

The type and extent of quality changes in the Canadian CPI

First Draft

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Introduction:

The evaluation of quality changes in the sample has always been one of the difficult problems of constructing good price indexes. Recently, as some countries' CPIs have come under public scrutiny, imperfect adjustments for quality changes have been included in the list of reasons why indexes overstate real price change. However, the bias introduced by treating quality change is unlike other sources of bias - product substitution, outlet substitution, treatment of new goods. For these, the direction of bias is known and the question is the degree to which it is mitigated. Quality changes, on the other hand, can be positive or negative, and can be over- or under-estimated, so the resulting bias can be in either direction.

It is usually claimed that the overall result of individual quality adjustments is to raise the index above its true value. It is suspected that most quality changes are improvements, and in those commodities where improvements are consistently being made, consumer durables for example, not all improvements will be captured. However, it is also suggested that for some other commodities, adjustments for changing quality may have led to the index being underestimated. Clothing, and to some extent cars, are candidates for this situation. Which errors are upwards, and which downwards, depend on the nature of the adjustment programmes, and it is a question of how they offset each other.

In order to understand these errors better we need to know how the process of quality adjustment works, and what impact it has on the index measures. This paper carries a description of how quality adjustment affected the Canadian CPI in one year, 1994. As such it offers no prescriptions; it only presents a summary of the existing programme in action and raises questions for further examination.

In the paper, the extent of quality changes are described and the areas where they occur most often are identified. The use of the most common adjustment mechanism, splicing, is examined to see for what commodities it is likely to be used, and what price behaviour tends to invoke it. The timing of quality changes and the relationships between reported price movements, quality adjustments and the resulting index calculations are looked at to see if there are common patterns. Finally, an attempt is made to measure the impact of quality change adjustments on indexes.

Quality adjustment in the CPI

For most commodities in the CPI price movements from one period to another are calculated by comparing prices for a sample of matching varieties observed in the two time periods. In 1994 about 600 separate representative products were defined covering the whole of the CPI. For most of these, the sample is further divided by geography into smaller strata. There were 34 strata in 1994 though sampling was not usually done in all strata. Within each of these strata the price movement to the current pricing period from the previous pricing period was calculated by taking the ratio of the arithmetic average of all prices in the current period to the average of the prices in the previous period for those items that had price observations in both periods.¹

When a price is not available for a particular item in the current period one of two actions may be taken. The first is to drop that item from the sample. The index is then calculated on a reduced sample, as the previous period price is also be dropped from the comparison. The sample may be increased then or later by the addition of another item, though it will not enter the index calculation until it has had observations for two pricing periods. There is no direct comparison between any item and its replacement.

Alternatively, if a replacement can be found that can be compared directly with the missing item, a price observation for the previous period will be computed for it, and will be included in the calculation of the price movement for the current period. The computed price for the previous period of the new item will be used instead of the actual price for the previous period of the item that has been dropped. The action of estimating a price in the previous period for the replacement item is the quality adjustment.

There are restrictions on when a direct comparison can be made. To be directly compared, the old and new item must belong to the same representative product and must be sold from the same outlet. This means that when outlets are replaced in a given stratum, even if similar varieties are collected from the new outlets, these are handled as sample changes. It also means that some replacements of fairly similar items are not allowed. For example

¹ In 1995 changes were made to the CPI sample. The size has been reduced and there are now 17 strata. The calculation of the price movement at the basic level has also been changed to the ratio of geometric means instead of arithmetic means. For further details see: Statistics Canada, The Consumer Price Index Reference Paper, Catalogue no. 62-533, Ottawa, 1995

20" TVs and 27" TVs are separate representative products and cannot be substituted for each other.

The index maker is torn between the need to keep as much continuity as possible and the need to reflect changes in what is being sold. Either approach introduces error. The first type of error arises if the price changes observed for matched varieties do not capture the price movement that is taking place for all varieties. This is likely to happen if items are selected mainly because they are available for a long period rather than to reflect the range of varieties sold. The second type occurs if the quality assessment between a variety and its successor is invalid. The stricter the rules for making comparisons between varieties, the more often will the problem be solved by reducing the matched sample, and the greater the number of varieties that will be excluded from the price index. This means that the more one guards against the second type of error, the more likely the index will contain the first one.²

Extent of intervention in the CPI

In 1994 there were 464 representative products for which quality adjustments could be made when the sample changes. These products accounted for about 55% of the CPI. Most of the remaining commodities are not subject to quality adjustment. These include Rented accommodation, Owned accommodation (except maintenance), and Water, Fuel and Electricity in the housing area, Public transportation, and several health and education items. Some of the other commodities can be adjusted for quality change but their prices are not collected by a field survey. Auto insurance and Cablevision are examples of these.

For the 464 surveyed products there were about 760,000 price observations in 1994. Of these 21,100 involved the quality adjustment procedure. By comparison there were about 13,250 additions to the sample in 1994 and about 9,000 deletions. Although there were some areas where items were added to cover new products or to expand the sample for existing products, most sample changes were to replace lost observations. Effectively, there were about 9,000 cases where the loss of an observation was dealt with by temporarily reducing the sample, compared with 21,100 where there was a direct comparison made. This paper focused on these direct comparisons.

² See Triplett, J. "The economic interpretation of hedonic methods", Survey of Current Business, Vol. 66, No.1, 1986, on a closely related discussion.

The 21,100 quality changes as a percentage of the 760,000 observations amounted to an overall incidence of 2.8%, though the incidence varied widely among different commodity groups. (See table 1). In some groups, notably Food, Health and Personal Care, and Tobacco and Alcohol, the incidence was low, below 1% for most products. Although these three groups accounted for 72% of the price observations they included only 39% of the quality changes. On the other hand, for many products in the groups Household Operations and Furnishings, Clothing, Transportation, and Reading and Recreation, the percentage of observations that attracted quality change during the year was over ten percent. For most of these products, price observations were not collected in every month, but only for a few consecutive months of the year for seasonal items, or semi-monthly or quarterly for others.

The concentration of a high incidence of quality change in certain groups can be seen in the following table.

Weights in the CPI of surveyed commodities subject to different incidence of
quality change
Percentage of CPI total, December 1988

	CPI weight	surveyed items	quality change more than 3%	quality change more than 10%
Food	17.6	13.9	2.7	0.5
Housing	36.7	8.5	6.3	3.2
Clothing	8.7	6.9	5.8	3.2
Transportation	17.9	13.5	10.1	9.4
Health and Personal Care	4.2	3.2	1.0	0.1
Reading and Recreation	9.0	3.8	3.0	2.4
Tobacco and Alcohol	5.9	5.5	0.0	0.0
Total	100.0	55.2	29.0	18.8

Commodities where more than 3% of price observations during the year involved quality change accounted for 29% of the total CPI. Commodities where the incidence was more than 10% were concentrated in four groups, and accounted for 19% of the CPI.

The incidence of quality change can also be expressed as the chance that the series of observations for a particular item from a given outlet will be treated for quality change in a certain time period. If there are, for example, 120 streams of observations for butter, and during the year 30 of them had a quality change, the chance would be 25% for butter. If, as is often the case for new cars, all the series had quality changes during the year, the chance would be 100%. The following table shows the percentage of such series that experienced at least one quality adjustment during 1994, and the share of the CPI that those commodities with a chance over 25%, or over 50%, accounted for.

Chance of experiencing quality change and weights of commodities with larger chances

	%age having quality change during 1994	CPI weight	weights of sampled items	weights of commodities with 25% 50% chance of qual change	
Food	15.4	17.6	13.9	2.6	0.6
Housing	24.3	36.7	8.5	4.4	0.9
Clothing	48.4	8.7	6.9	5.6	3.9
Transportation	35.3	17.9	13.5	6.8	6.8
Health & Personal Care	15.0	4.2	3.2	0.4	0.0
Reading & Recreation	18.3	9.0	3.8	2.5	0.9
Tobacco & Alcohol	2.0	5.9	5.5	0.0	0.0
Total	20.4	100.0	55.2	22.3	13.1

As before it can be seen that high incidence of quality change is concentrated in a few areas. Within housing it is highest for furniture (43.3%), appliances (45.1%) and appliance repairs (76.4%). In transportation the chance of a quality change in the year is over 90% for new vehicles and repairs, but below 20% for everything else. In the recreation category observations for sports equipment (50.7%) and entertainment equipment (54.5) are more likely than not to have a quality change during a year, and vacation packages have a chance of 38%. Except for clothing materials and notions, which have a small incidence of quality change (8.7%), almost all clothing commodities have a good chance of experiencing quality change in the year though it is higher for seasonal clothing (66.0%) than for items that are bought year-round (48.1%)

To analyze quality changes three pieces of information were studied: - the reported price for the old item in the previous period - (P_{old}), the estimated price for the previous period for the new item, - (P_{adj}), and the price in the current period for the new item - (P_{new}). If we consider the series of observations for one item and its replacement alone, the amount by which the price index for this series will go up or down in this period as a result of the quality change evaluation - the index ratio - is equal to the posted price ratio divided by the quality ratio.

$$P_{new}/P_{adj} = (P_{new}/P_{old}) / (P_{adj}/P_{old}), \text{ where:}$$

$$\text{Posted price ratio} = P_{new} / P_{old} ,$$

$$\text{Quality ratio} = P_{adj} / P_{old} , \text{ and}$$

$$\text{Index ratio} = P_{new} / P_{adj} .$$

When posted price changes, quality changes and index changes are quoted, they are the percentage changes in these ratios.

Across the whole CPI sample there were slightly more (42 to 39%) changes where the quality ratio was greater than one. That is, there were slightly more cases where the quality of the new item was higher than that of the item it replaced. This was generally true for each of the seven major groups as well, the major exception being Transportation where there were many more quality improvements than declines and a very large number of substitutions where the quality was judged not to have changed. (In Health and Personal Care and Tobacco and Alcohol there were slightly more quality declines than increases). Thus there does not seem to be any *general* shift of the sample towards either higher or lower quality items through the mechanism of quality change adjustment. However, as the major groups comprise commodities of varying characteristics, it is necessary to examine individual commodities as well.

The types of quality change

The most common adjustment is to judge the relative prices of the new and old items to reflect their relative qualities, so the index does not change on account of the quality change evaluation. In this case the posted price ratio equals the quality ratio. There is support for this judgment if the old and new items were both available in the market at the same time. It is also an attractively simple option. In Canadian index production this process is called splicing.

Splicing accounted for about two-thirds of all quality change adjustments, and was most common in Food, Health and Personal Care, and Tobacco and Alcohol, where intervention of any kind was relatively rare. In fact, 87% of quality changes in these groups were splices. However, it would not be true to say that for the remaining 13% a different quality change evaluation was made due to an observation being lost and replaced. Many of these reflected exceptional circumstances. For example, 4% of the quality changes in the Food major group were non-splices that occurred when it was decided for soft drinks to change the size of the container to be priced. In May 1994 the specification was changed from 750cl to 2 litres for the two representative soft drink products. In this case, the quality change was preset, - the ratio of quantities - so when prices obtained were not in the same ratio the result was not a splice.

Thus for the most part quality change adjustment on Food, Health and Personal Care, and Tobacco and Alcohol was almost equivalent to treating all discontinuities as sample changes, and the problems are those of maintaining relevant samples.³ The impact of direct intervention and judgment of quality differences is concentrated on commodities in the other groups and the rest of the paper focuses on those.

In those other groups, - Household Furnishings, Clothing, Transportation, and Reading and Recreation - where quality change adjustment is relatively common for most products,⁴ there was a mix of splices and other judgments. Questions arise whether splices are distinctive from other actions. Are price increases more likely to be treated as splices than price decreases? Are large changes, in either direction, more likely to be treated as splices than small increases. If quality differences are recognized, is there any relationship between them and the direction and size of reported price changes?

What quality changes are likely to be spliced?

At this point most analysis for this paper has been done on the Clothing major group. Whether or not the same observations apply to the others remains to be seen. For Clothing splices were slightly less common than non-splices. In the first month of surveying

³ This is almost true, but not quite. When a simultaneous deletion and addition occur in the sample, neither affects the index calculation for that period. The index is calculated only on the other matched observations. When a splice occurs the observations do enter the calculation, with a contribution of no change to the index. Occasionally this is quite different from the movement of the other observations in the calculation.

⁴ Though books themselves are exceptional since they are judged not to undergo quality change

seasonal goods, though, when there was a very high incidence of quality change, splicing was less common - only about 40% quality change evaluations were splices.

Splicing was also associated more often with some types of price behaviour than others. It was most likely when there was a change in the item being priced, but the new item had the same price as the old. This situation accounted for 35% of splices, but only 11% of non-splices. Splicing was more likely when the price change was small; when the new variety was spliced the average reported price change was 11% (up or down), while it was 23% when the new item was not spliced. Splicing was least likely when the large reported price change was an increase. Large decreases, on the other hand, were just as likely to be spliced as not.

Consequently, when an item was spliced the posted price was more likely to have fallen (39%) than to have increased (26%). For non-splices the reverse was true; - in 50% of these cases prices rose, while in only 39% they fell, and in 11% they were unchanged. For comparison, over the year, 53% of the price changes not affected by quality changes were increases while 47% were decreases.

In summary, splicing was more frequent with small changes in price and quality, especially with no change in price, and less frequent when there were large changes or when the process of quality change was institutionalised, as in the introduction of new items with a new season. In 1994, at least, the impact of splices, though leaving indexes unchanged, was to lower slightly the quality of items in the various samples; while the impact of non-splices was more neutral, as they more closely matched the pattern of other price changes.

The pattern of non-splices

The distribution of quality changes in the four groups that account for most of the quality change activity is shown in the following table. It shows the relationship between posted price change and quality change when the posted price went up, when it went down, and when it did not change. When there was no change in the posted price, the result almost always was a splice.

But when the posted price did change there were two different patterns in the range of quality change that was associated with it. Splices occurred with approximately equal frequency, but if the judgment was otherwise the results to the index were different.

If there was a quality change associated with an increase in the posted price it was usually judged to be quality increase, but that increase was usually less than the increase in price. If there was a quality change associated with a posted price decline the quality was usually judged to have declined, but was quite likely to have declined more than the price. Thus quality changes associated with price increases tended to raise the index but those associated with declines did not necessarily lower it.

There were a significant percentage of cases where the price went up or down but there was judged to be no quality change at all - the replacement was an exact match for the earlier item. This meant that overall, posted price increases were greater than quality increases and consequently they tended to raise the index. Conversely, posted price declines tended to lower the index, though with less certainty

Percentage distribution of quality changes in Household Furnishings, Clothing,
Transportation, and Reading and Recreation.

	Posted price up		Posted price down
(Splices	18.2		20.1)
Quality change up more	2.6	Quality changed down more	5.4
Quality change up less	12.7	Quality change down less	4.9
Quality unchanged	5.0		4.8
Quality down	2.2	Quality up	3.3

When the posted price is unchanged, the distribution was: splices 18.5, quality up .8, quality down 1.7

This result can be seen in all major groups. (See Table 2). For example for Clothing as a whole, the 39.8% of quality changes associated with a decline in the posted price showed an average⁵ decline in the price of 23.7%, but an average quality decline of only 17.4%, so the average result of an individual change was a 7.6% decline in its index. However, the 38.5% of quality changes associated with price increase showed an average increase in

⁵The averages in this section are computed as unweighted geometric means of the posted price, quality and index ratios for individual quality changes. The index changes referred to are calculations of the computed index movement for an individual observation.

price of 24.9%, of quality 17.7%, so an index increase of 6.1%. Overall, prices declined 2.2%, and quality by 1.5%, so indexes declined by 0.7% on average.

Although this pattern tended to be repeated at lower levels of detail (see Table 3), there were several exceptions. For example, when posted prices rose, there were only a few cases where quality rose more: - Kitchen utensils, Vehicle parts, - or where quality declined: - Cars, Driving lessons. When posted prices declined, though, there were several cases where the quality decline was even more: Tools and lawn equipment, Luggage, Women's clothing (as a whole), Shoes and accessories, Material and services, and Recreational equipment. In most of these cases price increases were usually associated with quality increases and price declines with quality declines. However, the contribution to index increases from the price increases may have been less than the contribution to index declines from the decreases, so that even though price increases outweighed declines, the average impact on indexes could have been down - as for Vehicle parts. When price declines were more common, the reverse holds true: the contribution of declines may be outweighed by the contribution of increase, and the index could rise. This accounts for more of the examples above. The really exceptional case was Recreational equipment, which includes bikes, boats, and trailers, where the index even rose on account of cases where the posted price declined, as quality declined even more. Probably at further levels of detail there was more variation in results, and this is something that still must be investigated.

The timing of quality changes

It might be instructive to know if the behaviour of the rest of the sample was different when quality changes were more common than when they were not. The analysis in this paper was only carried out for Clothing.

Two tendencies were noted. First, the highest percentage of price changes occurred when there were no quality changes at all for an item in a given period. In those periods 18.3% of prices changed, of which 11.3% were increases and 7.0% declines. In most other circumstances the percentage of the remaining price observations that changed was in a range from 15.6 to 17.5% with approximately equal numbers of increases and declines.

Second, however, in the first pricing of the season for seasonal goods there was a large amount of quality change activity. More than a third of the sample showed quality

changes, in those months, and they accounted for just over a third of all the quality changes in Clothing in the year (33.8%). For the remainder of the observations in the sample the fraction of prices that changed was only 11.1%. This shows that items which did not change their product description for the new season were unlikely to show a price change.

Impact on indexes

The earlier section has shown that when an adjustment is made it tends to moderate the reported price change - particularly when the posted price rises. For clothing we have seen that the average change showed a posted price decline of 2.2%, a quality change drop of 1.5% and a drop in the index of 0.7%. Given the number of quality changes in clothing these would have led to a downward impact of about 0.5% over the year. Since this includes splices, which by definition do not change the index, and splices were almost half the quality changes it could be said that the explicit adjustment programme lowered the clothing group index by about 1% during 1994. This is quite a high amount compared to the measured change in the CPI index for clothing in 1994.

However, this is only a rough approximation. All the changes have been given equal weight in that calculation whereas they have different weights in the computation of representative product indexes and different representative products have different weights in the CPI. The proper analysis of the impact of the programme of quality change adjustment can only be done on an index by index basis.

This has been done so far for about fifty commodities which had a relatively high incidence of quality change. A reconstruction of the index calculated according to the method used in the CPI was compared with an alternative computation in which all quality changes were treated as sample changes so that that index was computed on a set of pure matched samples. The results are shown in Table 4. It shows, for example, that the reconstructed index⁶ for a dining room suite rose 2.8% during 1994. If all the quality changes had been treated as sample changes the index would have risen by 3.7%.

⁶ The reconstructed indexes do not match the actual indexes for 1994 because it was difficult to retrieve the exact internal weights for different strata in the calculation of representative product indexes. They should be seen as close approximations.

Of the fifty, 25 were lower because of the quality change adjustments, 23 higher, and 2 were unchanged. (Four of five new car indexes were lower and one unchanged)⁷. There was a mild tendency for quality change adjustments to lower the index when it would have risen based on matched samples only, and to have raised it when that index would have fallen. This was shown most spectacularly for Boy's ski jacket (downwards) and Ski boots (upwards). However, there were plenty of exceptions to this pattern.

The indexes were sorted into commodities for which prices had tended to rise quickly or slowly over the last nine years. No distinction was discernible. They were also sorted according to whether they were seasonal commodities or not. (New cars were excluded). Although the number of examples is small there was some difference - quality change was more likely to lower the index for seasonal commodities, and to raise it otherwise.

Observations and questions

It is clear that the process of explicit adjustment for quality change had an impact on indexes. It is also clear that in 1994 at any rate, when prices for goods were stable, it produced no great shift to higher or lower quality items or to higher or lower indexes. There does appear to be some asymmetry; posted price increases seem to be more strongly associated with index increases than declines are with index declines. In a period where prices generally are rising strongly, this would lead one to expect that the process of quality adjustment would also be associated with index increases. Some work with 1989 data suggests this is this case. In 1989, when prices generally were rising faster, there was a stronger tendency for non-spliced quality changes to be associated with posted price increases, and (lesser) quality increases, so the indexes rose more than if the changes had been treated as sample changes. There was not the same pattern with splices, however, and these relationships need looking at over a longer record.

But whether quality changes tend to produce increases or decreases in the index is not the important question. More important questions are whether indexes based on evaluating quality changes will move differently from those based on matched samples, and whether

⁷ New cars are unusual in two ways. Firstly, they are unique in that when a new season comes *all* items generally undergo quality change and there is a systematic provision of information to evaluate it. There are no observations left on which to run a matched sample. Secondly, 1994 was unusual in that there were several cases of quality declines, to such an extent that overall there was an average quality decline, despite an overall index increase.

that is an improvement. These results presented in this paper suggest that the answer to the first question is yes, but do not answer the second.

Instead there are further questions. There is a tendency to moderate changes - this shows in individual quality changes, and at the level of the resulting aggregate indexes. But if the prices of ski jackets that had no quality change fell 14%, should there have been so much quality decline in the items that did change from the previous season? Or should there have been quality change in those items that did not change? Should there have been so many cases where there was found to be no quality change, even though there was significant price change? How representative are those seasonal items whose quality and price rarely change?

The difference between seasonal items and other items raises questions too. Quality change evaluation on seasonal commodities is expected and can be planned, while the timing of quality change adjustment on other items is usually fortuitous. Would the process bring different results if there was a systematic review in other commodities? And should this be extended to commodities which are not much subject to direct quality change at present?

Although quality change is difficult to judge, it does not appear that those doing the evaluation are intimidated by the job. In most cases, the job was not to compare small differences in two closely related items. The average price difference in clothing items when a judgment was made which changed the index was 23%. Splicing was not used as a technique of last resort when items are too different to be compared - splicing was less likely when price differences between the two items was large.

The ability to judge relatively large differences raises the question whether the criteria for making direct comparisons should be widened. There are representative products which are very closely related: for instance, high and medium quality dress shoes, 2-head and 4-head VCRs, different vacation packages, different new car models. Another possibility to widen the basis for comparison is in the treatment of disappearing outlets. Perhaps replacement outlets could be treated by direct comparison instead of by sample change. The present methods of quality evaluation restrict comparisons to a narrow set of data. The hedonic approach to quality change includes all possible cases in the data base for analysis; it seems sensible to consider as much of the same data as possible even in more primitive applications. These seem to be the directions for further investigation.

Table 1: Summary of Price Observations and Quality Adjustments

Number of Price Observations and Quality Adjustments:

Major Group	Observations	Add	Delete	Quality Adjustments	Positive Quality Adjustments	Negative Quality Adjustments	Quality Adjustments = 0	Spices
Food	472323	6457	4250	7058	3553	3307	158	6156
Housing	103381	1702	1228	4186	1794	1752	640	3024
Clothing	40055	1279	669	3809	1374	1374	1061	1841
Transportation	33990	687	1058	2265	740	433	1092	1360
Health & Personal Care	59340	1170	738	1095	503	553	39	972
Recreation, Reading & Ed.	31400	936	906	2590	921	835	834	1061
Tobacco & Alcohol	19890	1019	231	84	37	40	7	74
Total	760379	13250	9080	21087	8962	8294	3831	14488

Percentages based on Totals

Major Group	Observations	Add	Delete	Quality Adjustments	Positive Quality Adjustments	Negative Quality Adjustments	Quality Adjustments = 0	Spices
Food	62.12	48.73	46.81	33.47	40.09	39.87	4.12	42.49
Housing	13.60	12.85	13.52	19.85	20.02	21.12	16.71	20.87
Clothing	5.27	9.65	7.37	18.06	15.33	16.57	27.70	12.71
Transportation	4.47	5.18	11.65	10.74	8.26	5.22	28.50	9.39
Health & Personal Care	7.80	8.83	8.13	5.19	5.61	6.67	1.02	6.71
Recreation, Reading & Ed	4.13	7.06	9.98	12.28	10.28	10.07	21.77	7.32
Tobacco & Alcohol	2.62	7.69	2.54	0.40	0.41	0.48	0.18	0.51
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Percentages by major group

Major Group	Percentages based on observations:			Percentages based on quality adjustments:			Spices
	Add	Delete	Quality Adjustments	Positive Quality Adjustments	Negative Quality Adjustments	Quality Adjustments = 0	
Food	1.37	0.90	1.49	50.91	46.85	2.24	87.22
Housing	1.65	1.19	4.05	42.86	41.85	15.29	72.24
Clothing	3.19	1.67	9.51	36.07	36.07	27.86	48.33
Transportation	2.02	3.11	6.66	32.67	19.12	48.21	60.04
Health & Personal Care	1.97	1.24	1.85	45.94	50.50	3.56	88.77
Recreation, Reading & Ed	2.98	2.89	8.25	35.56	32.24	32.20	40.97
Tobacco & Alcohol	5.12	1.16	0.42	44.05	47.62	8.33	88.10
Total	1.74	1.19	2.77	42.50	39.33	18.17	68.71

Table 2: Distribution of quality changes, by direction of posted price change
Average individual percentage changes

Major Group 2: Household furnishings

	Posted price change	Quality change	Index change
Posted price declines (44.6%)	-23.6	-21.9	-2.3
Posted price unchanged (9.4%)	.0	-1.6	1.6
Posted price increases (46.0%)	34.0	30.9	2.3
Overall	1.4	1.2	.2

Major Group 3: Clothing

	Posted price change	Quality change	Index change
Posted price declines (39.8%)	-23.7	-17.4	-7.6
Posted price unchanged (21.7%)	.0	-0.8	.8
Posted price increases (38.5%)	24.9	17.7	6.1
Overall	-2.2	-1.5	-0.7

Major Group 4: Transportation

	Posted price change	Quality change	Index change
Posted price declines (18.1%)	-9.4	-8.0	-1.4
Posted price unchanged (48.0%)	.0	.0	.0
Posted price increases (33.9%)	9.0	4.8	4.0
Overall	1.1	.1	1.1

Major group 5: Health and Personal Care

	Posted price change	Quality change	Index change
Posted price declines (49.3%)	-22.8	-22.5	-0.3
Posted price unchanged (1.8%)	.0	-3.9	3.9
Posted price increases (48.9%)	32.1	27.7	3.5
Overall	.9	-0.,7	1.6

Major Group 6: Reading and Recreation

	Posted price change	Quality change	Index change
Posted price declines (43.9%)	-17.5	-13.1	-5.1
Posted price unchanged (15.0%)	.0	.3	-0.3
Posted price increases (41.0%)	20.2	15.7	3.9
Overall	-0.9	-0.1	-0.8

Major Group 7: Tobacco and Alcohol

	Posted price change	Quality change	Index change
Posted price declines (48.8%)	-16.3	-16.5	.2
Posted price unchanged (7.1%)	.0	.0	.0
Posted price increases (44.1%)	14.6	14.8	-0.2
Overall	-2.6	-2.7	.0

Table 3: Average price quality and index changes, selected commodity groups
Percentage change

Commodity	Posted price change	Quality change	Index change
Household supplies	6.2	4.6	1.5
Furniture	-5.8	-3.3	-2.6
Textiles	-0.7	-0.4	-0.3
Appliances	-1.5	-1.1	-0.3
Kitchen utensils	.9	1.0	.0
Tools and lawn equipment	-5.2	-5.7	.5
Luggage	-11.5	-12.4	1.0
Appliance repairs	37.0	35.7	1.0
1. Clothing (excl. 2,3, 4 below)	-2.2	-1.3	-0.9
1a. Women's	-0.4	-1.3	.9
1a1. Outdoor wear	-3.5	-2.7	-0.9
1a2. General clothing	.0	-1.1	1.1
1a3. Underwear, etc.	-0.4	-1.2	.8
1b. Men's	-5.8	-1.7	-4.2
1b1. Outdoor wear	-4.9	-0.1	-4.8
1b2. General clothing	-6.8	-1.4	-5.5
1b3. Underwear, etc.	-4.9	-4.9	.0
1c. Children's	-1.9	-0.8	-1.1
2. Jewelry	-9.9	-4.7	-5.5
3. Shoes and accessories	-0.6	-1.7	1.1
4. Material and services	-0.8	-1.8	1.0
Cars	2.3	-0.5	2.9
Trucks and vans	6.1	2.5	3.5
Auto rental	-3.2	.9	-4.1
Vehicle parts	1.1	1.4	-0.4
Auto repairs	-0.4	-0.4	.0
Driving lessons	3.9	-0.3	4.2
Sports and exercise equipment	-2.0	.1	-2.1
Toys and games	2.8	2.3	.5
Radio, TV, cameras etc.	.7	.3	.4
Recreation equipment*	-1.1	-4.1	3.1
Package vacations	-6.5	2.2	-8.5
Services to recreation	-2.1	-1.9	-0.2
*Details on recreation equipment			
Posted price declines. (35.6%)	-23.5	-24.4	1.2
Posted price unchanged (11.8%)	.0	1.1	-1.1
Posted price increases (52.5%)	17.4	11.3	5.5

Table 4: Comparison of indexes with alternative computed without quality change adjustment

Commodity	Percentage change during 1994		Index without quality change
	Normal index	Difference from alternative index*	
Household Furnishings			
Dining room suite	2.8	.9	3.7
Patio furniture	-3.9	4.5	.6
Refrigerator	2.0	.8	2.8
Electric range	2.5	-0.1	2.4
Microwave	-1.4	-0.9	-2.3
Gas Barbeque	-3.9	-2.4	-6.1
Lawn mower, gasoline	-2.7	-0.7	-3.4
Lawn mower, electric	-1.4	.9	-0.5
Clothing and footwear			
Women's raincoat	-5.9	2.7	-2.3
Women's dress	4.4	-3.8	.6
Women's dress	6.8	6.9	14.7
Women's slacks, summer	-1.5	.0	-1.5
Women's slacks, winter	1.4	1.5	2.9
Handbag	3.9	-1.8	2.1
Gold chain	6.9	5.6	13.2
Women's dress shoes, high-q.	3.5	-5.5	-1.9
Women's dress shoes, med-q.	5.8	-3.0	2.0
Girl's sweater	3.3	-1.7	1.6
Men's casual slacks	2.7	2.1	4.8
Men's dress shirt	.3	3.8	4.2
Men's knit shirt	-1.4	-3.4	-4.6
Men's dress shoes, high-q	5.9	.4	6.3
Men's dress shoes, med-q	4.1	-0.5	3.6
Boy's ski jacket	-3.9	-11.5	-13.8
Boy's shoes	-1.7	.4	-2.1
Boy's athletic shoes	8.5	9.8	20.3

* The difference is how much higher, or lower, the index without quality change adjustment would have been.

Table 4: Comparison of indexes with alternative computed without quality change adjustment, continued

Commodity	Percentage change during 1994		Index without quality change
	Normal index	Difference from alternative index*	
Transportation			
New cars (five models)	4.7	-3.8	.9
	7.3	-5.6	1.7
	-5.5	.0	-5.5
	17.4	-19.2	-1.8
	10.4	-9.3	1.1
Car rentals	6.3	2.4	8.9
Driving lessons	3.6	-0.5	3.1
Reading and Recreation			
Golf clubs	-1.3	-1.0	-0.3
Golf balls	.1	1.8	1.9
Skis, alpine	.8	3.3	4.1
Ski boots, alpine	2.6	11.4	14.0
Boat	3.0	-1.4	1.6
Bicycle, all terrain	5.9	.6	6.5
VCR, 2-heads	-2.7	-0.4	-3.1
VCR, 4-heads	-2.3	.0	-2.3
CD player	-4.3	1.6	-2.7
Stereo system	1.0	-0.7	.3
Ski lift ticket	1.6	.7	2.3
Package vacations (6 models)	.0	4.7	4.7
	.4	4.7	5.1
	14.8	-9.2	5.6
	2.5	-6.4	-3.9
	9.4	.5	9.9
	4.0	4.6	8.6

* The difference is how much higher, or lower, the index without quality change adjustment would have been.