Journal of Macroeconomics 48 (2016) 87–100

Contents lists available at ScienceDirect

Journal of Macroeconomics

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

Government spending multipliers and the zero lower bound

Yangyang Ji*, Wei Xiao

Department of Economics, State University of New York at Binghamton, 134 Crestmont Road, Binghamton, NY 13905, USA

ARTICLE INFO

Article history:
Received 26 December 2014
Revised 2 March 2016
Accepted 8 March 2016
Available online 21 March 2016

JEL Classification:
C11
C51
C63
E42
E52
E62
E63
H50

Keywords:
Government spending multiplier
Zero lower bound
Markov-switching algorithm
Bayesian estimation

ABSTRACT

It is well-known that when the nominal interest rate hits the zero lower bound, the size of the fiscal multiplier can be large. The effectiveness of fiscal stimulus depends on the duration and the *expected* duration of the zero-lower-bound regime. Most studies fix this duration and therefore suffer from a bias. In this paper, we propose a way to estimate the government spending multiplier that allows this duration to be endogenously determined. Specifically, we incorporate into the Smets and Wouters (2007) model a monetary policy reaction function that follows a two-state Markov-switching process, and use data to pin down the transitional probability from one policy regime to the other. We then estimate the model and compute the fiscal multiplier using a data set that spans 1985:2–2015:3.

1. Introduction

The question of how big the government spending multiplier is has intrigued economists for decades. A large portion of the literature focuses on reduced form empirical estimates: from the earlier work of Evans (1969) and Barro (1981) to the more recent endeavor of Gordon and Krenn (2010) and Ramey (2011), various estimates have been produced using advanced econometrics techniques. The most cited range for the multiplier is between 0.8 and 1.5 (Ramey, 2011). A common difficulty that reduced form estimation encounters is the identification issue – truly exogenous spending shocks are rare, as most fiscal stimuli are responses to the state of the economy. More recently, macroeconomists have turned to dynamic stochastic general equilibrium (DSGE) models to seek more structured answers. Examples include Cogan et al. (2010), Christiano et al. (2011), Drautzburg and Uhlig (2011), and Woodford (2011), among others. In a standard new Keynesian model the multiplier is small, because there is a negative wealth effect on consumption when rational consumers anticipate higher future taxes. In order for the multiplier to increase, unconventional features are often considered, such as rule-of-thumb consumers and inelastic labor supply (Gali et al., 2007).

There is one scenario, however, that can produce a larger multiplier when modeled, and is also empirically relevant. It is when the nominal interest rate reaches the "zero lower bound." As Eggertsson (2011), Christiano et al. (2011) and

* Corresponding author: Tel.: +8613911014088.
E-mail addresses: yji3@binghamton.edu (Y. Ji), wxiao@binghamton.edu (W. Xiao).

http://dx.doi.org/10.1016/j.jmacro.2016.03.002
0164-0704/

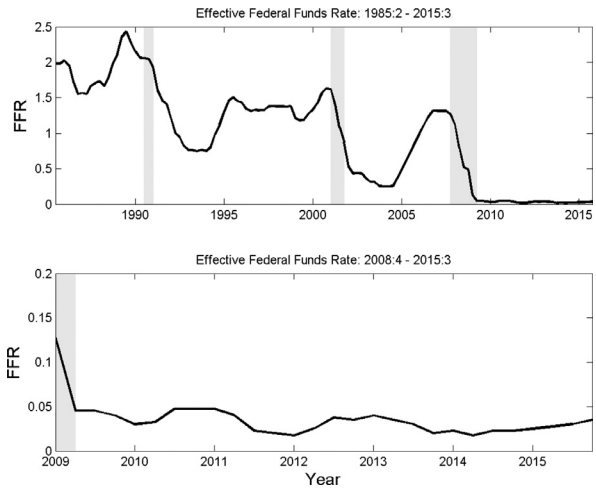

Fig. 1. The nominal interest rate.

Woodford (2011) show, the economy can fall into a deflationary cycle if consumption is weak and the desire for saving is high when the nominal interest rate hits the lower bound. In this case, higher government spending can raise output and expected inflation, which in turn lowers the real interest rate and boosts the economy further. Christiano et al. (2011)'s calibration is that if the zero lower bound is binding for 12 quarters when government spending increases, the multiplier can be as high as 2.3. Other authors, such as Eggertsson (2011) and Coenen et al. (2012), obtain similarly large estimates.

Thus, the duration and the *expected* duration of zero interest rate monetary policies can be crucial to the size of the multiplier. The duration matters because if it is not long enough to cover the period in which the fiscal policy is implemented, the size of the multiplier will be greatly reduced. Anticipated duration matters because economic agents are forward-looking (rational in DSGE models). Their response to the increased government spending naturally depends on how long they believe the zero lower bound policy will hold. In the aforementioned papers, the duration of the zero lower bound is treated rather "loosely." For example, Christiano et al. (2011) assume that the duration is 12 quarters, Drautzburg and Uhlig (2011) assume that it is 8 quarters, while Eggertsson (2011) experiment with 0, 4, and 8 quarters. This is problematic not just because the ex post duration of the policy in the U.S. is much longer, but also because by giving an exogenous duration, they have imposed an implicit assumption that agents all expect the duration to be a certain number of quarters. When taking the model to data, the estimates are surely biased by this arbitrary assumption.

Fig. 1 displays the time series for the nominal interest rate spanning the period from 1985:2 to 2015:3. The shaded areas correspond to the NBER-dated recessions. The top panel shows the federal funds rate for the entire sample period, while the lower panel focuses on the period in which the interest rate hits the lower bound. Near zero low interest rates prevailed from 2008 to 2015. Note that in the so-called "zero lower bound" regime, the nominal interest rate did not stay constant. It fluctuated around a near-zero but positive mean.

In this paper, we propose a way to estimate the government spending multiplier that allows firms and households to take the possibility of the economy reaching the zero lower bound regime into consideration. Specifically, we incorporate into the Smets and Wouters (2007) model, the workhorse model for structural estimation, a monetary policy reaction function that follows a two-state Markov-switching process. The reaction function has time variant parameters that depend on the state of the economy. In the normal state, the reaction function is a Taylor rule. In the other state, the nominal interest rate hits the zero lower bound. Therefore, the duration of the zero lower bound regime is endogenous, and the anticipated duration is no longer a fixed number. We take this model to the data and estimate the size of the government spending multiplier in the U.S. Our data set covers the most recent years of the U.S. economy, in which the monetary policy was essentially a zero lower bound regime. This is necessary because most of the earlier studies were done around 2009 and 2010, and the duration of the zero lower bound policy was invariably underestimated. It is a logical step forward to find out whether or not including newer data will change the results significantly. The fact that even economists equipped with the most advanced techniques can dramatically misjudge the duration of the zero interest rate regime accentuates the necessity to consider a model with endogenous durations.

This paper contributes to the literature of fiscal multipliers in two dimensions. First, this is the first paper that endogenizes the duration of the zero lower bound policy regime using a Markov-switching method. We create an economic environment in which agents are always aware that there is a probability that the policy regime may switch. By doing so, we can estimate the transitional probabilities from one regime to the other. In a rational expectations equilibrium, agents' expectations are consistent with the true probability distribution of random processes. Thus, we can use data to back out the *perceived* probability of regime switching. This is advantageous because one no longer has to arbitrarily impose a perceived duration.