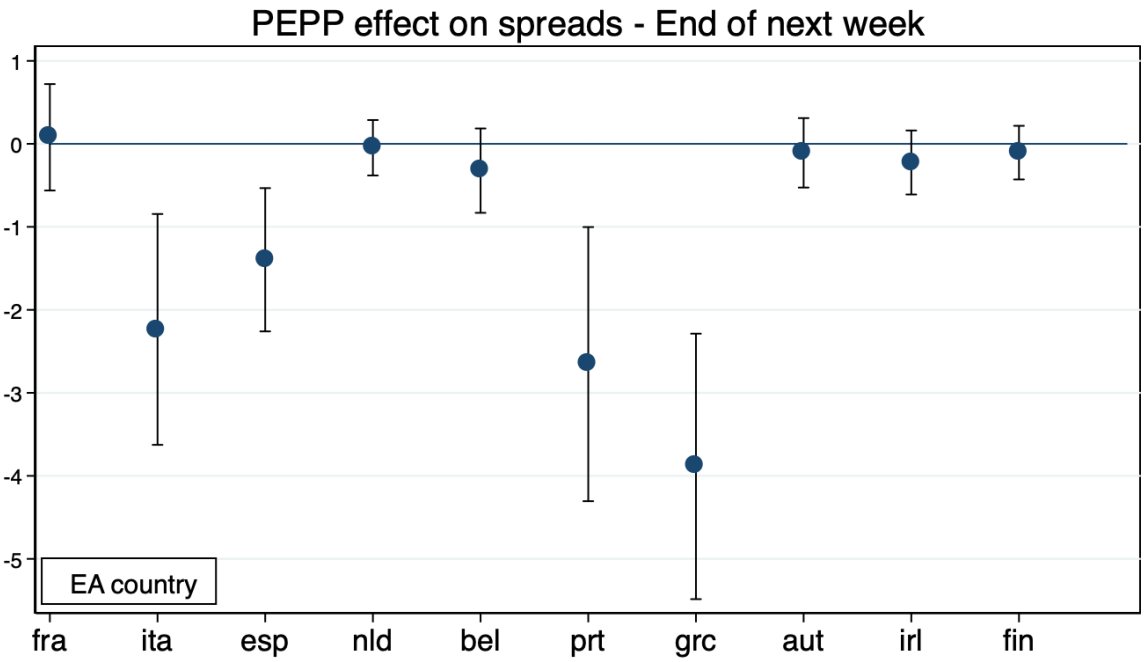
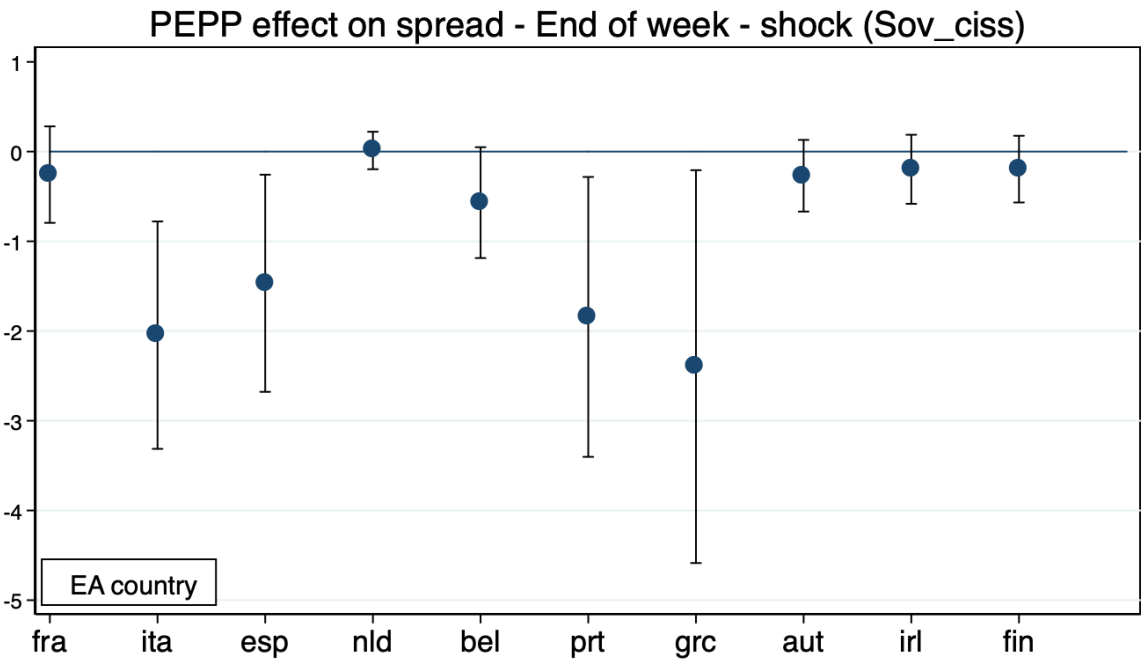
# ANNEX

Figure 8: PEPP effect on spreads – one week after, in basis points




Source: Authors' estimation.

Figure 9: PEPP effects on spread (alternative measure of sovereign stress), in basis points




Source: Authors' estimation.

This contribution reviews the ECB measures since the start of the COVID-19 crisis, i.e. the extension of APP and the introduction of PEPP. We show that APP announcements have helped steer inflation expectations upward. We also show that PEPP has alleviated fragmentation risk. Finally, we show that since the mid-2000s, ECB measures have had real effects on euro area unemployment rates, nominal effects on inflation rates and financial effects on banking stability.

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