Economic Systems 37 (2013) 61–68

Contents lists available at SciVerse ScienceDirect

Economic Systems

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

Persistence and non-linearity in US unemployment: A regime-switching approach

Emrah Ismail Cevik [a], Sel Dibooglu [b,*]

[a] Bulent Ecevit University, Department of Econometrics, 67100 Zonguldak, Turkey
[b] Department of Economics, University of Missouri St Louis, One University Blvd., St Louis, MO 63121, USA

ARTICLE INFO

Article history:
Received 25 February 2012
Received in revised form 8 May 2012
Accepted 2 June 2012

JEL classification:
C2
J6

Keywords:
Unemployment
Hysteresis
Markov switching model
Persistence

ABSTRACT

This article examines persistence and nonlinearity in the US unemployment rate in the post-war period by using a regime-switching unit root test. The empirical results indicate that a regime-switching unit root test outperforms conventional unit root tests and describes unemployment behavior better over the business cycle in the sample. While shocks to US unemployment dissipate in expansions, shocks to the unemployment rate seem to be persistent in recessions, supporting the hysteresis hypothesis. This is consistent with the usual explanation of hysteresis that workers may lose valuable job skills in protracted recessions.

1. Introduction

The time series behavior of unemployment has wide implications for the conduct of macroeconomic policy. The natural rate hypothesis formulated by Phelps (1967) and Friedman (1968) implies that the unemployment rate should converge to a "natural rate" in the long run, as such deviations from the natural rate are temporary and the unemployment rate follows a mean-reverting process. On the other hand, high and persistent unemployment (particularly in European countries) has cast a doubt on the natural rate hypothesis and a competing hysteresis hypothesis was suggested by Blanchard and Summers (1987) to explain the high and persistent unemployment rates observed in some countries. In the hysteresis hypothesis, unemployed workers may lose valuable job skills over

* Corresponding author. Tel.: +1 314 516 5530; fax: +1 314 516 5352.
E-mail address: dibooglus@umsl.edu (S. Dibooglu).

0939-3625/$ – see front matter
http://dx.doi.org/10.1016/j.ecosys.2012.06.002

time and recessions may have everlasting effects. In this case, shocks that affect unemployment may have permanent effects and hence unemployment is likely to exhibit a non-mean reverting process. From an empirical standpoint, evidence in favor of the unit root process indicates the existence of hysteresis while stationarity would support the natural rate hypothesis in unemployment.

There have been numerous studies that have examined the time series behavior of the US unemployment rate in the empirical literature. These studies can be classified into four groups. The first group generally employed univariate linear unit root tests. However, univariate linear unit root tests have been criticized for having low power to reject the null hypothesis of nonstationary when the span of data is not long enough. Hence the second group uses panel unit root tests to overcome the size problem in univariate unit root tests (Camarero and Tamarit, 2011; Mohan et al., 2008; Dreger and Reimers, 2009; Cheng et al., 2012). The third group of studies has focused on possible structural breaks in the US unemployment rate in testing for stationarity (Ewing and Wunnava, 2001; Gil-Alana, 2002; Clemente et al., 2005; Romero-Avila and Usabiaga, 2007; Lee and Chang, 2008; Lee et al., 2009).

Amable et al. (1995) and Cross (1995) emphasized that hysteresis in unemployment is essentially a feature of nonlinear models; as such, linear unit root tests are not adequate in ascertaining the presence of hysteresis in unemployment (van Dijk et al., 2002). In addition, Franchi and Ordonez (2008) noted that aggregate behavior of economic agents in labor markets is not simultaneous and nonlinear unit root tests would better capture the behavior of unemployment. Hence, the last group of studies examines the time series behavior of unemployment using nonlinear unit root tests (Caner and Hansen, 2001; van Dijk et al., 2002; Leon-Ledesma and McAdam, 2004; Caporale and Gil-Alana, 2007; Franchi and Ordonez, 2008; Lin et al., 2008).

Two important features of US unemployment that have been widely discussed in the empirical literature are persistence (van Dijk et al., 2002; Valetta and Kuang, 2012) and the asymmetric behavior of unemployment over the business cycle. The latter implies that the unemployment rate tends to increase sharply during recessions as compared to declining during expansions (Neftci, 1984; Koop and Potter, 1999; van Dijk et al., 2002; Caporale and Gil-Alana, 2008). While persistence in the unemployment rate can be examined using conventional unit root tests and other univariate methods, these tests fail to account for asymmetry. Hence nonlinear models must be employed to study the asymmetric behavior of unemployment. In this paper, we combine unit root tests and regime switching models to examine these two features of US unemployment in the post-war period.

US unemployment has increased dramatically due to the 2007–2009 global financial crisis, reaching 10.1 percent in October 2009. Even the recovery that followed thereafter did not create adequate jobs and the unemployment rate still stands at 8.3 percent as of January 2012. The high level of unemployment is one pressing problem for the US economy and understanding its behavior over the business cycle is important for formulating the policy response.

The aim of our study is to contribute to the literature by introducing the time series behavior of US unemployment by testing for the presence of unit root and regime-switching properties. In the empirical literature, the presence of a hysteresis effect for US unemployment has been examined by using some specific nonlinear unit root test (particularly threshold unit root tests). However, Maitland-Smith and Brooks (1999) showed that a Markov switching model outperforms the threshold autoregressive model particularly when the data series exhibit non-stationary properties. In addition, to the best of our knowledge, persistence and non-linearity in the US unemployment rate has not been examined using a Markov regime-switching unit root test. Toward that end, we use Markov Switching unit root tests to analyze persistence and the possibility of changing equilibrium unemployment due to breaks and business-cycle fluctuations. More importantly, we take into account regime-dependent hysteresis as multiple equilibria in the US labor market.

2. Econometric framework

We first examine the time series behavior of the US unemployment rate using the augmented Dickey and Fuller (ADF) unit root test proposed by Dickey and Fuller (1979) as follows:

$$\Delta u_t = a + \alpha u_{t-1} + \sum_{k=1}^{p} \rho_k \Delta u_{t-k} + \varepsilon_t \quad (1)$$