Economics Letters 167 (2018) 142–146

Contents lists available at ScienceDirect

Economics Letters

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

Are uncertainty shocks aggregate demand shocks?

Stefano Fasani [a], Lorenza Rossi [b,*]

[a] Dipartimento di Economia, Metodi Quantitativi e Strategie di Impresa, University of Milan Bicocca, Piazza dell'Ateneo Nuovo 1, 20126 Milan, Italy
[b] Dipartimento di Scienze Economiche e Aziendali, University of Pavia, via San Felice 5, 27100 Pavia, Italy

HIGHLIGHTS

- We study uncertainty shocks in Leduc and Liu (2016, JME) under different Taylor-rules.
- Interest rate smoothing changes the qualitative response for inflation.
- With a plausible smoothing an uncertainty shock raises inflation and reduces output.
- Uncertainty shock is demand or supply shock according to monetary policy reactiveness.

ARTICLE INFO

Article history:
Received 28 December 2017
Received in revised form 20 March 2018
Accepted 25 March 2018
Available online 31 March 2018

JEL classification:
E12
E21
E22
E24
E31
C32

Keywords:
Uncertainty shocks
DSGE model
Search and matching frictions
Taylor rules
Inflation dynamics

ABSTRACT

This note considers the Leduc and Liu (JME, 2016) model and studies the effects of their uncertainty shock under different Taylor-type rules. It shows that both the responses of real and nominal variables highly depend on the Taylor rule considered. Remarkably, inflation reacts positively so that uncertainty shocks look more like negative supply shocks, once an empirically plausible degree of interest rate smoothing is taken into account. This result is reinforced with less reactive monetary rules. Overall, these rules alleviate the recession.

1. Introduction

This note contributes to the literature on the macroeconomic effects of uncertainty shocks, by testing the robustness of the Leduc and Liu (2016) model – LL henceforth – to different Taylor-type rules.

The two authors were the first to claim that real uncertainty shocks look like negative aggregate demand shocks. First, using two different proxies for macroeconomic real uncertainty, they show that a linear BVAR implies that output, unemployment, inflation and nominal interest rate all reduce in response to an increase in uncertainty. Second, building up a NK-DSGE model with search and matching frictions, they show theoretical responses to a model equivalent uncertainty shock in line with the empirical ones. They conclude that uncertainty shocks are aggregate demand shocks. This note shows that their theoretical result on inflation is however based on a nominal interest rate rule which responds to output and inflation, without any interest rate smoothing. When the Central Bank does smooth the interest rate, the LL model cannot replicate the decline in inflation in response to a real uncertainty shock. With empirically plausible values of the interest rate smoothing, inflation reacts positively at impact and stays above the long-run level for several periods before going back to its steady state. In fact, when uncertainty about future outcomes is elevated, firms prefer to set their prices at an higher level due to the concavity of the profit function. If the Central Bank does not react immediately, the shock results inflationary instead of deflationary.

* Corresponding author.
E-mail addresses: stefano.fasani@unimib.it (S. Fasani), lorenza.rossi@unipv.it (L. Rossi).

https://doi.org/10.1016/j.econlet.2018.03.029
0165-1765/

Thus, with a less active but more realistic Taylor rule, uncertainty shocks look more like aggregate supply shocks rather than demand shocks. Remarkably, this result is reinforced when the monetary authority is less reactive in responding to inflation and output. Overall, less reactive rules also imply a less severe recession.

The positive response of inflation to uncertainty shocks is not new in the NK-DSGE literature. Examples are Fernández-Villaverde et al. (2015), Born and Pfeifer (2014) and Bonciani and van Roye (2016). The theoretical framework in Fernández-Villaverde et al. (2015) and Born and Pfeifer (2014) is closer to LL, albeit they consider a model without search and matching frictions, with physical capital and policy uncertainty shocks.[1] Differently from these contributions, this note considers the LL model and focuses on technology uncertainty shocks. By testing the LL findings under different Taylor-type rules, it stresses the importance of the monetary policy reactiveness for inflation dynamics.

Annicchiarico et al. (2011) and Annicchiarico and Rossi (2015), were the first to investigate the relationship between economic uncertainty and monetary policy rules. They find a non-negligible relationship between uncertainty and long-run growth, which depends on the Taylor rule considered, particularly on the smoothing parameter of the Taylor rule. However, using a medium-scale AK-model with endogenous growth, they focus on the long-run relationship between economic uncertainty and growth, without investigating the short-run dynamics

The rest of the paper proceeds as follows. Section 2 briefly discusses the model economy of the LL model. Section 3 presents the model solution and calibration and shows the dynamics of the model in response to an uncertainty shock under five different Taylor-type rules.

2. The Leduc and Liu (2016) model

The model considered is identical to that of LL. We now present a very brief description of their model, underlying the way in which uncertainty shock is introduced and the interest rate rule is implemented by the monetary authority.[2]

The economy is populated by households, firms and a monetary policy authority. Households consist of a continuum of worker members. They consume a basket of differentiated retail-goods and their consumption is characterized by internal habits formations. They own a continuum of firms, each of which uses one worker to produce an intermediate-good under monopolistic competition and flexible prices. The production function of the intermediate-goods' producing firm is then,

$$x_t = Z_t, \tag{1}$$

with x_t denoting the output and Z_t the aggregate technology shock given by,

$$\ln(Z_t) = \rho_z \ln(Z_{t-1}) + \sigma_{z,t}\varepsilon_{z,t}, \tag{2}$$

ρ_z measures its persistence and $\varepsilon_{z,t}$ is an i.i.d. standard normal process. $\sigma_{z,t}$ is a time-varying standard deviation of the innovation, interpreted as a real uncertainty shock, which follows an AR(1) process as,

$$\ln\left(\sigma_{z,t}\right) = (1-\rho_{\sigma z})\,\sigma_{zt} + \rho_{\sigma z}\ln\left(\sigma_{z,t-1}\right) + \sigma_{\sigma z}\varepsilon_{\sigma z,t} \tag{3}$$

$\rho_{\sigma z}$ measures its persistence and $\varepsilon_{\sigma z,t}$ is an i.i.d. standard normal process. $\sigma_{\sigma z}$ is the standard deviation of the stochastic volatility innovation.

The labor market is characterized by search and matching frictions. In each period, a fraction of workers is unemployed and searches for jobs. Firms post vacancies at a fixed cost. The number of successful matches is produced with a Cobb–Douglas matching technology. Real wages are determined by Nash bargaining between firms and workers. Real wages are however sticky and adjust slowly to their Nash optimal value. The government finances workers' unemployment benefits through lump-sum taxes. Retail sector firms compete under monopolistic competition and set their prices using quadratic Rotemberg (1982) adjustment costs.

Finally, the monetary policy is described by the following standard Taylor rule,

$$\log\left(\frac{R_t}{R}\right) = \rho_R \log\left(\frac{R_{t-1}}{R}\right) + (1-\rho_R)\left[\rho_\Pi\left(\frac{\Pi_t}{\Pi}\right) + \rho_Y\left(\frac{Y_t}{Y}\right)\right], \tag{4}$$

where the nominal interest rate responds to deviations of inflation and output from their long-run target. Importantly, differently from LL, and as standard in the literature, we allow the Central Bank to smooth the interest rate. All the equations characterizing the equilibrium of the economy are reported in Table 1.

3. Model calibration and dynamics

As in LL, we follow Fernández-Villaverde et al. (2011) to compute the impulse response functions (IRFs). The model calibration – reported in Table 2 – follows LL. Differently from them, we consider five different interest rate rules: (i) LL Rule (LLR), where $\rho_\Pi = 1.5$, $\rho_Y = 0.2$ and $\rho_R = 0$; (ii) LLR with Smoothing (LLRS), where $\rho_\Pi = 1.5$, $\rho_Y = 0.2$, and $\rho_R = 0.8$, which is a rather standard – and empirically plausible – Taylor rule[3]; (iii) LLRS with a Muted response to output (LLRSMY), where $\rho_\Pi = 1.5$, $\rho_Y = 0$, and $\rho_R = 0.8$, (iv) Strong Inflation Targeting Rule (SITR), where $\rho_\Pi = 5$, and $\rho_Y = \rho_R = 0$; (v) Weak Inflation Targeting Rule (WITR), where $\rho_\Pi = 1.2$, and $\rho_Y = \rho_R = 0$.

3.1. Impulse response functions

Figs. 1 and 2 report the IRFs of the model to real a uncertainty shock under the five Taylor rules described above.

First, notice that the responses of real variables do not change qualitatively under the different Taylor rules. Consumption, output and real marginal costs fall in response to an increase in uncertainty, while the unemployment rate increases. Both the option-value channel associated with search and matching frictions and the aggregate demand channel stemming from nominal rigidities are important for amplifying the negative effect of the uncertainty shock. The persistent decline in consumption, due to habits formation, further amplifies the effect of the option-value channel, generating an additional rise in the unemployment rate in response to the shock. Firms refrain from hiring, the fall in real wage is higher and the output contracts more than in a model without habits. LL conclude that "*overall, incorporating habit formation brings the magnitude of the peak unemployment response much closer to that estimated from the VAR model*". This is true for the LLR that makes the recession more severe and deflationary. The inflation response is different when an empirical plausible degree of interest rate smoothing is attached to the LLR. In fact with the LLRS, the reaction of inflation is positive at impact and takes almost six periods to go back to its steady state. Thus, with a more realistic Taylor rule

[1] Fernández-Villaverde et al. (2015) find that inflation might responds negatively provided that monetary policy follows a non-standard rule that systematically reacts to fiscal uncertainty.

[2] For a more detailed description see Leduc and Liu (2016).

[3] Among many others, Clarida et al. (1999) estimates the smoothing parameter ρ_R at 0.79, Benati and Surico (2008) at 0.81, Benati and Surico (2009) at 0.83, Christiano et al. (2016) at 0.84, Fernández-Villaverde et al. (2010) at 0.79, Justiniano and Primiceri (2008) at 0.85.