Journal of Monetary Economics 67 (2014) 78–92

Contents lists available at ScienceDirect

Journal of Monetary Economics

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

Uncertainty shocks and unemployment dynamics in U.S. recessions

Giovanni Caggiano [a,*], Efrem Castelnuovo [b,a,c], Nicolas Groshenny [d]

[a] University of Padova, Department of Economics and Management, via del Santo 33, 35123 Padova, Italy
[b] University of Melbourne, Australia
[c] Bank of Finland, Finland
[d] University of Adelaide, Australia

ARTICLE INFO

Article history:
Received 21 June 2013
Received in revised form
26 May 2014
Accepted 11 July 2014
Available online 22 July 2014

Keywords:
Uncertainty shocks
Unemployment dynamics
Smooth Transition Vector AutoRegressions
Recessions

ABSTRACT

What are the effects of uncertainty shocks on unemployment dynamics? We answer this question by estimating non-linear (Smooth-Transition) VARs with post-WWII U.S. data. The relevance of uncertainty shocks is found to be much larger than that predicted by standard linear VARs in terms of (i) magnitude of the reaction of the unemployment rate to such shocks, and (ii) contribution to the variance of the prediction errors of unemployment at business cycle frequencies. The ability of different classes of DSGE models to replicate our results is discussed.

1. Introduction

The U.S. unemployment rate has experienced a substantial upswing during the 2007–2009 economic crisis, moving from 4.4% in May 2007 to 10.1% in October 2009. Since then, the recovery of the labor market has been marked but not full. In January 2013, unemployment was assessed to be some 2% larger than its longer-run value by most FOMC participants (Yellen, 2013). Clearly, the identification of the drivers behind the evolution of the U.S. unemployment rate is of primary importance to policymakers. Increasing attention has recently been paid to the role played by uncertainty. As stated by John Williams,[1] "*There's pretty strong evidence that the rise in uncertainty is a significant factor holding back the pace of recovery now. […] research shows that heightened uncertainty slows economic growth, raises unemployment, and reduces inflationary pressures. […] There's no question that slow growth, high unemployment, and significant uncertainty are challenges for monetary policy.*"

This paper investigates the impact of uncertainty shocks on unemployment during U.S. post-WWII recessionary episodes. Since the seminal contribution by Bloom (2009), a large number of papers have been concerned with the role of uncertainty at a macroeconomic level (for a comprehensive survey, see Bloom et al., 2014). Part of the literature has studied the impact of uncertainty shocks with Dynamic Stochastic General Equilibrium models.[2] A related empirical literature has dealt with

* Corresponding author. Tel.: +39 049 827 3843.
E-mail addresses: giovanni.caggiano@unipd.it (G. Caggiano), efrem.castelnuovo@unipd.it (E. Castelnuovo), nicolas.groshenny@adelaide.edu.au (N. Groshenny).

[1] John Williams, President and Chief Executive Officer of the Federal Reserve Bank of San Francisco, FRBSF Economic Letter, January 21, 2013.

[2] A non-exhaustive list of studies includes Fernández-Villaverde et al. (2011), Bloom et al. (2012), Benigno et al. (2012), Mumtaz and Theodoridis (2012), Bianchi and Melosi (2013), Bachmann and Bayer (2013), Bachmann et al. (2013), Basu and Bundick (2012), Leduc and Liu (2013), and Christiano et al. (2014).

http://dx.doi.org/10.1016/j.jmoneco.2014.07.006
0304-3932/

the identification of uncertainty shocks by employing *linear* VAR models. Recent contributions include Bloom (2009), Alexopoulos and Cohen (2009), Bachmann et al. (2013), Mumtaz and Theodoridis (2012), Baker et al. (2013), Gilchrist et al. (2013), Leduc and Liu (2013), Colombo (2013), Mumtaz and Surico (2013), and Nodari (2014). Linear VAR frameworks are standard tools in the empirical macroeconomic literature. However, the U.S. unemployment rate has been found to be characterized by asymmetric dynamics across different phases of the business cycle (Koop and Potter, 1999; van Dijk et al., 2002; Morley and Piger, 2012; Morley et al., 2013), a stylized fact which naturally leads to the adoption of non-linear frameworks. Moreover, uncertainty is typically high during recessions, when unemployment also tends to increase abruptly (Jurado et al., 2013). For these reasons, recessionary episodes are very likely to be quite informative phases for the identification of the effects of uncertainty shocks on unemployment.

We isolate the impact of uncertainty shocks during recessions by modeling U.S. quarterly data on uncertainty, unemployment, and other standard macroeconomic variables with Smooth Transition Vector AutoRegressions (STVARs).[3] The STVAR set up conveniently allows us to isolate recessionary episodes while retaining enough information to estimate a richly parametrized VAR framework. To understand to what extent non-linearities are important for uncovering the effects of uncertainty shocks, the predictions of the non-linear STVAR models conditional on recessions are then contrasted with those produced with standard linear VARs.

Our main results are the following. First, the impact of uncertainty shocks on unemployment is shown to be substantially underestimated if one does not take into account that they typically occur in recessions. A linear VAR model returns estimates suggesting that a one standard deviation increase in the VIX, our proxy for uncertainty, may induce a reaction of the unemployment rate of about 0.17 percentage points four quarters after the shock, and of about 0.14 percentage points eight quarters after such shock. The non-linear VAR reveals that the same shock, when hitting the economy during a recession, is estimated to induce a much larger (and statistically different) increase in unemployment of 0.36 percentage points four quarters after the shock, and 0.41 two years after the shock. Evidence of non-linear dynamics is also found for the policy rate and inflation. The asymmetry result holds not only for unemployment, but also for a number of alternative real activity indicators, including hours, output, investment, durable and nondurable consumption. Second, consistently with the previous findings, the contribution of uncertainty shocks to the forecast error variance decomposition of the unemployment rate at business cycle frequencies is estimated to be (at least) three times larger in a non-linear VAR model. Interestingly, such shocks turn out to be more powerful than monetary policy shocks as a driver of the U.S. unemployment rate. A battery of checks, dealing with a different data-frequency, a number of additional variables in our VARs, different identification schemes, different empirical proxies for uncertainty, and a shorter sample omitting the zero-lower bound, confirm the robustness of our results. Wrapping up, the non-linear VAR analysis suggests that uncertainty shocks may be markedly more costly than previously estimated via linear frameworks.[4]

Overall, our findings corroborate those presented in previous contributions on the asymmetries characterizing the evolution of the unemployment rate over the business cycle. Koop and Potter (1999) perform an extensive model comparison involving linear and non-linear models for the U.S. unemployment rate. They find clear evidence in favor of a non-linear threshold autoregressive model featuring two distinct regimes. In their survey on STVAR models, van Dijk et al. (2002) provide further evidence in favor of asymmetric dynamics of the U.S. unemployment rate across different regimes. Morley and Piger (2012) construct an indicator of the U.S. business cycle by averaging a variety of competing linear and non-linear statistical frameworks. The resulting indicator clearly points to variations in the cycle larger during recessions than in expansionary periods. Interestingly, their measure displays an asymmetric shape and it is shown to be closely related to the unemployment rate. Importantly, Morley et al. (2013) show that the relevance of non-linearities for modeling an indicator of the business cycle survives also when considering a multivariate approach.

Our results are also of interest from a modeling standpoint. Gilchrist and Williams (2005) show that, in a standard real business cycle (RBC) set up featuring a Walrasian labor market, uncertainty shocks are expansionary because they negatively affect households' wealth, therefore increasing households' marginal utility of consumption and labor supply. Leduc and Liu (2013) show that this conclusion is overturned when some real frictions are added to the framework. In particular, in a model with search frictions in the labor market, positive uncertainty shocks negatively affect potential output. This occurs because firms pause hiring new workers when uncertainty hits the economy due to the lower expected value of a filled vacancy. As a consequence, firms post a lower number of vacancies, so inducing a drop in the job finding rate and an

[3] Section 2 develops this argument further. For a paper dealing with instabilities in the macroeconomic effects of uncertainty shocks via a rolling-window VAR approach, see Beetsma and Giuliodori (2012). An investigation dealing with instabilities via a time-varying VAR approach is proposed by Benati (2013). A related approach is that by Enders and Jones (2013), who estimate Logistic Smooth Transition Autoregressive Models for a number of macroeconomic indicators. They isolate different effects of uncertainty shocks in the presence of "high" vs. "low" uncertainty. Differently, this paper focuses on the effects of uncertainty shocks during recessions (i.e., phases of "low" economic growth) and contrast such effects to what is typically found with standard linear VARs. In doing so, we employ a multivariate framework to model the systematic interaction among policy-relevant macroeconomic indicators such as inflation, unemployment, and a short-term interest rate. This enables us to control for spurious evidence of non-linearity possibly arising when omitting to model systematic interactions among structurally related variables.

[4] In principle, it is possible that the countercyclical evolution of uncertainty is endogenous and due to movements in the business cycle, more than a cause of such movements. Bachmann and Moscarini (2012) propose a model in which strategic price experimentation during bad economic times (due to first moment shocks) leads to a higher dispersion of firms' profits. Baker and Bloom (2012) use natural disasters and events like terrorist attacks and unexpected political shocks to isolate exogenous increases in uncertainty in a panel of countries. They find the contribution of second moment shocks to explain at least half of the variation in real GDP growth.