Journal of International Money and Finance 30 (2011) 1358–1374

Contents lists available at ScienceDirect

Journal of International Money and Finance

journal homepage: www.elsevier.com/locate/jimf

Monetary policy and the exchange rate: Evaluation of VAR models

Jarkko P. Jääskelä*, David Jennings

Economic Research Department, Reserve Bank of Australia, GPO Box 3947, Sydney, NSW, Australia

JEL classification:
E32
C32

Keywords:
VAR models
Sign restrictions
Shock identification
Small open economy models

A B S T R A C T

This paper examines the ability of vector autoregressive (VAR) models to properly identify the transmission of monetary policy in a controlled experiment. Simulating data from a small open economy DSGE model estimated for Australia, we find that sign-restricted VAR models do reasonably well at estimating the responses of macroeconomic variables to monetary policy shocks. This is in contrast to models that use recursive zero-type restrictions, for which inflation can rise following an unexpected interest rate increase while the exchange rate can appreciate or depreciate depending on the ordering of the variables. Sign-restricted VAR models seem to be able to overcome puzzles related to the real exchange rate, provided that a sufficient number of different types of shocks are identified. Despite delivering the correct sign of the impulse responses, central tendency measures of sign-restricted VAR models can, however, be misleading and hardly ever coincide with the true impulses. This finding casts doubt on the common notion that the median impulses are the 'most probable' description of the true data-generating process.

1. Introduction

Vector autoregressive models (VARs) are widely used for understanding the effects of monetary policy on the economy. While the results of these models are generally consistent with economic theory, they tend to suffer from various puzzles. One of these anomalies is the *price puzzle*, a term coined by

* Corresponding author. Tel.: +61 2 9551 8856; fax: +61 2 9551 8833.
E-mail address: jaaskelaj@rba.gov.au (J.P. Jääskelä).

0261-5606/$ – see front matter Crown Copyright © 2011 Published by Elsevier Ltd. All rights reserved.
doi:10.1016/j.jimonfin.2011.06.014

Eichenbaum (1992), which refers to a situation in which an unexpected tightening in monetary policy leads to an increase in inflation. Other puzzles have been found regarding the behaviour of the real exchange rate in response to a monetary policy shock. Standard theory suggests that an unexpected tightening in monetary policy leads to an immediate appreciation of the currency and a future depreciation in line with uncovered interest rate parity (UIP).[1] However, many empirical studies, particularly those based on VAR models, find that following such a shock, the real exchange rate either depreciates, or if it appreciates, it does so over an extended period. In the literature, these phenomena have been referred to as the *exchange rate puzzle* and the *delayed overshooting puzzle*, respectively.

VAR studies have typically placed recursive, contemporaneous 'zero restrictions' on the interaction between monetary policy and the exchange rate (for instance, see Eichenbaum and Evans, 1995 Kim and Roubini, 2000 for G7 countries and Mojon and Peersman, 2001 and Peersman and Smets, 2003 for the euro area). Sign restrictions are an attractive alternative to recursive VARs as they avoid the use of strong restrictions on contemporaneous relationships for identification. An increasing number of VAR studies have employed sign restrictions to identify monetary policy shocks (see, for instance, Canova and De Nicoló, 2002 and Uhlig, 2005), and in particular the effects of monetary policy shocks on exchange rates. Using this approach, Faust and Rogers (2003) find no robust results regarding the timing of the peak response of the exchange rate. Scholl and Uhlig (2008) impose sign restrictions on a minimal set of variables but do not restrict the response of the exchange rate when identifying the monetary policy shock. While their findings confirm the exchange rate puzzles, their 'agnostic' sign restriction approach is open to criticism because it identifies only one shock and ignores all others.[2] The problem with such an approach is that the identification scheme is not unique – there are possibly other shocks which would also satisfy the minimal restrictions placed on the monetary policy shock. This raises the question of whether the use of a minimal set of sign restrictions is sufficient to identify a 'true' response of the exchange rate. This question is particularly pertinent, given that Bjørnland (2009) – using long-run restrictions on the effect of monetary policy shocks on the exchange rate – finds no evidence of exchange rate puzzles in four small open economies.[3]

This paper examines the consequences of using recursive and sign-restricted VAR models to identify monetary policy shocks when the data-generating process is an estimated small open economy DSGE model for Australia (in the spirit of Galí and Monacelli, 2005). In particular, it tests whether estimates of these models can replicate the true impulse responses from the DSGE model.[4] It finds that sign restriction models do reasonably well at estimating the responses of macroeconomic variables to monetary policy shocks, particularly compared to VAR models which use a recursive identification structure, which are generally inconsistent with the responses of the DSGE model. Using an identification procedure that is agnostic regarding the direction of the exchange rate response, the paper examines the ability of sign-restricted VAR models to overcome puzzles related to the real exchange rate.[5] It finds that that the sign restriction approach recovers the impulse responses reasonably well, provided that a sufficient number of shocks are uniquely identified; if we only identify the monetary policy shocks, in line with Scholl and Uhlig (2008), the exchange rate puzzle remains. In addition, it shows that central tendency measures of sign-restricted VAR models can be misleading since they hardly ever coincide with the true impulses. This casts doubt on the common notion that the median impulses are 'most probable'.

[1] The UIP condition is a key equation in structural open economy models; in its simplest formulation it suggests that the expected future change in the exchange rate equals the difference between domestic and foreign nominal interest rates.

[2] Farrant and Peersman (2006) also provide an open economy application, but they assume that the real exchange rate appreciates after a restrictive monetary policy shock.

[3] Bjørnland and Halvorsen (2008) combine sign and short-run (zero) restrictions. They find that following a contractionary monetary policy shock, the exchange rate appreciates on impact and then gradually depreciates back to baseline. However, as in Farrant and Peersman (2006), the appreciation of the real exchange rate after a monetary policy shock is imposed.

[4] The sign restriction approach is more natural than long-run restrictions in the context of this model; there are no permanent shocks in the model, so after a transitory shock the economy eventually returns to its steady state, making long-run restrictions irrelevant on simulated data.

[5] Canova and Paustian (2007) and Paustian (2007) assess the ability of sign restrictions to correctly identify monetary policy shocks in closed economy settings.