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ASSESSING THE FLEXIBLE IMPLEMENTATION OF THE ECB's PANDEMIC ASSET PURCHASES

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We estimate the impact on financial markets of the ECB's pandemic asset purchases at the height of the Covid-19 crisis. To do so, we rely on a new model that allows assessing both announcement and implementation (or flow) effects of central bank asset purchases within a unified framework and, in turn, evaluating their cumulative impact on financial markets. We find that the Pandemic Emergency Purchase Programme and the additional envelope under the Asset Purchase Programme led to an overall reduction of long-term government bond yields and risk-free rates in March and April 2020 by about 60 and 25 basis points respectively. The use of temporal flexibility in the implementation of the announced stock of pandemic asset purchases contributed significantly to these effects. In case of a constant-pace implementation, the reduction of government bond yields and risk-free rates would have been smaller, by about 15 and 5 basis points respectively. We provide evidence that these estimates can be interpreted as a lower bound of the true impact. The results indicate that the effectiveness of asset purchase programmes, although largely driven by official announcements, cannot be fully evaluated without also considering the contribution of actual purchase flows.

1. Introduction

In response to the rapid deterioration of the economic and financial outlook spurred by the spread of the Covid-19 pandemic, in March 2020 the Governing Council of the European Central Bank (ECB) announced new net purchases of public and private sector securities to be implemented until the end of the year. On March 12, it added a temporary envelope of €120 billion to its existing Asset Purchase Programme (APP). On March 18, it launched a new programme – the Pandemic Emergency Purchase Programme (PEPP) – with an initial envelope of €750 billion (later increased to €1850 billion). These "pandemic purchases" were designed with the dual role of easing the monetary policy stance and of contributing to the stabilization of financial markets. While the "stance role" was mostly ensured by the calibration of the announced size and the duration of the programmes, the "market stabilization role" has been mainly underpinned by a flexible implementation of the announced purchases over time, across asset classes, and among jurisdictions.[2]

This note evaluates the cumulative impact of the asset purchases announced and implemented by the ECB at the height of the Covid-19 crisis. So far, the literature has focused on estimating the

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[2] On the "flexibility" feature of the PEPP, see for example Lagarde (2020) and Schnabel (2021).

marginal effects of either purchase announcements (mainly using event-studies) or actual purchase flows (mainly employing microeconometric techniques).[3] The absence of a unified dynamic framework has however prevented to *(i)* combine these two types of effects together and to *(ii)* cumulate their joint impact over time. This lack of empirical evidence has recently led to slightly controversial views. On the one hand, in the policy debate it is sometimes argued that flow effects are on average of little importance in affecting the observed level of market rates. On the other hand, anecdotal evidence suggests that asset purchase programmes cannot be fully evaluated simply based on announcement effects on yields (Vissing-Jørgensen, 2021). Our contribution – sketched in this note and detailed in a forthcoming working paper (Bernardini and Conti, 2021) – is to develop an empirical model that allows assessing and comparing announcement and flow effects of central bank asset purchases and, in turn, evaluating their cumulative impact on financial markets. This also enables us to assess the role of temporal flexibility: that is, the specific impact stemming from frontloading or backloading purchases instead of implementing them at a constant pace.

In what follows, we first briefly sketch the empirical framework, we then present a set of policy counterfactuals, and we finally discuss their robustness. We conclude by highlighting some policy implications of our results.

2. Empirical approach

2.1. The model

We adopt a small-scale Bayesian Vector AutoRegressive (BVAR) model to capture the dynamic feedbacks between central bank asset purchases and market rates. Differently from other popular methods in empirical macroeconomics, the underlying structure of the VAR provides a simple way to sum-up dynamic marginal effects (i.e., impulse responses) over time and, in turn, to construct counterfactual policy scenarios. We specify the following VAR:

$$\boldsymbol{y}_t = c + A(L)\boldsymbol{y}_{t-1} + E(L)\boldsymbol{x}_t + \boldsymbol{u}_t \qquad (1)$$

where $\boldsymbol{y}$ is a vector of endogenous variables, c is a constant term, $\boldsymbol{x}$ is a vector of exogenous variables, and $\boldsymbol{u}$ is a vector of forecast errors. $A(L)$ and $E(L)$ are matrix polynomials in the lag operator L, while t denotes the time frequency, which in our setting is weekly.

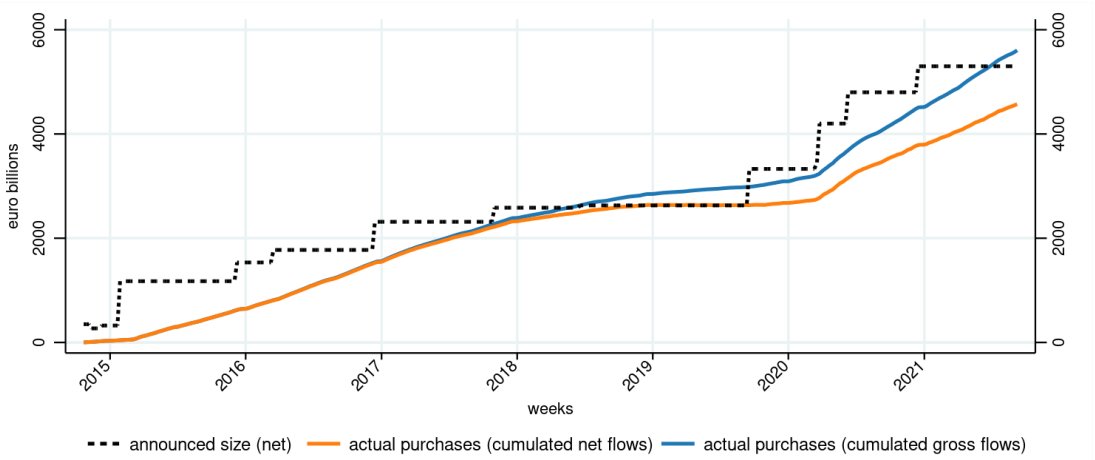
We include as endogenous variables the announced stock of purchases, the actual purchase flows, the long-term government bond yield, the long-term risk-free (OIS) rate and a stock price index, each measured at weekly frequency.[4] The first two variables define the set of policy variables. The

[3] Central bank asset purchases work primarily by affecting the risk premia component of long-term rates through portfolio rebalancing channels. The core mechanism is known as *duration extraction* (Vayanos and Vila, 2021). Under this channel, an increase in the stock of euro area bonds withdrawn from the market by the ECB reduces the aggregate risk to be borne by market participants, allowing them to accept a lower excess return on a long-term bond per unit of risk, which in turn compresses term premia along the entire yield curve. In addition, asset purchases can also lead to relatively isolated movements within particular sectors of the yield curve through a *local-supply* channel, which can operate under the presence of market segmentation between bonds of different maturity as well as impairments in market liquidity and functioning (D'Amico and King, 2013). An important takeaway of the theory is that both purchase announcements and actual purchases can activate these two channels and, therefore, shape the overall effectiveness of asset purchase programmes.

[4] The announced stock of purchases is constructed in the spirit of Lhuissier and Nguyen (2021). This variable measures the cumulative amount of asset purchases announced by the ECB under the APP and the PEPP in the press release or during the press conference following the monetary policy meetings. Under the PEPP, changes in the announced stock are communicated *directly*. Under the APP, changes in the announced stock are communicated *indirectly* as a function of the announced pace of purchases and the announced horizon of the net purchase phase. In order to deal with the open-ended nature of the APP since its restart in September 2019, we use the ECB Survey of Monetary Analysts (SMA)

announced stock of purchases is defined as the overall size – or envelope – of assets under the APP and the PEPP that the ECB's Governing Council anticipates to hold and that is communicated to the public after a new decision is taken. Therefore, by construction it measures the sum of all past, present, but also (announced) future net purchase flows under ECB's asset purchase programmes. Figure 1 compares this variable (dashed line) with the actual stock of purchases (solid orange line): a positive gap reflects the stock of net purchases that has been announced but not yet implemented; a zero gap signals that ECB's programmes are dormant, as in large part of 2019.[5] The inclusion of these two variables is of key importance for the analysis as it allows accounting for announcement and flow effects as well as for dynamic feedbacks between these two dimensions. We also include as exogenous variables a set of impulse dummies to clean the strong seasonality in gross purchases around year-end.[6]

Figure 1 – Announced vs. actual stock of purchases



Note. Announced size is the overall stock (or "envelope") of assets under the APP and the PEPP that the ECB's Governing Council anticipates to hold and which makes public after its monetary policy meeting. It is the sum of all past, present, and future purchases. *Actual purchases* is the effective stock of assets. It is the sum of all past and present purchases.

The sample period runs from 22 October 2014 to 8 September 2021. For the endogenous variables we specify seven lags (as to cover the average time interval between two consecutive

to infer the length of the programme. In the baseline analysis shown in this note, we update the latter only when a change in the announced pace of purchases occurs. Actual purchase flows are the gross purchases under the APP and the PEPP published by the ECB in the online commentary of its Weekly financial statement. To ensure a correct timing, we merge data on gross purchases with data on market yields using the trade date. The long-term government bond yield measures the GDP weighted average of 10-year government bond yields – the market rates that are most directly affected by ECB's asset purchases – for the eleven largest euro area countries. As a simple way to remove the noise induced by policy rate cuts, we subtract the 1-month OIS rate from the GDP-weighted government 10-year bond yield and the 10-year OIS rate. This data transformation has negligible effects on the results shown in this note. The stock index is the Euro Stoxx 50.

[5] Figure 1 also shows the cumulated gross flows (solid blue line). Since 2015, the Eurosystem fully reinvest the principal payments from maturing securities held in the APP and PEPP portfolios. A zero gap between the dashed and solid orange lines in Figure 1 therefore indicates that only the reinvestment component of the ECB's asset purchase programmes is active.

[6] In the last days of each year, the Eurosystem temporarily pauses its asset purchases under the APP and the PEPP in anticipation of significantly lower market liquidity in the proximity and during Christmas holidays, with the aim of avoiding market distortions. This generates a series of sudden and very large drops in gross purchase flows. To avoid that these seasonal effects might hamper the correct quantification of estimated effects, we include a set of seven impulse dummies, each of which takes value unity at the start of each Christmas break. Seasonal variation may also characterize other periods of the year (e.g., around Easter and in the summer). Its impact on the data is however much less pronounced as the ECB completely pauses its asset purchases only around year-end.

monetary policy meetings), while exogenous variables enter contemporaneously and with two lags. All the variables are specified in (log-)levels.

2.2. The joint identification of shocks to the announced stock of purchases and to the actual flows

We identify two distinct asset purchase shocks using a novel approach. As shown in equation (2), the standard identification problem in VARs consists in defining a matrix B such that the forecast errors of the model ($\boldsymbol{u}_t$) can be expressed as a linear combination of structural shocks ($\boldsymbol{\varepsilon}_t$):

$$\boldsymbol{u}_t = B\boldsymbol{\varepsilon}_t \tag{2}$$

In our study, we use a combination of external instruments and zero-sign restrictions to isolate two policy shocks: an announced stock shock (ε_t^{ann}) and a flow shock (ε_t^{flo}). The other shocks (ε_{1t}^{oth} and ε_{2t}^{oth}) absorb all the residual structural innovations in the system (i.e., they capture additional disturbances such as additional demand shocks, supply shocks, global shocks, and financial shocks). The set of identifying assumptions is summarized in Table 1.[7]

Table 1 – Identifying assumptions

	ε_t^{ann}	ε_t^{flow}	ε_{1t}^{oth}	ε_{2t}^{oth}	
u_t^{ann}	proxy	0			
u_t^{flo}	proxy	> 0	> 0	0	0
u_t^{yld}	proxy	< 0	> 0		
u_t^{rfr}	proxy				
u_t^{stp}	proxy	> 0			

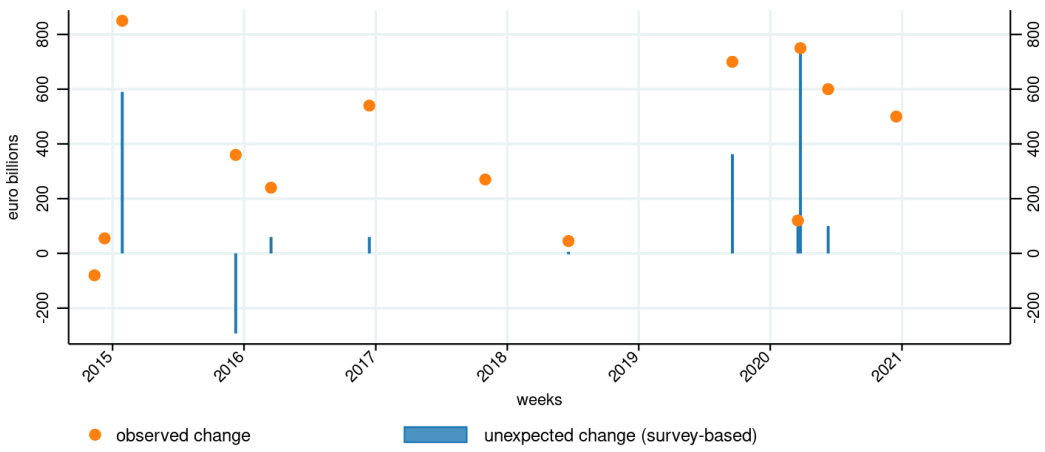
Note: "proxy" denotes the external instrument (IV approach). The sign and zero restrictions (ZSR approach) are imposed on impact only. Blank entries denote unrestricted responses.

Announced stock shocks are identified using an instrumental variable (IV) approach. Recalibrations of the announced stock of purchases are often anticipated by the private sector and followed by little-to-none changes in market rates. To isolate the exogenous component of this variable, we rely on an external instrument (or proxy variable) z_t. In particular, we follow Lhuissier and Nguyen (2021) and set z_t equal to a time series of survey-based surprises on the unexpected stock of additional purchases under the APP and the PEPP. Figure 2 compares the external instrument (blue bars) with the observed change in the announced stock (orange circles). While some announcements came as a total surprise (e.g., in March 2020), in many cases they were either fully anticipated by the private sector (e.g., in October 2017) or even associated with a negative surprise (e.g., in December 2015). The use of a measure of survey-based surprises as an external instrument for announced stock shocks therefore allows properly estimating the elasticity of financial variables to programmes' announcements. Formally, our first identifying assumption is that the external instrument z_t is correlated with an unobserved series of announced stock shocks (ε_t^{ann}) but is uncorrelated with the other series of shocks (Mertens and Ravn, 2013; Stock and Watson, 2018):

$$\begin{cases} E[\varepsilon_t^{ann} z_t'] \neq 0 \\ E[\varepsilon_t^{flo} z_t'] = E[\varepsilon_{it}^{oth} z_t'] = 0, i = 1,2 \end{cases} \tag{3}$$

[7] Notice that we are collapsing two shocks (last two columns in Table 1) in one convolution, which we label ε_{2t}^{oth}. This is common practice in the literature, when the focus of the empirical analysis hinges on partial rather than full identification.

Figure 2 – The survey-based external instrument



Note. The figure compares the *observed* change in the announced stock of purchases (orange dots) with the *unexpected* change in the same variable (light-blue bars), computed as the difference between the actual change and the median expectation in the surveys conducted by Bloomberg and by the ECB (Survey of Monetary Analysts). The unexpected change (survey-based) is the external instrument used to identify the announcement shock (see Table 1).

Flow shocks are identified using a zero-sign restriction (ZSR) approach. Our second identifying assumption is that flow shocks (ε_t^{flo}) generate on impact a negative co-movement between actual purchase flows (u_t^{flo}) and long-term government yields (u_t^{yld}). Additionally, they exert on impact a positive effect on stock prices (u_t^{stp}). The assumption that increases in actual purchase flows cannot systematically and immediately lead to increases in bond yields is supported by a growing body of evidence documenting a negative response of bond yields to autonomous increases in purchase flows.[8] Notice that our sign and zero restrictions are imposed on impact only, as suggested by the literature; this ensures that the persistence of flow effects, and therefore their quantitative relevance, is entirely driven by the data. Finally, imposing a zero restriction on the announced envelope is a convenient way to further disentangle the dynamic feedbacks between purchase announcements and actual purchases, since the latter are not supposed to affect the former on impact.

The other shocks are split in two broad categories. We do not aim at explicitly identifying the remaining shocks included in the system as all is needed to analyse the effects of central bank asset purchases on market rates is to identify the policy shocks. However, to provide a validation of the model, we disentangle them in two distinct groups. The first group is characterized by shocks that trigger a stabilizing within-week response by the central bank in terms of gross purchase flows (ε_{1t}^{oth}). These shocks have been often associated with financial shocks and their existence has been extensively documented in the literature on flow effects (see the discussion in Ghysels et al., 2017; De Santis and Holm-Hadulla, 2020; Bernardini and De Nicola, 2020). The second group (the last two columns in Table 1) is characterized by shocks that do not induce a within–week response by the central bank in terms of gross purchase flows (ε_{2t}^{oth}). These shocks can be thought mostly as macro and other financial shocks whose effects are assessed approximately every 6-7 weeks by the ECB Governing Council.[9] This group of shocks is identified by exploiting the policy lags that characterize

[8] For the Securities Markets Programme (SMP), Casiraghi et al. (2016), Eser and Schwaab (2016) and Ghysels et al. (2017); for the APP, De Santis and Holm-Hadulla (2020); for the PEPP, Bernardini and De Nicola (2020).

[9] Imagine that a highly-effective treatment for Covid-19 is officially announced to the public. The news will exert an immediate (i.e., within week) rise in bond yields and stock prices. As prescribed by the standard macro-textbook, the central bank will likely react to the news by tightening monetary policy. This reaction, however, will never materialize (on average) in the same week of the news release, as the ECB's Governing Council will wait until the next meeting before eventually re-calibrating its asset purchase programmes.

the response of monetary policy to macroeconomic and financial developments. This is a crucial advantage of estimating our BVAR with high-frequency data: while timing restrictions are very plausible at the weekly frequency, they become far less admissible moving towards lower frequencies such as quarterly or even monthly.

2.3. The estimation

We estimate the model with Bayesian techniques. We specify the BVAR in equation (1) with a standard Minnesota prior and obtain inference using Gibbs Sampling. The combination of external instruments and zero-sign restrictions underlying the identifying assumptions shown in Table 1 is implemented using the methodology proposed by Cesa-Bianchi and Sokol (2022).

Our model allows estimating multiple objects of interest, such as impulse responses, elasticities, shocks, forecast error variance decompositions, and historical decompositions. The discussion of these results, together with the technical details related to the estimation procedure and the full set of robustness checks, will be addressed in detail in a forthcoming research paper (Bernardini and Conti, 2021). In the remainder of this note, we instead focus on the estimation of policy counterfactuals.

3. The cumulative impact of the ECB's purchase announcements and actual purchases

In this section, we provide answers to the following questions.

- *What would have happened had the ECB not launched a series of pandemic asset purchases in March 2020?*
- *What would have happened had the ECB implemented the announced stock of pandemic purchases at a constant pace, like under the pre-covid APP?*

To this end, we rely on the estimation of policy counterfactuals.[10] This approach is needed since monetary policy shocks typically account only for a very limited share of the average and historical variability in financial and macro variables. Also in our case, asset purchase shocks explain at best 20 per cent of the average variation in long-term yields and asset prices (not shown). This reflects the fact that central bank asset purchases – as any other monetary policy tool – affect financial conditions mostly through their systematic component; that is, by responding endogenously to other shocks. Thus, policy counterfactuals provide the only appropriate way to evaluate *both* the discretionary and the systematic components of ECB's asset purchases.

Our policy counterfactuals have two key features. First, they are structural, as the counterfactual paths of the policy variables are attributed to the policy shocks only. Technically, the estimated time series of announcement and flow shocks are modified so that the assumed paths of the policy variables are realized, while all the other shocks in the system remain unchanged. Second, they have a short-term nature, as they are conducted over a narrow time window (i.e., the 6-7 weeks between two consecutive meetings of the ECB's Governing Council). Both features are of crucial importance to minimize concerns related to the Lucas' critique, which are typically raised to warn against the plausibility of counterfactual scenario analyses.

3.1. The impact of the ECB's pandemic purchases at the height of the Covid-19 crisis

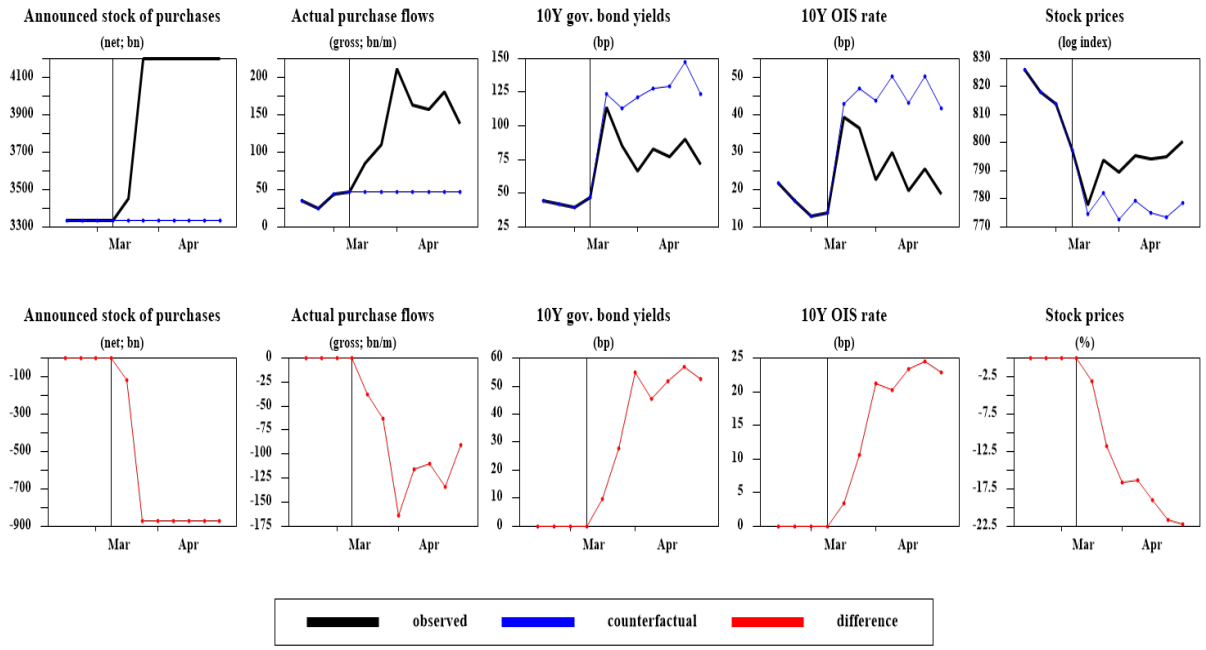
We start by evaluating the overall impact of announcing and implementing the pandemic purchases under the APP additional envelope and the PEPP at the height of the Covid-19 crisis (i.e., between the March and April 2020 meetings). In particular, we consider an alternative scenario in which the ECB:

[10] See Kilian and Luetkepohl (2017) and Antolin-Diaz et al. (2021).

a) keeps its announced stock of purchases unchanged, instead of increasing it by €870 bn as actually occurred (i.e., the combined amount of the APP additional envelope and the first announced envelope of the PEPP);
b) continues to implement the APP purchases at a constant pace (€20 bn/month; €47 in gross terms), instead of frontloading them as actually occurred.

The top panels of Figure 3 display the actual and counterfactual path for each of the endogenous variables included in the BVAR, while the bottom panels show the counterfactual effects (i.e., the difference between these two paths for each of the aforementioned variables). The results indicate that under the analysed scenario the 10-year bond yield and the 10-year OIS rate would have been higher by about 60 and 25 bp, with a consequent rise in the spread between the two rates (a commonly used measure of fragmentation) of about 35 bp. Furthermore, stock prices would have been lower by slightly less than 25 per cent. The probability that these counterfactual effects are at the peak greater than zero (or lower than zero in the case of stock prices) is estimated at around 95 per cent.[11]

Figure 3 – The impact of the ECB's pandemic purchases at the height of the Covid-19 crisis



Note. The top panels of the figure show the actual (black lines) and counterfactual paths (dotted blue lines) of all the endogenous variables included in the BVAR. Actual and counterfactual paths coincide until March 11, 2020, the day before the announcement of the APP additional envelope. Counterfactual paths are obtained assuming that the ECB neither announced the pandemic purchases neither operated in flexibility. The bottom panels show the difference between actual and counterfactual path (red dotted line) for each variable included in the BVAR.

3.2. The impact of the ECB's temporal flexibility at the height of the Covid-19 crisis

We then evaluate the contribution to financial market stability of the temporal flexibility used in the implementation of asset purchases at the height of the Covid-19 crisis: that is, the specific impact

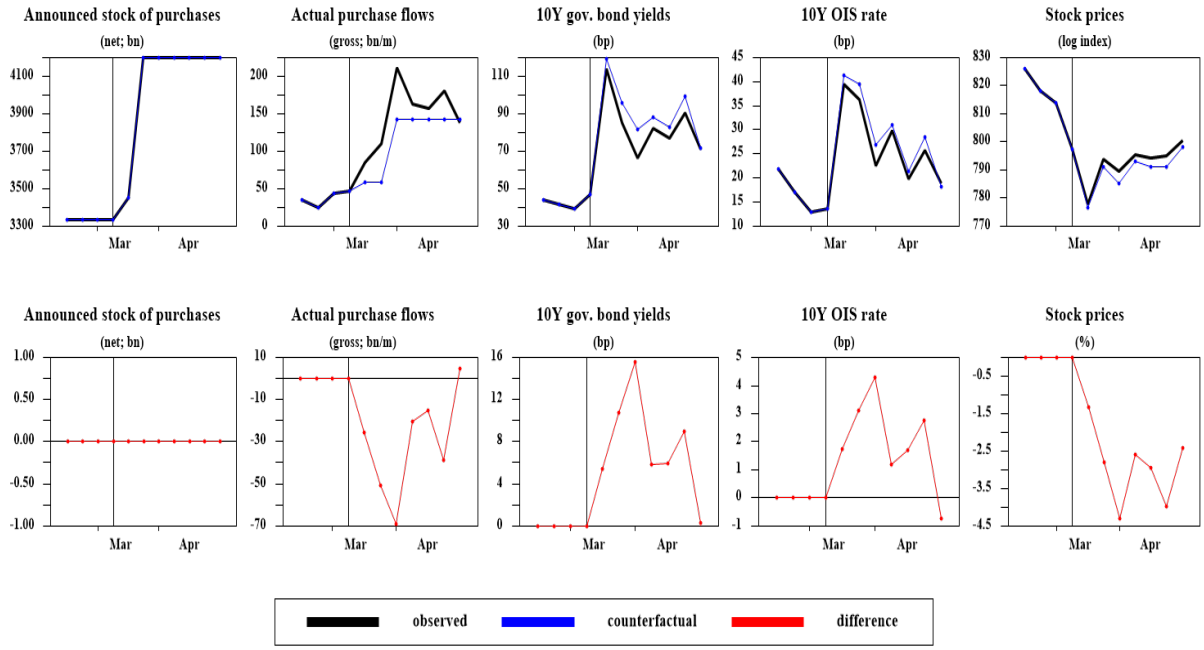
[11] For each variable and for each week in the analysed time window, the probability is computed as the percentage of draws for which the counterfactual effect has the same sign of the median effect taken across draws (we thoroughly show and discuss these estimates in the forthcoming research paper).

stemming from frontloading or backloading purchases instead of implementing them at a constant pace. In particular, we consider an alternative scenario in which the ECB:

a) increases its announced stock by €870 bn, as actually occurred;
b) implements the higher amount of announced purchases at the constant pace implied by the remaining envelope (€32 bn per month for the first two weeks since the March 2020 meeting and 115 bn per month afterwards, which corresponds to €59 and €142 in gross terms), instead of frontloading them as actually occurred.

Figure 4 shows that in the 7 weeks between the March and April 2020 monetary policy meetings the 10-year bond yield and OIS rate would have been higher by 16 and 4 bp, inducing a rise in fragmentation by 12 bp. Furthermore, over the same period stock prices would have been lower by about 4 per cent. The probability that these counterfactual effects are at the peak greater than zero (or lower than zero in the case of stock prices) is estimated at around 90 per cent.

Figure 4 – The impact of the ECB's temporal flexibility at the height of the Covid-19 crisis



Note. The top panels of the figure show the actual (black lines) and counterfactual paths (dotted blue lines) of all the endogenous variables included in the BVAR. Actual and counterfactual paths coincide until March 11, 2020, the day before the announcement of the APP additional envelope. Counterfactual paths are obtained assuming that the ECB announced the pandemic purchases but implemented them without temporal flexibility (i.e., at a constant pace until year-end). The bottom panels show the difference between actual and counterfactual path (red dotted line) for each variable included in the BVAR.

These findings suggest that the use of temporal flexibility in the implementation of the announced stock of purchases significantly contributed to the effectiveness of the programme and thus to financial market stability at the height of the Covid-19 crisis. The estimated cumulative impact of temporal flexibility, although smaller than that associated with the mere announcements of the pandemic purchases[12], is quantitatively very relevant as it is comparable to that of a typical recalibration of the announced stock.

[12] The overall impact shown in Figure 3 reflects the sum of two policy decisions: (*i*) the one of announcing a higher stock of purchases and (*ii*) the one of frontloading purchases instead of implementing them at a constant pace. The

4. Assessing the presence of time-variation in the effectiveness of temporal flexibility

The literature has documented, both theoretically and empirically, that asset purchases tend to be more effective in times of stressed market conditions, as they improve risk sentiment and support better market functioning. The VAR model in equation (1) assumes however that announcement and flow elasticities are constant over time, implying that the effectiveness of central bank asset purchases do not depend on the underlying state of the economy. We make this assumption because the availability of few official announcements limits us in specifying a fully-fledged model with time-varying coefficients. In this section, we partly address this issue by carrying-out a subsample analysis for the Covid-19 crisis, the major episode of market stress in our sample.

First, we check to what extent our model underestimates the effectiveness of temporal flexibility in times of market stress. Using confidential data sampled at very high frequencies (i.e., 5-minute intervals), Bernardini and De Nicola (2020) show that the elasticity of market rates to actual purchase flows was substantially larger in March 2020, at the height of the Covid-19 crisis. The assumption of a linear model, therefore, may lead to a downward bias in the estimated cumulative impact of temporal flexibility shown in Figure 4. As a robustness exercise, we check to what extent our counterfactual effects change if we only use 2020-21 data to estimate the BVAR. We find that the cumulative impact associated with the ECB's temporal flexibility tends to increase substantially, implying that the baseline estimates can be interpreted as a lower bound of the true impact.[13]

Second, we check to what extent our model overestimates the effectiveness of temporal flexibility in relatively quieter times. In a similar vein to the case discussed above, the assumption of a linear model may conversely lead to an upward bias in the estimated effects of temporal flexibility in tranquil periods. In particular, one may wonder whether our underlying flow elasticities are strongly influenced by the presence of abrupt and marked price changes in our set of financial variables during the most turbulent times of the Covid-19 crisis. As a robustness exercise, we compare the baseline elasticities with those obtained by estimating the model only with pre Covid-19 crisis data. We find that ending the estimation sample in 2019 does not change substantially the dynamic conditional correlations on which the policy counterfactuals shown in this note are based.[14]

Overall, this evidence indicates that the use of temporal flexibility is particularly warranted in times of heightened market stress. A step-up in the actual pace of asset purchases is in fact more likely to be effective at counteracting financial tensions and restoring proper market functioning. However, they also suggest that the use of temporal flexibility should be handled carefully in normal times as well, as flow effects are somewhat smaller but still relevant.

5. Lessons and implications

Two main messages emerge from this note. First, the effectiveness of asset purchase programmes cannot be evaluated simply based on announcement effects on yields; that is, by ignoring the contribution of flow effects. Second, temporal flexibility in the implementation of asset purchases can play a quantitatively-significant role in stabilizing financing conditions, especially (but not exclusively) in times of heightened market stress.

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counterfactual effects shown in Figure 4 provide the specific contribution of temporal flexibility (decision *ii*) to the overall impact. The specific impact coming from the higher announced stock of purchases (decision *i*) is approximately provided by the differences between the counterfactual effects shown in Figures 3 and 4 (about 45 and 20 bp on the 10-year bond yield and OIS rate respectively).

[13] The cumulative impact of temporal flexibility between the March and April 2020 meetings rises to 30 bp for the 10-year government bond (16 bp in the baseline), 15 bp for the 10-year OIS rate (4 bp in the baseline), and -8 per cent for stock prices (-4 per cent in the baseline).

[14] Obviously, we cannot compute policy counterfactuals when we end the estimation sample in 2019.

Our results also provide some key insights for the design of asset purchase programmes. The advantages of having some form of flexibility in the actual implementation of asset purchases have been recently highlighted by Villeroy (2021) and Visco (2021). In particular, temporal flexibility (the focus of this note) may allow the central bank to promptly adjust the pace of its asset purchases in the event of unforeseen market volatility, therefore preserving the smooth transmission of monetary policy to the real economy. According to this setup, temporal flexibility does not come at the cost of compromising the monetary policy stance, but rather makes the pursuit of central banks' primary targets more effective and proactive.

Although this note has focused on temporal flexibility in asset purchases, our results suggest that similar conclusions would hold for other forms of flexibility, in particular that among jurisdictions. The experience of the pandemic crisis indicates that it was efficient to step-up the pace of asset purchases more intensively in the jurisdictions where they were more needed. This aspect could be explored in further research, using disaggregated cross-country data.

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