

# Quality Change and Inflation Measurement

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Photo: Peter Dazeley – Getty Images

## Abstract

Households' perceptions of inflation can differ from inflation as measured by the Consumer Price Index (CPI). One factor that may contribute to this difference is that the CPI seeks to take into account changes in the quality of many items that households buy. Around 2–3 per cent of the CPI basket is adjusted for quality change each quarter, with the prices of consumer durables most affected. While a range of methods have been developed to help statisticians identify and quantify quality change, it remains a challenging area of price measurement.

## Introduction

Headline inflation has declined from an average annual rate of around 2¾ per cent over the 2000s to 1¾ per cent over the past five years. Households' expectations for inflation over the next year, as measured by the Melbourne Institute of Applied Economic and Social Research each month, have also declined over the same period but remain around 2 percentage points higher than actual inflation (Graph 1). Indeed, by this measure, households' inflation expectations have tended to be higher than actual inflation for more than two decades.

Despite lower measured inflation in recent years, concerns about the cost of living – both the level of prices and the rate of inflation – remain widespread in the community.<sup>[1]</sup> The quarterly NAB Consumer Anxiety Survey consistently finds that the cost of living is a more significant source of concern for consumers than their own health, job security and ability to fund retirement, or government policy. There are a number of potential explanations for why households remain concerned about the cost of living in an environment of low measured inflation:

- Growth in aggregate household disposable income has been subdued over the past decade. Growth in aggregate household spending has also slowed over the same period (Cokis and McLoughlin 2020).
- Statistical measures of inflation are constructed using a fixed basket of goods and services. While this basket is representative of the spending of all households in aggregate in a given year, it is not necessarily representative of the spending of any given household in the current period. Statistical measures of inflation are also based on average prices, which might not be the same as the prices paid by a given household.
- Measured inflation seeks to take into account changes in the quality of items that households buy. However, it is difficult for households to adjust for quality change in their experience of inflation.
- Psychological biases can contribute to differences between measured and perceived inflation. For example, research suggests that when forming perceptions and expectations of inflation, individuals tend to overweight large price increases they incur and price changes for items they purchase frequently.<sup>[2]</sup>

This article focuses on the adjustment for quality in measured inflation. It explains why quality adjustment is necessary to ensure that statistical

measures of inflation can serve a variety of purposes, but can lead to a gap between measured inflation and the inflation experienced by households. This article also explains why it is important for policymakers to be aware of the effect of quality adjustment on measured inflation.

### How Is Inflation Measured?<sup>[3]</sup>

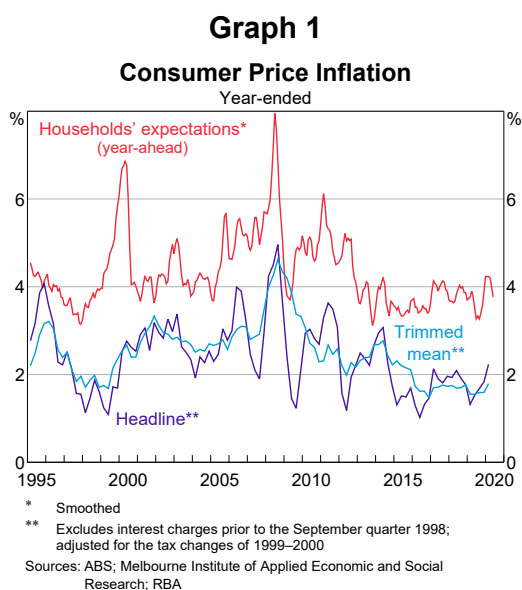
The CPI is a statistical measure of the prices of goods and services that households buy. The percentage change in the CPI provides a measure of consumer price inflation. Australia’s inflation target is to keep the CPI rate of inflation between 2 and 3 per cent per annum on average over the medium term.<sup>[4]</sup> The CPI is often used in contract indexation, some wage negotiations and to produce inflation-adjusted economic statistics.

The Australian Bureau of Statistics (ABS) constructs the CPI each quarter by collecting millions of prices for the goods and services that households buy.<sup>[5]</sup> The items included in the CPI are chosen based on the spending patterns of households in capital cities and are fixed for a year. The ABS calculates average price changes for each item every quarter and aggregates these price changes into 87 expenditure classes (ECs). Using household expenditure weights for each EC, the ABS then calculates the overall rate of inflation for each capital city and all capital cities combined.

Statisticians can face many challenges when constructing measures of inflation. One issue that can often arise is that the features or characteristics of an item can change between periods. The CPI aims to capture only ‘pure’ price changes, so there is a need to account for any price change that has resulted from changes in the ‘quality’ of goods and services over time. Statisticians use a range of techniques to quantify changes in quality, some of which are discussed below.

### An Example of Quality Change

The quality of a good or service is determined by its features or characteristics from which consumers derive value. Consider the case of mobile phones. Each year or so, mobile phone manufacturers tend to release new models with improved features, such as faster processors and better cameras. Statisticians



might not be able to observe the price of the old model in a given quarter because it has been discontinued, so instead must estimate the value of the improved features in the new model in order to make the old and new models comparable.

Using the specific example of an Apple iPhone, the launch price of new models has tended to be similar to or higher than the launch price of previous models (Graph 2).<sup>[6]</sup> If statisticians deem that consumers will place a positive value on the improved features in the new model, measured inflation will be lower than inflation observed from simply comparing launch prices. Indeed, the measured price of mobile phone handsets in the CPI has fallen by 18 per cent since mid 2015. Note that statistical quality adjustments aim to capture the average quality derived across all consumers; in reality, some consumers will derive more value or use from particular features than other consumers.

### How Does Quality Adjustment Work in Practice?

The ABS performs quality adjustments in line with international best practice. In all cases, the ABS makes quality adjustments by changing the measured price of the old model in the base period to make it comparable with the observed price of the new model in the current period. Continuing with the mobile phone example, this would involve inflating the observed price of the old model in the

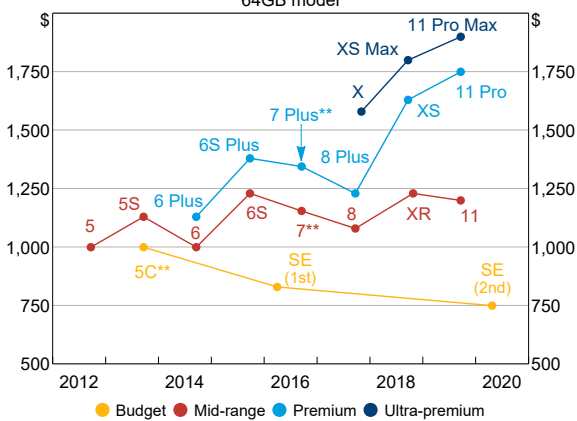
previous quarter to be comparable with the price of the new model (with better features) available in the current quarter.

Because the nature of quality differs across goods and services, a range of methods are available to perform quality adjustments. These methods can be based on product size, production or retail costs, expert judgement and information from other items in the basket (ABS 2019a). For example:

- Motor vehicles are quality adjusted using the internationally recognised ‘Delphi method’. When new models are introduced with different features, a panel of ABS analysts estimate the value of those features to consumers, with the median estimate used to perform the quality adjustment.
- Grocery items are often quality adjusted to account for changes in weight or volume. This type of quality adjustment tends to result in an increase in measured inflation because grocery items more commonly become smaller in size without a commensurate reduction in price (‘shrinkflation’). The use of transactions ‘scanner’ data in the Australian CPI since 2014 has enabled the ABS to more easily identify and adjust for changes in the quality of grocery items arising from changes in size, weight or volume (ABS 2019b). These data capture detailed information on transactions at the point of sale and account for 16 per cent of all data in the CPI.

**Graph 2**

**iPhone Launch Prices\***  
64GB model



\* iPhone is a trademark of Apple Inc, registered in the US and other countries  
 \*\* Estimated using prices for other storage capacities  
 Sources: Apple; RBA

Another method for performing quality adjustments is hedonic modelling, which involves using a statistical model to estimate the price of an item based on its observable features. While the ABS does not currently conduct any hedonic quality adjustments internally, changes in personal computer prices are calculated based on a hedonically adjusted index produced by the US Bureau of Labor Statistics (ABS 2019a). This index shows that computer prices have fallen by around 25 per cent over the past five years.

Improvements in quality adjustment techniques over time have enabled statisticians to more accurately measure pure price changes. However, statisticians still face significant challenges

estimating quality change for services. Changes in the quality of services can be difficult to measure objectively, and can occur slowly and subtly over time. Because of these challenges, the ABS adjusts a limited number of services prices for quality change (ABS 2019a; ABS 2019b).

### How Prevalent Is Quality Adjustment in the CPI?

In a typical quarter, 2–3 per cent of items in the Australian CPI are adjusted for changes in quality (ABS 2019b). Some items are quality adjusted more frequently than others (Graph 3).<sup>[7]</sup> For example:

- **Consumer durables** prices are subject to the most frequent quality adjustment. The prices of items such as motor vehicles, furniture, household appliances and televisions are often quality adjusted to capture rapid advances in technology and the introduction of new models. Quality adjustments are also commonly made to clothing prices. This reflects the relatively high rate of stock turnover for clothing; when an item is no longer sold and is replaced in the CPI sample, this triggers a quality adjustment.<sup>[8]</sup> However, quality changes for clothing tend to be largely cosmetic, resulting in relatively small quality adjustments. Overall, quality adjustments to the prices of consumer durables tend to lower measured inflation.
- **Rents and new dwelling prices** are also frequently adjusted for quality change. For rents, these adjustments tend to be for compositional changes in the stock of rented dwellings or to account for major alterations and additions. No quality adjustments are made for maintenance or repairs that restore a dwelling to a previous level of quality. For new dwelling prices, quality adjustments reflect changes in dwelling designs as well as the use of purchase incentives and bonus offers such as upgraded appliances or additional features. The magnitude of quality adjustments for purchase incentives and bonus offers reflects both take-up rates and the estimated additional value to consumers. Liaison information suggests that purchase incentives and bonus offers for new dwellings were particularly prevalent over most of 2019 as

housing activity slowed. Overall, quality adjustments to rents and new dwelling prices tend to lower measured inflation.

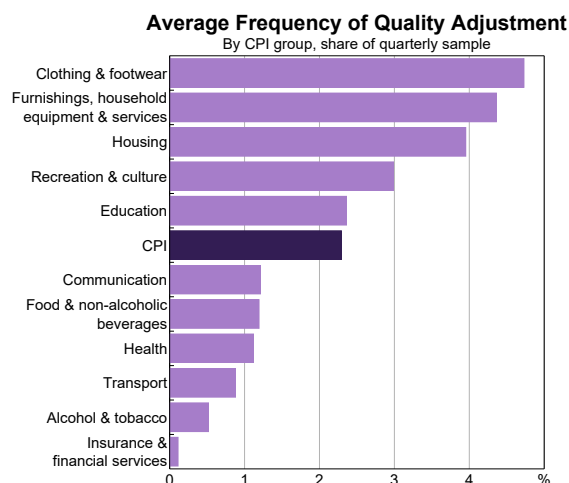
- **Grocery food** prices are adjusted for quality change arising from changes in product size. As discussed above, these adjustments tend to increase measured inflation. In the United Kingdom, researchers at the Office for National Statistics found that quality adjustments to grocery food prices have resulted in measured inflation being slightly higher than non-quality-adjusted inflation in recent years (Ochirova 2017; Corless 2019).

One of the few examples where services prices are quality adjusted in the CPI is education. Quality adjustments are mainly applied in the March quarter each year to reflect new school fees or changes in contact hours for tertiary students. Limited adjustments are applied to the prices of other services, usually on a case-by-case basis, owing to the difficulties associated with objectively measuring quality change.

### Considerations for Monitoring Inflation

Although only a small share of the CPI basket is quality adjusted each quarter, the size of the adjustment can potentially be meaningful for some items. For example, since mid 2015 the measured price of televisions in the CPI has fallen by over 60 per cent, while the measured prices of computers, cameras and mobile phone handsets

**Graph 3**



Source: ABS

have fallen by between 12 and 24 per cent (Graph 4). The ECs that include these items – audio, visual & computing equipment and telecommunication equipment & services – have together subtracted around 0.2 percentage points from annual CPI inflation each year over the same period. Some of this decline in measured prices can be explained by quality adjustments to capture improved features stemming from technological change. Other factors such as increased competition in the retail sector and changes in the dynamics of exchange rate pass-through have also affected consumer technology prices over this period (Debelle 2018).<sup>[9]</sup>

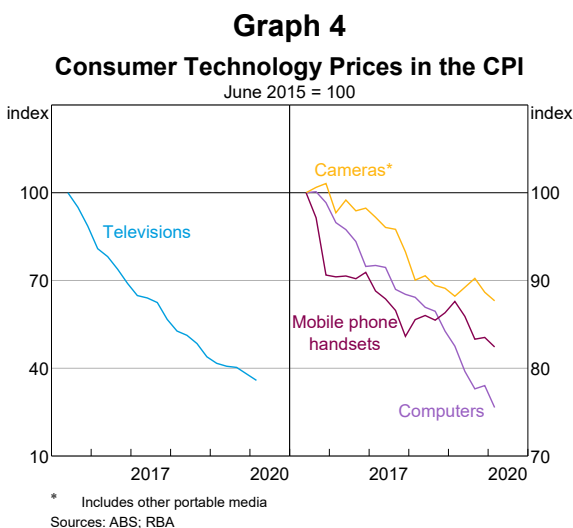
Consumers, however, do not pay these lower quality-adjusted prices. As a result, differences between measured and observed inflation could affect households’ perceptions of real interest rates

and real income growth. This could, in turn, affect consumption, saving and investment decisions.

Quality adjustment could also in principle have implications for monetary policy. If a method change were to have a significant effect on measured inflation, this could alter the interpretation of overall inflation outcomes; if persistent, this could be a consideration for policy.<sup>[10]</sup> In addition, approaches to quality adjustment can also vary across national statistical offices while remaining within international standards, leading to differences in perceived real outcomes across countries.<sup>[11]</sup>

### Conclusion

CPI inflation is a measure of pure price changes for a fixed basket of goods and services purchased by households. Statisticians at the ABS use a range of techniques to remove from the CPI any price changes owing to changes in quality. Around 2–3 per cent of the CPI basket is adjusted for quality change in a typical quarter, with the prices of consumer durables most affected. However, households’ perceptions of inflation can differ from measured inflation in part because the prices households pay reflect changes in quality as well as pure price changes. Differences between statistical measures of inflation and the inflation rate observed by households can affect households’ perceptions of real economic outcomes. ↗



### Footnotes

- [\*] The author is from Economic Analysis Department and would like to thank the ABS Prices branch, particularly Leigh Merrington, for their extensive input.
- [1] For a discussion of the conceptual differences between cost-of-living inflation and consumer price inflation, see Jacobs, Perera and Williams (2014).
- [2] For a discussion of psychological biases that can affect perceptions of inflation, see Jacobs, Perera and Williams (2014).
- [3] For detailed information on how the Australian CPI is constructed, see ABS (2019a). For a short explainer on inflation measurement, see RBA (2018).
- [4] CPI inflation is a good target for monetary policy for several reasons: it is calculated independently of the central bank using a transparent method; it is widely recognised and easy to communicate; and it does not get revised (Cockerell 1999).
- [5] For a discussion of the effects of the COVID-19 pandemic on price collection and inflation measurement, see ABS (2020).
- [6] iPhone is a trademark of Apple Inc, registered in the US and other countries.
- [7] ABS (2019a) outlines the structure of the 11 CPI groups presented in Graph 3.

- [8] The introduction of ‘fast fashion’ retailers to the Australian market in recent years has increased the rate of clothing stock turnover.
- [9] In addition, increasing data allowances for mobile plans have contributed to measured price falls in the telecommunication equipment & services EC.
- [10] Hill (2004) argues that, in some cases, significant and permanent changes to quality adjustment methods may require a change in the inflation target.
- [11] For example, Byrne (2019) finds large cross-country differences in mobile phone price inflation as well as differences in approaches to quality adjustment.

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