



Information Paper

Increasing the Frequency of Consumer Price Index Expenditure Class Weight Updates

Australia

July 2016

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AUSTRALIAN BUREAU OF STATISTICS

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PREFACE

The Australian Bureau of Statistics (ABS) maintains a program of periodic reviews of the Consumer Price Index (CPI) to ensure it continues to meet community needs. The 16th Series CPI Review (ABS 2010) was the last comprehensive review which examined CPI concepts, methodologies and data sources. A number of topics and strategies were considered to maintain the relevance of the CPI in a dynamic environment, particularly given recent developments in methods and approaches. These developments present new opportunities to enhance the CPI. As outlined in the recent information paper (ABS 2015), the ABS is currently conducting a research program aimed at re-examining the current approaches to compiling the CPI. This paper focuses on the frequency of expenditure class (EC) weight updates.

The ABS has primarily used the Household Expenditure Survey (HES) to derive CPI weights at the published level (EC level and above) and have updated these weights every six years. The International Labour Organization (ILO) Resolution on CPIs recommends published level CPI weights are updated at least every five years. Conducting a more frequent HES would deliver benefits to the measurement of household inflation and to other users. However a more frequent HES requires additional funding. Alternative data sources of household expenditure are available to update CPI expenditure weights more frequently, irrespective of the frequency of the HES. This paper discusses the feasibility of using Household Final Consumption Expenditure (HFCE) data to more frequently update Australia's CPI EC weights; identifies and addresses challenges of the proposal; and presents empirical results.

David W. Kalisch
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ABBREVIATIONS

ABS	Australian Bureau of Statistics
ABS DQF	Australian Bureau of Statistics Data Quality Framework
CAGR	Compound Annual Growth Rate
COICOP	Classification of Individual Consumption According to Purpose
CPI	Consumer Price Index
CPICC	Consumer Price Index Commodity Classification
EC	Expenditure Class
FHOG	First Home Owner Grant
GDP	gross domestic product
GFCF	gross fixed capital formation
GFS	Government Finance Statistics
GST	goods and services tax
HEC	Household Expenditure Classification
HES	Household Expenditure Survey
HFCE	household final consumption expenditure
ILO	International Labour Organization
IOPC	Input-Output Product Classification
NPIs	non-profit institutions
NPISH	non-profit institutions serving households
NSO	National Statistical Office
OECD	Organisation for Economic Co-operation and Development
ONS	Office for National Statistics
OOH	owner-occupied housing
p.a.	per annum
SLCI	Selected Living Cost Index
SNZ	Statistics New Zealand
UNSD	United Nations Statistics Division

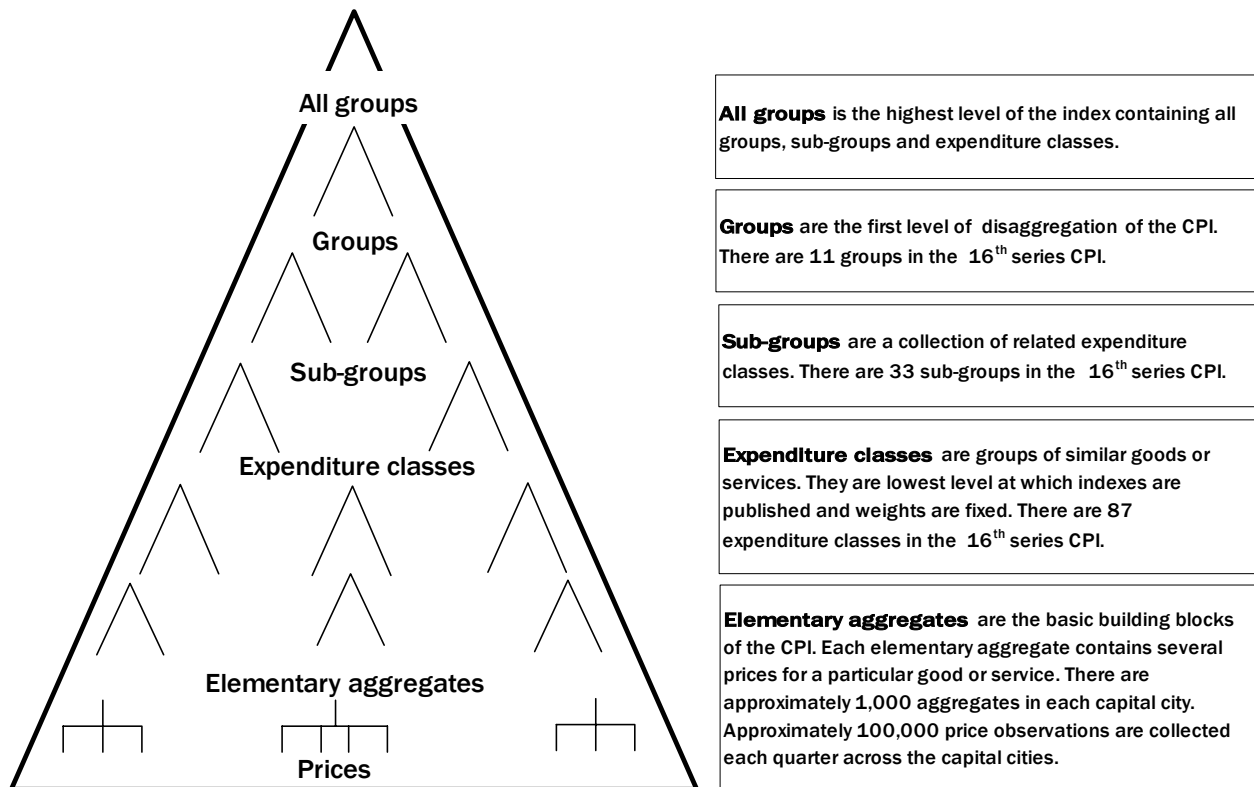
CHAPTER 1 INTRODUCTION

CURRENT ABS PRACTICE

1.1 The Australian Consumer Price Index (CPI) measures the change over time in the prices paid by households for a basket of goods and services. The basket reflects the composition of household consumption preferences, is compiled according to international standards and is based on robust data collection and compilation methodologies. In compiling aggregate measures of price change, the role of expenditure weights is to reflect the economic importance of each item to the total expenditure of Australian households. Therefore, in practice, National Statistical Offices (NSOs) periodically update expenditure weights to accurately reflect changing purchasing patterns of households.

1.2 The structure of the Australian CPI can be viewed from a top down approach to show the various levels of aggregation used in compilation (Figure 1.1). At the top is the total expenditure or pool of items purchased by the reference population. This is known as the All groups CPI and is commonly referred to as the headline rate of inflation. Below this, the index branches into finer and finer commodity groupings until the lowest level, where there are samples of prices for the individual items (elementary aggregates). Indexes are published down to expenditure class (EC). This is the level of the index for which the structure and weights are fixed for the life of a CPI series.

FIGURE 1.1 CONSUMER PRICE INDEX STRUCTURE



1.3 The division of the groups and sub-groups is intended to reflect increasing levels of substitutability of the items consumed by households in response to changes in relative prices. For example, at the group level there are unlikely to be any substitution effects between Food and non-alcoholic beverages and Transport in response to changes in their relative prices. However, within the Oils and fats EC it would be expected that

CURRENT ABS PRACTICE *continued*

households are more likely to substitute between margarine and butter in response to changes in their relative prices (ABS 2011).

1.4 With respect to upper level weights, the Australian CPI has 87 ECs whose weights are primarily sourced from the Household Expenditure Survey (HES) and updated every six years. Expenditure data is initially collected using the Household Expenditure Classification (HEC) which is then mapped to the Consumer Price Index Commodity Classification (CPICC). The HES is supplemented with a range of other data sources to update EC weights. As of the 16th Series review, 70% of the weight is derived from HES. The remaining 30% of the weight is derived by combining HES data with data from other sources, as well as utilising a range of other ABS and non-ABS data sources¹.

1.5 For the Australian CPI, the 16th Series was implemented in September quarter 2011 and uses the HES collected for the financial year 2009–10. The HES is the preferred data source to derive expenditure weights, primarily due to the ability to control for spending patterns of the population group (i.e. metropolitan households). It is a sample of approximately 7,000 metropolitan households where data is collected using a diary of personal expenditures for residents aged 15 years and older over a rolling two-week period. An interview questionnaire also collects information about each household's characteristics, expenditures common to all members of the household and irregular or infrequent expenditures.

1.6 The HES records all data as reported by the households. For some product groups, adjustments are required to the information reported in the HES before it can be used in the CPI. For example, HES data for alcohol and tobacco expenditure is adjusted using National Accounts HFCE data to account for under-reporting. In other cases, the HES may be supplemented or replaced by other data which provide a more accurate estimate of expenditure².

1.7 Consumers' purchasing patterns react to price change over time, where goods and services with high inflation are typically substituted with low inflation alternatives. This shift to lower inflation goods and services is known as item substitution. Most NSOs, including the Australian Bureau of Statistics (ABS), use a fixed-base Laspeyres³-type formula, also known as Lowe⁴ index formula to measure price change. The fixed-base index formula keeps quantities underlying the base period expenditures fixed over the life of the basket. These quantities are applied as weights to the prices in both the current period and the base period to produce the latest period's price index. Keeping the quantities fixed is done primarily for practical reasons, given the difficulty in measuring quantities accurately every period. One limitation⁵ of this is that it does not take into account substitutions consumers make in response to relative price change, resulting in substitution bias. As a result, NSOs attempt to mitigate the effects of substitution bias by updating upper level weights periodically.

1 See Appendix 1 for a complete list of expenditure data sources used to derive the 16th Series CPI.

2 See chapter 6 of 6461.0 – Consumer Price Index: Concepts, Sources and Methods, 2011 for a comprehensive description of adjustments made to upper level weights.

3 A price index in which the basket is composed of the actual quantities of goods and services in the earlier of the two periods compared.

4 The Lowe index is similar to the Laspeyres index with expenditures revalued to the price reference period (see paragraph 3.7 below).

5 Another limitation of fixed quantities is that changes in income are not reflected in the CPI weights.

CHAPTER 1 INTRODUCTION *continued*

CURRENT ABS PRACTICE *continued*

1.8 Infrequent weight updates have a statistical impact on the Australian CPI. The ABS has previously conducted research on this substitution bias, estimating an average upward bias of approximately +0.24% per year for the period June 2000 to June 2011 (ABS 2011). The measurement of the upward bias was not constant over time, with a larger bias estimated for periods further away from the weight updates. These results are similar to other countries investigations into substitution bias (SNZ 2014).

1.9 In response to this analysis during the 16th Series review, the ABS investigated the feasibility of conducting a four-yearly HES. A four-yearly HES was discussed for several reasons. The upward bias increases the further the index is from the weight reference period; and most significantly after four years. A four-yearly HES would enable integration with other ABS household surveys, and would deliver considerable benefits to a range of users including National Accounts, researchers and policy makers.

1.10 Without additional funding for the ABS, a more frequent HES is not feasible. The ABS has therefore investigated alternative data sources to increase the frequency of CPI weight updates.

HFCE DEFINED AND THE CURRENT ABS RESEARCH PROGRAM

1.11 As part of the "Enhancing Australia's CPI" work program, the ABS has reviewed data sources available for re-weighting the CPI more frequently. The availability of annual Household Final Consumption Expenditure (HFCE) data from the National Accounts provides the ABS with an opportunity to update CPI EC level weights more frequently. The International Labour Organization (ILO) endorses the use of HFCE data from the National Accounts when the time interval between household surveys is large, concluding that "household expenditure data in the national accounts may provide the best estimates of aggregate household expenditures" (ILO 2004, p.28). HFCE data is used by other NSO for CPI re-weighting purposes, including the Office of National Statistics (ONS) in the United Kingdom and Statistics Netherlands⁶.

1.12 HFCE measures expenditure by resident households on goods and services, whether the expenditure is made within the domestic territory or by Australian residents abroad, and expenditure by Non-Profit Institutions Serving Households (NPISH). Conceptually, the measurement of HFCE aligns closely with the HES. HFCE data captures household expenditure, including the Goods and Services Tax (GST). Both HFCE and HES data cover expenditure by Australian households only and exclude expenditure by non-residents in Australia.

1.13 HFCE data is available across a range of classifications (e.g. Input-Output, Supply-Use) that are differentiated by their level of aggregation. This paper focuses on annual HFCE data at the Supply-Use level. The compilation of Supply-Use tables are an important tool in balancing the production and expenditure estimates of Gross Domestic Product (GDP), utilising a large number of data sources including business activity surveys, household expenditure surveys, investment surveys, foreign trade statistics, government finance statistics and administrative data. GDP data is published by the ABS in the *Australian System of National Accounts* (cat. no. 5204.0).

⁶ See Appendix for a list of Organisation for Economic Co-operation and Development (OECD) countries weighting procedures.

CHAPTER 1 INTRODUCTION *continued*

HFCE DEFINED AND THE CURRENT ABS RESEARCH PROGRAM *continued*

1.14 The HES is used as a major benchmark in the compilation of the HFCE series. Benchmarking is a technique used by National Accounts, where less frequent (higher quality) data sources are used to validate more frequent estimates of HFCE. The other major benchmark used for HFCE is the *Retail and Wholesale Industries* (cat. no. 8622.0).

1.15 The use of HFCE data for CPI weights has many potential benefits for both internal and external users of inflation statistics, including more representative weights while at the same time aligning with international recommendations. The use of HFCE data will ensure the continued production of a robust CPI; and provide greater coherence between macro-economic statistics within the ABS.

1.16 There are, however, several challenges with using HFCE data for CPI weights. These challenges are grouped together as:

- i) Overarching challenges – encompassing classification, scope, coverage, and revision challenges; and
- ii) Specific EC challenges – encompassing a case-by-case assessment of using HFCE data for specific CPI ECs.

CHAPTER 2 METHODS AND PRACTICAL CONSIDERATIONS

INTRODUCTION

2.1 The majority of HFCE data align seamlessly into the CPI weight structure, however some challenges do exist due to conceptual, data source and coverage differences. These challenges arise because the CPI and HFCE estimates are produced for different purposes and use different data sources. This chapter outlines these challenges and the proposed treatments by the ABS. Empirical results are presented in chapter 3.

OVERARCHING CHALLENGES

(a) Classification of expenditure

2.2 Classifications are used by the ABS to group data collected from survey respondents (e.g. businesses, households) in a structured and consistent way. Classifications are developed to support the purpose and outputs of a specific set of statistics. In the case of household expenditure, various classifications are available and used by the ABS, depending on the purpose. As different classifications are used, there is a need to map the data collected under one classification to the other classification to make the data meaningful for each use, so concordance mapping is needed.

2.3 Information collected through the HES is classified according to the HEC, which is part of the *Household Expenditure Survey and Survey of Income and Housing, User Guide, Australia, 2009–10* (cat. no. 6503.0). As the Australian CPI is classified according to the CPICC, found in *Consumer Price Index Commodity Classification, Australia, 16th Series, 2011* (cat. no. 6401.0.55.004), a concordance mapping between HEC and CPICC is necessary to implement household expenditure data for CPI purposes. In total, there are 700 individual HEC codes that are used to map household expenditure to 87 ECs.

2.4 As HFCE covers a wider range of goods and services, it is further dissected by the purpose for which households engage in the transactions using the Classification of Individual Consumption by Purpose (COICOP). HFCE aligns as far as possible to COICOP, however, there are instances where it is not yet possible for Australia to follow all of COICOP's recommendations.

2.5 The CPI and HFCE collect and publish data using different classifications. The availability of classification concordances allows expenditure to be mapped between HFCE and CPI. As part of the annual *Australian System of National Accounts* (cat. no. 5204.0), Supply–Use tables enable expenditure that is more detailed than expenditure aggregates defined by COICOP categories. Supply–Use data can be further disaggregated based on the Input–Output Product Classification (IOPC). IOPC to CPICC mapping can take place based on the availability of a classification concordance, found in *Australian National Accounts: Input–Output Tables, Product Details* (cat. no. 5215.0.55.001).

2.6 Mapping the HFCE data from IOPC to CPICC sometimes requires further disaggregation with expenditure of one IOPC pertaining to multiple CPICCs. In these instances, expenditure is further disaggregated using supplementary data sources. In general, HFCE expenditures can be apportioned as proportions, r_i defined as follows:

$r_i = 0$ if the IOPC does not map to an EC

$r_i = 1$ if the IOPC maps to only one EC

$$r_i = \frac{e_i}{\sum_{j=1}^n e_j} \text{ if the IOPC maps to multiple ECs} \quad (2.1)$$

(a) Classification of expenditure *continued*

Where;

e_i = representative expenditure of EC i mapped to an IOPC (derived from alternative data sources)

e_j = representative expenditure of ECs j mapped to an IOPC (derived from alternative data sources).

(b) Scope – Exclusion of expenditure by Not for Profit Institutions Serving Households (NPISH)

2.7 HFCE estimates include expenditure that is excluded from the CPI. The challenge is to find methods to exclude this expenditure so HFCE can be used for CPI weighting purposes. This sub-chapter details the ABS approach to estimate and then remove the NPISH contribution to HFCE for each CPI EC.

2.8 NPISH "consist of non-market non-profit institutions (NPIs) that are not controlled by government" (UNSD 2008, p.74, paragraph 4.93). Unlike other NPIs, which are treated as corporations, NPISH can and do engage in final consumption expenditure in the form of goods and services provided to households free or at prices that are not economically significant. This does not mean that NPISH cannot produce market output but the majority of their costs of production are devoted to the provision of non-market output (UNSD 2008). At present, expenditure estimates for the NPISH units are published together with those for the household sector in HFCE, and cannot be explicitly identified. Examples of NPISH units include (but are not limited to) charities, aid agencies, religious institutions, cultural clubs and relief agencies.

2.9 As NPISH are not within the scope of the Australian CPI (it does not constitute expenditure by households) their expenditure must be removed from HFCE data in order to derive conceptually correct weights for CPI use.

2.10 Expenditure estimates of NPISH are currently explicitly compiled every six years coinciding with the HES. The contribution of NPISH to the CPI basket is small, with expenditure representing approximately 2.0% of the total HFCE that is included in the CPI basket. In order to remove NPISH expenditure on an annual basis, it is suggested NPISH is estimated as a proportion of total HFCE for each IOPC component, where the ratios are based on the closest available NPISH expenditure. This approach can be summarised as follows:

$$NPISH_i^t = HFCE_i^t \times \frac{NPISH_i^*}{HFCE_i^*} \quad (2.2)$$

Where;

$NPISH_i^t$ = NPISH expenditure at period t for IOPC i

$HFCE_i^t$ = HFCE expenditure at period t for IOPC i

$NPISH_i^*$ = NPISH expenditure in weight reference year for IOPC i (i.e. HES year)

$HFCE_i^*$ = HFCE expenditure in weight reference year for IOPC i (i.e. HES year).

The estimates for various IOPC components are then excluded from the HFCE (including NPISH) to obtain HFCE excluding NPISH estimates as follows:

$$HFCE_i^t(\text{excl NPISH}) = HFCE_i^t - NPISH_i^t \quad (2.3)$$

(c) Coverage –
Metropolitan households
and selected living cost
indexes

2.11 In terms of geographic coverage, the Australian CPI is compiled separately for the eight Australian capital cities. Each capital city's index is weighted to produce the index for the eight capital cities, which is considered the equivalent of a 'national' price index. It is estimated that the geographic coverage of the CPI covers approximately 64% of the Australian population (ABS 2011). Ideally, the Australian CPI would encompass all Australian households (like HFCE) however practical implementation is hindered by the additional costs associated with collecting prices outside capital cities.

2.12 The CPI differs in coverage to HFCE data, which is compiled at a National level. The analysis conducted in this paper derives CPI expenditure weights at the National level using HFCE data directly with further work being undertaken to remove non-metropolitan expenditure to align with the CPI. In order to utilise national HFCE data for CPI weighting purposes at the capital city level, a pro-rata approach is suggested to overcome the practical differences in geographic coverage. This proposal makes use of price updated expenditure aggregates for each capital city when distributing the annually re-weighted eight capitals link period expenditure aggregates. Further details on this method are included in Appendix 2. There would also be opportunities to adjust for household demographic changes within each capital city over time however, this paper does not explore this concept.

2.13 The *Selected Living Cost Indexes (SLCIs)* (cat. no. 6467.0) publish price indexes for five main sub-populations (e.g. Pensioner and Beneficiary, Employee, Age pensioner, Other Government Transfer Recipient and Self-funded Retiree) of Australian household. Expenditure weights for the SLCIs are currently derived from the HES, and categorised based on the principal source of household income. Within HFCE, it is not possible to identify the income characteristics of households necessary to derive sub-population weights. As a result, this paper does not further investigate the frequency of updating weights for SLCIs.

(d) Revisions – Impact of
revisions of HFCE data on
CPI EC weights

2.14 The headline measure for the CPI is the original series and it is only revised in exceptional circumstances. National Accounts' annual HFCE data undergoes annual cyclical revisions, where preliminary estimates can be revised up to twice after release and periodic historical revisions can take place, spanning the entire Supply-Use series. This occurs when there are significant statistical developments or when more complete benchmark data – such as the HES – becomes available (paragraphs 3.5 and 3.6 below summarise HFCE vintages and normal cyclical revisions).

2.15 In order to quantify the impact of HFCE revisions on CPI weights, analysis has been undertaken to investigate the impact of using HFCE data from preliminary (t-1), revised (t-2) and final (t-3) estimates. The impact of historical revisions is also analysed, with empirical results for all types of revisions provided below in chapter 3.

SPECIFIC EC CHALLENGES

2.16 The vast majority of HFCE estimates are fit for CPI weighting purposes. This sub-chapter outlines the relatively small number of CPI ECs where additional action is needed to address specific EC challenges.

(a) *New dwelling purchase
by owner-occupiers EC*

2.17 In the CPI, New dwelling purchase by owner-occupiers EC refers to the cost of net additions of household sector dwellings as a measure of owner-occupier housing costs, and includes new homes (excluding land) and major improvements. Specifically, expenditure on New dwelling purchase by owner occupiers EC comprises of four components; owner-occupied housing (OOH) costs, first home buyers grants (FHOGs), alterations and additions, and installed appliances.

2.18 While the HES is available as a data source, too few transactions are reported to produce reliable results, and it also includes the land component which is out of scope when using an acquisitions approach⁷ to compiling the CPI. As a result, alternative data sources have typically been used to supplement the HES for this EC.

2.19 In the National Accounts, persons who own the dwellings in which they live are treated as owning unincorporated enterprises that produce housing services that are consumed by the household to which the owner belongs (UNSD 2008, p. 187, paragraph. 9.65). As the National Accounts separate the ownership of dwellings from the household sector they create notional transactions between households as landlords and tenants. The housing services produced are deemed to be equal in value to the rentals that would be paid on the market for accommodation of the same size, quality and type, and they impute values of the housing services (i.e. imputed rents) and record these as household final consumption expenditures of the owners.

2.20 The conceptual basis for the acquisitions approach to OOH applied in the CPI is based on the premise that OOH has a dual nature – part consumable and part asset. As a result of this conceptual difference OOH will continue to be derived using methods outlined in 16th Series CPI review, with changes to the data sources proposed in this study.

2.21 To derive the OOH component in the CPI, expenditure is comprised of a price (p) and quantity (q) dimension, where p represents the average price of dwellings for that period and q the net additions of new owner-occupied dwellings. To derive estimates for p and q, two data sources have been identified to align the derived expenditure with the CPI concepts.

2.22 The price dimension can be estimated through the average value of private dwelling completions by State, published in *Building Activity, Australia* (cat. no. 8752.0).

2.23 The quantity dimension can be estimated from the change in dwelling stock used in the compilation of HFCE. Dwelling stocks are adjusted to take into account other changes, for example demolitions, net conversions from commercial uses and dwelling completions not within scope (ABS 2014). The dwelling stock estimates are then separated as owner-occupiers and renters using data from the Census of Population and Housing. For non-Census periods, the dwelling stock is moved forward using the number of dwelling unit completions by State from the ABS' *Building Activity, Australia* (cat. no. 8752.0).

2.24 In line with standard practice in the CPI relating to the inclusion of subsidies such as the FHOG, they are treated as negative expenditure and subtracted from the cost of the new dwelling purchase.

⁷ The acquisitions approach defines the basket of goods and services as consisting of all those consumer goods and services actually acquired by households during the base period (ABS 2011).

(a) *New dwelling purchase by owner-occupiers EC continued*

2.25 Expenditure on other items that are included in new dwelling purchase by owner-occupiers includes alterations and additions and installed appliances. HFCE data does not include expenditure on alterations and additions, as it is considered a fixed asset rather than consumption by households (ABS 2014). This expenditure data is available as part of the National Accounts alterations and additions component of private gross fixed capital formation (GFCF). This component uses building activity survey data adjusted for under coverage as the survey data only covers approved work valued above \$10,000.

2.26 Expenditure on installed appliances is included as part of HFCE and is directly included in new dwelling purchases by owner-occupiers.

Hence, total expenditure on new dwelling purchase of owner occupiers will be derived as:

$$\text{Total expenditure}^t = ((p^t \times q^t) - \text{FHOG}^t) + \text{Alterations \& Additions}^t + \text{Installed appliances}^t \quad (2.4)$$

Where;

p^t and q^t = annual average price and quantity of completed private residential dwellings at period t

FHOG^t = value of First Home Owners Grants at period t

$\text{Alterations \& Additions}^t$ = private GFCF for alterations and additions at period t

$\text{Installed appliances}^t$ = HFCE expenditure on installed appliances at period t.

(b) *Insurance EC*

2.27 The Insurance EC covers comprehensive insurance for dwellings and motor vehicles, and compulsory third party motor vehicle insurance services in the CPI. Of particular interest is the insurance for dwellings component of the EC, which is excluded from HFCE as it is considered intermediate consumption in the National Accounts. This difference in scope between HFCE and CPI means an alternative expenditure data source is required, this being the intermediate consumption component of National Accounts, which aligns with CPI concepts (i.e. net insurance charge⁸).

(c) *Maintenance and repair of the dwelling EC*

2.28 Within the CPI, the Maintenance and repair of the dwelling EC measures price change on goods (e.g. paint) and services (e.g. electrician) associated with the maintenance and repair of an owner occupied dwelling. The equivalent expenditure component is predominately excluded from HFCE as it is considered intermediate consumption in the National Accounts ownership of dwellings industry. There is an exception for certain goods (e.g. nails, bolts), which are included in HFCE, because they are considered to be associated with minor maintenance rather than capital improvements.

2.29 Expenditure estimates by households on maintenance and repair of the dwelling will be derived as the total expenditure recorded in both the HFCE and intermediate consumption component for repairs and maintenance. To summarise, Maintenance and repair of the dwelling EC can be expressed as follows:

$$\text{Total expenditure}^t = \sum_i \text{HFCE}_i^t + \text{Intermediate consumption (repair and maintenance)}^t \quad (2.5)$$

⁸ Gross premiums less claims.

(c) *Maintenance and repair of the dwelling EC continued*

Where;

$HFCE_i^t$ = expenditure on HFCE data component i mapped to the maintenance and repair of the dwelling in period t.

Intermediate consumption (repair and maintenance)^t = maintenance and repair component of Intermediate consumption of ownership of dwellings for period t.

(d) *Property rates and charges EC*

2.30 Within the CPI, the Property rates and charges EC measures price change of general rates and garbage collection fees. This EC includes both state and local council property based rates and charges except water and sewerage, taking into account concessional and standard rates (ABS 2011). The equivalent expenditure component is predominantly excluded from HFCE, as municipal rates are considered as a tax on production. There is an exception for certain government regulatory services which are included in HFCE.

2.31 Expenditure estimates by households for the Property rates and charges EC will be derived as the total expenditure recorded in both the HFCE and municipal rates component derived from other taxes on production. To summarise, Property rates and charges EC can be expressed as follows:

$$\text{Total expenditure}^t = \sum_i HFCE_i^t + \text{Municipal rates (other taxes on production)}^t \quad (2.6)$$

Where;

$HFCE_i^t$ = expenditure on HFCE data component i mapped to the Property rates and charges EC in period t

Municipal rates (other taxes on production)^t = Municipal rates household expenditure for period t.

(e) *Other services in respect of motor vehicles EC*

2.32 In the CPI, the Other services in respect of motor vehicles EC measures charges associated with the right to own and operate a vehicle on public roads. This includes items such as motor vehicle registration, roadworthiness tests, driver licence fees, parking fees, driving lessons and tollway charges. The equivalent expenditure component is predominantly excluded from HFCE, as vehicle registration and licences are considered as other current taxes on income, wealth etc.

2.33 Expenditure estimates by households on Other services in respect of motor vehicles EC will be derived as the total expenditure recorded in HFCE and other sources (i.e. for vehicles registration and licences). The vehicles registration and licences component will be derived from data supplied by the ABS Government Finance Statistics (GFS) section. To summarise, Other services in respect of motor vehicles EC can be expressed as follows:

$$\text{Total expenditure}^t = \sum_i HFCE_i^t + \text{GFS (registration and licenses)}^t \quad (2.7)$$

Where;

$HFCE_i^t$ = expenditure on HFCE data component i mapped to the Other services in respect of motor vehicles EC in period t

GFS (registration and licenses)^t = household expenditure on vehicle registrations/licences derived from GFS data for period t.

(f) *Other financial services*
EC

2.34 The Other financial services EC in the CPI covers the cost of those services acquired by households in selling or buying major assets, such as real estate fees and stamp duty fees. Expenditure weights for this EC are currently derived from various data sources (including HFCE).

2.35 The current data sources can be estimated on an annual basis and are maintained for all components of the Other financial services EC except for real estate services. The current CPI expenditure data for real estate services is derived using property transaction data and unpublished ABS survey data on real estate fees. It is proposed to derive expenditure directly from National Accounts' private GFCF ownership transfer cost real estate fees component. This data source uses a similar price and quantity method to estimate expenditure compared to methods used in previous CPI Series reviews. It is also preferred for this research as it increases the coherence in the methods and data sources used in macroeconomic statistics compilation.

CHAPTER 3 EMPIRICAL ASSESSMENT

INTRODUCTION

3.1 While HFCE data is the primary source used in this analysis to update expenditure weights for the CPI ECs, to meet the scope and conceptual requirements of the Australian CPI, a range of adjustments are required (see chapter 2). The use of HFCE and other data sources for CPI weighting purposes, together with the impact of revisions (both cyclical and historical), are analysed empirically in this chapter.

3.2 In order to assess each experimental HFCE price index, the ABS Data Quality Framework (DQF) provides a useful starting point to compare the empirical results. With reference to the ABS DQF and other considerations, there were three main criteria used to compare the HFCE vintages. These criteria are:

- Relevance – the distance between the weight reference and link period;
- Accuracy – consistency with a superlative⁹ index; and
- International practice – comparison of other NSOs using HFCE data for CPI weights.

METHODS

3.3 Experimental HFCE price indexes for the period September 2005 to September 2015 have been constructed using a total of 86 ECs. The Deposit and loans EC has been removed from the analysis¹⁰ and weights for this EC re-apportioned accordingly. This experimental series has used HFCE data as supplied by the National Accounts area of the ABS.

3.4 This analysis uses expenditure aggregates derived at the EC level as weights, and the 16th Series CPICC as the classification standard. This enables a comparison of expenditure with HFCE data and is consistent with the current production approach.

3.5 HFCE data used covers financial years, and are denoted as preliminary (t-1), revised (t-2) and final (t-3). The annual HFCE data is available in October each year, with the experimental HFCE price indexes re-weighted every December quarter¹¹. For example, the weights implemented from December 2014 to September 2015 are derived as follows: t-1 corresponds to preliminary 2012-13 financial year HFCE data, t-2 corresponds to revised 2011-12 financial year HFCE data, and t-3 corresponds to final 2010-11 financial year HFCE data. The experimental indexes below will be referred to as t-1, t-2 and t-3 respectively.

3.6 HFCE data is available on a financial year basis¹² which formulates the annual *Australian System of National Accounts* (cat. no. 5204.0), enabling expenditure weights to be derived annually for this study. The choice of annually re-weighted price indexes is the preferred option to measure consumer expenditure patterns, and is also operationally feasible for the ABS to implement. A price index is constructed for three sets of expenditure weights (one for each HFCE vintage respectively) over the ten year period. HFCE vintages are lagged by one (t-1), two (t-2) and three (t-3) years from the implementation period, indicative of when the data is available.

9 A superlative index is one of a small group of indexes that makes equal use of prices and quantities, and treats them in a symmetrical manner in each pair of periods under observation.

10 This was excluded due to index composition change across the 15th (includes direct and indirect fees) and 16th Series (direct fees only). For more information on the history of deposit and loans see sections 4.29–4.32 of ABS (2010).

11 The ABS has typically re-weighted price indexes during the September quarter in past series reviews. Due to availability of HFCE data in October, CPI will be re-weighted in December quarters.

12 HFCE data are also estimated quarterly when compiling quarterly GDP. The annual HFCE data are compiled using the Supply/Use framework.

METHODS *continued*

3.7 In practice, when the weight reference period differs from the price reference period¹³, in line with ABS and international practice, expenditure weights are price updated¹⁴ to take into account the price change that has occurred prior to implementation. Given that the weight reference year spans a complete financial year (September quarter to June quarter) a price movement representing the difference between the price reference period (September quarter) and the average price level in the weight reference period (September quarter to June quarter) is applied to the original weights. In practice, quantities pertaining to the t-1, t-2 and t-3 vintages should be revalued at the prices of the price reference period (September quarter) prior to implementation.

The application of price updating to expenditures can be expressed as:

$$W_{\text{HFCE}}^i \times \frac{p_i^{\text{SQ}}}{\text{Ave}(p_i^{\text{SQ}^* - JQ^*})} \quad (3.1)$$

Where;

p_i^{SQ} = September quarter (link period) price index for EC i

$\text{Ave}(p_i^{\text{SQ}^* - JQ^*})$ = average of price indexes for EC i covering the weight reference period (financial year) and;

W_{HFCE}^i = original expenditure weights for EC i derived from HFCE data.

3.8 HFCE derived weights are applied to EC price indexes published in *Consumer Price Index, Australia* (cat. no. 6401.0) at the weighted average of the eight capitals. The only difference between the experimental indexes and the CPI are the upper level weights, since both series use the same published level price movements. Given the experimental index is derived from the EC level, the Lowe index formula is used. The Lowe index formula is defined as:

$$\text{Lowe price index } (I_{\text{Lo}}^t) = \frac{\sum_{i=1}^n p_i^t q_i^b}{\sum_{i=1}^n p_i^0 q_i^b} = \sum_{i=1}^n \left(\frac{p_i^t}{p_i^0} \right) s_i^{0b} \quad (3.2)$$

Where;

p_i^t = current period price for EC i

p_i^0 = price reference period price for EC i

q_i^b = price reference period quantity for EC i

$s_i^{0b} = \frac{p_i^0 q_i^b}{\sum_{i=1}^n p_i^0 q_i^b}$ = price updated expenditure shares for EC i.

3.9 In practice, the availability of annual HFCE expenditure data from September 2005 to September 2015 means ten different CPI weighted baskets are derived, one for each HFCE vintage. In order to form a continuous time series, which takes into account changing purchasing behaviours and product substitution, the experimental HFCE price indexes are chain linked¹⁵ every September quarter. The application of chain linking can be expressed as:

13 Price reference period is the period for which prices are used as denominators in the index calculation (ABS 2011).

14 A procedure whereby the quantities in an earlier period are revalued at the prices of a later period. For more information, see sections 9.95–9.104 of ILO (2004).

15 An index number series for a long sequence of periods obtained by linking together index numbers spanning shorter sequences of periods (ILO 2004, p.491).

METHODS *continued*

$$I_{ChLo}^{06/15} = I_{ChLo}^{05/06} \times I_{ChLo}^{06/07} \times \dots \times I_{ChLo}^{14/15} \quad (3.3)$$

Where;

$I_{ChLo}^{06/15}$ = continuous chained-linked annual indexes from 2005–06 to 2014–15

3.10 In addition, the ABS has previously constructed a retrospective superlative index to estimate the amount of substitution bias in the CPI following previous series reviews. Superlative indexes allow for substitution as they make use of weights from both the earlier and later periods under consideration. The preferred superlative price index is the Fisher-type index, which is calculated as the geometric mean of the Laspeyres-type¹⁶ and Paasche-type¹⁷ indexes. The Fisher-type index formula for any given period t is defined as:

$$\text{Fisher} (I_F^t) = \sqrt{I_L^t \times I_P^t} \quad (3.4)$$

Where;

I_L^t = Laspeyres-type index at period t

I_P^t = Paasche-type index at period t

In order to assess the relationship between the experimental HFCE series and superlative index, a Fisher-type index is constructed for the period September 2005 to September 2011¹⁸.

EMPIRICAL RESULTS

3.11 A comparison of group level expenditure weights for each of the HFCE vintages and CPI following the 16th Series review is shown in table 3.1 below. The CPI and HFCE vintages show similar expenditure patterns, indicating the methods used to adjust HFCE data for CPI produces consistent expenditure results to those derived from household survey data. The results also indicate the impacts of cyclical revisions are small at the group level.

¹⁶ An index in which the basket is composed of the actual quantities of goods and services in the earlier of the two periods compared. In this study, the Laspeyres-type index equivalent to the All Groups CPI (excluding deposit and loans) for the period September 2005 to September 2011.

¹⁷ An index in which the basket is composed of the actual quantities of goods and services in the later of the two periods compared. In this study, the Paasche-type index derives expenditure weights each quarter using a linear model between the 15th and 16th Series CPI reviews to estimate price change for the period September 2005 to September 2011.

¹⁸ See detailed information on index theory and aggregation in chapter 4 of ABS (2011).

EMPIRICAL RESULTS
continued

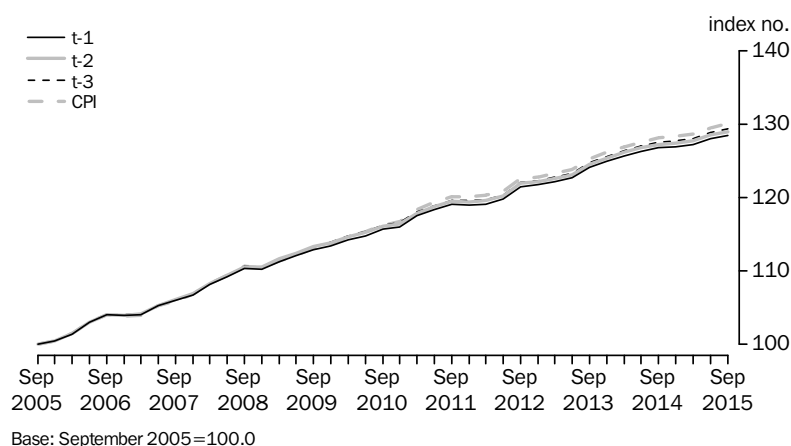
3.1 COMPARISON OF CPI 16TH SERIES AND HFCE WEIGHTS, proportion (%) of total expenditure—2011 financial year

GROUP	HES(a)	t-1	t-2	t-3
Food and non-alcoholic beverages	16.95	17.49	17.39	16.76
Alcohol and Tobacco	7.13	6.33	6.46	6.45
Clothing	4.02	4.83	4.68	4.47
Housing	22.47	21.96	23.00	23.32
Furnishing, Household equipment and Services	9.16	8.50	8.37	8.19
Health	5.33	6.38	6.29	6.03
Transport	11.64	11.22	11.25	11.96
Communication	3.07	3.13	3.13	3.01
Recreation	12.68	12.88	12.62	12.76
Education	3.20	3.78	3.68	3.35
Insurances and Financial services	4.35	3.50	3.13	3.70
All groups	100.00	100.00	100.00	100.00

(a) The CPI Group HES weights are taken from Consumer Price Index 16th Series weighting pattern (cat.no.6471) and re-calculated to exclude the weights for the deposit and loans EC.

3.12 Weights for the experimental HFCE price indexes are derived at the EC level for each vintage, which are then applied to the published price indexes (weighted eight capitals). The results at the All groups level are shown below in Figure 3.1, with the experimental HFCE price indexes tracking closely to the CPI. The experimental HFCE series grew by 28.5% (t-1), 29.0% (t-2) and 29.4% (t-3) respectively from September 2005 to September 2015. The CPI grew by a total of 30.1% over the equivalent period.

FIGURE 3.1: INDEX COMPARISON BETWEEN EXPERIMENTAL HFCE AND CPI SERIES



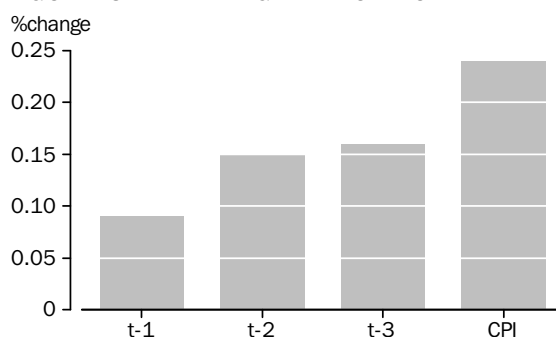
3.13 The compound annual growth rate (CAGR) is used to derive annual average inflation rates over the analysis period. This measure of average annual household inflation is consistent with previous methods used by the ABS, which accurately account for the effects of compounding when applying annual growth rates to a price index. The experimental HFCE series recorded average annual growth of 2.54% (t-1), 2.58% (t-2) and 2.61% (t-3) respectively from September 2005 to September 2015. The CPI recorded an average annual growth rate of 2.67% over the equivalent period.

EMPIRICAL RESULTS
continued

3.14 Using EC weights from the 15th and 16th CPI Series reviews, the Fisher-type index rose by a total of 18.5% across the period September 2005 to September 2011¹⁹. Across the equivalent period, the experimental HFCE series rose 19.1% (t-1), 19.5% (t-2) and 19.6% (t-3), while the CPI rose by a total of 20.2%, demonstrating all three HFCE experimental indexes lie closer to the Fisher-type index, relative to the CPI.

3.15 In order to quantify the amount of upper level substitution bias, the average annual price changes can be compared to the superlative Fisher-type index. As shown in Figure 3.2, the average annual upward substitution bias for the experimental HFCE series was 0.09% (t-1), 0.15% (t-2) and 0.16% (t-3) higher relative to the Fisher-type index. The CPI recorded a larger substitution bias compared to the experimental HFCE series, with an average annual upward substitution bias of 0.24% relative to the Fisher-type index.

FIGURE 3.2: AVERAGE ANNUAL UPPER LEVEL SUBSTITUTION BIAS



3.16 In addition to the annual normal cycle of revisions to HFCE data, the entire HFCE data series is periodically open for historical revisions, covering the entire Supply-Use time series, and occurs outside the normal cycle of revisions. The headline CPI is only ever revised in exceptional circumstances. HFCE data provide a timelier pattern of household expenditure between HES benchmarks, in comparison to the CPI where it is assumed all of the changes from the previous HES occur at the time the new benchmark is introduced. The impact of historical revisions as shown in this analysis is minimal. Hence, the CPI will maintain its current revisions policy.

3.17 In order to quantify the potential impact of historical revisions to the experimental HFCE price indexes, expenditure weights are derived from the revised series and implemented to determine whether aggregate household inflation measures would have changed. Using the 2010-11 historical revision specifically, the average annual price change for the historically revised series was 2.82% for the period September 2005 to September 2012. This was the same annual growth rate as the t-1 index (2.82%), while the other experimental HFCE indexes reported slightly higher household inflation of 2.88% (t-2) and 2.89% (t-3) per annum respectively. These results suggest that the impact of a historical revision is relatively small, producing an annual inflation rate very close to the t-1 index. This analysis was conducted on other historical revisions to HFCE data, with similar relationships observed for the 2009-10 and 2012-13 historical revisions.

¹⁹ The Fisher-type index is retrospectively constructed between September 2005 and September 2011 for the purpose of consistency with the experimental indexes. This assumes that the 15th Series was linked in September 2005 and the 16th Series in September 2011.

EMPIRICAL RESULTS
continued

3.18 The Lowe index formula is internationally the most used upper level aggregation formula. The application of the Lowe formula involves price updating expenditures from the weight reference period to the price reference period. The ABS currently implements CPI EC re-weights with an approximate 12 month lag from the weight reference period. If the time between weight and price reference period is long, the impact of price updating may have an upward impact on household inflation measurement. This finding is consistent with other national statistical agencies' investigations into the effects of varying the implementation lag of re-weighting a CPI (Huang et al 2015).

3.19 The analysis shows the t-1 price index lies closer to the historically revised HFCE price index when compared with the other two vintages. This is partially due to the impact of price updating, with the longer implementation lags for t-2 and t-3 vintages having an upward effect on household inflation rates. When the effects of price updating are removed (no implementation lag for all vintages), the t-3 price index reports the lowest rate of household inflation compared to the other two vintages. It also lies closest to the historically revised HFCE price index, providing further evidence of the upward impact price updating over long intervals has on household inflation measurement.

3.20 The t-1 vintage is recommended as the preferred option based on the three main criteria established, specifically; (1) it has the shortest implementation lag between weight reference period and price reference period; (2) it is closest in proximity to a superlative index; and (3) it aligns well with international standards. This is summarised in Table 3.2 below.

3.2 HFCE VINTAGE CRITERIA ASSESSMENT SUMMARY

<i>Criteria</i>	<i>t-1</i>	<i>t-2</i>	<i>t-3</i>
Relevance	15 months	27 months	39 months
Accuracy	+0.09 p.a.	+0.15 p.a.	+0.16 p.a.
International practice	ONS, Sweden, Netherlands	France	N/A

CHAPTER 4 SUMMARY AND CONCLUSIONS

SUMMARY AND CONCLUSIONS

4.1 The Australian CPI is a robust indicator of household inflation that has served Australia well for many decades. While the data sources and methods are well understood by users, there are particular aspects of the CPI that can be enhanced. In light of this, the ABS has embarked on a research program aimed at enhancing the Australian CPI. This paper focuses on one of the areas identified for enhancement, being the frequency of the EC weight updates.

4.2 The ABS currently updates expenditure weights at the EC level every six years using data from the HES. The availability of HFCE data from the National Accounts provides the ABS with an opportunity to update CPI EC weights more frequently. The ability to reweight the Australian CPI more frequently would have significant benefits to the user community. These include more representative expenditure weights that more accurately reflect consumer spending patterns, addressing stakeholder concerns following the 16th Series CPI review, coherence across macroeconomic statistics and, improved alignment with international standards.

4.3 The use of expenditure aggregates from the National Accounts is a recommended approach from the ILO in situations where the time interval between household surveys is large. Within Australia, HFCE data is available on an annual basis as part of the *Australian System of National Accounts* (cat. no. 5204.0). Practical challenges exist (due to scope and coverage differences) when using HFCE data for CPI weights. These have been examined in detail (in chapter 2) with treatments recommended.

4.4 The ABS has conducted empirical investigations with results demonstrating broad stability in weights at the group level when comparing HFCE (t-1, t-2 and t-3) and HES data, indicating both sources tell a coherent story of consumer expenditure patterns.

4.5 The ABS has produced three experimental HFCE price series over the period September 2005 to September 2015. The results reveal that all three experimental HFCE series reported lower average annual household inflation measures relative to the CPI. They were quantified as 2.54% (t-1), 2.58% (t-2) and 2.61% (t-3), compared to 2.67% for the CPI over the analysis period.

4.6 The empirical results support the theory that higher frequency re-weighting at the EC level captures consumers' substitution effects. When compared to a retrospective superlative index between the period September 2005 to September 2011, all three experimental HFCE series reported a lower estimate of substitution bias. This was quantified as 0.09% (t-1) per annum, 0.15% (t-2) per annum and 0.16% (t-3) per annum, compared to 0.24% per annum for the CPI. These results indicate that annually chain-linked HFCE price indexes capture a greater amount of consumer substitution when compared to the current re-weighting process (i.e. six yearly updates).

4.7 With respect to the available HFCE vintages, t-1 vintage is recommended as the preferred option. The t-1 vintage is preferred based on three main criteria; (1) it has the shortest implementation lag; (2) it is closest in proximity to a superlative index; and (3) it aligns with international practice.

4.8 While National Accounts annual HFCE data is historically revised, the Australian CPI is only revised in exceptional circumstances. These results show that the impacts of historical revisions to National Accounts HFCE data are small. This analysis shows that historically revised HFCE price indexes are very close to the t-1 vintage.

SUMMARY AND CONCLUSIONS *continued*

4.9 Since the HES is a major benchmark of the HFCE and CPI, a more frequent HES is still desirable.

4.10 The ABS will update CPI weights with HES data 2015–16 in December quarter 2017. The HES 2015–16 will also be incorporated into National Accounts HFCE data, ensuring consistency across macro–economic statistics.

4.11 After December quarter 2017, the ABS will move to update the CPI EC weights on an annual basis using the methods and data described in this paper.

4.12 The ABS will review its strategy of implementing HFCE weights in the CPI. Readers are invited to provide feedback on this paper. Specific points on which feedback would be appreciated are:

- proposed treatment of HFCE data to align with CPI;
- proposed treatment of geographic coverage differences;
- proposed alternate data sources to HFCE data; and
- maintaining the current quality of the SLCIs (using six–yearly weight updates).

4.13 Please provide feedback to prices.statistics@abs.gov.au by 30th September 2016. The *ABS Privacy Policy* outlines how the ABS will handle any personal information that you provide to us.

4.14 A timetable for feedback and consultation is as follows:

- *11 July 2016*: Release and widely distribute this information paper summarising investigations into more frequently updating CPI EC weights
- *July – September 2016*: Consult with users regarding the contents of the information paper
- *October – November 2016*: Communicate outcomes of feedback and consultation process.

APPENDIX 1 16TH SERIES CPI DATA SOURCES

A1.1 16TH SERIES DATA SOURCES AND WEIGHTS

	<i>16th Series data source</i>	<i>16th Series CPI weight (%)</i>
FOOD AND NON-ALCOHOLIC BEVERAGES GROUP		
Bread EC	HES	0.58
Cakes and biscuits EC	HES	0.74
Breakfast cereals EC	HES	0.18
Other cereal products EC	HES	0.21
Beef and veal EC	HES	0.39
Pork EC	HES	0.36
Lamb and goat EC	HES	0.26
Poultry EC	HES	0.49
Other meats EC	HES	0.38
Fish and other seafood EC	HES	0.41
Milk EC	HES	0.42
Cheese EC	HES	0.34
Ice cream and other dairy products EC	HES	0.39
Fruit EC	HES	1.6
Vegetables EC	HES	1.34
Eggs EC	HES	0.11
Jams, honey and spreads EC	HES	0.14
Food additives and condiments EC	HES	0.3
Oils and fats EC	HES	0.17
Snacks and confectionery EC	HES	0.97
Other food products n.e.c. EC	HES	0.47
Coffee, tea and cocoa EC	HES	0.27
Waters, soft drinks and juices EC	HES	0.87
Restaurant meals EC	HES/HFCE	2.81
Take away and fast foods EC	HES	2.63
ALCOHOL AND TOBACCO GROUP		
Spirits EC	HES/HFCE	0.91
Wine EC	HES/HFCE	1.64
Beer EC	HES/HFCE	2.2
Tobacco EC	HES/HFCE	2.32
CLOTHING AND FOOTWEAR GROUP		
Garments for men EC	HES	0.74
Garments for women EC	HES	1.47
Garments for infants and children EC	HES	0.31
Footwear for men EC	HES	0.14
Footwear for women EC	HES	0.34
Footwear for infants and children EC	HES	0.13
Accessories EC	HES	0.74
Cleaning, repair and hire of clothing and footwear EC	HES	0.12
HOUSING GROUP		
Rents EC	HES	6.71
New dwelling purchase by owner-occupiers EC	Building Activity/Household projections	8.67
Maintenance and repair of dwelling EC	HES	2.05
Property rates and charges EC	HES	1.26
Water and sewerage EC	HES	0.9
Electricity EC	HES	1.99
Gas and other household fuels EC	HES	0.72

APPENDIX 1 16TH SERIES CPI DATA SOURCES *continued*

A1.1 16TH SERIES DATA SOURCES AND WEIGHTS *continued*

	<i>16th Series data source</i>	<i>16th Series CPI weight (%)</i>
FURNISHINGS. HOUSEHOLD EQUIPMENT AND SERVICES GROUP		
Furniture EC	HES	1.63
Carpets and other floor coverings EC	HES	0.28
Household textiles EC	HES	0.61
Major household appliances EC	HES	0.5
Small electric household appliances EC	HES	0.24
Glassware, tableware and household utensils EC	HES	0.43
Tools and equipment for house and garden EC	HES	0.26
Cleaning and maintenance products EC	HES	0.29
Personal care products EC	HES	1.11
Other non-durable household products EC	HES	1.46
Child care EC	HES	0.69
Hairdressing and personal grooming services EC	HES	0.9
Other household services EC	HES	0.69
HEALTH GROUP		
Pharmaceutical products EC	HES	1.17
Therapeutic appliances and equipment EC	HES	0.14
Medical and hospital services EC	HES	3.42
Dental services EC	HES	0.56
TRANSPORT GROUP		
Motor vehicles EC	HFCE	3.25
Spare parts and accessories for motor vehicles EC	HES	0.99
Automotive fuel EC	HES	3.55
Maintenance and repair of motor vehicles EC	HES	1.67
Other services in respect of motor vehicles EC	HES	1.35
Urban transport fares EC	HES	0.74
COMMUNICATION GROUP		
Postal services EC	HES	0.12
Telecommunication equipment and services EC	HES	2.93
RECREATION AND CULTURE GROUP		
Audio, visual and computing equipment EC	HES/HFCE	1.56
Audio, visual and computing media and services EC	HES	0.98
Books EC	HES	0.4
Newspapers, magazines and stationery EC	HES	0.68
Domestic holiday travel and accommodation EC	HES	2.47
International holiday travel and accommodation EC	HES	2.29
Equipment for sports, camping and open-air recreation EC	HES	0.61
Games, toys and hobbies EC	HES	0.78
Pets and related products EC	HES	0.38
Veterinary and other services for pets EC	HES	0.4
Sports participation EC	HES	0.94
Other recreational, sporting and cultural services EC	HES	1.09
EDUCATION GROUP		
Preschool and primary education EC	HES	0.52
Secondary education EC	HES	1.25
Tertiary education EC	GFS	1.4

APPENDIX 1 16TH SERIES CPI DATA SOURCES *continued*

A1.1 16TH SERIES DATA SOURCES AND WEIGHTS *continued*

	<i>16th Series data source</i>	<i>16th Series CPI weight (%)</i>
INSURANCE AND FINANCIAL SERVICES GROUP		
Insurance EC	Australian Prudential Regulation Authority (APRA)	1.4
Deposit and loan facilities (direct charges) EC	Australian Financial Institutions/Reserve Bank of Australia (RBA)	0.76
Other financial services EC	HFCE/Taxation Revenue/Internal ABS data	2.92

APPENDIX 2 DERIVING CAPITAL CITY EXPENDITURE WEIGHTS

DERIVING CAPITAL CITY EXPENDITURE WEIGHTS

1. Geographical coverage is a key difference between HFCE (national) and the CPI (metropolitan). As mentioned in paragraph 2.12, the ABS is conducting further work to remove non-metropolitan expenditure to align with the CPI. For the purposes of the example shown below, National HFCE data is used to demonstrate how to utilise data for CPI weighting at the capital city level which would assume metropolitan household expenditure changes are the same as National household expenditure changes.

2. It is proposed to update capital city expenditure weights across the 87 ECs when the most recent HES data becomes available (every six years). The sum of the capital city expenditure aggregates would represent the weighted eight capitals for each EC – this is equivalent to current CPI six yearly re-weighting processes. For the intervening periods between HES years, the expenditure aggregate at the weighted eight capitals level will be updated via the annual movement in expenditure derived from National HFCE data for each EC. This estimate of weighted eight capitals expenditure will then be distributed across each capital city (for every EC) using price updated expenditure aggregates from the previous four quarters.

3. To illustrate the application, an example is included below with reference to September quarter 2011 and September quarter 2012. Table A2.1 shows hypothetical expenditure aggregates of a simplified economy (i.e. three products and cities) following the HES. The capital city expenditure aggregates are then aggregated to derive a new set of expenditure aggregates used for the total of three capitals.

A2.1 SEPTEMBER 2011 LINK PERIOD EXPENDITURE AGGREGATES (MILLIONS)

	<i>Sydney</i>	<i>Melbourne</i>	<i>Brisbane</i>	<i>Total (three capitals)</i>
Milk EC	40.00	35.00	25.00	100.00
Bread EC	60.00	30.00	30.00	120.00
Vegetables EC	30.00	30.00	30.00	90.00
Total	130.00	95.00	85.00	310.00

4. The expenditure aggregates in A2.1 are used in the compilation of the CPI using the Lowe index formula. In September 2012, suppose prices for each capital city have moved dynamically over the past twelve months which produced the following four quarter average of expenditure aggregates in Table A2.2.

A2.2 AVERAGE EXPENDITURE AGGREGATES FOR DECEMBER 2011 TO SEPTEMBER 2012 (MILLIONS)

	<i>Sydney</i>	<i>Melbourne</i>	<i>Brisbane</i>	<i>Total (three capitals)</i>
Milk EC	48.00	36.75	25.50	110.25
Bread EC	66.00	31.50	31.20	128.70
Vegetables EC	32.10	30.00	30.00	92.10
Total	146.10	98.25	86.70	331.05

5. National HFCE data is available that indicates the following changes in expenditure have occurred between September 2011 and September 2012: milk (+3.0%), bread (-5.0%) and vegetables (+7.0%). These estimates are used to derive new link period expenditure aggregates for each EC at the weighted three capitals level as shown in Table A2.3.

APPENDIX 2 DERIVING CAPITAL CITY EXPENDITURE WEIGHTS *continued*

DERIVING CAPITAL CITY
EXPENDITURE WEIGHTS
continued

A2.3 WEIGHTED THREE CAPITAL CITY LINK PERIOD EXPENDITURE AGGREGATES

	September 2011	September 2012
Milk EC	100.00	103.00
Bread EC	120.00	114.00
Vegetables EC	90.00	96.30
Total	310.00	313.30

6. Once new link period expenditure aggregates are derived at the weighted three capital city level, they are distributed across each EC in a manner that preserves each capital city's contribution to the weighted three capital aggregate for the preceding four quarters. The new link period value aggregates for September 2012 are shown below in Table A2.4. For example, the value of \$44.84 million for milk in Sydney is derived by multiplying the proportional expenditure for Sydney in Table A2.2 (48/110.25) by the new link period expenditure aggregate for milk (\$103 million). The expenditure aggregates in Table A2.3 form link period expenditure aggregates from which future period-to-period price change can be derived.

A2.4 SEPTEMBER 2012 LINK PERIOD EXPENDITURE AGGREGATES (MILLIONS)

	Sydney	Melbourne	Brisbane	Total (three capitals)
Milk EC	44.84	34.33	23.82	103.00
Bread EC	58.46	27.90	27.64	114.00
Vegetables EC	33.56	31.37	31.37	96.30
Total	136.87	93.60	82.83	313.30

7. This approach can be generalised and denoted as follows;

Step 1: Derive weighted eight capital expenditure aggregates using movements in National HFCE.

$$EA_{i8caps}^* = EA_{i8caps} \times \left(\frac{HFCE_i^t}{HFCE_i^{t-1}} \right)$$

Step 2: Pro-rate weighted eight capital expenditure aggregates across capital cities.

$$EC_{ij} = \frac{EA_{ij}}{\sum_{j=1}^8 EA_{ij}} \times EA_{i8caps}^*$$

Where:

EA_{i8caps} = previous weighted eight capitals link period expenditure aggregates

EA_{i8caps}^* = new weighted eight capitals link period expenditure aggregates
adjusted using HFCE

$HFCE_i^{t-1}$ = HFCE for the previous year for EC i

$HFCE_i^t$ = HFCE for the current year for EC i

EA_{ij} = four quarter (DQ, MQ, JQ, SQ) average of EC i and capital city j updated
expenditure aggregate

EC_{ij} = link period expenditure aggregate for EC i and capital city j.

APPENDIX 3 OECD MEMBER AND PARTNER COUNTRIES

OECD MEMBER AND PARTNER
COUNTRIES: DATA SOURCES
AND FREQUENCY OF WEIGHT
UPDATES

A3.1 OECD MEMBER AND PARTNER COUNTRIES: DATA SOURCES AND FREQUENCY OF WEIGHT UPDATES

<i>Country</i>	<i>Source of weights</i>	<i>Frequency of weights update</i>
Australia	Household Expenditure Survey	6 years
Austria	Household Budget Survey	5 years
Belgium	Household Budget Survey	2 years
Brazil	Consumer Expenditure Survey	1 year
Canada	Survey of Household Spending	2 years
Chile	Household Budget Survey	10 years
China	Household Surveys	5 years
Columbia	National Account HFCE	10 years
Costa Rica	National Survey of Households' Income and Expenses	5 years
Czech Republic	Household Budget Survey	5 years
Denmark	National Accounts HFCE	5 years
Estonia	Household Budget Survey and National Accounts	1 year
Finland	National Accounts HFCE	5 years
France	National Accounts HFCE	1 year
Germany	Survey of Income and expenditure	5 years
Greece	Household Budget Survey	2 years
Hungary	National Accounts	1 year
Iceland	Household Expenditure Survey	1 year
India	Consumer Expenditure Survey	5 years
Indonesia	Cost of Living Survey	5 years
Ireland	Household Budget Survey	5 years
Israel	Household Expenditure Survey	2 years
Italy	National Accounts HFCE	1 year
Japan	Family Income and Expenditure Survey	5 years
Korea	Family Income and Expenditure Survey	5 years
Latvia	Household Budget Survey	1 year
Lithuania	Household Monetary Expenditure	1 year
Luxembourg	National Accounts HFCE	1 year
Mexico	National Income and Expenditure Household Survey	Not fixed
Netherlands	National Accounts HFCE	1 year
New Zealand	Household Expenditure Survey	3 years
Norway	National Accounts HFCE	1 year
Office for National Statistics (ONS)	National Accounts HFCE	1 year
Poland	Household Budget Survey	1 year
Portugal	Household Budget Survey and National Accounts	1 year
Russian Federation	Household Budget Survey	1 year
Saudi Arabia	Household Expenditure and Income Survey	Not fixed
Slovak Republic	Household Budget Survey	1 year
Slovenia	Household Budget Survey	1 year
South Africa	Income and Expenditure Survey	5 years
Spain	Household Budget Survey	1 year
Sweden	National Accounts HFCE	1 year
Switzerland	Household Budget Survey	1 year
Turkey	Household Budget Survey	1 year
USA	Consumer Expenditure Survey	1 year

Source: Information obtained from the OECD Main Economic Indicators website (<http://stats.oecd.org/mei/>)

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