

# Regional Inflation Persistence in the Philippines

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### 1. Introduction

Shocks to inflation tend to push inflation away from the central bank's inflation target range. Hence, understanding the speed of adjustment of inflation back to its long-run trend after a shock—also known as inflation persistence—is essential for monetary policymakers, particularly those whose policy framework is geared towards maintaining price stability.

Persistence may also be viewed as the duration of the shocks that have some bearing on inflation behavior. The Inflation Persistence Network (IPN)<sup>2</sup> of the European Central Bank (ECB) has produced a substantial volume of literature on assessing inflation persistence in the euro area and what factors determine this phenomenon.

Following Willis (2003), we may define inflation persistence as the speed with which inflation returns to baseline after a deviation. More explicitly, the IPN defines inflation persistence as “the tendency of inflation to converge slowly towards its long-run value following a shock which has led inflation away from its long-run value.” Thus, if persistence is high, the speed of adjustment is low, and vice versa.

Inflation persistence has direct and immediate implications for monetary policy. This is because the appropriate response to shocks depends on the degree to which their effect on inflation is persistent (Mehrotra, 2007). For instance, if a prolonged shock has already fed into the public's expectations, then monetary authorities should act to ensure that the subsequent adjustment in prices are kept consistent with monetary policy objectives.

Moreover, for a country as geographically diverse as the Philippines, studying inflation persistence, particularly at the sub-national (regional) level, is useful from a monetary policy point of view. For one thing, institutional differences among regions may not be fully reflected in aggregate output and inflation trends. Differences in inflation persistence might be reflective of the structural rigidities that could reduce each region's capacity to adjust to shocks and the corresponding policy responses.

This paper examines regional or sub-national inflation persistence in the Philippines in order to gain a better understanding of how inflation processes differ at the sub-national level. Identifying which regions have inflation

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<sup>1</sup> The preliminary draft of this paper was presented in the 2nd Asian Research Network workshop of the Bank for International Settlements (BIS), 19-20 January 2009, Cebu City, Philippines.

<sup>2</sup> The IPN is a research team which is composed of economists from the European Central Bank and the national central banks of the Eurosystem studying the patterns, determinants and implications of inflation persistence in the euro area and in its member countries.

rates that are relatively persistent gives important additional information for policymakers in crafting complementary structural policies in regions whose inflationary processes are less responsive to monetary policy. This will enable anti-inflationary policy actions to be more effective in mitigating price pressures.

The structure of the paper is as follows: in Section 2, we present a survey of related literature on regional inflation persistence and the methodology used to examine this phenomenon. Section 3 describes the data and presents the empirical results. Section 4 concludes.

## 2. Survey of Literature on Inflation Persistence

One of the most widely used approaches in examining inertia in sectoral and regional inflation is to apply an Augmented-Dickey-Fuller (ADF) test to a univariate autoregressive (AR) model of a time series representation of inflation. The approach simply tests the presence of a unit root in the inflation series (adjusted for a baseline trend or mean). A unit root is interpreted to be indicative of a high degree of persistence, suggesting further that macroeconomic shocks could lead inflation to diverge from its long-run value or steady-state path.

Vladova and Pachedjiev (2008) measure inflation persistence for all euro area countries and other new member states based on a univariate AR model with a time-varying mean of inflation for each country. Based on the estimated country-specific persistence parameters, the authors conclude that inflation persistence in the major euro-area countries is much lower than those of the new member states. In their study, O'Reilly and Whelan (2004) show that there is relatively little instability in the full-sample estimates of persistence parameters in the euro area inflation process.

Busetti, et al. (2006) use univariate unit root tests to study the convergence properties of prices and inflation for 19 Italian cities at a monthly frequency from 1970 to 2003 and find that all inflation rates of the individual cities have converged or are in the process of converging.

In addition, Cogley and Sargent (2008) present a measure of the inflation-gap persistence in the U.S. and show that this persistence changes following certain breaks in the monetary policy regime. They also show evidence that movements in the inflation-gap persistence emerge more from the multivariate regressions than from the univariate model.

Meanwhile, Levin and Piger (2003) apply both classical and Bayesian econometric methods to characterize the dynamic behavior of inflation persistence for 12 industrial countries by estimating a univariate AR model for each series, while checking for the possibility of structural breaks in the persistence. In their study, they find that high inflation persistence is not an inherent characteristic of industrial economies.

Researchers on the topic, however, note that while univariate unit root tests can contain much information on an individual region's inflation persistence behavior, they find that using panel data and conducting panel unit root tests have a better sample performance than analyzing their univariate time series counterparts, especially if the time series data is rather short (Cecchetti, 2002;

Alberola and Marques, 2004; Mapa, 2008). Nevertheless, panel unit root tests also have their drawbacks. Taylor and Sarno (1998) show that since panel unit root tests are constructed on the premise that all the series in the panel are stationary, then there may be a tendency to overestimate stationarity, as the unit root hypothesis may be rejected too often even if only one series in the panel is stationary. Despite this caveat, panel tests are applied quite extensively in the literature on sectoral and regional inflation persistence.

Cecchetti, Mark and Sonora (2000) analyze price-level behavior among cities in the United States to focus on deviations from the purchasing power parity across cities using panel unit root tests of Levin, Lin and Chu (LLC) (1993) and Im, Pesaran and Shin (IPS) (1996). They find that relative price levels among U.S. cities exhibit a very slow convergence, with an estimated half-life of convergence of approximately nine years. They attribute this to the presence of transportation costs, the inclusion of non-traded goods prices and the different speeds of adjustment to small and large shocks as the most probable factors for the slow rate of convergence.

Weber and Beck (2006), using a similar model by Cecchetti et al. (2000), analyze a panel data of 77 European provinces using monthly year-on-year inflation from 1991 to 2002. The authors conclude that: (a) regional inflation rates do not show smooth convergence; (b) regional inflation rates display internal volatility, in that regions with a high persistence in one time sub-sample can exhibit lower persistence in the next time sub-sample; and (c) the persistence coefficient is quite high for different sub-samples, such that the regions revert to their long-run value of inflation at a rather slow pace.

## 2.1 Methodology

To measure the speed of adjustment of inflation in each of the provincial regions in the Philippines, we test for inflation persistence using a univariate approach. We also exploit the panel dimension of the regional dataset by employing panel econometric tests such as that of Levin, Lin and Chu (1993) and Im, Pesaran and Shin (1996).

The univariate AR process is represented by the form (Vladova and Pachedjiev 2008; O'Reilly and Whelan, 2004; Levin and Piger, 2004; Marques, 2004):

$$Y_t = \alpha + \sum_{j=1}^k \beta_j Y_{t-j} + \varepsilon_t \quad (1)$$

where:  $Y$  = inflation series at time  $t$  (measured as year-on-year growth of monthly inflation)

$\varepsilon$  = random disturbance error term

To see clearly the degree of persistence in terms of the sum of AR coefficients, equation (1) may be re-written as

$$Y_t = \alpha + \rho Y_{t-1} + \sum_{j=1}^{k-1} \delta_j \Delta Y_{t-j} + \varepsilon_t \quad (2)$$

The persistence parameter  $\rho$  of an inflation time series is computed as the sum of the coefficients from the estimated univariate AR(k) time series model.<sup>3</sup> It

<sup>3</sup> The persistence parameter  $\rho = \sum \beta_j$ , and higher-order dynamic parameters  $\delta_j$  are transformations of the higher-order AR coefficients,  $\delta_{k-1} = \beta_k$ .

is interpreted as the speed with which inflation goes back to its equilibrium value after a shock. Put another way, it represents the length of time it takes for the effect of a one-percent rise in inflation due to a shock to dissipate fully.<sup>4</sup>

Or equivalently, equation (2) may be expressed in difference form,

$$\Delta Y_t = \alpha + \varphi Y_{t-1} + \sum_{j=1}^{k-1} \delta_j \Delta Y_{t-j} + \varepsilon_t \quad (3)$$

which is essentially a basic ADF specification to test for the presence of a unit root and where  $\varphi = (\rho - 1)$ . The ADF procedure tests the null hypothesis that the process has a unit root ( $\rho = 1$ ). When  $\rho = 1$ , the inflation series is a random walk, non-stationary, and therefore highly persistent because of autocorrelation with its own lags. Shocks will tend to have long-lasting effects on the behavior of the series in that it may take a long time to converge back to its long-run equilibrium or may even diverge from its long-run path permanently. The intuition behind this is that if  $\rho$  is relatively high (close to unity), inflation will be stubbornly high in future periods during high inflationary regimes while during periods of low inflation, a highly persistent inflation time series will result in consistently low values of inflation (Vladova and Pachedjiev, 2008; Dorsche, 2005; Vaona and Ascari, 2007). On the other hand, if the absolute value of the parameter  $\rho$  is less than 1, then the inflation series is broadly stationary and returns back to its mean. If  $\rho$  is close to 0, the speed of adjustment of the inflation series to its long-run trend is high. Dorsche (2005) notes that for values  $\rho = 0.5$  and below, the inflation series is considered to have a relatively low persistence.

In running the ADF test, the appropriate choice of lag length is crucial as using differing information criteria produce varying lag lengths which, in turn, heavily influences the behavior of the point estimate for  $\rho$ . Vladova and Pachedjiev (2008) suggest that it would be more appropriate if an ADF test was conducted with an automatic selection of lag length (e.g., Akaike information criteria or Schwartz information criteria).

It is worth noting that persistence cannot be measured without knowledge of the long-run path of a stationary inflation time series, typically represented by the mean. As pointed out by Marques (2004), deviations from this long-run path provide the basis for evaluating the persistence of a series. Thus, in order to gauge the behavior of a particular region's inflation in response to a shock, we must know what path inflation would have taken had the shocks not occurred. Meanwhile, a look at the long-run path reveals that changes in the mean are common due to structural breaks (i.e., change in monetary policy regime, significant events). Failing to account for changes in the mean of the series could produce biased estimates of  $\rho$ . Hence, assuming a constant mean implies that the series is insensitive to structural changes in the mean of inflation or to possible changes in the persistence parameter itself.

Levin and Piger (2004) argue that in order to ensure the robustness of the results after accounting for structural changes across time, changes in the

<sup>4</sup> Marques (2004) notes that while the concept of persistence is closely related to the impulse response function (IRF) of the AR process, the IRF is not a useful measure of persistence as it is an infinite-length vector. As such, there is a need to come up with scalar measures of inflation persistence. Among the four known measures of persistence, the sum of AR coefficients was deemed to deliver the best estimates of inflation persistence.

mean of inflation should be taken into consideration. As in Vladova and Pachedjiev (2008), we assume a time-varying mean in order to account for structural breaks and modify equation (3) to include a time-varying mean as follows:

$$\Delta Z_t = \sum_{j=1}^{k-1} \delta_j \Delta Z_{t-j} + (\rho - 1)Z_{t-1} + \varepsilon_t \quad (4)$$

where  $Z_t = Y_t - \mu t$ , or the difference between the inflation series and the time-varying mean. To estimate the time-varying mean, we apply the Hodrick-Prescott (HP) filter to the inflation time series.<sup>5</sup> Then, we used the differential between the inflation series and the HP-filtered series as our input series. Following Cecchetti (2000), we then estimate the half-life of a shock to inflation,<sup>6</sup> which is computed as  $-\ln(2)/\ln(\rho)$ .<sup>7</sup>

After estimating the individual inflation persistence parameters  $\rho$ , we proceed to do panel unit root tests on the panel data set of the 17 regions. We use two types of panel econometric tests for unit root processes, namely, that of Levin, Lin and Chiu (LLC) (1993) and by Im, Pesaran and Shin (IPS) (1996). By using panel unit root tests, we are able to determine whether the 17 regions in the Philippines share a common trend and if they converge back to the common mean after a shock.

The panel estimation takes the following form (Alberola and Marques (2000); and Cecchetti et al. (2000)):

$$\Delta Y_{i,t} = \alpha_i + \theta_t + \sum_{j=1}^{k_i} \beta_{i,j} \Delta Y_{i,t-j} + (\rho - 1)Y_{i,t-1} + \varepsilon_{i,t} \quad (5)$$

where  $\alpha_i$  refers to the individual effects (i.e., differing income levels) while  $\theta_t$  refers to the common time effects.<sup>8</sup> The  $\rho$ ;  $Y_{i,t}$ ;  $\beta_{i,j}$ ; and  $\varepsilon_{i,t}$  are as in equations (1) and (2), pertaining to the  $i$ th region and period  $t$ . In order to eliminate the time effect, Cecchetti, et al. (2000) recommend subtracting the cross-sectional mean of the panel from the individual series.

For both the region by region and panel ADF unit root tests, we will examine the changes of inflation persistence over time by splitting the sample into shorter periods of time and testing the hypothesis about changes in the persistence parameter  $\rho$ .

We take the examination of regional inflation time series data a step further by estimating persistence parameters for food, beverage and tobacco (FBT), fuel, light and water (FLW) and non-food inflation across regions from 1989-2008 (full sample). Persistence in FBT inflation and FLW inflation are analyzed considering that these major items widely accounted for the shocks in overall inflation in recent history.

<sup>5</sup> There are also other ways to proxy a time-varying mean, among the most commonly used are moving average methods and simple averaging.

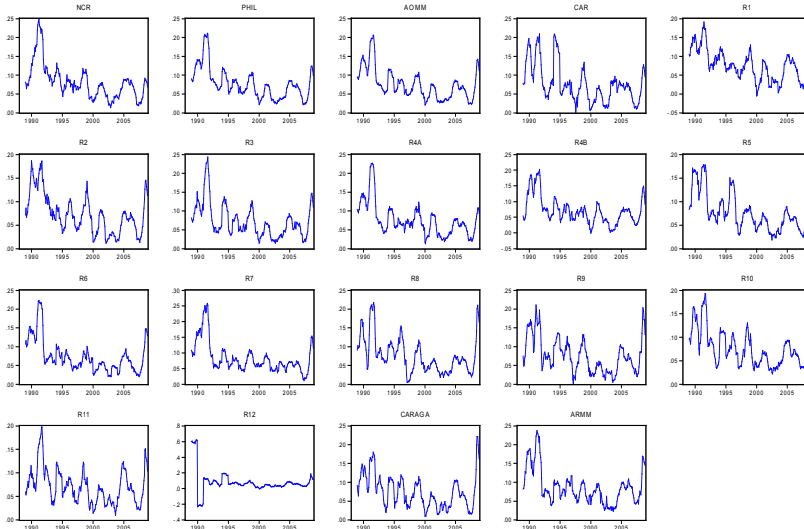
<sup>6</sup> The half-life of a shock (whose value decreases with time) is the time interval required for inflation to return to half of its initial value.

<sup>7</sup> Cecchetti, et al. (2000) applied the half-life estimation to panel estimates of  $\rho$ .

<sup>8</sup> The LLC and IPS tests differ in the treatment of the parameter  $\beta_i$ . The null hypothesis in both of the test procedures is that  $H_0: \beta_i = \beta = 0$  for all  $i$ . However, in the LLC, the alternative hypothesis is  $H_a: \beta_i = \beta < 0$  for all  $i$ , while in the IPS, the alternative hypothesis is  $H_a: \beta_i = \beta < 0$  for some  $i$ . The intuition behind these tests is that the LLC tests whether each region in the panel shares the same AR coefficient, while the IPS tests whether the AR structure varies across regions.

Figure 1

### Regional Inflation, 1989-2008 (Consumer Price Index, 2000=100)



Source of basic data: National Statistics Office

## 3. Data Presentation and Empirical Results

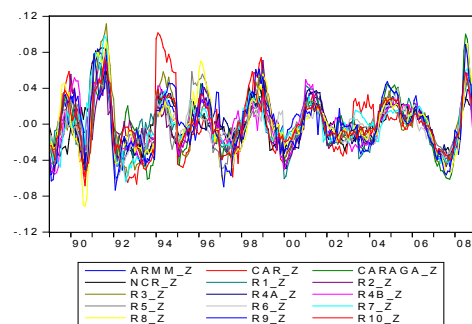
### 3.1 Data Presentation

In our analysis, we examine monthly inflation data, computed as the year-on-year growth in the 17 regional monthly Consumer Price Index series (2000=100) of the National Statistics Office (NSO). The time span covers the period January 1989–November 2008. By graphical inspection (Figure 1), we may divide the sample into three distinct periods. The first period, marked by the high inflation, starts from 1989 until roughly the end of 1993. The second period covers 1994 to 1998 and is characterized by a pronounced downward trend relative to the preceding subsample. The third period is roughly from 1999 to 2007, when inflation exhibited a generally low and stable trend. In 2008, inflation was on an uptrend, brought about by sharp price increases in oil and food. Thus, there is some reason to expect that evaluating inflation persistence under a time-varying mean instead of a constant mean is a more feasible and realistic approach as the former could account for structural breaks and changes in the mean of inflation.

In addition, we also show in Figure 2 the deviations from the long-run value of inflation—as measured by the HP filtered series—of actual inflation to see the duration by which inflation rates tend to revert to their long-run values. Figure 2 suggests that deviations from long-run values appear to have a persistent nature. Deviations of more than

Figure 2

### Regional Deviation of Inflation from Long-Run Trend 1989-2008



Source: authors' own estimates



three percentage points are common and take place in cycles lasting for an average of three years, after which inflation reverts to its long-run value.

### 3.2 Discussion of Test Results

The objective of this section is to gain an understanding of inflation persistence across the 17 Philippine regions; to see which regions exhibit unit root processes; and to assess the degree of persistence over time.

#### 3.2.1 Univariate ADF Test for Regional Inflation

Persistence parameters obtained indirectly from the OLS estimation of the ADF test of the input series as well as the half-life estimates are presented in Table 1 below. We present results for the full sample as well as for four non-overlapping sub-periods of five years each. Thus, the regional data series is broken down into the years 1989-1993, 1994-1998, 1999-2003 and 2004-2008. Each one of the series for the full sample and the sub-samples rejected the null hypothesis of a unit root, suggesting that inflation in the various regions reverts to its long-run value following a shock. The persistence estimates  $\rho$  are generally higher than three-fourths, ranging from 0.73 to 0.93.

In the full sample, the half-life is estimated between 3.0 and 6.3 years on the average. We continue to see high persistence estimates in all the sub-samples but we note a slightly declining pattern overall in the first three time periods. Similarly, the estimated half-life has also been declining, from an average of 4.6 years in 1989:1993 to 4.0 years in 1999:2003. This declining trend appears to reverse during the period 2004:2008, as the half-life

Table 1

Estimates of Inflation Persistence ( $\rho$ ) Using Time-Varying Mean										
Region	Full Sample	Estimated		Estimated		Estimated		Estimated		Estimated
	( $\rho$ )	half-life	$\rho$	half-life	$\rho$	half-life	$\rho$	half-life	$\rho$	half-life
	1989:2008	1989:2008	1989:1993	1989:1993	1994:1998	1994:1998	1999:2003	1999:2003	2004:2008	2004:2008
NCR	0.883	5.556	0.934	10.1	0.785	2.9	0.844	4.1	0.921	8.4
CAR	0.792	2.974	0.751	2.4	0.836	3.9	0.902	6.7	0.903	6.8
Region 1- Ilocos Region	0.832	3.772	0.878	5.3	0.789	2.9	0.781	2.8	0.928	9.2
Region 2-Cagayan Valley	0.810	3.293	0.810	3.3	0.926	9.0	0.885	5.7	0.919	8.2
Region 3-Central Luzon	0.876	5.225	0.805	3.2	0.878	5.3	0.865	4.8	0.903	6.8
Region 4A- Calabrzon	0.895	6.272	0.871	5.0	0.741	2.3	0.880	5.4	0.922	8.5
Region 4B-Mimaropa	0.897	6.350	0.863	4.7	0.733	2.2	0.894	6.2	0.875	5.2
Region 5-Bicol	0.879	5.380	0.794	3.0	0.883	5.6	0.582	1.3	0.888	5.8
Region 6-Western Visayas	0.880	5.399	0.898	6.4	0.863	4.7	0.808	3.3	0.925	8.9
Region 7-Central Visayas	0.872	5.072	0.928	9.3	0.873	5.1	0.832	3.8	0.835	3.8
Region 8-Eastern Visayas	0.892	6.063	0.866	4.8	0.840	4.0	0.843	4.0	0.878	5.3
Region 9-Western Mindanao	0.837	3.895	0.636	1.5	0.887	5.8	0.752	2.4	0.865	4.8
Region 10-Northern Mindanao	0.859	4.572	0.762	2.5	0.846	4.2	0.795	3.0	0.898	6.4
Region 11-Davao	0.854	4.397	0.875	5.2	0.796	3.0	0.781	2.8	0.884	5.6
Region 12-Central Mindanao	0.841	4.009	0.857	4.5	0.815	3.4	0.885	5.7	0.871	5.0
CARAGA	0.859	4.565	0.779	2.8	0.864	4.8	0.861	4.6	0.897	6.4
ARMM	0.836	3.861	0.830	3.7	0.834	3.8	0.714	2.1	0.882	5.5

Source: Authors' estimates



jumped significantly to 6.5 years, in tandem with the point estimate of  $\rho$ , which increased around the neighborhood of 0.89. This trend could be partly linked to the events in 2008, as the exceptionally high price increases in commodities significantly affected regional prices.

### 3.2.2 Panel Unit Root Tests for Regional Inflation

For the LLC and the IPS panel tests (accounting for individual effects), we continue to strongly reject the null hypothesis that all the regional inflation series contain a unit root. This indicates that inflation rates are stationary and go back to the cross-sectional mean of the series, across the time periods considered in the study with the exception of the sub-period 1994:1998. It may be instructive to note that the country experienced a number of generalized shocks in this particular sub-period, particularly the rice crisis in 1995 and the Asian financial crisis in 1997-1998.

In summary, results of the univariate ADF tests and the panel LLC and IPS tests, strongly reject the null hypothesis of the presence of a unit root, implying stationarity. However, the estimates of  $\rho$  indicate that each of the regional inflation rates revert to their long-run value at a very slow rate, with a half-life of around 5 years.

### 3.2.3 Univariate Unit Root Test for Regional Inflation Components

We took the exercise a step further by computing persistence estimates of selected components of the CPI basket of the 17 regions for the period 1989-2008. We obtained an estimated  $\rho$  indirectly by running an OLS estimation of the univariate ADF test on FBT, FLW and non-food inflation for each of the regions. The input series were all adjusted for a time-varying mean. We then grouped the persistence estimates of the regions into the three major island sub-groupings in the country, namely Luzon, Visayas and Mindanao to see which component in the CPI basket exhibits the most persistence. Results are presented in Table 3.

The persistence estimates across commodities and across regions are high, but we get the following impressions: First, Luzon seems to have the most regions with relatively lower persistence in FBT inflation. For one, the two

Table 2

Panel Data Test Results		
Levin, Lin and Chu		
Sample	t-statistic	p-value
1989:2008	-2.348	0.0094
1989:1993	-1.132	0.0017
1994:1998	1.031	0.8488
1999:2003	-2.964	0.0015
2004:2008	-3.413	0.0003

Im, Pesaran and Shin		
1989:2008	-10.977	0.0000
1989:1993	-2.276	0.0114
1994:1998	2.254	0.9879
1999:2003	-3.51	0.0002
2004:2008	-4.212	0

Source: Authors' estimates

Table 3

Panel Data Test Results			
	Food, Beverage and Tobacco	Fuel, Light and Water	Non-food
LUZON			
CAR	0.79	0.77	0.85
NCR	0.69	0.89	0.83
Region 1	0.79	0.87	0.87
Region 2	0.76	0.82	0.88
Region 3	0.82	0.83	0.81
Region 4a	0.88	0.84	0.81
Region 4b	0.84	0.84	0.89
Region 5	0.87	0.82	0.85
Average	0.80	0.83	0.85
VISAYAS			
Region 6	0.82	0.87	0.66
Region 7	0.79	0.84	0.81
Region 8	0.81	0.82	0.84
Average	0.81	0.84	0.77
MINDANAO			
Region 9	0.77	0.84	0.82
Region 10	0.80	0.86	0.82
Region 11	0.87	0.87	0.84
Region 12	0.84	0.84	0.86
ARMM	0.84	0.85	0.82
CARAGA	0.83	0.84	0.82
Average	0.82	0.85	0.83
<b>Average</b>	<b>0.81</b>	<b>0.84</b>	<b>0.83</b>

Source: Authors' estimates

biggest rice-producing regions, namely Region 2 and Region 3 are in Luzon. Region 2 and Region 3's active investment in agricultural activities, allow them to maintain a faster response to price increases in food (Mapa, 2008). At the same time, these regions are predominantly agricultural and have various industries including food processing and machinery production.

Second, FLW inflation is most persistent in the islands of Visayas and Mindanao. This is validated in the observation that the regions in Visayas and Mindanao have exhibited historically high FLW inflation due to higher cost of generation and transmission in these regions.<sup>9</sup>

It is important to note, however, that the univariate ADF tests and the LLC and IPS tests do not allow for the identification of the possible sources of persistence in the regional data. While conclusive explanations for the differences in inflation persistence in the different regions cannot be made, these tests support the observation that the degree of inflation inertia reflects, to a certain extent, the variability of inflation dynamics across the regions and across time periods.

#### 4. Conclusion

In this study, we examined inflation persistence in the Philippines using univariate models of inflation as well as panel unit root tests and applied these tests to regional headline inflation over the period 1989-2008. In the univariate tests, we assessed whether regional inflation reverts back to its long-run value given a macroeconomic shock. In the panel tests we examined whether inflation rates converge back to the common mean in the long run. We also analyzed the persistence behavior of selected commodity groups in the CPI basket of each region using the univariate approach.

Our main results on regional inflation persistence in the Philippines can be summarized as follows: (a) Inflation in the individual regions reverts back to the long-run path after a shock. Estimates of  $\rho$ , however, indicate that mean-reversion takes a relatively long time for most regions; (b) Results of the panel unit root tests suggest that regional inflation rates tend to converge toward the cross-sectional mean in the long run except during periods of generalized shocks, in which case underlying cross-sectional factors (e.g., geography, income development, etc.) could be playing an important role in the regions' inflation processes; and (c) Food inflation appears to have a relatively lesser persistence in the major island of Luzon compared to Visayas and Mindanao. This is not unexpected since food supply and distribution networks are more well-established in Luzon. In addition, fuel, light and water inflation is persistent in the islands of Visayas and Mindanao, possibly reflecting the high distribution costs of electricity in these areas.

The analysis does not identify from time series tests the sources of persistence, but studies focusing on using multivariate models may be a useful area for future research.

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<sup>9</sup> For example, in the Visayas, there are no hydropower plants unlike in Luzon.

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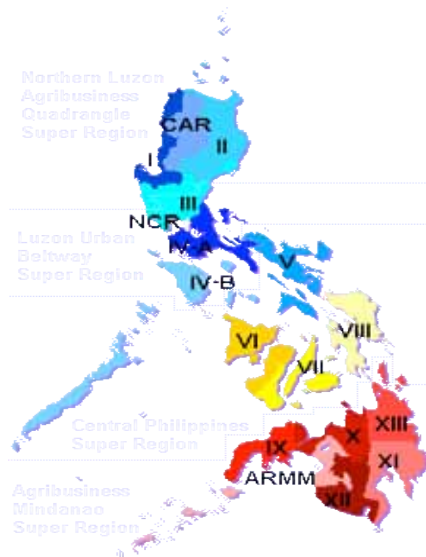
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## Annex A

### 1. Qualitative analysis of commodity price dynamics in Philippine regions

This section offers a qualitative analysis of why regions have higher inflation for some commodity groups while others have slower inflation in other commodity groups. This persistence in regional inflation illustrates the need to look deeper into the regional differences in inflation of several commodity groups in the CPI. The following characteristics of the Philippine economy offer explanations for such a divergence.

**Archipelagic topography.** Since the Philippines is an archipelago, it is naturally costly to transport food and other staples from production centers to the various islands in the country. This is evident in the higher cost of shipping and handling in the country relative to other countries in Asia. A World Bank study (“Philippines: Invigorating Growth, Enhancing its Impact,” May 2007) stated that the Philippines had the highest trading cost in Asia. The study said that expenses related to processing twenty-foot metal containers were at US \$1,336 in the Philippines, compared with US \$335 in China, \$382 in Singapore, and \$848 in Thailand.



Source: [http://philippines-archipelago.com/politics/administrative\\_map.html](http://philippines-archipelago.com/politics/administrative_map.html)

Table A1

Regional CPI Weights		
Philippines	Name of Region	CPI Weight
Regions		100.0
LUZON		
	National Capital Region	30.0
	Cordillera Autonomous Region (CAR)	1.7
	Region I Ilocos Region	4.3
	Region II Cagayan Valley	2.8
	Region III Central Luzon	10.5
	Region IV a CALABARZON	14.6
	Region 4b MIMAROPA	2.0
	Region V Bicol Region	4.7
VISAYAS		
	Region VI Western Visayas	6.3
	Region VII Central Visayas	5.2
	Region VIII Eastern Visayas	2.8
MINDANAO		
	Region IX Western Mindanao	2.1
	Region X Northern Mindanao	3.1
	Region XI Southern Mindanao	3.6
	Region XII Central Mindanao	2.9
	Region XIV ARMM	1.7
	Region XV CARAGA	1.6

Source: NSO, BSP-DER

**Natural and Geographical Endowments.** Regions with more arable land tend to have lower food prices because they have sufficient food supply. Mapa (2008) also pointed out that geography influences food prices, in that regions nearer to the sources of food supply pay cheaper transportation cost and have more access to trade.

Table A2

Per Capita Gross Domestic Regional Product				
1988-2007				
Regions	Name of Region	Mean per capita GRDP (in 1985 pesos)	Mean per capita Growth Rate (%)	Mean per capita RGDP Index (National =100)
1	Ilocos Region	6,607	2.09	53.30
2	Cagayan Valley	6,816	2.13	54.99
3	Central Luzon	10,943	0.69	88.28
4	Southern Tagalog	13,260	0.75	106.97
5	Bicol	5,620	2.12	45.34
6	Western Visayas	10,425	2.6	84.10
7	Central Visayas	11,307	2.31	91.21
8	Eastern Visayas	5,809	1.44	46.86
9	Western Mindanao	8,169	2.83	65.90
10	Northern Mindanao	10,543	1.5	85.05
11	Northern Mindanao	12,069	1.81	97.36
12	Central Mindanao	7,505	0.15	60.54
13	National Capital Region	29,669	2.37	239.34
14	CAR	14,766	3.04	119.12
		12,396	1.73	100.0

Source: National Statistical Coordination Board, Mapa, et al. (2008)

**Level of Economic Development.**The higher the level of development, the easier it is for a region to monitor and anchor prices. Regions with booming economy have more sources of government revenue so they have greater funds for price-stabilizing policies (Mapa, 2008).

**Food CPI.** Since food has a larger weight in the CPI basket of regions outside the NCR, overall inflation in these regions are expected to exhibit more volatility. This is because the food CPI is more easily influenced by supply-side shocks such as weather disturbances, seasonal events, infrastructure damages, and animal diseases, among others. At the same time, the higher costs of distributing food products, which are highly traded, could also explain inflation differentials among regions. For instance, ARMM<sup>10</sup>, CARAGA, Cagayan Valley and the Zamboanga Peninsula which are regions that are far from the big cities such as Manila and Cebu have the highest weights in terms of the food CPI.

**Divergence in input costs such as fuel and electricity.** The higher costs of inputs such as power, fuel and other utilities in the other regions of the country contributed

Table A3

Weight of Food Items in the CPI Basket	
in percent	
Areas	
PHILIPPINES	50.0
NATIONAL CAPITAL REGION	40.2
AREAS OUTSIDE NCR	54.2
Regions	
CAR	51.3
I - Ilocos	55.4
II-Cagayan Valley	59.6
Luzon	53.3
III - Central Luzon	53.3
IVA-Calabarzon	49.7
IVB - Mimaropa	55.7
V - Bicol	56.9
VI - Western Visayas	53.8
Visayas	55.0
VII - Central Visayas	55.0
VIII - Eastern Visayas	57.6
IX - Zamboanga Peninsula	58.8
X - Northern Mindanao	54.2
XI - Davao	53.4
Mindanao	56.4
XII - SOCCSKSARGEN	56.4
XIII - Caraga	58.5
ARMM	63.3

Source: NSO

<sup>10</sup> The Autonomous Region in Muslim Mindanao (ARMM) is the region of the Philippines that is composed of all the Philippines' predominantly Muslim provinces (used to be called Central Mindanao), namely: Basilan (except Isabela City), Lanao del Sur, Maguindanao, Sulu and Tawi-Tawi, and the Philippines' only predominantly Muslim city, the Islamic City of Marawi. The regional capital is at Cotabato City, although this city is outside of its jurisdiction.

to different inflation trends across regions. This could be validated in the observation that all regions outside the NCR have higher Fuel, Light, and Water inflation compared to that of the NCR. The surge in fuel prices in the first half of the year aggravated the costs associated with the distribution of goods and services in many regions of the country.

**Meteorological diversity.** As a consequence of the Philippines being an archipelago and due to geographical diversity, weather disturbances hit some regions harder and thus, affect the prices of fish and agricultural products in these regions more.

**Other factors relating to economic diversity.** Citing geographical diversity, remoteness from the NCR, and diverse endowment of natural resources as possible reasons, the differences in the standard of living also have a significant impact on the price differences among the regions in the country. This is because lower-income regions would generally have lower prices considering lower labor costs in these areas, especially in times of low-inflation regimes. However, in times of rising inflation, lower income regions would generally have higher inflation considering their relatively limited access to services that are meant to arrest rising inflation.

Table A4

Region-Specific Reports Relating to Weather Disturbances in 2008		
Area/BSP Branch/Regional Office	Region	Details
Ilocos	Region I	Typhoons Frank, Helen, Igme affected the prices of fruits.
Western Visayas	Region VI	Typhoon Frank affected the agricultural and livestock industry.
Negros Occidental	Region VI	The commercial fishing industry was affected by typhoon Frank.
Southern Visayas	Region VII	Typhoon Frank affected the prices of fruits and vegetables. The freeze of the vessels of Sulpicio lines also increased transportation costs.
Negros Oriental	Region VII	Typhoon Frank indirectly affected the prices of meat, chicken, and processed foods as the sinking of the MV Princess of the Stars caused a "fish care" and shifted demand from catch fish to these products.
SOCCSKSARGEN	Region XII	Floods affected the agricultural sector.