STATISTICS DIRECTORATE
COMMITTEE ON STATISTICS AND STATISTICAL POLICY

Working Party on National Accounts

MEASURING OUTPUT OF THE RETAIL TRADE INDUSTRY

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This document has been prepared by Jeff Tyndall and Terry Bradley (Australian Bureau of Statistics) and will be presented under item 6 of the draft agenda

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MEASURING OUTPUT OF THE RETAIL TRADE INDUSTRY

1. Introduction

1. The retail supply chain, which includes both retailers and parts of the wholesale sector, accounts for a significant part of Australian economic activity, representing around 5 per cent of GDP and more than 10 per cent of total employment. Purchases of retail goods collectively make up around 30 per cent of the basket of household expenditure covered by the consumer price index (CPI) and Household Final consumption expenditure (HFCE) in the national accounts.

2. The ABS recently developed and commenced publication of a PPI Retail Trade Price series. This series is now being assessed to identify how it might most effectively be used to improve the quality of the National Accounts and particularly the calculation of quarterly Chain Volume Measures. There were critical gaps in calculating quarterly CVMs for the retail trade industry – a lack of timely data on changes in retailer’s margins, and the lack of a price index for the output of the industry.

3. This paper presents some of the established concepts for the measurement of retail services and current ABS methods for capturing estimates of the activity within Australia. Section 2 defines the service and discusses the measurement problems, section 3 presents ABS activity data sources, section 4 presents the ABS retail trade price index, and section 5 presents ABS current methodology and section 6 presents conclusions and potential improvements.

2. Defining Retail Output

4. Retail trade is defined as the resale (sale without transformation) of new and used goods mainly to the general public for personal or household consumption or utilization, by shops, department stores, stalls, e-commerce retailers, mail-order houses, consumer cooperatives, etc. The goods sold are limited to those usually referred to as consumer goods or retail goods.

5. Retail output is a service of intermediation from producers or wholesalers to final consumers. The value of service is representative of the additional consumer utility of providing desired goods in a convenient location with sales support.

6. Retail output in the national accounts is measured as gross margin or the difference between the purchase value the retailer paid for goods and the sale value received on resale.

   Gross margin = Sale Value of product less Replacement cost of product.

   Gross margin and retail output are used interchangeably throughout the rest of this paper.

Issues in measurement of Gross margins

7. Data items for compilation of gross margins are collected in annual business surveys. The two main problems are sourcing replacement cost of products sold and obtaining the required level of product detail on a timely basis.
Compilation of gross margins requires business surveys to collect sales value of products sold as well as the replacement cost of products sold. Sales value of products sold is collected in a number of annual and sub annual collections for the retail industry, and is relatively straightforward. Replacement cost as defined by the System of National accounts (SNA) requires goods be valued at their replacement cost at the time of sale. This is difficult to achieve in practice with most businesses reporting cost of goods sold based on the purchase price rather than the current replacement cost. The major consequence of using cost of goods sold as opposed to replacement cost is that holding gains/losses will be included in measures of output. To overcome this, holding gains/losses must be separately adjusted for in the national accounts.

Gross margins differ greatly both between different products and between different industries selling the same products. As such it is important to capture margins at detailed product and industry levels so that compositional changes in product mix from period to period are accounted for. Due to the resource intensive nature of collecting data at this level of detail, it is only usually collected intermittently. This requires more detailed estimates to be interpolated between collections in the Australian national accounts.

Volume of Margins

Measuring volume gross margins is a difficult due to the intangible nature of the service provided. The most common approach in producing volumes of gross margins, and the one currently used in the Australian National Accounts, is to use volume sales of product as an output indicator. This implicitly makes the assumption that mark-up charged on each unit of a good sold is held fixed over time, thus meaning the only factor influencing change in the volume of gross margins is change in the volume of sales. Holding retail mark-up fixed over time also infers that this is the price of retail intermediation service.

An attempt to show this algebraically as well as defining terminology used in the rest of this paper is undertaken below.

Volume sales of product is the sales value in current prices deflated to reference year prices using consumer price index (CPI) for the closest product match.

\[ \text{Volume of Sales} = \left( \frac{\text{Value of sales}}{\text{CPI}(T)} \right) \times \text{CPI(Ref year)} \]

Gross margin is the difference between value of turnover and replacement cost in current prices

\[ \text{Gross margin} = \text{Value of sales} - \text{Replacement cost} \]

Retail mark-up is better defined as relative margin. This is the calculated as the ratio of gross margin to value of sales in current prices. It is representative of the service charge (mark-up) for a single unit of product sold by the retailer.

\[ \text{Relative margin} = \frac{\text{Gross margin}}{\text{Value of sales}} \]

Rearranging formula (2) for gross margin then gives;

\[ \text{Gross margin} = \text{Value of sales} \times \text{Relative margin} \]

An implicit price deflator (IPD) for retail sales can be created as

\[ \text{Retail sales IPD} = \frac{\text{Value of retail sales}}{\text{Volume of retail sales}} \]

The IPD is a Paasche price index of retail sales that will behave similarly to the Laspeyres CPI used to create volume of sales. Equation 4 can then be rearranged to represent the value of sales as;

\[ \text{Value of retail sales} = \text{Retail sales IPD} \times \text{Volume of retail sales} \]

Substituting equation 5 into equation 3 we get;

\[ \text{Gross margin} = \text{Retail sales IPD} \times \text{Volume of sales} \times \text{Relative margin} \]
19. In percent change terms ($\%\Delta$) this will then give;
   \[(8) \quad \%\Delta \text{Gross margin} = \%\Delta \text{Retail sales IPD} \times \%\Delta \text{Relative margin} \times \%\Delta \text{Volume of retail sales}\]

20. If we then assume retail sales IPD and relative margin represent price change of gross margins, and then remove them to create a volume of gross margins we then get;
   \[(9) \quad \%\Delta \text{ Volume gross margin} = \%\Delta \text{ Volume of retail sales}\]

21. As such using volume of sales as an output indicator for volume gross margins is consistent with holding relative margins fixed over time. This can be seen as similar to holding more explicit price indexes constant when producing volumes for other national accounts estimates (eg volume retail sales with CPI above).

22. If relative margins are the price of retail service, implicit in this assumption is that every unit of intermediation provided by the retailer is the same, and hence that any changes in relative margin are representative of pure price change with no quality change. The next section will look at the validity of this assumption.

**Quality of Retail Service and Volumes**

23. Broadly quality of retail service can be defined as the amount of consumer utility derived from units of retail service. This is most easily observed either for changes in service over time by the same retailer (temporal) or across comparable retailers in the same period (spatial). Quality dimensions of retail service are very broad and could include characteristics such as opening hours, availability of service, general ambience, convenience of location, range of products just to name a few.

24. Changes in quality of products should be represented in volume measures, even if there are no changes to observable quantities. Most commonly in the national accounts this is done as part of the price deflation process using price indexes compiled to constant quality, largely the producer and consumer price indexes (PPI, CPI).

25. If constant quality price deflators were available for retail output, then a volume gross margin could be produced with price deflation. This would correctly represent quality changes as volume changes of retail output. In the absence of such deflators, the next best alternative is make assumptions using available information. Available information which may help describe the quality of retail service are the size of relative margins as well as input costs in providing retail service.

26. In a spatial sense a quality premium in relative margins can be observed empirically using both relative margins and input costs. Comparing two retailers, a factory outlet offering minimal service, and a boutique retailer offering premium service, all else equal (same products and technology) you would expect higher prices and hence higher relative margin for the boutique retailer. This is representative of the amount that consumers value the additional service of the boutique such as sales assistance, convenience of location and store layout. From a resource cost view it is also to cover additional input costs of providing a higher service provision.

27. Changes in any quality of service period to period for the same retailer (temporal), however are not so readily observable. Small changes in the quality of service of retailers may occur daily in response to quality of staff, stock and check out queues. These changes are unlikely to have any correlation to relative margins or even input costs of a single retailer. Temporal changes are the key driver in producing volume estimates in the national accounts.

28. Some larger changes in retail operations period to period may have observable and measurable quality impacts, an empirical example is discussed below.
Australian empirical example - Deregulation of trading hours

29. An observable change in quality in the operation of retailing in Australia occurred due to deregulation of trading hours, which occurred during the 90's and early 2000's across most Australian jurisdictions. Supermarkets in particular responded by increasing opening hours to late nights and weekends. Allowing consumers greater choice to shop at times most convenient is an improvement in quality of service to the majority of consumers. What then was the effect on prices, relative margins and input costs which resulted from this change?

30. Due to the staggered nature of deregulation making observations is difficult, however the Australian productivity commission has put together a paper which summarises trading hours deregulation, including (largely modelled) effect on prices, sales volumes and employment. 

31. Modelling undertaken details weak evidence for minor reductions in retail price growth and increased sales volumes as a result of trading hours deregulation. There was no clear evidence of increased employment hours as a result of changes, with the lower intensity of peak periods providing offset to increased employment requirements of longer opening hours. Reductions in price were likely facilitated by economies of scale, competition and efficiencies created from longer hours.

32. This means that despite clear quality improvements relating to retail deregulation, there was no evidence of either increased retail margins or input costs (at least for labour) across periods. As such while there is a clear link between relative margins to quality spatially, there doesn’t appear the same link on a temporal basis.

33. This is important for the assumption that changes to relative margin are representative of pure price change, as it indicates that relative margins are more likely to change due to broader economic factors than quality change.

Assumptions of quality change behaviour

34. As there are no clearly observable patterns of behaviour between quality of retail service and either relative margins or input costs period to period, the best option available to national accounts is to assume that quality of retail service is unchanged period to period across products. This then means that all changes in relative margin should be treated as pure price change, with volume of turnover used as an output indicator for gross margin.

35. The only other possible assumption is that relative margins only change due to changes in quality of service. This would mean that all changes in relative margin would be treated as volume, rather than price change. This assumes that retailers have enough market power to increase service to facilitate larger mark ups, or possibly reduce service if consumers become more price sensitive. While this is possible, the assumption also requires that there are no other factors other than quality of service that will affect relative margin, which doesn't reflect economic reality.

36. This assumption is also likely to create inequality across volume GDP measures. Analysis below details impacts if changes in relative margin were treated as volume change (second assumption) across GDP(P) and GDP(E). The below example leaves import price and volumes (for imports and HFCE) unchanged. Increased margin is received by retailers through higher consumer prices to cover additional retail service provided.

37. Firstly it can be seen that nominal GDP will increase by 10,000 both for the production and expenditure measures, this will be the same whichever assumption is made.
<table>
<thead>
<tr>
<th>Current price</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>A - Retail Sales (HFCE)</td>
<td>140,000</td>
<td>150,000</td>
<td>10,000</td>
</tr>
<tr>
<td>B - Cost of sales (imports)</td>
<td>100,000</td>
<td>100,000</td>
<td>0</td>
</tr>
<tr>
<td>GDP(P) equals Margin (A - B)</td>
<td>40,000</td>
<td>50,000</td>
<td>10,000</td>
</tr>
</tbody>
</table>

**GDP(E) Components**

| D - HFCE (equals A) | 140,000 | 150,000 | 10,000 |
| E - Imports (Equals B) | 100,000 | 100,000 | 0 |
| GDP(E) - (D - E) | 40,000 | 50,000 | 10,000 |

38. In the case where relative margins is an increase in volume, GDP(P) will increase to reflect higher margins. On the expenditure side because imports and HFCE are independently deflated only the underlying volume changes will be represented, which in this case means no change.

<table>
<thead>
<tr>
<th>Volume</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>A - Retail Sales (HFCE)</td>
<td>140,000</td>
<td>140,000</td>
<td>0</td>
</tr>
<tr>
<td>B - Cost of sales (imports)</td>
<td>100,000</td>
<td>100,000</td>
<td>0</td>
</tr>
<tr>
<td>GDP(P)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C - Margin to sales (current price)</td>
<td>0.286</td>
<td>0.333</td>
<td></td>
</tr>
<tr>
<td>D - Volume Margin (C*A)</td>
<td>40,000</td>
<td>46,666.67</td>
<td>6,667</td>
</tr>
</tbody>
</table>

**GDP(E) Components**

| D - HFCE (equals A) | 140,000 | 140,000 | 0 |
| E - Imports (Equals B) | 100,000 | 100,000 | 0 |
| GDP(E) - (D - E) | 40,000 | 40,000 | 0 |

39. As such treating changes in relative margins as volume change will result in inequality across volume measures of GDP. So even in the case where relative margin changes as a result of quality change, it may be sub optimal to adjust for quality changes on the production side.

### 3. Activity Data Sources - Business Surveys

40. Activity of the retail industry is sourced from both annual and sub annual business surveys. Retail sales information is collected annually, quarterly and monthly. Cost of sales information is only collected on an annual basis.

**Annual estimates**

*Cat no 8155.0 - Australian Industry*

41. The Australian industry presents estimates of the economic and financial performance of Australian industry. This is compiled from sample surveys of business supplemented with administrative
data from business taxation returns. The Australian industry survey is an economy wide survey and includes, but is not limited to the retail trade industry.

42. For the retail trade industry the survey collects a range of business sales and expenditure items which are used to compile national accounting aggregates including Wages, Gross operating expenses, Capital formation, Intermediate consumption as well as output or Gross margins.

43. Gross margin is calculated using data items for:
   1. Sales of goods bought and resold by this business/organisation
   2. Purchases of finished goods for resale

44. Gross margin can then be calculated as the net of sales and purchases, this is done at the industry aggregate level rather than enterprise level.

45. This has two major problems;
   • There is no product level information for either item
   • Industry data may be unreliable below the subdivision level due to sampling issues

46. Because low level industry and product data are required to accurately calculate current price and volume margins, this means that this annual survey is only useful when combined with the more detailed intermittent data.

8622.0 - Retail and Wholesale Industries, Australia

47. The retail and wholesale industry survey is an intermittent survey for the retail and wholesale industry. This is very closely related to the Australian Industry 8155 collection.

48. Retail and Wholesale Industries (8622) collects similar economic and financial performance information to 8155, including a range of business sales and expenditure items. The major differences between 8155.0 and 8622.0 are;
   • More concentrated sampling of the retail industry
   • Product information for margins at Input Output Product Classification (IOPC)

49. For compilation gross margins, this means that estimation can occur at IOPC product level by industry subdivision or even class level.

50. Margins information by product is calculated similarly by collection from providers;
   1. Sales of goods bought and resold
   2. Cost to purchase the goods for resale

51. Gross margins by product can then be calculated as the net of the sales and cost of goods sold.

52. As discussed above due to resource constraints and survey provider load concerns 8622.0 is run intermittently on a 5 yearly cycle.

Sub Annual estimates

Retail Trade, Australia (cat. no. 8501.0)

53. Australian Bureau of Statistics (ABS) compiles and publishes in Retail Trade, Australia (cat. no. 8501.0) estimates of the value of turnover of “retail trade” businesses classified by industry, and by state and territory.
54. This survey has a slightly different scope than standards for industry used by National accounts (Australian equivalent of ISIC – ANZSIC 2006), and includes some wholesale sales, repairs, restaurant and café’s as well as hiring of goods.

55. Monthly estimates are presented in current price terms. Quarterly chain volume measures at the state and industry levels are updated with the March, June, September and December issues of this publication.

56. This survey doesn’t include any expenses data, and as such cannot produce gross margins information. It is used as an output indicator for the retail industry.

*Business Indicators, Australia (cat. no. 5676.0)*

57. Business indicators, Australia collects sales of goods and services, wages and salaries, operating profit, and inventories for selected industries in Australia.

58. For the retail trade industry this is used for the compilation of wages and Gross operating surplus. Sales of goods is not used directly in the national accounts. 5676.0 collects expenses information, however doesn’t ask for cost of goods sold separately and as such cannot be used to produce gross margins information.

4. Prices data sources - Retail Trade Price Index (RTPI)

*Prices for Retail output*

59. Prices for the output of the retail trade industry have traditionally been limited to implicit measurement of the service. This occurs in the CPI where by retail service premium is included in prices of most goods measured. As an example, if retailers increase margins and hence prices, all else equal, this will see an increase in the CPI. While there is little attempt to explicitly measure the effect of margin change in the CPI, adjustments are made for consumers substituting to different type of retail outlets and hence paying different prices (largely through different margins). As an example if consumers shifted from boutique retailers to factory outlets this would be treated as a sample change, not a price change in the CPI and any change in the level of prices due to the shift in outlets would not be allowed to pass through into the index. Relative margins and retail prices in the CPI are however not necessarily correlated and changes in the CPI don’t give any indication of changes in margin.

60. Historically, the ABS has not measured the change in the price of retail output either implicitly or explicitly until the recent introduction of a Retail Trade Price Index (RTPI) as part of PPI suite.

61. The RTPI is a producer price index which aims to measure price change in the output of retail services. In its current form it has been in production for just over a year. The survey on which the index is based was discontinued in 2007 after a period of about four years but was reinstated in 2013. Broadly the RTPI measures temporal change in what has been described above as the relative margin on products sold by the retail industry.

*RTPI Data sources*

62. To collect required data to produce the price index the ABS carries out the Retail Trade Margins Survey (RTMS). A sample of businesses is selected from those classified as Retail Trade (ANZSIC 06) on the basis of market influence and the individual products they sell. Businesses selected are primarily large retail businesses, with smaller firms included only where industry concentration is significant.
The data items collected are:

- Business level total Sales and Cost of Goods Sold (COGS), by state/territory of operation, for product groups as classified by product;
- For each business, outlet level total Sales and COGS, for each of a selection of outlets within each state/territory of operation, for product groups as classified by product;
- Product classification is Supply and Use product classification (SUPC) which is a more aggregated version of IOPC.

**RTPI Methodology**

64. The RTPI is constructed using a Lowe index formula with weights updated and indexes chained annually. The ABS, like most NSOs, makes use of the Lowe index approach to compile their PPIs and CPIs.

65. The RTPI is first calculated by outlet by region (state) and product class. Product class is Supply use product code (SUPC), which is similar Input Output Product Classification (IOPC) but at more aggregated product classes. State SUPC Outlet level elemental indexes are then weighted to total SUPC indexes, then to national level indexes.

**Outlet level indexes**

66. Outlet level indexes are compiled at state by SUPC using data from the RTMS. This involves applying the current period relative margin by outlet to a reference period ‘preserved volume of sales’.

67. The preserved volume of sales, intended to uphold the notion of the fixed basket price index, is determined by adjusting the reference period sales data by the movement in the component of the CPI which most closely matches the product coverage of the index SUPC. This results in the derivation of the dollar retail trade margin in period $t$ based on the sale volumes in period $0$. A final margin price relative at the outlet level is obtained from the ratio of the final margin price in the current period, $t$, to the final margin price in the price reference period, $0$.

This can be shown algebraically as:

$$v_{supc, state, i}^t = \left( S_{supc, state, i}^0 \cdot \frac{CPI_{supc, state}^t}{CPI_{supc, state}^0} \right) \cdot \frac{M_{supc, state, i}^t}{S_{supc, state, i}^t}$$

Where,

- $v_{supc, state, i}^t$ is the final retail trade margin price at outlet $i$ in period $t$;
- $S_{supc, state, i}^0$ is the total sales for the SUPC at outlet $i$ in period $0$;
- $M_{supc, state, i}^t$ is the retail trade margin for the SUPC at outlet $i$ in period $t$;
- $S_{supc, state, i}^t$ is the total sales for the SUPC at outlet $i$ in period $t$;

And,

- $\frac{CPI_{supc, state}^t}{CPI_{supc, state}^0}$ is the change in the level of a the CPI component most closely aligned with the SUPC.
68. Below is a simple numerical example of calculation of RTPI for an outlet. The reference year is 0 and the current year is 3

<table>
<thead>
<tr>
<th>Year 0</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>% Year 1</th>
<th>% Year 2</th>
<th>% Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>A - Sales of goods</td>
<td>120,000</td>
<td>130,000</td>
<td>135,000</td>
<td>150,000</td>
<td>8.3%</td>
<td>3.8%</td>
</tr>
<tr>
<td>B - Cost of Goods sold</td>
<td>90,000</td>
<td>91,000</td>
<td>98,000</td>
<td>100,000</td>
<td>1.1%</td>
<td>7.7%</td>
</tr>
<tr>
<td>C - Gross (Dollar) Margin</td>
<td>30,000</td>
<td>34,000</td>
<td>37,000</td>
<td>44,000</td>
<td>13.3%</td>
<td>8.8%</td>
</tr>
<tr>
<td>D - Relative Margin = C/A</td>
<td>0.25</td>
<td>0.26</td>
<td>0.27</td>
<td>0.29</td>
<td>4.6%</td>
<td>4.8%</td>
</tr>
<tr>
<td>E - Relevant CPI</td>
<td>110.2</td>
<td>111.9</td>
<td>112.3</td>
<td>113.8</td>
<td>1.5%</td>
<td>0.4%</td>
</tr>
<tr>
<td>F - Preserved Volume of Sales = A(Year0) * E(Year'1)/E(Year0)</td>
<td>120,000</td>
<td>121,851</td>
<td>122,287</td>
<td>123,920</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G - Margin Price = D*F</td>
<td>30,000</td>
<td>31,869</td>
<td>33,516</td>
<td>36,350</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H - RTPI</td>
<td>100.0</td>
<td>106.2</td>
<td>111.7</td>
<td>121.1</td>
<td>6.2%</td>
<td>5.2%</td>
</tr>
</tbody>
</table>

**Weighting of outlet level indexes**

69. Weighting of elemental outlet price indexes is undertaken as a number of stages.

70. SUPC state/territory index is calculated as a weighted sum of these outlet price relatives (margin prices).

71. The next stage is the derivation of national margin indexes representing the SUPCs. These national SUPC indexes are created by weighted aggregation of the state/territory level SUPC indexes. Weights used at this stage are ‘SUPC retail trade margin shares by state/territory’. These first two stages are based on RTMS survey data.

72. The final stage is the derivation of the national RTPI by weighted aggregation of the national SUPC indexes.

73. This is weighted independently using unpublished national supply and use tables which include retail trade margin shares by SUPC.

**Pricing to Constant Quality**

74. The importance of removing changes in quality over time is discussed above, from a national accounts compilation perspective, it is also important for analysis of price change more generally and the ABS aims to produce all price indexes as constant quality.

75. The starting point is to measure price change for specific individual products to constant quality and then to weight these measures together in terms of their relative economic importance with respect to one another to arrive at an aggregate or summary measure of price change. These objectives present a number of practical challenges when producing RTPIs.
76. As discussed above retail service quality includes dimensions such as outlet opening hours, numbers of checkouts, floor space, general ambience, temperament of staff etc. While these characteristics may not lend themselves to ready measurement, it is clear that they are linked to the specific outlet providing the products. Therefore, although it may not be possible to make explicit adjustments for any changes in the quality of the service, steps can be taken to minimise or control for quality change.

77. Given that the quality of the service can be considered to be unique to each outlet, it follows that the measurement of retail trade margins prices is best done at the outlet level. In the case of multi-location businesses, aggregated data for products represented by selected SUPCs are requested for the selected outlets in each state and territory in which the business operates.

78. To assist in identifying any changes in outlet specific quality characteristics, the ABS maintains a close relationship with all data providers. When a quality change is identified at an outlet then the results for that outlet are adjusted to accommodate for the change in quality. Such adjustment includes the imputation of retail trade margins for that outlet from other similar outlets in the sample.

Comparison to national accounts methodology

79. The compilation of the RTPI is broadly similar with national accounts methodology, with Sales, cost of goods sold and margins (gross and relative) calculated the same way. As discussed above national accounts use of volume sales as an output indicator is equivalent to holding relative margins and retail prices fixed. As the RTPI also measures change in relative margins, deflating gross margins with RTPI should give a similar result to using volume sales as an output indicator.

80. Using the RTPI calculation above, we see that this is the case, with the growth rate observed for volume sales deflated with CPI as volume gross margin deflated similarly with RTPI.

<table>
<thead>
<tr>
<th></th>
<th>Year 0</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>% Year 1</th>
<th>% Year 2</th>
<th>% Year 3</th>
</tr>
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<tr>
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<td>130,000</td>
<td>135,000</td>
<td>150,000</td>
<td>8.3%</td>
<td>3.8%</td>
<td>11.1%</td>
</tr>
<tr>
<td>B - Relevant CPI</td>
<td>110.2</td>
<td>111.9</td>
<td>112.3</td>
<td>113.8</td>
<td>1.5%</td>
<td>0.4%</td>
<td>1.3%</td>
</tr>
<tr>
<td>Volume Sales of goods - prices Year 0</td>
<td>120000</td>
<td>128025</td>
<td>132475.5</td>
<td>145254.8</td>
<td>6.7%</td>
<td>3.5%</td>
<td>9.7%</td>
</tr>
<tr>
<td>C - Gross (Dollar) Margin</td>
<td>30,000</td>
<td>34,000</td>
<td>37,000</td>
<td>44,000</td>
<td>13.3%</td>
<td>8.8%</td>
<td>18.9%</td>
</tr>
<tr>
<td>D - RTPI</td>
<td>100</td>
<td>106.2</td>
<td>111.7</td>
<td>121.2</td>
<td>6.2%</td>
<td>5.2%</td>
<td>8.5%</td>
</tr>
<tr>
<td>Volume Gross margin - prices year 0</td>
<td>30000</td>
<td>32006.3</td>
<td>33118.9</td>
<td>36313.7</td>
<td>6.7%</td>
<td>3.5%</td>
<td>9.7%</td>
</tr>
</tbody>
</table>

81. Such a relationship is unlikely to hold in reality due to different data sources and weighting between national accounts and the RTPI, it does however show that the RTPI may have use as a price deflator in the national accounts. The major advantage would be the fact that the RTPI does attempt some adjustment for quality change at the outlet level as described in section 4.4.
5. Methodology for the Australian National accounts

Supply Use and Input Output - Annual

82. Supply use estimates are compiled on an annual basis for current price and chain volume estimates

Supply and Use Input Output Current Price estimates

83. On an annual basis retail margins are calculated in current price terms by product at IOPC using the Australian industry (8155) and Retail and Wholesale Industries (8622.0) collections.

84. Data from both surveys are combined to produce product and industry level retail margins. Australian industry (8155) is used as a control total for gross margins at industry level, this is split to required product level detail using the intermittent 8622 collection. The same data is used for both published Input output and unpublished Supply and use tables, with the major difference being the detail undertaken in the balancing process.

85. Given current data sources this methodology is robust, but could be improved with the addition of more timely splits of IOPC level margins to better capture compositional changes which occur in the industry. Investigation is currently being undertaken into whether the RTPI may help in achieving this.

Supply and Use Volume estimates

86. Volumes for annual supply and use estimates are compiled using quantity revaluation at the IOPC product level. Year to year growth of annual margins at the IOPC level is determined by volume growth of the product on which the margin is received. The other way to look at this is that relative margin is held fixed in the reference year.

87. This occurs as two steps,

1. Deflate product level retail turnover to create volume turnover
   This will generally occur by deflating current price retail sales with CPI for equivalent IOPC product groups.

2. Set product volume growth of volume margins equal to volume sales
   There are a number of ways mechanically to undertake step 2, but the easiest way is multiply the relative margin in the reference year by volume sales. This is illustrated in the table below.
<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>% Year 2</th>
<th>% Year 3</th>
<th>% Year 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>A - Clothing Sales - Current value</td>
<td>120,000</td>
<td>130,000</td>
<td>135,000</td>
<td>150,000</td>
<td>8.3</td>
<td>3.8</td>
<td>11.1</td>
</tr>
<tr>
<td>B - Cost of sales - Current value</td>
<td>90,000</td>
<td>91,000</td>
<td>98,000</td>
<td>100,000</td>
<td>1.1</td>
<td>7.7</td>
<td>2.0</td>
</tr>
<tr>
<td>C - Margin - Current Value (A-B)</td>
<td>30,000</td>
<td>39,000</td>
<td>37,000</td>
<td>50,000</td>
<td>30.0</td>
<td>-5.1</td>
<td>35.1</td>
</tr>
<tr>
<td>Relative Margin - (C/A)</td>
<td>0.25</td>
<td>0.3</td>
<td>0.274074</td>
<td>0.333333</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D - Clothing Sales - year 4 prices</td>
<td>120653.4</td>
<td>131064.6</td>
<td>135612</td>
<td>150000</td>
<td>8.6</td>
<td>3.5</td>
<td>10.6</td>
</tr>
<tr>
<td>E - Margin to sales - Year 4 fixed</td>
<td>0.333333</td>
<td>0.333333</td>
<td>0.333333</td>
<td>0.333333</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F - Margin - year 4 prices (D*E)</td>
<td>40,218</td>
<td>43,688</td>
<td>45,204</td>
<td>50,000</td>
<td>8.6</td>
<td>3.5</td>
<td>10.6</td>
</tr>
</tbody>
</table>

88. As discussed above this methodology is consistent with the assumption that relative margin is representative of pure price change with no quality change. Within current data constraints this is the most appropriate methodology for calculation of volume margins.

89. Price deflation using the RTPI could be used as an alternative to quantity revaluation for annual estimates. As discussed above this would likely give similar results to quantity revaluation. The main advantage would be the fact that some quality adjustment is undertaken. This needs further investigation however.

Quarterly national accounts

90. In the quarterly national accounts retail margins are most visible as retail gross value added (GVA) as well as being embedded in HFCE on the GDP expenditure side.

Quarterly GVA

91. Quarterly GVA uses the output indicator approach. This involves extrapolating reference year estimates of current price gross value added using movements in a volume indicator of output. For retail industry the output indicator is volume retail sales from the retail trade survey, which is current price sales deflated using consumer prices (CPI). The output indicator is applied at industry division level.

92. Despite the fact that there are no margins data available quarterly, using the output indicator method with volume retail sales data is consistent with annual methodology. As discussed above holding relative margins constant means that volume of margins will have the same profile as volume sales of products. As such using volumes of retail sales is then the best quarterly indicator of quarterly retail output and by extension GVA.

93. While use of the output indicator method is acceptable and produces a result consistent with annual methodology, it could be improved. The output indicator method currently is compiled at industry division level, but would be more appropriate at industry subdivision level to account for compositional changes. The output indicator method is not suitable for compilation of current price GVA, which means there is no quarterly current price GVA for the retail industry.
Use of the RTPI in the national accounts

94. The RTPI has two possible uses in the national accounts, firstly is the use of RTMS data as current price indicators. This could be for annual product split of margins as well as producing quarterly splits of gross margins. This needs more investigation to assess the suitability of using the RTMS in this way, noting that is has not been designed for this purpose.

95. The second major use is as a deflator for gross margins, as an alternative to quantity revaluation with volume sales. This would be possible now for annual estimates, extension to quarterly estimates would require gross margins to be calculated. While in theory this would give very similar results to quantity revaluation, the main advantage of deflating with RTPI is that it does account for some quality changes.

6. Conclusion

96. Currently the quarterly Australian National Accounts do not have a current price measure of retail trade margins nor do they utilise the recently developed Retail Trade Price Index to calculate volumes.

97. The use of volume turnover as an output indicator for volume margins appears to be a “next best” methodology. Its major weakness is that quality changes won’t be represented as changes in volumes.

98. The above analysis does highlight the importance of pricing to constant quality to the national accounts to ensure volumes correctly reflect quality change. The lack of constant quality pricing is not just an issue for retail trade, but also many other service industries such as wholesaling, finance and other brokerage services.

99. The compilation of the RTPI is a major step forward in the measurement of prices and output of the retail industry. Prior to the RTPI the retail industry was largely excluded from Producer price indexes. It is also a missing link between producer prices and consumer price indexes, with changes in margins determining the full impact of changes in producer and import prices on final consumers of goods.

100. Utilizing the RTPI in the national accounts is proving more difficult than expected and further investigation is required. This should be both into using current price data from the RTMS to fill annual and quarterly data gaps, as well as investigating whether price deflation would improve volume measures of gross margins.