## 1. Introduction

One of the key features of unemployment rate is its persistence, normally described as hysteresis (Lindbeck and Snower, 1985; Blanchard and Summers, 1987). Several papers have used long-memory techniques to analyse it (see, e.g. Caporale and Gil-Alana, 2008, 2009, Caporale et al. 2016). However, such studies normally do not take into account possible asymmetries in the behaviour of the unemployment rate, despite the evidence of nonlinearities (see Bianchi and Zoega, 1998 and Skalin and Teräsvirta, 2002); these reflect the counter-cyclical nature of unemployment, which typically increases faster during recession than it decreases during expansions, possibly as a result of asymmetric costs of hiring and firing (see Bentolila and Bertola, 1990) or insider-outsider effects (see Lindbeck and Snower, 1988). These asymmetries have been examined in some more recent studies (see, e.g., Caporale and Gil-Alana, 2007) and in the case of Spanish unemployment by Casado and Trivez (2004), who estimate a smooth transition autoregressive (STAR) model and whose results confirm the counter-cyclical and asymmetric nature of Spanish unemployment.

The present note focuses on persistence and whether it exhibits asymmetries, being higher during recessions than during expansions. Using fractional integration techniques we show that indeed this is the case for Spanish unemployment. The data and the empirical analysis are discussed in the next section, which is followed by some conclusions.

## 2. Data and Empirical Results

The series analysed is the harmonized unemployment rate (Total: All Persons for Spain, monthly, seasonally adjusted), obtained from the Federal Reserve Bank of St. Louis database (LRHUTTTESM156S) see Figure 1.

**[Insert Table 2 about here]**

For the first subperiod (an expansion with a decrease in unemployment) the estimated values of d are 1.30 (no autocorrelation) and 1.24 (autocorrelation); for the next subperiod (a recession with an increase in unemployment) they increase to 1.55 and 1.43; for the third subperiod (an expansion) they fall to 1.41 and 1.20; for the fourth (a recession) they go up to 1.83 and 1.85; finally, for the last subperiod (an expansion) they go down again to 1.27 and 1.38 respectively.

## 3. Conclusions

This note has applied fractional integration methods to analyse persistence in Spanish unemployment. Whilst previous studies had allowed for possible asymmetries in its dynamic behaviour (see, e.g., Casado and Trivez, 2004

## References

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Bianchi, M., and Zoega, G. (1998), "Unemployment Persistence: Does the Size of the Shock Matter?", Journal of Applied Econometrics, 13, 283-304.

Blanchard, O. J., and Summers, L.H. (1987), "Hysteresis in unemployment", European Economic Review, 31, 288-295.

Skalin, J. and Teräsvirta, T. (2002), "Modeling Asymmetries and Moving Equilibria in Unemployment Rates", Macroeconomic Dynamics, 6, 202-241.

**Figure 1: Unemployment rate in Spain**

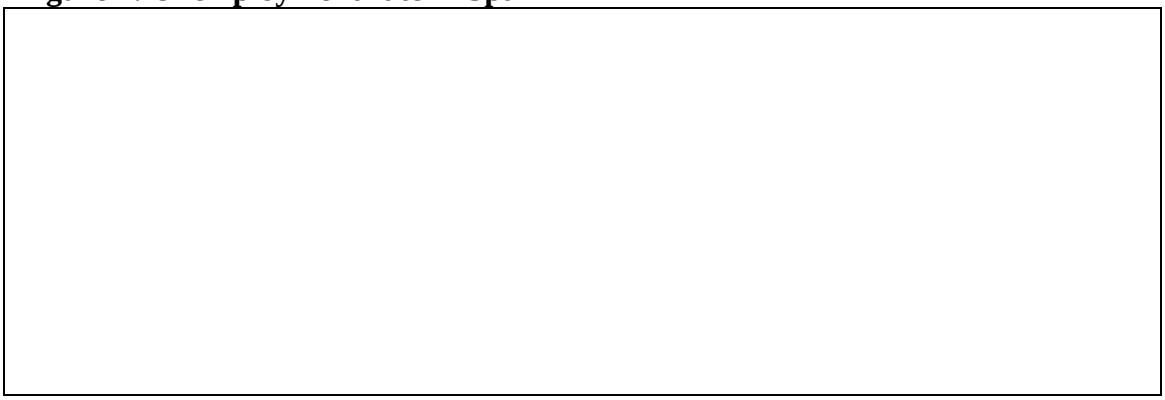

**Table 1: Estimates of d and 95% confidence intervals for the whole sample**

| | No regressors | An intercept | A linear time trend |
|---|---|---|---|
| No autocorrelation | 1.03 (0.97, 1.19) | | |