Some issues in measuring and tracking prices in emerging market economies

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Introduction

Price stability is now generally accepted as a primary responsibility of central banks. However, in carrying out that responsibility, central banks must decide which price indicators are most suitable for monetary analysis. Two types of indicator are particularly relevant: one reflects the overall production of goods and services in the economy, and the other gives insights on the cost of living. In the first group are indicators that measure real GDP and its components, that is, consumption, investment, government spending and net exports. Indicators in the second group, such as the deflator for consumption expenditures in the national accounts and the consumer price index (CPI), focus on consumer spending.

The macroeconomic factors underlying the behaviour of the chosen price indicators must be well understood if the indicators are to be useful for monetary policymaking. Moreover, the chosen indicators must be relatively easy to understand and perceived to be accurate because they will often be used in government programs and contractual arrangements as well as for monetary policy.

This note highlights some of the issues surrounding the choice and use of price indicators through a discussion of the following five topics: (1) alternative price indicators; (2) measurement issues for the CPI, including bias and administered or regulated prices; (3) CPI coverage of owner-occupied housing; (4) pipeline inflation pressures; and (5) inflation persistence, shocks and core inflation.

Alternative price indicators

Measures based on the national accounts

An important source of indicators for inflation are price series based on the national accounts. These prices refer to goods and services *produced* in the entire economy (comprising consumption, investment, government spending and exports less imports). The decomposition of nominal GDP into price and quantities provides information that is essential for policy analysis.

Two issues may be highlighted here. First, precisely how this decomposition is performed has implications for the interpretation and usefulness of these price indicators. In particular, distortions arise in quantity and price measurement from the use of Laspeyres-type quantity indices. Advanced market economies have addressed this by resorting to chain-weighted quantity indices, but these measures are technically more demanding and pose problems of interpretation (see Box 1).

Box 1

Computing national accounts price and quantity indices

Three sets of statistics are usually involved in computing national account price and quantity indices: (1) output at current prices (eg millions of US dollars in sales); (2) output in real quantities (eg tons of steel or barrels of oil produced); and (3) price indices for a variety of products and services. Aggregate quantities are obtained by weighting different types of production volumes by their relative prices. The weights can be interpreted as relative costs of manufacturing or relative utilities of these products for consumers.

Changes in aggregate real output over time are measured by comparing the (price-weighted) sum of quantities in period 0 with that of quantities in period *t*, where the weighting in both periods reflects the price structure of period 0 (Laspeyres quantity or volume index). Changes in price are measured by comparing volume-weighted sums of prices in period 0 with that of prices in period *t*, where the weighting in both periods reflects the production structure of period *t* (Paasche price index). The product of a Laspeyres quantity index and the corresponding Paasche price index is equal to the change in the value, at current prices, of the goods or services between period 0 and 1. That relationship yields the following price-quantity decomposition of nominal GDP:

$$NGDP_t = P_t Q_t = \frac{\sum p_t q_t}{\sum p_0 q_t} \frac{\sum p_0 q_t}{\sum p_0 q_0} \quad (1)$$

where the left-hand side is the index value of nominal GDP (ie GDP at current prices) at *t*, P_t is a Paasche volume-weighted price index corresponding to the first right-hand side term, and Q_t is the Laspeyres price-weighted quantity index corresponding to the second right-hand side term. An implicit price deflator can be obtained from some publicly reported GDP price series (eg the IMF's *International Financial Statistics*) by dividing GDP at current prices by GDP at constant prices. Equation (1) indicates that given a Laspeyres volume index, the implicit GDP deflator would correspond to a Paasche price index in which the quantity weights vary each period.

A shortcoming of the Laspeyres quantity index is that the price weights can increasingly diverge from the current price structure. That is, base weights are in many cases changed infrequently, so as time passes, the year 0 price structure, which provides the price weighting in all periods, increasingly differs from the current price structure, which provides the basis for agent decision-making. The resulting distortions can be considerable, particularly in sectors where relative price changes have been large. For example, Lequiller and Blades (2006, Box 2, p 54) estimate that in France, the Laspeyres quantity series for computers, which reported a cumulative increase in 1980–2000 of 316%, overstated the increase relative to that computed by a chained index by as much as 173 percentage points.

Because of the Laspeyres weakness, statisticians and agencies in a number of industrial countries and in some emerging-market economies have shifted to chain-weighted quantity indices. In this approach, quantities are calculated for every period using prices in the previous period (Laspeyres).[1] These quantities are then "chained" by multiplying each period's quantity by the next. Finally the series are multiplied by the values of these products at the current prices of the reference year. This method produces far better estimates of changes in volume, but volume categories can no longer be added and are therefore much less intuitive. For example, the identity equating GDP to the sum of consumption, investment and net exports no longer holds; instead (appropriately measured) contributions of these components to GDP must be calculated for purposes of analysis.

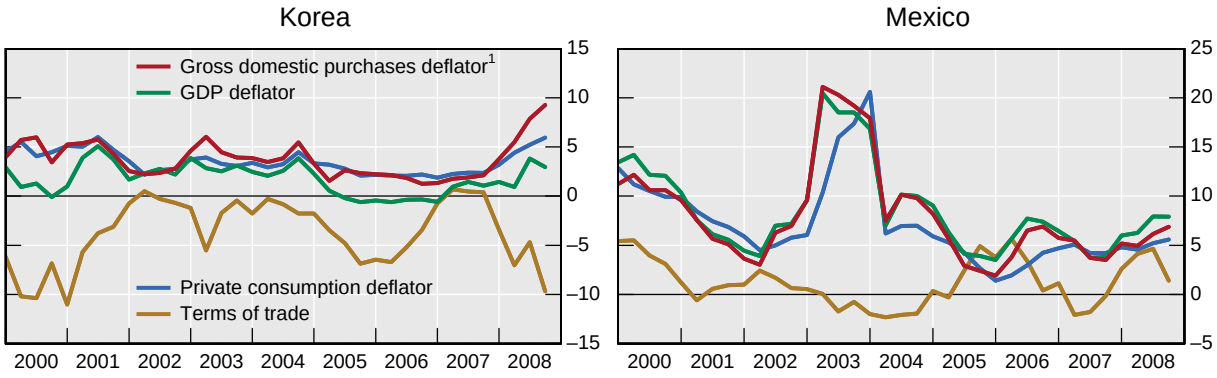
[1] These Laspeyres indices are used by most countries that have switched to chaining. Two exceptions are the United States and Canada, which use an average of the current and previous periods, ie a Fisher index. The latter is a theoretically superior method of estimating volume changes. However, it has the disadvantage of not allowing quantities in the national income accounts to be added in any period. Also, the differences with chained Laspeyres appear to be relatively small.

Second, there is a set of national accounts prices[1] to choose from, including deflators or indices for GDP, domestic demand, consumption or investment. An important consideration is that the behaviour of the various series may differ considerably. For example, a GDP price index or deflator is a natural choice for the analysis of price movements because it refers to the overall production of goods and services of the economy. However, changes in the terms of trade can induce large and counterintuitive changes in the price of GDP. In particular, because imports enter with a negative weight, an increase in the price of imports tends to *lower* the GDP price. Some have argued that policymakers should focus on price measurements that exclude terms of trade effects, such as the gross domestic purchases deflator, comprising consumption, investment and government spending. However, partly due to a desire to address the cost of living discussed below, it has been argued that investment and government spending should be excluded to ultimately focus on consumer spending.[2] Terms of trade changes, and the behaviour of GDP prices and various GDP components are illustrated in Graph 1, with reference to the recent experiences of Korea and Mexico.

Graph 1

Alternative price deflators and the terms of trade

Annual change, in per cent



[1] Gross domestic purchases comprise private consumption, government consumption and total investment.

Sources: Thomson Reuters Datastream; national data.

Since mid-2007, when Korea experienced a deterioration of its terms of trade, the gross domestic purchases and personal consumption expenditures deflators rose above the GDP deflator. The reverse occurred in Mexico, where the terms of trade improved, and the GDP deflator rose above the gross domestic purchases and personal consumption expenditures deflators.[3] These gaps in growth rates among alternative price series are generally temporary and not always large, but they are quite visible over certain periods.

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[1] For a more detailed discussion of national income accounts and deflators, see Lequiller and Blades (2006).

[2] Government spending is often directly related to consumption expenditures so in principle should be retained. In practice there are difficulties in estimating price deflators for government expenditures, so some argue that these should be excluded for purposes of monetary policy analysis.

[3] See related discussions by Desormeaux, Garcia and Soto (2009); Leung, Chow And Chan (2009) and Waiquamdee et al (2009).

Cost of living and consumer prices

Another reason for measuring prices is to assess changes in the cost of living faced by consumers. A cost of living index would attempt to measure what it costs a consumer to maintain a living standard as prices change.[4] This is important because it gives insights into how the population is affected by price changes and can be the basis for indexation schemes to compensate certain groups in society (eg retirees, taxpayers, workers, low income groups) for the erosion in their standard of living caused by price changes. However, the concept of living standards is based on consumer utility or preferences and is therefore unobservable, so changes in a consumer's cost of living cannot be measured precisely. Bearing in mind that price indices that refer to consumer expenditures are at best imperfect indicators of the cost of living, monetary authorities usually must decide whether to monitor consumer prices via the consumption expenditures deflator from the national income accounts or via CPI. A case could be made for the consumption expenditure deflator, as its coverage is generally broader than that of the CPI. However, almost all central banks in emerging market economies (EMEs) responding to a questionnaire use a CPI as their primary price indicator (Table A1).[5] Indeed few of the EME central banks in the survey report using a national income price deflator as a secondary indicator.

The widespread use of the CPI as the major price indicator reflects its perceived advantages. First, it is relatively easy to understand and is arguably the best available measure of the cost of living faced by consumers. The CPI is typically constructed as a weighted average of the prices of a basket of goods and services, with the weights reflecting the relative importance of each item in household consumption in some base period.[6] CPI weights are based on consumer expenditure surveys, while GDP price weights are based on surveys of businesses that provide only indirect estimates of consumption expenditure. Furthermore, GDP price index weights change every period, and the intuition is somewhat harder to explain.

Second, the CPI is familiar to large segments of the population. It is regularly reported in the news media and is often used as a reference in the provision of government benefits or in contracts (including wage negotiations). It is also widely followed as an indicator of macroeconomic stability.

Finally, the CPI is available frequently (typically monthly) and is not subject to many revisions, which enhances its transparency to the public and its usefulness for purposes of monetary policy. In contrast, national accounts prices are typically available only quarterly and with a significant lag. Because national accounts prices are Paasche indices (see Box 1), they are also affected by short-term and medium-term revisions in GDP volumes.

CPI measurement issues

Notwithstanding its advantages, the CPI index poses a number of issues of interpretation.

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[4] For a more thorough discussion, see Schultze and Mackie (2002), pp 46 ff and pp 79–93.

[5] A related measure is a retail price index, which measures prices of goods sold at retail outlets. In Hong Kong, CPI and Retail Price index are highly correlated (Leung, Chow And Chan, 2009, Chart 4).

[6] Revisions of the weights in EMEs are typically made every five years; see IFC (2006).

Measurement bias

EME central banks cite the four types of bias identified in the literature: new-product; quality-change; substitution; and outlet; but the ranking they assign to each varies (Table A2). New-product bias arises because the CPI does not adequately reflect the value of new products to consumers. Quality-change bias arises because quality differences between the goods priced in two consecutive periods cannot be accurately measured. Substitution bias arises because the CPI, which holds weights fixed at base period quantities, puts too much weight on the relatively more expensive items from which consumers have shifted away. Outlet bias reflects the fact that the CPI does not take into account the fact that consumers may switch to discount outlets.[7] Estimates of the size of these biases in EMEs are not widely available, although estimates reported for Colombia, Hong Kong SAR, and Korea (0.7% to 1.7%) appear to be comparable to biases reported in advanced market economies. However, in the Central Bank of Turkey's contribution for this meeting, Yorukoglu (2009) offers reasons why outlet and new-goods biases in particular may be much larger in EMEs than in advanced market economies.

Some EMEs have taken steps to deal with quality bias. However, the products covered vary, ranging from consumer durables or its components, including electronic goods (particularly computers) and cars, to education and apparel. The approaches to adjustment also vary, and include the use of hedonic regressions, adjustments in CPI compilation, and rebasing every five years. A number of countries report that the effects of quality adjustments are small. In some countries, statistical agencies do not provide information about quality adjustments.

Substitution bias is related to the weighting of the price index.[8] CPIs in EMEs are typically constructed with fixed weights that reflect expenditure shares in a base period (Laspeyres indices) and that are updated every 5 years (IFC (2006)). By construction, fixed weights assume no substitution away from high-priced products. During the interval until weights are revised, the effect of substitution bias rises, and the CPI increasingly overstates inflation relative to other indices that address the substitution effect.

One way of dealing with substitution bias is to use averaging methods (eg geometric weights) that make some assumption about substitution effects[9]. Another is to use indices that more closely reflect recent consumer behaviour and expenditures, such as the national account price indices discussed earlier. As noted earlier, in most countries a disadvantage of this solution is that expenditure data are available only with a lag. Furthermore, research on US prices cited by Clark (1999) suggests that the advantages offered by better indexing are small.

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7 For these definitions, see, for example, US BLS (1997).

8 Indeed, one difference between the CPI and a true cost of living index is that the latter explicitly takes into account how consumer spending responds to price changes (ie substitution effects). It is possible, however, to reach certain conclusions about how existing price indices are related to cost of living indices. For example, it can be shown that a base-period cost of living index will not exceed a Laspeyres price index, while a current period cost of living index is always at least as large as the Paasche price index. Furthermore, it may be possible to construct cost of living indices with existing data by making certain assumptions about substitution effects.

9 For example, in 1999, the US CPI converted to a geometric-mean formula for the 61% of the index for which substitution is considered to be realistic. The geometric mean implicitly assumes constant relative expenditure on a given item rather than constant quantity. That is, an increase in the relative price implies a proportionate decrease in the quantity (unitary elasticity of substitution). This geometric-mean formula is used only in creating basic indexes, not in the aggregation of those indexes.

Administered and regulated prices

Administered and regulated prices are heavily influenced by government policies (eg price or quantity controls, subsidies) rather than being set freely in the market (Table A3). The share of administered prices in many EMEs is significant, ranging from about 10% in Saudi Arabia to about 20% in Argentina or Hungary. The sectors covered include energy related items and other utilities (eg fuels and electricity, water and sewage), public transportation, rents, and public services (eg education, postal services).

While administered or regulated prices tend to be rigid and do not vary with the business cycle, recent experience reveals that sudden changes in these prices can induce sharp fluctuations in the CPI. For example, the impact on the CPI of this decade's rise in oil prices was muted in a number of EMEs where price controls or subsidies limited the price increases faced by consumers. However, the fiscal impact of those controls or subsidies became so large that a number of governments were prompted to reduce them resulting in sudden sharp increases in CPI inflation. Most central banks deal with administered prices by excluding them from official measures of core inflation (treated below, in the final section).[10]

CPI coverage of owner-occupied housing

A number of issues pertain to CPI coverage, such as the segments of the population covered and the treatment of hard-to-measure services.[11] But whether and how to include owner occupied housing services in the CPI has attracted a great deal of attention in recent years. Reasons for the concern with owner occupied housing include (1) the large proportion of household expenditures devoted to it;[12] (2) the possible effect of recent boom-bust cycles in home prices that could affect the interpretation of inflation behaviour and purchasing power; and (3) the expectation that Eurostat will incorporate owner occupied housing in the Harmonised Indices of Consumer Prices (HICP) in 2009.

The extent to which the inclusion of owner occupied housing affects measured inflation appears to vary. Christensen, Dupont and Schreyer (2005) report that when using a rental equivalence measure of home costs, the effect is small for France, Japan and the United States. However, simulations suggest that the effect under a user cost approach (applied to Europe), and the effect under approaches for homes that include interest payments, are potentially quite large.

In EMEs, all respondent countries in Table A4 include rental values in the CPI. But although a majority of the EMEs for which responses are available now include owner occupied housing in the CPI, many do not (eg Argentina, Brazil, Chile, Indonesia, Korea, Malaysia, Poland, Russia and Turkey), perhaps because of data constraints and some perceived disadvantages in the measures for such housing.

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[10] However, it may be the case that headline inflation will be more stable than core inflation over some periods because of the effect of regulated prices (see Pesce, 2009, this volume).

[11] For discussion of some of these issues, see ILO (2004).

[12] For example, in Mexico, rental costs have a 2.52% weight in the CPI, but the rental equivalent cost of homes (described later in this section) is nearly 12%. Double-digit weights for homes using rental equivalents or user costs are also reported in Colombia, Israel and South Africa, and are also seen in advanced market economies (Table A4).

Assessing the merits of including owner occupied housing in the CPI is complicated by the fact that there are at least three widely used approaches[13] to their measurement. Some countries (eg Hong Kong SAR, Japan, Mexico, Thailand and the United States) use the *rental equivalence* approach*,* which imputes a rent to such housing. Other countries, such as Canada and China, apply *the user cost* approach*,* which covers various costs of home ownership (eg interest payments on mortgages, depreciation, opportunity cost of alternative investments, unrealised capital gains, repairs and maintenance, taxes and insurance). A third approach, known as the *net acquisition approach*, focuses on the average change in the price paid by a household to acquire a home.[14] Australia uses this approach, and European countries are expected to adopt it soon. It mainly measures the price of newly constructed properties (reflecting transactions between households and other sectors of the economy, and excluding purchases of dwellings from other households) and includes repairs and maintenance costs, insurance, and fees for real estate agents.

Which approach for owner occupied housing is best? It has been argued that the answer depends on whether the goods included in the CPI basket have been "used", "acquired" or "paid" in the base period. For example, the rental equivalence or the user cost approaches to owner occupied housing are appropriate if the CPI goal is to measure the cost of living. The (net) acquisition approach would be appropriate for a CPI that seeks to measure household monetary expenditures (like the HICP used in Europe).[15]

A broader issue is whether the CPI should include *asset prices*, and particularly real estate prices. The rationale is that present and future prices of consumption are relevant in spending decisions, and although future prices are generally not observable, asset prices could provide an indicator. In line with this, some have argued that house prices may be a good approximation of owner occupied housing and should be included in the CPI, particularly to the extent that fluctuations in house price appear to be more closely related to future output growth and future goods and services inflation than do changes in other asset prices (eg equity prices). At this time, no CPI index reported by EMEs in Table A4 includes house prices. However, some central banks do track house prices separately, as these can influence monetary variables, macroeconomic activity and inflation.[16]

A number of implementation issues arise under the three approaches to owner occupied housing listed above.

1. *Data quality*. Indicators that rely on rental (rental equivalence) or house prices (eg net acquisition) require frequently updated, high quality data. Furthermore, the underlying assumption is that rental or housing markets are well developed and relatively free (of government controls). Neither of these conditions may be met in some EMEs.

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[13] A fourth, the payment approach, measures household payments for housing (mortgage interest, alterations and additions etc), but excludes transactions that have no net impact on the household balance sheet (eg down payments, mortgage principal).

[14] See Christensen, Dupont and Schreyer (2005), Table 1. This is regardless of whether they were wholly paid for or used in the period under consideration. Thus, the full value of a dwelling would be included in the CPI, regardless of the timing of its use.

[15] In line with this, the rental equivalence approach to OOH has been rejected by the European Commission because it involves imputation rather than actual transactions, which is not consistent with the HICP approach. For a discussion of the HICP approach, see Diewert (2002).

[16] For example, see discussion of Figure 6 in the paper contributed by the Central Bank of Peru to this meeting, Armas, Vallejos and Vega (2009). For a recent empirical study of links between housing prices and inflation in developed market economies, see Goodhart and Hofman (2008).

2. *Problems of interpretation.* Inclusion of mortgage interest payments in the CPI can raise measured inflation if the central bank raises the policy rate. The effect might be amplified in cases in which variable-rate mortgages or indexation are common. (To avoid this difficulty, the definition used for inflation targeting in South Africa (RPIX) until end-2008 excluded interest payments.) Another issue is whether owner occupied housing indicators based on house prices are misleading. Some approaches (eg net acquisition) require separating the investment component from the consumption component, which may not be feasible. For example, it is argued that excluding land (which is not consumed) is appropriate for the net acquisition approach, but that is hard to do in practice.

3. *Higher volatility*. Measures of owner occupied housing that include interest rates or housing prices may be highly volatile, introducing more noise in the CPI index.

Pipeline inflation pressures and the PPI[17]

Monetary authorities need data that can help predict the behaviour of the CPI, particularly in the short run. An obvious place to start is by tracking the (output) producer price index (PPI), as so-called "pipeline" inflation pressures – that is, changes in the prices producers charge for goods and services – should eventually be reflected in changes in the prices ultimately paid by consumers (the difference would reflect distribution costs). A number of EME central banks monitor the PPI or similar measure as an indicator of inflation (Table A1). Market analysts' commentary also frequently discusses pipeline inflation pressure with reference to the behaviour of the PPI.

One issue is the extent to which the aggregate PPI helps predict CPI behaviour. The two series could diverge for extended periods, as the purposes of the two series are quite different. Items included and corresponding weights in the CPI reflect its focus on demand and consumer spending behaviour. In contrast, the PPI has been designed to measure price changes for domestic goods production and for service transactions for which there is an intermediate demand. In some countries, the CPI coverage of services is much more extensive than PPI coverage, which can cause large divergences in the behaviour of the two series.

An open question is how much the PPI should cover final demand transactions, particularly those involving consumer that form part of the personal consumption expenditures (PCE) portion of GDP. Some argue against this, seeing it as "duplicative and costly" (IMF (2004), p 73, paragraph 3.5).[18] One possible solution is to coordinate surveys for the PPI and the PCE. Also, an implication of the paper by the Bank of Mexico (2009, this volume) for this meeting could be that the tracking or forecasting of CPI behaviour might be an important consideration in PPI design. This criterion might also be a factor in determining how much CPI and PPI coverage of final demand should overlap.

The underlying purpose of the PPI also influences recommended PPI coverage. As noted in the PPI manual (IMF, 2004) a PPI concept associated with output price change which is

[17] The PPI is closely related to, and in many countries is the successor to, the wholesale price index, or WPI. The WPI was developed to measure price changes in markets other than retail. Compared with the WPI, the PPI covers more products and industries and conforms more closely to the System of National Accounts. See Chapter 14 of IMF (2004).

[18] It has also been noted that covering final demand is more feasible when a PPI program is industry based (rather than commodity based) as survey respondents for an industry-based PPI can usually provide data for final demand transactions (as well as for intermediate transactions).

appropriate for GDP deflation will generally include export prices (pertaining specifically to business establishments covered by the PPI) and exclude import prices. In contrast, the CPI, which is more consistent with a (domestic) demand-based index, excludes both, implying that there will be (export price-driven) movements in the PPI that are absent from the CPI. Related differences between production-based and demand-based concepts of inflation were highlighted in our earlier discussion of national account prices (see discussion of Graph 1).[19]

How much divergence is there in practice between PPI inflation and CPI inflation? As illustrated in Graph A1, divergences can be quite large and persistent, as the PPI tends to be much more volatile than the CPI. In this decade, PPI inflation has on average been significantly higher than CPI inflation. Against this, the median correlation between the CPI and the PPI is high in Latin America and other EME regions, and has risen in recent years in Asia (Table 1). However, country detail reveals that the correlation remains quite low in many countries (Table A5).

Table 1

Consumer and producer price inflation in EMEs[1]

EME	2001–08					2007–08
	CPI average	PPI average	CPI standard deviation	PPI standard deviation	Correlation CPI and PPI	Correlation CPI and PPI
Asia[2]	3.0	4.7	2.1	3.8	0.45	0.86
Latin America[3]	5.9	9.6	2.9	7.8	0.81	0.79
Other[4]	6.1	7.8	3.5	4.9	0.80	0.76

[1] Regional figures are the median of the economies listed in each group. Average, standard deviation and correlation coefficients are calculated using the 12-month changes in consumer and producer prices, in per cent. [2] China, Hong Kong SAR, India, Indonesia, Korea, Malaysia, the Philippines, Singapore and Thailand. [3] Argentina, Brazil, Chile and Mexico. [4] Poland, Russia, Saudi Arabia, South Africa and Turkey.

Sources: Thomson Reuters Datastream; national data.

Empirical evidence on the extent to which the PPI can help predict the CPI is mixed. Studies based on US data (Clark (1995); Blomberg and Harris (1995)) find no evidence that the PPI helps predict the CPI. In contrast, the Bank of Mexico's contribution to this volume finds that PPI inflation predicts CPI inflation in Mexico in a cointegrating regression that explains just under 60% (adjusted R-squared) of the variance of CPI inflation.[20] This reflects two improvements in the Bank of Mexico's study compared to earlier studies: the PPI data have been revised in Mexico so that services are included, reducing the divergence between the CPI and the PPI caused by the inclusion of very different items; time series analysis exploits the stationarity of the CPI and PPI series and the cointegration of these two series. Further study of the relationship between the CPI and PPI in EMEs (including analysis of out of sample forecast errors) can yield additional insights.

[19] Administered or regulated prices could also be a source of difference between the CPI and PPI if they apply to one and not to the other. Such prices account for a large share of the CPI in a number of EMEs (Table A3) even in cases in which producer prices are not subject to controls.

[20] The CPI responds to a lagged error-correction term reflecting long-run convergence of the CPI and the PPI.

Inflation persistence, shocks and core inflation

An important challenge for monetary authorities is how to deal with persistence in inflation. Research (eg Angeloni, Coenen and Smets (2003)) indicates that higher inflation persistence amplifies and prolongs the output and inflation effects of a monetary policy shock, and that these effects can be large. Inflation persistence thus implies that monetary policy is more costly and can increase the risk that inflation will interact with expectations and institutional arrangements like indexation, producing undesirable effects such as wage-price spirals. However, the significant decline in inflation in recent decades has alleviated some of the concerns associated with inflation persistence; indeed a recent study finds that inflation persistence is not a major feature of inflation in industrial economies (Levin and Piger (2003)).

Persistence is related to inflation expectations (see Moreno and Villar (2009, this volume)) and particularly to the credibility of the target in an inflation targeting regime (see Central Bank of Chile's contribution to this meeting by Desormeaux et al (2009, this volume)). A study of advanced and emerging market economies (Kuttner and Posen (2001)) indicates that inflation persistence has declined in those EMEs that have formally adopted inflation targeting. However, concerns remain about inflation persistence in EMEs, in part because wage indexation is still significant in some countries (see companion background note). Also, Capistran and Ramos Francia (2006) find that while inflation persistence has declined in a number of countries in Latin America it remains high in others.

A related challenge is to interpret the behaviour of CPI inflation, and its consequences for monetary policy, when it is driven by temporary but possibly persistent external and domestic shocks. For example, as noted earlier, EMEs in recent years have experienced very large terms-of-trade shocks associated with sharp increases in the prices of oil and other commodities that lasted for an extended period (see Graph 1). A special challenge is to determine to what extent shocks to the prices of food commodities reflect cyclical factors or structural changes such as increasing demand due to rising incomes, the effects of globalisation and external demand, and reduced supply due to urbanisation (eg see Vargas et al (2009, this volume) or Yorukoglu (2009, this volume)). An additional consideration is the effects of commodity price shocks on the fiscal position of the government in a commodity exporting country (eg see Al-Hamidy (2009, this volume)). The transmission channels of these shocks are too complex to be identified or quantified informally or through simple pass-through assumptions (the pass-through would vary depending on a variety of factors, as discussed below).

How should these effects be interpreted or dealt with for purposes of policymaking? We highlight two approaches here. One approach is to isolate the effects of temporary shocks to the terms of trade using an economic model (typically a dynamic stochastic general equilibrium model) that can illustrate transmission channels and show how key features of the economy or policy affect the inflation response. For example, Desormeaux et al (2009, this volume) employ a model of a small, open economy (based on Medina and Soto (2007)) to show how CPI inflation responds to an oil price shock under alternative assumptions of monetary policy credibility and to a copper price shock under alternative fiscal rules (Chile is an oil importer and a copper exporter). Their simulations indicate that CPI inflation would rise by more and be more persistent in response to (1) a temporary increase in the oil price when monetary policy is less credible;[21] (2) a copper price increase if fiscal policy is expansionary

[21] To analyse the effects of less monetary policy credibility, the authors assume that "since the oil price shock leads to a temporary increase in inflation ... private agents believe that part of this increase is due to a relaxation of the target by the monetary authority while in fact it is not" (Desormeaux et al (2009, this volume), p 103).

rather than constrained by following a fiscal surplus rule. For another example, Jakab and Karvalits (2009, this volume) show how in a small open economy like Hungary optimal monetary policy will respond to import price (or terms-of-trade) shocks if imports are production inputs but not necessarily if imports are used only in final consumption.

Because it clarifies the impact of shocks and transmission channels in a rigorous way, policy analysis using these types of models is becoming increasingly popular among central banks. However, the methodology is technically demanding and the accuracy of these types of simulation is still uncertain.

The second approach to be highlighted is to focus on measures of core (also called here "underlying") inflation, which exclude or dampen the measured impact of temporary shocks. Three issues surrounding the design and use of core measures warrant particular attention.

The first is *how to measure underlying inflation*. EME central banks typically use statistical techniques that decompose transitory and underlying inflation.[22] However, the precise methods can vary considerably. The most popular approach (Table A6) is exclusion-based, ie a core inflation measure is obtained that excludes items on the basis of a variety of criteria such as volatility (eg raw food and energy), seasonal behaviour (eg raw food), a large effect of indirect taxation, or administered prices (eg energy in a number of countries).

Graph A1 illustrates the behaviour of measures of core inflation in EMEs. Central banks sometimes exclude several items at a time, to focus on a single core inflation series, or alternatively exclude one or few items at a time so that several core inflation indicators are monitored. One limitation of the exclusion approach is that it is not always clear which items, if any, should be removed. For example it has been argued that while demand for commodities from China has put upward pressure on headline inflation in EMEs, the increase in the global supply of manufactured consumer goods originating in China has had the opposite effect. It is then not clear why, when defining core inflation, commodity prices should be excluded while manufactured consumer goods prices are retained. A related difficulty is that the inflation signal from alternative measures of core inflation may differ significantly, and it is not always obvious which one to believe (see Vargas et al (2009, this volume)).

An alternative approach to measuring underlying inflation that is also popular in EMEs is to exclude the upper and lower segments of price changes in the components of headline inflation (trimmed means). The idea is that large relative price changes will be quickly reversed and can therefore be excluded in measuring underlying inflation. However, it has been argued that extreme price movements could contain useful information about future inflation that should be retained.[23]

A second issue is *the usefulness and reliability of measures of underlying inflation as indicators of the trend of headline inflation*. In particular, measures of headline and underlying inflation sometimes diverge for extended periods, raising the question of whether the core measure is indeed capturing the trend in inflation. A related question is which measure of underlying inflation is best as an indicator of the trend in headline inflation. Work by Rich and Steindel (2007) and a number of central bank contributions for this meeting (eg Armas et al(2009); Guinigundo (2009); Kim et al (2009), Leung et al (2009); and Wiesiolek and Kosior (2009)) apply criteria for judging indicators of underlying inflation. These include:

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[22] An alternative is to derive core inflation from an economic model. In this approach, restrictions in a multivariate (empirical) model of aggregate inflation and its determinants separate core from non-core inflation.

[23] For other approaches to measuring core inflation, see the contributions of Leung et al (2009); Wiesiolek and Kosior (2009) in this volume; and Rich and Steindel (2007). The Leung, et al paper discusses in detail the principal components method, which uses constituent items of the CPI to estimate a set of weights that explain the largest part of the variation in headline inflation.

- the transparency of the measure;
- computational effort;
- data consistency (eg the average of the core inflation measure should be close to the average of the headline measure, and the volatility of core inflation should be lower than that of the headline measure);
- information content (an underlying inflation measure that retains more information is preferred);
- cointegration between headline and underlying inflation, in which headline inflation reverts to the underlying rate and not vice versa (ie the underlying or core measure is exogenous); and
- in-sample and out-of-sample forecasting performance.

A third issue is *how the measure of underlying inflation should be used*. It could be argued that comparing a well-defined core inflation measure (one that is a good predictor of headline inflation and that adequately reflects its long-run trend) with the inflation target could be more relevant than comparing headline inflation with the target. In the short run, the gap between headline and target could be very wide but not reflect underlying trends that would be captured the gap between core and target. Indeed, in the Bank of Israel contribution to this meeting, Eckstein and Segal (2009) use a New Keynesian model of a small open economy and a loss function adapted to the Israeli economy and find that a Taylor rule that responds to core inflation is preferable to one that responds to the headline measure. However, all central banks participating at this meeting – with the exception of Thailand – target or focus on headline measures of inflation. Indeed, although measures of core inflation are often published and are monitored regularly, many central banks report that they are mainly for supplementary and internal use.

Why are measures of core inflation not used more often as policy targets? One reason is that headline inflation more accurately reflects the short run effect of prices on the cost of living or purchasing power of households. This is a very important consideration for policymakers and the public at large. Another is that core inflation poses difficulties in communication. For example, it involves additional statistical manipulation and can be defined in a variety of ways; those characteristics can reduce its credibility and its transparency as an indicator of inflation.[24]

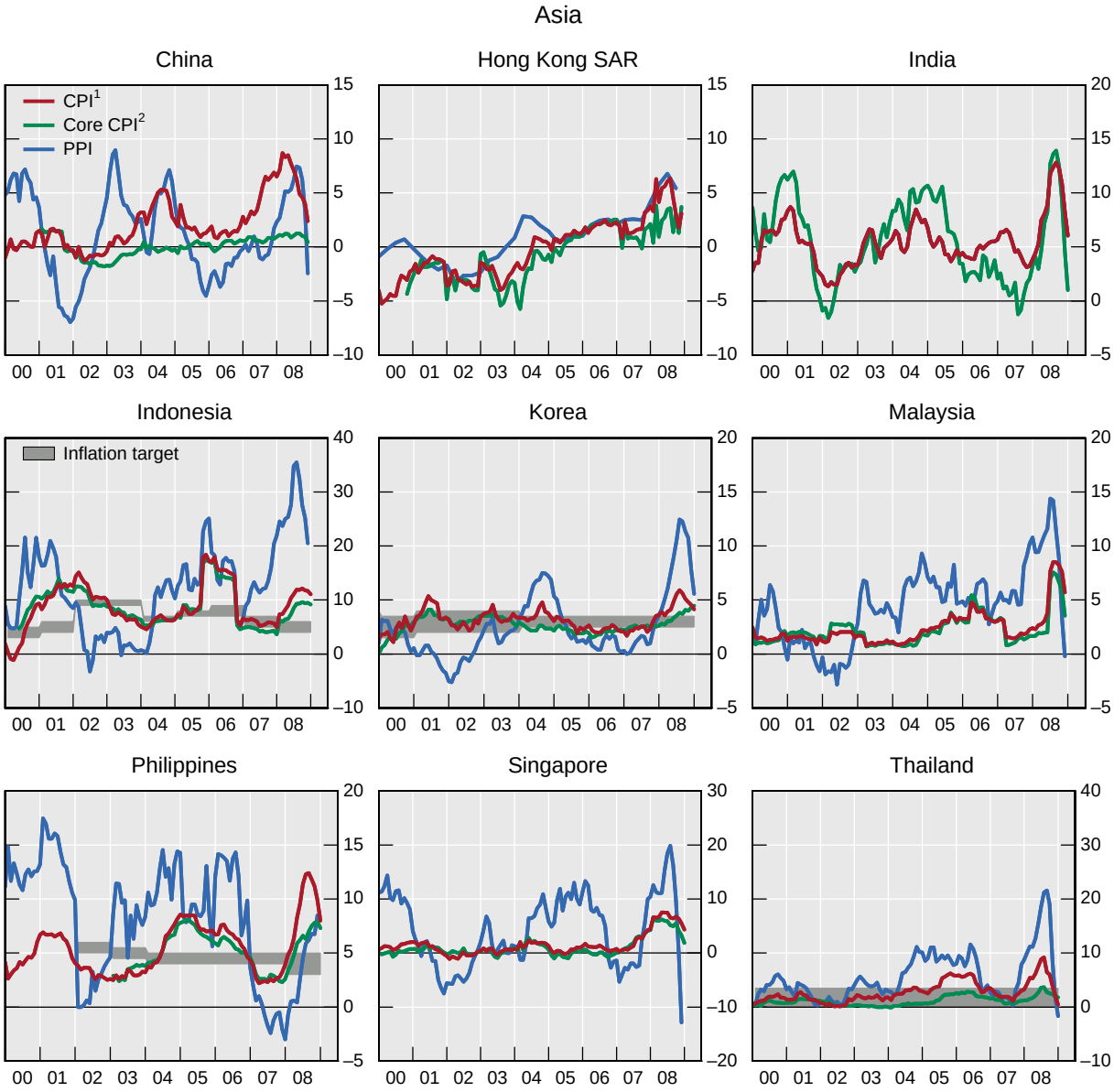
[24] Further discussion of the issues in selecting a measure for core inflation is provided in the Bank of Thailand's contribution to this meeting (see Waiquamdee (2009)).

Annex
Graphs and tables

Graph A1

Price developments

Annual changes, in per cent



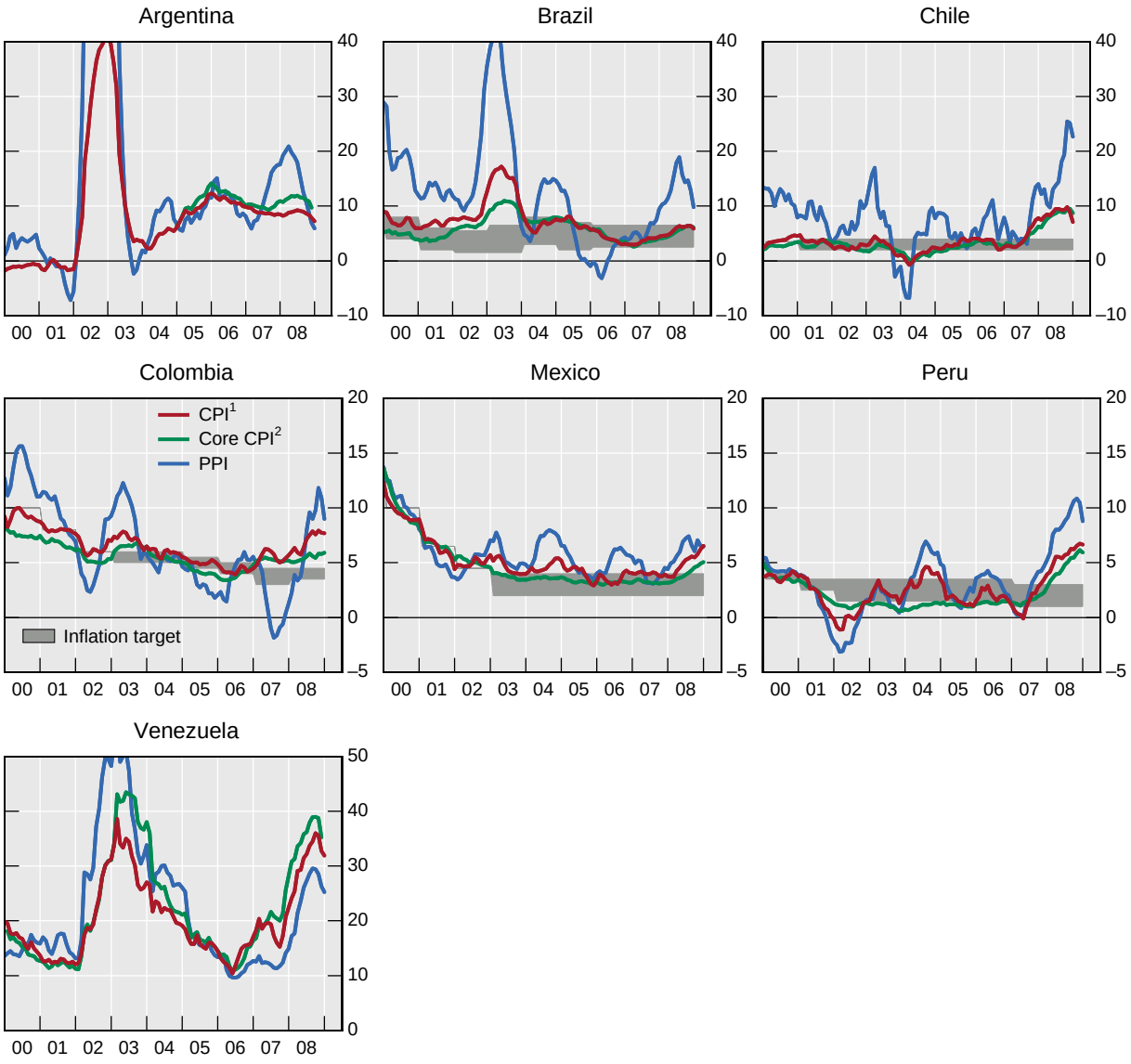
[1] For India, wholesale prices. [2] Data are not comparable across countries due to differences in the scope of items in the core measure: For the Czech Republic, Hungary, Korea and Mexico, core is the OECD CPI non-food non-energy series. For China, Indonesia, Hong Kong, India and Singapore, core consists of BIS calculations excluding food and energy. Official data otherwise.

Graph A1 (cont)

Price developments

Annual changes, in per cent

Latin America

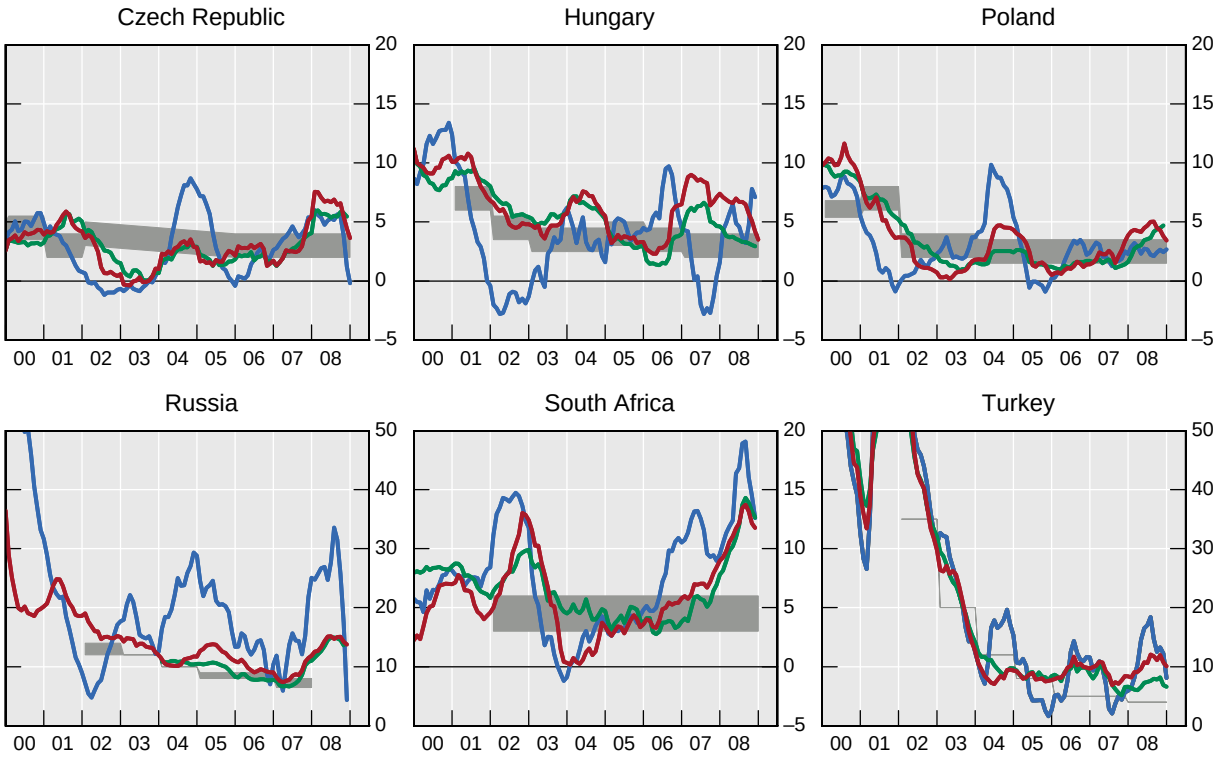


Graph A1 (cont)

Price developments

Annual changes, in per cent

Other emerging economies



Sources: Thomson Reuters Datastream; CEIC; national data.

Table A1

Inflation measures and their use by central banks

Central bank	Inflation measure	Target, objective, guideline, reference rate, indicator, benchmark	Other price indices[1]
Argentina	CPI GBA	Benchmark	Producer price index, construction cost index, export and import prices, GDP deflator, index of commodity prices, CPI for other provinces
Brazil	IPCA	Target	INPC (CPI for low-income population)
			IPC-Fipe (CPI for Sao Paulo – City)
			IGP-DI and IGP-M (general price indices, including CPI, construction index and wholesale price index)
			Import and export prices
Chile	CPI	Target	Producer price index (PPI)
			Wholesale price index (WPI)
China	CGPI (corporate goods price index)		Retail prices
	CPI		Ex-factory price indices of industrial goods
			Purchasing price indices of raw materials
			Fuel and power
			Price indices of investment fixed assets
			Price indices for real estate
Colombia	CPI	Target	PPI (Includes Import Prices)
			Export prices (at the producer level)
			Used/new house prices
			Construction cost index
Czech National Bank	CPI	Target	GDP deflator
			PPI
			Import prices
			Unit labour costs

Table A1 (cont)

Inflation measures and their use by central banks

Central bank	Inflation measure	Target, objective, guideline, reference rate, indicator, benchmark	Other price indices[1]
Hong Kong SAR	CPI	Not used for monetary policy (Objective of HKMA: exchange rate stability through currency board arrangement)	PCE deflator
			GDP deflator
			Rental index
			Retail sales deflator
Hungary	CPI	Target (within inflation targeting framework)	Pensioners price index, constant tax index, HICP
Indonesia	CPI	Target, objective, benchmark	Wholesale price index
			Producer price index
			Construction price index
			Unit value index
Israel	CPI	Target	Unit labour cost indices
			Business sector product deflator
			Import prices
Korea	CPI	Target	Producer price index
			Import price index
			Housing price index
Malaysia	Headline CPI	Benchmark	Producer price index
			Import/export value index
			House prices
Mexico	CPI	Target	PPI
			ITPI (international trade price index).
			CCI (construction cost index)
Peru	Headline CPI	Target (1%–3%)	Wholesale price index
Philippines	Headline CPI	Target	Core inflation
Poland	Monthly CPI, y-o-y, not seasonally adjusted	Inflation target	Agricultural price indices
			Import price index
			Industry, services and construction price indices
			World markets commodities prices
Russia	CPI	Objective	Wholesale price index
			Cost indices
			Import/export prices

Table A1 (cont)

Inflation measures and their use by central banks

Central bank	Inflation measure	Target, objective, guideline, reference rate, indicator, benchmark	Other price indices[1]
Saudi Arabia	CPI	Price stability, financial stability, and exchange rate stability	Wholesale price Index, GDP deflator, non-oil GDP deflator
Singapore	Headline CPI	Both inflation measures are used as a benchmark for monetary policy	Import and export prices
	MAS underlying inflation (CPI excluding private road transport and accommodation costs)		Domestic supply index
			Manufacturer price index
South Africa	1. CPIX up to the Dec 2008 data point	1. Target range between 3 and 6% in CPIX	1. CPIX excl. food and petrol, trimmed mean CPIX
	2. Headline CPI from Jan 2009	2. Target range between 3 and 6% in headline CPI	2. Headline CPI excl. food and petrol, trimmed mean headline CPI
Thailand	Core inflation (CPI excluding prices of fresh food and energy)	Target	• Producer price index • Import/export price index • GDP deflator
	Headline inflation	Guideline/indicator	• Nominal/real unit labour costs
Turkey	CPI	Target	– Producer price index – Import and export prices – World market commodity prices – Unit labour costs
Memo:			
Canada	*CPI*	*Target*	*PCE* *GDP deflator* *Commodity price index*
Euro area – ECB	*HICP*	*Index of reference in the definition of price stability (to compute the euro area average)*	*Producer prices* *National account deflator* *Labour costs* *Unit labour costs* *World market commodity prices*

Table A1 (cont)

Inflation measures and their use by central banks

Central bank	Inflation measure	Target, objective, guideline, reference rate, indicator, benchmark	Other price indices[1]
Japan	*CPI* *Core inflation (CPI excluding fresh food)*	*CPI is the benchmark to assess price stability in the long run* *Core inflation is the benchmark to assess price stability in the current and near future*	*Corporate goods price index (domestic, import, export)* *Corporate service price index* *GDP deflator*
United States	*PCE excluding food and energy*	*Guideline/indicator*	*Producer price index* *Import and export prices*

[1] Refers only to headline inflation; core inflation measures are listed in Table 3.

Source: Questionnaire responses of meeting participants or "Inflation measures from the perspective of monetary policy", IFC (2006), Table 1, p 47.

Table A2

Ranking and estimates of the measurement bias in CPI statistics

Central Banks	Ranking of bias	Estimates (sources)
Argentina	1. New-product; 2. Substitution; 3. Outlet; 4. Quality	...
Brazil	...	...
Chile	...	...
China	...	...
Colombia	...	Substitution bias: 0.7 percentage points 1989–98 (Caicedo, Banco de la República, WP152 (2000))
		Total bias: 1.63–1.69 percentage points, based on Hamilton's methodology applied to the income/expenditure surveys of 1984/85 and 1994/95 (Langebaek and Caicedo, Banco de la República, WP435 (2007))
Czech National Bank	...	...
Hong Kong SAR	Substitution, quality, outlet, new-product	Around 1.0%
Hungary	...	...
Indonesia	1. Quality; 2. Substitution; 3. Outlet; 4. New-product	...
Israel	...	...
Korea	1. Quality; 2. Outlet; 3. Substitution; 4. New-product	0.7 percentage points (Chung et al (2007))
Malaysia	1. Substitution	...
Mexico	1. Quality; 2. Substitution; 3. Outlet; 4. New-product	...
Peru	...	...
Philippines	...	...
Poland	Quality, new-product, outlet, substitution	...
Russia	1. Quality; 2. Substitution; 3. New-product	...
Saudi Arabia	–	–
South Africa	No statistical ranking of biases exists	No estimates of biases exist
Thailand	1. Substitution; 2. New-product and new-outlet; 3. Quality	Very preliminary internal study
Turkey	...	...

Table A2 (cont)

Ranking and estimates of the measurement bias in CPI statistics

Central Banks	Ranking of bias	Estimates (sources)
Memo:		
Canada	*1. Quality (0.15); 2. Substitution (0.15); 3. New-product (0.10); 4. Outlet (0.10)*	*0.58 with a upper bound of 0.75 (Rossiter, 2005)*
Euro area – ECB	*1 Quality and new-product; 2. Substitution*	*1–1.5 (Wynne, 2005)*
Japan	*1. Quality; 2. New product*	*Not yet available*
United States	*1. Quality (0.4); 2. Upper-level substitution (0.3); 3. Measure errors in expenditure weights (0.1); 4. Lower-level substitution (0.05); 5. New-outlet (0.05)*	*0.4–1.5 (Lebow, Roberts and Stockton, 1994)*
		1.0 (Shapiro and Wilcox, 1996)
		1.1 (Boskin Report, 1996)
	The figures in brackets are reported by Lebow and Rudd (2003)	*0.8 (GAO update of Boskin Report, 1999)*
		0.9 (Lebow and Rudd, 2003)

– Not applicable.

... Not available.

Source: Questionnaire responses of meeting participants or IFC (2006).

Table A3

Administered and regulated prices

Central bank	Categories	Weight in CPI	Treatment in assessing inflation
Argentina	Fuels for housing (1.57%), electricity (1.60%), water and sewage services (0.55%), public transport (6.31%), vehicle maintenance (5.31%), postal services (0.08%), phone services (3.70%)	19.1%	Excluded from main official core inflation indicator
Brazil	Housing (water, electricity, gas) (6.14%) Transportation (bus, subway, gasoline, ethanol, vehicle gas etc) (11.71%) Healthcare (medicines and health insurance) (6.21%) Communication (post and telephone) (5.15%) Other (0.40%)	29.62%	...
Chile	Electric power (1.6%); water distribution (1.1%); telecommunications (2.3%); public transport (3.0%); and certain local taxes (2.7%)	10%	Excluded from a central bank measure of underlying inflation
Colombia	Natural gas (home use) 0.60; electric energy 1.46; water, sewage and garbage collection 1.29; urban public transportation 3.81; intermunicipal transportation 0.78; fuel (gasoline, diesel) 1.08	9.04%	All or some regulated prices are excluded from the core inflation measures
Czech Republic	Electricity 3.5%; heating 2.9%; natural gas 2.3%; transport 1.7%; regulated rents 1.6%; health 1.3%	16.4%	A secondary measure of core inflation excludes administered prices. However, monetary policy discussions focus on core inflation without energy and headline inflation net of the impact of indirect taxes

Table A3 (cont)

Administered and regulated prices

Central bank	Categories	Weight in CPI	Treatment in assessing inflation
Hong Kong SAR	Public housing rents in the rental component of the CPI are set and reviewed by the government. Periodic adjustments reflecting the movement in the median household income of the tenants	...	For one-off waivers on property rates, public housing rents and other short-term relief measures implemented by the government, their effects on the headline CPI inflation will be removed in assessing the underlying inflation pressure
Hungary	Energy related items including heating (central heating, natural gas) and electricity (7%); utilities (water, sewerage, refuse collection) 3%; telecom services (4%) and travel-related expenses (local and domestic public transport) 2%; medicines represent an additional 2.5% and regulated house rent 0.4%	21%	The main underlying inflation measure is based on core inflation, which includes traded goods, market services, processed food, alcoholic beverages and tobaccos, covering 65% of the total CPI basket; administered prices are excluded from the core. The calculation of underlying inflation also takes into account the price effects of indirect tax changes (eg VAT rates changed three times in Hungary in the past four years)
Israel	Two groups: controlled prices and supervised prices – Controlled prices: prices in public services such as education (elementary and high school), public health services, public transportation and communications Supervised prices: prices of monopolistically manufactured products such as fuel and dairy products and bread prices	Controlled prices, about 16%; supervised prices, about 4.5%	Because the administered prices are dealt with by various government ministries and are not grouped in a usable manner, the BoI does not adjust its assessments of underlying inflation to take them into account. A project is in progress to collate these prices so that they can be taken into account in inflation assessments

Table A3 (cont)

Administered and regulated prices

Central bank	Categories	Weight in CPI	Treatment in assessing inflation
Korea	Postal and telephone services, 4.12%; electricity, city gas and regional heating charges, 3.67%; medical services, 3.06%; transportation services, 2.73%; tuition(public), 1.14%; water and sewage disposal charges, 0.78%; others, 0.81%	16.31%	City gas charge (weight in CPI, 1.16%), which is an administered price, is excluded in calculating core inflation
Mexico	Administered prices are energy products (gasoline, electricity, propane and natural gas) prices set by the federal government (7.77%) Regulated prices by different government levels: goods and services such as public transportation, telephone service, property taxes, road fees, parking fees, passports and licenses (9.39%)	17.17%	Administered and regulated prices are excluded from the core inflation measure
Peru	Electricity, 2.2%; telephone services, 1.3%; water services, 1.0%	4.5%	Administered prices are excluded from core CPI measure
Philippines	Transportation: the Land Transportation and Regulatory Board regulates the adjustment in land and transportation fares by reviewing and approving petitions filed by transport and consumer groups Utilities: the Energy Regulatory Commission regulates the adjustment in electricity rates by reviewing/approving petitions filed by Meralco	Transportation and communication comprises 7.52% of CPI; light (under fuel, light and water) is 2.35% of CPI.	The BSP regularly and carefully monitors developments as well as the outlook in the petitions for fare and rate increases. Upside risks in higher utility rates as well as transport fares figure prominently in the assessment of the BSP's inflation outlook. Transport fares and utility rates are treated as sensitivity add-ons based on their CPI weights relative to the multi-equation and single equation model baseline

Table A3 (cont)

Administered and regulated prices

Central bank	Categories	Weight in CPI	Treatment in assessing inflation
Poland	Water supply, 1.040%; electricity, 3.767%; natural gas, 1.650%; heat energy, 2.680%; actual rents paid by tenants including other actual rentals, 0.538%; sewage collection, 0.493%; other services relating to the dwelling nec, 0.293%; other services in respect of personal transport equipment, 0.113%; by railway, 0.266%; by road, 0.903%; by air, 0.115%; by sea and inland waterway, 0.010%; combined passenger transport, 0.197%; postal services, 0.042%; telephone and telefax services, 5.121%; fees for TV and radio, 0.419%; other services nec, 0.370%	All administered prices: 18.017%	The NBP's macroeconomic model, Necmod, divides CPI inflation into three components: core inflation, energy prices and food prices. Forecasts from the energy prices equation are then judgmentally corrected to account for administrative decisions (energy prices are the largest component of administered prices). No use has been made of corrections to account for the impact of administrative measures on other inflation sub-indices other than energy The NBP also maintains a disaggregated short-term inflation forecast (unpublished) that directly takes into account many of the administrative measures that influence prices
Saudi Arabia	Main sectors: petroleum products, 6.0%; electricity 3.1%	Less than 10%	SAMA does not issue the inflation index. The CPI and the wholesale price index (WPI) are issued monthly by the Central Department of Statistics and Information. The indices are issued with the relevant detailed information, including the relative shares of the administered prices. Given that the administered prices are usually set for a long period of time, those prices have no upward or downward effect on the underlying inflation

Table A3 (cont)

Administered and regulated prices

Central bank	Categories	Weight in CPI	Treatment in assessing inflation
South Africa	Housing (sanitary fees, refuse removal, assessment rates, water and university boarding fees), 3.57% Fuel and power (electricity and paraffin), 3.21% Medical care (public hospitals), 0.09% Communication (telephone calls, telephone rent and installation, postage, cell phone connection fees and cell phone calls), 2.90% Education (school fees and university, technicons and college fees), (2,70%) Transport (petrol, public transport – municipal buses and trains, motor licenses and registration); and (5,21 %) Recreation and entertainment (television licence) (0,21%)	17.89%	To account for the effect of administered price changes on underlying inflation, the SARB also, when deemed necessary, analyses core inflation excluding administered prices. When deemed necessary, specific administered price increases, such as electricity, may also be excluded from inflation indicators
Thailand	Administered to energy and public utilities (11.1%) and public transportation (4.1%)	Price controls account for 38% of the CPI basket (2007 as base year)	Calculate, and use internally, CPI ex. administered prices
Turkey	Main sectors: public health and transportation services, medicines, government education fees, alcoholic beverages and tobacco products (through tax policies), fuel prices (through tax policies). There are also some minor sub-items, such as lottery games, water fees (set by municipalities), fees for legal services	...	There are special CPI aggregates in Turkey. Some of them are designed to make adjust for administered prices, including the effect of indirect taxes. For example, special CPI aggregate F (CPI excluding energy, alcoholic beverages, tobacco products – the products having administrated prices and indirect taxes) is largely constructed with these considerations in mind.

Source: Questionnaire responses of meeting participants or IFC (2006).

Table A4

The treatment of housing services in the CPI

Central bank	Rental values		Owner-occupied housing		
	Collection practices	Weight (%)	Is OOH included?	Valuation methods for OOH	Weight (%)
Argentina	Survey sample of rented houses	5.37	No	–	–
Brazil	Surveys (1) house to house (not very important); (2) major private rental companies	2.71	No	–	–
Chile	Survey panel of households that pay rent	4.43	No	–	–
China	...	13.00	Yes	User cost	...
Colombia	Sample unit: lessee that pays rent for an apartment, house or room, polled once every four months (ie sample rotates every month in a four-month period) Lessee population is stratified by city and income level according to sample areas	5.06% of CPI basket	Yes	Rental equivalence (impute to the homeowner the percentage change in rental value nearest to the homeowner)	15.06
Czech National Bank	Survey sample of rented houses (net rent, cooperative dwellings)	13.3	Yes	Cost-based (mainly prices of construction work and materials)	9.8
Hong Kong SAR	Public rental values: administrative records Private rental values: Survey	29.86	Yes	Rental equivalence	...
Hungary	Only public rents (administered price), monthly	0.4	Yes	Simple average of house maintenance products and services	5.4
Indonesia	Survey (cost of living and routine survey of prices)	26.2486	No	–	–
Israel	Survey of rental houses	3.97	Yes	User cost approach	16.32
Korea	Monthly survey of tenant households	9.75	No	–	–
Malaysia	Quarterly survey	...	No	–	–

Table A4 (cont)

The treatment of housing services in the CPI

Central bank	Rental values		Owner-occupied housing		
	Collection practices	Weight (%)	Is OOH included?	Valuation methods for OOH	Weight (%)
Mexico	Survey of housing sample divided into six subgroups, each surveyed twice per year	2.52	Yes	Rental equivalence adjusted by construction cost variations	11.97
Peru	Survey in sample of rented houses	2.3	No	–	–
Philippines	Housing and repairs component of CPI (includes only minor repairs and rentals). Rent control is still in effect, an increase of no more than 10% is allowed	16.8	No	–	–
Poland	Actual rent paid by tenants	0.54	No	–	–
Russia	Price survey of households and real estate firms	12.53	No	–	–
Saudi Arabia	Data collected every six months. Data for one-sixth of the rent sample are collected each month	18 (1999 weights)	Yes	Rental equivalence (included in rent weight)	–
Singapore	Rent survey conducted by DOS. Data obtained from relevant public sector agencies	14	Yes	Rental equivalence	...
South Africa	Quarterly visits to rental agencies to track actual rent values for specific houses, flats and townhouses	4.76 (CPIX)	Yes	Rental equivalence (use of interest on home loans discontinued from January 2009)	12.2 (headline CPI)
Thailand	Housing units are surveyed every 6 months on a rotating basis	15.2 (Including rental values and owner-occupied housing)	Yes	Rental equivalence	...

Table A4 (cont)

The treatment of housing services in the CPI

Central bank	Rental values		Owner-occupied housing		
	Collection practices	Weight (%)	Is OOH included?	Valuation methods for OOH	Weight (%)
Turkey	Rent index based on monthly survey of a fixed sample of dwellings. Household budget surveys determine weights	4.74	No	–	–
Memo:					
Canada	*Monthly survey of tenants, based on the framework of the Labour Force survey (15000 dwellings)*	*6.14*	*Yes*	*User cost approach*	*15.98*
Euro area – ECB	*Weighted average of the member states*	*6.321*	*No*	–	–
Japan	*Monthly price survey for selected areas for 22 000 rental units (rotation over time)*	*3.48*	*Yes*	*Rental equivalence*	*13.60*
United States	*Survey to a sample of households (50 000 landlords and tenants)* *Rental values are quality adjusted*	*5.832*	*Yes*	*Rental equivalence*	*23.442*

– Not applicable.

... Not available.

1. Represents the component “Residence”, which contains, among other items, water, electricity and fuels, house construction and decoration materials and house renting. No breakdown is available for the sub-components.

2. Includes rental values but also water, electricity, gas and fuels.

3. Includes rental values, water, electricity, gas and other fuels.

4. Includes rental values and owner occupied housing.

Source: Questionnaire responses of meeting participants or IFC (2006).

Table A5

Consumer and producer price inflation[1]

	2001–08					2007–08
	CPI average	**PPI average**	**CPI standard deviation**	**PPI standard deviation**	**Correlation coefficient of CPI and PPI**	**Correlation coefficient of CPI and PPI**
Asia	3.0	4.7	2.1	3.8	0.45	0.86
China	2.4	0.7	2.5	3.8	0.45	0.50
Hong Kong SAR	0.2	1.0	2.6	2.6	0.87	0.99
India	5.0	5.4	1.8	2.3	0.43	0.86
Indonesia	9.5	12.2	3.7	8.6	0.33	0.80
Korea	3.3	2.6	1.0	3.3	0.65	0.97
Malaysia	2.5	4.7	1.7	3.7	0.45	0.31
Philippines	5.5	7.6	2.6	5.5	0.40	0.86
Singapore	1.6	3.4	2.1	6.6	0.52	0.74
Thailand	3.0	5.9	2.0	4.7	0.87	0.95
Latin America	5.9	9.6	2.9	7.8	0.81	0.79
Argentina	10.3	19.9	10.2	31.6	0.96	0.00
Brazil	7.1	11.8	3.5	10.1	0.84	0.91
Chile	3.7	7.5	2.3	5.6	0.77	0.81
Mexico	4.7	5.4	1.0	1.3	0.46	0.77
Other EMEs	6.1	7.8	3.5	4.9	0.80	0.76
Poland	2.7	2.6	1.8	2.2	0.29	0.30
Russia	13.4	17.5	4.0	6.7	0.17	0.76
Saudi Arabia	2.0	2.8	3.3	3.4	0.89	0.93
South Africa	6.1	7.8	3.5	4.9	0.80	0.73
Turkey	21.0	23.3	18.9	23.1	0.98	0.86
Total EMEs	4.2	5.6	2.5	4.8	0.58	0.80

[1] Average, standard deviation and correlation coefficients are calculated with the 12-month changes in consumer and producer prices, in per cent. Regional figures are the median of the economies listed in each group.

Sources: Thomson Reuters Datastream; national data.

Table A6

Number of core inflation measures and their use by central banks

Central bank	Specific product exclusion measures	Trimmed means or related	Other core inflation measure	Purpose
Argentina	2 (i) Excludes highly volatile items or those with a seasonal pattern; items largely affected by indirect taxation or administered prices (published); (ii) food and energy (unpublished).	...	1 CPI weighted by persistence (Cutler)	Internal use to assess inflationary pressures
Brazil	1 Excluded: administered prices and food at home	3 (i) Excludes percent changes in prices with cumulative weight less then 20% or higher than 80%; (ii) same as (i) but smoothing price increases of some utilities; (iii) excludes percentage changes in prices for which cumulative weight is less than 14.4% or more than 90.4%	...	As an "auxiliary tool" in determining the interest rate For both internal and external communication of monetary policy
Chile	4 All published. Excluded: (i) fruits, fresh vegetables and fuels; (ii) like (i) minus perishable foods, regulated tariffs, indexed prices, financial services; (iii) like (ii) minus all foods; (iv) all food and energy	1 Truncated mean of CPI index	...	Provide a general and robust measure of the trajectory of underlying inflation
China	...	...	...	...

Table A6 (cont)

Core inflation measures and their use by central banks

Central bank	Specific product exclusion measures	Trimmed means or related	Other core inflation measure	Purpose
Colombia	6 Excluded: (i) food; (ii) unprocessed food and utilities; (iii) most volatile items 1990–99 accounting for 20% of the CPI basket; (iv) food and regulated prices; (v) food and energy; (vi) the average of indicators (iii) and (v). First three measures are regularly published.	...	...	Not a target Identify "transitory" or supply shocks Help explain and justify policy decisions to the public Used in CB reaction functions in internal policy simulation models
Czech	2 Excluded: (i)regulated and very volatile prices; (ii) energy	...	...	Monetary policy considerations: to see the evolution of CPI after regulated and very volatile prices are set aside
Hong Kong SAR	1 Excluded: basic food and energy	...	...	Remove the effect of transitory supply shock on general consumer prices
Hungary	1 Excluded: more volatile elements of CPI (traded goods, market services, processed food and alcoholic beverages). Unofficial short-term indices are also calculated from seasonally adjusted core and its components	...	...	To better capture the inflation trend
Indonesia	1 Excluded: administered prices and volatile food	...	...	External communication

Table A6 (cont)

Core inflation measures and their use by central banks

Central bank	Specific product exclusion measures	Trimmed means or related	Other core inflation measure	Purpose
Israel	2 Excluded: (i) food, energy, fruit and vegetables; (ii) like (i) excluding housing	...	...	Analysed internally on a regular basis Starting February 2008 (unofficial) core inflation measures are in policy press release
Korea	3 Excluded: (i) petroleum products and non-grain agricultural products (published National Statistical Office); (ii) petroleum products; (iii) food and energy	1 Trimmed mean (18%)	...	Assess underlying trend of changes in prices and to forecast headline CPI.
Malaysia	1 Excluded: price volatile and price administered items	...	...	External and internal communication of the central bank, economic analysis and monetary policy decisions; forecasts of headline inflation
Mexico	1 Excluded: energy, raw food, administered and regulated prices	...	...	Assess medium term inflation trend External communication
Peru	1 Excluded: most volatile food prices, fuel, utilities, transportation	...	...	Inflation trend measure

Table A6 (cont)

Core inflation measures and their use by central banks

Central bank	Specific product exclusion measures	Trimmed means or related	Other core inflation measure	Purpose
Philippines	1 Net of volatile items. Items excluded: fresh food and oil	2 Trimmed mean; weighted median	...	Official core inflation rate first published by the National Statistics Office in February 2004 (with CPI headline inflation) Exclusion method chosen because: (a) easier to understand (specially by the general public); (b) more transparent and can be replicated by others using CPI data; (c) available at the same time as the headline inflation rate; and (d) in line with international practice
Poland	5 Excluded: (i) administratively controlled prices; (ii) most volatile prices; (iii) like (ii) less fuel prices; (iv) food and energy; (v) food and fuels	1 15% trimmed mean	...	Support decisions of the MPC When the MPC considers core inflation measures in their decisions, that fact appears in the after-meeting statements and minutes Used in forecasting model Necmod and in internal forecasts
Russia	1 Excluded: volatile and administered items	...	...	To eliminate the impact of short-term market shocks and seasonal and administrative factors. Used as a benchmark for monetary policy

Table A6 (cont)

Core inflation measures and their use by central banks

Central bank	Specific product exclusion measures	Trimmed means or related	Other core inflation measure	Purpose
Saudi Arabia	...	...	...	
Singapore	1 Excluded: private road transport costs and accommodation costs	...	...	Internal and external communications. Assessing the persistent part of cost and price pressures Contribute to monetary policy decision process
South Africa	1 Excluded: fresh and frozen meat and fish, fresh and frozen vegetables and fresh fruit and nuts; interest rates on mortgage bonds and overdrafts/ personal loans and property insurance; value added tax	...	...	Capture underlying inflationary pressures, ie the trend in the general price level which reflects the balance between aggregate demand and supply in the economy over the medium term
Thailand	1 Excluded: raw food and energy	...	...	CPI inflation is used as a guideline/indicator; core CPI inflation is the target

Table A6 (cont)

Core inflation measures and their use by central banks

Central bank	Specific product exclusion measures	Trimmed means or related	Other core inflation measure	Purpose
Turkey	9 Excluded: (i) seasonal products; (ii) unprocessed food; (iii) energy; (iv) unprocessed food and energy; (v) energy, alcoholic beverages and tobacco; (vi) like (v), products with administered prices, and indirect taxes; (vii) like (vi), and unprocessed food; (viii) unprocessed food, energy, alcoholic beverages, tobacco products and gold; (ix) food, energy, alcoholic beverages, tobacco products and gold	...	...	All the measures are considered in regular price analysis (sources of change etc) Not used in forecasting
Memo:				
Canada	*2* *Excluded*: *(i) eight most volatile components with adjustments of remaining components for changes in indirect taxes; (ii) food, energy and the effect of indirect taxes*	*...*	*1* *Weighted variance*	*Internal analysis, published in monetary policy report* *Predictive power of core inflation for future headline inflation is limited*

Table A6 (cont)

Core inflation measures and their use by central banks

Central bank	Specific product exclusion measures	Trimmed means or related	Other core inflation measure	Purpose
Euro area – ECB	*2* *Excluded*: *(i) energy and unprocessed food; (ii) energy*	*(1)* *Trimmed means*	*...*	*Used in regular analysis. For external communication, HICP excluding energy and unprocessed food is used. First step of analysis of sectoral inflation developments* *Not considered as a leading indicator for future headline inflation*
Japan	*1* *Excluded*: *Fresh food*	*...*	*...*	*External communications (monthly report)*
United States	*2* *Excluded: (i) food and energy (CPI); (ii) food, alcoholic beverages and energy (PCE)*	*4* *Trimmed mean (CPI, PCE)* *Weighted median (CPI, PCE)*	*...*	*Monitoring and forecasts; in general, non-energy, non-food indices are combined with separate forecast for food and energy to yield a forecast of headline CPI*

– Not applicable.

... Not available.

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