Economic Modelling 30 (2013) 245–252

Contents lists available at SciVerse ScienceDirect

Economic Modelling

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

Revisiting the mean reversion of inflation rates for 22 OECD countries

Tsangyao Chang [a,*], Omid Ranjbar [b], D.P. Tang [c]

[a] Department of Finance, Feng Chia University, Taichung, Taiwan
[b] Ministry of Industry, Mine, and Trade, Tehran, Iran
[c] Graduate Institute of National Development, National Taiwan University, Taipei, Taiwan

ARTICLE INFO

Article history:
Accepted 2 September 2012

Keywords:
Mean reversion
Inflation
OECD countries
Fourier stationary test

ABSTRACT

This study applies a flexible Fourier stationary test, proposed by Becker et al. (2006) to investigate the mean reversion of inflation in 22 OECD countries over the period of 1961 to 2011. While traditional unit root tests give us mixed results, empirical results from our flexible Fourier stationary test indicate that mean reversion of inflation holds in all 22 OECD countries. Our results have important policy implications for the 22 OECD countries under study.

1. Introduction

The issue of inflation has clearly become one of the most pressing problems for countries around the world. It is also well known that inflation targeting has become one of the concerns of monetary policy designed by a number of central banks. In the case of the United Kingdom, inflation rate was last reported at 4.5% in August of 2011. From 1989 until 2010, the average inflation rate in the United Kingdom was 2.72% reaching an historical high of 8.50% in April of 1991 and a record low of 0.50% in May of 2000. The United States inflation rate on August 2008 has spiked to 5.4%, a level not seen in the last 10 years. The dominant feature of inflation is its high persistence. What causes this higher persistence in inflation rates has attracted a lot of both theoretical and empirical studies devoted to investigating whether the mean reversion or stationarity in inflation holds true for those countries with higher inflation rates. These studies are critical not only for empirical researchers but also for policy makers.

Considering the assumptions inherent in the unit root hypothesis in inflation, if inflation is the I(1) process, then the shocks affecting the series will have permanent effects, thus shifting the inflation equilibrium from one level to another. Should this be the case, from the policy perspective, policy action is, indeed, required to return inflation to its original level. On the other hand, if inflation is the I(0) process, the effects of the shock will merely be transitory, making the need for policy action less mandatory since inflation will eventually return to its equilibrium level.

The persistency of inflation has a number of macroeconomic implications. Dornbusch (1976) and Taylor (1979), suggest a stationary inflation level, implying sticky-price models due to the difficulty of constantly changing them with wage or cost of goods. Calvo (1983) and Ball (1993) propose high-order Phillip curves allowing for stationary inflation. The stationarity of inflation does matter for the relation between nominal and real interest rates. To sustain the stationarity of real interest rate, inflation should be unit root and cointegrated with the nominal interest rates. Chapman and Ogaki (1993) rejects the cointegration where the real interest rate is stationary, assuming that nominal interest rates and inflation are stationary around a trend which includes a known structural break. Furthermore, the persistency of inflation is the determination and evaluation of monetary policies. Hall (1984) and Taylor (1985) advocate that monetary policy should target either the level or growth rate of nominal income. If inflation is non-stationary, then so is nominal income growth unless inflation and real income growth are cointegrated. This causes difficulties for the types of rules suggested by McCallum (1988), which use the growth rate of the monetary base as the instrument for monetary policy. Faria and Carneiro (2001) argued that inflation persistence may affect economic growth.

Numerous studies have empirically examined whether inflation is best described as a stationary or unit root process. However, these literatures do not reach a consensus. For example, Nelson and Schwert (1977), Barsky (1987), MacDonald and Murphy (1989), Ball and Cecchetti (1990), Brunner and Hess (1993), Evan and Lewis (1995), Crowder and Hoffman (1996), Culver and Papell (1997), Crowder and Wohar (1999), Rapach and Weber (2004), and Christopoulos and Leon-Ledesma (2007) accepted the unit root hypothesis in inflation rates. Accordingly, any shock to inflation has a permanent effect. On the other hand, Rose (1988) rejected the presence of unit root in the inflation. Lee and Chang (2007) also rejected the presence of unit root in the inflation for a sample of 19 OECD countries. Beechey and Osterholm (2009) investigate how inflation persistence in the Euro area has evolved between 1991 and 2006. Employing an

* Corresponding author. Tel.: +886 4 2451 7250x4168; fax: +886 4 2451 3796.
E-mail addresses: tychang@fcu.edu.tw (T. Chang), o_rangbar@yahoo.com (O. Ranjbar).

0264-9993/$ – see front matter © 2012 Elsevier B.V. All rights reserved.
http://dx.doi.org/10.1016/j.econmod.2012.09.018

ARMA(1,11) model with a time-varying autoregressive parameter, they find that inflation persistence has fallen markedly since the third stage of the EMU which began in January 1999 and that inflation no longer exhibits unit-root behavior. Meller and Nautz (2012) provide new evidence on inflation persistence before and after the European Monetary Union (EMU). Taking into account fractional integration of inflation, they confirm that inflation dynamics differed considerably across Euro area countries before the start of EMU. Since 1999, however, results obtained from panel estimation indicate that the degree of long run inflation persistence has converged. Allowing for nonlinearity, Cuestas and Harrison (2010) show that inflation rates in more than half of a panel of Central and Eastern European countries are stationary.

As for methodology, recent studies have mostly utilized conventional unit root tests such as the ADF and PP — which fail to reject the unit root hypothesis of inflation rate.[1] The omission of some structural breaks is a possible cause of the traditional unit root tests failing to reject the unit root null on inflation rate. Perron (1989) argued that if there is a structural break, the power to reject a unit root decreases when the stationary alternative is true and the structural break is ignored. Meanwhile, structural changes present in the data generating process, but have been neglected, sway the analysis toward accepting the null hypothesis of a unit root. As we know that inflation rate might be affected by internal and external shocks generated by structural changes may be subject to considerable short-run variation. It is important to know whether or not the inflation rate has any tendency to settle down to a long-run equilibrium level. If inflation rate is found stationary by using unit root test with structural break(s), the effects of shocks such as real and monetary shocks that cause deviations around a mean value or deterministic trend are only temporary.

Table 2
Univariate unit root tests (without trend).

Country	ADF unit rot test				KPSS stationary test	
	ADF statistic	Optimum lags	Ljung–Box	P-value	KPSS statistic	Bandwidth
Australia	−1.676	15	21.662	0.544	0.422*	11
Austria	−1.624	12	11.801	0.974	0.880***	10
Belgium	−2.477	10	12.592	0.961	0.591**	10
Canada	−1.715	12	25.214	0.342	0.526**	11
Finland	−1.861	15	16.781	0.822	0.888***	10
France	−1.550	10	18.540	0.730	0.734**	11
Germany	−2.895**	10	19.162	0.695	0.608**	10
Greece	−1.561	12	18.502	0.732	0.393*	11
Italy	−1.801	14	17.421	0.791	0.558**	11
Japan	−1.254	15	19.583	0.670	1.212***	10
Korea	−2.434	12	23.100	0.458	1.118***	10
Luxembourg	−2.220	13	26.329	0.288	0.457*	10
Netherlands	−1.565	12	19.304	0.686	0.837***	10
New Zealand	−1.011	15	14.335	0.918	0.598**	10
Norway	−1.336	12	24.259	0.393	0.865***	10
Portugal	−1.414	13	21.563	0.550	0.613**	10
Spain	−1.763	11	25.964	0.305	0.714**	11
Sweden	−1.372	9	27.370	0.243	0.820***	10
Switzerland	−2.896**	13	10.625	0.987	0.858***	10
Turkey	−1.661	10	19.155	0.695	0.514**	11
United Kingdom	−1.190	14	25.425	0.332	0.603**	11
United States	−2.087	9	17.842	0.769	0.431*	10

Bandwidth for KPSS stationary test was selected by the Bartlett kernel, as suggested by Newey and West (1987). Optimum lags were selected based on the recursive t-statistic, as suggested by Campbell and Perron (1991). Ljung–Box Q statistic was calculated for testing the serial correlation in the error term of the ADF equation with 23 lags and its P-values show that using the lag terms, we have successfully removed the serial correlation from the error term series. The critical values for the ADF unit root test at 10%, 5%, and 1% are −2.575, −2.876, and −3.464 and for the KPSS stationary test they are 0.347, 0.463, and 0.739. *, ** and *** indicate significant at the 10%, 5%, and 1% levels, respectively.

Table 1
Summary statistics of data sets.

Countries	Mean	Median	Maximum	Minimum	Std. dev.	Skewness	Kurtosis	Jarque–Bera	Probability
Australia	0.038	0.027	0.125	−0.007	0.029	0.883	3.124	26.356	0.000
Austria	0.026	0.023	0.080	−0.004	0.017	0.744	3.057	18.639	0.000
Belgium	0.028	0.022	0.117	−0.011	0.021	1.488	5.922	146.443	0.000
Canada	0.030	0.025	0.092	−0.010	0.023	0.957	3.133	30.978	0.000
Finland	0.038	0.030	0.131	−0.008	0.031	1.007	3.371	35.293	0.000
France	0.034	0.022	0.109	−0.008	0.027	1.055	3.101	37.533	0.000
Germany	0.021	0.019	0.058	−0.012	0.014	0.624	2.839	13.314	0.001
Greece	0.067	0.047	0.245	−0.028	0.057	0.726	2.763	18.212	0.000
Italy	0.047	0.035	0.169	−0.001	0.039	1.263	3.620	56.926	0.000
Japan	0.025	0.018	0.175	−0.020	0.032	1.878	8.277	353.115	0.000
Korea	0.063	0.045	0.269	−0.009	0.054	1.355	4.494	80.627	0.000
Luxembourg	0.027	0.022	0.082	−0.014	0.020	0.977	3.556	34.740	0.000
Netherlands	0.027	0.020	0.081	−0.014	0.020	0.792	3.037	21.134	0.000
New Zealand	0.045	0.028	0.145	−0.009	0.038	0.940	2.665	30.721	0.000
Norway	0.036	0.030	0.104	−0.016	0.025	0.747	2.923	18.859	0.000
Portugal	0.067	0.045	0.289	−0.017	0.059	1.147	3.756	49.124	0.000
Spain	0.053	0.041	0.196	−0.019	0.039	0.990	3.568	35.685	0.000
Sweden	0.036	0.030	0.107	−0.013	0.027	0.500	2.446	10.983	0.004
Switzerland	0.021	0.017	0.082	−0.017	0.018	0.861	3.548	27.491	0.000
Turkey	0.215	0.178	0.642	−0.008	0.163	0.504	2.081	15.643	0.000
UK	0.041	0.030	0.193	−0.002	0.036	1.754	6.170	188.165	0.000
USA	0.030	0.024	0.103	−0.023	0.021	1.241	4.852	80.731	0.000

As discussed above, the traditional unit root tests lose power if structural breaks are ignored in unit root testing. The general method to account for breaks is to approximate them using dummy variables. However, this approach has several undesirable consequences. First, one has to know the exact number and location of the breaks. These are not usually known and therefore need to be estimated. This in turn introduces an undesirable pre-selection bias (see Maddala and Kim, 1998). Second, current available tests account only for one to two breaks. Third, the use of dummies suggests sharp and sudden changes in the trend or level. However, for low frequency data it is more likely that structural changes take the form of large swings which cannot be captured well using only dummies. Breaks should

[1] With one exception, Lee and Tsong (2009) using bootstrap covariate stationary tests for a sample of G-10 countries and their bootstrap tests consistently provide strong evidence in support of mean reversion in inflation in most countries of the G-10.