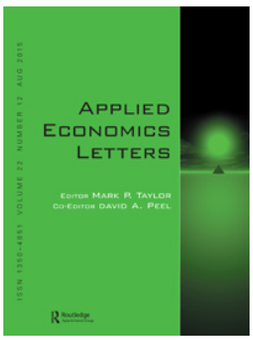

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The international impact of US unconventional monetary policy

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Using a structural factor-augmented vector autoregression model and a large data set of daily time series, we study the impact of US unconventional monetary policy on British and German financial markets. Our findings indicate that a surprise US unconventional monetary policy easing leads to increased equity returns and lower government bond yields for both Germany and the United Kingdom. These effects then nearly completely dissipate after approximately 750 days.

Keywords: unconventional monetary policy; international financial markets

JEL Classification: E52; E58; F33; F42

I. Introduction

In the wake of the global economic downturn of 2008, the Federal Reserve employed a number of extraordinary and unconventional monetary policy tools in an attempt to stem the crisis, return the economy to full employment and reduce extreme financial market volatility. Given the leading role of the United States in the global economy, these policies may have had substantial international implications. Yet most of the recent research has focused on the impact of US unconventional monetary policy on US financial markets.[1]

In this article, we aim to bridge this gap and assess the effects of US unconventional monetary policy on international financial markets. More specifically, we use a factor-augmented vector autoregression model (FAVAR), along with an identification strategy that assumes that information regarding monetary policy surfaces in a lumpy manner (Wright 2012), to examine the effects of US unconventional monetary policy on German and British financial markets. Our results indicate that expansionary US unconventional monetary policy shocks lead to increased equity returns and reduced government bond yields for both Germany and the United Kingdom (UK). Further, we find that the estimated effects nearly completely dissipate after approximately 750 days.

II. Data

Our large data set of daily time series is based on Gabriel and Lutz (2014) and consists of an extensive set of US time series spanning equity, real estate, and

[1] See, for example, D'Amico and King (2013), Doh (2010), Duygan-Bump *et al.* (2013), Fuster and Willen (2010), Glick and Leduc (2013), Gagnon *et al.* (2011), Hamilton and Wu (2012), Hancock and Passmore (2011, 2012, 2014), Krishnamurthy and Vissing-Jorgensen (2011), Swanson (2011) and Swanson and Williams (2014).

debt markets.[2] To this data set, we add UK and German equity market returns and zero coupon 2- and 10-year government bonds. These daily data range from November 2008 to December 2013 and cover all three rounds of US Quantitative Easing (QE) and the recent so-called "taper period" where the Federal Reserve reduced its unconventional monetary stimulus.[3]

III. Econometric Methodology

Within the FAVAR framework, we assume that a common component, C_t, captures the evolution of financial markets over the sample period[4]; where

$$C_t = \begin{bmatrix} F_t \\ S_t \end{bmatrix} \tag{1}$$

where F_t is a $K \times 1$ vector representing latent factors and S_t is a vector of observed factors. Here, we follow Gabriel and Lutz (2014) and let the observed factors be the six key interest rate series from Wright (2012): The 2- and 10-year Treasuries; the 5-year TIPS break-even rates; the 5-to-10-year forward TIPS break-even rates and Moody's AAA and BAA corporate bond yields. Then we first estimate the following observation equation using principal component analysis:

$$X_t = \Lambda C_t + e_t \tag{2}$$

where X_t is a matrix that consists of all time series in the data set except for the six key interest rate series that make up the observed factors; Λ is an $N \times (K + 6)$ matrix of factor loadings; and e_t is an $N \times 1$ vector representing the idiosyncratic component to each time series. Next, with C_t in hand, we estimate the following reduced form VAR:

$$C_t = \Phi(L)C_{t-1} + v_t \tag{3}$$

From there, we let the reduced-form errors be a linear combination of the structural shocks as in Wright (2012):

$$v_t = \sum_{i=1}^{p} R_i \eta_{i,t} \tag{4}$$

Then we identify the structural monetary policy shocks by assuming that variance–covariance matrix of the VAR residuals is heteroscedastic across monetary policy event and nonevent days (Wright 2012).[5] After identifying the structural monetary policy shocks, we can compute impulse response functions (IRFs) for all variables in the data set. See Gabriel and Lutz (2014) for more details.

IV. Results

We plot the IRFs for the key variables of interest in Fig. 1. As the size of the unconventional monetary policy shock is not identified, we normalize the shock so that the yield on 10-year Treasury falls immediately by 25 basis points as in Wright (2012). First, the top row of the figure shows the dynamic responses for the US/Euro and US/Pound exchange rates. The results indicate that an unconventional monetary policy shock that lowers the yield on the 10-year Treasury by 25 basis points leads to a depreciation of the dollar relative to the Euro and the Pound. These findings are congruent with Glick and Leduc (2013) and Gabriel and Lutz (2014).

Next, the second row shows the dynamic responses for the 2-year German and UK bonds. First, we find that 2-year German bond yields rise slightly in response to the US unconventional monetary policy shock. These effects then quickly

[2] More specifically, this data set includes 2- and 10-year zero coupon US Treasuries; the 5 year and forward 5-to-10-year TIPS break-even rates; Moody's AAA and BAA seasoned corporate bond yields; the corporate default spread (BAA–AAA), returns on the S&P500 and Dow Jones Industrial Average; the VIX index; the returns on exchange traded funds that track real estate investment trusts and homebuilders; the ABX AAA index, ABX AA index, and the ABX Risk Premium; the CMBX index; the US-Euro, US-Pound and US-Yen exchange rates; the yields on Fannie Mae mortgage backed securities (MBS); and the spread between Fannie Mae MBS yields and the 30-year Treasury. See Gabriel and Lutz (2014) for more details.

[3] The international data were downloaded from Bloomberg. The Bloomberg symbols are as follows: German 2-year zero coupon bonds (F91002Y); German 10-year coupon bonds (F91010Y); German stock returns (DAX); UK 2-year zero coupon bonds (I02202Y); UK 10-year coupon bonds (I02210Y); UK stock returns (UKX).

[4] For further details see Bernanke *et al.* (2005), Boivin *et al.* (2009) and Gabriel and Lutz (2014). See also Vargas-Silva (2008), Gupta *et al.* (2010), Lombardi *et al.* (2012) and Lutz (2014).

[5] See also Rigobon (2003), Rigobon and Sack (2003, 2004, 2005), Gabriel and Lutz (2014) and Lutz (2014).

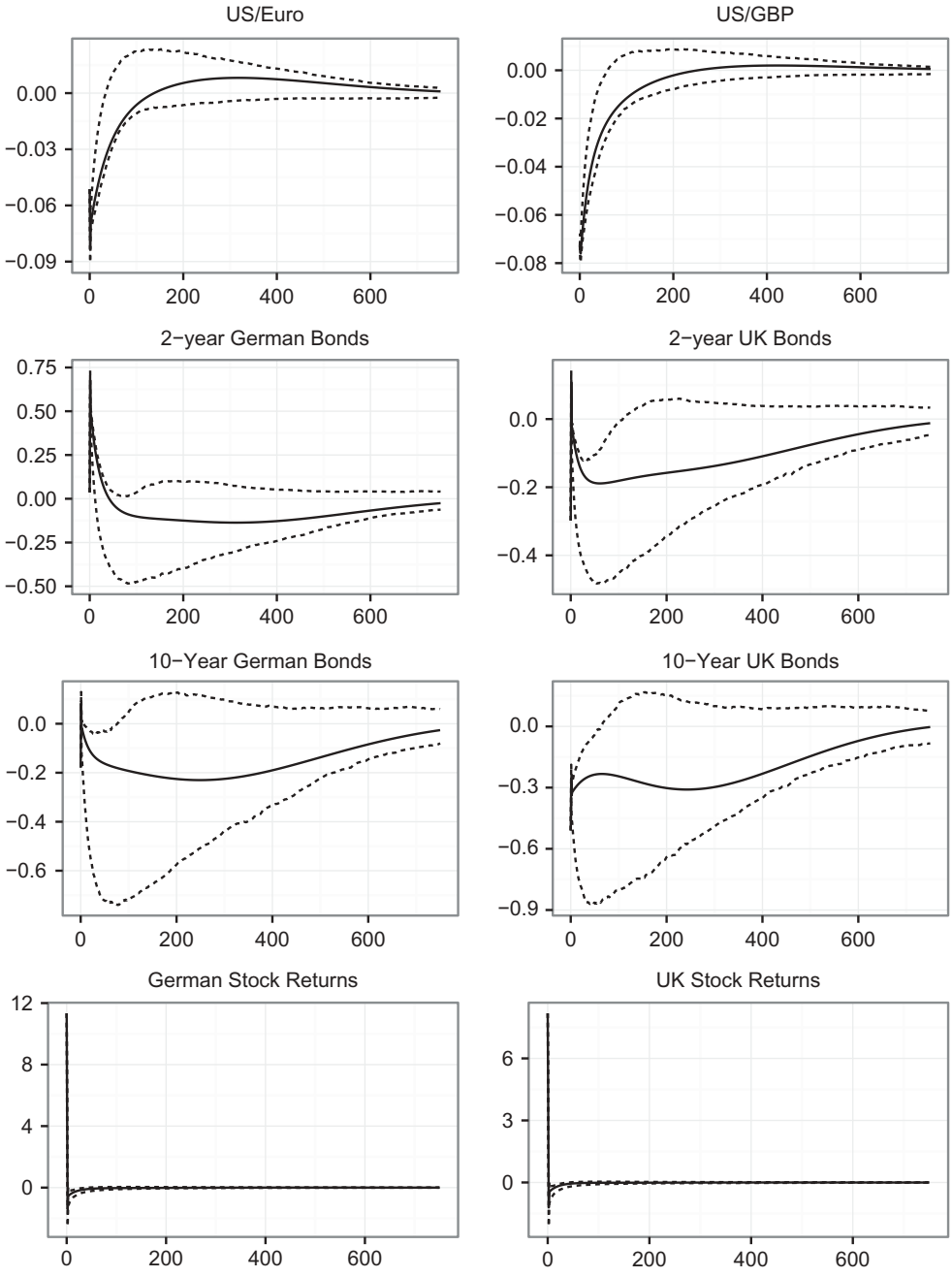

Fig. 1. Estimated impulse responses for German and British financial market variables an identified unconventional monetary policy shock

Notes: Plots of structural Impulse Response Functions (IRFs). The IRFs are traced out for 750 periods and normalized so that the initial decrease in the 10-year Treasury is 10 basis points.

dissipate as the lower confidence interval crosses the zero line after just 12 days. The middle-right plot in Fig. 1 shows the dynamic response for UK 2-year government bonds. The IRF is initially quite volatile. Then, the 2-year UK bonds fall in response to US unconventional monetary policy shocks. Indeed, in response to a surprise US unconventional monetary easing that lowers the yield on the 10-year Treasury by 25 basis points, 2-year UK bonds fall by over 18 basis points after 40 days. These effects then reserve course and nearly completely dissipate after about 750 days.

The third row of the figure shows the IRFs for the 10-year German and UK bonds. Here, longer term

government yields fall initially in response to US unconventional monetary policy shocks. For example, a surprise US unconventional monetary easing that reduces the yield on the 10-year Treasury by 25 basis points lowers the 10-year German and UK yields by 17 and 50 basis points, respectively. These effects appear to persist for some time as the 10-year German and UK government bonds fall by 23 and 30 basis points, respectively, after 200 days in response to the US unconventional monetary policy shock. After 750 days, the impact of the monetary shock on the 10-year German and UK yields nearly completely dissipates.

Lastly, as suggested by the dynamic responses in the bottom row of Fig. 1, US unconventional monetary policy shocks lead to large increases in German and UK equity returns: An expansionary unconventional US monetary policy shock that reduces the yield on the 10-year Treasury by 25 basis points increases German and UK equity returns by 11 and 8 percentage points, respectively. These effects are large in magnitude, economically meaningful, and similar in size to the estimated effects for US equity returns.

V. Conclusion

In this article, we use a structural FAVAR model and a large data set of daily time series to examine the international effects of US unconventional monetary policy. We find that a surprise US unconventional monetary policy shock lowers government bond yields and increases equity returns in both Germany and the United Kingdom. These effects then nearly completely dissipate after approximately 750 days.

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