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An official core inflation measure for the Philippines[1]

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Abstract

Many countries routinely publish a "core" or underlying inflation rate alongside the "headline" inflation rate. In February 2004, the National Statistics Office (NSO) began publishing an official rate of core inflation for the Philippines, defined as the rate of change of headline CPI after excluding selected food and energy items. This paper provides some background in the construction of the new measure and attempts a preliminary evaluation using a few simple statistical tests. The analysis suggests that, compared to alternative measures of core inflation (such as a trimmed mean and weighted median measure), the NSO core inflation measure is more stable but appears to be less correlated with future inflation. This implies that other core inflation measures may also provide useful additional information in the assessment of future price developments. Nevertheless, the NSO core inflation measure is an important step toward addressing the policy need to identify long-term or permanent movements in the path of inflation. The new series will also help build public understanding of both the inflation process in the Philippines and the medium-term orientation of macroeconomic policy.

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"Monetary policy is most effective in the presence of a firmly established nominal anchor, and the more understandable is the anchor to the public the better."

Bernanke, B.S., T. Laubach, F.S. Mishkin, and A.S. Posen [1999] *Inflation Targeting: Lessons from the International Experience*.

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1. Introduction

Many countries routinely publish a "core" or underlying inflation rate alongside the commonly known "headline" inflation rate (which is calculated from the consumer price index or CPI) as a means of distinguishing the permanent, long-run trend of the inflation rate from its transitory movements. Identifying the long-run component of the inflation path is an important aid to economic policymaking. For example, monetary policy, which operates under long and variable lags, strives to maintain a medium-term orientation and seeks to respond only to changes in the long-run path of inflation, rather than to its short-term shocks. As a rule, temporary shocks, despite their impact on the headline rate, tend to be quickly reversed without affecting expectations and thus do not require a policy response from monetary authorities. Central banks, therefore, have a natural use for core inflation indicators in making monetary policy decisions.

In February 2004, the National Statistics Office (NSO) began publishing, alongside the CPI headline inflation rate, an official rate of core inflation, defined as the rate of change of headline CPI after excluding selected food and energy items. The new measure, which is intended as a complementary measure to headline inflation, will be useful in analyzing and predicting the long-run path of inflation in the Philippines.

This paper provides some background in the construction of the recently introduced official core inflation measure for the Philippines. A preliminary evaluation of the new core inflation data, as an input to policymaking and economic analysis, is presented using a few simple statistical tests.

2. Methods for estimating core inflation

The economic literature cites a number of methods for estimating core inflation. Some of the methods are based on economic theory, while others are more computational in nature, requiring the use of econometric and statistical tools. Yet all of them call for some degree of arbitrariness in deciding on how best to capture the underlying long-term inflationary trend. We briefly discuss three methods that were considered in the inter-agency technical discussions that eventually led to the adoption of the new core inflation measure. These are: (1) the exclusion method; (2) the limited influence estimators (LIE); and (3) the model-based estimation methods.

2.1. Exclusion method

The most popular method used in many countries is the exclusion method, which simply excludes a fixed, pre-specified list of volatile CPI components (typically food and energy items) whose short-term behavior tends to diverge from that of the underlying price trend. This method has the advantage of being transparent,

easy to understand by the public, and can be made available at the same time as the headline inflation. Its main disadvantage is that there appears to be no theoretical justification or objective criteria for excluding particular items such as food and energy except for their volatility. Moreover, it is possible that the excluded items may actually contain information that could be useful for predicting the long-term trend in inflation.

2.2. *Limited influence estimators*

Limited influence estimators emerged in the economic literature in the 1990s as an alternative to exclusion-based methods of measuring core inflation. These are statistical measures in which the influence of the values located in the tails of the cross-sectional distribution of price changes is reduced. By symmetrically excluding the largest positive or negative price changes that comprise the CPI inflation rate in each month, LIEs capture the central tendency of inflation over time. Examples of LIEs are: (1) the weighted median and, (2) the trimmed mean measures originally proposed by Bryan and Cecchetti [1994] and Bryan, Cecchetti and Wiggins [1997]. The trimmed mean results from the computation of the mean of a distribution where fixed portions of the tails (e.g., 10 percent in each tail) are removed. The weighted median is simply a trimmed mean in which nearly 50 percent is removed from both tails.

Methods based on LIEs have the advantage of being less subjective or arbitrary than the exclusion method, since the choice of excluded components is made on the basis of their statistical behavior. However, they can also make it more difficult to interpret core inflation in economic terms, since the components of core inflation effectively change every month. Another disadvantage is that such methods are less easily understood by the public, and may therefore be less acceptable to them.

2.3. *Model-based estimates*

Some authors advocate the use of econometric techniques to arrive at a measure of core inflation in accordance with economic theory. Quah and Vahey [1995], for example, link inflation with real output using a bivariate vector autoregression (VAR) model. The estimated regression model is then used to generate monthly estimates of core inflation using actual data for the other variables in the model. More recently, Arrazola and de Hevia [2002], using Spanish data, estimated an "independent inflation rate" (IIR) which is constructed in such a way that its movements are unaffected by contemporaneous variations in relative prices. This method is based on the notion that variations in relative prices reflect the existence of surpluses or shortages in individual markets for goods and may not necessarily represent the underlying path of the general price level. Estimates from these methods tend to be more consistent with economic theory and thus readily submit to economic interpretation. However, the methodology may not be transparent to the public,

since it requires familiarity with econometric techniques. Timeliness may also be a problem since the other data required for estimation may have a longer publication lag compared to the CPI. Core inflation figures may also change when econometric models are reestimated to take account of new time-series data.

2.4. Comparing the core inflation measures

The empirical literature tends to find support for the use of LIE-based and econometric-based measures. Marques, Neves and Sarmento [2001], using US data, find that the trimmed mean and weighted median satisfy testable criteria as leading indicators of future inflation, in contrast to the measure excluding food and energy. Figueiredo and Staub [2002] find that variants of a trimmed mean measure outperform an exclusion-based measure for Brazilian data. Meanwhile, Bautista [2003] conducts a test of statistical conditions for a useful core inflation measure described in Marques et al. [2000] on four measures of core inflation computed from Philippine data: an IIR measure based on Arrazola and de Hevia [2002]; a trimmed mean measure, a weighted median measure, and an exclusion-based (CPI ex-food and energy) measure. He finds that the IIR is the only measure that satisfies all statistical criteria. This echoes the findings of Marques et al. [2002], where tests on exclusion-based core inflation estimates from six developed countries (US, Germany, France, Italy, Spain and Portugal) suggest that they do not appear to be ideal leading indicators for headline inflation.

3. Measures of core inflation in other countries

Generally speaking, the exclusion method is the most common approach used by many statistical agencies and central banks in estimating publicly announced measures of core inflation. Often this would be used in tandem with other measures, such as the trimmed mean and weighted median, which are calculated by central banks for internal purposes as a guide to policy formulation.

The majority of countries define core inflation as the overall price index net of the effects of shocks such as policy changes in taxes, exchange rate, interest rate, and items which exhibit seasonal patterns. The most common items excluded are food and energy due to their supply-side linkages. Canada, for example, excludes food, energy and the effects of indirect taxes, while the US excludes food and energy (Table 1). Thailand's core inflation measure excludes raw food and energy prices, while the United Kingdom and New Zealand exclude only interest rates.

Some Latin American countries use statistically-based approaches. Chile, for example, constructs its core measure by excluding both the largest 20 percent of negative price changes and the largest 8 percent of positive price changes. Meanwhile, Peru excludes nine volatile items—including food, fruits and vegetables, and urban transport—comprising about 21.2 percent of the CPI basket.

4. Choosing an appropriate core inflation measure for the Philippines

In defining an official measure of core inflation, statistical authorities took note of suggestions from Roger [1997] that the core inflation measure should be (1) available for use in a timely manner; (2) robust and unbiased, able to remove unwanted distortions, and should not have a systematically divergent trend from headline CPI; and (3) readily verifiable by anyone in order to have credibility. Authorities also placed a considerable premium on the core inflation measure being easily understandable to both policymakers and the general public. Public understandability was deemed an important consideration in the Philippine setting since core inflation is a new concept being introduced to the public. The new series should also not be subject to frequent and significant adjustments whenever new data are added to the inflation series, in order to establish its credibility with the public.

On the basis of these criteria, authorities agreed on the use of the exclusion method for generating the official core inflation rate for the Philippines. This method was deemed easier to understand compared to the other methodologies and is in accordance with the common international practice of excluding food- and energy-related components of the CPI.

5. An official core inflation measure for the Philippines

The NSO definition of core inflation excludes food- and energy-related CPI components drawn from a ranking of the most historically volatile items in the CPI basket. The analysis was originally carried out before the introduction of the new 2000-base year series for the CPI. Based on the 1994-base year CPI data, the most volatile CPI components were identified based on the largest standard deviations for the sample period 1996-2000 using two-digit (or subgroup level) CPI data from the NSO (Table 2a). Items selected for exclusion were those that are large (i.e., with a CPI weight of greater than 1 percent) and volatile, and whose volatility is not predictable—i.e., their extreme price changes were neither seasonal nor pre-announced, as in the case of regulated items, and thus cannot be factored into forecasts and/or assessments of future inflation.

The set of volatile items originally included *other miscellaneous items*, which comprise 1.0 percent of the CPI basket. However, discussions with the NSO revealed that the extreme price changes observed during the sample period were an aberration, caused mainly by adjustments in the price of sweepstakes (lottery) tickets. *Fish*, comprising 7.54 percent of the CPI, also showed some volatility. However, it was thought that volatility for this item is partly seasonal as well as mostly weather-related and, therefore, very short-term.

Table 1. Core inflation measures in other countries

Country	*Official Core Measure*	*Other Measures Used Internally by Central Bank*
Canada	CPI excluding food energy and indirect taxes	CPI excluding 8 most volatile items (16%) Weighted median Trimmed mean (15%)
Thailand	CPI excluding fresh food and energy (23%)	Trimmed mean (10%)
Australia	Treasury underlying CPI	Trimmed mean Weighted median
New Zealand	CPI excluding interest charges	
Singapore	CPI excluding costs of private road transport and costs of accommodation	CPI excluding volatile items (30%) Weighted median Trimmed mean (15%) Structural VAR
Japan	CPI excluding fresh food	
Peru	CPI excluding 9 volatile items (food, fruits and vegetables, and urban transport, about 21.2 %)	

Table 1. Core inflation measures in other countries (continued)

Country	*Official Core Measure*	*Other Measures Used Internally by Central Bank*
United States	CPI excluding food and energy	
United Kingdom	Retail price index excluding mortgage interest payments (RPIX)	Weighted median Trimmed mean (15%)
Chile	CPI excluding 20% with higher (-) variations and 8% with higher (+) variations	
Colombia	CPI excluding agricultural food, public services, and transport	
Germany	CPI excluding indirect taxes	
Spain	CPI excluding energy and unprocessed food (IPSEBENE)	
Netherlands	ULI minus fruits, vegetables, and energy	
Ireland	CPI (ULI 1) less mortgage on interest payments (MIPS) CPI (ULI 1) less mortgage on interest payments (MIPS)	
Portugal	CPI (ULI) less unprocessed food and energy	

Table 2a. Volatility of CPI components (1994-based series)

	1994=100 CPI weights	*Std dev. of price changes Jan 95–Dec 03*	*Rank*
Other miscellaneous items	1.01	25.3	1
Water	0.73	11.8	2
Fruits & vegetables	5.35	9.8	3
Rice	11.82	8.9	4
Corn	1.23	7.8	5
Transp. & communication	4.81	6.1	6
Light	2.73	5.8	7
Other services	0.00	5.6	8
Fuel	2.27	5.2	9
Eggs	1.17	4.4	10
Recreational	0.44	4.1	11
Misc. Food	10.83	4.0	12
Dairy products	2.51	3.9	13
Educational	2.93	3.5	14
Personal	1.75	3.4	15
Rentals	13.68	3.2	16
Fish	7.54	3.2	17
Household operations	1.61	3.1	18
Personal care & effects	2.74	2.9	19
Cereal preparation	2.95	2.9	20
Meat	7.59	2.8	21
Tobacco	1.49	2.7	22
Medical	2.34	2.5	23
Beverages	2.65	2.4	24
Footwear	0.92	2.3	25
Minor repairs	1.01	2.1	26
Ready made apparel excl. footwear	2.63	2.1	27
Custom clothes	0.12	1.9	28
Household furnishing & equipment	3.16	1.5	29

The release of the new 2000-base year CPI by the NSO in February 2004 prompted discussions on whether authorities needed to draw up a new set of components. Calculations of standard deviations for individual components from the 2000-based series yielded a generally similar ordering compared to the 1994 CPI data (Table 2b). Authorities thus decided to use the excluded items derived from the 1994 series in calculating the 2000-based core inflation.

Table 2b. Volatility of CPI components
2000-based series

	1994 CPI Wts	*2000 CPI Wts*	*Std dev. of price changes 1994-2003*	*Rank*
Other miscellaneous items	1.0	1.0	21.0	1
Communications	0.5	1.9	13.9	2
Oil, gasoline & diesel	0.7	1.3	12.5	3
Kerosene	0.4	0.3	12.2	4
Gas, LPG	0.7	1.3	12.2	5
Water	0.7	0.8	11.3	6
Fruits & vegetables	5.4	5.3	10.1	7
Rice	11.8	9.4	9.2	8
Corn	1.2	0.9	8.0	9
Transportation	3.2	3.8	7.0	10
Light	2.7	3.7	5.5	11
Recreational	0.4	0.4	4.6	12
Eggs	1.2	1.0	4.6	13
Other services	0.0	0.0	4.1	14
Misc. food	10.8	10.6	3.9	15
Dairy products	2.5	2.3	3.8	16
Other lubricants	0.1	0.2	3.4	17
Charcoal	0.1	0.1	3.4	18
Household operations	1.6	1.2	3.2	19
Educational	2.9	3.8	3.1	20
Personal	1.7	2.1	3.0	21
Personal care & effects	2.7	3.3	3.0	22
Cereal preparation	3.0	3.0	2.9	23
Fish	7.5	6.4	2.9	24
Rentals	13.7	15.8	2.7	25
Meat	7.6	7.6	2.6	26
Tobacco	1.5	1.2	2.6	27
Maintenance & repair	0.3	0.3	2.5	28
Medical	2.3	2.1	2.5	29
Firewood	1.0	0.7	2.4	30
Beverages	2.6	2.3	2.3	31
Minor repairs	1.0	1.0	2.2	32
Footwear	0.9	0.9	2.0	33
Ready made apparel excl. footwear	2.6	2.0	1.9	34
Custom clothes	0.1	0.1	1.9	35
Household furnishing & equipment	3.2	1.8	1.5	36

The final list of excluded items and their corresponding CPI weights (2000=100) is shown in Table 3.

Table 3. Components excluded from core inflation
CPI data at subgroup (2-digit) level

	1994-based	*2000-based*
Rice	11.8	9.4
Corn	1.2	0.9
Fruits & vegetables	5.4	5.3
LPG	0.7	1.3
Kerosene	0.4	0.3
Oil, gasoline and diesel	0.7	1.3
Total excluded weights	20.2	18.4

Authorities also agreed that the composition of the list will be reviewed by the NSCB Board and the Technical Committee on Price Statistics (TCPS) whenever the CPI data are rebased.

6. Analyzing the official core inflation measure

This section briefly examines the statistical properties of the official exclusion-based core inflation measure and compares them with the headline inflation as well as a few alternative core inflation indicators.

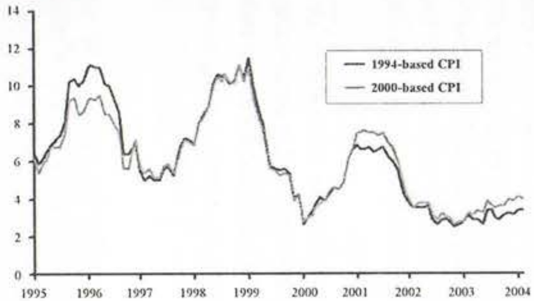
6.1. Historical plot and summary statistics

Figure 1 compares the 1994 and 2000 CPI headline inflation rates with each other and with their respective core inflation (e.g., food and energy) series. The plots indicate that the two headline series display a similar historical path with respect to each other and also their respective core inflation measures.

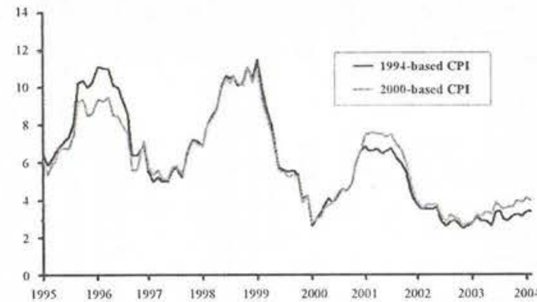
Summary statistics presented in Table 4 show the headline inflation and various measures of core inflation during two sample periods. We compare the official core inflation measure (labeled 'CPI ex food & energy') with a reference or benchmark measure commonly used in the literature, a centered 17-month moving average of the headline inflation rate, along with a trimmed mean, weighted median, and an exclusion-based measure that takes out seven volatile CPI components not limited to food and energy (labeled 'CPI ex-volatile items').

Figure 1. 1994 and 2000 CPI headline inflation rates

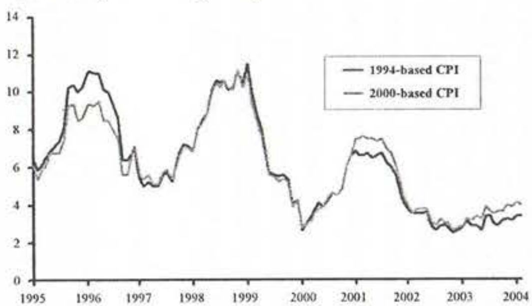
Headline inflation, 1994- and 2000 base years
Year-on-year change in percent



Headline inflation, 1994- and 2000 base years
Year-on-year change in percent



Headline inflation, 1994- and 2000 base years
Year-on-year change in percent



Headline inflation, 1994- and 2000 base years
Year-on-year change in percent

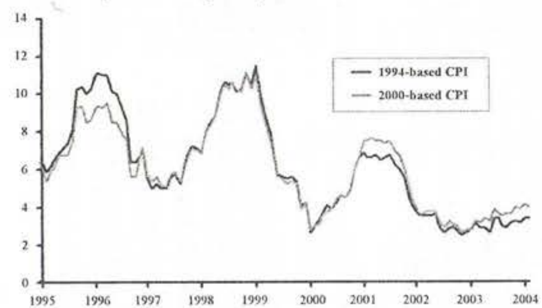


Table 4. Descriptive statistics

	Mean	*Std. dev.*	*Coeff. of variation*	*Skewness*	*Kurtosis*
1994-based CPI data (Sample period: Jan 1994-March 2003; 111 obs)					
Headline inflation	6.8	2.6	38.4	0.1	1.9
CPI ex-food & energy	6.8	2.1	31.2	0.01	2.9
Centrd 17-mo. moving ave.	6.7	2	29.8	-0.4	1.9
15% trimmed mean	4.4	2	46	0	1.9
Wtd. median	6.2	2.6	42.1	0.2	2
CPI ex-volatile items	3.9	1.4	35	0.2	2.7
2000-base CPI data (Sample period: Sep 1995-June 2003; 94 obs)					
Headline inflation	6.3	2.4	38.5	0.2	2
CPI Ex-food & energy	6.3	2.3	36.2	0.5	2.7
Centrd 17-mo. moving ave.	6.2	1.8	29.3	-0.1	2

Mean values indicate that the trimmed mean and the 'CPI ex-volatile items' have a downward bias compared to the 'CPI ex-food and energy' and the centered moving average, which have a mean that is close to that of headline inflation. All core inflation measures except the weighted median show a lower standard deviation compared to the headline rate, suggesting that such core indicators are likely to be more stable. While the 'CPI ex-food and energy' shows the second highest standard deviation value, its coefficient of variation actually ranks second lowest among the five core measures. Furthermore, it comes closest to having a normal distribution, based on indicators of skewness and kurtosis.

LIE estimates from 2000-base year CPI data are unavailable as of this writing, and so we compare instead the exclusion measure with a centered moving average. The exclusion measure shows roughly similar statistics as the headline measure, and has a higher standard deviation than the centered moving average.

6.2. Unit root tests

Augmented Dickey-Fuller (ADF) tests for the presence of unit roots in the different series for both CPI data sets yield sufficiently large ADF statistics that allow us to reject the null hypothesis of a unit root and thereby infer that, along with the headline inflation rate, our core inflation indicators appear to be stationary (Table 5). This finding allows us to analyze predictive ability with respect to headline inflation in the subsections that follow.

Table 5. Augmented Dickey-Fuller (ADF) test

Series	*ADF Statistic*	*No. of Lags*	*Intercept*	*Trend*	*Lag Selection Criterion*
1994-base CPI data (Sample period: Jan 1994 - March 2003)					
Headline inflation	-3.74 *	4	Yes	Yes	None
CPI Ex-food & energy	-3.85 *	5	Yes	Yes	SIC
Centrd 17-mo. moving ave.	-6.72 *	1	Yes	Yes	None
15% Trimmed mean	-3.74 *	5	Yes	Yes	None
Wtd. median	-3.69 *	5	Yes	Yes	HQIC
CPI Ex-Volatile Items	-3.11 *	3	Yes	No	SIC
2000-based CPI data (Sample period: Sep 1995 - June 2003)					
Headline inflation	-3.57 *	5	Yes	Yes	None
CPI Ex-food & energy	-3.13 *	5	Yes	No	AIC
Centrd 17-mo. moving ave.	-5.66 **	2	Yes	Yes	SIC

* (**) denotes rejection of the null hypothesis of the presence of a unit root at the 5% (1%) level. AIC is the Akaike Information Criterion; SIC is the Schwartz Information Criterion; HQIC is the Hannan-Quinn Information Criterion.

6.3. *Correlation with headline inflation*

To examine the ability of our core inflation measures to predict headline inflation, we examine their correlations with various leads of headline inflation (h = 6, 12, 18, and 24 months). In both the 1994-based and 2000-based CPI data sets, the exclusion-based measure fails to outperform the LIEs and the centered moving average (Table 6).

6.4. *Mean square errors*

The ability of the core measures to forecast inflation may be compared in terms of mean squared errors (MSE) at h=6, 12, 18 and 24 months ahead, where

$$MSE = \frac{1}{T}\sum_{i=1}^{T}\left(\pi_t^{CORE} - \pi_{t+h}^{HEADLINE}\right)^2 .$$

A lower MSE is associated with better ability to predict future inflation. The ranking in Table 7 is based on the average of the MSE across all four forecast horizons. The results indicate that the NSO Ex-Food and Energy measure does well in the 1994-base period data set, but not in the new 2000-base year data. In both data sets, none of the core inflation measures are able to outperform the benchmark centered moving average measure.

Table 6. Correlation with π_{t+h}

	h=6	*h=12*	*h=18*	*h=24*
1994-base CPI data (Sample period: Jan 1994-March 2003; 111 obs)				
CPI Ex-food & energy	0.61	0.23	0.09	0.22
Centrd 17-mo. moving ave.	0.74	0.41	0.30	0.51
15% Trimmed mean	0.64	0.19	0.11	0.41
Wtd. median	0.65	0.17	0.12	0.45
CPI Ex-volatile items	0.44	0.04	-0.11	0.00
2000-based CPI data (Sample period: Sep 1995-June 2003; 94 obs)				
CPI Ex-food & energy	0.59	0.03	-0.23	-0.02
Centrd 17-mo. moving ave.	0.70	0.19	-0.03	0.30

Table 7. Ranking of core inflation measures in terms of ability to predict headline inflation, as measured by mean square error (MSE)

	Forecast Horizon				
	h=6	*h=12*	*h=18*	*h=24*	*Ranking*
1994-base CPI data (Sample period: Jan 1994 - March 2003)					
Headline inflation	4.99	11.98	12.66	8.77	4
CPI Ex-food & energy	4.69	9.20	10.80	9.75	2
Centrd 17-mo. moving ave.	3.23	7.06	8.42	6.88	1
15% Trimmed mean	8.05	12.04	12.36	7.80	5
Wtd. median	4.77	11.34	11.86	7.50	3
CPI Ex-volatile items	11.94	13.67	14.11	11.63	6
2000-base CPI data (Sample period: Sep 1995 - June 2003)					
Headline infflation	4.27	11.51	13.98	10.06	2
CPI Ex-food & energy	4.62	10.52	13.40	11.99	3
Centered 17-mo. moving ave.	2.97	7.30	9.19	7.21	1

In sum, the above analysis suggests that the official exclusion-based core inflation measure introduced recently by the NSO is a more stable indicator of inflation. However, as a predictor of future inflation, it does less well compared to alternative core inflation measures such as a trimmed mean and weighted median measure. This implies that alternative core inflation measures may also provide useful additional information in the assessment of future price developments.

7. Concluding remarks

The official core inflation rate recently introduced by the NSO is an important step toward addressing the policy need to distinguish between long-term or permanent movements in the path of inflation and its short-term changes. The new series, which defines core inflation as headline CPI excluding food and energy, will help build public understanding not only of the inflation process in the Philippines, but also of the long-run or at least medium-term orientation of macroeconomic policy. Once the concept of core inflation becomes familiar to, and is duly accepted by, the public, it will become an important component of the macroeconomic policymaking process. In the context of inflation targeting, monetary authorities hope to eventually use the core inflation series as the operational target of monetary policy.

The new series is admittedly far from perfect. The preliminary analysis in this paper suggests that measures derived using alternative methodologies may have better statistical properties, particularly in terms of being able to predict future inflation. This means that policymakers should complement the official exclusion-based measure with internal estimates using alternative methods in assessing the inflation environment. Improvements in the measurement of core inflation in the future offer fertile ground for future research.

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