8. Inflation Persistence in Nine Latin American Countries: Panel SURKSS Test with a Fourier Function[1]

Yanli LI[2]
Hongfeng PENG[3]

Abstract

This study employs the panel seeming unrelated regression of the Kapetanios-Shin-Snell (SURKSS) test with a Fourier function to investigate the inflation persistence in Nine Latin American Countries over the period of January 1993-January 2012. The empirical results from the univariate unit root and panel-based unit root tests indicate that the inflation rates are non-stationary in these nine countries under study. However, the panel SURKSS test with a Fourier function rejects the null hypothesis of a unit root in Argentina, Dominica, Grenada, Mexico, Saint Lucia and Saint Vincent and the Grenadines, while accepting the non-stationarity in other three countries(Chile, Columbia and Costa Rica). We conclude that, among the selected nine Latin American countries, inflation rates of Chile, Columbia and Costa Rica demonstrate high levels of persistence which implies the permanent influence of external shocks on Chile, Columbia and Costa Rica.

Keywords: inflation persistence, panel SURKSS test, Fourier function, Latin American Countries

JEL Classification: E31; C22

I. Introduction

There has been a great deal of study concerning inflation persistence and its properties, because the degree of inflation persistence is very important for monetary

[1] This study was presented at 2013 Global Business, Economics, and Finance Conference, Wuhan University, China, 9-11 May 2013.
The authors thank Tsangyao Chang for kindly providing the Rats codes for the SURKSS approach. Of course, we are alone responsible for any remaining errors.
[2] *School of Economics and Management, Wuhan University, China.
E-mail: liyan73@hotmail.com.*
[3] *Corresponding author. School of Economics and Management, Wuhan University, China.
E-mail: fhpeng@whu.edu.cn.*

policy design and monetary transmission mechanism. The theoretical background of inflation persistence is the sticky price models (Taylor, 1979, 1980; Calvo, 1983), after that a lot of document focused on the empirical performance of inflation persistence (Fuhrer and Moore, 1995; Christiano, Eichenbaum, and Evans, 2001; Roberts, 2001; Driscoll and Holden, 2004; Coenen and Wieland, 2005, etc.). Some research has found that inflation exhibits high persistence in industrial countries, but others point out that the above-mentioned results are very sensitive to the statistical techniques employed. Another issue which has attracted much attention and research is the persistence stability, some authors have found evidence of a decrease in inflation persistence in recent years (Taylor, 2000; Cogley and Sargent, 2001; Kim, Nelson, and Piger, 2004; Meller, 2012; Gerlach and Tillmann, 2012, etc.), while others give support to the opposite conclusion (Batini, 2002; Stock, 2001; Levin and Piger, 2003; O'Reilly and Whelan, 2004, etc.). At the same time, there is much literature focusing on explaining the factors that influence the degree of inflation persistence (Amano, 2007; L Benati,2008; Hubrich and Marcellino, 2009; T Davig, T Doh , 2009; Conrad, 2012).

Despite the extensive literature focusing on inflation persistence, most of it is concerned about industrial countries. In most developing countries, the inflation problem is far more serious than that in developed countries and the external shock to inflation is more common. This paper is mainly interested in the inflation persistence in Latin America; in this developing area the inflation level was high and volatile in past several decades. There is little literature on this issue in Latin America, among them Carlos Capistrani (2009) studies on the mean and persistence of inflation in the 10 largest Latin American countries for the period 1980–2007; Manuel Ramos-Francia, D Chiquiar, AE Noriega, M Ramos-Francia (2010) test a change in inflation persistence in Mexico; Nikolaos Giannellisa&Minoas Koukouritakis (2013) test the inflation rate persistence in Brazil, Mexico, Uruguay and Venezuela.

The most often used methodology in empirical research in inflation persistence is using I(1) or I(0) to describe the data processes, and the Augmented Dickey Fuller (ADF) to test if there is a unit root in it; if there is a unit root, it means that the impact of shocks to the data series of inflation is permanent - then the speed of inflation return to its long-run equilibrium value after a shock is slow. The models to describe the I(1) or I(0) processes can be AR, ARMA and ARIMA. In these methods, all data are supposed to be linear series and do not consider the cross-sectional dependence and heterogeneity across panel members. This paper analyzes inflation persistence using recent work by Wu and Lee (2009) which tests panel unit root of non-linear series. This methodology employs the Kapetanios-Shin-Snell(KSS) test based on the panel seeming unrelated regression method(SURKSS) with a Fourier function. In contrast to the conventional univariate unit root test and panel-based unit root test, the SURKSS test with a Fourier function is superior in power when the data generating process is highly non-linear and when there is cross-sectional dependence and heterogeneity across panel members.

The rest of this paper is organized as follows: section two presents the data, section three describes the methodology framework, section four discusses the empirical results of the test, and section five provides the main conclusions.

II. Data

Monthly data with the time span from January 1993 to January 2012 are employed in our empirical study. All consumer price indices, CPI (in local currency, period average, over the previous year) for the Argentine, Chile, Columbia, Costa Rica Dominica, Grenada, Mexico, Saint Lucia and Saint Vincent and the Grenadines are taken from (IMF, International Financial Statistics). We calculate inflation rates of nine countries by their seasonally adjusted CPI data. Figure 1 plots the inflation rates series for Argentina, Chile, Columbia, Costa Rica Dominica, Grenada, Mexico, Saint Lucia and Saint Vincent and the Grenadines. In the figure, we find some significant upward or downward trend in the inflation rate series, which shows some non-linear adjustment patterns.

III. Methodology Framework

Panel SURKSS Test with a Fourier Function

Breuer *et al*. (2001) developed a panel unit root test that involves the estimation of the ADF regression in a seemingly unrelated regression framework (SURADF) and then tests for individual unit roots within the panel members. This procedure also handles slope heterogeneous serial correlation across panel members. The SURADF test is based on the system of ADF equations which can be expressed as

$$\begin{aligned} \Delta X_{1,t} &= \alpha_1 + \beta_1 X_{1,t-1} + \sum_{j=1}^{k} \theta_{1,j} \Delta X_{1,t-j} + \mu_{1,t} \\ \Delta X_{2,t} &= \alpha_2 + \beta_2 X_{2,t-1} + \sum_{j=1}^{k} \theta_{2,j} \Delta X_{2,t-j} + \mu_{2,t} \\ &\vdots \\ \Delta X_{N,t} &= \alpha_N + \beta_N X_{N,t-1} + \sum_{j=1}^{k} \theta_{N,j} \Delta X_{N,t-j} + \mu_{N,t} \end{aligned} \quad (1)$$

where: $\beta_j = \rho_j - 1$, ρ_j is the autoregressive coefficient for series j and t=1,2...,T.

Wu and Lee (2009) shows that SURADF is not feasible for panel unit root test if the data follows a non-linear path. Based on the idea of Kapetanios, Shin and Snell (2003), who apply a test（KSS）that is based on a non-linear smooth transition autoregressive procedure in which the null is still unit root but the alternative is non-linear stationarity in a time series variable, Wu and Lee (2009) develop a non-linear unit root test for panel data which is the Kapetanios-Shin-Snell (KSS) test based on the panel estimation method of SUR (SURKSS). SURKSS test is the mixture of Breuer *et al.* (2001) panel SURADF test and Kapetanios *et al*. (2003)

According to Wu and Lee (2009), this non-linear panel unit root test is superior in power to the Breuer *et al*. (2001) test when the data generating process is highly non-linear. In contrast to panel-based unit root tests, which are joint tests of a unit root for all panel members and are incapable of determining the mix of I(0)and I(1)series in a panel setting, the panel SURKSS tests a separate unit root null hypothesis for each individual panel member and, therefore, identifies how many and which series in the panel are stationary processes. In applications of SURKSS, we can consider the use of Fourier function to characterize the non-linear trend of time series. The SURADF test with a Fourier Function is based on the system of ADF equations which can be expressed as

$$\begin{aligned}
\Delta X_{1,t} &= \alpha_1 + \beta_1 X_{1,t-1}^3 + \sum_{j=1}^{k} \theta_{1,j} \Delta X_{1,t-j} + c_1 \sin(\frac{2\pi kt}{T}) + d_1 \cos(\frac{2\pi kt}{T}) + \varepsilon_{1,t} \\
\Delta X_{2,t} &= \alpha_2 + \beta_2 X_{2,t-1}^3 + \sum_{j=1}^{k} \theta_{2,j} \Delta X_{2,t-j} + c_2 \sin(\frac{2\pi kt}{T}) + d_2 \cos(\frac{2\pi kt}{T}) + \varepsilon_{2,t} \\
&\vdots \\
\Delta X_{N,t} &= \alpha_N + \beta_N X_{N,t-1}^3 + \sum_{j=1}^{k} \theta_{N,j} \Delta X_{N,t-j} + c_N \sin(\frac{2\pi kt}{T}) + d_N \cos(\frac{2\pi kt}{T}) + \varepsilon_{N,t}
\end{aligned} \quad (2)$$

This system is estimated by the SUR procedure where the null and the alternative hypotheses are tested individually as

$$\begin{aligned}
&H_0^1 : \beta_1 = 0 \; ; \quad H_A^1 : \beta_1 < 0 \\
&H_0^2 : \beta_2 = 0 \; ; \quad H_A^2 : \beta_2 < 0 \\
&\quad \vdots \\
&H_0^N : \beta_N = 0 \; ; \; H_A^N : \beta_N < 0
\end{aligned}$$

The rationale for selecting $[\sin(\frac{2\pi kt}{T}), \cos(\frac{2\pi kt}{T})]$ is based on the fact that a Fourier expression is capable of approximating absolutely integrable functions to any desired degree of accuracy. Where k represents the frequency selected for the approximation, and $(c_i, d_i)'$ measures the amplitude and displacement of the frequency component. It also follows that at least one frequency component must be present if there is a structural break. Becker *et al*. (2004), Enders and Lee (2009) and Pascalau (2010) show that a Fourier approximation can often capture the behavior of an unknown function even if the function itself is not periodic.

As this test has non-standard distributions, the critical values of the SURADF test must be obtained through simulations. To obtain the critical values, the experiments were replicated 10,000 times and the critical values of 1 per cent, 5 per cent and 10 per cent were tailored to each of the panel members. For recent application of the panel unit root tests, see for example Chu *et al*. (2007).

Test for Cross-Sectional Dependence in Panels

Before estimating the models above, we first test for cross-sectional dependency. Breusch and Pagan (1980) propose the Lagrange Multiplier (LM) statistics

$$CD_{BP} = T\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\hat{\rho}_{ij}^{2} \tag{3}$$

for testing for cross-sectional dependence, where: $\hat{\rho}_{ij}$ is the estimated correlation coefficient among the residuals obtained from individual OLS estimations.

Under the null hypothesis of no cross-sectional dependence with a fixed N and T→∞, CD_{BP} is asymptotically distributed as chi-squared with N(N−1)/2 degrees of freedom.

The CD_{BP} test has a drawback when N is large, implying that it is not applicable when N→∞. To overcome this problem, Pesaran (2004) developed a new Lagrange multiplier statistics for cross-sectional dependence which is defined as following

$$CD_{LM} = \sqrt{\frac{1}{N(N-1)}}\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}(T\hat{\rho}_{ij}^{2}-1) \tag{4}$$

Under the null hypothesis of no cross-sectional dependence with the first T→∞ and then N→∞ , this test statistics are asymptotically distributed as standard normal.

However, these two tests are likely to exhibit substantial size distortions when N is large relative to T. A new test for cross-sectional dependence (hereafter, CD) of Pesaran (2004) can be used where N is large and T is small. The CD statistics are calculated as follows:

$$CD = \sqrt{\frac{2T}{N(N-1)}}\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\hat{\rho}_{ij} \tag{5}$$

Under the null hypothesis of no cross-sectional dependence, the test statistics are asymptotically distributed as standard normal. Pesaran (2004) approach has remarkable positive qualities in samples of practically all relevant sizes and remains robust in a variety of settings (see Pesaran, 2004).

Test for Slope Homogeneity

Second issue before estimating Equations (2) is to decide whether the slope coefficients are homogenous. In Equations (2), the null hypothesis of slope homogeneity-H$_0$: $\beta_i = \beta$, for all i is tested against the alternative hypothesis of heterogeneity-H$_1$: $\beta_i \neq \beta_j$, for a non-zero fraction of pair-wise slopes for $i \neq j$ .In order to test for the null hypothesis, Swamy (1970) developed the slope homogeneity test on the dispersion of individual slope estimates from a suitable pooled estimator.

$$\tilde{S} = \sum_{i=1}^{N}(\hat{\beta}_i - \tilde{\beta}_{WFE})' \frac{x_i' M_\tau x_i}{\hat{\sigma}_i^2}(\hat{\beta}_i - \tilde{\beta}_{WFE}) \tag{6}$$

where: $\hat{\beta}_i$ is the pooled OLS estimator, $\tilde{\beta}_{WFE}$ is the weighted fixed effect pooled estimator, M_τ is an identity matrix, and $\hat{\sigma}_i^2$ is the estimator of error variance, σ_i^2.

However, the Swamy test requires panel data models where *N* is small relative to *T* (Pesaran and Yamagata, 2008). Based on Swamy test, Pesaran and Yamagata (2008) proposed a Delta test which is valid for small sample:

$$\tilde{\Delta}_{adj} = \sqrt{N}\left(\frac{N^{-1}\tilde{S} - E(\tilde{z}_{it})}{\sqrt{\operatorname{var}(\tilde{z}_{it})}}\right) \tag{7}$$

where: the mean $E(\tilde{z}_{it}) = k$ and the variance is $\operatorname{var}(\tilde{z}_{it}) = 2k(T-k-1)/(T+1)$.

IV. Empirical Results

Table 1 reports the summary statistics of the data studied. We found that Costa Rica had the highest monthly inflation rate of 0.894%, and Dominica had the lowest one of 0.157% over this sample period. The measures of skewness and excess kurtosis show that the inflation rate series are highly leptokurtic and positively skewed with respect to the normal distribution except Grenada, indicating that all inflation rates are non-normal distributed.

Table 1

Summary Statistics

	Mean	Median	Maximum	Minimum	Std. Dev	Skewness	Kurtosis	Jarque-Bera
Argentina	0.00515	0.00436	0.103886	-0.00752	0.00947	5.722275	54.98565	26918.11***
Chile	0.00381	0.00365	0.025738	-0.01302	0.00472	0.522893	5.883842	89.39701***
Columbia	0.00800	0.00597	0.040281	-0.00192	0.00781	1.525324	5.650214	155.1359***
Costa Rica	0.00894	0.00886	0.041928	-0.00421	0.00614	0.950293	6.679188	162.9121***
Dominica	0.00157	0.00131	0.036095	-0.0177	0.00550	1.223108	11.79705	792.0349***
Grenada	0.00212	0.00157	0.020423	-0.03209	0.00536	-0.46573	10.7581	580.0301***
Mexico	0.00796	0.00566	0.079692	-0.00738	0.00971	3.316528	19.60116	3036.163***
Saint Lucia	0.00220	0.00247	0.032339	-0.02479	0.00878	0.003089	3.892968	7.575587**
Saint Vincent and the Grenadines	0.00215	0.00115	0.044324	-0.0225	0.0087	1.218015	7.161592	220.9043***

Note: **and***indicate significance at the 5% and 1% level, respectively.

For comparison, several univariate unit root and panel-based unit root tests are first employed to examine the null of a unit root in inflation rates for these nine Latin American countries. Table 2 presents the country-by-country for the unit root tests. At first sight, the individual unit test statistics seem to show that inflation rates are non-stationary for all nine Latin American countries.

Table2

Univariate Unit Root Tests

	ADF	PP
Argentina	-4.860064***	-6.545738***
Chile	-9.719336***	-9.852887***
Columbia	-3.868770***	-5.545409***
Costa Rica	-8.976874***	-9.072233***
Dominica	-14.459101***	-14.46315***
Grenada	-13.28161***	-13.47703***
Mexico	-4.329405***	-4.097993***
Saint Lucia	-15.96038***	-16.06597***
Saint Vincent and the Grenadines	-14.73480***	-15.73985***

Note: ***indicates significance at the 1% level.

As we know, univariate unit root tests might have lower power when they are applied to a finite sample. In this situation, the panel-based unit root tests are found to be of great help provided that they allow for an increase in the power of the integration analysis order by combining the cross section and temporal dimensions. Tables 3 reports the results for the panel-based unit root tests. All the statistics yield the same results indicating that inflation rates are non-stationary in these nine Latin American countries. However, there exists a serious drawback of the panel-based unit root tests, i.e. they do not take the cross-sectional dependence into account.

Table 3

Results for Panel Unit Root Tests

	Test Statistic	P-value
LLC（2002）	-1.56997	0.0582
IPS（2003）	-4.52108	0.0000
ADF（fisher chi-square）	57.4170	0.0000
ADF（choi z-stat）	-4.42441	0.0000
PP（fisher chi-square）	48.1997	0.0000
PP（choi z-stat）	-3.65870	0.0000

To investigate the existence of cross-sectional dependence, we carried out Pesaran (2004) CD test and illustrated results in Table 4. It is clear that the null hypothesis of no cross-sectional dependence across the members of panel is strongly rejected at 1% level of significance, revealing that the SUR method is more appropriate than country-by-country OLS estimation. The cross-sectional dependence tests confirm that strong economic links exist between the nine Latin American countries. Table 4 also reports the results from the slope homogeneity test of Pesaran and Yamagata (2008).The test rejects the null hypothesis of the slope homogeneity hypothesis, supporting the country-specific heterogeneity. The rejection of slope homogeneity implies that the panel causality analysis by imposing homogeneity restriction on the variable of interest results in misleading inferences.

Table 4

Results for Cross-Sectional Dependence Tests and Homogeneity

	Test Statistic	
	CD	$\tilde{\Delta}_{adj}$
P=1	33.6250***	82.0875***
P=2	17.3207***	67.9144***
P=3	4.4823***	38.0727***

Note: p is the lag order in ADF test. ***indicate rejection of the null hypothesis at 1percent level of significance.

As we stated earlier, The SURADF test with a Fourier Function is feasible for panel unit root test if the inflation rates follow a non-linear path, and there are cross-sectional dependence and heterogeneity across the inflation rates of Latin American Countries.

Therefore, we proceed to test the inflation rates by using the panel SURKSS test with a Fourier function to investigate a separate unit root null hypothesis for each individual panel member. In so doing, we can clearly identify how many and which series in the panel are stationary processes.

Table 5

SURKSS with Fourier Unit Root Test of Nine Latin American Countries

Country	β	SURKSS	Critical value		
			1%	5%	10%
Argentina	-0.037227352	-4.21739***	-4.056819	-3.494235	-3.176510
Chile	-0.036936771	-2.87585	-4.060632	-3.515570	-3.207930
Columbia	-0.010014422	-1.47929	-4.061511	-3.438295	-3.126100
Costa Rica	-0.032781372	-2.58764	-4.039888	-3.469480	-3.155420
Dominica	-0.171070699	-5.29931***	-4.063909	-3.394325	-3.081360
Grenada	-0.088994954	-3.93567**	-4.181344	-3.557790	-3.245040
Mexico	-0.027104655	-4.45899***	-3.809723	-3.190805	-2.877930
Saint Lucia	-0.117168899	-3.74141**	-4.029505	-3.483555	-3.180100
Saint Vincent and the Grenadines	-0.112236050	-3.65555**	-4.138113	-3.546505	-3.234610

Note: ** and *** indicate significance at the 5% and 1% level, respectively. Critical values are calculated by Monte Carlo simulation with 10,000 draws, tailored to the present sample size.

Table 5 reports the results from the panel SURKSS test with a Fourier function. To avoid the small sample size bias, we estimate the 1%, 5% and 10% critical values, obtained from simulations based on observations for each series and 10,000 replications using the lag and covariance structure from the panel of inflation rates for each of the nine panel members. These are also presented in Table 5. Substantially, Panel SURKSS with a Fourier function rejected the unit root null in inflation rates for six of these nine Latin African countries (*i.e.* Argentina, Dominica, Grenada, Mexico, Saint Lucia and Saint Vincent and the Grenadines), which means that there is stationarity in inflation rates for the six Latin African countries. The results suggest that Argentina, Dominica, Grenada, Mexico, Saint Lucia and Saint Vincent and the Grenadines don't show a significant degree of inflation persistence, the deviation from the long-run value following a shock is transitory.

Panel SURKSS with a Fourier function do not reject the unit root null in inflation rates for Chile, Columbia and Costa Rica, indicating that there is high inflation persistence and inflation rate cannot converge towards its long-run value following external shocks in these three countries.

Figure 1 presents the time paths of the inflation rate for the nine Latin American countries. We can clearly observe the fluctuations in these series. Accordingly, there is significant non-stationarity in some countries, such as Columbia, which is consistent with our SURKSS results. It is also indicates in these time series that the inflation rates of all nine countries are non-linear. Thus a Fourier function is applied to estimate initial time paths. The estimated time series of the time-varying intercepts are also shown in Figure 1. A further examination of the figures shows that even if there are structural breaks, all the Fourier approximations seem reasonable and support the notion of long swings in inflation rates.

Figure 1

Time paths of inflation rate and fitted non-linearities for nine Latin American countries

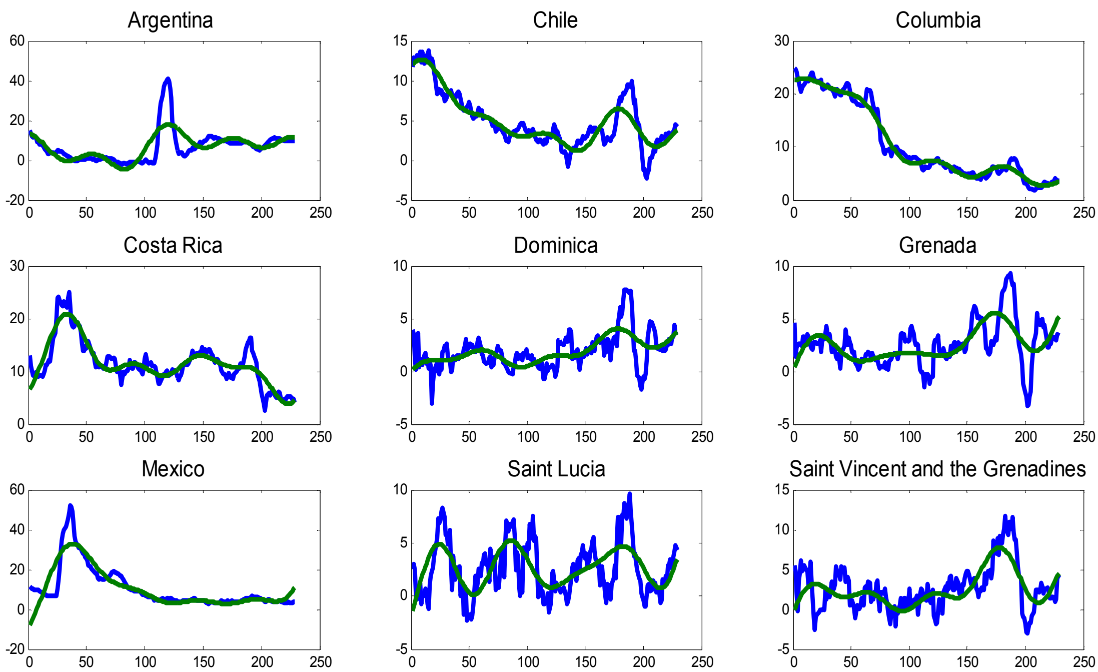

Table 6 reports the estimation results of inflation persistence duration. It is clear that the inflation persistence in the nine Latin American countries demonstrate relatively high levels of duration. Among these countries, the inflation rate of Dominica takes the shortest average time length, i.e. 5.8 months, to return to its equilibrium level after external shocks, followed by Saint Lucia and Saint Vincent and the Grenadines, with

8.5 months and 8.9 months respectively. While Columbia requires the longest average time length, i.e. 99.9 months, to return to its equilibrium level after external shocks.

From the perspective of the countries' central banks and governments, these results are of great significance for the formulation of inflation control policies. Columbia has the largest inflation persistence duration, indicating that it will take 8 years or even longer for the inflation rate of Columbia to return to its equilibrium level if there is no intervention of monetary policy or administrative means. The inflation rate of Columbia declined gradually before 2009, suggesting that the economic situation was worse year by year. However, since 2010 the inflation rate of Columbia has been rising and the economy has been growing fast. Under such circumstances, Columbia authorities successively raised the benchmark interest rate twice to force the economic growth to slow down, but the effect was not obvious. Therefore, the local government can take monetary policy combining credit type and interest rate type to control inflation more effectively. In contrast to Columbia, Dominica takes only 6 months to recover from the influence of external shocks, so the monetary policy can be relatively moderate.

Table 6

Estimation of the Duration of Inflation Persistence

Country	β	Duration	t- statistic	p-statistic
Argentina	-0.037227352	26.86197	-4.21739	0.00002471
Chile	-0.036936771	27.07329	-2.87585	0.00402936
Columbia	-0.010014422	99.85599	-1.47929	0.13906183
Costa Rica	-0.032781372	30.50513	-2.58764	0.00966367
Dominica	-0.171070699	5.845536	-5.29931	0.00000012
Grenada	-0.088994954	11.23659	-3.93567	0.00008297
Mexico	-0.027104655	36.89403	-4.45899	0.00000823
Saint Lucia	-0.117168899	8.534688	-3.74141	0.00018299
Saint Vincent and the Grenadines	-0.112236050	8.909793	-3.65555	0.00025663

V. Conclusion

The aim of this paper is to investigate inflation persistence in Nine Latin American countries over the period of January 1993–January 2012. We employ panel SURKSS unit root test with a Fourier function to assess the inflation persistence in Nine Latin American countries. Empirical results from our panel SURKSS test with a Fourier function indicate that a unit root in inflation rates is flatly rejected for Argentina, Dominica, Grenada, Mexico, Saint Lucia and Saint Vincent and the Grenadines, which suggests that Argentina, Dominica, Grenada, Mexico, Saint Lucia and Saint Vincent and the Grenadines don't show a significant degree of inflation persistence, the deviation from the long-run value following a shock being transitory. On the other hand, Chile, Columbia and Costa Rica show high levels of inflation persistence, and the inflation rate cannot converge towards its long-run value following external shocks in these three countries.

References

Amano Robert. 2007. Inflation persistence and monetary policy: A simple result. *Economics Letters*. 94, 26-31.

Beck, G.W., Hubrich K., Marcellino M. 2009. Regional inflation dynamics within and across Euro Area countries and a comparison with the United States. *Economic Policy*. 24, 141-184.

Beck Guenter W., Hubrich Kirstin and Marcellino Massimiliano. 2009. Regional inflation dynamics within and across euro area countries and a comparison with the United States. *Economic Policy*. January 141-184.

Benati L. 2002. Investigating inflation persistence across monetary regimes. Manuscript, Bank of England.

Benati. L. 2008. Investigating inflation persistence across monetary regimes. *The Quarterly Journal of Economics*. 123, 1005-1060.

Breusch, T.S., Pagan, A.R., 1980. The Lagrange Multiplier test and its application to model specifications in econometrics. *Review of Economic Studies* 47, 239_253.

Breuer J.B., McNown R., Wallace M.S. 2001. Misleading inferences from panel unit-root tests with an illustration from purchasing power parity. *Review of International Economics*. 9 (3), 482–493.

Calvo Guillermo A. 1983. Staggered Contracts in a Utility-Maximizing Framework. *Journal of Monetary Economics*. 12, 383-98.

Chiquiar D., Noriega A.E., Ramos Francia M. 2010. A time-series approach to test a chage in inflation persistence: The Mexican experience. *Applied Economics*. 42, 3067-3075.

Christian Conrad, Thomas A. Eife. 2012. Explaining inflation-gap persistence by a time-varying Taylor rule. *Journal of Macroeconomics*. 34, 419-428.

Christiano Lawrence J., Martin Eichenbaum. Charles Evans. 2001. Nominal Rigidities and the Dynamic Effects of a Shock to Monetary Policy. *NBER Working Paper.* No. 6455.

Coenen G., Wieland V.2005. A small estimated euro area model with rational expectations and nominal rigidities. *European Economic Review*. 49, 1081–1104.

Cogley T., Sargent T.J. 2001. Evolving post-World War II US inflation dynamics. In: Bernanke, B.S., Rotemberg, J.J. (Eds.), *NBER Macroeconomics Annual*, vol. 16. MIT Press, Cambridge, MA.

Chu, H.P., Chang, T., Chang, H.L., Su, C. W. and Young, Y. (2007). Mean Reversion in the Current Account of Forty-eight African Countries: Evidence from the Panel SURADF Test, *Physica A*, 384(2), pp. 485–492.

Driscoll J., Holden S. 2004. Fairness and inflation persistence. *Journal of the European Economic Association*, 2, pp.240–251.

Giannellis Nikolaos, Koukouritakis Minoas. 2013. Exchange rate misalignment and inflation rate persistence: Evidence from Latin American countries. *International Review of Economics and Finance*, 25, pp.202-218.

Gerlach Stefan, Tillmann Peter. 2012. Inflation targeting and inflation persistence in Asia-Pacific'. *Journal of Asian Economics*.,23, pp.360-373.

Fuhrer Jeffrey, Moore George. 1995. Inflation Persistence. *Quarterly Journal of Economics*, 110, pp.127-60.

Fuhrer Jeffrey C. 1995. The Persistence of Inflation and the Cost of Disinflation. New England *Economic Review*, 1, pp.3-16.

Imbs Jean, Jondeau Eric, Pelgrin Florian. 2011. Sectoral Phillips curves and the aggregate Phillips curve. *Journal of Monetary Economics*, 58, pp.328-344.

Kapetanios, G., Shin, Y., Snell, A., 2003. Testing for a unit root in the nonlinear STAR famework. *Journal of Econometrics,* 112, pp.359–379.

Kim Chang Jin, Nelson Charles R., Piger Jeremy. 2004. The less-volatile U.S. economy. *Journal of Business& Economic Statistics*, 22, pp.80-93.

Khan Hashmat. 2001. Price stickiness, inflation, and persistence in real exchange rate fluctuations: cross-country result. *Economics Letters*, 71, pp.247-253.

Le Bihan Herve, Matheron Julien. 2012. Price Stickiness and Sectoral Inflation Persistence: Additional Evidence. *Journal of Money, Credit and Banking*. 44(7).

Levin A.T., Piger J. 2003. Is inflation persistence intrinsic in industrial economies? , Federal Reserve Bank of St. Louis *Working Paper 2002-023B.*

Meller Barbara, Nautz Dieter. 2012. Inflation persistence in the Euro Area before and after the European Monetary Union. *Economic Modelling*, 29, pp.1170-1176.

Pesaran, M.H., 2004. General diagnostic tests for cross section dependence in panels. Faculty of Economics and Politics, University of Cambridge (Unpublished manuscript).

Pesaran, M.H., Ullah, A., Yamagata, T., 2006. A bias-adjusted LM test of error cross section independence. *The Econometrics Journal,* 11, pp.105-127.

Pesaran, M.H., Yamagata, T., 2008. Testing slope homogeneity in large panels. *Journal of Econometrics*, 142, pp.50-93.

Stock J.H. 2001. Comment on 'Evolving post-World War II U.S. inflation dynamics'. *NBER Macroeconomics Annual,* 16, pp.379–387.

Swamy, P.A.V.B., 1970. Efficient inference in a random coefficient regression model. *Econometrica,* 38, pp.311–323.

Taylor John B. 1980. Aggregate Dynamics and Staggered Contracts. *Journal of Political Economy.* 88, 1–23.

Wu Jyh Lin, Lee Hsiu Yun. 2009. A revisit to the non-linear mean reversion of real exchange rates: Evidence from a series-specific non-linear panel unit-root test. *Journal of Macroeconomics*. 31, 591-601.

Zhang Chengsi. 2011. Inflation persistence, inflation expectations, and monetary policy in China. *Economic Modeling*, 28, pp.622-629.