Economics Letters 77 (2002) 271–277

economics letters

www.elsevier.com/locate/econbase

Monetary policy and long term interest rates in Germany

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Received 15 October 2001; received in revised form 29 March 2002; accepted 16 April 2002

Abstract

In this paper, we provide new empirical evidence on the relationship between short and long run interest rates for Germany. We find a positive correlation after a supply and demand shock and a negative correlation after a monetary policy shock. This finding is consistent with the theory of Ellingsen and Söderström [American Economic Review 2001;91(5):1594–1607].

Keywords: Monetary policy; Term structure of interest rates; SVARs

JEL classification: E4-E5

1. Introduction

There is still a lot of uncertainty regarding the impact of monetary policy on long-term interest rates. This is because the relationship between short rates and long rates is believed to be based on the expectations theory of interest rates. In this theory, long-term rates are an average of current short-term rates and expected future short-term rates. So, monetary policy affects long-term rates to the extent that it influences current and expected short-term rates. This effect on long rates of a change in the stance of monetary policy will partly depend on the impact of the policy change on inflation expectations.

The empirical evidence on the quantitative effect of monetary policy on the long-term interest rates finds on average a positive relationship: an increase in the central bank rate leads to an increase in interest rates of all maturities.[1] Romer and Romer (2000) find this positive movement in the long rate

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[1] For example: Cook and Hahn (1989), Dale (1993), Roley and Sellon (1995), Buttiglione et al. (1997), and Mehra (1996).

0165-1765/02/$ – see front matter
PII: S0165-1765(02)00135-0

inconsistent with standard monetary theory, because an increase in short rates should reduce inflation, and hence reduce the level of sufficiently long rates. Also, there are many exceptions to this empirical phenomenon. Examples are declines of long-term rates in response to a monetary tightening.

Romer and Romer (2000) explain this empirical finding by arguing that when the Central Bank tightens monetary policy, market participants infer that it has unfavourable private information about the likely behaviour of inflation, and they therefore revise their expectations of inflation upward. Ellingsen and Söderström (2001) construct a model for the US within which the mechanism of Romer and Romer fits. The model they use is taken from Svensson (1997), and is a dynamic version of a simple aggregate supply–aggregate demand model, where they add an equation for the term structure of interest rates. They presume that a change in monetary policy can have two reasons: either the monetary authorities respond to new and possibly private information about the economy (such as supply and demand shocks), or their policy preferences change (which is a monetary policy shock). In the first case, monetary policy is endogenous, reflecting new input into a given objective function. In the second case, policy is exogenous because the input is the same but the objective function has changed. After an endogenous policy action, their model predicts that interest rates of all maturities move in the same direction as the policy innovation. On the other hand, after an exogenous policy action, short and long interest rates should move in the opposite directions. If the central bank becomes more averse of inflation, the weight of inflation in the objective function increases and there is a positive exogenous monetary policy shock. This results in an unexpected upward shift in the short-term interest rate. However, because the preference of the monetary authority has changed, economic agents have to adjust their inflation expectations downward. The latter results in a decrease of sufficiently long-term interest rates. On the other hand, if the economy is hit by a positive demand shock, the central bank reacts to this shock by increasing the short-term interest rate. However, also economic agents have to adjust their inflation expectations upwards, resulting in a higher long-term interest rate.[2] In the former case, there is a negative correlation between the move in short and long-term interest rates, in the latter case a positive correlation.

In an accompanying paper, Ellingsen and Söderström (1998) find positive empirical evidence for their propositions by interpreting newspaper reports from the Wall Street Journal immediately before and after each meeting of the FOMC. In this paper, we provide new empirical evidence for Germany, confirming the theory of Ellingsen and Söderström (2001). To do so, we estimate a block-recursive SVAR for Germany, and investigate the reaction of the term structure of interest rates to supply, demand, monetary policy and exchange rate shocks. A similar methodology is used by Evans and Marshall (1998) for the investigation of how exogenous impulses to monetary policy affect the yield curve in the US. The methodology and the results are discussed in the next section.

2. Methodology and results

Let Y_t be a vector of macroeconomic variables at time t. Let R_t^j denote an interest rate of maturity j months. The following SVAR is estimated:

[2] The analysis of the consequences of a supply shock is similar.

$$\begin{bmatrix} Y_t \\ R_t^j \end{bmatrix} = \begin{bmatrix} A(L) & 0 \\ B(L) & C(L) \end{bmatrix} \begin{bmatrix} Y_{t-1} \\ R_{t-1}^j \end{bmatrix} + \begin{bmatrix} a & 0 \\ b & 1 \end{bmatrix} \begin{bmatrix} \epsilon_t^Y \\ \epsilon_t^j \end{bmatrix} \tag{1}$$

where a is a square matrix with ones on the diagonal, b is a row vector, $A(L)$ is a matrix polynomial in the lag operator L, $B(L)$ is a row vector polynomial, and $C(L)$ is a scalar polynomial. Throughout our analysis, we maintain the assumptions that neither contemporaneous nor lagged values of the long-term interest rates enter the other equations in the system. These assumptions ensure that the shocks are invariant to bond maturity j.

For the basic block of endogenous variables and the identification scheme for Germany, we follow Smets (1996). The advantage of this approach is that he uses a mixture of short and long-run identification restrictions (as in Gali, 1992). This is necessary to disentangle supply and demand shocks. The latter is not possible when we only use short-term restrictions. The vector of endogenous variables is:

$$Y_t' = [\Delta y_t \quad \Delta p_t \quad s_t \quad \Delta x_t] \tag{2}$$

with Δy_t denoting output growth, Δp_t the rate of inflation, s_t the German overnight interest rate, and x_t the real effective exchange rate. The vector of structural shocks is:

$$\epsilon_t^Y = [\epsilon_t^s \quad \epsilon_t^d \quad \epsilon_t^p \quad \epsilon_t^x] \tag{3}$$

With, respectively, a supply, demand, monetary policy, and an exchange rate shock. In order to identify the supply shock, we assume that there is no long-run impact of demand, monetary policy and exchange rate shocks on output. Furthermore, we assume that there is no contemporaneous influence of monetary policy and exchange rate shocks on output. In order to disentangle the latter two shocks, we follow the same strategy as Smets (1996), Smets and Wouters (1999) and Mojon and Peersman (2001), where there is a simultaneous impact of a monetary policy shock on the exchange rate and vice versa. We solve this simultaneity problem by estimating the reaction coefficient on the exchange rate using the Japanese interest rate and US dollar/Yen exchange rate as instruments.[3]

Doing this analysis, we should be aware of the limitations of our approach. Long run restrictions are necessary to disentangle supply and demand shocks. The use of long-run restrictions is, however, criticized by Faust and Leeper (1997). They find that the estimates could be biased in finite samples and if the true number of shocks exceeds the number of identified shocks in the VAR.[4] On the other hand, Rudebusch (1998) criticizes the estimated monetary policy shocks in a VAR. He finds that the endogenous part of the interest rate equation does not always correspond to other (more direct) evidence on the monetary policy reaction function and the correlation of the shocks is small across various VARs and with shocks that are derived from forward-looking financial markets.

To do the estimation, we use monthly data for the period 1979:1–1998:12. Fig. 1 plots the response of, respectively, output, prices, the interest rate and the exchange rate to supply, demand, monetary policy and exchange rate shocks, together with 10% confidence bands. The results are as expected and similar to the ones obtained by Smets (1996). As the textbook predicts, a supply shock has a positive

[3] See Smets and Wouters (1999) or Smets (1996) for an explanation of this two-step methodology.
[4] For an alternative way of identifying supply and demand shocks, see Peersman (2002).

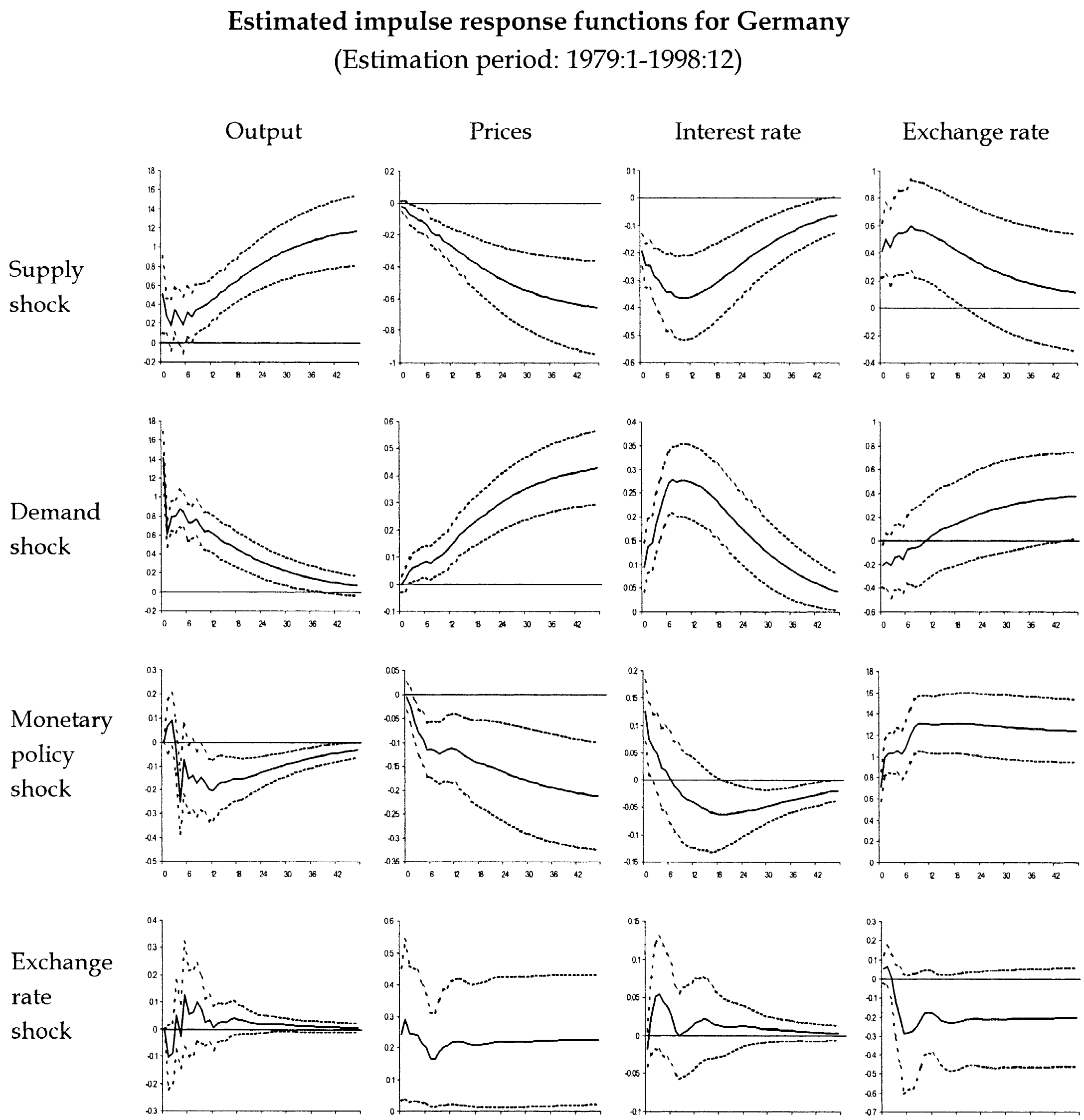

Fig. 1. Estimated impulse response functions for Germany.

influence on output and a negative influence on prices. After a demand shock, output initially increases to fall back to baseline after a while. There is a permanent effect on prices. There is a temporary effect of a monetary policy shock on output, and prices decrease. The effect of an exchange rate shock is probably misspecified. These shocks are associated with a large shock to the price level. This may be due to the fact that exchange rate developments are associated with monetary policy shocks (Smets, 1996).

Fig. 2 presents the responses of, respectively, the overnight (from the basic VAR), the 1, 3, 6 and 12 month interest rates (swap rates), and the 3, 5, 7 and 10 year government bond yields to the supply,

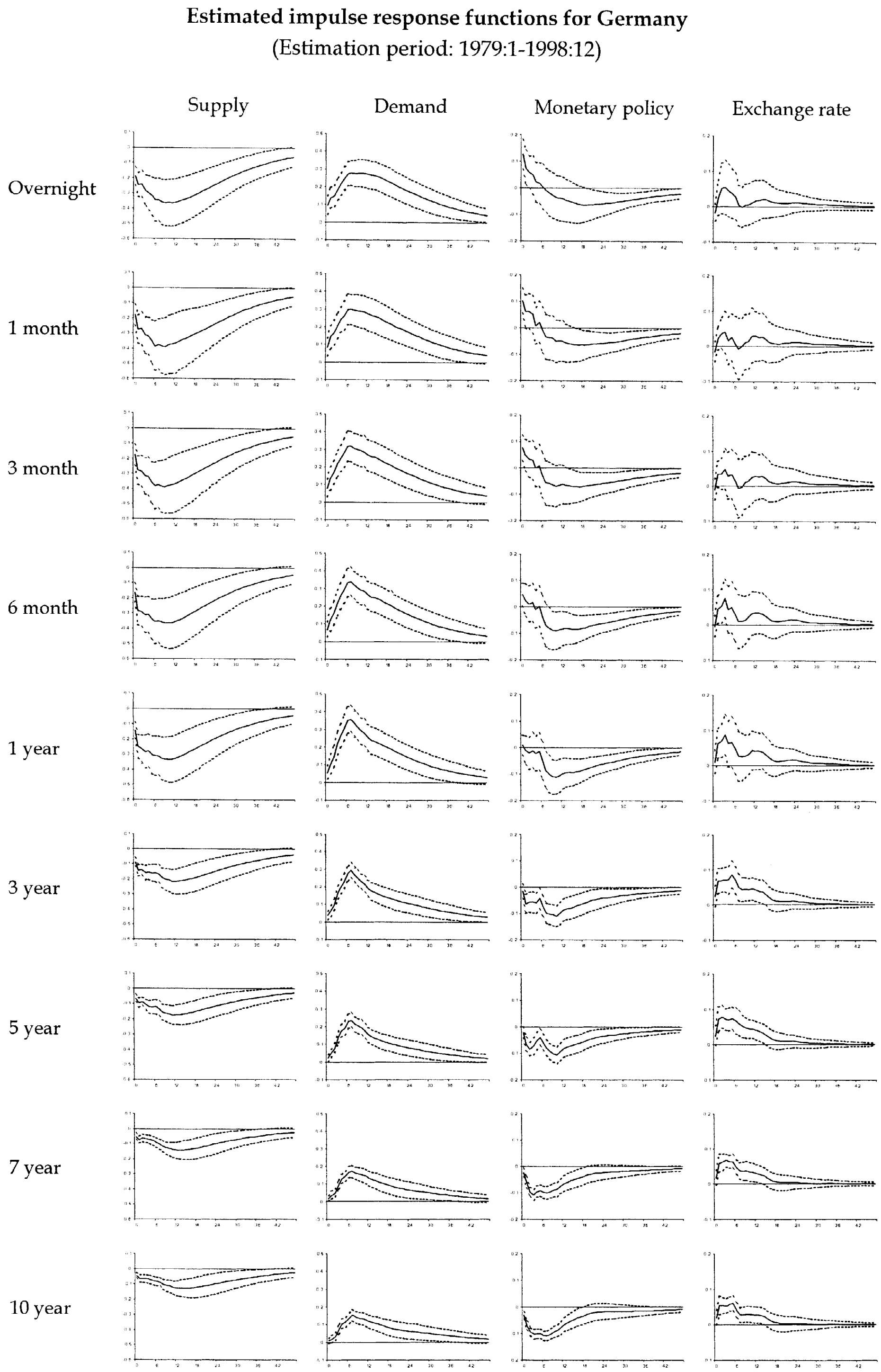

Fig. 2. Estimated impulse response functions for Germany (Estimation period: 1979:1–1998:12).

demand, monetary policy and exchange rate shocks. These results confirm the theory of Ellingsen and Söderström (2001). After supply and demand shocks, short and long-term interest rates move in the same direction. However, after a monetary policy shock, short and sufficiently long-term interest rates move in the opposite direction. These results are very robust to other specifications. If we construct a VAR like Bagliano and Favero (1998), or Mojon and Peersman (2001), we also find a negative correlation between the short and long-run interest rates. With the latter two models and identification strategies, however, we cannot make a distinction between supply and demand shocks since these models only use restrictions on the contemporaneous impact matrix.

3. Conclusions

The impact of short-term interest rates on long-term rates is difficult to assess. This relationship is believed to be based on the expectations theory of interest rates and partly depends on the impact of policy changes on inflation expectations. In this paper, we provided new empirical evidence on the relationship between short and long-term interest rates using an SVAR for Germany. We find that after a supply and demand shock, short and long term interest rates move in the same direction. On the other hand, after a monetary policy shock, both rates move in the opposite direction. This finding is consistent with the theory of Ellingsen and Söderström (2001).

Acknowledgements

The author is FWO post-doctoral fellow at Ghent University. This paper was written before I joined the Bank of England and the views expressed are solely mine and do not necessarily represent those of the Bank of England. I thank an anonymous referee and Anders Vredin for useful suggestions.

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