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The inefficiency of Quantitative Easing in the Euro Area

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Abstract

We examine whether quantitative easing had an impact on output and inflation in the euro area. Using a BVAR model, over the March 2015 - December 2021 period, our results suggest that quantitative easing is an inefficient policy tool. In particular, following a shock that increases asset purchases by around 1% of euro area GDP, inflation increases by around 0.01%, while industrial production rises by 0.3%. The biggest beneficiary of quantitative easing is the stock market, rising more than 2% after the shock. Since only a very small share of the general populace holds stocks, this has adverse inequality effects.

Keywords: quantitative easing; euro area; inequality; asset purchases

JEL Codes: E58, E52, C32

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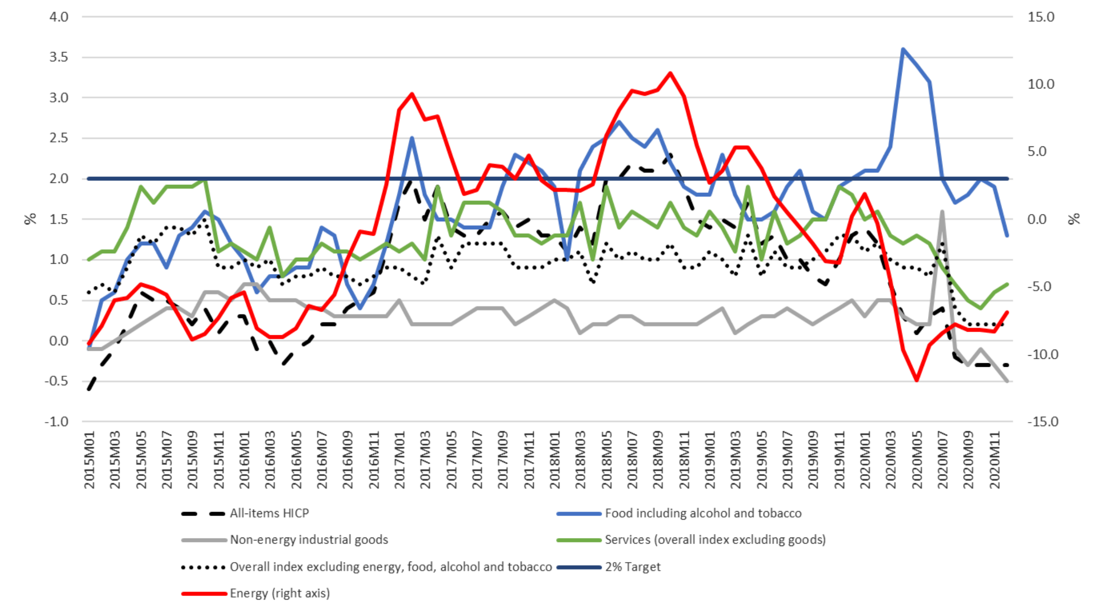
The inefficiency of Quantitative Easing in the Euro Area

1. Introduction

Central banks across the world seek to maintain financial stability and keep prices stable, with the consensus view being that inflation should be around 2% (Michail, 2021). Hence, any deviation from the target, regardless of the direction, is treated as equally important. In the European Central Bank's (ECB) words, "we view inflation that is too low just as negatively as inflation that is too high".[1]

Figure 1: Evolution of HICP components (source: Eurostat)



This was the case from 2015 and up until the Covid-19 pandemic in 2020, when inflation was on the lower side. As Figure 1 suggests, only energy and food inflation were, at times, higher than the 2% throughout that period. On the other hand, the HICP overall index (headline inflation) rose slightly above 2% only for a few months in 2018, with core inflation standing around 1%. To boost inflation back to its target, the ECB kept its interest rates at record negative levels. In addition to the conventional policy measures employed, it proceeded with the introduction unconventional policy actions,

[1] https://www.ecb.europa.eu/ecb/tasks/monpol/html/index.en.html - Accessed 15 June 2023

namely in the form of a quantitative easing (QE) programme, to the tune of 60 billion euros per month, starting in March 2015.[2]

Albeit novel for the ECB, the use of unconventional monetary policy measures has long been in the policymakers' lexicon, but has increased significantly since the 2008 global financial crisis. Its heavy use by the US Federal Reserve (Fed) in 2008 aimed to both stabilize bond prices as well as boost commercial banks' lending ability. By purchasing government and other types of bonds from commercial banks, policymakers assumed that banks would seek to lend out these newly-acquired cash to eager loan seekers. Implicit here is that one of the reasons behind the banks' lower loan granting was that they did not have enough liquidity. Hence, boosting that liquidity via asset purchases would enable them to purchase more assets (Michail, 2021). On the basis of the above assumptions, the Fed, the ECB, and the Bank of England (BoE) poured billions of dollars, euros, and pounds into the economy to buy bonds and other asset classes as part of QE (Gertler and Karadi, 2018).

While the two assumptions above were assumed to hold, evidence appears to be, at best mixed. In an exhaustive review of the literature on quantitative easing, covering 54 published studies, Fabo et al., (2021) find that articles published by central banks tend to find QE to be more effective than academic papers do. Furthermore, central bank papers report larger effects of QE on output and inflation, while they also report more significant effects on output, both statistically and economically.

Other studies that hint to the ineffectiveness of QE have been around in the literature but are scarce. For example, Martin and Milas (2012), argue that while the original large-scale QE programs were successful in lowering government bond rates, econometric research indicates that these impacts might have just been temporary.

[2] ECB announces expanded asset purchase programme (europa.eu) – Accessed 15 June 2023

Similarly, Goodhart and Ashworth (2012) suggest that diminishing returns exist in the implementation of QE. Pesaran and Smith (2016) support the view that the QE effects die out fast, a result in line with Kapetanios et al., (2012).

In the euro area, empirical applications tend to suggest that asset purchases by the ECB have had a sizeable effect on the economy (inter alia, Gambacorta et al., 2014; Balfousia and Gibson, 2016; Boeckx et al., 2017), even though the magnitude shown does not tend to confirm these suggestions. One possible reason for this could lie in career aspirations, with Fabo et al., (2021) noting that central bank researchers who report larger QE effects on output experience more favourable career outcomes.

As such, the goal of this study is to offer an empirical examination of whether quantitative easing had an impact on output and inflation in the euro area and whether that impact was economically meaningful. To do so, we use monthly data from the Statistical Data Warehouse of the European Central Bank (ECB SDW) from March 2015 to December 2021, the main period when asset purchases were active in the euro area, using a Bayesian Vector Autoregressive (BVAR) model. Our results suggest that some effects do exist, but quantitative easing is an inefficient monetary policy tool. In particular, following a shock that cumulatively increases holdings by around 1% of euro area GDP over a year (around 100 billion euros), inflation increases by around 0.01%, while industrial production improves by 0.3%.

The biggest beneficiary of quantitative easing appears to have been the stock market, which rises by more than 2% in a balance sheet expansion shock. Furthermore, the change is not commensurate to the decrease in the euro area 10-year bond, since the decline stands at around two basis points. In addition to QE being very inefficient, there are also some important distribution effects: given that only a very small share of the general populace holds stocks (see Haliassos and Bertaut, 1995), and since this share usually belongs to the richest quantiles (Zhan, 2015), higher stock prices would tend to benefit those who are already rich, hence increasing wealth inequality. This result supports a similar argument made by De Luigi et al., (2023), using micro data.

The remainder of this paper proceeds as follows: section 2 explains our model and the identification strategies imposes as well as provides details of our data. Section 3 presents the empirical results and section 4 concludes.

2. Data and Methodology

We use monthly data from March 2015 to December 2021 to analyse the effectiveness of asset purchases. By construction, our start date coincides with the announcement and implementation of the asset purchase programme, while our end date has been selected in order to avoid contamination of our data by the price increases due to the war in Ukraine, and the gradual reduction of the APP and PEPP programmes.

Regarding the econometric model used in the paper, we employ a Bayesian Vector Auto-Regression (VAR) model in which $y_{i,t}$ denotes a matrix with *i* variables relevant to the QE. The BVAR representation is

$$\Delta \boldsymbol{y}_t = \alpha + \sum_{j=1}^{k} \beta_{1j}\, \Delta \boldsymbol{y}_{t-j} + \sum_{j=1}^{k} \beta_{2j}\, \Delta \boldsymbol{x}_{t-j} \varepsilon_t, \;\; \varepsilon_t \sim N(0, \boldsymbol{\Sigma}) \qquad (1)$$

where y_t is a vector of endogenous variables and x_t is a vector of exogenous variables, Δ is the year-over-year difference operator, *j* is the appropriate lag length and ε_t denotes the vector of serially and mutually uncorrelated structural innovations, with variance-covariance matrix $\boldsymbol{\Sigma}$. β_j are the appropriate coefficients related with lag *j* of the vector of dependent variables.

In particular, vector y_t includes the cumulative level of asset purchases as a share of the euro area GDP, the 10-year government bond yield, real equity prices, the consumer price index, and industrial production as a proxy for real output. The use of these variables is in line with Weale and Wieladek, (2016) who use the same structure for the US. Our main difference with the previous literature is that we focus on the implementation and not the announcement effect. This is because the announcement effect would imply a one-off change in the variables (upon announcement), while the researcher should be looking into is the overall total effect.

In particular, when one wants to measure the effects of asset purchases, considering the announcement effect would imply that a one-time impact takes place when the policy is presented to the public. Taking the ECB case as an example, the “60 billion euros per month” purchase amount implies more than 1 trillion euros of bond purchases from March 2015 to September 2016, as per the original announcement, amounting at around 10% of the euro area GDP at the time. Given that markets tend to discount the effect of new information, it is thus likely that the announcement effect would be lower than the actual effect once this is fully presented to the market (Frederick et al., 2002).

While it is only natural that an announcement effect would take place, one should view this as an “over and above” effect, which only signals the market’s expectation, but not the total extent of the policy’s effect. As such, for a proper analysis, we would need to have constant changes in the announcements; if we do not then we would simply have a linear accumulation of the announcement amount, something which would have been rather unrealistic, especially since we have the actual purchase amounts. Furthermore, as the amount of holdings by the ECB increases, it is only reasonable that the overall impact of the policy could likely be more dependent on the total amount of purchases rather than the effect upon new announcements, as the stock of available instruments for purchase declines. In a scenario where a central bank purchases bonds without suggesting an end-date, measuring the effect only at the time of the announcement would certainly undermine the total extent of the impact. In the literature, no study that has thus far used the actual amount of QE purchases, even though Weale and Wieladek (2016) cumulate the QE announcement amounts to obtain the variable of interest.

Regarding the rest of the variables, the 10-year government bond yield is used to assess the effect on the unconventional policy on the main instrument that it is implemented above. Naturally, Goodhart's Law applies here, hence providing further arguments on why our focus should be on the total effect of the policy and not on the announcement impact on the target variable (Goodhart, 1984). Similar to Weale and Wieladek (2016), we also employ real equity prices, the consumer price index, and industrial production as a proxy for real output. We also control for the Covid-19 pandemic by using an exogenous dummy variable that takes the value of 1 for the time period of March 2020 to December 2020 and 0 otherwise.

To account for any sample issues, we follow the literature and apply Bayesian inference techniques, as introduced by Litterman (1986). As is known, the original Litterman (1986) Minnesota prior comes with the disadvantage of assuming a known variance-covariance matrix and hence it can be too tightly imposed, and dominate information from the data. More specifically, assuming an unknown variance-covariance matrix comes at the cost of imposing a Kronecker structure on the prior distribution. This structure creates, for each equation, a dependence between the variance of the residual term and the variance of the VAR coefficients, which may be an undesirable assumption (see Dieppe et al., 2016). To avoid this issue, we employ a non-informative normal inverse-Wishart prior, as in Uhlig (2005).

The prior distribution is specified such that, $\beta \sim N(\beta_0, \Omega_0)$.While any structure can be adopted for β_0 and Ω_0, the former is typically defined as the Minnesota β_0 vector, with ones in the first lag of each endogenous variable and zero for further lags and cross-variable lag coefficients (Dieppe et al., 2016). Similarly, Ω_0 also takes the form of the Minnessota covariance matrix. Given these conditional distributions, it is possible to use the Gibbs sampler to obtain random draws from the unconditional posterior distributions of the parameters of interest. In this setup, we employ 10,000 iterations for the convergence of the algorithm, with the first 1,000 iterations reflecting the burn-in sample. For estimation purposes, standard hyperparameter values have been used, i.e. an autoregressive coefficient of 0.8, tightness of 0.1, cross-variable weighting of 0.5, lag decay of 1 and 100 for the exogenous variable tightness. A lag length of two was selected based on the log-likelihood function results.

Table 1: Identification schemes

Identification Scheme I					
	Inflation	Ind. Production	Asset purchases	Bond Yields	Stock Prices
Inflation	1	0	0	0	0
Ind. Production		1	0	0	0
Asset Purchases			1	0	0
Bond Yields				1	0
Stock Prices					1
Identification Scheme II					
	Demand Shock	Supply Shock	Money Shock	Bond Yields	Stock Prices
Inflation	+	-			
Ind. Production	+	+			
Asset Purchases			+		
Bond Yields	+	+	-		
Stock Prices	+	+	+		
Identification Scheme III					
	Demand Shock	Supply Shock	Money Shock	Bond Yields	Uncertainty Shock
Inflation	+	-			
Ind. Production	+	+			
Asset Purchases	0	0	+		+
Bond Yields					
Stock Prices			+		-

The table shows the restrictions imposed by each of the three identification schemes. + indicates that the response of the variable (in the row) is positively restricted to the shock (in the column), 1 is 1, 0 is zero-restrictive and – is negatively restricted.

With regards to identification, we follow Weale and Wieladek (2016), and first employ a Cholesky lower triangular ordering (table 1, identification scheme I) with QE following the developments of inflation and output, while the bond yield and stock market respond contemporaneously to a change in asset purchases. This implies that output and prices respond with a lag with asset purchases not responding to any other variable contemporaneously, other than these two. The identification restrictions imply that long-term bond yields react (decrease) after a positive shock on QE, as a result of a reduction in risk premia (Weale and Wieladek, 2016). Lower bond yields, in turn, raise real equity prices, while their reduction causes some reallocation towards other assets (portfolio rebalancing channel).

We note here that we do not explicitly take into consideration any zero lower bound (ZLB) issues. This is because the ECB effectively abolished the possibility of a zero lower bound in 2014, when it pushed interest rates to negative levels for the first time in history. As a result, sound banks could transmit negative rates on to their corporate depositors without experiencing a contraction in funding; as a result, the transmission mechanism is not hindered below the zero lower bound (Altavilla et al., 2022).

The two additional identification methods, which capture the transmission mechanism of monetary policy, include sign restrictions, and a mixture of zero and sign restrictions and are found in Table 1. Identification scheme II follows Weale and Wieladek (2016) and focuses on the assumption that asset purchases have an impact on real economy via portfolio rebalancing from long-term government bonds into equities. Given that it is likely that long-term bond yields will rise following an aggregate supply shock, it is important to distinguish asset purchase shocks from aggregate supply shocks. While a positive aggregate supply shock manifested as an increase in investment or a higher competition for funds would imply higher bond yields, a positive supply shock, can also be viewed as the result of a monetary policy response to reduce consumer prices. As such, it is important to distinguish between the two. In this case, identification scheme II imposes a positive reaction of asset purchases and a negative one on bond yields, while stock prices also rise. In contrast, a supply shock does not involve asset purchases in this case.

In the third identification scheme, we assume of a zero contemporaneous response of asset purchases to aggregate demand and supply shocks, given that policy-makers do not observe aggregate demand or supply shocks within a short period. Furthermore, the decision of change asset purchase is a discretionary one, and thus some amount of time needs to pass before a decision is made. To account for these, and in addition to the money shock that pushes both asset purchases and stock prices higher, identification scheme III also uses an uncertainty shock. This shock captures a decrease in real equity prices to which the monetary policy authority responds with an increase in asset purchases, perhaps as a result of a coincident financial crisis, such as the Fed actions in 2008.

Other variable orderings have also been tested, with no qualitative change in the estimates; results are available upon request. The model passes all stability criteria, as all roots of the characteristic polynomial lie within the unit circle. The impulse responses from the model are presented in the following section.

3. Results

Figure 2 shows the impulse responses from the BVAR model, with shaded areas representing the 90% confidence interval. The middle column shows the results from a shock in QE, in which purchases increase by around 0.4% of euro area GDP upon impact. At first, the response of the bond yield is approximately zero, but becomes negative a few periods later. As expected, QE reduces the desired risk compensation per unit of risk exposure (also known as the "price of risk"), and the term premium follows. According to this reasoning, QE reduces the overall duration risk that arbitrageurs must bear, which causes the term premium and bond yields to decrease (Eser et al., 2019). The effect is not large as an increase of asset purchases by 1% of GDP over the course of a year implies a 1.5 basis points decline in bond yields, a smaller effect compared to Altavilla et al., (2021), who report the equivalent of 6.5 basis points.

On the other hand, following a positive shock on QE, stock prices increase significantly. This is also an expected phenomenon, as per Breckenfelder et al. (2016), Chebbi (2018), Gambetti and Musso (2020), and De Santis (2020), who suggest that asset purchases indicate a route for portfolio rebalancing, as a result of an increase in money supply that is expected to have a positive impact on overall demand (Michail, 2021). In addition, as bond yields decrease and publicly listed companies are able to issue new bonds, their overall cost of debt will decline, allowing for higher profits. Both effects are likely to result in higher firm revenues, and thus investors buy stocks in anticipation. The effect is quite large, suggesting that a (normalized) shock of 1% of GDP over 12 months leads to an almost 2% increase in stock prices over the same period.

On the other hand, inflation does not appear to have a significant response on prices. Even if we consider lower confidence levels (e.g. 68%) to allow the possibility of statistical significance, the response of inflation is economically insignificant: an increase of asset purchases by 1% of GDP leads to just 0.01% increase in inflation. Interestingly, this implies that the policy has been inefficient about the very purpose that it had been enacted.

Economic activity has similar a reaction to inflation, since it increases after a positive shock on QE. However, in this case, the effect is more economically meaningful, since industrial production appears to increase by around 0.3% per 1% of a QE shock. The rationale is similar to the stock market movement observed before: lower yields decrease loan costs and boost demand, as debt repayments decline. This could encourage banks to extend additional loans, which would usually imply higher interest rates. However, the implementation of QE here supresses interest rates, something that leads to looser financing conditions and higher economic activity.

We next turn to the other two identification methods, which, as specified in table 1, capture the transmission mechanism of monetary policy, and include both zero and sign restrictions. Figure 3 shows the impulse responses related with identification scheme II, which distinguishes asset purchase shocks from aggregate supply and aggregate demand ones. In this case, we observe some differences in the responses after a positive shock in quantitative easing compared with the Cholesky identification of Figure 2, even though the main conclusions remain the same.

In particular, following a money shock (i.e., an asset purchase shock), both inflation and industrial production are not affected. However, a positive money shock that increases asset purchases by 0.2%, decreases bond by almost 10 basis points, a slightly larger effect than in Figure 2, even though this tends to die out over the impulse horizon. Similar to the previous results, an increase in asset purchases raises stock market by around 3%, suggesting that a positive money shock leads to a higher increase in the stock market compared with Figure 2.

Figure 4 shows the responses after implementing Identification Scheme III. As already suggested, the scheme assumes that asset purchases do not react contemporaneously to aggregate demand and supply shocks, thus we also include an uncertainty shock in the model. Interestingly, in this case, it appears that only the QE and the stock market responses are significant. In particular, following an increase in QE by 0.25%, stock prices increase by 3%. As expected, stock markets react negatively to an uncertainty shock. No effect is registered on industrial production or inflation following any shock that increases asset purchases.

The policy implications stemming from the above are straightforward: quantitative easing had a small effect on the real economy but is not a policy that can push inflation higher. Reasons for low inflation during the period can be found in low prices of imported products (Michail et al., 2022), or to the relative stability of energy and food prices over that time, but do not appear to have been related with liquidity issues. Given that the size of the shock stands at around 100 billion euros, the cost of implementing asset purchases appears to be extremely high compared to the proposed gain in inflation.

Naturally, a promising avenue that has been left unexplored is one that relates to the interaction of fiscal and monetary policies, namely, if an increase in deficit spending, aided by lower bond yields could have affected inflation. However, given the fiscal austerity regime that had prevailed in the euro area over the period (Gechert et al., 2019; Michael and Christofides, 2020) this necessitates a counterfactual analysis that is beyond the focus of this paper.

While QE does not appear to have had the anticipated real economy effects, it did have an impact on easing financing conditions, by lowering yields and boosting the stock market. This is perhaps the most important welfare implication from our findings. While stock prices rise significantly, studies have shown that only a very small share of the general populace holds stocks (see Haliassos and Bertaut, 1995), with the stock-owners usually belonging to the richest quantiles of the income/wealth distribution (Zhan, 2015). As a result, higher stock prices tend to benefit those who are already rich, hence increasing both income and wealth inequality. This is in line with Giangregorio and Villani (2023), who show that an increase in profits and property income contributes to rising inequality. As such, these results support the views of De Luigi et al., (2023) who, using micro data, find that QE increases income inequality.

4. Conclusions

We provide evidence that, asset purchases did not have an impact on euro area inflation, while their impact on industrial production has been relatively small. Our results, obtained via a Bayesian Vector Autoregressive (BVAR) model, using three different identification schemes, over the March 2015 - December 2021 period, suggest that the response of inflation to an increase of QE by 1% of GDP is just 0.01%, with the response also being insignificant. For the case of inflation, other factors may be the reason of the relatively modest responses, such as exogenous shocks (such those relating to the price of food, oil, or NEIG), fiscal austerity, or the offshoring of supply chains. In contrast, industrial production appears to increase by 0.3%. In both cases, the effect is economically meaningless, given that the size of the shock is around 100 billion euros.

The effect on interest rates is mild, at around 1.2 basis points per shock, while the impact that stands out is the one of the stock market, given that a 1% QE increase results in a 2% increase in the stock market. This has a potentially important welfare effect on the markets, given that, usually, only the top quantiles own shares. As such, QE is probably increasing inequality, even though it appears to have been successful in easing financing conditions.

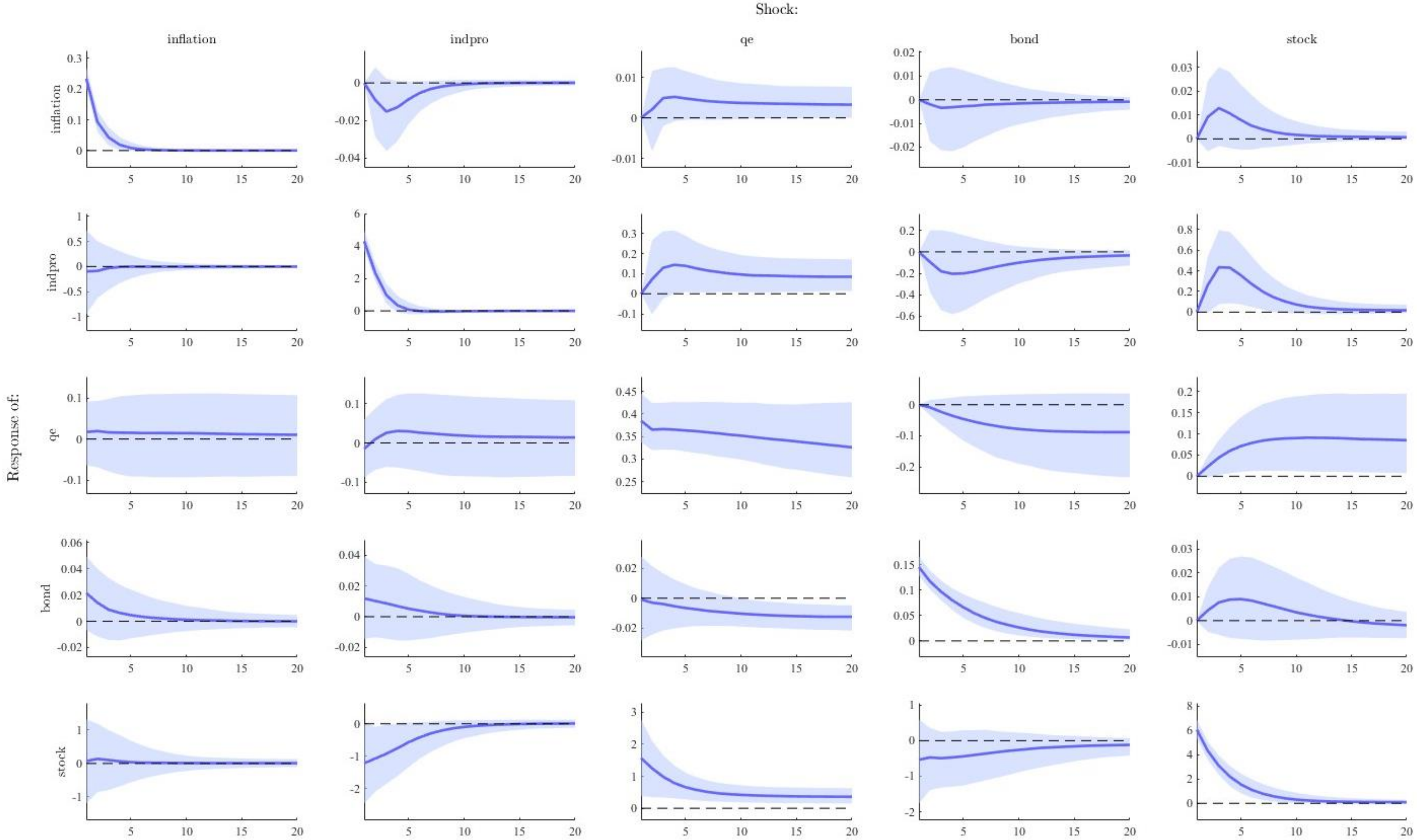
Data Availability Statement

The data used in this study are publicly available.

Conflict of Interest Statement

The authors have no conflicts of interest.

Figure 2: Impulse-response functions for Identification Scheme I (Cholesky decomposition)



The figure reports the impulse-response functions from the Bayesian VAR model after examining how quantitative easing affects bonds and other variables for the euro area. Shaded areas denote the 90% confidence intervals. The estimated VAR model satisfies the stability condition, since no root of the characteristic polynomial lies outside the unit circle.

Figure 3: Impulse response functions for Identification Scheme II

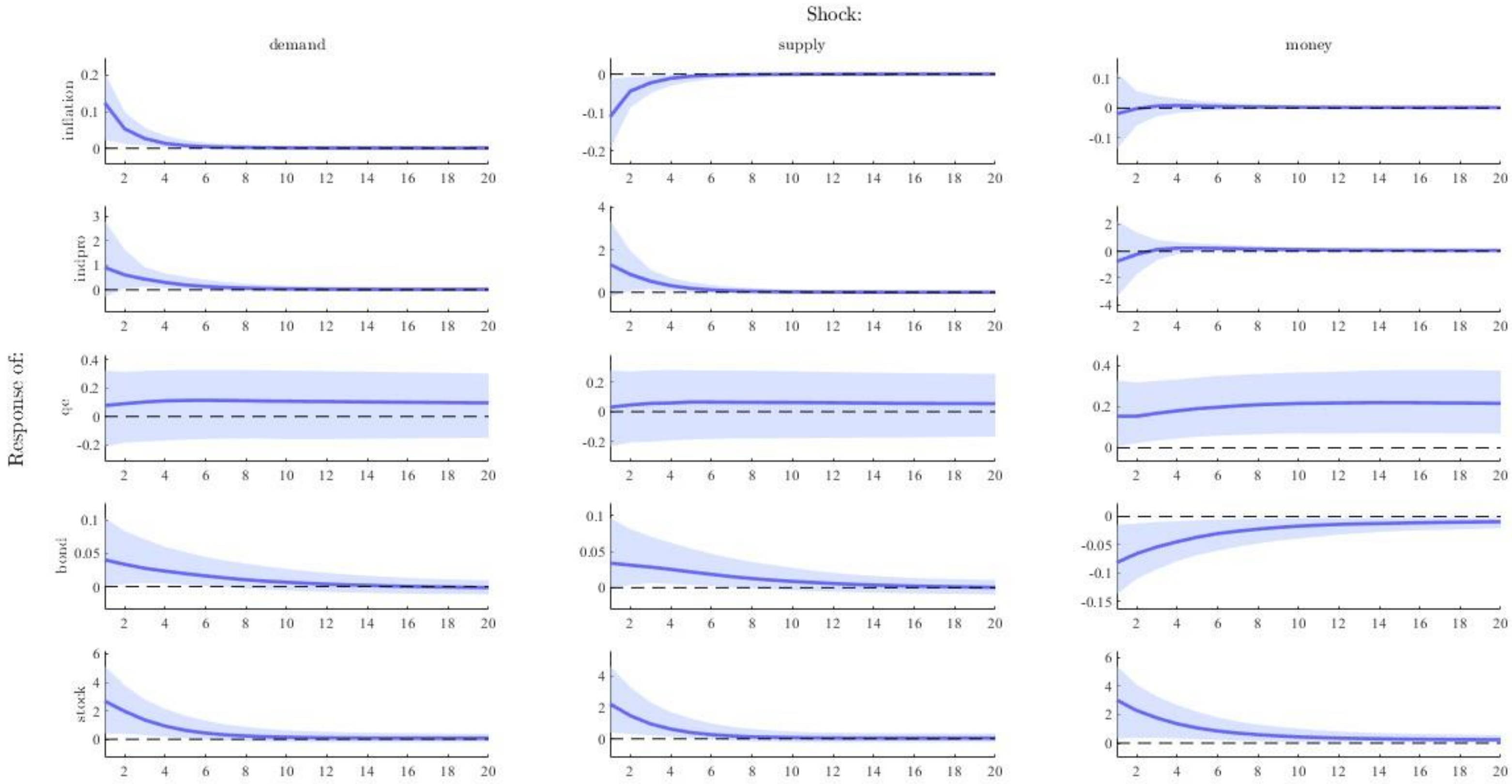
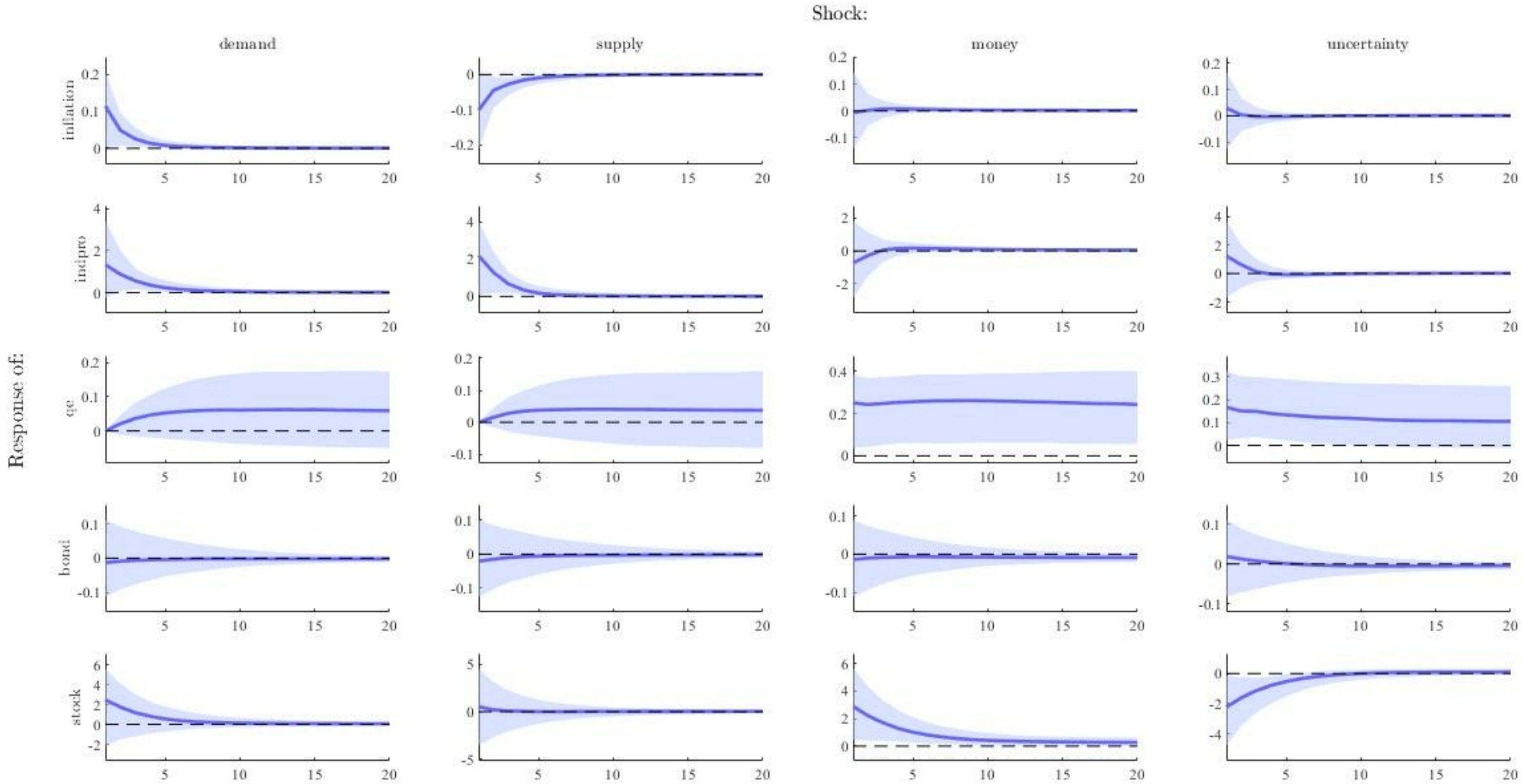


Figure 4: Impulse response functions for Identification Scheme III



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