THE ASYMMETRIC BEHAVIOUR OF SPANISH UNEMPLOYMENT PERSISTENCE

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Abstract

One of the key features of unemployment rate is its persistence, normally described as hysteresis. This note applies fractional integration techniques to show that Spanish unemployment is highly persistent and exhibits asymmetric behaviour, specifically its degree of persistence is higher during recessions (when unemployment is going up) compared to expansions (when it is going down). Further work should investigate whether this is a stylised fact also in other countries exhibiting hysteresis.

Keywords: Unemployment; persistence; Spain

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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 Figure 1 about here]

Table 1 displays the estimates of d and their corresponding 95% confidence bands from the following model,

$$y_t \;=\; \alpha \;+\; \beta t \;+\; x_t\,, \qquad (1 - B)^d x_t \;=\; u_t, \qquad t \;=\; 1, 2, ..., \qquad (1)$$

where y_t is the series of interest, i.e., the unemployment rate, α and β are unknown parameters corresponding to the intercept and a linear time trend, and x_t is assumed to be I(d), where d is the differencing parameter. We assume that the errors u_t in (1) are uncorrelated (white noise) and autocorrelated in turn, and use a parametric approach based on the Whittle function in the frequency domain (Dahlhaus, 1989; Robinson, 1994) in the former case, whilst in the latter case apply a non-parametric method proposed by Bloomfield (1973) that is well suited for approximating highly parameterised AR(MA) processes in the context of fractional integration (see, Gil-Alana, 2004). The model is estimated for the three cases of i) no deterministic terms, ii) an intercept, and iii) an intercept with a linear time trend. The results in Table 1 suggest that the intercept is sufficient to describe the deterministic component, the estimated value of d being 1.62 with white noise errors, and 1.63 with autocorrelated ones. This implies a high degree of persistence in the series.

[Insert Table 1 about here]

Next we investigate whether there is any evidence of asymmetric behaviour, more specifically whether the degree of persistence differs during expansions and recessions. The subsamples are based on visual inspection. For example, after the starting date and 59 consecutive decreases in the unemployment rate, there is an increase in 1991m01 that is followed by 36 consecutive periods of increase till 1994m01. For the period between1994m02 and 2007m05 there is generally a decrease though there is a small increase in the middle of the subsample; however, from

2007m06 till 2003m02 there are only monotonic increases, and in the last subsample only monotonic decreases (see again Figure 1).

To provide further evidence on the presence of changing trends, we also carry out the Bai and Perron's (2003) and Gil-Alana's (2008) tests for detecting breaks, the latter being specifically designed for the case of fractional integration. The results were almost identical with the two methods, the break dates being 1991m01, 1994m01, 2007m04 (2007m05) and 2013m02 (2013m01). It is plausible to think that similar results would be obtained with other methods such as Hassler and Meller (2014).

To analyse asymmetries we re-estimated the model (1) with a linear time trend over five sub-periods of continuous increases and decreases in the unemployment rate; these are defined in Table 2, which also reports the estimated values of d, again for the two cases of uncorrelated and autocorrelated errors (see the third and four columns respectively).

[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.

The orders of integration are not significantly different across subsamples, with the confidence intervals being relatively wide in most cases as a result of the small sample sizes. Only the values for the third and the fourth sub-periods are statistically different (whether the errors are correlated or not). When employing finite sample critical values obtained by Monte Carlo simulations the results did not change.

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), they had not specifically analysed whether persistence itself is characterised by asymmetric behaviour. The empirical results suggest that indeed this is the case, its degree being higher during recessions as opposed to expansions. Future work will extend the analysis to other European labour markets to establish whether or not this is a stylized fact characterising unemployment in countries where hysteresis is a well-known phenomenon.

References

Bai, J., and Perron, P. (2003). Computation and Analysis of Multiple Structural Change Models, Journal of Applied Econometrics, 18, 1-22.

Bentolila, S., and Bertola, G. (1990), "Firing costs and labour demand: How bad is eurosclerosis?", Review of Economics and Statistics, 57, 381-402.

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.

Bloomfield, P. (1973): "An exponential model in the spectrum of a scalar time series," Biometrika, 60, 217-226.

Caporale, G.M. and L.A. Gil-Alana (2007), "Non-linearities and fractional integration in the US unemployment rate", Oxford Bulletin of Economics and Statistics, 69, 4, 521-544.

Caporale, G.M. and L.A. Gil-Alana (2008), "Modelling the US, UK and Japanese unemployment rates: fractional integration and structural breaks", Computational Statistics and Data Analysis, 52, 11, 4998-5013.

Caporale, G.M. and L.A. Gil-Alana (2009), "Multiple shifts and fractional integration in the US and UK unemployment rates", Journal of Economics and Finance, 33, 4, 364-375.

Caporale, G.M., Gil-Alana L.A. and Y. Lovcha (2016), "Testing unemployment theories: a multivariate long memory model", Journal of Applied Economics, 19, 1, 95-112.

Casado, J.M. and F.J. Trivez (2004), "Asymmetries, persistence and non-linearity of Spanish unemployment rates", EconWPA.

Dahlhaus, R. (1989) Efficient parameter estimation for self-similar process, *Annals of Statistics*, 17, 1749-1766.

Gil-Alana, L.A. (2004), The use of Bloomfield (1973) model as an approximation to ARMA processes in the context of fractional integration, Mathematical and Computer Modelling 39, 429-436.

Gil-Alana, L.., (2008) Fractional integration and structural breaks at unknown periods of time, Journal of Time Series Analysis 29, 1, 163-185.

Hassler, U. and B. Meller (2014) Detecting multiple breaks in long memory the case of U.S. inflation, Empirical Economics 46, 2, 653-680.

Lindbeck, A. and Snower, D. (1985), Explanations of Unemployment, Oxford: Oxford

University Press.

Lindbeck, A. and Snower, D.J. (1988), "Cooperation, Harassment, and Involuntary Unemployment: An Insider-Outsider Approach", American Economic Review, 78, 167-188.

Robinson, P.M. (1994) Efficient tests of nonstationary hypotheses, Journal of the American Statistical Association 89, 428, 1420-1437.

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

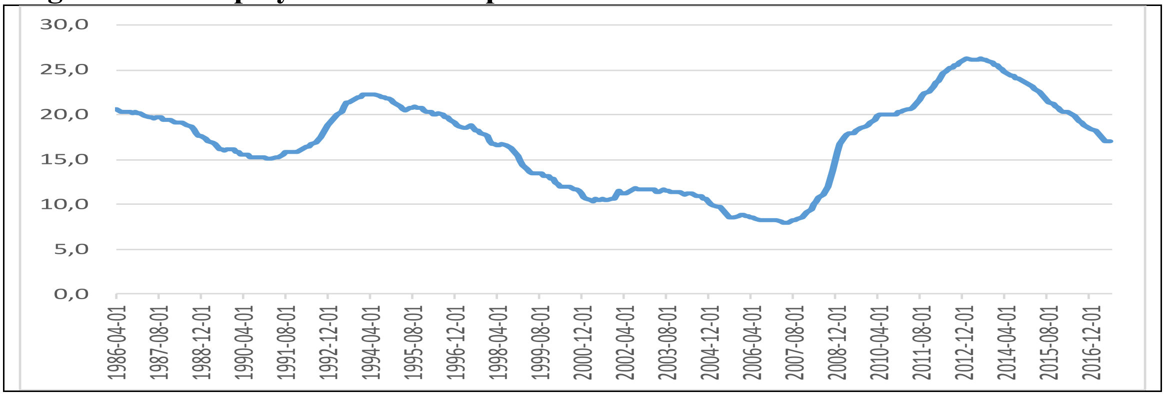

Table 1: Estimates of d and 95% confidence intervals for the whole sample

	No regressors	An intercept	A linear time trend
No autocorrelation	1.03 (0.97, 1.19)	**1.62 (1.55, 1.70)**	1.62 (1.55, 1.70)
Autocorrelation	1.02 (0.92, 1.16)	**1.63 (1.52, 1.79)**	1.63 (1.52, 1.80)

In bold, the selected models according to the deterministic terms.

Table 2: Estimates of d and 95% confidence intervals for the subperiods

Time period	Evolution	No correlation	Autocorrelation
1986m04 – 1991m01	Expansion (Fall in Un..)	1.30 (1.14, 1.52)	1.24 (0.98, 1.60)
1991m02 – 1994m01	Recession (Incr. in Un.)	1.55 (1.38, 1.83)	1.43 (1.06, 1.87)
1994m02 – 2007m05	Expansion (Fall in Un.)	1.41 (1.27, 1.57)	1.20 (1.04, 1.45)
2007m06 – 2013m02	Recession (Incr. in Un.)	1.83 (1.67, 2.05)	1.85 (1.45, 2.51)
2013m03 – 2017m08	Expansion (Fall in Un.)	1.27 (1.09, 1.50)	1.38 (0.91, 1.91)