

**The Difference between the Consumers Price  
Index and the Household Consumption  
Expenditure – Implicit Price Deflator: A Preliminary  
Analysis**

**Piyasena Liyange**

**New Zealand Association of Economists**

**Annual Conference 2007**

**Christchurch**

**27 June 2007**

[www.stats.govt.nz](http://www.stats.govt.nz)

### **Liability statement**

Statistics New Zealand gives no warranty that the information or data supplied in this paper is error free. All care and diligence has been used, however, in processing, analysing and extracting information. Statistics New Zealand will not be liable for any loss or damage suffered by customers consequent upon the use directly, or indirectly, of the information in this paper.

### **Reproduction of material**

Any table or other material published in this paper may be reproduced and published without further licence, provided that it does not purport to be published under government authority and that acknowledgement is made of this source.

Piyasena Liyanage

*Statistics New Zealand,  
PO Box 2922,  
Wellington,  
New Zealand  
Telephone: 04 931 4665  
Email: info@stats.govt.nz*

## **Abstract**

Over recent years, differences in the measure of price change have been observed between the Consumers Price Index (CPI) and the Household Consumption Expenditure Implicit Price Deflator (HCE-IPD). There are a number of reasons why these two measures differ, including scope and coverage issues, calculation processes and differing source data.

With policy makers having a key interest in inflation in New Zealand, understanding the reasons for these differences is an important part of an analysis of New Zealand macro-economic performance.

Statistics New Zealand has undertaken this preliminary analysis of the differences between the CPI and the HCE-IPD to illustrate empirically the causes of the differences in these two measures of price change.

## 1. Introduction

The New Zealand Consumers Price Index (CPI) measures the changing cost for New Zealand resident households of purchasing a fixed 'basket' of representative goods and services purchased by households. The CPI basket is generally re-selected and re-weighted every three years (with the latest rebase being implemented for the June 2006 reference quarter). Household Consumption Expenditure (HCE) is an estimate of total expenditure by New Zealand resident households. It includes expenditure by New Zealand households overseas but does not include expenditure by overseas tourists in New Zealand. The HCE Implicit Price Deflator (HCE-IPD) is an index obtained by dividing the current price value of HCE by its corresponding constant price value and therefore, the IPD is a derived measure of price change rather than an explicitly observed one.

While on a quarter on quarter basis, the CPI and HCE-IPD have shown similar movements, over the longer term there has been a sustained divergence in the levels of the two indexes, with the CPI growing at a greater rate than the HCE-IPD.

Policy makers and economic analysts have a keen interest in understanding inflationary pressures in the New Zealand economy, particularly when CPI inflation reaches the upper limits of the target mandated by the Reserve Bank Act. Understanding of the reasons for the differences between the two inflation indicators is an important part of the analysis of the country's economic performance. This paper examines how the movements of these two price indexes differ and endeavours to illustrate and explain what brings about those differences.

## 2. The HCE and the CPI

HCE measures all outlays on consumer goods and services (including expenditure on durables such as motor vehicles and furniture) and the imputed rent of owner-occupied dwellings. Households consist of New Zealand-resident households and consumption expenditure relates to their outlays both within New Zealand and overseas. As much of the source data available for HCE records total spending in New Zealand, final consumption expenditure of New Zealand resident households is practically derived as follows:

$$\begin{array}{rcccl}
 \text{Final consumption} & & \text{Expenditure} & & \text{Expenditure in} & & \text{Final consumption} \\
 \text{expenditure in the} & & \text{overseas by} & & \text{New Zealand by} & & \text{expenditure by New} \\
 \text{domestic market} & + & \text{New Zealand} & - & \text{foreign residents} & = & \text{Zealand resident} \\
 & & \text{residents} & & & & \text{households} \\
 & & \textit{(Travel Debits)} & & \textit{(Travel Credits)} & & 
 \end{array}$$

Included is expenditure on:

- new durable and non-durable goods, excluding dwellings;
- services; and
- second-hand goods (reduced by the value of sales by households of similar goods).

Transactions directly between households' (such as garage sales) net out and for transactions between households through a dealer, only the dealer's margin plus any associated transfer costs are included.

The CPI measures the rate of price change of goods and services purchased by households for the purpose of consumption. The New Zealand CPI uses an acquisitions framework. The use of this approach is influenced by the primary use of the CPI as a measure of inflation. There are two main uses of a CPI: as a measure of general inflation that can be used in determining monetary policy

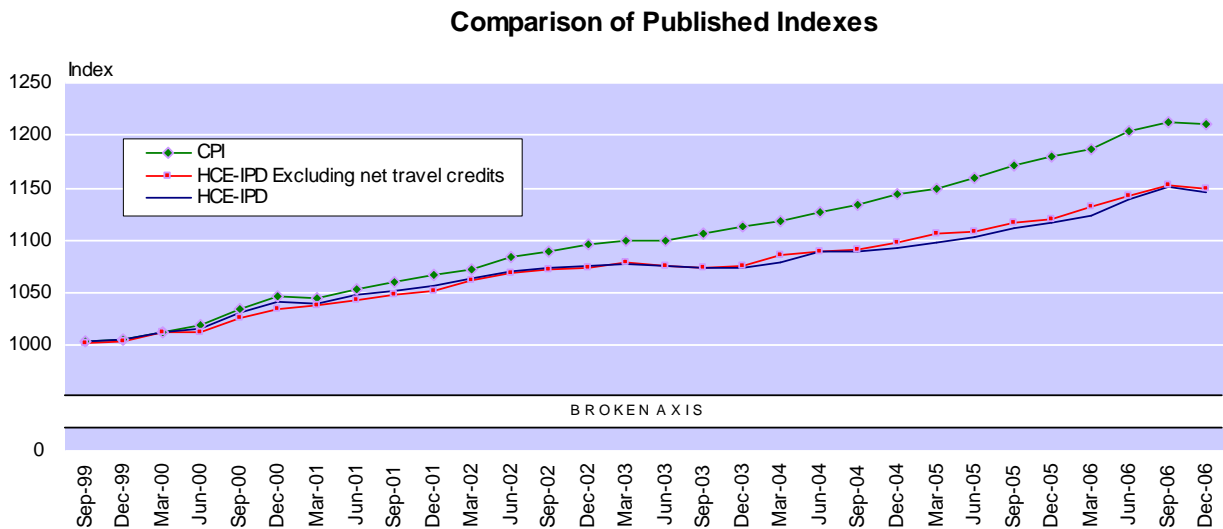
and as a measure of changes in the cost of living (a compensation index), which can be used to adjust wages and income transfers.

In New Zealand the CPI is often used for both purposes. Because of this dual use, the New Zealand CPI does include some goods and services that are conceptually included in a compensation index, but might not be included in an inflation index (for example, local authority rates).

**Figure 1**, Comparison of published indexes, below shows the quarterly indexes (expressed on a common base of the June 1999 quarter = 1000) for the CPI, the published HCE-IPD and the HCE-IPD excluding the travel debits and credits adjustments. While the travel debits/credits adjustments can influence the quarter-on-quarter comparison between the CPI and the HCE-IPD (due to the differing prices used), the long-run trend of the divergence between the CPI and the HCE-IPD is unaffected. For the purpose of subsequent analysis in this paper, the HCE-IPD referred to is the deflator **prior to** the travel debits and credits adjustments being made (i.e., representing total spending in New Zealand).

As can be seen from **Figure 1**, Comparison of published indexes, the CPI has been rising at a consistently greater rate than the HCE-IPD, to the extent that over the 7-year span covered by this analysis the level of the CPI is approximately 6 percent higher than the corresponding level of the HCE-IPD.

**Figure 1**



Source: Statistics NZ

Possible reasons for this divergence/difference between these two measures of price change include:

- scope / coverage differences,
- the index formula used, and
- differences in weighting and pricing data.

## 2.1 Scope/Coverage

As the purpose and conceptual basis for the CPI and HCE-IPD are different, there are a number of areas where there are significant differences in the scope/coverage of the two measures.

According to the System of National Accounts 1993 (SNA93) definition, HCE has some special inclusions and exclusions as follows (note that this is not a definitive list).

Inclusions:

- spending by New Zealanders overseas,
- second-hand goods (margins and transfer costs),
- service charge component of insurance premiums,
- imputed rental value of owner-occupied housing,
- net spending on gambling and
- farm production for own consumption.

Exclusions:

- spending by overseas tourists in New Zealand,
- non-monetary goods and services,
- investment items,
- transfer payments (donations, subscriptions, govt fees),
- purchase of dwellings,
- household to household payments and
- expenditure reimbursed by employers.

The CPI reference population is New Zealand resident private households in permanent dwellings. This is also the target population of the Household Economic Survey (HES), which provides the majority of the data for the calculation of expenditure weights within the CPI. The reference population of the CPI covers approximately 98 percent of the usually resident population of New Zealand. In case of overseas expenditure, purchases made by residents whilst in New Zealand from overseas outlets are included in the CPI but purchases made by residents whilst overseas are excluded. Additionally, the CPI does not cover specific items of expenditure which are included in HCE such as imputed rent, gambling, on-farm agricultural consumption and wages in kind and fringe benefits.

In the empirical analysis presented in this paper, we have endeavoured (where possible) to align the CPI and the HCE-IPD in such a way that they are both measuring the same thing. This has been done by excluding certain items from the CPI (such as purchase of dwellings, local authority rates, and legal expenses for sale/purchase of property) and excluding certain items from the HCE-IPD (such as imputed rentals, gambling, and wages in kind and fringe benefits).

## 2.2 Index formula

The HCE-IPD is an index obtained by dividing the actual current price value for HCE by its corresponding actual constant price value. Thus implicit price deflators are derived measures (hence the term 'implicit') and are not normally direct measures of price change by which current price estimates are converted to estimates at constant prices. The general formula for an Implicit Price Deflator (IPD) in period  $t$  is:

$$IPD_t = \frac{\sum P_{it}Q_{it}}{\sum P_{i0}Q_{it}} * 1000$$

Where  $IPD_t$  = the value of the IPD in period  $t$

$P_{it}$  = price of good  $i$  ( $i = 1, \dots, m$ ) in period  $t$

$P_{i0}$  = price of good  $i$  ( $i = 1, \dots, m$ ) in the base period

$Q_{it}$  = quantity of good  $i$  ( $i = 1, \dots, m$ ) in period  $t$

The numerator series for the IPD is the current price expenditure, while the denominator series is the current period quantities consumed expressed in base period prices. As the general form of the constant price series calculated is a chain-linked (Laspeyres) volume index, the resulting IPD is effectively a chained Paasche price index. Consequently, when two periods other than the base period and current period are compared, the change in the IPD is a combination of both price and quantity changes.

The CPI is calculated as a Laspeyres price index using fixed (annual) base year weights and measures the change in cost of purchasing a fixed 'basket' of representative goods and services. The prices are weighted by the quantities in the base period.

### Laspeyres index

$$\text{Index} = \frac{\sum (P_{it}Q_{i0})}{\sum (P_{i0}Q_{i0})} \times 1,000$$

Where  $P_{it}$  = Price of item  $i$  ( $i = 1, \dots, m$ ) in period  $t$

$P_{i0}$  = Price of item  $i$  ( $i = 1, \dots, m$ ) in the base period

$Q_{i0}$  = Quantity of item  $i$  purchased in the base period

Consequently the movement of the CPI between different quarters will be solely a function of the change in prices (since the quantities are held constant).

Over time, there is a tendency for a Laspeyres price index to overestimate inflation as a result of substitution bias (i.e., the tendency of consumers to switch consumption away from goods whose prices are increasing relative to substitutable goods), amongst other things. In contrast, a Paasche index will tend to understate the true rate of inflation. A practical illustration of the differences which can result from using the above formulae is provided below.

Suppose that we needed to construct a price index for "Fruit" using price and quantity information for bananas and kiwifruit. A Laspeyres price index and the associated IPD (together with their movements) are calculated and compared in Table 1, Price, quantity and index results.

**Table 1**

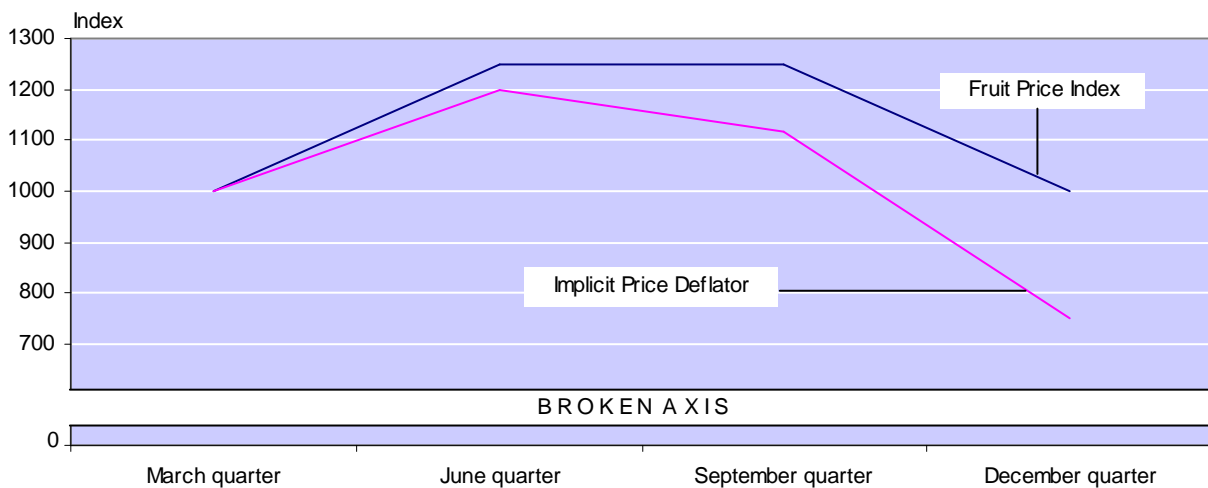
**Price, Quantity and Index Results**

	Mar qtr (Base period)	Jun qtr	Sep qtr	Dec qtr
Bananas – Price per kg (\$)	1	2	2	2
Quantity purchased – no of kgs	4	3	2	1
Kiwifruit – price per kg (\$)	3	3	3	2
Quantity purchased – no of kgs	4	4	5	5
FPI: Level	1000	1250	1250	1000
FPI: Percentage change		25	0	-20
IPD: Level	1000	1200	1118	750
IPD: Percentage change		20	-7	-33

In the June quarter, an increase in the price of bananas, together with a reduction in the volume of bananas consumed, results in the Laspeyres price index increasing 25 percent compared with a 20 percent increase in the Paasche price index. For the September quarter, even though the price levels have remained unchanged between the June and September quarters, the shift in quantities causes a reduction in the Paasche price index (an example of a variant of Simpson’s Paradox), while the Laspeyres price index remains unchanged.

**Figure 2**

**Comparison of FPI and IPD**



In the empirical analysis presented in this paper, we have endeavoured to control differences due to the choice of index formulae by re-compiling the HCE-IPD using the lower-level HCE-IPD’s as an indicator of price change and weighting them together using fixed weights, so as to approximate a Laspeyres price index.

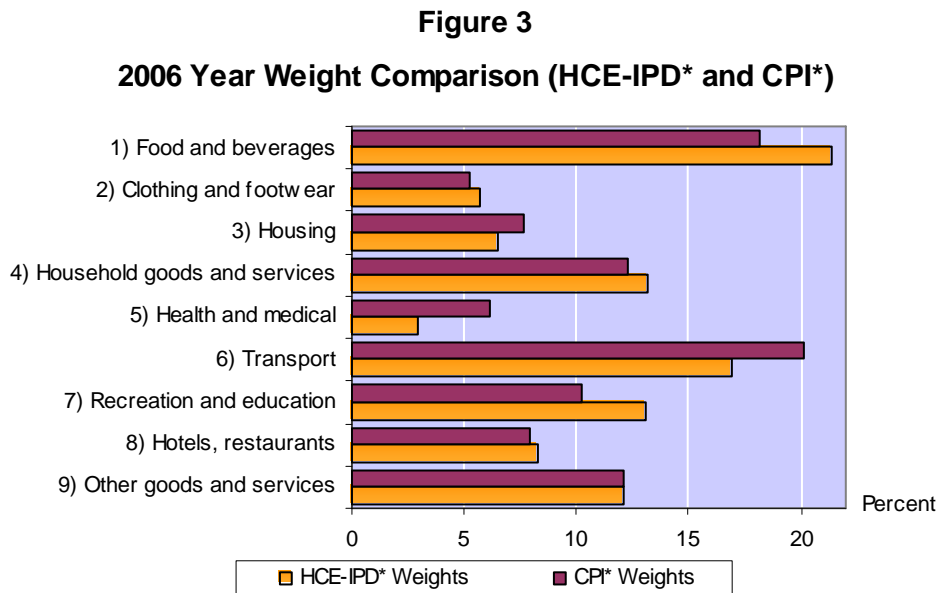


### 2.3 Weighting and data sources

The HCE annual current price expenditure data is sourced from a variety of sources including the HES (approximately 17 percent), the Retail Trade Survey (approximately 42 percent) and other sources (approximately 41 percent). The main source of CPI weights is the Household Economic Survey (HES), which contributes approximately 65 percent of the weight, with the remainder coming from a variety of data sources, including scanner data, the Census of Population and Dwellings, building consents, data from the National Accounts, and a variety of government and industry sources.

While a process of annual balancing within the National Accounts uses much of the same data the feed into the CPI weights, the scope and coverage differences noted above mean that there will inevitably be differences in the expenditures associated with corresponding CPI and HCE commodity groupings. This is further complicated by the fact that for periods post the latest balanced year, the annual estimates are derived from the sum of quarterly current price HCE series which have been extrapolated using whatever data is available on a sub-annual basis. For the release of the March 2007 quarter GDP numbers (released on 29 June 2007), the annual estimates for current price HCE for the year ended March 2004 will be revised to incorporate balanced annual data for the first time, meaning that the annual current price estimates for the 3 years at the “tail” of the series will be influenced by a variety of subannual indicators which are used to extrapolate current and constant price estimates.

Once adjustments have been made for the scope and coverage differences already referred to, the respective weights for the CPI\* (recompiled CPI, based on weights applicable for the June 2006 quarter) and HCE-IPD\* (recompiled HCE-IPD) for the year ended March 2006 are presented in **Figure 3**, 2006 year weight comparison (HCE-IPD\* and CPI\*), below. Here the weights have been expressed as proportions using the groupings under which the HCE-IPD is constructed. It should be noted that some of the difference in the weights presented below will be as a result of residual scope differences which could not be removed during this preliminary analysis.



### 3. Empirical analysis

In the preceding section, a number of reasons for the divergence between the CPI and the HCE-IPD were presented and explained. In this section, the results of an empirical exercise are presented which endeavour to isolate and quantify the impacts of the differences.

This process has been undertaken in a series of progressive steps so that the various sources of divergence between the two measures can be separately identified.

In the first step, we compare the headline CPI measure with that of the HCE-IPD (excluding net tourist expenditure). In this and all subsequent steps the indexes are re-expressed to a common base (June 1999 quarter = 1000) to enable a comparison of difference. The impact of the divergence between the CPI and HCE-IPD is presented as a time-series of the cumulative difference between the two (i.e., the level of the re-expressed CPI less the level of the re-expressed HCE-IPD).

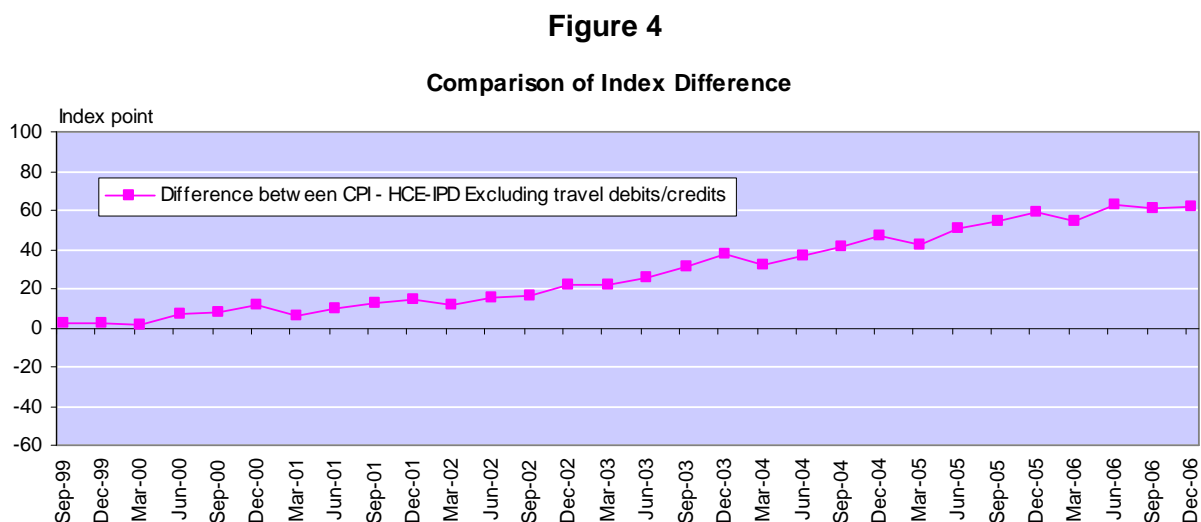
In the second step, we make a number of scope adjustments to both the CPI and the HCE-IPD to account (as far as practicable) for the scope and coverage differences outlined in **Section 2.1**. The indexes are then re-compiled using their respective index formulae to produce a time series of the differences between the corresponding CPI\* and HCE-IPD\* index levels.

In the third step, we control for the difference due to index formula, by re-calculating the HCE-IPD\* index using a fixed-weight Laspeyres index formula. To ensure consistency of weights between the CPI\* and HCE-IPD\*, the HCE-IPD\* weights were updated to reflect the CPI weights that were applicable at the time. The re-compiled index is denoted HCE-IPD\* Laspeyres or Chained Laspeyres, and the difference from the original CPI series presented. We also undertook this analysis using the HCE weights to see whether the difference in weights had an impact.

In section 3.2, we summarise the results of the re-compilations.

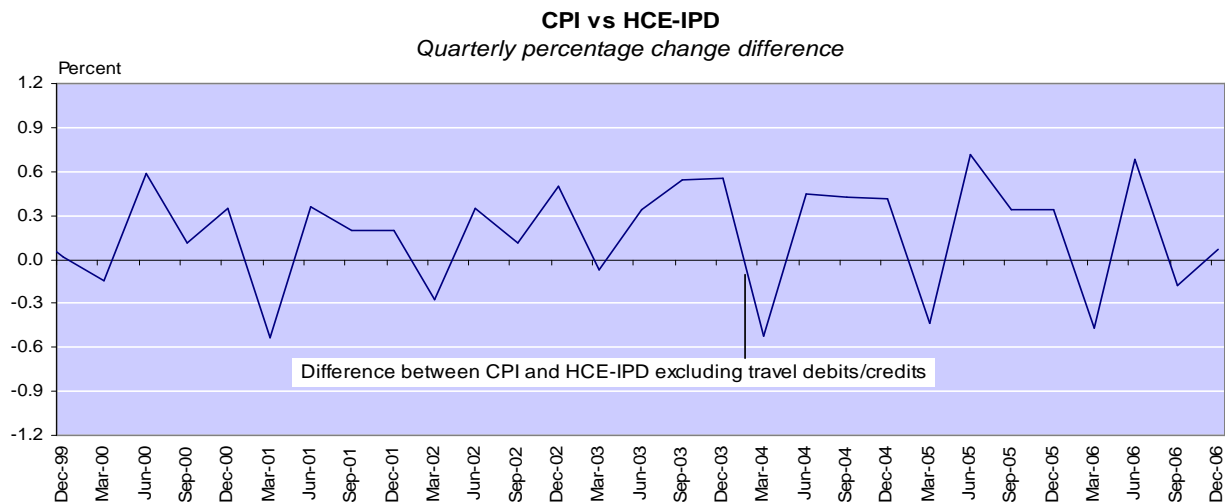
#### 3.1 Headline CPI vs HCE-IPD

The progressive divergence over time between the Headline CPI and the HCE-IPD is clearly illustrated in **Figure 4**, Comparison of index difference, below.



From the June 1999 quarter to the December 2006 quarter, the level of the CPI increased to a level approximately 6 percent higher than the level of the HCE-IPD. There is also a degree of volatility in the quarterly percentage changes in these two series, as illustrated in **Figure 5**, CPI vs HCE-IPD, below. This volatility (which has a seasonal pattern) is in large part due to the seasonal movement of prices for international airfares, which appear in the CPI with their associated annual expenditure weight, while in the HCE-IPD, they are weighted using current period quantities. In addition, Overseas Trade Indexes (OTI's) for certain overseas airfares are used in the HCE-IPD as opposed to solely relying on CPI prices.

**Figure 5**



### 3.2 CPI\* vs HCE-IPD\*

The second step was to re-compile the two indexes having made a number of adjustments to account for the scope and coverage differences noted in **Section 2.1**. These adjustments were achieved by excluding a number of sub-components from each index to more closely align the two. A summary of the items excluded from each index is presented in **Table 2**, Summary of items excluded from indexes, below.

**Table 2**

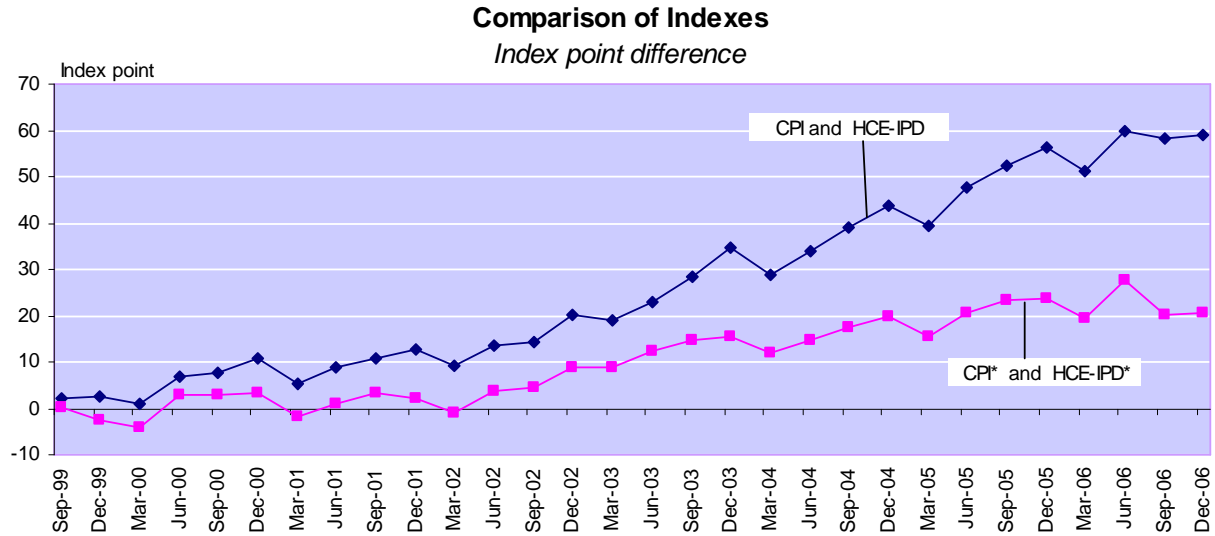
#### Summary of Items Excluded From Indexes

CPI	HCE-IPD
Purchase of new housing	Imputed rent
Water supply	Superannuation Service charge
Local authority rates and payments	On farm Agricultural consumption
Dwelling insurance	Wages in Kind
Loan application fee	Welfare Services
Legal expenses for the sale and purchase of property	Fringe benefits
Real estate services	Gambling
Vocational services	Tourist Accommodation
Property maintenance	Mortgage and other expenses

## The Difference between the CPI and the HCE-IPD, Piyasena Liyanage

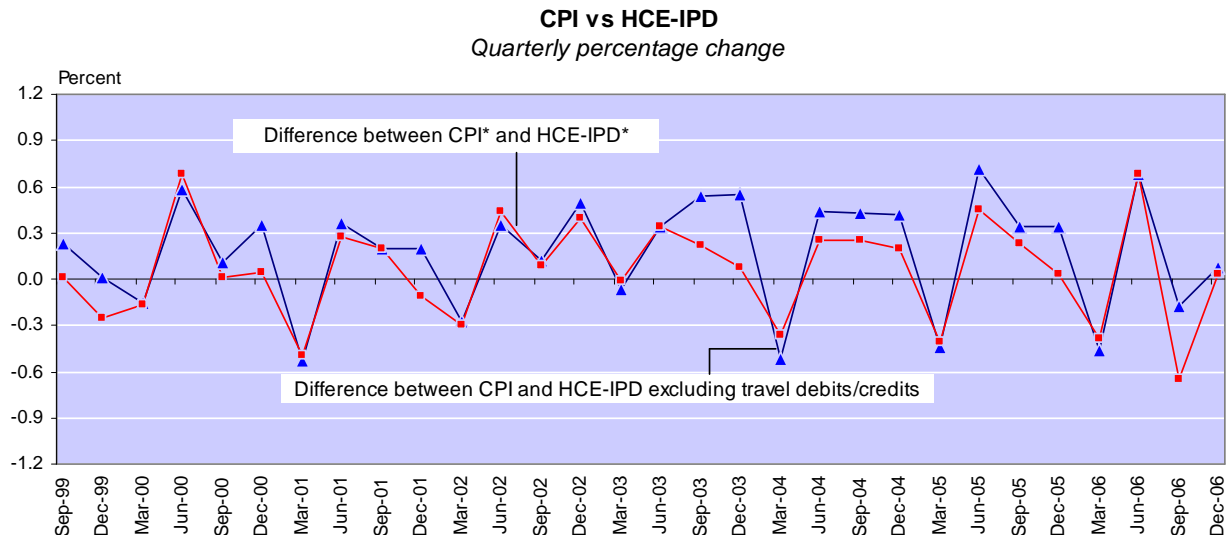
The time series of the resulting difference in index levels is presented in **Figure 6**, Comparison of indexes, below. As can be seen, more than half of the difference in the two series has been accounted for by controlling for the scope and coverage differences.

**Figure 6**



As well as accounting for a substantial portion of the long-run divergence in the compared series, the variance of the quarterly percentage changes has been reduced, and the adjusted series are more highly correlated (correlation coefficient has increased from 0.57 to 0.73), as illustrated in **Figure 7**, CPI vs HCE-IPD, below.

**Figure 7**



### 3.3 CPI\* vs HCE-IPD\* Laspeyres

By converting the HCE-IPD\* index to a Laspeyres base-weighted index (using the same weights as the CPI\* index), we are now able to control for the differences in weighting and index calculation methodology. In this process, only the aggregate level HCE sub-indexes have been base-weighted. Each of these sub-indexes effectively remains as a Paasche price index, so some residual weighting and calculation effects will remain. The adjusted CPI\* weights used in this process are presented in **Table 3**, CPI\* base year weights (expressed as proportions), below. As can be seen, the expenditure weights at this aggregated level have not changed significantly over the 7-year period.

**Table 3**

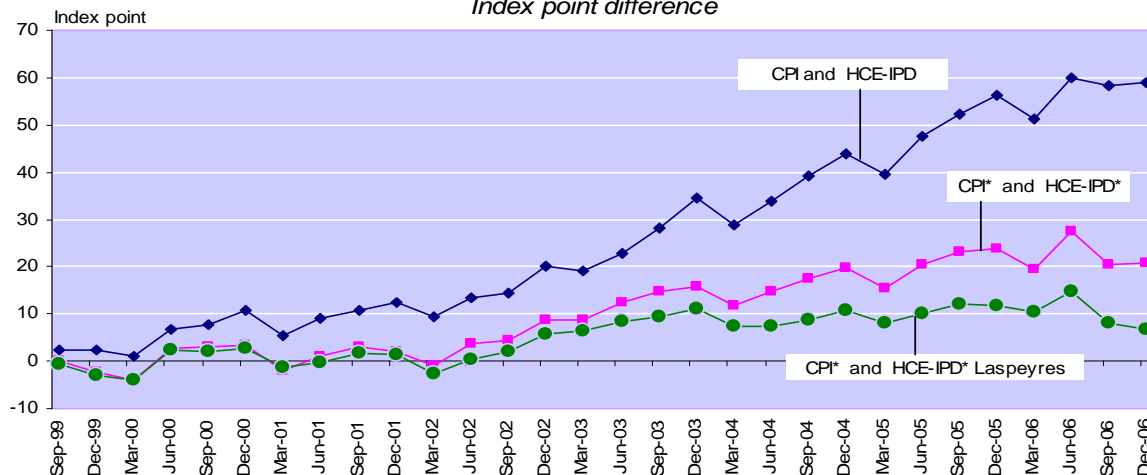
**CPI\* Base Year Weights (expressed as proportions)**

Group	Jun-99 (%)	Jun-02 (%)	Jun-06 (%)
Food and beverages	21	21	19
Clothing and footwear	4	4	5
Housing	8	7	7
Household goods and services	13	13	13
Health and medical	4	4	6
Transport	19	20	21
Recreation and education	10	10	9
Hotels and restaurants	9	9	9
Other goods and services	12	12	11

As can be seen from **Figure 8**, Comparison of indexes, a further half of the remaining long-run drift has now been accounted for as a result of controlling for the differing weights and index calculation method. Over the seven year span of this analysis, the cumulative drift in level now only amounts to less than 1 percent at the December 2006 quarter. This means that we have accounted for over 80 percent of the difference between the CPI and the HCE-IPD through controlling for scope/coverage differences and weighting/calculation effects.

**Figure 8**

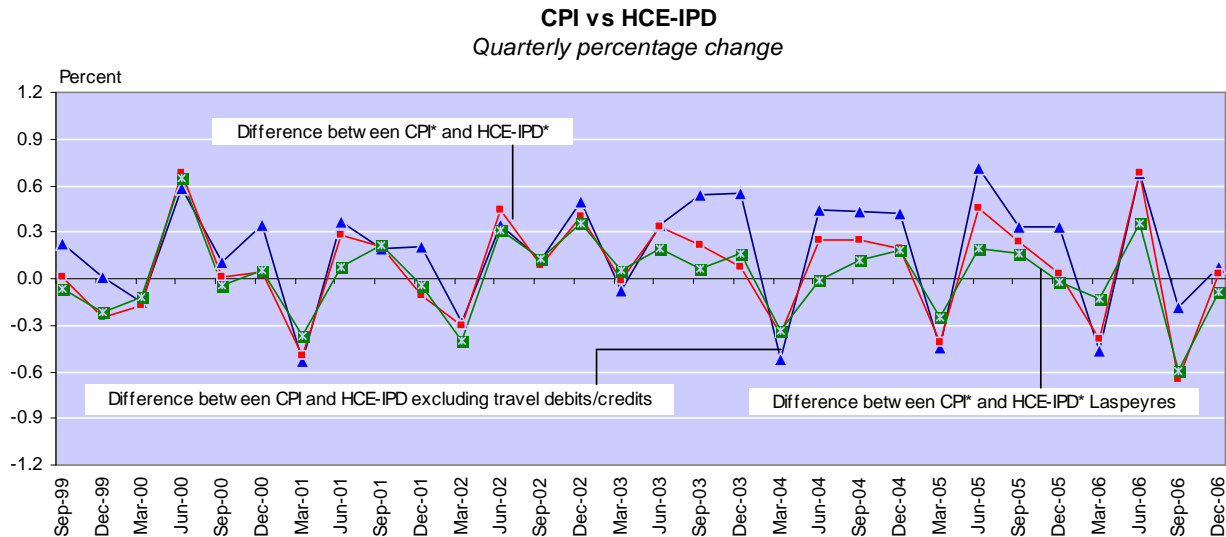
**Comparison of Indexes**  
*Index point difference*



## The Difference between the CPI and the HCE-IPD, Piyasena Liyanage

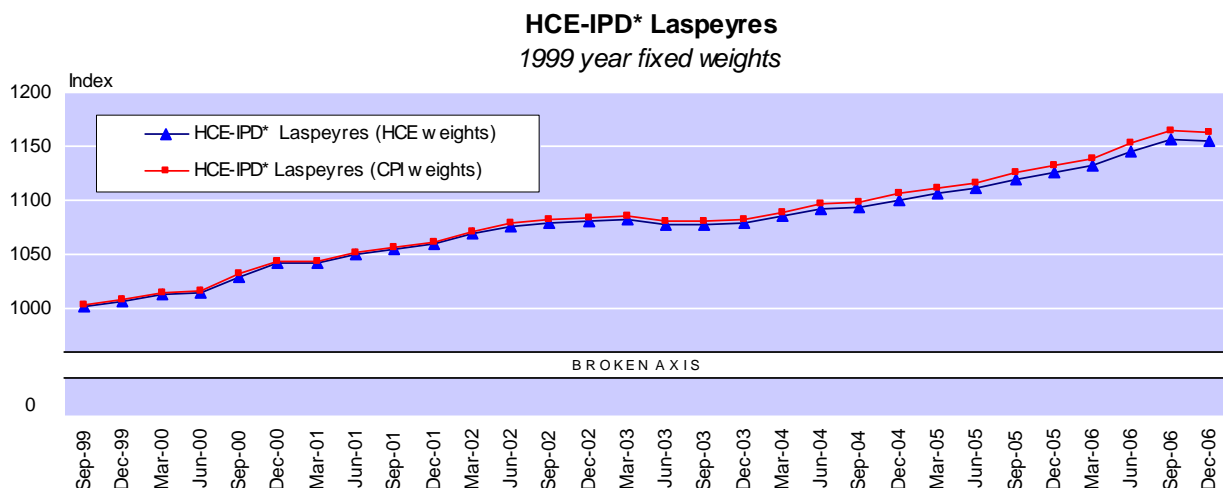
In addition to mitigating the long-run drift effect, calculating the indexes using similar weightings and calculation methodologies has meant that the quarterly percentage changes are much more in line (see **Appendix B** for more details), particularly as a result of changing the index calculation method, since quarterly variations in quantities are no longer present at the higher level, and are now much more highly correlated (correlation coefficient of 0.86) as can be seen in **Figure 9**, CPI vs HCE-IPD, below.

**Figure 9**



It is possible to identify the impact which the weights alone have by comparing the HCE-IPD Laspeyres indexes which result from using the equivalent CPI weights versus using HCE weights. As can be seen in **Figure 10**, HCE-IPD\* Laspeyres, below, the impact of changing the weights is relatively minor over the 7 year period.

**Figure 10**



### 3.4 Residual differences

While the above empirical exercise has served to explain over 80 percent of the long-run divergence between the CPI and the HCE-IPD, there remains a small residual long-run difference between the recompiled CPI\* and HCE-IPD\* Laspeyres indexes which accumulates to approximately 1 percent over the 7-year analysis period.

These residual differences will be a function of 3 potential factors:

- lower level weighting/calculation effect,
- residual differences in scope/coverage, and
- differences in pricing and weighting data.

As mentioned in **Section 3.3**, this preliminary analysis did not re-compile the HCE-IPD\* on a Laspeyres basis from the lowest possible level, which means that there will likely be some residual calculation and weighting effects coming from the fact that the HCE-IPD\* sub-indexes remained as Paasche price indexes.

Additionally, the adjustments made to correct for differences in scope and coverage focussed mainly on the predominant/material sources of difference, meaning that some minor differences may remain at a lower level (although this is unlikely to be significant).

Finally, there will be inevitable differences where the source data used to compile the current and constant price series will differ from that used in the pricing collection in the CPI. This will be particularly the case where we have not used the CPI to deflate (or reflate) the current and constant price series.

Graphs of each of the lower HCE-IPD\* sub-indexes difference from the equivalent CPI\* index are presented in **Appendix A**, Detailed HCE-IPD sub-indexes, together a brief summary of the changed differences.

## 4. Summary of results

**Table 4**, Comparison of index point difference in re-compiled indexes (base June 1999 quarter =1000), below provides a summary of the index-points differences between the re-compiled indexes created in this analysis.

Looking at the December 2006 quarter, it can be seen that the difference between CPI and HCE-IPD was 59 index points. Once the scope adjustments had been made, this difference reduced to 21 index points meaning that 38 out of the 59 index points difference (or 64 percent of the difference) can be explained by scope/coverage differences. A further 13 index points (i.e., 21 minus 8), or 22 percent of the original difference can be attributed to a combination of weighting and index formula effect. The remaining 8 index points difference (or 14 percent of the difference) remains to be explained by a combination of:

- lower level weighting/calculation effects,
- residual differences in scope and coverage, and
- differences in weighting and pricing data.

**Table 4**

**Comparison of Index Point Difference in Re-compiled Indexes (Base June 1999=1000)**

Quarter	CPI minus HCE-IPD	CPI* minus HCE-IPD*	CPI* minus HCE-IPD* Chained Lasperyes
Sep-99	2	0	-1
Dec-99	2	-2	-3
Mar-00	1	-4	-4
Jun-00	7	3	2
Sep-00	8	3	2
Dec-00	11	3	3
Mar-01	5	-2	-1
Jun-01	9	1	-1
Sep-01	11	3	2
Dec-01	13	2	1
Mar-02	9	-1	-3
Jun-02	13	4	0
Sep-02	14	5	2
Dec-02	20	9	6
Mar-03	19	9	6
Jun-03	23	12	8
Sep-03	28	15	9
Dec-03	35	16	11
Mar-04	29	12	7
Jun-04	34	15	7
Sep-04	39	17	9
Dec-04	44	20	11
Mar-05	40	15	8
Jun-05	48	20	10
Sep-05	52	23	12
Dec-05	56	24	12
Mar-06	51	20	11
Jun-06	60	28	15
Sep-06	58	20	9
Dec-06	59	21	8

**Table 5**, Comparison of index point difference (2006 calendar year average), below provides a summary of this decomposition for the average differences for the 2006 calendar year, while **Figure 11**, Decomposition of differences between the CPI and HCE-IPD – 2006, presents the same information graphically.

**Table 5**

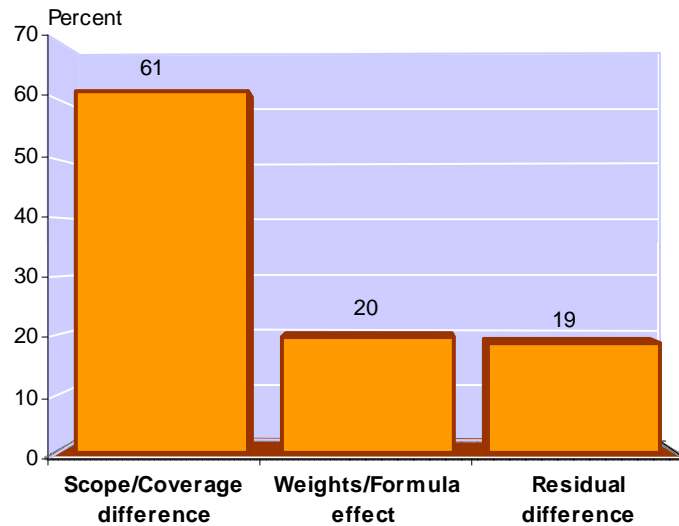
**Comparison of Index Point Difference (2006 calendar year average)**

	Average		Index Points	Percentage
Difference between CPI and HCE-IPD	57	Scope/coverage difference	(57-22) = 35	61
Difference between CPI* and HCE-IPD*	22	Weights/formula effect	(22-11) = 11	20
Difference between CPI* and HCE-IPD* Chained Lasperyes	11	Residual difference	(11-0) = 11	19



**Figure 11**

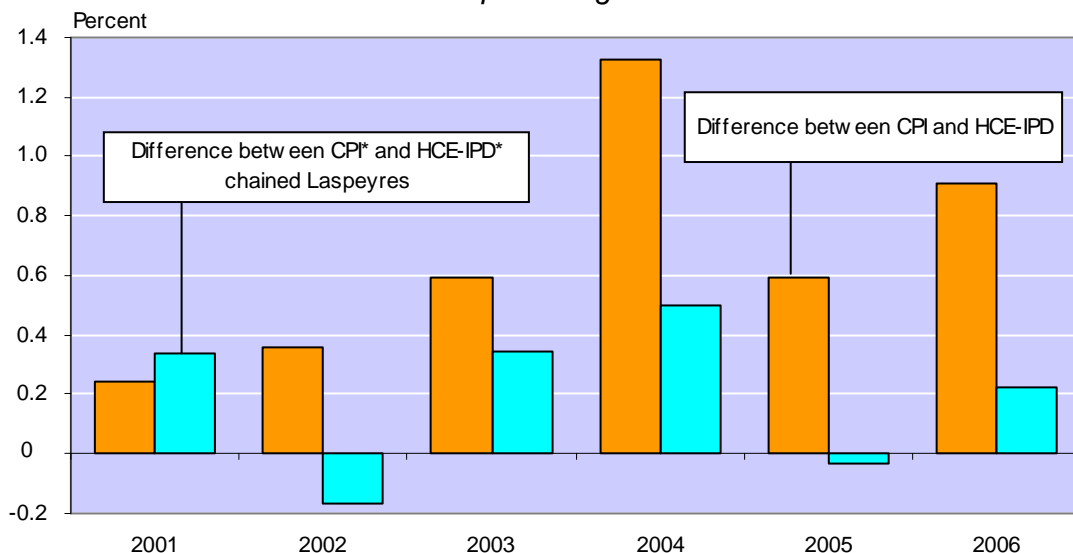
**Decomposition of Difference Between the CPI and HCE-IPD - 2006**



**Figure 12**, Comparison of annual indexes, shows the annual (calendar) index movement difference between the CPI and the HCE-IPD indexes. It illustrates that the annual movement difference reduces when we compare the CPI\* and the HCE-IPD\* chained Laspeyres index.

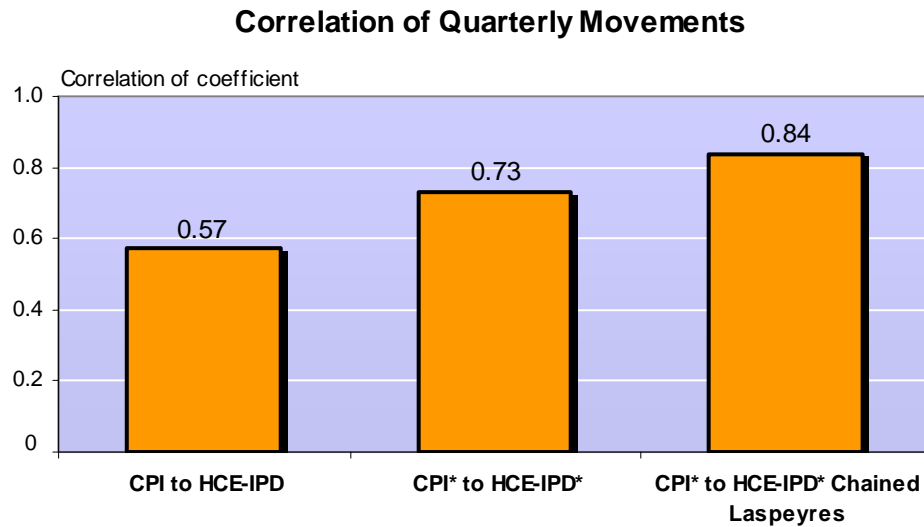
**Figure 12**

**Comparison of Annual Indexes**  
*Annual percentage difference*



In addition to lining up the annual percentage movement, the analysis has also shown that the combination of scope/coverage adjustments and weighting/formula alignment has significantly improved the correlation of the quarterly index movements (see **Figure 13**, Correlation of quarterly movements).

Figure 13



## 6. Conclusion

The purpose of this paper was to undertake some preliminary analysis to provide empirical evidence to explain the known underlying reasons for the long-run divergence in the CPI and the HCE-IPD.

By isolating each of the known sources of differences in the two measures of underlying price change, and recompiling the indexes sequentially, we have been able to quantify the actual contribution of the major sources of divergence between the two series. In this process approximately 80 percent of difference in level between the two measures over the 7 year period has been accounted for, while also significantly improving the correlation of the quarterly movements.

As this analysis has been undertaken at a relatively aggregate level, there remain some residual differences which would appear (to a large part) to be due to the lower level weighting and index formula effect.

## Appendix A: Detailed HCE sub-indexes

In this Appendix, we graphically present the results of recompiling the lower level HCE-IPD\* analytical series, and comparing these to the CPI\* indexes. The change in the two series reflects the difference due to scope/coverage alignment. Residual differences will be due to a combination of:

- lower level weighting/calculation effect,
- residual differences in scope and coverage, and
- differences in weighting and pricing data.

A summary of the sources of pricing data for the HCE-IPD aggregates is presented in **Table 6**, Sources of HCE pricing data, below. Overall, approximately 85 percent of the pricing data for HCE is sourced (either directly or indirectly from the CPI).

**Table 6**

**Source of HCE Pricing Data**  
*Percent of 2005 year expenditure weights*

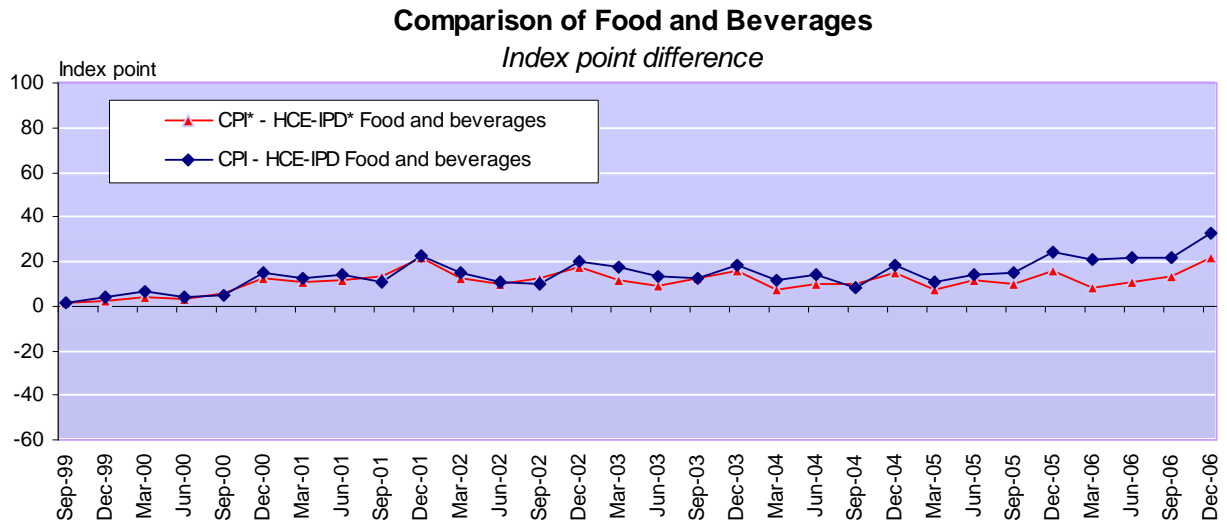
Group	CPI	Retail Trade Deflators	Producers Price Index	Overseas Trade Indexes	Labour Cost Index	Independent Sources	Capital Good Price Indexes
Food and Beverages	100						
Clothing and Footwear	99		1				
Housing	99	1					
HH Goods and Services	95		1			4	
Health and Medical	14		86 <sup>1</sup>				
Transport	80			12		1	8
Recreation and Education	96		2			2	
Hotels and Restaurants	37	63					
Other Goods and Services	72		15		12	2	
Total	85	5	4	2	1	1	1

### A.1 Food and beverage

As can be seen in **Figure 14**, Comparison of food and beverages, approximately 30 percent of the difference in this series has been accounted for through the scope/coverage adjustment. The main scope/coverage adjustment was moving restaurants and takeaways out of the CPI grouping (to the Hotels and Restaurants grouping). The residual difference is likely to be attributable to the lower level weighting/calculation effect, since virtually all of the pricing data used in deriving the HCE estimates are sourced from the CPI.

<sup>1</sup> Health and Medical prices sourced from the PPI include a combination of CPI and LCI processes.

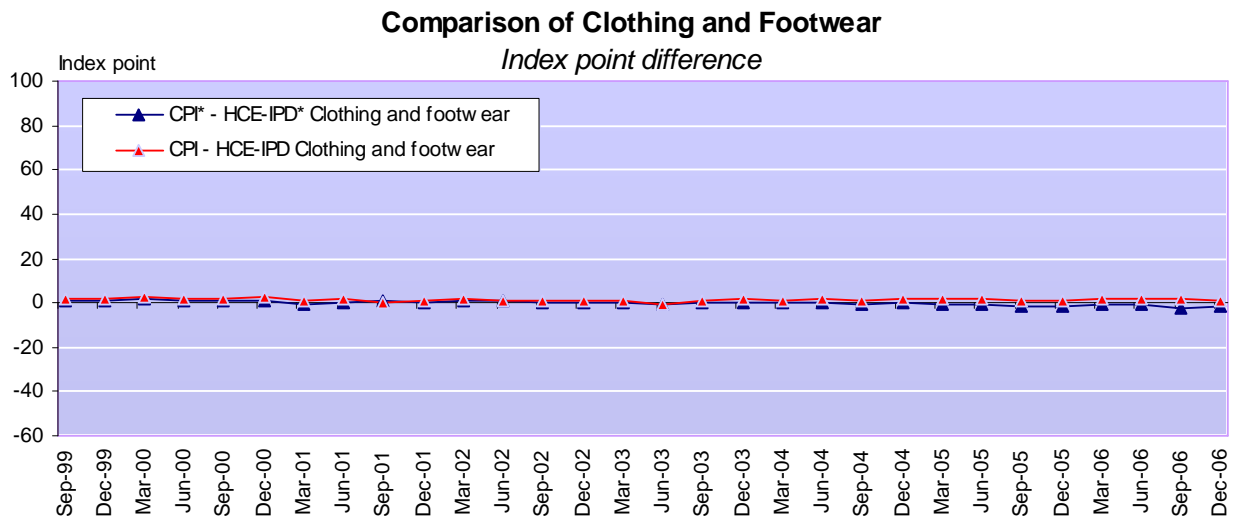
Figure 14



### A.2 Clothing and footwear

For this aggregate as shown in **Figure 15**, Comparison of clothing and footwear, there was virtually no difference in the two series. This is because there were no scope/coverage differences, and 99 percent of the pricing data is sourced from the CPI.

Figure 15



### A.3 Housing, and household goods and services

Both Housing and Household Goods and Services components are significantly impacted by scope/coverage adjustments such as:

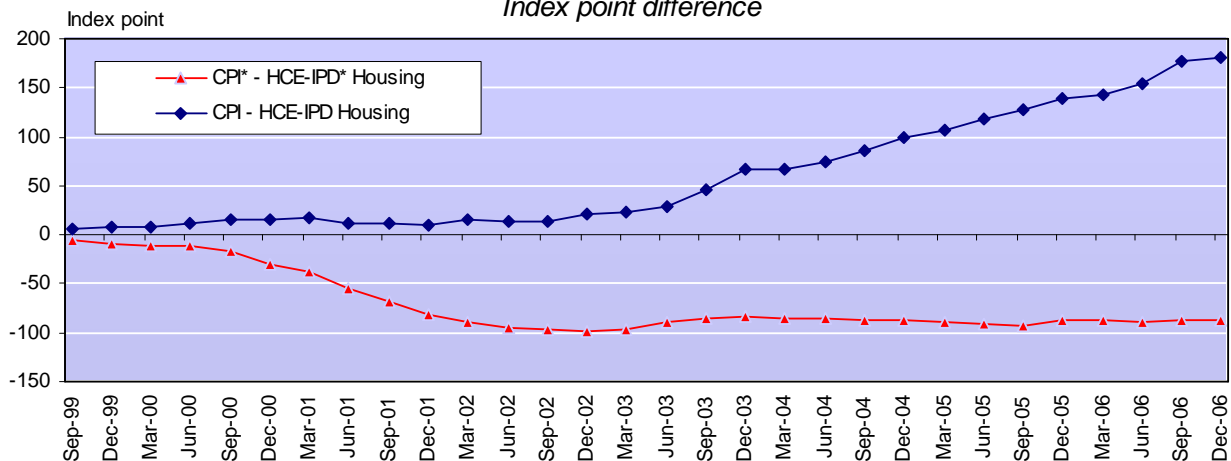
- the removal of new dwelling purchases from the CPI,
- the removal of rates and water supply from the CPI,
- the removal of dwelling insurance and mortgage costs from the CPI and
- the removal of imputed rents from HCE.

There is potential for differences in this preliminary analysis to arise from aligning the new CPI expenditure classes precisely with the existing HCE classes. Weighting effects can also impact significantly here, particularly with such commodities as electricity which has experienced significant price movements in recent years. In addition, electricity is included within the “Housing” group in the CPI, whereas in HCE it is included in the “Household Goods and Services” group. For the purposes of this analysis, electricity has been moved to the “Household Goods and Services” group.

As can be seen from the “Housing” component graph in **Figure 16**, Comparison of housing, there was a divergence between the CPI\* and the HCE-IPD\* indexes during 2001/2002. While well over 95 percent of the pricing data for the HCE-IPD comes directly from the CPI, this pricing data is benchmarked to Census of Population and Dwelling figures (both volume and price) as this data becomes available every 5 years. This, together with a process of reconciling current price annual benchmarks to balanced annuals, has the potential to cause the CPI and the HCE-IPD to diverge over time.

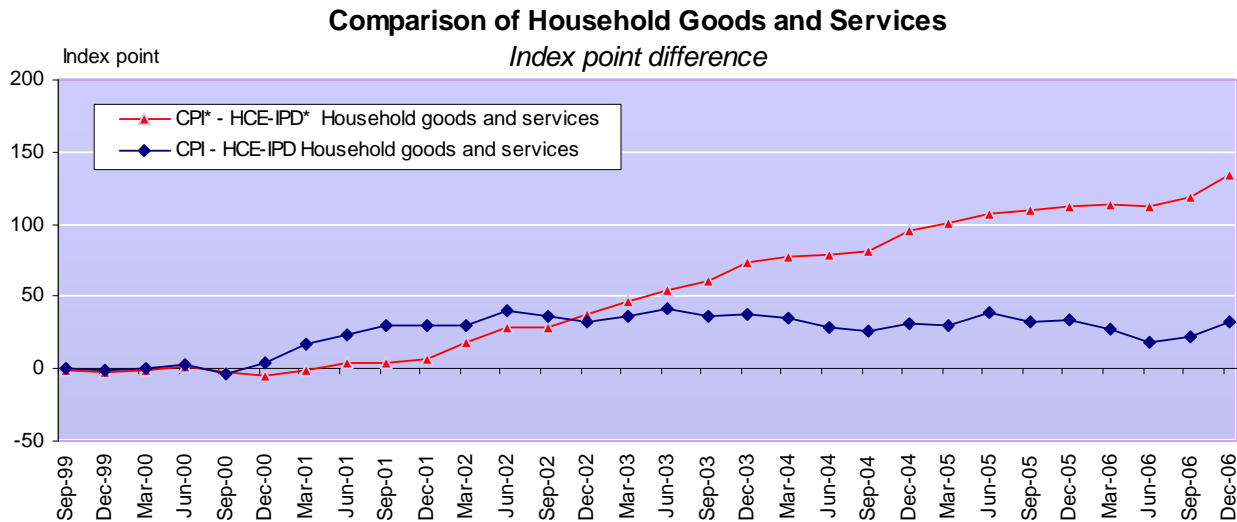
**Figure 16**

**Comparison of Housing**  
*Index point difference*



In **Figure 17**, Comparison of household goods and services, the scope-adjusted Household Goods and Services index shows residual drift over the span of this analysis. Over 95 percent of the prices feeding into this aggregate are sourced directly from the CPI, indicating that there remain significant weighting/formula effects at the lower level within this aggregate.

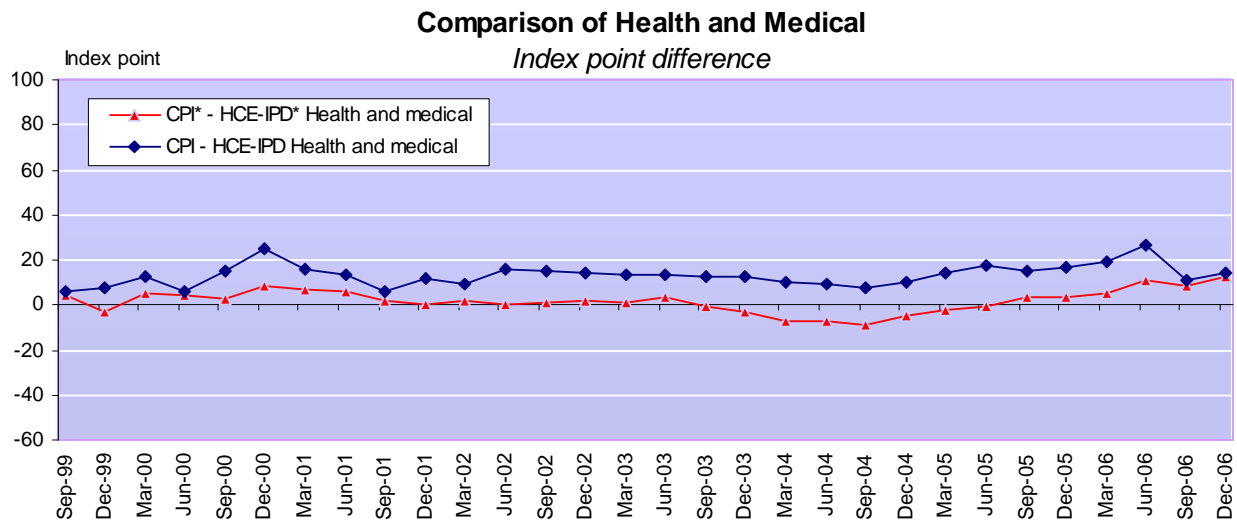
Figure 17



#### A.4 Health and medical

Minor scope adjustments are made here and the resulting sub-index shows very similar movements in **Figure 18**, Comparison of health and medical.

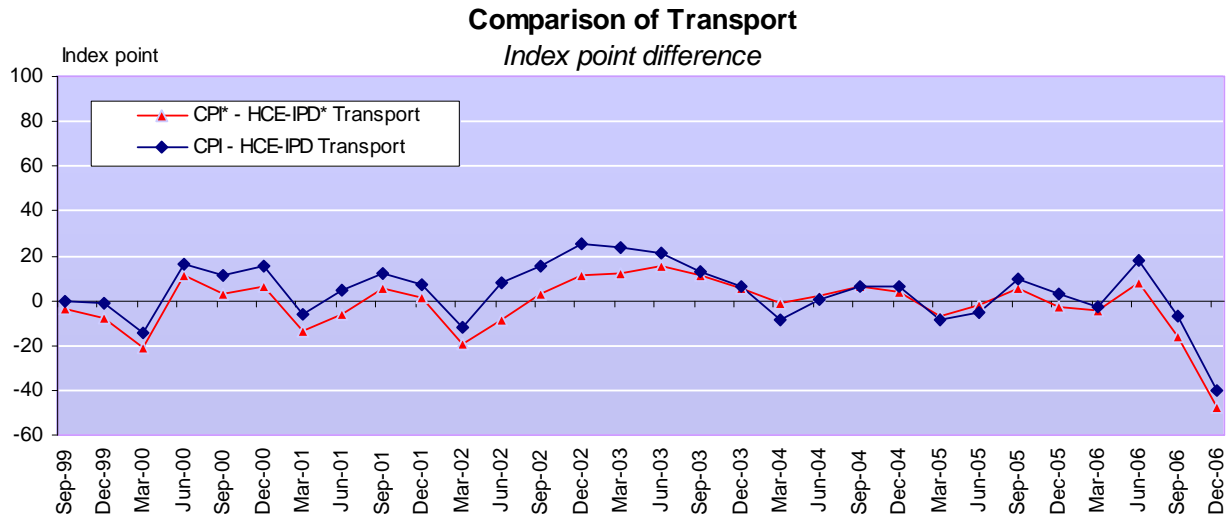
Figure 18



#### A.5 Transport

While there is very little in the way of scope/coverage difference for this aggregate, the impact of calculation effects will be significant here, particularly for overseas airfares, due to pricing, weighting and calculation effects. As has been noted previously, overseas airfares prices within the HCE-IPD are sourced from Overseas Trade Indexes as well as from the CPI (see **Figure 19**, Comparison of transport).

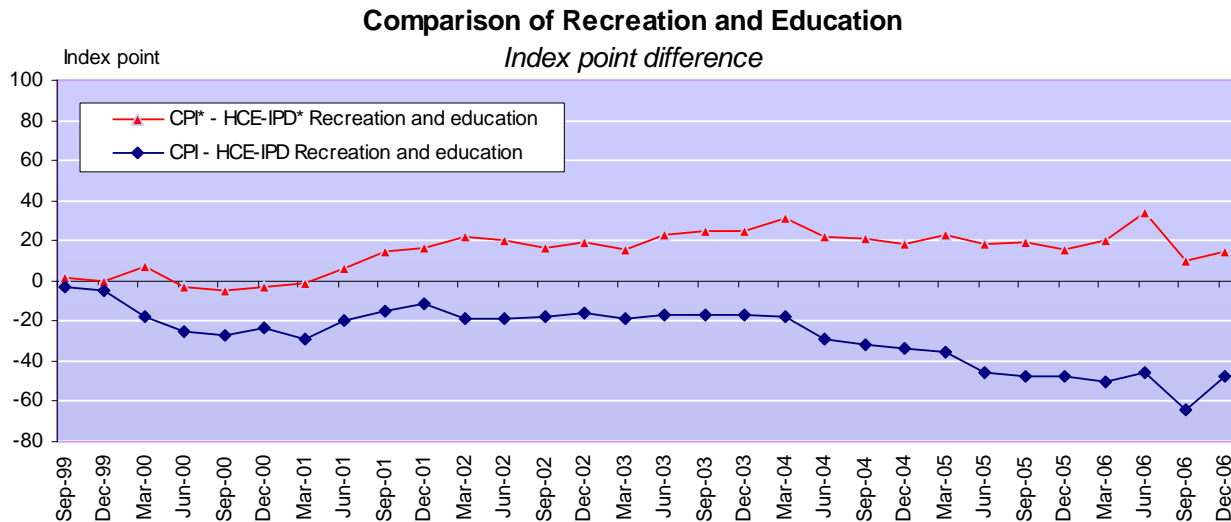
Figure 19



### A.6 Recreation and education

Following minor scope adjustments, the price movements are very similar for this aggregate (see **Figure 20**, Comparison of recreation and education). Weightings here have the potential to be impacted by the fact that the HCE-IPD\* weights will implicitly include overseas student expenditure on education (since the travel debits/credits adjustments are made independently of these sub-indexes).

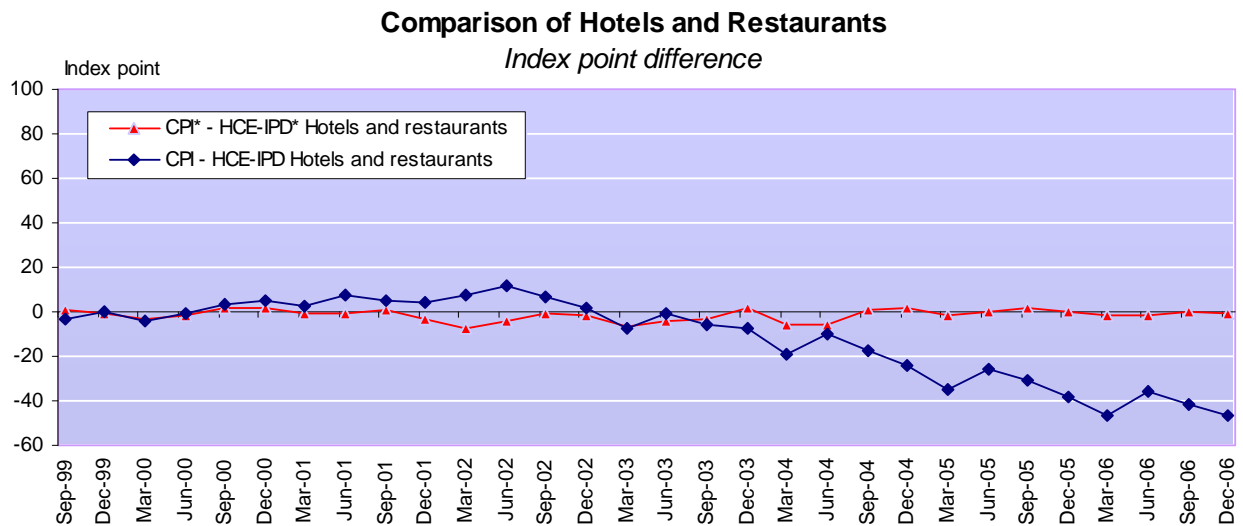
Figure 20



### A.7 Hotels and restaurants

Once scope differences are accounted for (i.e., adjusting the CPI to include restaurants and takeaways), this index tracks very closely to the adjusted CPI (As shown in **Figure 21**, Comparison of hotels and restaurants), which is to be expected given the virtually all of the prices are sourced from either the CPI or the Retail Trade Deflators (which are sourced from the CPI).

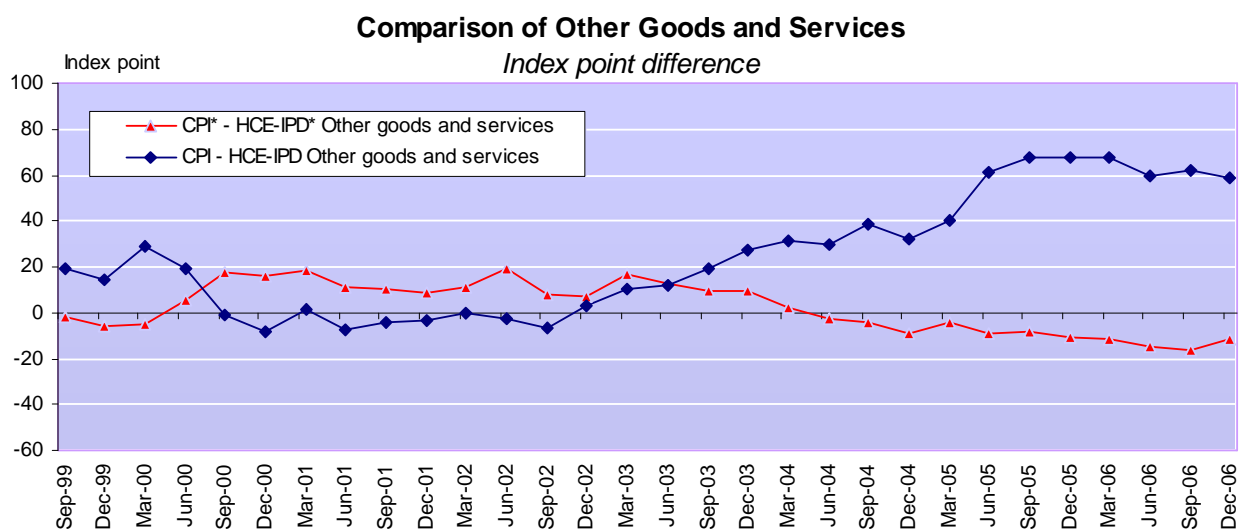
**Figure 21**



### A.8 Other goods and services

Once scope differences are accounted for, this index tracks very closely to the adjusted CPI (see **Figure 22**, Comparison of other goods and services). This aggregate contains the greatest mixture of pricing sources, with approximately 72 percent of prices coming from the CPI, with the remainder coming from a combination of Labour Cost Index and Producer Price Index prices.

**Figure 22**





**Appendix B**

**Table 7**

**Comparison of Quarterly Percentage Change**

Quarter	CPI	HCE-IPD	CPI*	HCE-IPD*	HCE-IPD* Laspeyres	HCE-IPD* Chained Laspeyres
Sep-99	0.4	0.2	0.3	0.2	0.3	0.3
Dec-99	0.2	0.2	0.2	0.5	0.4	0.4
Mar-00	0.7	0.8	0.6	0.7	0.7	0.7
Jun-00	0.7	0.1	0.8	0.1	0.1	0.1
Sep-00	1.4	1.3	1.5	1.5	1.6	1.6
Dec-00	1.2	0.9	1.2	1.2	1.1	1.1
Mar-01	-0.2	0.3	-0.3	0.2	0.0	0.1
Jun-01	0.9	0.5	0.9	0.6	0.8	0.8
Sep-01	0.6	0.4	0.6	0.4	0.4	0.4
Dec-01	0.6	0.4	0.5	0.6	0.5	0.5
Mar-02	0.6	0.9	0.5	0.8	0.9	0.9
Jun-02	1.0	0.7	1.1	0.6	0.8	0.8
Sep-02	0.5	0.4	0.3	0.3	0.2	0.2
Dec-02	0.6	0.1	0.5	0.1	0.2	0.2
Mar-03	0.4	0.5	0.2	0.2	0.2	0.2
Jun-03	0.0	-0.3	-0.2	-0.6	-0.4	-0.4
Sep-03	0.5	0.0	0.0	-0.2	0.0	0.0
Dec-03	0.7	0.1	0.4	0.3	0.2	0.2
Mar-04	0.4	0.9	0.2	0.6	0.6	0.6
Jun-04	0.8	0.4	0.6	0.4	0.6	0.6
Sep-04	0.6	0.2	0.4	0.1	0.2	0.2
Dec-04	0.9	0.5	0.8	0.6	0.6	0.6
Mar-05	0.4	0.8	0.3	0.7	0.5	0.5
Jun-05	0.9	0.2	0.6	0.1	0.4	0.4
Sep-05	1.1	0.8	1.0	0.7	0.8	0.8
Dec-05	0.7	0.4	0.6	0.5	0.6	0.6
Mar-06	0.6	1.1	0.5	0.9	0.6	0.6
Jun-06	1.5	0.8	1.6	0.9	1.2	1.2
Sep-06	0.7	0.9	0.4	1.1	1.0	0.9
Dec-06	-0.2	-0.3	-0.3	-0.3	-0.2	-0.2