Department of
Economics and Finance

Working Paper No. 18-03

Economics and Finance Working Paper Series

Guglielmo Maria Caporale, Luis Alberiko Gil-Alana,
Tommaso Trani

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A Long-Range Dependence Approach

March 2018

http://www.brunel.ac.uk/economics

ON THE PERSISTENCE OF UK INFLATION: A LONG-RANGE DEPENDENCE APPROACH

Guglielmo Maria Caporale,
Brunel University London, CESifo and DIW Berlin

Luis Alberiko Gil-Alana
University of Navarra

Tommaso Trani
University of Navarra

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Abstract

This paper examines the degree of persistence in UK inflation by applying long-memory methods to historical data that span the period from 1660 to 2016. Specifically, we use both parametric and non-parametric fractional integration techniques, that are more general than those based on the classical I(0) vs I(1) dichotomy. Further, we carry out break tests to detect any shifts in the degree of persistence, and also run rolling-window and recursive regressions to investigate its evolution

1. Introduction

Inflation persistence has been extensively analysed in the literature because its properties have implications for both theoretical models and monetary policy. Central banks aim to anchor expectations in order to lower persistence and reduce the output costs of disinflation (Moreno and Villar, 2010), since high persistence is often due to backwa3(t)-2410 12 70.92pd5 2n2(s)-

suggest the presence of a structural break that can be associated with the introduction of inflation targeting in October 1992; the reduction of inflation persistence after 1993 is seen as unknown and = 0 a priori; and iii) with a linear time trend, with and in eq. (1) both being unknown.

Regardless of the case considered, the model in eq. (1) implies that y_t is a stationary variable only if $d < 0.5$; otherwise, i.e., for d • 0.5, it is not covariance-stationary and is highly persistent.[3] In the latter case, y_t can either be mean-reverting (i.e., $d < 1$) or not. Therefore, since d is a real-value parameter, one can assess the degra 3.52 (m)-6((er.27 0 Td

decades the de facto

Hassler and Meller (2014), both specifically designed for the case of fractional integration. These methods are based on minimising the sum of squared residuals over different subsamples. The results indicate that there is a single break in the series around 1933. Therefore, we split the sample into the two corresponding subsamples, and estimate the differencing parameter for each of them. The results are displayed in Table 4. There appears to be a very significant increase in the degree of persistence after the break. In particular, under the white noise assumption for the error term, the estimated value of d increases from 0.12 in the first subsample to 0.73 in the second one. When allowing for autocorrelation in the disturbances, the estimates are much smaller, but there is again a sharp increase from 0.29 in the first subsample to 0.34 in the second one. Note that these results provide evidence of long memory ($d > 0$) in the second subsample, regardless of the assumption made about the error term.

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The recursive estimation under the alternative assumption of autocorrelated inflation in terms of permanent and transitory shocks. Next we describe the results obtained applying the most recent version of their model, namely the UCSVO model (Stock and Watson, 2016), which embeds a correction for outliers.

We estimate this model over two subsamples, namely (a) 1918-2016 and (b) 1950-2016. The first is chosen on the basis of the previous empirical analysis: visual inspection of the data (Figure 1) suggests that the biggest change in the behaviour of UK inflation occurred at the end of WWI, and our tests have in fact detected a statistically significant break in 1917 in the context of both the rolling-window and recursive analysis. The choice of the second subsample follows the literature, with most studies examining the period starting around 1950 when the Bretton Woods system had just been put in place.

[Insert Figure 5 about here]

Figure 5 shows the results for both subsamples; specifically, it displays the variance of permanent and transitory shocks respectively and also the estimated outliers, which are a

These findings suggest that

(2009); the fact that these and related studies are based on relatively standard ARMA models and analyse a much shorter time series might account for the different findings. The UCSVO estimates suggest that inflation targeting might have reduced to some extent the impact of permanent shocks on inflation; however, it is their higher volatility as well as the presence of some sizeable outliers that appear to account for the break detected in the early 1980s.

Future work will aim to investigate possible nonlinearities, for instance applying the method of Cuestas and Gil-Alana (2016) based on Chebyshev polynomials in time.

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1900
1950
2000

Table 1: Historical summary statistics

	Pre-"de jure" Gold Standard:	"De jure" Gold Standard:	Interward period	Bretton Woods	Bretton Woods to inflation targeting	Inflation targeting
Mean	0.55	0.03	-1.89	4.37	9.18	2.09
Median	0.39	0.20	-0.80	3.88	7.50	2.06
Min	-25.19	-14.40	-14.00	0.60	3.20	0.04
Max	30.02	15.66	3.40	10.65	22.70	4.46
Standard deviation	7.60	4.36	4.12	2.49	5.33	1.07

Table 4: Estimated coefficients for the UK inflation rate

i) White noise errors			
	No regressors	An intercept	A linear time trend
(1660 - 1933)	0.12 (0.00, 0.29)	**0.12 (0.00, 0.29)**	0.12 (-0.01, 0.29)
(1934 - 2016)	0.74 (0.57, 1.00)	**0.73 (0.57, 1.00)**	**59.12 Tm E01 ( ) 0.29 E01, 0.29 59.12 Tm ( )**

Figure 3: Rolling-window estimates of d with 60 years of observations.

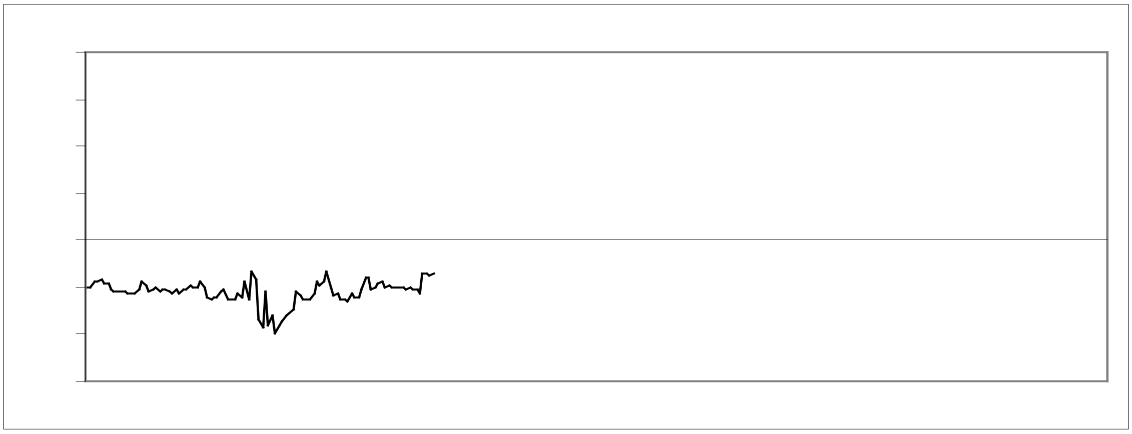
i) No autocorrelation (white noise)

ii) Autocorrelation (Bloomfield)

Table 5: Rolling window e

Table 6: Recursive estimates of d for each subsample

i) White noise errors				
Period	Dates	No regressors	An intercept	A linear trend
1st subsample	1660 – 1822	-0.05 (-0.16, 0.15)	**-0.05** **(-0.17, 0.16)**	-0.11 (-0.29, 0.14)
2nd subsample	1823 – 1917	0.54 (0.27, 0.85)	**0.51** **(0.26, 0.81)**	0.53 (0.30, 0.82)
3rd subsample	1918 – 1975	0.70 (0.45, 1.04)	**0.77** **(0.50, 1.07)**	0.77 (0.48, 1.07)
4th subsample	1976 – 2016	0.71 (0.4[illegible], 1.13)	0.60 (0.4[illegible], 1.18)	**0.78** **(0.5[illegible], 1.1[illegible])**

Figure 5: Time-varying volatilities predicted by the UCSVO model

” 1 SHUPDQHQW VKRFN” is the volatility of changes in the permanent component of inflation, and “1 transitory shock” is the volatility of changes in the transitory component. After an initial burn-in phase of 10000 iterations,

Appendix A

Figure A.1: UK inflation rate and estimated trends

Appendix B

B.1 UCSVO

B.2 Estimation

We estimate model (B.1)–(B.5) with Bayesian methods, which require priors for @ @ p, s and the initial values of t, 2û O1Q and û O1Q. We set these priors and calibrate the estimation following Stock and Watson (2016), who applied the UCSVO model to US data. The setup is also suitable for the UK since, as recently documented by Miles et al. (2017), UK and US

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B.3 Additional results

In the paper, we report the posterior distributions for ${}_{y,t,}$ 11