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What are the macroeconomic effects of asset purchases?

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ABSTRACT

The impact of announcements of large-scale purchases of government bonds on real GDP and the CPI in the United Kingdom and the United States is explored with a Bayesian VAR, estimated on monthly data from 2009M3 to 2014M5. Four different identification schemes are used, all leaving the reactions of GDP and CPI unrestricted, and the transmission channels of the policy are examined. An asset purchase announcement of 1% of GDP leads to a statistically significant rise of 0.58% (0.25%) and 0.62% (0.32%) rise in real GDP and CPI for the US (UK). The transmission channels differ in the two countries.

1. Introduction

In response to the 2008–9 financial crisis, both the Bank of England and the Federal Reserve undertook large-scale asset purchases (LSAP), buying government debt as a means of providing monetary stimulus once interest rates were reduced as far as deemed possible. A number of academic studies have examined the effects of this unconventional policy. For example Chung et al. (2012) used the Federal Reserve Board's macroeconomic model to show that real GDP and inflation were respectively 3% and 1% higher as a result of US LSAPs. Kapetanios et al. (2012) used a range of BVAR methods to explore the effects of the Bank of England's purchases, finding that GDP and CPI were raised by 2.5% and 1.5% as a result of the first round of asset purchases in the UK.

This paper takes previous work on asset purchases in four new directions. First, in contrast to most existing studies, three mechanisms are explored through which asset purchases may influence output and prices. Secondly, the passage of time, together with use of monthly data, allows us to estimate our model using only data since March 2009 when the policy was first introduced. This makes our results less susceptible to bias from the introduction of the new policy regime, and hence the Lucas Critique and structural breaks, than any other empirical study of this issue. We also explore whether our results are materially affected if the acute phase of the crisis, in 2009, is omitted from our data. Thirdly, effects found in VAR-based studies (e.g. Kapetanios et al., 2012) were identified on the assumption that asset purchases led to a rise in real GDP and CPI only through their impact on the long-term interest rate. Here, instead, four different identification schemes are used to identify asset purchase shocks. All of these leave both the transmission mechanism and the responses of real GDP and CPI unrestricted. The possibility implied by Eggertson and Woodford (2003) that, except as a result of signaling the future path of short-term rates, asset purchases have no impact on GDP

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or CPI is therefore not excluded. Finally, all existing VAR studies rely on the imposition of either Litterman (1986) or time-varying parameter priors. Our analysis is carried out using a non-informative normal inverse-Wishart prior, avoiding possible bias from priors that are set too tightly to let the data speak.

Theoretically, asset purchases might affect demand through three different mechanisms. The first is the so-called portfolio balance channel (Vayanos and Vila, 2009). This relies on the presence of investors with a preferred habitat for a given maturity in the government bond market. If this is the case, purchases of long-term government debt have the effect of reducing yields on debt of the maturities purchased, through their impact on term premia. An alternative mechanism is the signaling channel—the idea that purchases signal that the policy interest rate will remain at its effective lower bound for longer. This was originally suggested by Eggertson and Woodford (2003) and Bernanke et al. (2004). Gagnon et al. (2011) found little evidence to support it but Bauer and Rudebusch (2014) suggested that rather stronger signaling effects were present. A third possible mechanism is that asset purchases help to manage expectations about future economic outcomes and hence reduce economic uncertainty.[2] All of these channels might lead to wealth effects from higher asset prices and raise consumption and investment.

Our modeling framework allows us to explore which mechanisms may play a role by including relevant variables in the VAR one-by-one. If the portfolio balance (signaling) mechanism is behind the reduction in government bond yields, one should observe a relatively greater reaction of government debt yields (interest rate futures) at longer (shorter) maturities. Inclusion of yields at both maturities makes it possible to establish whether either mechanism is relevant. Further, inclusion of the VIX and a weighted average of implied interest rate futures' volatilities (MOVE) make it possible to examine the impact on uncertainty and risk-taking.

We find that an asset purchase anouncement shock worth 1% of nominal GDP, leads to a peak impact of about 0.62% (0.25%) of real GDP and 0.58% (0.32%) in CPI in the US (UK). Conditional forecast exercises, the method of choice for calculating the total impact of QE1 in Baumeister and Benati (2013) and Kapetanios et al. (2012), suggest a total GDP and CPI impact broadly similar to that found by scaling up the peak impacts derived from the impulse response analysis. The overall real GDP and CPI impact of QE1 obtained with our approach is generally only slightly higher than Baumeister and Benati (2013) and Kapetanios et al (2012) for their US and UK real GDP and CPI responses to spread shocks, despite allowing for more transmission channels. But there is one notable exception: for the UK, our results suggest that the impact on the CPI is almost three times as large as the effect reported in these studies. The implied UK inflation-output trade-off is larger than in the US, meaning that the same change in GDP would have a greater impact on UK inflation. These estimates are, nevertheless, in line with studies of conventional monetary policy for the UK and the US.

In terms of the transmission mechanism, our study suggests that US asset purchases influence yields on medium and long-term government debt, but not interest rate futures, which implies a role for the portfolio rebalancing, rather than the signaling, channel. In contrast, UK purchases do not have clear impacts on either interest rate futures or long rates. In both countries there is evidence that announcements have the effect of reducing measures of financial market and household uncertainty.

The remainder of this paper proceeds as follows. Section 2 explains our model and discusses the details of our identification schemes. Section 3 presents the results and Section 4 concludes.

2. Methodology and data

We use the following VAR model estimated on monthly data:

$$\boldsymbol{Y_t} = \boldsymbol{\alpha_c} + \sum_{\boldsymbol{k}=1}^{\boldsymbol{L}} \boldsymbol{A_k} \boldsymbol{Y_{t-k}} + \boldsymbol{e_t}, \quad \boldsymbol{e_t} \sim \boldsymbol{N}(0, \boldsymbol{\Sigma}) \tag{1}$$

where $\boldsymbol{Y_t}$ is a vector of the following endogenous variables: the announcement of asset purchases divided by nominal GDP; the log of CPI; the log of real GDP; the yield on the 10-year government bond and the log of real equity prices at time $\boldsymbol{t}$. $\boldsymbol{A_k}$ is the array of coefficients associated with the corresponding lagged vector of variables for lag $\boldsymbol{k}$. $\boldsymbol{e_t}$ is a vector of residuals at time $\boldsymbol{t}$. This is assumed to be normally distributed with variance–covariance matrix $\boldsymbol{\Sigma}$. When the time-series dimension is small, estimates of $\boldsymbol{A_k}$ are likely to be imprecise. Previous work has addressed this problem by relying on Bayesian methods of inference and imposing a Litterman (1986), or time-varying parameter, prior. But there is always the risk that tight priors dominate information from the data. Our approach avoids this problem. The model is estimated with a non-informative normal inverse-Wishart prior, as[3] in Uhlig (2005) and a lag length, **L**, of two throughout.[4]

[2] This is in line with Woodford (2003), who argues that the main transmission mechanism of modern monetary policy is through management of expectations about inflations and real GDP growth.

[3] Jarocinski and Marcet (2013) propose imposing priors on the growth rates of variables, as opposed to priors on parameters, as the least controversial way to impose priors in small sample VARs. But it is unclear how to choose suitable priors for variables in our VAR such as real GDP, CPI or asset purchase announcements during this turbulent period of time. That is why it seemed better to use the normal inverse-Wishart prior, with hyperparameters set to small values to ensure that the prior is non-informative (Uhlig, 2005). See Appendix D of his paper for more information.

[4] *Ex ante* lag length tests such as the Hannan–Quinn or BIC criterion suggest a lag length of 2. When our model was estimated with six lags, it was, as a result of the short time-series, necessary to use a Litterman (1986) prior, with the hyper-parameters estimated from the data following the approach in Giannone et al. (2015). This suggests that a 1% US (UK) asset purchase announcement leads to a peak impact of .53 (.23) and .61(.37) on real GDP and CPI, respectively. These values are almost identical to those found with two lags and described in Section 3.1.