Measuring inflation for industry price determinations

Change in calculation method

Analysis and Policy Development — Information Paper
July 2009
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1 Overview

IPART intends to change the method used to measure general price inflation in industry price determinations. The change is to apply to all future industry price determinations apart from some limited cost indexation arrangements within the transport sector.1

In the past, IPART’s practice has been to use an ‘annual average’ percentage change in the Consumer Price Index (CPI) for this purpose. This involves comparing the average of the four quarterly CPI index numbers for the latest period with the average of the preceding four quarterly CPI index numbers.

With the change, an annual inflation factor will be calculated for future price determinations on a ‘through-the-year’ basis by comparing the CPI index number for the latest quarter with the CPI index number for the corresponding quarter of the previous year as shown in Box 1.1.

Box 1.1 Through-the-year calculation of annual inflation rate

\[
\Delta CPI = \left( \frac{CPI_{Quarter \ 0}}{CPI_{Quarter \ -4}} \right) - 1
\]

CPI: Consumer Price Index* Australian Bureau of Statistics (Cat. No. 6401.0).

a The CPI All Groups Weighted average of eight capital cities is generally used although the Sydney All Groups index is used for certain applications.

The through-the-year method is the more commonly used measure of annual inflation in Australia and is more familiar to the public. It is also a more timely measure of inflation with a smaller legacy of past inflation in its calculation.

At present, the through-the-year measure is lower than the annual average measure but this differential is likely to fluctuate from period to period. For example, the relativities may be reversed in the coming year as the through-the-year measure is boosted by the impacts of particular one-off factors. Over time, differences between the two measures will average out and IPART considers that the change will not give rise to any systematic bias in IPART’s price determinations.

1 The calculation method currently used in the cost indexes for taxis, private ferries and rural and regional buses is not affected by this change.
Under the building block approach, the base revenue requirement for each new determination is independent of previous price caps. The price path is set to generate the required revenue over the life of the determination with annual adjustments to the price path for general inflation and other factors.

Within the transport sector, industry-specific cost indexes are used instead of the building block method to set fares for taxis, private ferries and rural and regional buses. These arrangements are intended to compensate for past costs incurred within those industries and it is not intended to change the annual average calculation method employed in cost indexation for those purposes.

Since this is a technical change with minimal expected impacts, IPART does not intend to undertake a formal round of consultations on this issue. However, IPART will consider any comments or concerns that stakeholders may wish to submit on the change.

In the absence of any substantive objection, IPART will implement the change in the inflation formula progressively commencing with the next determination for each affected industry.

This Information Paper provides an outline of IPART’s review of the inflation factor in industry price determinations and the reasons for making this change.

2 Introduction and summary

Movements in the overall level of prices are important considerations in setting prices in the regulated industries. IPART uses measures of general inflation for a number of purposes in its price determinations.

Under the CPI-X approach used by IPART, prices are set to provide a ‘real return on a real asset base’. Adjustments for inflation are required to determine the real cost of capital, to adjust the regulatory asset base, other costs and revenues and to set the annual escalation factors for price caps during the period of the determination.

IPART has recently reviewed possible approaches to adjusting the cost of capital for inflation and has decided to use swap market data for this purpose.2

Whereas the cost of capital estimate has a ten-year horizon, the other adjustments have a much shorter time span. This review focuses on those shorter term inflation adjustments in the determinations of price caps which are generally set for 4 to 5 years.

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For a few regulated sectors, IPART employs industry-specific cost indexes in place of the building block method. These are composite input price indexes which capture movements in costs impacting on those particular industries.

The next section of this paper outlines the role of the inflation factor in price regulation in more detail. Section 4 compares the alternative growth formulae for calculating annual inflation. Section 5 discusses various measures of underlying inflation that have been proposed to minimise the volatility of the published (or ‘headline’) CPI. Sections 6 and 7 examine alternatives to the CPI and the inflation measures used by others. The final section assesses the relative merits of the alternative inflation measures.

The major findings from this review are:

1. Over the long run, both the annual average and the through-the-year growth formulae produce similar outcomes. Compared with the through-the-year formula, the annual average measure of inflation provides a small decrease in volatility but is less timely (more retrospective).

2. Historically, the annual average measure has tended to be lower than the through-the-year growth rate when inflation is rising and, conversely, to be higher when inflation is falling. However, it is not clear that this pattern will hold over the coming year. The Reserve Bank forecasts that the current downturn in inflation will be interrupted by a temporary rebound in the through-the-year rate due to the effects of large one-off price movements. Those price movements will impact more on the through-the-year rate in the short term.

3. Various measures of ‘underlying’ inflation have been developed to abstract from the volatility of the published CPI. While these measures produce much smoother measures of inflation they are more complex and incorporate arbitrary judgments as to which price components are temporary and which are persistent.

4. During the 1990s, an exclusion measure of underlying inflation developed by the Commonwealth Treasury achieved wide prominence and was adopted as the target measure for the Reserve Bank’s anti-inflation policy at the time. The Treasury underlying inflation index removed a number of items from the published CPI including the prices of fresh food, clothing, government-owned dwelling rents, property rates and charges, the costs of utilities, health services, pharmaceuticals, and interest rate charges. In 1998, the Reserve Bank of Australia switched its inflation target from underlying inflation to the unadjusted (‘headline’) CPI. The Treasury underlying series was no longer published after June 1999.

5. Although technical changes to the CPI in 1998 (specifically the removal of interest charges) were a catalyst for the switch in its inflation target, the Reserve Bank cited simplicity as the main advantage of the change.
6 The current research evidence suggests that methods involving the statistical removal of outliers – such as the Reserve Bank’s trimmed mean and weighted median - are superior to traditional time averaging and exclusion measures of underlying inflation. However, analysts caution that it is unlikely that any single measure of underlying inflation can be held up as the ‘best’ measure at all times.

7 Notwithstanding the change in its inflation target, the Reserve Bank also monitors and publishes a number of measures of underlying inflation for the purpose of assessing inflationary trends. The Bank currently publishes six measures of underlying inflation. Its current preferred indicator is an average of the trimmed mean and the weighted median.

8 The Australian Bureau of Statistics also publishes an additional 15 CPI ‘special’ and ‘analytical’ series.

9 The ABS publishes a number of price indexes in addition to the CPI. These include chain price indexes for Gross Domestic Product, providing economy-wide measures of domestic output price movements, and producer price indexes which measure changes in the prices of goods and/or services purchased by or sold by various industries. It is also possible to construct a ‘composite’ price index as a weighted combination of the published indexes or of their components.

10 The through-the-year formula is more widely used than the annual average measure to calculate annual inflation in Australia and in many other countries. Nonetheless, the annual average measure is popular in Europe and in Japan.

11 The choice among the options involves balancing timeliness, stability and simplicity. While no individual inflation measure satisfies all the criteria of an ideal inflation factor for industry price determinations, the through-the-year CPI measure is, for most applications, considered to be the simplest option with the advantages of relative timeliness and a high level of credibility and familiarity to the public.

12 However, in the case of taxis, private ferries and rural and regional buses, the continued use of the annual average method for cost indexation is considered to be consistent with the specific objectives of those arrangements.
3 The role of the inflation factor in price regulation

IPART uses a form of incentive regulation known as CPI-X to set maximum prices. With this approach, IPART estimates the amount of revenue a regulated business requires in each year of the determination period using the building block revenue methodology. Given forecast demand, prices are set to generate the required amount of revenue in the first year. At the same time, IPART calculates the amount by which these prices can rise or fall in each subsequent year of the period, to account for movements in general inflation, efficiency improvements and significant changes in the operating environment such as new environmental standards or customer service standards.

Regulators usually set the value of the general inflation factor based on the most recently available historical data. It could be argued that the inflation factor should in principle be forward-looking to replicate the operation of competitive markets. If so, the use of historical data as indicators of future inflation (instead of using forecasts) can be justified for the following reasons:

- in many situations, past inflation is a reasonable predictor of future inflation
- forecasting inflation is complex, time consuming and open to dispute
- forecasting may require error correction which adds to complexity and regulatory uncertainty.

On the other hand, it can be argued that the use of historical price information serves to compensate regulated entities for past increases in costs. CPI indexation clauses in many commercial contracts are intended to preserve the real value of a price or other monetary value set at the beginning of the contract.

Under the building block approach, the base revenue requirement for each new determination is, however, independent of previous price caps. Prices are set to generate the required revenue in the first year and are adjusted in subsequent years for general inflation and other factors.

An important part of regulation is to encourage the regulated businesses to achieve the efficiency targets implied in the building block approach. CPI-X means that once the revenue requirement is determined within a year, prices are escalated for subsequent years by general price inflation measured by the CPI index, modified by an X-factor (representing positive or negative adjustments to prices, above or below general price rises).

3 The building block methodology is the main method used by economic regulators in Australia and overseas for determining prices for monopoly services. Alternative approaches include the use of index based approaches such as total factor productivity or data envelope analyses to determine X-factors.

The CPI-X approach provides an incentive to the business to pursue efficiencies because for the regulatory period they retain the benefits in full of any efficiency gains through higher profits (compared to their profits if they had not achieved these efficiencies). If the agency better the efficiency target allowed in the revenue build-up, actual profits will be higher than the rate of return allowed in the revenue build-up. If the agency does not achieve the expected efficiency improvements the reverse applies.

It is through the separation of actual revenues from actual costs and profits once the CPI-X price path has been set that provides the incentives for the achievement of efficiency improvements in the delivery of the business’ services to customers.

For some purposes IPART uses measures of sectoral inflation rather than general inflation. Historical cost indexes incorporating specific input prices affecting taxis, private ferries and rural and regional buses are used for setting fares in those industries. These cost indexes are intended to measure, in percentage terms, how much the overall cost of providing services in those industries has changed in the year since IPART’s previous review.

4 Comparison of alternative growth formulae

In calculating an annual inflation factor for price determinations, IPART’s past practice has been to use an ‘annual average’ percentage change in the Consumer Price Index (CPI)\(^5\). This involves comparing the simple (arithmetic) average of the four quarterly CPI index numbers for the latest year with the average of the preceding four quarterly CPI index numbers. For example, the annual average percentage CPI increase for the year ending March 2009 is calculated as follows:

\[
\Delta CPI = \left( \frac{CPI_{Jun2008} + CPI_{Sep2008} + CPI_{Dec2008} + CPI_{Mar2009}}{CPI_{Jun2007} + CPI_{Sep2007} + CPI_{Dec2007} + CPI_{Mar2008}} \right) - 1
\]

The annual average formula is sometimes referred to as the ‘year-on-year’ approach.

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\(^5\) The CPI All Groups Weighted average of eight capital cities is generally used although the Sydney All Groups index is used for certain applications (Australian Bureau of Statistics Cat. No. 6401.0).
Alternatively, an annual inflation factor can be calculated on a ‘through-the-year’ (known also as ‘year-ended’ or ‘quarter-on-quarter’) formula by comparing the CPI index number for the latest quarter with the CPI index number for the corresponding quarter of the previous year. For example, the through-the-year percentage CPI increase for the year ending March 2009 is calculated as follows:

\[
\Delta CPI = \left( \frac{CPI_{Mar2009}}{CPI_{Mar2008}} \right) - 1
\]

Figure 4.1 and Table 4.1 compare the statistical features of these two inflation measures using rolling annual growth rates calculated from the published quarterly index levels over the past 25 years. They show that:

- Over the long run, the two growth formulae produce similar outcomes on average. In the 25 years to March 2009, average inflation was 3.9 per cent per annum on both measures.

- Both measures are cyclical. The cyclical patterns are similar except that the annual average measure lags cyclical swings in the through-the-year inflation measure.

- The intrinsic time lag in the annual average formula reduces the timeliness of the incoming data. This may reduce its relevance as an indicator of future inflation.

- The annual average measure has tended to be lower than the through-the-year growth rate when inflation is rising and, conversely, to be higher when inflation is falling.

- The annual average measure provides a small reduction in volatility (the statistical dispersion or variability of measured inflation). The standard deviation of the annual average measure (2.48) is 3.7 per cent lower than the standard deviation of the through-the-year measure (2.58).\(^6\)

\(^6\) Measured over the past ten years, however, the standard deviation of the annual average measure is 19.5 per cent lower than the through-the-year measure.


Figure 4.1  Comparison of annual CPI inflation rates: 25 years to March 2009

![Graph comparing annual CPI inflation rates]

**Note:** Rolling annual growth rates based on quarterly data.

**Data source:** ABS 6401.0.

Figure 4.2 compares the statistical distributions of the two measures graphically in the form of a box plot of CPI inflation rates over the past 25 years. While there is not a large reduction in the range between the maximum and minimum inflation rates, the interquartile range for the annual average measure is narrower (3.04 percentage points compared with 4.03 percentage points for the through-the-year growth measure) suggesting a greater concentration in the middle part of the distribution.

With inflation now in decline, the annual average growth in CPI inflation (3.9 per cent based on the March quarter 2009 data) is currently higher than the rate derived from the through-the-year method (2.5 per cent). The Reserve Bank is expecting a significant but gradual decline in underlying inflation over the next two and a half years. However, this does not mean that the through-the-year rate will continue to be less than the average annual rate over the foreseeable future. The Reserve Bank is forecasting that through-the-year inflation over that period will be volatile as a result of significant movements in a few CPI components:

- the large falls in petrol prices and the ABS estimate of deposit and loan facilities prices from their peaks in the September quarter 2008 will together subtract up to 2 percentage points from inflation in the year to the September quarter 2009 when through-the-year CPI inflation is expected to fall to below 1.5 per cent
- the fall in through-the-year inflation will, however, be partially reversed as these particular effects drop out of the calculation of the annual rate by early 2010.

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7  The interquartile range is the difference between the 75th percentile (the upper quartile) and the 25th percentile (the lower quartile) of the distribution of CPI changes.

The Reserve Bank has forecast a rise in through-the-year inflation from an estimated rate of 1.5 per cent in the year to June 2009 to a rate of 2.5 per cent in the year to June 2010.\(^9\)

### Table 4.1 Comparison of annual CPI inflation rates: 25 years to March 2009

<table>
<thead>
<tr>
<th></th>
<th>Annual average formula (A)</th>
<th>Through-the -year formula (B)</th>
<th>Difference (A) – (B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of observations</td>
<td>100</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Average % pa</td>
<td>3.94</td>
<td>3.89</td>
<td>0.06</td>
</tr>
<tr>
<td>Median% pa</td>
<td>3.22</td>
<td>3.06</td>
<td>0.16</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>2.48</td>
<td>2.58</td>
<td>-0.09</td>
</tr>
<tr>
<td>Kurtosis(^a)</td>
<td>-0.66</td>
<td>-0.62</td>
<td>-0.04</td>
</tr>
<tr>
<td>Skew(^b)</td>
<td>0.63</td>
<td>0.66</td>
<td>-0.03</td>
</tr>
<tr>
<td>Max % pa</td>
<td>9.32</td>
<td>9.77</td>
<td>-0.45</td>
</tr>
<tr>
<td>Min % pa</td>
<td>-0.10</td>
<td>-0.33</td>
<td>0.23</td>
</tr>
<tr>
<td>Range % pts</td>
<td>9.42</td>
<td>10.10</td>
<td>-0.68</td>
</tr>
<tr>
<td>Upper quartile % pa</td>
<td>5.36</td>
<td>6.00</td>
<td>-0.64</td>
</tr>
<tr>
<td>Lower quartile % pa</td>
<td>2.32</td>
<td>1.97</td>
<td>0.35</td>
</tr>
<tr>
<td>Interquartile range % pts</td>
<td>3.04</td>
<td>4.03</td>
<td>-0.99</td>
</tr>
</tbody>
</table>

\(^a\) Kurtosis is a measure of the relative ‘peakedness’ or flatness of a distribution compared with the normal distribution. Positive kurtosis indicates a relatively peaked distribution. Negative kurtosis indicates a relatively flat distribution.

\(^b\) Skewness characterizes the degree of asymmetry of a distribution around its mean.

**Note:** Rolling annual growth rates based on quarterly data.

**Source:** ABS 6401.0.

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Findings

1. Over the long run, both the annual average and the through-the-year growth formulae produce similar outcomes. Compared with the through-the-year formula, the annual average measure of inflation provides a small decrease in volatility but is less timely (more retrospective).

2. Historically, the annual average measure has tended to be lower than the through-the-year growth rate when inflation is rising and, conversely, to be higher when inflation is falling. However, it is not clear that this pattern will hold over the coming year. The Reserve Bank forecasts that the current downturn in inflation will be interrupted by a temporary rebound in the through-the-year rate due to the effects of large one-off price movements. Those price movements will impact more on the through-the-year rate in the short term.
5 Measures of underlying inflation

Quarterly CPI data can be ‘distorted’ by transitory and volatile fluctuations in the prices of its component goods and services. The use of annual averages is one of many possible statistical techniques that can be used to dampen such volatility or statistical ‘noise’.

Underlying inflation is a measure of inflation that excludes or diminishes volatile price movements such as large movements in food and energy prices. Despite the widespread use of the term ‘underlying inflation’, there is no agreed method of measuring it. The concept has become popular with the adoption of inflation targeting by central banks in a number of countries. Because there is a lag between a change in monetary policy and its impact on the economy, policy makers are interested in the outlook for inflation over a one to two year horizon. Measures of underlying inflation may be useful if they help analysts separate the ‘noise’ in inflation data from the ‘signal’ or the trend.

Time averaging

Averaging the CPI over time is one of the simplest ways of removing ‘noise.’ Simple arithmetic averaging over four quarters, as in the annual average growth formula, is only one of many possible averaging options.

Averaging over longer periods creates smoother measures of inflation. For example, in the US it has been suggested that the long term trend in inflation could be approximated by the 36-month centred moving average of actual inflation.10 In Australia, it has recently been proposed that trend inflation be defined as a 9-quarter moving average of the CPI.11

There are also alternatives to simple arithmetic averaging. Underlying inflation can be measured by an exponentially weighted moving average where the weights applied to earlier quarters decrease exponentially, giving more prominence to recent observations. In addition, varying weights can be applied to different CPI components, for example, according to their volatility.12

Time averaging inevitably reduces the timeliness of measured inflation. While this impact can be mitigated, but not eliminated, by more sophisticated weighting schemes, this comes at the cost of increased complexity.

‘Exclusion’ measures of underlying inflation

‘Exclusion’ measures of inflation remove the impact of particular price movements. One common approach is to calculate the inflation rate for the CPI basket excluding a few items which historically have had particularly volatile prices. One frequently used measure of underlying inflation is the overall CPI excluding food and/or energy. These ‘exclusion’ measures of underlying inflation remove the direct effect of movements in the prices of those items on the rationale that they do not reflect the underlying trend.

Treasury underlying inflation index

During the 1990s, a measure of underlying inflation developed by the Commonwealth Treasury achieved wide prominence. Known as the Treasury underlying inflation index, this measure removed a large number of items from the published CPI including the prices of fresh food, clothing, government-owned dwelling rents, property rates and charges, the costs of utilities, health services, pharmaceuticals, and education. Another important exclusion was interest rate charges, which were used in the CPI to proxy the cost of housing.

From 1993 to late 1998, the Treasury underlying inflation index was adopted as the target inflation rate by the Reserve Bank of Australia. From the Bank’s perspective, a major benefit of the Treasury underlying inflation index was its exclusion of interest rate charges: this precluded a mechanical relationship between changes in monetary policy (e.g., increasing interest rates) and targeted inflation.\(^{13}\)

However, after interest charges were removed from the published CPI in 1998, the Reserve Bank switched its inflation target from underlying inflation to ‘headline’ (unadjusted) inflation.

While the Treasury underlying inflation rate was a simple and transparent method of reducing volatility, it suffered from a number of disadvantages\(^{14}\):

- Low coverage - the Treasury underlying rate excluded 49 per cent of the CPI basket by weight. This made it less representative of market-determined price changes.

- Loss of information - relevant information which might have been provided by the excluded components was lost. As the excluded items were removed entirely from the index, even at times when movements in these items were not volatile, there was a substantial loss of price information.

- It was not well suited to the removal of the effects of general price disturbances, such as indirect tax regime changes.

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\(^{13}\) Note that the inclusion of interest costs had not been a long term practice. Interest rates were included in the 1980s after the ABS conducted a major review of the CPI basket and the weights.

The method was inflexible in coping with various other price disturbances, including volatility from unanticipated sources.

The Treasury underlying series was no longer published after June 1999.

Statistical removal of outliers

‘Trimmed mean’ measures of underlying inflation are calculated by excluding (trimming) a certain percentage of the largest and smallest (weighted) price changes among the components of the CPI. The trimmed mean does not require a priori judgment about which components to include or exclude permanently. Rather, components’ price changes are included or excluded on the basis of their relative magnitudes.15

The trimmed mean rate of inflation is the average rate of inflation after excluding a certain percentage of the distribution of price changes from both ends of that distribution. A judgment is required to determine the size of the trim. The Reserve Bank of Australia, for example, excludes the top 15 per cent and the bottom 15 per cent of price changes.16 However, it also calculates a ‘weighted median’ which effectively trims away all but the median price rise.17 These measures represent an attempt to estimate the central part of the distribution of price changes, and provide a measure of inflation that is not excessively affected by large price changes – either increases or decreases – in individual items.18

How useful are measures of underlying inflation?

In mid 2006, there was a spike in the CPI as a result of large increases in the prices of bananas (reflecting a cyclone in Queensland) and petrol (reflecting higher world oil prices). These price increases were ignored by both the ‘exclusion’ and ‘trimmed mean’ measures of underlying inflation. While banana prices subsequently returned to normal, higher petrol prices persisted, leading to suggestions of bias in the underlying measures of inflation, on the basis that the increase in petrol prices was not transitory and was part of ‘inflation’.

In practice, bias is less of a problem for the trimmed mean because of its symmetrical treatment in ignoring both large increases in prices and large falls/ small increases. Recent research by the Reserve Bank of Australia has concluded that:

… trimmed means tend to outperform headline and exclusion-based core measures on a range of different criteria, which indicate that trimmed mean measures can be thought of as having a higher signal-to-noise ratio than either of the other measures. This makes

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17 The weighted median is the price change at the 50th percentile (by weight) of the ordered distribution of price changes.
trimmed means more useful for extracting information about the current trend in underlying inflation from the relatively noisy monthly or quarterly prices data.  

Nonetheless, consistent with the findings of overseas research the Reserve Bank study suggests that:

… it is unlikely that any single measure of underlying inflation can be held up as the ‘best’ measure at all times and in all countries. The relative usefulness of different measures may change depending on the nature of the shocks, suggesting that central banks and other analysts should look at a range of measures of inflation in assessing inflation developments.

Although the removal of interest charges was a key catalyst for the switch in the inflation target, the Reserve Bank stated that:

The main argument in favour of pursuing a CPI target as opposed to one for an underlying series is its simplicity, given the CPI’s much greater general public recognition and acceptance.

The Reserve Bank still analyses underlying inflation measures for the purpose of assessing the overall trend in inflation. Table 5.1 shows the measures of consumer price inflation published quarterly by the Bank, including six measures of underlying inflation.

The Reserve Bank’s current preferred measure of underlying inflation is the average of the trimmed mean and the weighted median measures of inflation.

The Australian Bureau of Statistics includes the Reserve Bank’s six measures of underlying inflation in its quarterly CPI publication. The Bureau also publishes the following additional 15 CPI ‘special’ and ‘analytical’ series:

Selected CPI components:

- Non-tradables component
- Tradables component

CPI excluding:

- Hospital and medical services
- Housing and Financial and insurance services
- Financial and insurance services
- Education

19  Ibid p 30.
Recreation
Communication
Transportation
Health
Household contents and services
Housing
Clothing and footwear
Alcohol and tobacco
Food.

Table 5.1 Reserve Bank of Australia: Measures of Consumer Price Inflation

<table>
<thead>
<tr>
<th></th>
<th>Consumer price index</th>
<th>Private consumption chain price index</th>
<th>Other consumer price measures</th>
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<tr>
<td></td>
<td>All groups</td>
<td>Excluding volatile items*</td>
<td>Market prices excluding volatile items</td>
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<tr>
<td></td>
<td>Goods</td>
<td>Services</td>
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<tr>
<td>2005/06</td>
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<tr>
<td>Sep</td>
<td>3.0</td>
<td>2.4</td>
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<td>Dec</td>
<td>2.8</td>
<td>2.3</td>
<td>1.5</td>
</tr>
<tr>
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</tr>
<tr>
<td>Mar</td>
<td>2.5</td>
<td>3.2</td>
<td>3.0</td>
</tr>
</tbody>
</table>

a Excludes fruit and vegetables and automotive fuel.
b Excludes utilities, property rates and charges, child care, health, other motoring charges, urban transport fares, postal, and education.

Note: Year-ended percentage changes.
Findings

3 Various measures of ‘underlying’ inflation have been developed to abstract from the volatility of the published CPI. While these measures produce much smoother measures of inflation they are more complex and incorporate arbitrary judgments as to which price components are temporary and which are persistent.

4 During the 1990s, an exclusion measure of underlying inflation developed by the Commonwealth Treasury achieved wide prominence and was adopted as the target measure for the Reserve Bank’s anti-inflation policy at the time. The Treasury underlying inflation index removed a number of items from the published CPI including the prices of fresh food, clothing, government-owned dwelling rents, property rates and charges, the costs of utilities, health services, pharmaceuticals, and interest rate charges. In 1998, the Reserve Bank of Australia switched its inflation target from underlying inflation to the unadjusted ('headline') CPI. The Treasury underlying series was no longer published after June 1999.

5 Although technical changes to the CPI in 1998 (specifically the removal of interest charges) were a catalyst for the switch in its inflation target, the Reserve Bank cited simplicity as the main advantage of the change.

6 The current research evidence suggests that methods involving the statistical removal of outliers – such as the Reserve Bank’s trimmed mean and weighted median - are superior to traditional time averaging and exclusion measures of underlying inflation. However, analysts caution that it is unlikely that any single measure of underlying inflation can be held up as the ‘best’ measure at all times.

7 Notwithstanding the change in its inflation target, the Reserve Bank also monitors and publishes a number of measures of underlying inflation for the purpose of assessing inflationary trends. The Bank currently publishes six measures of underlying inflation. Its current preferred indicator is an average of the trimmed mean and the weighted median.

8 The Australian Bureau of Statistics also publishes an additional 15 CPI ‘special’ and ‘analytical’ series.

6 Alternatives to the CPI

There are a number of published price indexes that could potentially be used as an alternative to the CPI for the inflation factor in price determinations.

Box 6.1 outlines the various price indexes published by the Australian Bureau of Statistics. These vary importantly in the scope of their coverage. The chain price index for Gross Domestic Product (GDP) provides an economy-wide measure of national or domestic output price changes. The CPI is narrower in scope: it measures changes over time in the prices of a wide range of consumer goods and services acquired by Australian metropolitan households. Other indexes are narrower again. Producer Price Indexes measure changes in the prices of goods and/or services
purchased by or sold by a defined sector of the economy. The ABS also publishes specific price indexes for import prices, export prices, labour prices and wage prices as well as price indexes for the various components of GDP as part of the national accounts.

A number of regulators in the United Kingdom and Europe have adopted consumer or retail price indexes as the inflation factor in their price cap formulae. On the other hand, many regulators in the US and in Canada have chosen one of the broadly-based GDP price indexes or deflators for purposes of price regulation.24

It is also possible to construct a ‘composite’ price index as a weighted combination of the published indexes (or their components). A composite price index can be tailored to the particular cost profile of a given business or industry by selecting individual indexes (or component indexes) from published sources and combining them with weights appropriate to the particular business or industry. Alternatively, the unit costs of the regulated businesses or industries could be measured directly. Either way, a sector-specific index has the potential to more accurately reflect the particular costs of an industry or a specific business.

Finding

9 The ABS publishes a number of price indexes in addition to the CPI. These include chain price indexes for Gross Domestic Product, providing economy-wide measures of domestic output price movements, and producer price indexes which measure changes in the prices of goods and/or services purchased by or sold by various industries. It is also possible to construct a ‘composite’ price index as a weighted combination of the published indexes or of their components.

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Box 6.1  Price indexes published by the Australian Bureau of Statistics

The Consumer Price Index (CPI) is regarded as Australia’s key measure of inflation. It is designed to provide a general measure of price inflation for the Australian household sector as a whole. The CPI measures changes over time in the prices of a wide range of consumer goods and services acquired by Australian metropolitan households and it is published quarterly, 3 to 4 weeks after the end of the reference quarter. It is revised only in exceptional circumstances, such as to correct a significant error.

Several Producer Price Indexes (PPIs) are produced and published. Economy-wide indexes are presented within a stage of production framework together with a set of indexes relating to specific industries (selected manufacturing, construction, mining and service industries). PPIs can be constructed as either output measures or input measures. Output indexes measure changes in the prices of goods and/or services sold by a defined sector of the economy while input indexes measure changes in the prices of goods and/or services purchased by a particular economic sector. PPIs are published quarterly, 3 to 4 weeks after the end of the reference quarter. Once published the PPIs are revised infrequently, sometimes to incorporate improved methods in one or more of the components and occasionally to correct an error.

International trade price Indexes are intended to broadly measure changes in the prices of goods imported into Australia (the Import Price Index (IPI)) and goods exported from Australia (the Export Price Index (EPI)). As the prices used in the indexes are expressed in Australian currency, changes in the relative value of the Australian dollar and overseas currencies can have a direct impact on price movements for the many commodities that are bought and sold in currencies other than Australian dollars. Both the IPI and EPI are published quarterly, 3 to 4 weeks after the end of the reference quarter. The IPI and EPI are not often revised.

The Labour Price Index (LPI) broadly measures annual changes in the price of labour in the Australian labour market. The Wage Price Index (WPI) broadly measures changes in the wages paid by Australian businesses to employees and it is compiled and published quarterly, about 6 to 7 weeks after the end of the reference quarter. The non-wage price indexes and the aggregate labour price index are only produced annually in respect of financial years ending 30 June.

Price indexes covering a wide range of economic transactions are produced as part of the National Accounts. Two types of national accounts based price index are published. The first type is referred to as chain price indexes which are calculated for all expenditure components and sub-components of Gross Domestic Product (GDP). Chain price indexes use as their weights the volumes of expenditure in the previous financial year (ending 30 June). The second type of price index is referred to as implicit price deflators (IPDs) which are compiled at the same levels as for the chain price indexes but which use for their weights the volumes of expenditure in the current period. IPDs have long been used to provide macro-economic measures of price change and are usually used in seasonally adjusted form. Both chain price indexes and IPDs are compiled quarterly and are published roughly two months after the reference period. The National Accounts price indexes are often revised, sometimes to a significant extent.

Source: ABS Cat 6401.0 December 2008.
7   Inflation measures used by others

The Australian Bureau of Statistics gives greater prominence to the through-the-year measure of annual CPI inflation than the annual average measure. Only the through-the-year measure is shown for annual inflation in the ‘Key Points’ of the Bureau’s CPI publication, although it also provides annual average measures (on a financial year only basis) elsewhere in the publication.

The through-the-year measure is also widespread in media reporting of annual inflation outcomes. Both the Reserve Bank and the Commonwealth Treasury use the through-the-year measure in preference to the annual average measure for reporting inflation trends.

The through-the-year formula appears to be more popular than the annual average for inflation targeting. According to the Bank of England Quarterly Bulletin:

Inflation targets around the world are exclusively framed in terms of annual inflation rates, so that the price level in the latest month is compared with the price level twelve months earlier.25

Nonetheless, as observed by Professor Alan S. Blinder, a former Vice-Chairman of the US Federal Reserve System, the annual average approach to measuring inflation:

… tends to be the European way: When the inflation rate is announced in, say, Germany or Italy, it is almost always the 12-month trailing moving average.26

The annual average formula is also used by the Bank of Japan as well as the European Central Bank.

Box 7.1 provides summary details of the inflation measures used for monetary policy purposes in a number of countries.

The through-the-year method is more widely used by other Australian utility regulators than the annual average method. The Australian Capital Territory is an exception together with IPART.

CPI indexation arrangements applying to Commonwealth pensions and allowances use a ‘through the period’ rather than a ‘period average’ basis for calculating CPI movements. Base pension rates are indexed twice yearly. The base rate is indexed by the percentage increase in the CPI over the preceding six months. For example, the January indexation adjustment is based on the increase in the CPI between the March and September quarters of the previous year.27

Finding

10 The through-the-year formula is more widely used than the annual average measure to calculate annual inflation in Australia and in many other countries. Nonetheless, the annual average measure is popular in Europe and in Japan.

Box 7.1 Inflation measures used for monetary policy

US Federal Reserve System

In 2000, the Fed switched from headline CPI inflation to headline Personal Consumption Expenditures (PCE) deflator, because the latter allows for commodity substitution in response to changes in relative prices, has more comprehensive coverage of expenditure than the CPI and can be revised to take into account new information and improvements in measurement techniques.

Analysis of new developments also includes data for core (excluding food and energy) CPI and PCE inflation.

European Central Bank

Price stability is defined in terms of the year-on-year increase in the Harmonised Index of Consumer Prices in the euro area.

Bank of Japan

The minutes of the Bank’s Monetary Policy Board routinely refer to the year-on-year increase in the CPI excluding fresh food in the assessment of domestic price developments.

Bank of Canada

Inflation target is defined in terms of the 12-month rate of change in the headline CPI.

Bank of England

The Bank’s inflation target was originally defined in terms of the core-inflation (excluding mortgage interest) but was redefined in terms of the headline CPI or a harmonised index of consumer prices in 2003.

Reserve Bank of Australia

In 1998 the Bank announced that in the future the inflation target would be interpreted as referring to the headline CPI inflation rate rather than underlying inflation. The Bank regularly publishes a number of measures of core inflation including the trimmed mean, the weighted median, the CPI excluding volatile items, and market goods and services excluding volatile items.

8 Evaluation of alternative inflation measures

Options and selection criteria

The relative merits of the following seven options for use as an inflation factor in industry price determinations are considered below:

1. CPI – annual average growth rate.
2. CPI – through-the-year growth rate.
3. CPI – Reserve Bank underlying rate.
4. CPI – ABS market prices excluding volatile items (total).
5. National accounts chain price index.
6. Producer price index.

These options are assessed against the following criteria:

1. Timeliness
   - reflects recent past/ forward looking
   - short publication lag.
2. Stability
   - low volatility
   - not revised after publication.
3. Simplicity
   - construction method is clear and well understood by the public
   - familiar to public; credible independent source.

Table 8.1 provides a summary assessment of the six published measures (that is, excluding the industry-specific price index option) against these criteria.

CPI versus non-CPI measures

Although somewhat narrower in scope than many of the other options, the CPI is eminently suitable for use as an inflation factor. The ABS describes the principal purpose and uses of the CPI in the following terms:

...The Australian CPI is specifically designed to provide a general measure of price inflation for the household sector as a whole. It measures changes over time in the prices of consumer goods and services acquired by Australian households.
The use of the CPI is appropriate in circumstances where a measure of general price inflation is required. A major role of the index is as an input to the conduct of general economic policy, in particular monetary policy by the Reserve Bank of Australia.

...The CPI, or one of its components, is widely used in indexation arrangements of both the private and public sectors. These include indexing various pension and superannuation payments, taxes and charges, indexed government bonds and business contracts.28

Table 8.1 Evaluation of alternative inflation measures

<table>
<thead>
<tr>
<th>Criteria</th>
<th>CPI</th>
<th>National accounts chain price index</th>
<th>Producer price index</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Annual average growth</td>
<td>Through the year growth</td>
<td>Reserve Bank underlying rate</td>
</tr>
<tr>
<td>Timeliness</td>
<td>x</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Reflects recent past</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short publication lag</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Stability</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low volatility</td>
<td>√</td>
<td>x</td>
<td>√</td>
</tr>
<tr>
<td>Not revised</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Simplicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clear method</td>
<td>√</td>
<td>√</td>
<td>x</td>
</tr>
<tr>
<td>Familiar to public</td>
<td>x</td>
<td>√</td>
<td>x</td>
</tr>
</tbody>
</table>

Option 1: CPI – annual average growth rate

The key benefits of the current method are that it is less volatile than the through-the-year measure and it captures all price information in the year (not just the end points).

Option 2: CPI – through-the-year growth rate

Through-the-year CPI growth is:

- More timely (less retrospective) than the annual average measure.
- The simplest option, with a high level of credibility and familiarity to the public.
- Consistent with contemporary practice in Australia for measuring annual inflation.

Specific industry cost indexes are used to compensate for past costs incurred within the taxis, private ferries and rural and regional buses industries. Given the specific objective of compensating service providers for costs incurred since the last review date, there is a case for retaining the annual average calculation method of cost indexation for those industries.

For other regulated industries, adopting the through-the-year formula for the CPI will impact on resulting price determinations because of possible differences between the two formulae in individual quarters. The differential is likely to fluctuate from period to period. Over time, differences between the two measures will average out and IPART considers that the change will not give rise to any systematic bias in IPART’s price determinations. Moreover, as noted previously, under the building block method, the base year prices are recalculated in each new review.

Reflecting the recent downturn in inflation, the annual average growth in CPI inflation (3.9 per cent, based on the March quarter 2009 CPI) is currently higher than the rate derived from the ‘through-the-year’ method (2.5 per cent). However, the position may be reversed in the coming year as the through-the-year measure is boosted by the impacts of particular one-off factors. As noted in section 4 above, the Reserve Bank is forecasting a rebound in the through-the-year measure for the year to June 2010 before resuming a downward trend. The large one-off price movements causing this rebound will impact less on annual average growth in CPI over the short term.

Option 3: CPI – Reserve Bank underlying rate

There is research support for the Reserve Bank’s current preferred measures of underlying inflation - the trimmed mean and the weighted median annual CPI inflation – as the best available indicators of underlying inflation. The Bank uses an average of these two measures.

However, acceptance by the public is hindered by the technical nature of these series which may be perceived by some as ‘black boxes’. It is difficult to analyse the sources of changes in these measure because the items included vary from quarter to quarter. They are also vulnerable to possible future definitional changes by the Reserve Bank.
Option 4: CPI – ABS market prices excluding volatile items (total)

While the coverage of this ABS exclusion measure is more transparent and more certain than the Reserve Bank’s preferred underlying rate, it performs less well as an indicator of underlying inflation on statistical grounds. It also suffers from reduced familiarity and from the risk of future definitional change.

Option 5: National accounts chain price index

The national accounts-based price indicators offer a broad coverage of prices in the economy. However, the chain price indexes are not a practical option for use in industry price determinations given their longer publication lag and the fact that they are often revised.

Option 6: Producer price index

Producer price indexes offer the potential of greater alignment of coverage with the industry sectors subject to price determinations. However, in practice it may be difficult to find a close match of the regulated utilities to the available producer price index series. Furthermore, there are concerns as to whether producer prices incorporate appropriate productivity improvements to the same extent as consumer or retail prices. The producer price indexes are less familiar to the public and are subject to (infrequent) revision.

Option 7: Industry-specific price index

While an industry-specific index has the potential to more accurately reflect the particular costs of an industry or a specific business there are important conceptual and measurement difficulties in this approach.

Under the direct costing approach, there is a risk that resulting retail price caps could equate to the pass-through of actual costs without sufficient regard to efficiency and productivity considerations. In competitive markets, rates of change in industry unit costs may differ from general inflation for various reasons. Profit rates, taxes and competition may cause the amount paid by the producer to differ from what the consumer pays. There is also typically a delay between an increase in the costs and any eventual increase in the CPI. Industry costs may be passed on to consumers, or could be absorbed by profits, or offset by increasing productivity.

Composite indexes may be useful where an industry is labour intensive or capital intensive in which cases general inflation may not be a reliable indicator of movements in the industry’s costs. IPART currently uses a composite index for the labour intensive taxi industry and in the case of capital intensive utilities applies weighted average cost of capital methodology to proxy capital costs.
The accuracy of a composite price index depends on the appropriateness of both the weightings and the price indexes applied to each cost component. In practice it is difficult to determine weightings that allow for, and encourage, potential productivity improvements that may be available from cost-saving innovations in the production process. Also, errors arising from mismatches between the price data used in the calculation of the price index and the actual prices experienced in the industry can be significant. For example, the ‘automotive fuel’ subgroup of the CPI may be inappropriate for businesses or industries where the type of fuel consumed differs significantly from that of metropolitan households.

IPART currently uses industry-specific cost indexes as a practical alternative to the building block method within certain areas of the transport sector to set fares for taxis, private ferries and rural and regional buses.

Findings

11 The choice among the options involves balancing timeliness, stability and simplicity. While no individual inflation measure satisfies all the criteria of an ideal inflation factor for industry price determinations, the through-the-year CPI measure is, for most applications, considered to be the simplest option with the advantages of relative timeliness and a high level of credibility and familiarity to the public.

12 However, in the case of taxis, private ferries and rural and regional buses, the continued use of the annual average method for cost indexation is considered to be consistent with the specific objectives of those arrangements.