Australian Bureau of Statistics

Information Paper

Seasonal Adjustment of Consumer Price Indexes

Australia

2011

6401.0.55.003

INQUIRIES

AUSTRALIAN BUREAU OF STATISTICS

EMBARGO: 11.30AM (CANBERRA TIME) WED 14 SEP 2011

ABS Catalogue No. 6401.0.55.003

Produced by the Australian Bureau of Statistics.

INQUIRIES

For further information about these and related statistics, contact the National Information and Referral Service on 1300 135 070.

CONTENTS

page

PREFACE

In the June quarter 2007, the ABS included two analytical measures of underlying inflation – the Trimmed mean and Weighted median – using seasonally adjusted data in the *Consumer Price Index, Australia* (cat. no. 6401.0). These measures, which abstract from short-term volatility, are considered useful in identifying underlying trends of price level change and were developed by the Reserve Bank of Australia (RBA).

In December 2010, the ABS completed an extensive review of the Australian Consumer Price Index (CPI) and announced changes to ensure the CPI continues to meet the requirements of the Australian community. The review recommended replacing the 15th series seasonal adjustment methodology used to calculate the underlying trend inflation measures with a methodology using standard ABS practices. For more details about these and other changes to the CPI, please refer to *Information Paper: Outcome of the 16th Series Australian Consumer Price Index Review, December 2010* (cat. no. 6469.0).

From the commencement of the 16th series CPI in the September quarter 2011, the ABS will introduce a new 16th series seasonal adjustment methodology to identify and adjust for seasonality. This will replace the 15th series seasonal adjustment methodology.

The non-seasonally adjusted All groups CPI, weighted average of eight capital cities is the official inflation measure. It is not subject to revision. The seasonally adjusted measures will show small revisions from quarter to quarter as the seasonal factors are updated using the latest available data.

Readers wishing to obtain further information about the matters covered in this information paper should contact:

Mr Lewis Conn
Director
Consumer Price Index Section
Australian Bureau of Statistics
PO Box 10
BELCONNEN ACT 2616
Telephone: (02) 6252 7326
Email: < *lewis.conn@abs.gov.au* >

Brian Pink
Australian Statistician

CHAPTER 1: BACKGROUND

1.1 The ABS first compiled the CPI in 1960 with series extending back to the September quarter 1948. The CPI measures quarterly changes in the price of a basket of goods and services, which accounts for a high proportion of expenditure by the CPI population group (i.e. metropolitan households). This basket covers a wide range of goods and services.

1.2 The movements in prices measured each quarter reflect a range of influences. Some users wish to focus on components or a subset of these influences. Analysts use a variety of measures, including seasonal adjustment, exclusion measures (eg. CPI excluding fuel) and statistical measures such as the Trimmed mean and Weighted median to undertake analysis of inflation in the Australian economy. Seasonal adjustment helps the analysis of price movements as it estimates and then removes influences that are systematic and calendar related from a time series.

1.3 The ABS produces two measures of underlying trend inflation, the Trimmed mean and Weighted median. In the 15th series these measures were calculated using a seasonal adjustment methodology developed by the RBA (Roberts, 2005). The 16th series CPI review recommended the ABS continue to produce analytical measures of underlying trend inflation, but replace the 15th series seasonal adjustment methodology with standard ABS seasonal adjustment methodology. This will ensure seasonally adjusted CPI data is consistent with other ABS data and results in more transparent and robust analytical series.

1.4 The following analytical measures will be published in the September quarter 2011 issue of *Consumer Price Index, Australia* (cat. no. 6401.0), scheduled for release on 26 October 2011:

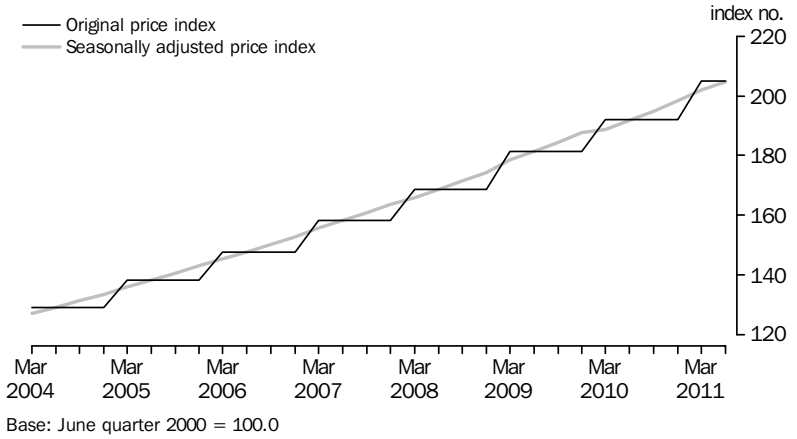
- All groups CPI, seasonally adjusted; comprises all components included in the All groups CPI, seasonally adjusted where seasonality has been identified at the weighted average of eight capital cities level.
- CPI Expenditure classes, seasonally adjusted; comprises the subset of seasonally adjusted expenditure classes at the weighted average of eight capital cities level.
- Trimmed mean and Weighted median; these are two analytical measures of underlying trend inflation. For more details see Chapter 5.

CHAPTER 2: SEASONAL ADJUSTMENT METHODOLOGY

2.1 When analysing an original series, users may want to identify the cause of the movement recorded. An original time series can be decomposed into three components: the trend (the general direction of the series), the seasonal component (systematic, calendar related movements) and the irregular component (unsystematic, short term fluctuations). Seasonally adjusted series are produced by estimating the seasonal component and removing this from the original series. In most economic data the seasonal component is a combination of seasonal influences (e.g. the effect of the weather or social traditions) plus other kinds of calendar related variations such as Chinese New Year and Christmas. The seasonal adjustment methodology takes into account both seasonal and other calendar related factors that evolve over time to reflect changes in activity patterns.

2.2 As an example, it can be seen from Graph 1 that the expenditure class 'Secondary education' typically rises each March quarter, with little movement recorded in the remaining quarters of the year. In the seasonally adjusted series the systematic rise recorded in the March quarter each year has been removed.

GRAPH 1: SECONDARY EDUCATION PRICE INDEX, Weighted average of eight capital cities



Base: June quarter 2000 = 100.0

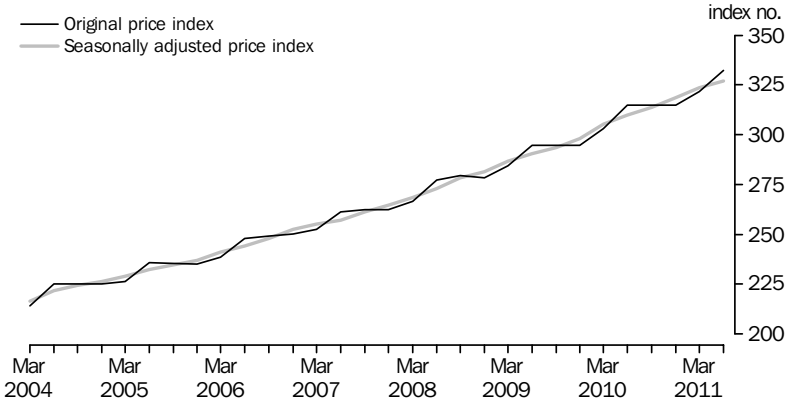
2.3 The seasonal adjustment methodology used in the 15th series to calculate the Trimmed mean and Weighted median underlying trend measures was developed by the RBA (this is referred to as the 15th series seasonal adjustment methodology). The methodology primarily looked for a consistent seasonal pattern over the entire span of a series and used a series of statistical tests to test for seasonality. Using this seasonal adjustment methodology, 20 out of the 90 expenditure classes in the 15th series of the CPI were identified as being seasonal.

2.4 In 2010, the ABS conducted a seasonal adjustment review that used a range of statistical tests to determine if stable and evolving seasonality was present in each expenditure class. This methodology, called the 16th series seasonal adjustment methodology, identified expenditure classes that show seasonal patterns over any part of the time series as being seasonal. The review identified an increased number of expenditure classes to be seasonal. The increase was due to the availability of additional time series data, changes in the seasonality of expenditure classes and a different conceptual basis for assessing seasonality. Using this seasonal adjustment methodology, 64 of the 90 expenditure classes in the 15th series of the CPI were identified as having a seasonal pattern.

2.5 A table which outlines the 15th series expenditure classes that were identified as seasonal under the 15th and 16th series seasonal adjustment methodologies is attached in Appendix 1.

2.6 For example, from Appendix 1 it can be seen that the 'Hospital and medical services' expenditure class was identified as not being seasonal under the 15th series seasonal adjustment methodology. Following the 2010 review, the 16th series seasonal adjustment methodology identified the 'Hospital and medical services' expenditure class to contain emerging seasonality with March quarters seasonally low and June quarters seasonally high (as seen in Graph 2). The benefit of adjusting the series is seen in the following graph of the 'Hospital and medical services' original and seasonally adjusted price index, where the seasonally adjusted series has removed the calendar related influences from the original series.

GRAPH 2: HOSPITAL AND MEDICAL SERVICES PRICE INDEX, Weighted average of eight capital cities



Base: 1989–90 = 100.0

2.7 The standard ABS seasonal adjustment methodology being introduced is concurrent seasonal adjustment. This method uses the original time series available at each reference period to estimate seasonal factors for the current and previous quarters. Concurrent seasonal adjustment uses all available data to derive the combined adjustment factors for the previous quarter and for the same quarter in the preceding year. Seasonal patterns are reanalysed when there are known changes to regular events. The ABS will conduct reanalysis of the model used to estimate seasonal factors annually.

REVISIONS

2.8 Through concurrent seasonal adjustment, the most recent data can be utilised to capture changes in spending patterns and other macro-economic impacts. Moving to the standard ABS seasonal adjustment methodology will result in a greater than usual number of revisions to the historical series when first published in the September quarter 2011 for the Weighted median and Trimmed mean. The potential increase in the number of revisions initially is due to the increase in the number of expenditure classes identified as seasonal when the standard ABS seasonal adjustment methodology is applied.

2.9 For more information regarding the seasonal adjustment methodology used in the ABS please see *Information Paper: An Introductory Course on Time Series Analysis* (cat. no. 1346.0.55.001).

BREAKS IN A TIME SERIES

2.10 Price indexes can be affected by an abrupt and sustained change in the level of the series. Breaks in individual series are not removed from the seasonally adjusted price indexes, but are accounted for in the Trimmed mean and Weighted median as described in Chapter 5.

2.11 For example, the introduction of the Goods and Services Tax (GST) in the September quarter 2000 caused a shock to a large number of price series at the same time. The break in series caused by the introduction of the GST has not been removed from the seasonally adjusted estimates but its effect has been taken into account during the seasonal adjustment process as per ABS standard practice. Analysis of the impact of the introduction of the GST on the CPI is available in the feature article 'Measuring the impact of the new tax system on the September Quarter 2000 Consumer Price Index' in the December 2000 issue of *Australian Economic Indicators* (cat. no. 1350.0).

2.12 More information regarding seasonal adjustment treatments can be found in the feature article 'When it's not "Business-as-usual": Implications for ABS Time Series' in the August 2009 issue of *Australian Economic Indicators* (cat. no. 1350.0).

TREND ESTIMATES OF THE CPI

2.13 A study conducted in 2004 into seasonal adjustment of the CPI concluded that trend estimates of the CPI were generally not markedly different from the original series. The results of the 2004 study 'Seasonally Adjusted and Trend Estimates for the Consumer Price Index (CPI)' can be found in the December 2004 issue of *Australian Economic Indicators* (cat. no. 1350.0).

2.14 Analysis undertaken in 2011 confirmed the conclusions of the 2004 study – that direct trend estimates of the All groups CPI, derived using standard trend calculations, was still not distinctly different from the original series. A direct trend series is derived by adjusting the All groups CPI, and not through the aggregation of trend estimates of its components. The ABS does not propose to produce direct trend estimates of the All groups CPI at this stage. As part of the analytical work program the ABS will re-conduct this analysis to review if trend estimates of the All groups CPI should be produced.

CHAPTER 3: SEASONAL ADJUSTMENT OF THE ALL GROUPS CPI

3.1 During the 16th series CPI review consultation in 2010, there was strong demand for the ABS to produce an All groups CPI, seasonally adjusted series to assist users in analysing price inflation. Seasonally adjusted CPI figures are currently produced, in addition to the headline CPI, by a number of international statistical agencies including Statistics Canada and the United States Bureau of Labour Statistics (BLS).

3.2 To calculate the All groups CPI, seasonally adjusted estimate, two approaches were considered: direct seasonal adjustment and aggregation of the seasonally adjusted components.

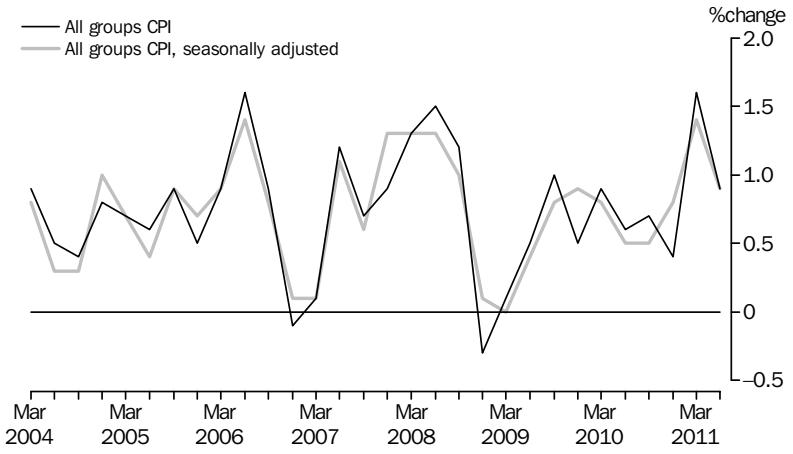
- Direct seasonal adjustment of the original All groups CPI is not considered effective as there are a number of different seasonal components feeding into the original series making it difficult to identify the seasonal patterns. In a previous study conducted by the ABS (ABS, 2004), the All groups CPI was found not to have any stable seasonal pattern. However, some expenditure class components of the CPI did display a seasonal pattern.
- Aggregation of the seasonally adjusted components applies seasonal adjustment to the expenditure class components of the CPI which are found to be seasonal, and then aggregates the seasonally adjusted and non-seasonally adjusted components to calculate the All groups, seasonally adjusted estimate. Analysis found the aggregation of seasonally adjusted components approach gives a robust All groups CPI, seasonally adjusted estimate and the results can also be used in the calculation of the Trimmed mean and Weighted median.

3.3 Various approaches to seasonally adjust consumer price indexes were considered in a European taskforce in 2000 (ECB, 2000). The taskforce recommended the aggregation of the seasonally adjusted components approach which is the second methodology described above. The taskforce also recommended that price index level series, rather than growth rates, should be adjusted for seasonality.

3.4 In line with these recommendations, the ABS will calculate an All groups CPI, seasonally adjusted figure by aggregating the seasonally adjusted and non-seasonally adjusted expenditure classes together using the weighting pattern (seasonally adjusted) at the weighted average of eight capital cities level from the September quarter 2011. As the seasonal adjustment process will be based on concurrent seasonal adjustment, the All groups CPI, seasonally adjusted estimates will be subject to revision. The original All groups CPI, weighted average of eight capital cities will continue to be the official inflation measure and will not be subject to revision.

3.5 The following graph (Graph 3) compares the percentage change from previous quarter for the original All groups CPI and the All groups CPI, seasonally adjusted. Note that March quarters are typically high and December quarters typically low for the original series.

GRAPH 3: ALL GROUPS CPI AND ALL GROUPS CPI, SEASONALLY ADJUSTED, Weighted average of eight capital cities - Percentage change from previous quarter



3.6 Table 2 of Appendix 2 contains the index numbers for the All groups CPI, seasonally adjusted series at the weighted average of eight capital cities level. Table 3 of Appendix 2 shows the percentage change from previous quarter and corresponding quarter of previous year for the All groups CPI, seasonally adjusted series.

3.7 The All groups CPI, seasonally adjusted, percentage change from previous quarter series provides users with information on the overall price change accounting for regular seasonal influences such as the education price rises in the March quarter of each year. Seasonal adjustment ensures that seasonal price movements are spread evenly over the year. The following gives an example of interpretation of the All groups CPI, seasonally adjusted results:

- In the March quarter 2011, the percentage change from previous quarter for the All groups CPI, seasonally adjusted rose 1.4%, compared with the All groups CPI rise of 1.6%. The seasonally adjusted CPI was relatively lower in the March quarter 2011 as the systematic increase in components such as education every March quarter were removed. The percentage change from corresponding quarter of previous year for both the All groups CPI and the All groups CPI, seasonally adjusted, was 3.3%.

- In the December quarter 2010, the percentage change from previous quarter for the All groups CPI, seasonally adjusted rose 0.8%, compared with the All groups CPI rise of 0.4%. The seasonally adjusted CPI was higher in the December quarter as it included the effect of systematic price rises from other quarters. For example, the December quarterly change for education is generally zero for education in original terms but will show a rise after seasonal adjustment. The percentage change from corresponding quarter of previous year for both the All groups CPI and the All groups, seasonally adjusted, was 2.7%.

3.8 While the percentage change from previous quarter for the All groups CPI, seasonally adjusted may be higher or lower than the All groups CPI within a particular quarter, the long term price movement will be similar. The percentage change from corresponding quarter of previous year for the two All groups measures will be approximately the same, as it is comparing the same quarter in different years and the seasonal factors will be similar.

3.9 For more information regarding seasonal adjustment and interpretation of results users should refer to *Time Series Analysis: The Basics*, available on the ABS website.

4.1 The Trimmed mean and Weighted median series are part of the suite of analytical measures of the CPI. They aim to remove volatility observed in the quarterly price change of the CPI caused by large, irregular price movements to estimate the underlying trend inflation. In calculating underlying trend inflation measures, previous analysis by the RBA found seasonal adjustment "reduces the chance that a highly seasonal item will be trimmed from the distribution of price changes, providing that inflation over the year in that item is not significantly greater than overall CPI inflation" (Roberts, 2005).

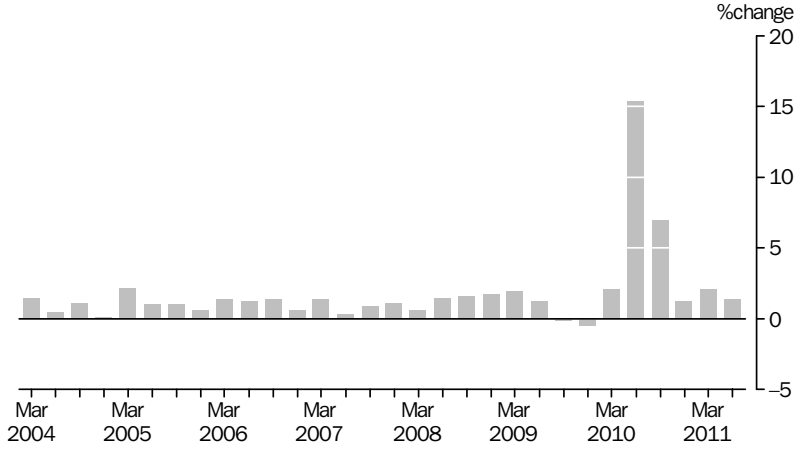
4.2 A detailed explanation of the calculation of the Trimmed mean and Weighted median underlying trend measures, is shown in Appendix 3, together with a worked example.

4.3 In summary, the Trimmed mean and Weighted median are calculated using a distribution of expenditure classes derived as follows:

- The CPI expenditure classes are ranked from lowest to highest according to the seasonally adjusted percentage change from previous quarter.
- The seasonally adjusted relative weight of each expenditure class is calculated based on its previous quarter contribution to the All groups CPI.
- The Trimmed mean is calculated using a weighted average of percentage change from previous quarter (seasonally adjusted) from the middle 70 per cent of the distribution.
- The Weighted median is calculated using the percentage change from previous quarter (seasonally adjusted) expenditure class at the 50th percentile of the distribution.

4.4 The Trimmed mean and Weighted median account for regular seasonal movements and exclude, through the trimming out process, expenditure classes showing irregular movements based on their movements within each quarter. For example, the 'Tobacco' expenditure class is generally considered to be a stable index. However policy changes, such as the increase in excise tax, can result in large, irregular movements, which can influence the original CPI figure. In the June quarter 2010, the 'Tobacco' expenditure class recorded a 15.4% rise, predominantly due to a one off increase in excise tax. This resulted in this expenditure class recording the highest quarterly percentage change of the 90 expenditure classes contributing to the All groups CPI for June quarter 2010. The 'Tobacco' price index was excluded (trimmed out) when calculating the underlying trend measures of inflation in the June quarter 2010, due to the large movement shown in that quarter. Graph 4 depicts the percentage change from previous quarter for the Tobacco price index at the weighted average of eight capital cities level.

GRAPH 4: TOBACCO PRICE INDEX, Weighted average of eight capital cities - Percentage change from previous quarter

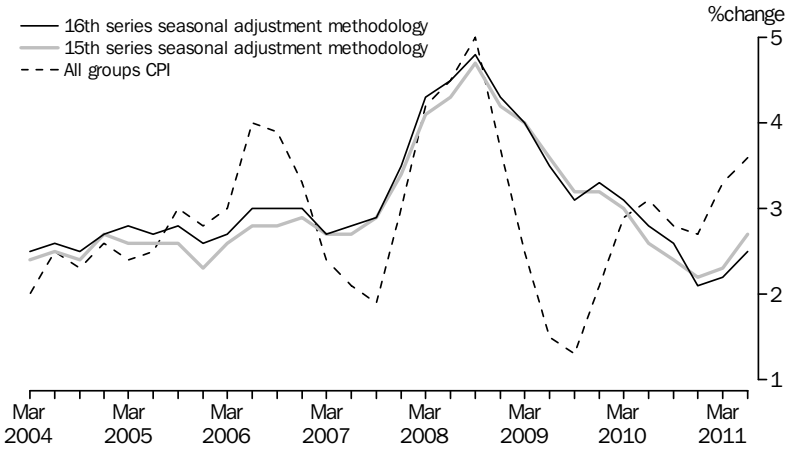


IMPACT OF USING ABS SEASONAL ADJUSTMENT METHODOLOGY ON TRIMMED MEAN AND WEIGHTED MEDIAN

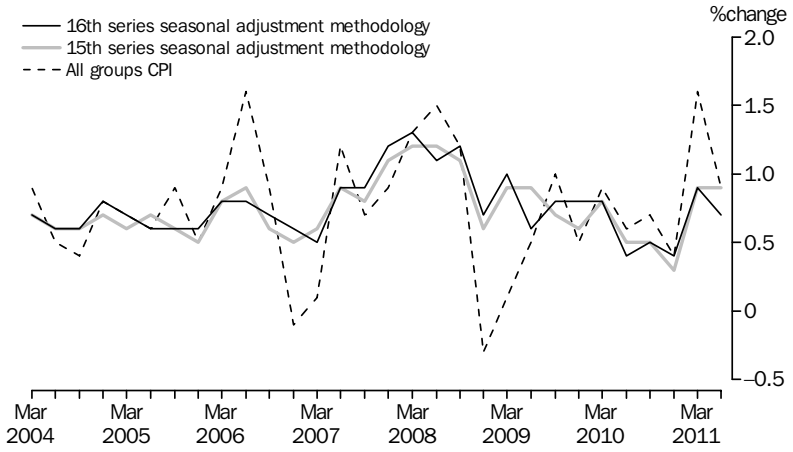
4.5 The following graphs (Graphs 5 – 8) compare the percentage change from corresponding quarter of previous year and percentage change from previous quarter for the Trimmed mean or Weighted median using the 15th and 16th series seasonal adjustment methodologies and the All groups CPI where the:

- 16th series seasonal adjustment methodology (standard ABS seasonal adjustment) is the Trimmed mean or Weighted median using seasonal adjustment on 64 out of the 90 expenditure classes.
- 15th series seasonal adjustment methodology is the Trimmed mean or Weighted median using seasonal adjustment on 20 out of the 90 expenditure classes.
- All Groups CPI is the All groups CPI, weighted average of eight capital cities.

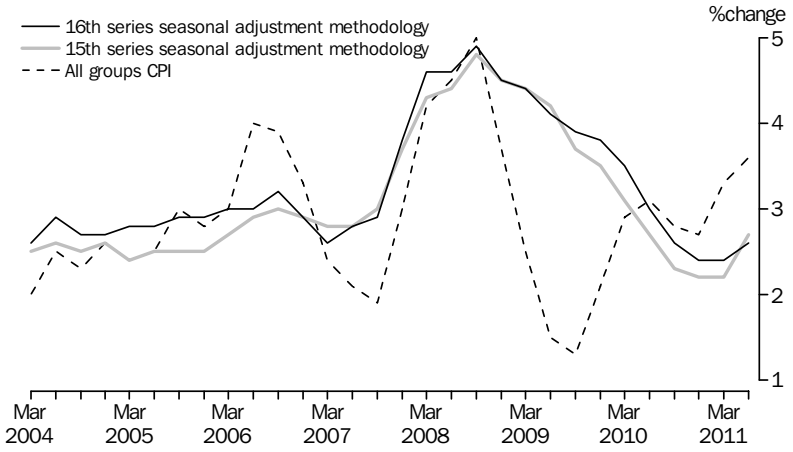
GRAPH 5: TRIMMED MEAN, Percentage change from corresponding quarter of previous year



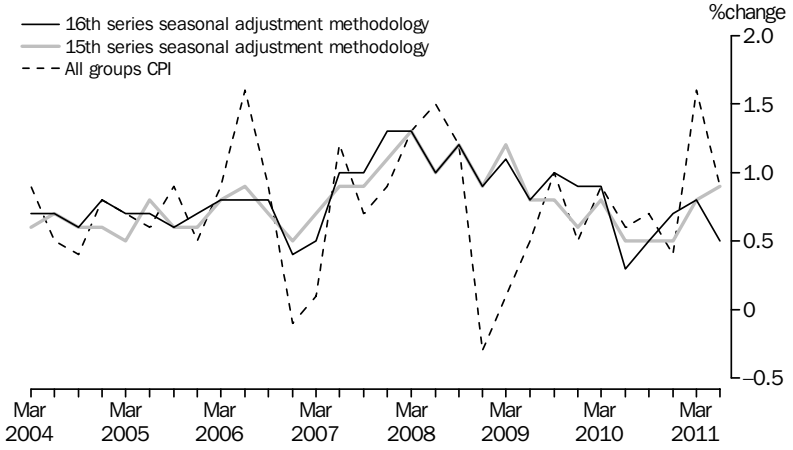
GRAPH 6: TRIMMED MEAN, Percentage change from previous quarter



GRAPH 7: WEIGHTED MEDIAN, Percentage change from corresponding quarter of previous year



GRAPH 8: WEIGHTED MEDIAN, Percentage change from previous quarter



4.6 Graphs 5 – 8 show that moving to the 16th series seasonal adjustment methodology slightly increases the percentage change from the corresponding quarter of previous year in most (although not all) quarters, for both the Trimmed mean and Weighted median. Analysis found the differences were primarily due to the inclusion of 'Automotive fuel' and 'Hospital and medical services' as seasonal expenditure classes under the 16th series seasonal adjustment methodology. Seasonal adjustment reduces their volatility and reduces the chance that these expenditure classes will be trimmed from the distribution of price changes.

4.7 For further information on the measures of underlying trend inflation, please see 'Underlying Inflation: Concepts, Measurement and Performance', Reserve Bank of Australia Research Discussion Paper No 2005-05 (Roberts, 2005), available at *<http://www.rba.gov.au/publications/rdp/index.html>*.

CHAPTER 5: CHANGES TO THE CPI PUBLICATION

5.1 The September quarter 2011 issue of *Consumer Price Index, Australia* (cat. no. 6401.0), scheduled for release on 26 October 2011, will contain the following changes to the analytical measures.

Seasonally Adjusted Price Indexes

- All groups CPI, seasonally adjusted. The index numbers, percentage change from corresponding quarter of previous year and percentage change from previous quarter series will all be published to one decimal place. Percentage changes will be calculated in the conventional way, that is from the index numbers that have been rounded to one decimal place. Index numbers for the All groups CPI, seasonally adjusted time series will begin with the December quarter 1986, with an index reference period of 1989-90 = 100.0.
- CPI expenditure classes, seasonally adjusted. The index numbers will be published to one decimal place. The CPI expenditure classes, seasonally adjusted time series will begin with the September quarter 1972 for the subset of expenditure classes that are identified as seasonal, with an index reference period of 1989-90 = 100.0.

Trimmed mean and Weighted median

- The index numbers, percentage change from corresponding quarter of previous year and percentage change from previous quarter series, calculated using the 16th series (standard ABS) seasonal adjustment methodology, will all be published to one decimal place. Percentage changes will be calculated in the conventional way. The Trimmed mean and Weighted median time series will begin with the June quarter 2002, with an index reference period of June quarter 2002 = 100.0.

FURTHER INFORMATION

5.2 For more information regarding the changes to the CPI from the September quarter 2011, please contact the Consumer Price Index Section, on Canberra (02) 6252 6654.

REFERENCES

Australian Bureau of Statistics (2000), *Measuring the impact of the new tax system on the September Quarter 2000 Consumer Price Index*, Australian Economic Indicators, December 2000 (cat. no. 1350.0), available at *<www.abs.gov.au>*

Australian Bureau of Statistics (2004), *Seasonally Adjusted and Trend Estimates for the Consumer Price Index (CPI)*, Australian Economic Indicators, December 2004, (cat. no. 1350.0) available at *<www.abs.gov.au>*

Australian Bureau of Statistics (2005), *An Introductory Course on Time Series Analysis, January 2005* (cat. no. 1346.0.55.001), available at *<www.abs.gov.au>*

Australian Bureau of Statistics (2007), *Information Paper: Consumer Price Index with Reserve Bank of Australia Consumer Price Measures, July 2007*, (cat. no. 6401.0.55.002), available at *<www.abs.gov.au>*

Australian Bureau of Statistics (2008*), Time Series Analysis: The Basics*, (last updated July 2008), available at *<www.abs.gov.au>*

Australian Bureau of Statistics (2009), *When it's not "business-as-usual": Implications for ABS time series*, Australian Economic Indicators, August 2009, (cat. no. 1350.0), available at *<www.abs.gov.au>*

Australian Bureau of Statistics (2010*), Outcome of the 16th Series Australian Consumer Price Index Review, December 2010*, (cat. no. 6469.0), available at *<www.abs.gov.au>*

European Central Bank (ECB) (2000), *Seasonal Adjustment of Monetary Aggregates and the HICP for the Euro Area*. available at: *<http://www.ecb.int/pub/pdf/other/sama0008en.pdf>*

Roberts, I (2005), *Underlying Inflation: Concepts, Measurement and Performance*, RBA Research Discussion Paper No 2005-05, available at *<http://www.rba.gov.au/publications/rdp/index.html>*

APPENDIX 1

SEASONALITY OF CPI EXPENDITURE CLASSES

Table 1: 15th series CPI Expenditure classes identified as seasonal, using the 16th and 15th seasonal adjustment methodologies - as at September quarter 2010

CPI Expenditure Class	*16th series seasonal adjustment methodology*	*15th series seasonal adjustment methodology*	*CPI Expenditure Class*	*16th series seasonal adjustment methodology*	*15th series seasonal adjustment methodology*
Milk	y	n	Property rates and charges	y	y
Cheese	n	n	House repairs and maintenance	y	n
Ice cream and other dairy products	y	n	Furniture	y	y
Bread	n	n	Floor and window coverings	y	n
Cakes and biscuits	y	n	Towels and linen	y	n
Breakfast cereals	y	n	Major household appliances	n	n
Other cereal products	y	n	Small electric household appliances	y	n
Beef and veal	y	n	Glassware, tableware and household utensils	y	n
Lamb and mutton	y	y	Tools	y	n
Pork	y	y	Household cleaning agents	y	n
Poultry	y	n	Toiletries and personal care products	y	n
Bacon and ham	y	n	Other household supplies	y	n
Other fresh, processed meat	y	n	Child care	y	n
Fish and other seafood	y	y	Hairdressing and personal care services	n	n
Fruit	y	n	Other household services	n	n
Vegetables	n	n	Hospital and medical services	y	n
Soft drinks, waters and juices	y	n	Optical services	n	n
Snacks and confectionery	y	n	Dental services	y	y
Restaurant meals	n	n	Pharmaceuticals	y	y
Take away and fast foods	y	n	Motor vehicles	n	n
Eggs	n	n	Automotive fuel	y	n
Jams, honey and sandwich spreads	n	n	Motor vehicle repair	n	n
Tea, coffee and food drinks	n	n	Motor vehicle parts and accessories	n	n
Food additives and condiments	y	y	Other motoring charges	y	n
Fats and oils	n	n	Urban transport fares	y	y
Food n.e.c.	y	n	Postal	n	n
Beer	n	n	Telecommunication	n	n
Wine	y	n	Audio, visual and computing equipment	n	n
Spirits	n	n	Audio, visual, media and services	n	n
Tobacco	y	n	Books	y	y
Men's outerwear	y	y	Newspapers and magazines	n	n
Men's underwear, nightwear and socks	y	n	Sport and recreational equipment	y	n
Women's outerwear	y	n	Toys, games and hobbies	y	y
Women's underwear, nightwear and hosiery	y	n	Sports participation	y	n
Children and infants' clothing	y	n	Pets, pet food and supplies	y	n
Men's footwear	y	n	Pet services including veterinary	y	y
Women's footwear	y	n	Other recreation activities	y	y
Children's footwear	y	n	Domestic holiday travel and accommodation	y	y
Accessories	y	n	Overseas holiday travel and accommodation	y	n
Clothing services and shoe repair	n	n	Preschool primary education	y	y
Rents	y	n	Secondary education	y	y
Electricity	y	y	Tertiary education	y	y
Gas and other household fuels	y	n	Deposit and loan facilities	n	n
Water and sewerage	y	y	Other financial services	n	n
House purchase	n	n	Insurance services	y	n

Note: y = seasonal
n = non seasonal
This table will be updated following the 2011 seasonal adjustment review, and presented using the 16th series Commodity Classification in the September quarter 2011 issue of *Consumer Price Index, Australia* (cat. no. 6401.0), scheduled for release on 26 October 2011.

APPENDIX 2

MEASURES OF UNDERLYING TREND INFLATION

Table 2: Measures of underlying trend inflation, Index numbers (a)

			16th series seasonal adjustment methodology	
Period	*All groups CPI (b)*	*All groups CPI, seasonally adjusted (b)*	*Trimmed mean (c)*	*Weighted median (c)*
		INDEX NUMBERS		
2007				
June	157.5	157.4	114.7	115.2
September	158.6	158.3	115.7	116.3
December	160.1	160.3	117.1	117.8
2008				
March	162.2	162.4	118.6	119.3
June	164.6	164.5	119.9	120.5
September	166.5	166.1	121.3	122.0
December	166.0	166.2	122.1	123.1
2009				
March	166.2	166.2	123.3	124.5
June	167.0	166.9	124.1	125.5
September	168.6	168.2	125.1	126.7
December	169.5	169.7	126.1	127.8
2010				
March	171.0	171.1	127.1	128.9
June	172.1	172.0	127.6	129.3
September	173.3	172.9	128.3	130.0
December	174.0	174.3	128.8	130.9
2011				
March	176.7	176.7	129.9	132.0
June	178.3	178.3	130.8	132.7

Note: (a) Weighted average of eight capital cities.
(b) Base: 1989-90 = 100.0.
(c) Base: June quarter 2002 = 100.0.

APPENDIX 2

Table 3: Measures of underlying trend inflation, Percentage changes (a)

			16th series seasonal adjustment methodology		15th series seasonal adjustment methodology	
Period	*All groups CPI*	*All groups CPI, seasonally adjusted*	*Trimmed mean*	*Weighted median*	*Trimmed mean*	*Weighted median*
		PERCENTAGE CHANGE (from corresponding quarter of previous year)				
2007						
June	2.1	2.1	2.8	2.8	2.7	2.8
September	1.9	1.9	2.9	2.9	2.9	3.0
December	3.0	3.0	3.5	3.8	3.4	3.7
2008						
March	4.2	4.3	4.3	4.6	4.1	4.3
June	4.5	4.5	4.5	4.6	4.3	4.4
September	5.0	4.9	4.8	4.9	4.7	4.8
December	3.7	3.7	4.3	4.5	4.2	4.5
2009						
March	2.5	2.3	4.0	4.4	4.0	4.4
June	1.5	1.5	3.5	4.1	3.6	4.2
September	1.3	1.3	3.1	3.9	3.2	3.7
December	2.1	2.1	3.3	3.8	3.2	3.5
2010						
March	2.9	2.9	3.1	3.5	3.0	3.1
June	3.1	3.1	2.8	3.0	2.6	2.7
September	2.8	2.8	2.6	2.6	2.4	2.3
December	2.7	2.7	2.1	2.4	2.2	2.2
2011						
March	3.3	3.3	2.2	2.4	2.3	2.2
June	3.6	3.7	2.5	2.6	2.7	2.7
		PERCENTAGE CHANGE (from previous quarter)				
2007						
June	1.2	1.1	0.9	1.0	0.9	0.9
September	0.7	0.6	0.9	1.0	0.8	0.9
December	0.9	1.3	1.2	1.3	1.1	1.1
2008						
March	1.3	1.3	1.3	1.3	1.2	1.3
June	1.5	1.3	1.1	1.0	1.2	1.0
September	1.2	1.0	1.2	1.2	1.1	1.2
December	-0.3	0.1	0.7	0.9	0.6	0.9
2009						
March	0.1	0.0	1.0	1.1	0.9	1.2
June	0.5	0.4	0.6	0.8	0.9	0.8
September	1.0	0.8	0.8	1.0	0.7	0.8
December	0.5	0.9	0.8	0.9	0.6	0.6
2010						
March	0.9	0.8	0.8	0.9	0.8	0.8
June	0.6	0.5	0.4	0.3	0.5	0.5
September	0.7	0.5	0.5	0.5	0.5	0.5
December	0.4	0.8	0.4	0.7	0.3	0.5
2011						
March	1.6	1.4	0.9	0.8	0.9	0.8
June	0.9	0.9	0.7	0.5	0.9	0.9

Note: (a) Weighted average of eight capital cities.

APPENDIX 3

CALCULATION OF UNDERLYING TREND INFLATION MEASURES USING PUBLISHED CPI DATA

This appendix gives a more detailed explanation of the calculation of the Trimmed mean and Weighted median underlying trend inflation measures. For more information regarding the calculation of these please contact the CPI Director on 02 6252 7326.

This example outlines the steps to calculate the underlying trend inflation measures for the June quarter 2011 from publically available CPI data. Please note there may be small differences in the example shown here compared with the final numbers published due to ABS rounding procedures. The ABS calculations of the Trimmed mean and Weighted median index numbers are derived from the relevant components that are unrounded until the final stage. The final percentage changes (also rounded to one decimal place) are calculated from the rounded index numbers. In the example below, some rounding is shown in earlier stages to illustrate the calculation process.

Weighted median

1. The seasonally adjusted June quarter 2011 percentage change from previous quarter is calculated for all expenditure classes at the weighted average of eight capital cities level. (Note: For the expenditure classes not identified as seasonal, their seasonally adjusted percentage change from previous quarter is calculated using a seasonal adjustment factor of 1).
2. All expenditure classes are ranked from lowest to highest according to the seasonally adjusted percentage change from previous quarter movement calculated in step 1. See Table 4, column 2.
3. The relative weight of each expenditure class in the previous quarter is calculated on a seasonally adjusted basis. For example, the relative weight of each expenditure class in June quarter 2011, seasonally adjusted, is calculated using the March quarter 2011 points contribution to the All groups CPI and the March quarter 2011 seasonal factors calculated in the June quarter 2011.
4. The relative weight of the expenditure class is assigned according to the ranking calculated in step 2.
5. Using the relative weight distribution calculated in step 4, a distribution of cumulative weights by expenditure class is calculated. See Table 4, column 3.
6. The Weighted median is the seasonally adjusted quarterly percentage change of the expenditure class at the 50th percentile (or immediately over).
7. In this example, the June quarter 2011 Weighted median is 'Fish and other seafood' with a (rounded) movement of 0.6%. See table Table 4, footnote (a).

Trimmed mean

8. To calculate the Trimmed mean, the expenditure classes with a cumulative total below 15% and above 85% are removed (trimmed). See Table 4 column 3 and footnotes (b) and (e).
9. Expenditure classes which cross the 15% and 85% threshold have the component of their weight inside the 70% trim included. See table 4, footnotes (c) and (d).The results of steps 8 and 9 are shown in Table 5. It can be seen in Table 5, that the trimmed relative weights in column 3 total 70%.
10. As some of the expenditure classes have been trimmed from the original distribution, the expenditure classes relative weights are rescaled to total to 100%. See Table 5, column 4 and formula (a).
11. The Trimmed mean is calculated as the sum of the rescaled March quarter 2011 relative weights (seasonally adjusted) multiplied by the percentage change from previous quarter (seasonally adjusted), all divided by 100. See formula (b).
12. In this example, the June quarter 2011 Trimmed mean is 0.7%.

APPENDIX 3

Table 4: Expenditure classes ranked from lowest to highest by percentage change from previous quarter, June quarter 2011

Expenditure class, ranked from lowest to highest (1)	*June quarter 2011, percentage change from previous quarter (seasonally adjusted) (2)*	*March quarter 2010, cumulative weights % (seasonally adjusted) (3)*
Vegetables (b)	-10.3	1.50
Audio, visual and computing equipment (b)	-6.3	2.07
Tea, coffee and food drinks (b)	-4.9	2.31
Milk (b)	-3.6	2.83
Fats and oils (b)	-3.0	3.03
Toiletries and personal care products (b)	-2.7	4.04
Other household supplies (b)	-1.9	5.38
Ice cream and other dairy products (b)	-1.7	5.70
Sports and recreational equipment (b)	-1.3	6.13
Small electric household appliances (b)	-1.1	6.36
Pork (b)	-1.0	6.52
Women's footwear (b)	-0.9	6.79
Men's outerwear (b)	-0.9	7.29
Motor vehicle repair and servicing (b)	-0.9	9.20
Toys, games and hobbies (b)	-0.7	9.61
Women's underwear, nightwear and hosiery (b)	-0.7	9.86
Bread (b)	-0.6	10.58
Food n.e.c. (b)	-0.6	11.12
Wine (b)	-0.6	12.51
Automotive fuel (c)	-0.5	16.71
Eggs	-0.3	16.80
Motor vehicle parts and accessories	-0.2	17.51
Motor vehicles	-0.2	21.47
Children and infants' clothing	-0.2	21.78
Soft drinks, waters and juices	0.0	22.77
Floor and window coverings	0.0	23.48
Audio, visual and computing media and services	0.0	24.65
Overseas holiday travel and accommodation	0.1	26.34
Tools	0.2	26.65
Books	0.2	27.04
Food additives and condiments	0.3	27.32
Newspapers and magazines	0.3	27.71
Beef and veal	0.3	28.14
Spirits	0.3	29.14
Pharmaceuticals	0.4	30.16
Tobacco	0.4	33.33
Telecommunication	0.4	36.04
Beer	0.4	38.12
Optical services	0.4	38.22
Women's outerwear	0.4	39.07
Glassware, tableware and household utensils	0.4	39.45
Household cleaning agents	0.4	39.74
House purchase	0.5	47.70
House repairs and maintenance	0.5	49.85
Fish and other seafood (a)	0.6	50.28
Dental services	0.6	51.00
Sports participation	0.6	51.77
Other motoring charges	0.6	52.92
Tertiary education	0.8	54.23
Clothing services and shoe repair	0.8	54.39
Take away and fast foods	0.8	57.11
Other financial services	0.9	60.29
Men's underwear, nightwear and socks	1.0	60.39
Major household appliances	1.0	60.90
Cakes and biscuits	1.0	61.66
Hairdressing and personal care services	1.0	62.42
Rents	1.0	68.32
Hospital and medical services	1.1	71.51
Poultry	1.1	71.94
Other recreational activities	1.1	73.14
Other household services	1.2	73.80
Gas and other household fuels	1.2	74.64
Restaurant meals	1.3	76.67
Snacks and confectionery	1.3	77.76
Preschool primary education	1.4	78.35
Cheese	1.4	78.71

Property rates and charges	1.4	80.06
Other cereal products	1.5	80.25
Secondary education	1.5	81.40
Breakfast cereals	1.6	81.58
Child care	1.7	81.89
Electricity	1.7	84.16
Pet services including veterinary	1.8	84.62
Jams, honey and sandwich spreads	1.8	84.77
Domestic holiday travel and accommodation (d)	1.9	86.94
Urban transport fares (e)	1.9	87.68
Bacon and ham (e)	2.0	87.90
Pets, pet food and supplies (e)	2.0	88.37
Lamb and mutton (e)	2.0	88.67
Deposit and loan facilities (e)	2.1	92.67
Postal (e)	2.1	92.78
Insurance services (e)	2.2	94.48
Towels and linen (e)	2.5	94.76
Men's footwear (e)	2.5	94.89
Other fresh and processed meat (e)	2.7	95.29
Furniture (e)	3.0	96.96
Water and sewerage (e)	3.0	98.09
Accessories (e)	4.8	98.62
Children's footwear (e)	8.2	98.72
Fruit (e)	33.8	100.00

Note: (a) Weighted median.
(b) Trimmed out - cumulative weight below 15%.
(c) Partially trimmed out. Included weight = 16.71% - 15% = 1.71%.
(d) Partially trimmed out. Included weight = 85% - 84.77% = 0.23%.
(e) Trimmed out – cumulative weight above 85%.

APPENDIX 3

Table 5: Expenditure classes included in the Trimmed mean ranked from lowest to highest by percentage change from previous quarter, June quarter 2011

Expenditure class included in the Trimmed mean (1)	*June quarter 2011, percentage change from previous quarter (seasonally adjusted) (2)*	*Trimmed March quarter 2011, relative weights % (seasonally adjusted) (3)*	*Rescaled March quarter 2011, relative weights % (seasonally adjusted) (a) (4)*
Automotive fuel	-0.5	1.71	2.44
Eggs	-0.3	0.10	0.14
Motor vehicle parts and accessories	-0.2	0.71	1.01
Motor vehicles	-0.2	3.97	5.67
Children and infants' clothing	-0.2	0.31	0.44
Soft drinks, waters and juices	0.0	0.99	1.41
Floor and window coverings	0.0	0.72	1.02
Audio, visual and computing media and services	0.0	1.17	1.66
Overseas holiday travel and accommodation	0.1	1.69	2.41
Tools	0.2	0.31	0.44
Books	0.2	0.39	0.56
Food additives and condiments	0.3	0.28	0.40
Newspapers and magazines	0.3	0.39	0.56
Beef and veal	0.3	0.43	0.61
Spirits	0.3	1.00	1.43
Pharmaceuticals	0.4	1.02	1.46
Tobacco	0.4	3.16	4.52
Telecommunication	0.4	2.71	3.87
Beer	0.4	2.08	2.97
Optical services	0.4	0.11	0.15
Women's outerwear	0.4	0.84	1.21
Glassware, tableware and household utensils	0.4	0.38	0.54
Household cleaning agents	0.4	0.29	0.41
House purchase	0.5	7.97	11.38
House repairs and maintenance	0.5	2.15	3.07
Fish and other seafood	0.6	0.43	0.61
Dental services	0.6	0.72	1.03
Sports participation	0.6	0.77	1.10
Other motoring charges	0.6	1.15	1.65
Tertiary education	0.8	1.31	1.87
Clothing services and shoe repair	0.8	0.16	0.23
Take away and fast foods	0.8	2.72	3.88
Other financial services	0.9	3.18	4.54
Men's underwear, nightwear and socks	1.0	0.10	0.14
Major household appliances	1.0	0.51	0.74
Cakes and biscuits	1.0	0.75	1.08
Hairdressing and personal care services	1.0	0.76	1.09
Rents	1.0	5.90	8.43
Hospital and medical services	1.1	3.19	4.56
Poultry	1.1	0.43	0.61
Other recreational activities	1.1	1.20	1.71
Other household services	1.2	0.66	0.94
Gas and other household fuels	1.2	0.85	1.21
Restaurant meals	1.3	2.03	2.90
Snacks and confectionery	1.3	1.09	1.55
Preschool primary education	1.4	0.59	0.84
Cheese	1.4	0.36	0.52
Property rates and charges	1.4	1.35	1.93
Other cereal products	1.5	0.19	0.27
Secondary education	1.5	1.15	1.64
Breakfast cereals	1.6	0.18	0.26
Child care	1.7	0.31	0.44
Electricity	1.7	2.27	3.24
Pet services including veterinary	1.8	0.46	0.66
Jams, honey and sandwich spreads	1.8	0.15	0.21
Domestic holiday travel and accommodation	1.9	0.23	0.33
TOTAL		70.00	100.00

APPENDIX 3

FORMULAE

(a) $$\text{Rescaled March quarter 2011 relative weights (seasonally adjusted)} = \frac{\text{Trimmed March quarter 2011 relative weights (seasonally adjusted)}}{\sum \text{Trimmed March quarter 2011 relative weights (seasonally adjusted)}} \times 100$$

$$= \frac{column\ 3}{\sum (column 3)} \times 100$$

(b) $$\text{Trimmed Mean} = \sum (\text{Rescaled March quarter 2011 relative weights (seasonally adjusted)}\ /100 \times \text{June quarter 2011, percentage change from previous quarter (seasonlly adjusted)})$$

$$= \sum \left(\frac{column\ 4}{100} \times column\ 2 \right)$$

FOR MORE INFORMATION . . .

www.abs.gov.au the ABS website is the best place for data from our publications and information about the ABS.

INFORMATION AND REFERRAL SERVICE

Our consultants can help you access the full range of information published by the ABS that is available free of charge from our website. Information tailored to your needs can also be requested as a 'user pays' service. Specialists are on hand to help you with analytical or methodological advice.

POST Client Services, ABS, GPO Box 796, Sydney NSW 2001

FAX 1300 135 211

EMAIL client.services@abs.gov.au

PHONE 1300 135 070

FREE ACCESS TO STATISTICS

All ABS statistics can be downloaded free of charge from the ABS web site.

WEB ADDRESS www.abs.gov.au

Produced by the Australian Bureau of Statistics