THE TREATMENT OF SEASONAL COMMODITIES IN THE CONSUMER PRICE INDEX

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ABSTRACT

Most aggregate price indexes that are monthly series are based on a fixed-basket formula; they are averages of their component series weighted using annual expenditures. Unfortunately, this formula is not well-suited to the treatment of seasonal commodities, whose purchases fluctuate substantially from month to month following a clear seasonal pattern. A fixed-basket price index will overweight seasonal commodities in some months and underweight them in others. An annual series for a seasonal commodity may be unsatisfactory because, being calculated as a simple average of monthly index numbers, off-season months with low purchase volumes are overweighted and in-season months with high purchase volumes are underweighted. A commodity may disappear from the market completely for several months of each year. In a fixed-basket index either a fictive price movement must be imputed to that seasonally disappearing commodity in its out-of-season months or it must be excluded from the index altogether.

None of these defects exist in a seasonal-basket index. The component series of a seasonal-basket aggregate are weighted using monthly rather than annual expenditures so a seasonal commodity is not badly overweighted or underweighted in any month of the year. An annual series, calculated as a weighted average of monthly index numbers, fairly represents in-season and off-season months according to their volume of purchases. Seasonally disappearing commodities have nil weight in their out-of-season months, and can be components of a seasonal-basket aggregate without imputation of fictive prices for their out-of-season months.

The official Consumer Price Index (CPI) for Canada is now based on a fixed-basket formula for all commodities. It would be a better series if consumer price indexes were based on a seasonal-basket formula for those seasonal commodity groups for which reliable monthly expenditure data exists. The seasonal pattern of purchases for some commodities is quite volatile from year to year. The monthly baskets used in a CPI for seasonal commodities might be based on monthly expenditures for a multi-year period to obtain more representative monthly weights.

The official CPI used a seasonal-basket formula with annual base prices for seasonal commodity groups when it was based on 1947-48 expenditures, and the same formula with adjusted weights when it was based on 1957 expenditures. Neither formula is acceptable; a seasonal-basket index should be based on the far superior Rothwell formula. Had it been adopted for use in the official CPI at the time of the updating to 1957 expenditures, the seasonal-basket concept would probably not have been abandoned for seasonal commodities in favour of a fixed-basket concept at the time of the updating to 1967 expenditures.

The monthly index movement of a seasonal-basket series does not, unlike a fixed-basket series, provide a measure of pure price change; its monthly movement is distorted by seasonal weight shifts. This is not such a grave defect in a series for highly seasonal commodities; if there are very large differences between monthly baskets then measures of monthly price change do not mean very much anyway. The monthly movement of a Rothwell index can, much like a Paasche index, be readily decomposed between pure price change and the interaction of price and volume changes.

If the monthly expenditure data needed to calculate a seasonal-basket index do not exist, the CPIs for seasonal commodities should be based on the standard fixed-basket formula. An index movement must be assigned to seasonally priced commodities in their unpriced months. Imputation should be based on the index movement of the continuously available or in-season items in a higher level aggregate to which the commodity belongs. This type of imputation constitutes a kind of seasonal weighting. The higher level aggregate used as the source series should be the lowest level aggregate compatible with a reliable imputed series. In a CPI with a non-revision policy, imputation must be based on extrapolation but interpolation would provide superior results and the changes in the CPI revision policy required to make it feasible do not seem unreasonable.

Imputation for seasonally priced commodities in seasonal-basket indexes may be based on benchmark estimates of the seasonal pattern of the series, or on a related indicator that seeks to approximate the commodity's actual price movement during its unpriced months. This is quite different from imputation in a fixed-basket index where one does not really care what the actual price movement of the seasonally disappearing commodity is.

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INTRODUCTION

1.1 Importance of the Consumer Price Index

Many goods and services are purchased more in some months of the year than in others. This is due to 3 determining causes: weather conditions, traditions and institutional arrangements, which interact with each other to produce the perceived seasonal patterns of economic activity.

Weather conditions dictate the harvest seasons for fresh produce, the months in which construction of building and engineering projects is conducted, the season of safe navigation on inland waterways (which greatly affects the levels of exports and imports). Weather also influences the demand for many items of food and clothing. Recreational vehicles and articles of sports equipment, although durable goods with multi-year lifespans, are also normally purchased in the season in which they are used.

Tradition is responsible for the seasonal demand for turkey, lamb and some confections, the heightened sales of wine and spirits in the holiday season, and the peak sales of toys and games and many other articles around Christmas. Institutional factors are not always easily distinguished from traditions, but they determine such things as statutory holidays, the months of the school year and the seasons for professional athletic sports, which influence the seasonal pattern of expenditures on hotels and motels, education supplies and tuition fees, and admissions to spectator sports.

Practicing statisticians have long recognized the special problems posed by seasonal commodities for the construction of price indexes. Unfortunately, these problems have until recently interested few theoretical economists. Each statistical agency has been left to do what it thinks best without any theoretical framework to guide it; many different procedures, some of them quite ingenious, have been devised, but no collective wisdom has emerged.

In the case of the Consumer Price Index (CPI), this is the more surprising, since in almost every country such a series serves as the most widely accepted indicator of inflation. The CPI is the escalator used for cost-of-living adjustments in many labour contracts. Other financial agreements are tied to it, including alimony and child allowances and insurance coverages. In Canada, income brackets and personal exemption levels for income tax are adjusted using the CPI, as are payments under the Canada Pension Plan, Old Age Security, the Guaranteed Income Supplement and Family Allowances. In total, billions of dollars in payments are linked to the CPI in this country, and the index is just as or more important as an escalator in many other countries. Finally, the CPI is the major source of deflators for Gross National Expenditure, so that the calculation of its component series will considerably affect the measurement of real output.

Seasonal commodities have an important share in the CPI basket (see 1.5) and many of them have volatile price movements. Consequently, the choice among the range of treatments proposed for seasonal commodities has an impact on the official CPI which cannot be ignored.

Although this paper is limited to the discussion of the treatment of seasonal commodities in the CPI, much of the material is also appropriate to other types of indexes. In fact, most of the formulas to be discussed were originally developed, not for the CPI, but for producer price indexes, specifically, indexes of farm product prices. However, the objectives of the CPI and of producer price indexes are not altogether the same, which influences the approaches to seasonal commodities adopted. Also, most CPIs are subject to a non-revision policy which, if it is not to be relaxed, limits the options available to the index maker. This is not such a serious obstacle for a producer price index, since most official indexes of this type can be revised over several months or several years.[1]

1.2 Example of a Poultry Price Index

Before giving a formal definition of seasonal commodities, it may be useful to show an example where the seasonal commodity problem arises in practice. Table 1.1 shows price indexes for chicken and turkey, the components of a poultry CPI, with expenditures and quantities purchased for each month of 1978, the base period of the component indexes. Examining the quantities purchased for turkey it is obvious that consumption is much higher than average in October and December, corresponding to the Thanksgiving and Christmas holidays, when turkey dinner is the traditional meal in most Canadian households. Consumption is at its lowest in November, the intervening month, and is also low in January, and the hot summer months, when turkey roasts fall out of favour. The seasonality in chicken purchases is much less pronounced, but one may note a decline in chicken consumption in December, no doubt in response to the increased consumption for turkey, and below average purchases from June through August.

Before considering the problem of aggregating the chicken and turkey indexes into a poultry index, one may already notice a difficulty with the annual turkey series. It is calculated as a simple average of its monthly values, the normal practice for CPI series and registers a 22.2% increase in turkey prices from 1978 to 1979. If instead one calculated an average weighted by 1978 monthly quantities, the 1978 annual value would be 103.0, the 1979 annual value 118.6, and the 1979 price increase 15.2%, a much lower rate than that calculated in the conventional way. The reason is obvious: for December, which has much the highest purchases of any month, the price of turkey was 22.8% above the annual level in 1978, but 6.5% below the annual level in 1979.

Turkey tends to be used as a loss leader by supermarkets during both the Thanksgiving and Christmas seasons, to attract customers making their large shopping orders for the holiday feasts. Thus, the price of turkey tends to fall in both October and December. On the other hand, because the demand for turkey is so much higher in these months, supply constraints may not allow the retailer to lower his prices and may even force him to raise them. This is particularly true of the Christmas season, following hard on the Thanksgiving holiday which has already cut into stocks.

There was just such a light supply of turkeys in the 1978 Christmas season, while there was a more normal supply at the same time in 1979.[2] The annual index in Table 1.2 exaggerates the increase in turkey prices in terms of what the consumer must pay, ignoring that consumers buy as much turkey at Thanksgiving and Christmas as they do in all of the rest of the year.

Turning to the problem of calculating a composite poultry index, it can be seen that the 1978 annual expenditures for chicken and turkey do not provide very representative weights for certain months of the year, especially October through December. Turkey's share of annual expenditures is 28% but its October and December shares are much higher at 36% and 45% respectively, while its November share is much lower at 10%. Seasonal basket index A in Table 1.2 shows the index numbers obtained by calculating a separate Laspeyres index for each month of the year. Thus the January 1979 value represents a comparison between January 1979 and 1978 with a January 1978 base. The January 1979 index number for chicken on a January 1978 base is 100 x 109.6 / 92.7 = 118.2, and the corresponding index number for turkey is 100 x 119.6 / 90.3 = 132.4. Then the January 1979 composite index number is 100 x (1.35 x 118.2 + .23 x 132.4) / (1.35 + .23) = 120.3.

One can see that the 12-month percent changes of the fixed-basket index and seasonal-basket index A are quite different: in October the former index increases by 1.6% while the latter index increases by 3.6%; in November the former index increases by 1.2% while the latter index remains constant; in December the former index increases by .9% while the latter index actually falls with a −1.1% rate of change.

The 1979 annual index number for seasonal-basket index A is an average of the monthly index numbers weighted by 1978 monthly expenditures. Note that its value is 110.6, significantly lower than the 112.1 value of the fixed-basket index. This is in large part due to the higher weight attached to December turkey prices in the annual series corresponding to the seasonal-basket index.

The annual index corresponding to seasonal-basket index A can be interpreted as a normal fixed-basket index where chicken or turkey in each month of the year is treated as a different commodity. Following this interpretation, it is a fixed-weighted average of indexes for 2 x 12 = 24 commodities.

Seasonal-basket index A is weighted using the actual expenditures on poultry in 1978. These actual expenditures are also called current dollar expenditures. One might also weight the component price indexes using 1978 constant dollar expenditures, which are shown in the last columns of Table 1.1. They represent what the actual purchases of chicken and turkey would have cost if average 1978 prices had prevailed in every month of 1978. For example, the average 1978 price of turkey is \$.42 / .183 = \$2.30 and the January 1978 expenditures on turkey in 1978 constant dollars is \$2.30 x .108 = \$.25. These expenditures, unlike the current dollar expenditures used in calculating seasonal-basket index A, do not reflect monthly price changes but only monthly quantity shifts. The current dollar expenditure weights were compatible with index numbers at the 1978 monthly base prices. The constant dollar expenditure weights are compatible with index numbers at 1978 annual base prices. But since the annual prices used in deriving the constant dollar expenditures were unit values, the monthly index numbers for chicken and turkey should be re-expressed in terms of the quantity-weighted averages of their 1978 monthly index numbers. The 1978 average index numbers for chicken and turkey weighted by their 1978 monthly quantities or constant dollar expenditures are 99.98 and 102.91 respectively. Then the monthly index number for, let us say, January 1979, can be calculated as:

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100x(1.52x(109.6/99.98) + .25x(119.6/102.91)) / (1.52 + .25) = 110.6
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An average of the monthly index numbers, weighted by monthly constant dollar expenditures, gives the annual series. It is no coincidence that the 1979 value is the same for both seasonal-basket indexes. In the general case their annual series will be the same when each monthly index is weighted by the appropriate expenditures. This annual series conforms to the ideal annual index formula discussed in the next chapter.

The monthly movements of the fixed-basket index and seasonal-basket index B show marked differences between each other, especially in October through December, and neither's movement is wholly satisfying. The fixed-basket index is very much dominated by the movement of chicken prices even in October and December. For example, in October 1978 the fixed-basket index rises 1.8% despite a -7.5% decline in turkey prices. Seasonal-basket index B does give more weight to turkey in both these months, but its monthly movements are strongly affected by weight shifts. This is understandable given the unusual seasonal demand for turkey. The two months of peak purchases, October and December, are non-consecutive, and separated by the month of lowest purchases, November. Thus, in December 1979, when chicken prices rose 0.8% and turkey prices fell -9.2%, it is the fixed-basket index and not seasonal-basket index B that registers a price decrease. In fact the 1.0% change registered by seasonal-basket index B is greater than that of either of its components. This is the result of the weight shift to turkey from chicken, since turkey has the higher index level in November 1979.

1.3 Definition of a Seasonal Commodity

A seasonal commodity may now be formally defined as a commodity subject to significant seasonality in its volume of purchases. Note that this definition omits mention of seasonality in prices. It is also a more inclusive one than is used by some economists, notably Diewert [1983], who regard only commodities that are not purchased at all in their off-season months as seasonal commodities. The example described above shows that seasonal purchases can create problems for a price index even when off-season purchases are well above the zero level, and sufficient to allow pricing in every month of the year. Chicken and turkey are not seasonally disappearing or seasonally priced commodities but they are seasonal commodities. Seasonally disappearing commodities are just extreme cases of seasonal commodities.

In the above example, based on CPI series for Canada, seasonality in quantities purchased makes the fixed-basket index unrepresentative of some months in the year, turkey's share in poultry consumption being so different from one month to another. On the other hand, a fixed-basket index does provide a measure of pure price change, that is, changes in the index reflect only changes in prices and not changes in quantities. A seasonal-basket index, which uses a different basket for each month of the year, provides representative weighting for each month of the year and a weighted average of its monthly index numbers provides a more representative annual series. On the other hand, it does not provide a measure of pure price change for monthly comparisons. Its monthly movement will be affected by quantity shifts, and in some cases may exhibit anomalous behaviour, as in the December 1979 change for seasonal-basket index B.

Normally, there is a correlation between monthly prices and quantities so that commodities with a seasonal pattern of expenditures will also have seasonality in their prices. This correlation may be positive or negative depending on whether seasonal fluctuations in demand dominate seasonal fluctuations in supply or vice-versa.

For fresh fruit and vegetables, supply factors dominate. The price of these commodities drop during and following the annual harvest when they are in abundant supply, and rise in the months preceding the next harvest, when they are not. These is thus a negative correlation between prices and quantities for fresh fruit and vegetables, since the period of abundant supply is also the period of peak sales.

For clothing, demand factors dominate. New spring or fall lines in clothing sell at higher prices, when the demand for such apparel is highest; the same lines sell at reduced prices and in reduced volume at end-of-season sales. Thus, there is a positive correlation between prices and quantities for most lines of clothing.

Turkey represents quite a special case. It is a commodity subject to strong seasonal demand, which would normally be consistent with a positive correlation of prices and quantities. But in this case the seasonal supply of turkey rises at the same time as the seasonal demand for turkey, and by enough to be dominant. There is thus a strong negative correlation between prices and quantities. Turkey prices reach their seasonal peak in November, the month that represents the seasonal trough of purchases. Turkey prices are at their lowest in October and December (October's are lower than December's) while turkey purchases are greatest in the same two months (December's are greater than October's).

While price seasonality may accentuate the difference between indexes for seasonal commodities based on different formulas, it does not, for the most part, justify their existence. If quantities purchased were the same in all months of the year the fixed-basket index and seasonal-basket index B would be identical. If there was no seasonality in purchases of chicken or turkey then the fixed-basket formula would provide representative weighting for each month of the year and there would be no reason to adopt another formula even in the (unlikely) event that there was seasonality in prices. This is worth underlining because it is too easy to link seasonality in quantities and seasonality in prices together as if they were a single problem. It is seasonality in quantities that relates to the index number problem of calculating a price index for seasonal commodities. Seasonality in prices relates to the problem of seasonally adjusting a price index.

This is not to say that the two problems are completely distinct. The weighting of component indexes that is called for by the index formula may itself impose a seasonal pattern on the composite index and this may influence the choice of a seasonal adjustment technique. Strong price seasonality will generally tend to accentuate the differences between aggregate series based on different formulas, and in this way price seasonality makes the choice of an index number formula more critical. The differences between the poultry indexes in Table 1.2 are no doubt larger because chicken and turkey prices are so seasonal. But sometimes differences between indexes based on different formulas will be augumented just because commodities do not show a stable seasonal pattern. The difference between the 1979 annual increases registered by fixed-basket and seasonal-basket indexes is greater because turkey prices rose strongly in December 1978, when they would normally show a seasonal decline.[3]

1.4 Example of a Fresh Fruit Price Index

When the scope of an index includes seasonally disappearing commodities, the fixed-basket formula appears at an even greater disadvantage than it does in the example relating to poultry prices. An example incorporating seasonally disappearing commodities is shown in Table 1.3. Peaches are in-season only from June to October, and strawberries only from May to July. The fixed-basket formula really falls apart in the case of data such as these. There are only two ways in which it can be patched together again, neither of them very satisfactory. First, the seasonally disappearing commodities can be dropped as priced items in the index, and their price movement can be imputed from one or more of the continuously available items. This alternative is only attractive if the expenditures on the seasonally disappearing commodities are trivial, which is not the case with peaches and strawberries in

Table 1.3. Second, one may assign a fictive price movement to a seasonally available item in its out-of-season months. For both peaches and strawberries one can see that these fictive prices would have greater influence on the movement of their annual indexes than the actual transaction prices.

This fresh fruit data was devised by International Labour Organization (ILO) Economic Advisor Ralph Turvey [1979], who asked official statisticaians in a little more than twenty countries to calculate an index according to their official methodologies for the months of 1973 with a 1970 base period.

The resultant estimates showed surprising divergences between the different countries; there was a range of 129.13 - 169.5 for the month of June[4] and the peak month of the year varied from as early as June to as late as December. To a certain extent, the divergences indicated were misleading. In many cases a country's official methodology entailed seasonal adjustment of the fruit prices (e.g. Denmark, Netherlands, Sweden) or of the fruit composite price index (e.g. France) and these indexes were compared to the unadjusted series of other countries. There would be less divergence if only seasonally adjusted series had been compared. Some of the countries for which unadjusted series are shown (e.g. Canada, Germany) also calculate seasonally adjusted CPI series. Nevertheless, Turvey's inquiry showed to what a large extent uniformity in the treatment of seasonal commodities is missing in the official CPIs of different countries, and what a substantial impact the choice of treatment can have on measured price change. This created fresh interest in a problem that until then had not received from economists and statisticians the attention that it deserved.

1.5 Fixed-Basket and Constant-Utility Price Indexes

Few reference works on price indexes have much to say about the treatment of seasonal commodities. Papers on the subject have appeared from time to time since the 1920's; most of these have been written by practicing statisticians rather than by theoretical economists. Probably this is because most official series are fixed-basket indexes[5] while the theoretical literature relating to the CPI is largely concerned with constant-utility price indexes. The existence of seasonal commodities creates problems for a fixed-basket index, but not so much for a constant-utility price index. In the latter index, the quantities purchased in the given period and the base period will generally be different, due to the substitution from commodities that have shown large price increases to those that have not. Even if commodities are seasonally disappearing due to seasonal supply, this only implies adding extra constraints to the income constraint in determining the minimum cost of expenditures in the given period that will maintain the base period level of utility. (See 10.4.)

Seasonal commodities do have implications for constant-utility price indexes, but these are not part of the topic of this paper, which considers only formulas and procedures that might be used in official series. Given this narrowed range of concern, the problem posed by seasonal commodities is how might they be treated in a reasonable way while preserving the consistency and coherence of the all items CPI, most of whose component series will be calculated according to a fixed-basket formula, whatever is done for seasonal commodity groups.

Since all of the formulas that have been developed for handling seasonal commodities are in a sense responses to the fixed-basket formula's weaknesses, it might be well to begin this study by considering the formula's strengths.

The fixed-basket formula can be expressed as

$$I_{ym/0} = \sum_j P^j_{ym} Q^j_c \;/\; \sum_j P^j_0 Q^j_c \qquad (1.1)$$

where P^j_{ym} is the price of commodity j in month m of year y,

P^j_0 is the price of commodity j in base year 0

Q^j_c is the quantity purchased of commodity j in basket reference year c.

The same formula can be re-expressed in terms of expenditure weights and component price indexes as

$$I_{ym/0} = \Sigma \; {}_0W^j_c \; I^j_{ym/0} \qquad (1.2)$$

where

$${}_0W^j_c = P^j_0 \, Q^j_c \;/\; \sum_j P^j_0 \, Q^j_c$$

$$I^j_{ym/0} = P^j_{ym} \;/\; P^j_0$$

The weights in (1.2) can be seen to be expenditures for year c at year 0 prices.

An index so defined satisfies all of the four axioms of a price index stipulated by Eichorn and Voeller [1983] as well as their four tests for a price index.

Notably, it satisfies the identity test, so that if all prices remain constant between the given period and the base period, the value of the fixed-basket index will also remain constant. It also satisfies the mean value test; the value of the fixed-basket index will always lie between the smallest and largest values of its component indexes. These properties hold not just for the fixed-basket index itself, but for any fixed-basket index created from ratios of its values. The month-to-month and year-to-year ratios of a fixed-basket index themselves define fixed-basket indexes which possess the same desirable properties as the index from which they are derived.

It is easy to determine the contributions to percent change by the components of a fixed-basket index. If the percent change of the index from one month to the next is:

$$100 \times \Sigma \; {}_0W_c^j \; (I_{ym/0}^j - I_{ym-1/0}^j) \; / \; I_{ym-1/0}$$

the contribution by the **jth** component is

$$100 \times {}_0W_c^j \; (I_{ym/0}^j - I_{ym-1/0}^j) \; / \; I_{ym-1/0}$$

This defines what the percent change in the fixed-basket index would have been if only the **jth** component had changed in price, and is similar to a partial correlation coefficient in econometrics. There is no weight change involved in the percent change or the percent contribution, so that both statistics reflect only changes in component price indexes. The fixed-basket index has been called a measure of pure price change because its index values only change when prices change; it is not influenced by changes in quantities.

The component indexes used in (1.2) may themselves be fixed-basket composites. The same aggregate index will be generated calculating a weighted average of component indexes, so the fixed-basket formula possesses the useful property of consistency in aggregation.

These are all attractive properties of the fixed-basket formula, and largely explain its almost universal use in official CPIs. From the standpoint of a constant-utility price index, the fixed-basket formula is not so attractive; it can only be interpreted as a constant-utility index if one makes the extreme assumption of a fixed-coefficient utility map. Just the same, any realistic constant-utility price index would not have many of the nice features of a fixed-basket index. Notably, it is not generally possible to calculate subindexes of a constant-utility index that will aggregate in a logical way to the overall constant-utility index.

It is tempting to consider some of the seasonal-basket formulas considered in subsequent chapters as representing approximations to a formula for a constant-utility price index but it is misleading to do so. A constant-utility price index and a seasonal-basket index for food prices generally both show a negative correlation between index weights and price changes, while the fixed-basket index's weights are constant. Therefore, one might claim a seasonal-basket index approximates a constant-utility index. However, by the same criterion, a Paasche index might be considered as an approximation of a constant-utility index. In fact, this is only a superficial point of resemblance between seasonal-basket and constant-utility indexes. Conceptually, it makes much more sense to consider a seasonal-basket formula as representing a departure from the fixed-basket formula when highly seasonal purchases make the latter formula inappropriate. This is what makes the seasonal-basket formulas described in Chapter 2 particularly attractive; each formula reduces to the fixed-basket formula if all monthly baskets are the same. This also accounts for the appeal of the Diewert-French formula described in Chapter 4, since it is a fixed-basket index of a special kind, a 12-month moving average of a seasonal-basket index.

1.6 Relative Importance of Seasonal Commodities in the CPI

What is the empirical importance of the treatment of seasonal commodities in the CPI? Some idea can be obtained by trying to estimate the weight of seasonal commodity groups in the official CPI. (The phrase "*official CPI*" will always be used to indicate the official CPI for Canada.) Table 1.4 shows the relative importance of seasonal commodity groups in the 1978 basket for Canada. Their total amounts to 29% of the All-items index, which suggests that the treatment of seasonal commodities in the CPI is a question of considerable significance.

The most important single category is food, with 8.4% of all items and 29% of seasonal items, followed by clothing, with 7.8% of all items and 27% of seasonal items. Seasonal recreational commodities, which are all those items listed in Table 1.4 from other vehicle purchases[6] through all other recreation, have 4.8% of all items and 17% of seasonal items.

Any list of seasonal commodities has to be somewhat arbitrary. This one is based on those food groups for which the monthly family expenditure survey shows substantial seasonality of purchases, plus those non-food groups in which some or all priced items are only priced when they are in-season. Water, fuel and electricity[7] and alcoholic beverages are included because monthly estimates show both groups to be seasonal. Dairy products such as ice cream, sherbet and eggnog are highly seasonal in their purchases but they are excluded from the list because dairy products as a group are not. Some dishes served in restaurants are seasonal, even seasonally disappearing (e.g. many kinds of fresh fish). Take-out meals can also be seasonal; in fact, some take-out outlets, such as chip wagons and ice-cream vendors, are only open part of the year. But it was not feasible to break out the seasonal portion of expenditures on food purchased in restaurants, so all such items are excluded from the list of seasonal commodity groups. Monthly expenditure data by item is not available for most commodity groups in Canada, so it is difficult to establish the seasonality of many non-food commodities, but the pronounced seasonal patterns of monthly retail sales estimates by kind of business suggests that some other goods might have been included in this list. The sales of jewellery stores and of bookstores and stationery dealers peak strongly in December; perhaps jewellery and books should also be considered seasonal commodities.

Table 1.1: 1978 EXPENDITURES PER HOUSEHOLD ON CHICKEN AND TURKEY

Month	Average Weekly Food Quantities (in Kilograms)		Average Weekly Food Expenditures		Average Weekly Food Expenditure in 1978 Constant Dollars	
	Chicken	Turkey	Chicken	Turkey	Chicken	Turkey
Jan	.623	.108	1.35	.23	1.52	.25
Feb	.612	.133	1.39	.28	1.49	.31
Mar	.631	.130	1.23	.26	1.54	.30
Apr	.547	.154	1.76	.34	1.33	.35
May	.788	.149	1.36	.31	1.92	.34
Jun	.574	.113	1.40	.25	1.40	.26
Jul	.564	.121	1.42	.27	1.38	.28
Aug	.554	.147	1.49	.32	1.35	.34
Sep	.614	.144	1.80	.35	1.50	.33
Oct	.705	.406	1.72	.96	1.72	.93
Nov	.653	.065	1.55	.18	1.59	.15
Dec	.585	.519	1.63	1.34	1.43	1.19
Year	.623	.183	1.52	.42	1.52	.42

Table 1.2: POULTRY PRICE INDEXES

Date	Chicken	Turkey	Fixed-Basket Index	Seasonal-Basket Index A	Seasonal-Basket Index B
1978					
Jan	92.7	90.3	92.2	100.0	92.0
Feb	89.3	94.3	90.4	100.0	89.7
Mar	91.8	94.4	92.3	100.0	91.8
Apr	95.6	95.5	95.6	100.0	95.2
May	98.7	94.1	97.7	100.0	97.3
Jun	100.2	95.7	99.2	100.0	99.0
Jul	104.3	99.9	103.4	100.0	103.1
Aug	105.0	99.2	103.8	100.0	103.3
Sep	103.8	102.6	103.6	100.0	103.2
Oct	108.5	94.9	105.5	100.0	102.5
Nov	107.0	116.4	109.1	100.0	107.6
Dec	103.0	122.8	107.4	100.0	110.4
Year	100.0	100.0	100.0	100.0	100.0
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1979					
Jan	109.6	119.6	111.8	120.3	110.6
Feb	108.9	121.2	111.6	123.1	110.4
Mar	111.8	125.1	114.8	128.4	113.7
Apr	115.3	120.0	116.3	118.4	115.5
May	112.4	127.0	115.6	120.2	114.6
Jun	109.9	127.9	113.9	115.4	112.2
Jul	109.0	128.6	113.2	109.1	111.7
Aug	107.9	123.7	111.4	107.5	110.4
Sep	105.8	126.8	110.4	107.1	108.6
Oct	107.5	106.1	107.2	103.6	105.9
Nov	106.0	125.8	110.4	100.0	107.6
Dec	106.8	114.2	108.4	96.9	108.7
Year	110.2	122.2	112.1	110.6	110.6

Table 3: PRICE AND QUANTITIES OF FRESH FRUIT SOLD

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
APPLES												
1970 p	1.14	1.17	1.17	1.40	1.64	1.75	1.83	1.92	1.38	1.10	1.09	1.10
q	3,086	3,765	4,363	4,842	4,439	5,323	4,165	3,224	4,025	5,784	6,949	3,924
1971 p	1.25	1.36	1.38	1.57	1.77	1.86	1.94	2.02	1.55	1.34	1.33	1.30
q	3,415	4,127	4,771	5,290	4,986	5,869	4,671	3,534	4,509	6,299	7,753	4,285
1972 p	1.43	1.53	1.59	1.73	1.89	1.98	2.07	2.12	1.73	1.56	1.56	1.49
q	3,742	4,518	5,134	5,738	5,498	6,420	5,157	3,881	4,917	6,872	8,490	5,211
1973 p	1.67	1.79	1.85	1.94	2.06	2.13	2.22	2.25	1.95	1.87	1.88	1.73
q	4,051	4,909	5,567	6,253	6,101	7,023	5,671	4,187	5,446	7,377	9,283	4,955
PEACHES												
1970 p	---	---	---	---	---	3.15	2.53	1.76	1.73	1.94	---	---
q	---	---	---	---	---	91	498	6,504	4,923	865	---	---
1971 p	---	---	---	---	---	3.77	2.85	1.98	1.80	1.95	---	---
q	---	---	---	---	---	98	548	6,964	5,370	932	---	---
1972 p	---	---	---	---	---	4.69	3.32	2.29	1.90	1.97	---	---
q	---	---	---	---	---	104	604	7,378	5,839	1,006	---	---
1973 p	---	---	---	---	---	6.10	4.08	2.80	2.06	2.01	---	---
q	---	---	---	---	---	111	653	7,856	6,291	1,073	---	---

Table 3: Price and Quantities of Fresh Fruit Sold (continued)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
GRAPES													
1970	p	2.48	2.75	5.07	5.00	4.98	4.78	3.48	2.01	1.42	1.39	1.75	2.02
	q	82	35	9	8	26	75	82	1,490	2,937	2,826	1,290	338
1971	p	2.80	3.32	5.48	5.67	5.44	5.30	3.93	2.33	1.66	1.64	2.10	2.35
	q	85	32	10	8	53	80	94	1,583	3,021	2,984	1,308	354
1972	p	3.20	4.03	6.06	6.59	6.01	5.94	4.61	2.79	1.94	1.95	2.46	2.92
	q	88	34	11	8	70	87	103	1,668	3,118	3,043	1,441	373
1973	p	3.52	4.67	6.48	7.34	6.51	6.43	5.00	3.07	2.20	2.19	2.74	3.13
	q	91	37	11	9	80	92	97	1,754	3,208	3,199	1,646	391
STRAWBERRIES													
1970	p	---	---	---	---	5.13	3.48	3.27	---	---	---	---	---
	q	---	---	---	---	700	2,709	1,970	---	---	---	---	---
1971	p	---	---	---	---	5.68	3.72	3.78	---	---	---	---	---
	q	---	---	---	---	806	3,166	2,153	---	---	---	---	---
1972	p	---	---	---	---	6.21	3.98	4.30	---	---	---	---	---
	q	---	---	---	---	931	3,642	2,533	---	---	---	---	---
1973	p	---	---	---	---	6.89	4.32	4.91	---	---	---	---	---
	q	---	---	---	---	1,033	4,085	2,877	---	---	---	---	---

Table 3: Price and Quantities of Fresh Fruit Sold (concluded)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
ORANGES													
1970	p	1.30	1.25	1.21	1.22	1.28	1.33	1.45	1.54	1.57	1.61	1.59	1.31
	q	10,226	9,656	7,940	5,110	4,089	3,362	3,396	2,406	2,486	3,222	6,958	9,762
1971	p	1.35	1.36	1.37	1.44	1.51	1.56	1.66	1.74	1.76	1.77	1.76	1.50
	q	10,888	10,314	8,797	5,590	4,377	3,681	3,748	2,649	2,726	3,477	3,548	10,727
1972	p	1.56	1.53	1.55	1.62	1.70	1.78	1.89	1.91	1.92	1.95	1.94	1.64
	q	11,569	10,993	9,621	6,063	4,625	3,970	4,078	2,883	2,957	3,759	8,238	11,827
1973	p	1.68	1.66	1.70	1.85	1.95	2.03	2.10	2.12	2.07	2.13	2.14	1.79
	q	12,206	11,698	10,438	6,593	4,926	4,307	4,418	3,165	3,211	4,007	8,833	12,558

Table 1.4: RELATIVE 1978 EXPENDITURES IN CANADA ON SEASONAL COMMODITY GROUPS

Group	Percentage Weight
Meat, poultry and fish	5.19
Fruit and vegetables	2.96
Sugar and confections	.25
Water, fuel and electricity	3.79
Flowers and garden supplies	.24
Household and outdoor tools and equipment	.44
Women's coats and jackets	.76
Women's suits and dresses	.75
Women's sportswear	.98
Women's "active" sportswear	.15
Women's hoisery, lingerie, foundation garments and intimate apparel	.66
Women's clothing accessories	.20
Women's footwear	.57
Girls' wear	.38
Men's coats and jackets	.39
Men's suits and sports jackets	.68
Men's pants	.52
Men's furnishings	.74
Men's "active" sportswear	.13
Men's clothing accessories	.14
Men's footwear	.46
Boys' wear	.36
Other vehicle purchase	.19
Other vehicle operation	.28
Admission to entertainment	.59
Toys and play equipment	.15
Games, cards and puzzles	.07
Outdoor recreation equipment	.89
Fees and dues for recreational activities	.48
Travel/holiday lodging in hotels and motels	.60
Recreational shelter	.53
Package holiday trips	.78
All other recreation	.29
Alcoholic beverages	3.65
Total	29.24

1.7 ENDNOTES

[1] In Canada, the industry selling price index has a 6-month revision policy and the raw materials price index a 4-month revision policy. Both indexes may be revised over several years when they are rebased.

[2] The stock of turkey at year end was 15,783 metric tonnes for 1977, 9,920 metric tonnes for 1978 and 18,275 metric tonnes for 1979. See Statistics Canada [1983].

[3] For an X11-ARIMA seasonal adjustment of the turkey price index over 1978-1984, the average December seasonal factor was 96.48. The final unmodified seasonal factor for December 1978 was 106.0, which the program identified as an extreme value.

[4] The upper limit of this range was the June value for the Canadian index; the lower limit, the value of the Netherlands index.

[5] It would be more accurate to say that most official series are chain fixed-basket series. Little is gained from working with chain formulas rather than direct formulas so this complication has largely been ignored in this study. A further simplication might have been made by discussing the Laspeyres formula as opposed to the fixed-basket formula, and consistently treating the base period and basket reference period as identical. In fact, for the indexes calculated in this study, the base year and basket reference year are always the same year. But in the theoretical exposition, I thought it best to preserve the distinction between the time base and the weight base of the index.

[6] Other vehicles in the official CPI is dominated by motorcycles and snowmobiles, which are highly seasonal with respect to both purchase and operation.

[7] Fuel charges are highly seasonal with respect to actual consumption, but considerably less seasonal with respect to cash disbursements for fuel use, due to the common use of equal monthly billings as a method of payment. In terms of its use as an escalator, it is the degree of seasonality in cash disbursements that is relevant to determining whether fuel charges should be considered a seasonal commodity group.

Chapter 2

SEASONALLY VARIANT BASKETS WITH BASE YEAR PRICES

2.1 The Ideal Annual Formula

Although there is little agreement on the appropriate index formula for a monthly series relating to seasonal commodities, there is substantial agreement on the appropriate formula for an annual index. It is

$$I_{y/0} = \sum_m \sum_j P^j_{ym} \, Q^j_{cm} \Big/ \sum_m \sum_j P^j_{0m} \, Q^j_{cm} \qquad (2.1)$$

where P^j_{ym} indicates the price of commodity j in month m of year y, and Q^j_{cm} indicates the quantities purchased of commodity j in month m of the basket reference period c. This formula can be re-expressed in terms of index numbers and index weights. Let

$$I^j_{ym/0m} = P^j_{ym} / P^j_{0m}$$

and

$${}_0W^j_{cm} = P^j_{0m} \, Q^j_{cm} \Big/ \sum_m \sum_j P^j_{0m} \, Q^j_{cm}$$

Then (2.1) is equivalent to

$$I_{y/0} = \sum_m \sum_j {}_0W^j_{cm} \, I^j_{ym} \qquad (2.2)$$

The above formula defines a fixed-basket index which can nonetheless handle seasonally disappearing commodities. If any item is out-of-season for some months of the year, so that the quantities purchased in those months of the basket reference period are zero, the weights for those months will also be zero. Note that in the special case where all monthly baskets are identical, so that

$$Q^j_{cm} = Q^j_c \;/\; 12$$

for all j, that (2.1) reduces to the standard formula for a fixed-basket annual index:

$$I_{y/0} = \sum_j P^j_y Q^j_c \;/\; \sum_j P^j_0 Q^j_c \qquad (2.3)$$

where

$$P^j_y = (\sum_m P^j_{ym}) \;/\; 12$$

Many of the monthly formulas discussed in this paper have the property that a weighted average of their monthly values gives an annual index corresponding to (2.1). In fact, one might be justified in stipulating this property as a necessary one for a monthly formula if one adopted an axiomatic approach to the problem. And so, in conformity to an honourable axiomatic tradition dating back to Irving Fisher, let us call (2.1) the **"ideal annual formula"**.

2.2 The Rothwell Formula: Definition

Note that if average base prices are defined as averages of monthly prices weighted by basket reference month quantities, that is,

$$P^j_0 = \sum_m P^j_{0m} Q^j_{cm} \;/\; \sum_m Q^j_{cm} \qquad (2.4)$$

that (2.1) may be re-expressed in terms of base year prices as:

$$I_{y/0} = \sum_m \sum_j P^j_{ym} Q^j_{cm} \;/\; \sum_m \sum_j P^j_0 Q^j_{cm} \qquad (2.5)$$

or as:

$$I_{y/0} = \sum_m \sum_j {}_0W^j_{cm} \; I^j_{ym/0} \qquad (2.6)$$

where

$$ {}_0W^j_{cm} = P^j_0\, Q^j_{cm} \,/\, \sum_j P^j_0\, Q^j_{cm} \qquad (2.7) $$

and

$$ I^j_{ym/0} = P^j_{ym} \,/\, P^j_0 \qquad (2.8) $$

Note that if

$$ V^j_{cm} = P^j_{cm}\, Q^j_{cm} $$

represents the basket reference month expenditures for month m on item j, then (2.7) can be re-expressed as

$$ {}_0W^j_{cm} = V^j_{cm}\, I^j_{0/c} \,/\, \sum_j V^j_{cm}\, I^j_{0/c} $$

From formula (2.5) it is obvious that one possible monthly formula is

$$ I_{ym/0} = \sum_j P^j_{ym}\, Q^j_{cm} \,/\, \sum_j P^j_0\, Q^j_{cm} \qquad (2.9) $$

or

$$ I_{ym/0} = \sum_j {}_0W^j_{cm}\, I^j_{ym/0} $$

The above formula specifies the ratio of basket reference month expenditures at given month prices to the same expenditures at base year prices, where the basket reference period is the same month of the year as the given month. Equivalently, it specifies a weighted average of monthly index numbers with base year 0, weighted by basket reference month expenditures at base year prices. One can see that it is an old friend; this is the formula used to calculate seasonal-basket index B for poultry in Chapter 1.

This formula has been called the Rothwell formula, because it was described and advocated by Doris P. Rothwell [1958] of the U.S. Bureau of Labour Statistics. However, it was discovered much earlier by Bean and Stine [1924] of the U.S. Bureau of Agriculture Economics, in a pathfinding paper which which anticipated much of the later work on seasonal commodities.[1] Formula (2.8) will nonetheless be referred to as the Rothwell formula in this study, since the usage has become established (e.g. Balk [1980a], Zarnowitz [1961]).

2.3 The Rothwell Formula: Discussion

The Rothwell formula has a number of attractive properties that have earned it favour among statistical practicioners. Several countries base their CPIs for seasonal commodities on the Rothwell formula, including Israel, Japan and the United Kingdom.[2]

First, if all monthly baskets are equivalent, the Rothwell formula reduces to the standard fixed-basket formula, as can be readily seen by comparing (2.9) and (1.1).

Second, a weighted average of the monthly index numbers gives the annual index number corresponding to the ideal annual formula. The appropriate weights are:

$$ {}_0\bar{W}_{cm} = \sum_j P_0^j\, Q_{cm}^j \;/\; \left(\sum_m \sum_j P_0^j\, Q_{cm}^j\right) \qquad (2.10)$$

that is, the ratios of monthly expenditures for each month of the basket reference period to total annual expenditures, with expenditures expressed at constant base year prices. The weighting of monthly index numbers to obtain the annual index is consistent with the weighting of component index numbers to get the monthly indexes. One would, by the same logic, calculate a quarterly series from the monthly series as a weighted average of the monthly index numbers.

Third, the Rothwell formula is consistent in aggregation. If Rothwell group indexes already exist, a higher level aggregate can be calculated from these group indexes just as well as from the original component indexes. The fixed-basket formula has the same property of consistency in aggregation.

Fourth, the 12-month changes of an index calculated using the Rothwell formula are measures of pure price change. The ratio of the index numbers for the same month of consecutive years would have the formula

$$\sum_j P_{ym}^j\, Q_{cm}^j \;/\; \sum_j P_{y-1m}^j\, Q_{cm}^j = \sum_j {}_{y-1m}W_{cm}^j\, I_{ym/y-1m}^j \qquad (2.11)$$

so that any change in the index over a 12-month period would reflect a change in the component indexes and not weight shifts.

Fifth, the monthly change in the index, while it is not a measure of of pure price change, does adjust in a reasonable way for quantity shifts.[3] The ratio of the index numbers for consecutive months will be

$$\left(\sum_j P_{ym+1}^j\, Q_{cm+1}^j \;/\; \sum_j P_{ym}^j\, Q_{cm}^j\right) \;/\; \left(\sum_j P_0^j\, Q_{cm+1}^j \;/\; \sum_j P_0^j\, Q_{cm}^j\right) \qquad (2.12)$$

that is, the ratio of expenditures in month **m+1** of the basket reference period at prices of the same month of the given year to expenditures in month **m** at prices of the same month of the given year, divided by the same ratio of expenditures at base year prices. In the unlikely event that a price index had a pronounced pattern of seasonal purchases but no seasonality in its price movement, the Rothwell formula should not generate an index subject to seasonal variation.

The last point deserves more comment since it is the monthly movement of the Rothwell index that is most open to criticism. There are 12 possible ratios in (2.12); they have a product and a geometric mean of one. They can, as Zarnowitz [1961] notes, quite accurately be described as seasonal adjustment factors, adjusting the ratio of prices in the two months for the seasonal quantity shift.

Zarnowitz criticizes this aspect of the Rothwell formula, arguing that *"while seasonal weighting is used in the formula, the effect of it is largely cancelled again by the adjustment, so that the measure we get does not really reflect the influence of the consumption seasonals or does so only to some unknown but presumably small extent"* (see Zarnowitz [1961; p.272]).

This does not seem to be a really valid criticism of the Rothwell formula. Presumably, the **"consumption seasonals"**, that is, seasonality in quantities purchased, should not impart a seasonal pattern in a price index if there is no seasonality of prices,[4] anymore than seasonality of prices should impart a seasonal pattern to a volume index if there is no seasonality of quantities. Rather than a defect, this is a merit of the Rothwell formula, and one that is not shared by the Old Canadian formula described below. Moreover, the adjustment factor adjusts only for seasonality in purchases; if there is strong price seasonality evident in component series, a Rothwell index will also be highly seasonal, as the examples in this paper demonstrate.

It is nonetheless true that the Rothwell index does not give a measure of pure price change for monthly or quarterly price movements. The index does not satisfy the monotonicity axiom of Eichorn and Voeller for a price index, and consequently, does not satisfy the identity test. This test states that if prices remain constant between two periods, the price index should not register any change. But between consecutive months of the same year with constant prices, the Rothwell index would, from (2.12), show a growth ratio of

$$\left(\sum_j P^j_{ym} Q^j_{cm+1} \Big/ \sum_j P^j_{ym} Q^j_{cm}\right) \Big/ \left(\sum_j P^j_0 Q^j_{cm+1} \Big/ \sum_j P^j_0 Q^j_{cm}\right)$$

which in general will not equal one.

The Rothwell formula is similar in this respect to a Paasche formula, which likewise fails the identity test of a price index. In fact, by comparing the formulas below for a monthly Paasche index:

$$I_{ym/0} = \sum_j P^j_{ym} Q^j_{ym} \Big/ \sum_j P^j_0 Q^j_{ym} \quad .$$

or

$$I_{ym/0} = \sum_j {}_0W^j_{ym} \; I^j_{ym/0}$$

with (2.9), it can be seen that the two formulas differ only in their weights. Both indexes use weights for the same month as the given month to average their component indexes, but the Paasche formula is based on the current year expenditures, the Rothwell formula on those of the basket reference year.

Similar to a Paasche index, a Rothwell index's monthly change can be readily decomposed between pure price change and weight change,[5] the first and second terms respectively in the expression on the right hand side of equation (2.13) below:

$$I_{ym+1/0} - I_{ym/0} = \sum_j {}_0W^j_{cm+1} \; I^j_{ym+1/0} - \sum_j {}_0W^j_{cm} \; I^j_{ym/0} \qquad (2.13)$$

$$= \sum_j {}_0W^j_{cm} \; (I^j_{ym+1/0} - I^j_{ym/0}) + \sum_j ({}_0W^j_{cm+1} - {}_0W^j_{cm}) \; I^j_{ym+1/0}$$

If the first term for pure price change is divided by the index number for the earlier month, and multiplied by 100, the pure price change can be expressed in a percentage form. This percentage is identical to that of a seasonal chain Laspeyres index with a fixed annual basket, as shown in 6.3.

There is more to be said on the similarity between the Paasche and Rothwell formulas. Indexes calculated according to the two formulas will tend to resemble each other the more closely, and will tend to show greater divergence from an index calculated according to the fixed-basket formula, the more that seasonal variations in relative expenditures dominate irregular or cyclical variations. In the extreme case, where relative expenditures exhibit a highly seasonal pattern, but no change from one year to the next, the Rothwell and Paasche indexes would be identical, but still quite different from the corresponding fixed-basket index. That is, if

$${}_0W^j_{ym} = {}_0W^j_{cm}$$

for all **j** and **m** then

$$\sum {}_0W^j_{cm} \; I^j_{ym/0} = \sum {}_0W^j_{ym} \; I^j_{ym/0} \neq \sum {}_0W^j_{c} \; I^j_{ym/0}$$

Although such a special case is only a theoretical possibility, many series show substantial seasonal shifts in relative expenditure shares but only minor cyclical or irregular shifts. For such series, the Rothwell index is an adequate proxy for a Paasche index, if such an index is needed to deflate a value series, but due to the paucity of expenditure data cannot be calculated.

This is a real advantage of the Rothwell index, since in actual statistical work CPI series are often used as deflators rather than Paasche indexes. For example, in the Canadian System of National Accounts, the food purchased at retail aggregate is deflated by the food purchased from stores CPI, the information available on food detail from retail outlets being judged inadequate to construct a Paasche deflator. The CPI for food purchased from stores would more closely approximate the desired Paasche deflator if its seasonal food subindexes were calculated according to the Rothwell formula instead of a fixed-basket formula.

2.4 Aside on Quantity Indexes with Seasonal Base Prices

R.G.D. Allen [1975; p.4] has noted that "practically everything that is said [concerning price index numbers] applies to the parallel or matching case of quantity index numbers". For example, take the statement that "a Laspeyres price index is superior as a measure of pure price change to a Paasche price index". Substitute 'quantity' for 'price' in the preceding phrase and it is an equally valid statement about quantity indexes.

With respect to seasonal commodities, especially seasonally disappearing commodities, this is not always the case. There is an incomplete parallelism between quantities and prices for a seasonally disappearing commodity. If a commodity is out-of-season for several months of the year, no price for it exists, but the volume of its purchases is known to be nil. While one must impute a fictive price movement in a fixed-basket price index for a seasonally disappearing commodity, one need not impute a fictive quantity movement for the same commodity in a fixed-price quantity index. A zero value represents the true value of the quantity index for the seasonally disappearing commodity in its out-of-season months.

The formula for a Rothwell quantity index is

$$I^{Q}_{ym/0} = \sum_j P^j_{cm} Q^j_{ym} \Big/ \sum_j P^j_{cm} Q^j_0$$

$$= \sum_j \left(P^j_{cm} Q^j_0 \Big/ \sum_j P^j_{cm} Q^j_0\right) \left(Q^j_{ym} / Q^j_0\right)$$

where

$$Q^j_0 = \sum_m Q^j_{0m} \,/\, 12$$

The index weights are base year quantities at monthly prices. If a commodity disappeared for some months of year c, prices must be assigned to those months because they are multiplied by annual quantities. For a price index it is the fixed-basket formula that requires imputation for missing prices, not the Rothwell formula. For a quantity index it is just the opposite: it is the Rothwell formula, not the fixed-basket formula, that requires price imputation. Since the Rothwell index, unlike the fixed-price index, would not provide a measure of pure quantity change on a monthly basis there seems little reason to favour its use in preference to a fixed-price quantity index.

There would not normally seem to be a valid reason to assign equivalent units of a commodity different valuations in an output index depending on what month of the year they are produced or purchased. To return to our poultry example, while it seems unsatisfactory to calculate the average annual price of turkey giving the same weight to October as to other months, it would seem absurd to calculate the annual volume of consumption assigning a lower value to October turkeys because they cost less around Thanksgiving. One might argue that someone who consumes the same amount of strawberries in a given year as in the previous year, but has switched his consumption from the in-season months of low prices to the off-season months of high prices has raised his real level of consumption. Such behaviour certainly seems to be consistent with a rising standard of living. Using a Rothwell quantity index his real consumption would be increased, while a fixed-basket index would not record a change. But even in this case the argument for a quantity index based on seasonal prices does not appear overwhelming.

Another case where it might be argued that a form of seasonal weighting of quantities is appropriate is in the Gross National Expenditure estimates in constant dollars. Conceptually, these estimates should not include imports. Let us say that grapes are imported to Canada in the winter months at much higher prices than are paid for domestic grapes in the fall months. The average base year retail price for grapes will be a weighted average of prices for imported and domestic grapes. Ignoring wholesalers' and retailers' markups on produce, the unit price of imports will thus be higher than the unit sales price so that there will be more than a full offset for imports of grapes if the relative share of imports declines and less than a full offset for imports if it increases. This could be prevented by treating imported grapes as a separate commodity from domestic grapes, even if there is no difference in quality between the two. This would of course violate the equivalence between domestic and imported grapes, since imported grapes would receive the larger weight. While this kind of a breakdown of commodity series would have the effect of seasonal weighting, since grapes purchased in winter would be assigned higher prices than grapes purchased in fall, it would not formally be seasonally weighting at all; only the calculation of a fixed-price quantity index with a finer breakdown between varieties of grapes.

In conclusion, there does not seem to be a real need for seasonally-weighted quantity indexes as there is for seasonally-weighted price indexes.

2.5 The Old Canadian Formula

The Rothwell formula is not the only formula based on seasonally variant baskets at base year prices that has been used by government agencies in official CPIs. From 1949 - April 1973, the Canadian CPI employed seasonal weights for fats and oils, eggs, fruit, vegetables, meat and fish. (Dominion Bureau of Statistics [1952a], [1952b]) For the first part of this period, until January 1961, the following formula was used:

$$I_{ym/0} = \sum_j P^j_{ym} Q^j_{cm} \; / \; (1/12 \times \sum_m \sum_j P^j_{0m} Q^j_{cm}) \qquad (2.14)$$

$$= \sum_j P^j_{ym} Q^j_{cm} \; / \; (1/12 \times \sum_j P^j_0 Q^j_c)$$

where

$$Q^j_c = \sum_m Q^j_{cm}$$

or

$$I_{ym/0} = \sum_j (P^j_{0m} Q^j_{cm} \; / \; (1/12 \times \sum_j P^j_0 Q^j_c)) \; I^j_{ym/0}$$

This formula represents the ratio of basket reference month expenditures at the corresponding current month prices to average monthly expenditures for the basket reference year at base year prices.

Equivalently, it represents a weighted average of component price indexes with base year 0 where each component's weight represents its share of basket reference month expenditures (for the same month of the year as the given month) to average reference month expenditures for all commodities.

Formula (2.14) shall be called the Old Canadian formula in this paper, a name more appropriate to a rare, aged rye whiskey than to something as untoxicating as a price index formula, but it indicates that it was developed for and is no longer used in the CPI for Canada.

It can be seen that the Old Canadian and Rothwell formulas are the same in their numerators, differing only in their denominators, and the Old Canadian formula also has some of the nice features of the Rothwell formula. Because the numerators of the Old Canadian and Rothwell formulas are the same, their estimates of 12-month percent change will be identical.

Like the Rothwell formula, the Old Canadian formula reduces to the standard fixed basket formula if all monthly baskets are identical. Both the Old Canadian and the Rothwell formulas are consistent in aggregation. Again like the Rothwell formula, an average of its monthly series will give the ideal annual index series, but using the Old Canadian formula, a simple average rather than a weighted average is required. On the one hand, this can be seen as a considerable advantage of the Old Canadian formula, since in virtually all countries annual CPI index numbers are calculated as simple averages of monthly index numbers. If one established as a necessary criterion for a monthly index that its simple average must yield the ideal annual index, then only the Old Canadian formula would qualify. On the other hand, it seems inconsistent for seasonal weights to be applied over commodities for each month of the year, but equal weights to be applied over the months of the annual average.

Obviously, the Old Canadian formula will fail the identity test of a price index for a monthly change just as the Rothwell formula did. The monthly growth ratio of an Old Canadian index would be

$$\Sigma P^j_{ym+1} Q^j_{cm+1} \ / \ \sum_j P^j_{ym} Q^j_{cm} \qquad (2.15)$$

Even if prices were constant in the 2 months, so that

$$P^j_{ym+1} = P^j_{ym} \text{ for all } j$$

(2.15) would not generally be equal to one.

It can be seen that (2.15) is equivalent to (2.12) without division by a seasonal adjustment factor. This implies, as is indeed the case, that the Old Canadian formula is sensitive to seasonality in both prices and quantities. If there is seasonality in quantities, but not in prices, an Old Canadian index will show a pronounced seasonal pattern; a Rothwell index will not.

Like a Rothwell index, an Old Canadian index permits a decomposition of its monthly movement between pure price change and the interaction of price and weight change; it is identical to the decomposition shown in (2.13) except for the definition of the weights. As with the Rothwell index, when pure price change is calculated as a percentage, it equals the percent change of the corresponding seasonal chain Laspeyres index.

2.6 The Adjusted Quantities Variant

There was some disatisfaction with the Old Canadian formula when it was used in the CPI because, to quote the CPI reference paper for the updating to 1957 expenditures:

> *movements of the food component have reflected not only changes in prices but also changes in the total quantities of food purchased. These have affected the seasonal pattern but not the seasonal amplitude of the food index, nor its trend or annual averages.*

(Dominion Bureau of Statistics, [1961]). Incidentially, it is hard to credit the statement that the choice of the Old Canadian formula did not affect the seasonal amplitude of the food index, since for every example shown in this paper, the index calculated based on the Old Canadian formula has a substantially greater seasonal amplitude than the corresponding indexes based on other formulas.

In 1961, when the 1947–48 basket was replaced by the 1957 basket, the Old Canadian formula was modified to correct this shortcoming. The reference paper for the 1957 updating states that:

> *For each seasonal item in a given month, quantity purchased was adjusted by multiplying it by the ratio of the average monthly aggregate to the actual aggregate for that month, both valued at 1957 average prices. Thus, if the month's actual aggregate is higher (lower) than the average, the quantities of all seasonal items are proportionately reduced (increased)....The weights assigned to seasonal food items in the revised index are the adjusted quantities.*

(Dominion Bureau of Statistics [1961; p.14]).

In terms of formulas, the actual quantities are replaced by the adjusted quantities in (2.14) so that

$$I_{ym/0} = \sum_j P^j_{ym} Q'^j_{cm} \; / \; (1/12 \times \sum_j P^j_0 Q'^j_c) \qquad (2.16)$$

where

$$Q'^j_{cm} = ((1/12 \times \sum_j P^j_0 Q^j_c) \; / \; \sum_j P^j_0 Q^j_{cm}) \, Q^j_{cm} \qquad (2.17)$$

and

$$Q'^j_c = \sum_j Q^{j'}_{cm} = Q'^j_0 \qquad (2.18)$$

Although it seems to be closer in form to the Old Canadian formula, this formula is actually equivalent to the Rothwell formula. Substituting (2.17) and (2.18) into (2.16) gives (2.9).

The seasonal food index in the CPI based on 1957 weights was thus a Rothwell index, but its subindexes were not also Rothwell indexes. One set of adjusted quantities was calculated for all seasonal food items and used at each level of aggregation. For the subindexes to equal Rothwell indexes, separate sets of adjusted expenditures would have been calculated for each subgroup and the Old Canadian formula applied using these adjusted expenditures. Thus while changes in the seasonal food index due to changes in the volume of monthly expenditures were eliminated in the seasonal food aggregate, they were very far from being eliminated in the subgroup indexes, which would show quite different, and more erratic, movements than the corresponding Rothwell indexes (Foster [1960a]). In the CPI based on 1957 expenditures, the subindexes were instead calculated using a fixed-basket formula. This inconsistency between the formulas used for the aggregate and its subindexes was rightly seen as a weakness and was one of the reasons for the reinstitution of a fixed-basket formula for seasonal food items with the updating to 1967 expenditures. Had the Rothwell formula been used at all levels of aggregation there would have been no need for a fixed-basket index, since at every level of aggregation, price indexes would be unaffected by changes in the monthly volume of purchases.

2.7 The Balk Formula: Definition

Recently, the Dutch economist Bert M. Balk [1980a] has suggested another price index formula for seasonal commodities that is closely related to the Rothwell formula. It is

$$I_{ym} = \sum_j P^j_{ym} Q^{yj}_{cm} / \sum_j P^j_0 Q^{yj}_{cm} \tag{2.19}$$

where

$$Q^{yj}_{cm} = (Q^j_{ym} / \sum_m Q^j_{ym}) Q^j_c \tag{2.20}$$

This is the Rothwell formula with basket reference month quantities replaced by given month quantities prorated to basket reference period quantities. Consequently the relative importance of different commodities on an annual basis depends on basket reference period expenditures but the seasonal variations in commodity weights are determined by the given year monthly expenditures.

It can be seen that if $Q^j_{ym} = Q^j_y/12$ for all m, j, y that (2.19) reduces to (1.1) so the Balk index also reduces to a fixed-basket index in the special case of non-seasonal commodities. Note, however, that the special conditions in this case are more restrictive than for the other 2 formulas considered in this chapter; the Old Canadian or Rothwell index will reduce to a fixed-basket index if quantities are the same in every month of the basket reference period; for a Balk index, the same reduction requires that monthly purchases be identical not just in one year, but in each year of the estimation period.

In the special case where $Q^{yj}_{cm} = Q^j_{cm}$ for all values, so that

$$Q^j_{ym} / \sum_m Q^j_{ym} = Q^j_{cm} / \sum_m Q^j_{cm} \tag{2.21}$$

(2.19) reduces to (2.9) and the Balk formula is identical to the Rothwell formula that it resembles. This implies that the Balk and Rothwell indexes are only likely to diverge markedly if there is moving seasonality in monthly purchases, with sharp shifts in the seasonal pattern from one year to the next.[6]

2.8 The Balk Formula: Discussion

The calculation of adjusted quantities according to (2.20) creates practical difficulties for the computation of a Balk index as a component of the CPI. First, like a Paasche index, a Balk index requires expenditure data, or at least data on unit purchases, for every month of the estimation period. One way they could be found is by linking the monthly collection of price quotes to a monthly collection of purchase data from the same outlets for the same items. Another possibility is their independent collection via a continuous household expenditure survey that would obtain monthly expenditures by commodity. Either way, satisfying the onerous data requirements of the Balk formula is not easily done. Most statistical agencies today would be equipped to calculate Balk indexes for few if any seasonal commodity groups using their existing database.[7]

Second, even if detailed quantity data were available on an ongoing basis, the adjusted quantities needed to calculate the index for January of the most recent year could not be estimated until December quantities were available. Consequently, even under the best of circumstances, where monthly quantities become available at the same time as monthly prices and not with a lag of one or several months, the Balk index would have to be projected from January to November and revised with the December estimates. Any lag in the availability of quantity data would lengthen the span over which the indexes would have to be projected and revised.[8] A revision period of 11 months is probably unacceptably long for the official CPI. For its entire history, it has been subject to a policy of non-revision; most other countries have the same policy regarding their consumer price indexes. If the official CPI will be made revisable in the future, it seems unlikely that its use as an escalator would permit a longer revision period that 1-6 months. This would seem to eliminate the Balk formula from consideration for use in the official CPI, although other price indexes that could be revised over many months might still use it. Still, the Balk formula is worth examining if only because doing so gives a clearer idea of the strengths and weaknesses of the Rothwell formula.

The annual index corresponding to the monthly Balk index is

$$I_{y/0} = \sum_m \sum_j P^j_{ym} Q^{yj}_{cm} \;/\; (\sum_m \sum_j P^j_{0m} Q^{yj}_{cm}) \qquad (2.22)$$

or

$$I_{y/0} = \sum P'^j_y Q^j_c \;/\; \sum_j P^j_0 Q^j_c \qquad (2.23)$$

where

$$P'^j_y = \sum_m P^j_{ym} Q^j_{ym} \;/\; \sum_m Q^j_{ym} \qquad (2.24)$$

The annual index is thus a fixed-basket index based on annual expenditures for basket reference period c, as in (2.1). The Balk annual index and the ideal annual index differ only in their calculation of annual prices. For the ideal annual index, the annual price is an average of monthly prices weighted by basket reference period quantities. For the Balk annual index, the annual price is an average of monthly prices weighted by given year quantities, that is, the annual unit price.

Balk believes one of the principal advantages of his monthly formula is that it is compatible with an annual fixed-basket formula based on annual unit prices. This, it should be noted, is not an advantage only for seasonal commodity groups. The Balk formula would also be useful for a non-seasonal commodity group whose purchases are subject to strong, irregular month-to-month fluctuations. An annual series based on a simple average of monthly values is a poor indicator of the annual price movement of such a highly irregular series, just as a quarterly series based on a simple average of monthly values is a poor indicator of its quarterly price movement. The annual and quarterly series based on the Balk formula, with the average monthly values weighted by monthly purchases in the given year, provides a much better indicator. The Balk formula is therefore potentially useful for irregular as well as seasonal commodities, unlike the Rothwell formula, which is only useful for seasonal commodities.

Balk holds that, for seasonal food groups, the ideal annual index will generally take larger values than the Balk annual index. Normally, there is a negative correlation between given month prices and basket reference month quantities for the same month of the year as the given month, just as there is a negative correlation between given month prices and given month quantities. Usually, however, the first correlation is not so strongly negative as the second, so the ideal annual index, based on the seasonal pattern of the basket reference period, will register higher annual levels than the Balk index, based on the seasonal pattern of the given year. Consider the example of strawberries in the Turvey data. The unit prices for strawberries in 1970 and 1973 are 3.62 and 4.86 respectively. If there had been an unusually early harvest in 1970, one may imagine the prices and quantities of May and June 1970 being reversed, so that the unit price for 1970 remains the same, but the 1973 average price weighted by 1970 quantities is

$$6.89 \times 1970 + 4.32 \times 2709 + 4.91 \times 700 \; / \; (1970 + 2709 + 700)$$

or 5.34. The ideal annual index would thus show a price increase of 48%; the Balk annual index an increase of 34%. The large discrepancy arises because 1973 monthly quantities and prices are highly correlated in a negative way; 1970 monthly quantities and 1973 monthly prices are barely negatively correlated. In general, when the seasonal purchase pattern of the basket reference period does not resemble the normal seasonal purchase pattern, the Balk annual index provides a better measure of annual price change than the ideal annual index, and also shows a lower rate of price change. Now, consider a situation the opposite of the previous one, where the seasonal purchase pattern of the basket reference period is normal but that of the given year is unusual. Suppose that due to an early frost the quantities of strawberries in July 1973 are only 800 and the price is $7.00. The unit price is then $5.13, the average price weighted by 1970 quantities is $5.64. Have strawberry prices risen since 1970 by 42% or by 56%?

From the standpoint of the producer, and Balk designed his index as an index of producer prices, the first figure is the more appropriate one, since it is the increase in the average selling price of strawberries from 1970 to 1973. From the standpoint of the consumer, the second figure is certainly more appropriate. It represents the change in the cost to the consumer of maintaining his normal seasonal pattern of consumption. Note that his 56% increase represents the Laspeyres-type estimate of price change; the corresponding Paasche-type estimate, that is, where monthly prices in both 1970 and 1973 are weighted by 1973 monthly quantities, is 51%, which is still much higher than the 42% increase indicated by the Balk annual index. In this case the ideal annual index, although it exceeds the Balk annual index, provides the superior measure of consumer price change.

These examples may suggest that the ideal annual index always exceeds the Balk annual index, which is not so. Balk's own examples show otherwise. He used two sets of price and quantity data in his study, one relating to fruit grown outdoors, the other relating to fruit and vegetables grown in greenhouses. The outdoor fruit index calculated by (2.1) exceeds the index calculated by (2.19) in all years but one for the years 1970–1974, which is as expected. For the greenhouse fruit and vegetable index however, the former series is exceeded by the latter in every year. This is due to the dominance of asparagus in the greenhouse fruit and vegetable index, whose monthly prices for any year are more strongly negatively correlated with 1969 base month quantities than with given month quantitites. Although it seems plausible that the correlation between given month prices and given month quantities should be more strongly negative than the correlation between given month prices and basket reference period quantities, the opposite may sometimes hold in practice, and in such a case the ideal annual index will fall below the Balk annual index.

Incidentally, the magnitude of the differences in annual movements between annual series calculated according to (2.1) and (2.9) in Balk's examples is quite amazing. This is because the weights appropriate to his indexes are the quantities marketed by domestic producers. In consumer price series, the appropriate weights are consumer purchases including imports. International commodity flows tend to dampen the seasonality in consumer purchases, so that the differences in indexes based on alternative seasonal-basket formulas are not so great.

The Balk and Rothwell formulas should not be compared exclusively on the basis of their corresponding annual indexes. The ratio of the Balk index numbers for the same month of consecutive years has the formula

$$\sum_j P^j_{ym} Q^j_{cm} \Big/ \sum_j P^{yj}_{y-1m} Q^{y-1j}_{cm} \tag{2.25}$$

Comparing (2.25) to (2.11), the same expression for a Rothwell index, it can be seen that only the Rothwell index provides a measure of pure price change. Because it is a fixed-basket index in terms of 12-month comparisons, the Rothwell index satisfies both the identity and the mean value test for such comparisons; the Balk index satisfies neither.

In summary, the Balk formula has an advantage over the Rothwell formula as an indicator of consumer price change if the pattern of seasonal purchases is so unstable that it is difficult to establish representative seasonal baskets for the basket reference period. Otherwise, the Rothwell formula should be favoured. Of course, the Balk formula cannot be employed for seasonal commodities in the official CPI because it requires data revisions incompatible with any reasonable revision policy for the official estimates.

Because a Rothwell index compares poorly to a Balk index when its seasonal purchase pattern is unrepresentative, that seasonal pattern should be chosen with some care. It may be wise to base monthly weights on monthly expenditures over several years, even if annual weights are derived from a single basket reference year (see 5.2). Then the seasonal purchase pattern is more likely to be a normal one, to the extent that such a thing exists. Unusual monthly changes in the volume of purchases due to special factors will be dampened by averaging with other years and will not have such an adverse impact on measured price change.

Calculating price indexes for seasonal commodities based on a moving average of several months prices is another means of allowing for the instability of seasonal patterns for one year to another (see 4.5).

2.9 An Example of a Fresh Fruit Index

Table 2.1, Table 2.2 and Table 2.3 show price indexes for fresh fruit based on Turvey's fictive data listed in Table 1.3. Indexes are calculated according to the Old Canadian, Rothwell and Balk formulas, with 1970 as both base period and basket reference period. In other words, all indexes are of the Laspeyres type. The annual values for the Old Canadian index are the values of the annual ideal index, calculated by taking the simple average of its monthly values. The annual values for the Rothwell index would also be those of the ideal annual index if a weighted average of its monthly values were calculated, but in Table 2.1 they are based on a simple average of the monthly values. It can be seen that this makes little difference to the annual series. Notice that the Balk and Rothwell monthly indexes are identical, for 1970, where the seasonal pattern of the given year is also the seasonal pattern of the basket reference year.

It can be seen that there is little difference between the ideal annual index and the Balk annual index in any year. What slight differences there are do not all run in the same direction; the ideal annual index exceeds the Balk annual index in 1971, as expected, but falls short of its counterpart in 1972 and 1973.

One may also remark that while there is little divergence between the monthly movement of the Rothwell and Balk indexes, there is a marked divergence between the monthly movement of either series and the Old Canadian index. Where there is a regular season pattern in monthly purchases with little moving seasonality, the Balk and Rothwell indexes will be very close to each other, and the data devised by Turvey exhibit a fixed or almost fixed seasonal pattern ensuring that the two series will not be far apart. The real life production data used by Balk showed much greater differences in monthly movement between Balk and Rothwell indexes; actual consumer price and expenditure data for fresh fruit would probably show larger divergences than those shown by Table 2.2 but much smaller divergences than those shown by Balk's data.

The much greater seasonal amplitude of the Old Canadian index in comparison to the other indexes is obvious from the values in Table 5; the coefficient of variation of the Old Canadian index is .221; much higher than the almost equal coefficients for the Rothwell and Balk indexes.

The seasonal pattern of the Old Canadian index is also markedly different from that of the other two indexes. It rises most strongly in June, when the other indexes decline. It also rises strongly in August although the Rothwell and Balk indexes do not show strong increases in that month in any year and actually fall in 1972. From Table 2.4 it is clear that the seasonal price pattern of the Old Canadian index is strongly influenced by the seasonal purchase pattern. The volume of purchases shows its strongest increase in June, rising by 55%, and its second strongest increase in August, rising by 18%. These volume changes are large enough to swamp the impact of price changes running in the opposite direction.

Table 2.3 shows the 12-month percent changes of the different indexes. There is only one column for the Old Canadian and Rothwell indexes since their changes are the same. In most months, the differences between the indexes are slight, but note that in November 1971 the Balk index shows a substantially smaller increase than the Rothwell index and in the following November it shows a substantially larger increase. This is largely due to the unusually low November purchases of oranges in 1971 compared to other years. November's share of 1971's quantities purchased was only 5.0%, as opposed to 10.1% for base year 1970 and 10.2% for 1972. Although in November of both 1971 and 1972 its 12-month increase was much less than that of the other in-season fruits, apples and grapes, its price is considerably higher in these years than their weighted average price. (Apples are lower priced, grapes are higher priced, but in November apples have the dominant weight). Consequently, the weight shift away from oranges in 1971 caused the 12-month percent change of the Balk index to fall short of the change in the Rothwell index and the weight shift back to oranges in 1972 caused it to exceed the change in the Rothwell index. In fact, the 12-month percent change of November 1972 exceeds that of any of its components. Prices of apples increased 17.3%, grapes 17.1% and oranges 10.2% but the Balk index rose 18.1%. This provides an illustration of how a Balk index violates the mean value test for 12-month percent changes, a test that the Rothwell formula satisfies.

Table 2.1: INDEXES WITH SEASONALLY VARIANT BASKETS AND BASE YEAR PRICES FOR FRESH FRUIT

Date	Old Canadian	Rothwell	Balk
1970			
Jan	91.0	93.7	93.7
Feb	88.6	90.8	90.8
Mar	78.9	88.3	88.3
Apr	69.8	96.3	96.3
May	86.8	114.5	114.5
Jun	127.6	108.8	108.8
Jul	109.8	111.2	111.2
Aug	130.2	111.4	111.4
Sep	118.5	98.0	98.0
Oct	91.8	92.7	92.7
Nov	111.8	99.2	99.2
Dec	95.1	93.1	93.1
Year	100.0	99.8	100.0
1971			
Jan	95.7	98.5	98.6
Feb	98.3	100.7	100.7
Mar	90.7	101.4	101.5
Apr	80.3	110.7	110.6
May	97.1	128.0	128.3
Jun	138.9	118.4	118.2
Jul	122.5	124.1	124.6
Aug	144.7	123.8	124.0
Sep	130.3	107.8	108.0
Oct	105.8	106.8	107.1
Nov	129.4	114.9	110.3
Dec	109.9	107.5	107.7
Year	111.9	111.9	111.6

Base Year Prices for Fresh Fruit (continued)

Date	Old Canadian	Rothwell	Balk
1972			
Jan	110.3	113.6	113.5
Feb	110.6	113.3	113.3
Mar	103.2	115.5	115.5
Apr	89.4	123.3	123.2
May	106.1	139.9	141.1
Jun	150.7	128.5	128.4
Jul	136.6	138.4	138.9
Aug	163.0	139.6	139.8
Sep	143.3	118.6	118.5
Oct	120.5	121.7	121.7
Nov	147.2	130.7	130.7
Dec	122.2	119.6	119.3
Year	125.3	125.2	125.4
1973			
Jan	121.0	124.6	124.6
Feb	122.7	125.7	125.7
Mar	115.7	129.4	129.3
Apr	101.1	139.5	139.5
May	118.3	155.9	157.1
Jun	165.3	140.8	140.8
Jul	152.4	154.4	154.8
Aug	188.0	160.9	161.0
Sep	158.3	131.0	131.0
Oct	137.0	138.3	138.3
Nov	168.4	149.6	149.7
Dec	135.4	132.5	132.6
Year	140.3	140.2	140.5
Coefficient of Variation	.221	.153	.154

Table 2.2: INDEXES WITH SEASONALLY VARIANT BASKETS AND BASE YEAR PRICES FOR FRESH FRUIT PERIOD TO PERIOD PERCENT CHANGES

Date	Old Canadian	Rothwell	Balk
1970			
Jan	—	—	—
Feb	- 2.6	- 3.1	- 3.1
Mar	-10.9	- 2.8	- 2.8
Apr	-11.6	9.1	- 9.1
May	24.4	18.8	18.8
Jun	47.0	- 4.9	- 4.9
Jul	-13.9	2.3	2.3
Aug	18.5	0.2	0.2
Sep	- 9.0	-12.0	-12.0
Oct	-22.5	- 5.5	- 5.5
Nov	21.8	7.1	7.1
Dec	-14.9	- 6.2	- 6.2
Year	—	—	—
- - - - - - - - - -			
1971			
Jan	.6	5.8	5.9
Feb	2.7	2.2	2.1
Mar	- 7.7	0.7	0.8
Apr	-11.5	9.2	9.0
May	20.9	15.6	16.1
Jun	43.1	- 7.5	- 7.9
Jul	-11.8	4.8	5.4
Aug	18.1	- 0.2	- 0.5
Sep	-10.0	-13.0	-12.9
Oct	-18.8	- 0.9	- 0.8
Nov	22.4	7.6	2.9
Dec	-15.1	- 6.5	- 2.3
Year	11.9	12.1	11.6

Indexes With Seasonally Variant Baskets and Base Year Prices for Fresh Fruit Period to Period Changes (continued)

Date	Old Canadian	Rothwell	Balk
1972			
Jan	0.4	5.7	5.4
Feb	0.2	- 0.2	- 0.2
Mar	- 6.7	1.9	2.0
Apr	-13.4	6.7	6.7
May	18.8	13.5	14.5
Jun	42.0	- 8.2	- 9.0
Jul	- 9.4	7.7	8.2
Aug	19.3	0.8	0.6
Sep	-12.1	-15.0	-15.2
Oct	-15.9	2.6	2.7
Nov	22.2	7.4	7.4
Dec	-17.0	- 8.5	- 8.7
Year	11.9	11.9	12.4
- - - - - - - - - -			
1973			
Jan	0.6	4.2	4.4
Feb	2.7	0.9	0.9
Mar	- 7.7	3.0	2.9
Apr	-11.5	7.8	7.9
May	20.9	11.7	12.7
Jun	43.1	- 9.7	-10.4
Jul	-11.8	9.6	10.0
Aug	18.1	4.2	4.0
Sep	-10.0	-18.6	-18.7
Oct	-18.8	5.6	5.6
Nov	22.4	8.1	8.2
Dec	-15.1	-11.4	-11.4
Year	12.0	12.0	12.0

Table 2.3: INDEXES WITH SEASONALLY VARIANT BASKETS AND BASE YEAR PRICES FOR FRESH FRUIT 12-MONTH PERCENT CHANGES

Date	Rothwell	Balk
1971		
Jan	5.1	5.2
Feb	10.8	10.8
Mar	14.8	14.9
Apr	14.9	14.8
May	11.9	12.1
Jun	8.8	8.6
Jul	11.6	12.0
Aug	11.1	11.2
Sep	9.9	10.2
Oct	15.3	15.6
Nov	15.8	11.1
Dec	15.6	15.7
1972		
Jan	15.3	15.2
Feb	12.6	12.5
Mar	13.9	13.9
Apr	11.4	11.4
May	9.3	10.0
Jun	8.5	8.6
Jul	11.5	11.5
Aug	12.7	12.7
Sep	10.1	9.7
Oct	13.8	13.6
Nov	13.7	18.6
Dec	11.1	10.8

Indexes With Seasonally Variant Baskets and Base Year Prices for Fresh Fruit 12-Month Percent Changes (continued)

Date	Rothwell	Balk
1973		
Jan	9.7	9.7
Feb	10.9	11.0
Mar	12.0	11.9
Apr	13.1	13.2
May	11.4	11.3
Jun	9.6	9.7
Jul	11.5	11.4
Aug	15.2	15.2
Sep	10.4	10.5
Oct	13.7	13.7
Nov	14.4	14.5
Dec	10.9	11.1

Table 2.4: INDEX OF BASE MONTH FRESH FRUIT EXPENDITURES AT 1970 BASE YEAR PRICES (1970 = 100)

1970	Jan	97.1
	Feb	97.6
	Mar	89.4
	Apr	72.5
	May	75.9
	Jun	117.3
	Jul	98.7
	Aug	116.8
	Sep	120.8
	Oct	99.0
	Nov	112.6
	Dec	102.2

2.10 ENDNOTES

[1] Many thanks to Bohdan Szulc who showed me this reference. It has not been listed in the references of any study on seasonal commodities that I have seen. The Bean and Stine paper proposed four types of index numbers for seasonal farm products. Type A was the fixed-basket index, and they assumed that seasonally disappearing items would simply be dropped from the index. Type B was a fixed-basket index at base month prices, which they interpreted as a fixed-basket index with seasonal adjustment of prices. Type C was the Rothwell index and type D was an index with seasonally variant baskets at base month prices, as described in the next chapter.

[2] In the British Retail Prices Index, the seasonal-basket series are calculated at January rather than annual base prices. See 6.4.

[3] The same point could be made with respect to 3-month, 6-month or 9-month changes, or to any s-month changes where s is not a multiple of 12.

[4] This situation is uncommon, but can be found for some commodities. For example, beer and softdrinks are subject to seasonal demand, which would normally imply a positive correlation between prices and quantities. However, because both the beer and soft drink industries are oligopolistic, prices of these products do not respond to seasonal fluctuations in demand. It is difficult to think of a case of a commodity which exhibits price seasonality but not seasonality in its purchases.

[5] Note that a component's percent contribution to the change in the aggregate is also calculated in a similar way to a Paasche index. The contribution to change of component j would be

$$100 \times \left({}_0W^j_{cm+1} \; I^j_{ym+1/0} - {}_0W^j_{cm} \; I^j_{ym/0} \right) / \, I_{ym/0}$$

where it can be seen that weight shifts and price shifts both determine a component's contribution.

[6] One CPI series where this may be so is alcoholic beverages purchased from stores. Liquor and wine purchases peak in December of each year but beer purchases peak in the summer. Depending on the weather, however, beer sales may peak in any month from May to August, probably due to a rise in consumption when the weather is hot and sunny.

[7] In Canada, monthly household expenditure data is not available for any commodities except for food. Moreover, the Family Food Expenditure Survey is only conducted every other year, and in most cities, only every fourth year.

[8] The United Kingdom, which updates its expenditure weights with the shortest lag of any country, still has a 6-month lag in the introduction of weights, so that expenditures for the 12 months from July of one year to June of the next are only implemented in January of the following year. Updating the quantities for the seasonal commodities in a CPI from a continuous household expenditure survey might not be so much work as the updating of expenditure weights for all commodities, but it would probably entail at least a 3-4 month lag on top of the lag between the given month and the end of the calendar year.

Chapter 3

SEASONALLY VARIANT BASKETS WITH MONTHLY BASE PRICES

3.1 Unadjusted Monthly Base Prices

Suppose that there were no relationship between the months of the year in terms of commodities purchased, i.e. that all commodities are seasonally disappearing and are only in-season for a single month. Given this hypothetical case, estimates of month-to-month price change are largely meaningless, but measures of 12-month change, between, say, January and January of consecutive years, remain valid.

Then one might wish to calculate separate fixed-basket indexes for each month of the calendar year. Each index would be independent of its monthly counterparts so there would be no basis for month-to-month comparisons but only for comparisons involving the same months in different years. These indexes would have the formula

$$I_{ym} = \sum_j P^j_{ym} Q^j_{cm} \bigg/ \sum_j P^j_{0m} Q^j_{cm} \qquad (3.1)$$

Re-expressed in terms of component index numbers and weights, one obtains

$$I_{ym} = \sum_j {}_{0m}W^j_{cm} \, I^j_{ym/0m}$$

where

$${}_{0m}W^j_{cm} = P^j_{0m} Q^j_{cm} \bigg/ \sum_j P^j_{0m} Q^j_{cm} \qquad (3.2)$$

This formula is another old friend from Chapter 1, where it was used to calculate seasonal-basket index A for poultry. Remember that seasonal-basket index A was really 12 separate indexes, one for each month of the year, with each monthly index number in the base year equal to 100.

It can be seen that a weighted average of the monthly index numbers using weights

$${}_0W_{cm} = \sum_j P^j_{0m} Q^j_{cm} \bigg/ \sum_m \sum_j P^j_{0m} Q^j_{cm} \quad .$$

gives the ideal annual index whose formula is (2.1). Thus (3.1), like the Rothwell and Old Canadian formulas, satisfy this criterion of a monthly index formula for seasonal commodities.

Because it is essentially a fixed-basket formula defined over a single calendar month, (3.1) is also consistent in aggregation, so that major group indexes can be calculated indifferently from subgroup or component indexes.

Formula (3.1) was one of the 4 index formulas considered by Bean and Stine's paper and they noted that it *"represents changes in price level as measured against the 'normal' for each month. In other words, seasonal price trend is here eliminated"*. (Bean and Stine [1924, p.32])

This can be clearly seen if one considers the ratio of consecutive monthly index numbers, which is

$$\left(\sum_j P^j_{ym+1} Q^j_{cm+1} \Big/ \sum_j P^j_{ym} Q^j_{cm}\right) \Big/ \left(\sum_j P^j_{0m+1} Q^j_{cm+1} \Big/ \sum_j P^j_{0m} Q^j_{cm}\right) \qquad (3.3)$$

Compare (3.3) with (2.12), the corresponding expression for a Rothwell formula. In each case the ratio of prices in month **m+1** to those in month **m**, each weighted by their own purchases, is divided by a monthly factor. In each case the geometric sum and mean of these factors is 1, so their interpretation as seasonal adjustment factors is valid. But whereas the seasonal adjustment factor in (2.12) is a ratio of monthly expenditures for consecutive months at base year prices, the factor in (3.4) is the same ratio with each month's expenditures at its own prices, so that monthly price movements are adjusted for seasonality in both prices and purchases.

Indexes calculated according to (3.1) will thus tend to be smooth, stable series. In fact, Turvey's study shows that the countries whose fruit indexes are based on formulas with seasonally variant baskets and monthly base prices have among the lowest coefficients of variation.

Figure 1 indicates the 4 quadrants within which all types of price indexes for seasonal commodities may be placed. This type of 4-way partition was recognized by Bean and Stine, and prompted them to title their paper **"Four Types of Index Numbers of Farm Prices"**. Indexes may have fixed or monthly baskets at base year or base month prices. If one were to fill this quadrant with points representing the official practice of different countries with respect to seasonal commodities, all of the quadrants would have their fair share of points except the top right hand quadrant, which would be empty. Bean and Stine recognized the possibility of a fixed basket index with base month prices, this was their designated type B index, but no country has ever adopted base month prices in an index for seasonal commodities that has not also adopted monthly baskets. This illustrates that it is the seasonality in purchases and not in prices that properly defines a seasonal commodity, and creates a problem for indexmakers. This is why so many countries have adopted a seasonal-basket formula with annual base prices but no country has adopted a fixed-basket formula with monthly base prices.

It can be seen that in the special case where

$$Q^j_{cm} = Q^j_c \; / \; 12$$

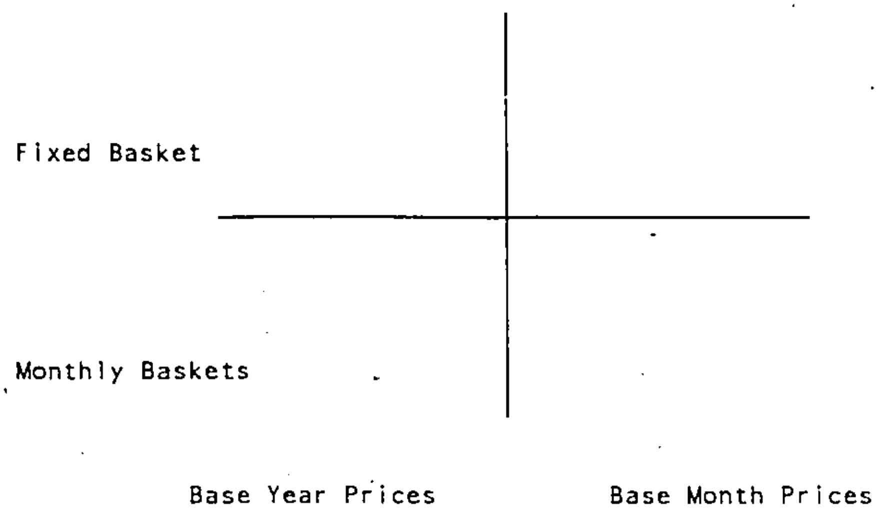

Figure 1: Defining Index Formulas for Seasonal Commodities

for all j, that (3.1) reduces to

$$I_{ym} = \sum_j P^j_{ym} Q^j_c \Big/ \sum_j P^j_{0m} Q^j_c \qquad (3.4)$$

which is not equal to (2.1). (3.4) defines a fixed-basket formula at base month prices, not the standard fixed-basket formula at base year prices, and so fails one important criterion of a monthly index formula that is passed by the formulas studied in Chapter 2. The use of a seasonal-basket formula with monthly base prices for seasonal commodities is inconsistent with the use of a fixed-basket formula for non-seasonal commodities. Employing a seasonal-basket formula with monthly base prices for seasonal commodities in the official CPI would do damage to its logical coherence. The same objection cannot be made about a seasonal-basket formula with annual base prices (see Chapter 2).

Obviously, (3.1) does not satisfy the monotonicity axiom or the identity test for a price index with respect to different calendar months. Also, it cannot, unlike the Rothwell formula, be considered as a special case of a Paasche formula, if CPI series for seasonal commodities are used as deflators. Finally, there is no simple decomposition of monthly index change between price change and weight change as there is for the Rothwell formula.

None of these objections have any force if one accepts the extreme assumption that each monthly basket represents a distinct set of commodities with no overlap between those of one month and the next. Then monthly measures of price change are irrelevant and only annual or 12-month changes have any meaning. Whether it is appropriate to use (3.1) depends on the credibility of its basic assumption. And in almost all cases, it is not plausible to consider commodities to be non-overlapping from month to month. Consequently the use of (3.1) is inappropriate. This can be seen in our example of an index for fresh fruit, where only 2 of the 5 fruits are seasonally disappearing, and these are available for more than a single month of the year. Of course, one can always redefine a commodity so that if it is sold in a different month of the year it represents a different commodity. This can be justified to a certain extent by the seasonal substitution of varieties, the replacement, for example, of domestic MacIntosh apples by imported Granny Smith apples when domestic apples are out-of-season. But to say that a MacIntosh apple should be treated as a different commodity from a Granny Smith apple is not the same thing as to say that a December apple should be treated as a different commodity from a January apple. Both MacIntosh and Granny Smith apples are sold in more than one month of the year; in some months both are sold.

For a commodity such as potatoes, one may argue that the quality deteriorates from month to month following the harvest period, so that potatoes in each month may be considered as representing a different variety. But it is probably more appropriate in this case to treat potatoes as representing a single commodity with quality adjustment of price quotations to account for deteriorating quality.[1]

In any case, these arguements revolving around the domestic harvest of fruit and vegetables do not have any relevance for seasonal non-food commodities such as sports equipment or articles of clothing. For agricultural commodities, varieties or grades of a commodity may show different seasonal purchase patterns but it is ludicrous to suggest that manufactured articles sold in one month should be treated as if they represented different commodities from those sold the month before. Thus, the separate commodities arguement does not provide an acceptable justification for the use of monthly base prices in a seasonal-basket index.[2]

3.2 Trend-Adjusted Monthly Base Prices: the Netherlands Adjustment

If the separate commodities argument is rejected, seasonal-basket indexes with base month prices must be regarded as seasonally adjusted series, since, as mentioned, the use of base month rather than base year prices tends to reduce the seasonal variation of an index. As a seasonal adjustment method, calculating such a price index amounts to the use of constant seasonal factors for each price series. The monthly base prices used should not, then, be the actual monthly base prices but the product of monthly seasonal factors and the annual base price. Such base prices will differ from the annual base prices only because of their seasonal pattern or random influences.

This is the philosophy behind the Netherlands adjustment of base prices. The base prices are not only detrended but irregular movements between the months of the base year are also smoothed over so that ideally only the seasonal pattern remains.

The method begins by calculating for the 4 years up to and including the base year, the ratio of monthly prices for the seasonal commodity to its weighted annual price. This is done for all the months of the year in which the commodity is priced, plus the first in-season month of the following year. The four sets of ratios, from 3 to 13 in number[3], are then averaged, so that

$$R_m = \left(\sum_{y=0}^{4} R_{0-ym}\right) / 4$$

Let R_{n+1} be the ratio for the first in-season month of the following year, where **n** is the number of in-season months for the seasonal commodity. Then

$$CF_m = (R_{n+1} - R_1) / 2 - m \times (R_{n+1} - R) / n \qquad (3.5)$$

defines a trend correction factor for the **mth** in-season month of the base year.

With a positive trend in the prices of the seasonal commodity, the correction factors will be positive for the first in-season months and negative for the last in-season months. In fact, the corrections are, except for the last in-season month, symmetric, as can be seen in Table 3.1, where they are calculated for Turvey's fresh fruits.[4]

The correction factors are added to the initial ratios to give trend-adjusted ratios, that is

$$R^*_m = R_m + CF_m$$

The average of these adjusted ratios, weighted by basket reference month quantities is divided into one to give a factor which is multiplied by each of the adjusted ratios. These final ratios are multiplied by the average base year prices to yield the adjusted base month prices. It can be seen that an average of the adjusted base month prices, weighted by base month quantities, will equal the average base price.[5]

A monthly index based on these trend-adjusted monthly base prices is compatible with the ideal annual index. The latter series is an average of the former series, weighted by basket reference month expenditures at trend-adjusted monthly base prices. However, in the Netherlands, the Central Bureau of Statistics calculates its annual indexes as simple, not weighted, averages of monthly index numbers, and a complex method of weight adjustment is employed to ensure that monthly weights sum to the annual weights (see Turvey [1981; p.xix]).

3.3 Trend-Adjusted Monthly Base Prices: the Köves Adjustment

Another method has been suggested by Professor Köves, a Hungarian economist. (See Turvey [1979; p.xxi].) unadjusted base month prices as in (3.1). He then calculates simple geometric means for each month of the year over several years:

$$\left(\prod_y I_{ym}\right)^{1/y} \qquad (3.6)$$

and the corresponding geometric mean for the average months:

$$\left(\prod_m \prod_y I_{ym}\right)^{1/12y} \tag{3.7}$$

The geometric mean monthly trend over the years is

$$t = \left(\prod_{m=1}^{12} I_{ym}\right)^{1/144y}$$

Now, there exist 12 trend values whose geometric mean equals (3.7), that is,

$$\prod_m kt^m = \left(\prod_m \prod_y I_{ym}\right)^{1/y}$$

The solution[6] for **k** is

$$k = \left(\left(\prod_m \prod_y I_{ym}\right)^{1/y} \div t^{78}\right)^{1/12} \tag{3.8}$$

and the base year index for month **m** can be calculated as

$$100 \times k \times t^m / \left(\prod_y I_{ym}\right)^{1/y}$$

The use of geometric rather than arithmetic averages in the above calculation is not necessary, but is the better choice. Any price index is much more likely to follow a geometric than an arithmetic growth trend. A trend adjustment based on an arithmetic trend will overadjust the monthly base prices if the base year is the first year in the sequence of years used in calculating the monthly trend, and underadjust them if it is the last year in the sequence. The use of a simple geometric average rather than a weighted geometric average in the computation is more questionable. The simple geometric mean of the base month index numbers equals 100; it would seem more appropriate for a weighted geometric mean of the base month index numbers to equal 100 for an index of seasonal commodities. If weighted geometric means are used, however, the solution for **k** would be much more complicated than is (3.8).

3.4 Example of a Fresh Fruit Price Index

Table 3.2 shows price indexes for Turvey's fruit data calculated according to the three different variants just described. The simple index used unadjusted monthly base prices; the Dutch index uses monthly base prices adjusted using the official Netherlands methodology. For both monthly indexes the corresponding yearly values are those of the ideal annual index. For the Köves index, the annual series represents simple geometric means of the monthly series.

The coefficients of variation, not surprisingly, are much lower for these 3 indexes than for any of the indexes shown in Table 3.2. If one looks at the Dutch and Köves indexes there is some evidence of overadjustment in the large values for September in every year. This month marks the seasonal low point for both the Rothwell and Balk indexes. The coefficient of variation of the Köves index is slightly lower than that of the Dutch index.

If one is constructing a stand-alone index the Köves variant of a monthly base price index may be superior to the Dutch one. If one is constructing an index for seasonal commodity groups in the CPI, then the Dutch variant is superior. It is more consistent with the treatment of non-seasonal commodities that quarterly or annual series for seasonal commodities should be arithmetic averages of the monthly series as opposed to geometric averages. Moreover, the Dutch variant has the advantage that its monthly index is compatible with the ideal annual index.

Finally, the Dutch method is more flexible. Once base month prices are calculated for all component series they can be used to generate any desired aggregate. The Köves method must be applied to each calculated aggregate. A group index calculated using the Dutch method will always be a weighted average of its subgroup indexes; not so using the Köves method.

Table 3.3 shows the seasonal ratios or seasonal factors associated with each fruit in the Dutch index. It can be seen that they are similar to the seasonal factors in the X11 seasonal adjustment program, with ratios exceeding one in months of seasonally high prices and falling below one in months of seasonally low prices. Unlike the X11 program, the factors can be calculated for seasonally disappearing commodities with missing prices. In fact, the Netherlands Central Bureau of Statistics follows the unusual but by no means indefensible practice of publishing its indexes for seasonally disappearing commodities only for their in-season months, leaving blank the entries for out-of-season months (Netherlands [1978]).

Suppose one used the seasonal factors from Table 3.3 to calculate seasonally adjusted fruit price indexes and then calculated a Rothwell index based on the adjusted indexes. The resulting index would be almost identical to the Dutch index in Table 3.2. The use of monthly base prices is thus not the only alternative if one must reconcile the adjustment of price indexes for seasonality with a non-revision policy.

3.5 Revision Policy and Seasonal Adjustment

As mentioned, the use of trend-adjusted monthly base prices is equivalent to seasonal adjustment based on constant seasonal factors. Specifically, the ratio of the trend-adjusted monthly base price to the annual base price represents the seasonal adjustment factor for that month. This is not a terribly sophisticated form of seasonal adjustment relative to other methods available (see Dagum and Morry [1983]). In addition, the seasonally adjusted estimates are never revised, once calculated, so new information relating to the seasonal pattern of the series is not incorporated as it might be. From the point of view of its properties as an index formula, a seasonal-basket formula at monthly prices has no advantages over the Rothwell formula, but does have several obvious defects (see 3.2).

In spite of this, indexes based on seasonally variant baskets at monthly base prices are employed in CPIs for seasonal commodities in many countries. These include Austria, Belgium, Czechoslovakia, Hungary and Poland, which use observed monthly base prices, as in (3.1), and the Netherlands, which uses trend-adjusted base prices (see Turvey [1979; p.xviii]).

One might ask why the use of monthly base prices is so widespread if there is so little to commend it. One reason may be that CPIs have not traditionally been seasonally adjusted series, so there has been a tendency to eliminate seasonality in special ways in seasonal group indexes rather than by seasonally adjusting the CPI or its components. A consequence of this is that no series unadjusted for seasonal variation are published for these seasonal group indexes. Also, the seasonal adjustment of the CPI using a moving average program such as X11-ARIMA necessarily involves revision of the seasonally adjusted estimates and this is in conflict with the non-revision policy most countries have adopted for their official CPIs. The same factors may also account for the use of moving average indexes in official CPIs as discussed in Chapter 5.

This raises the question of whether one needs an index of consumer prices that fully reflects the seasonal movement of prices or only a CPI that is adjusted for seasonal variation. The right answer is that both unadjusted and adjusted series are required and it would be a mistake to try to dispense with either of them. Consider the principal uses of the CPI:

1. as a deflator of an expenditure series or of an income series,

2. as an indicator of changes in the rate of inflation,

3. as an escalator of wages and salaries, government transfer payments, personal income tax brackets, etc.

For the purpose of deflation, constant dollar series unadjusted for seasonal variation, such as are published by most official agencies, are properly calculated by deflating unadjusted current dollar estimates by an unadjusted deflator. Similarly, a seasonally adjusted constant dollar series requires a seasonally adjusted deflator to deflate seasonally adjusted current dollars. Both unadjusted and adjusted series are required for deflation, but of the two types of series the unadjusted series is the more necessary. The CPIs produced by an official agency may be used as deflators by other agencies. Many of these agencies can calculate their own seasonally adjusted deflators, and some might prefer their own estimates to the official ones. But if only seasonally adjusted estimates are published, unadjusted estimates cannot be derived from them.

For an indicator of inflation, most often a seasonally adjusted series is required but sometimes an unadjusted series may also be of value. The seasonal pattern of price movements is a phenomenon of interest in itself and there is no reason it should be suppressed from official estimates.

For purposes of escalation, only an unadjusted series is required; there is no real need for a seasonally adjusted series. The empirical evidence of this is that virtually all Canadian contracts which use the CPI as an escalator rely on the unadjusted series, and there are several reasons why this accepted practice is eminently sensible.

First, almost every escalation contract refers to the All-items CPI, and there is very little seasonality in this CPI series, as there is in indexes at a lower level of aggregation. Dagum and Morry [1983; p.959] show the All-items CPI for 1979-1981 unadjusted and seasonally adjusted. The quarterly averages of their estimates never differ by more than .2 between unadjusted and adjusted estimates although the index numbers themselves are in the 145-200 range.

Second, it is probably safest to escalate based on annual average index movements, not necessarily based on calendar year annuals. Both federal income tax brackets and exemptions and family allowances are escalated based on the annual change in the CPI for a fiscal year running from October to September. The indexation factor used in determining 1985 income tax brackets will be based on the average change in the CPI from October 1983 - September 1984 to October 1984 - September 1985. Escalation based on annual movements does not require seasonally adjusted series, and should be based on series unadjusted for seasonal variation. This is so because seasonally adjusted series will have different annual averages from the original series, whatever seasonal adjustment method is used.[7]

Nor would there be any special reason to base escalation on seasonally adjusted series if the base of escalation were a period shorter than 12 months. For example, the Old Age Security payments are escalated every quarter. There may be seasonality in the adjustment of payments from the first quarter to the second quarter but there would be no seasonality in the adjustment of payments from the first quarter of one year to the next; over several years the total increase in OAS payments due to seasonal factors would be negligible.[8]

Similarly, a multi-year contract might be escalated each year based on the CPI movement from December to December. Since this December to December movement is not a seasonal movement it also can be based on a CPI unadjusted for seasonal variation.

Finally, consider a worst case scenario, where a 2-year contract is escalated using the CPI as an escalator. For the first half of the second year, wages are escalated based on the December-to-December CPI movement, and for the second half of the second year wages are escalated based on the CPI movement from December to June. Here it would be more logical to use a seasonally adjusted CPI as the escalator, since the December to June movement would be influenced by seasonal factors. Does this undermine the arguement that only a CPI unadjusted for seasonal variation is needed for escalation? It does not, first, because this hypothetical case constitutes an abusive use of the official CPI, and, second, because it would likely make no practical difference to the dollar amount of escalation anyway.

It has been argued that both unadjusted and seasonally adjusted CPI series have their uses, but that only unadjusted series need be used for escalation. Hence, both types of series should be calculated but any non-revision policy for the official CPIs should apply only to the unadjusted series. There is no reason that seasonally adjusted CPIs should not be revised over several years for changes in estimates stemming from the seasonal adjustment process itself.[9] If seasonally adjusted CPIs can be revised over a multi-year period, then there is no reason to calculate a seasonal basket CPI at monthly rather than annual base prices.

Table 3.1: TREND CORRECTION FACTORS FOR MONTHLY RATIOS USING THE NETHERLANDS METHODOLOGY

Month	Apples	Peaches	Grapes	Strawberries	Oranges
Jan	.0500		.0707		.0330
Feb	.0400		.0566		.0264
Mar	.0300		.0424		.0198
Apr	.0200		.0283		.0132
May	.0100		.0141	.0248	.0066
Jun	0	.1639	0	-.0248	0
Jul	-.0100	.0546	-.0141	-.0743	-.0066
Aug	-.0200	-.0546	-.0283		-.0132
Sep	-.0300	-.1639	-.0424		-.0198
Oct	-.0400	-.2732	-.0566		-.0264
Nov	-.0500		-.0707		-.0330
Dec	-.0600		-.0848		-.0396

Table 3.2: INDEXES WITH SEASONALLY VARIANT BASKETS AND BASE MONTH PRICES FOR FRESH FRUIT

Date	Simple	Dutch	Köves
1970			
Jan	100.0	99.3	99.9
Feb	100.0	97.0	96.9
Mar	100.0	94.3	93.3
Apr	100.0	95.9	95.2
May	100.0	98.7	100.6
Jun	100.0	102.4	105.4
Jul	100.0	100.2	101.3
Aug	100.0	96.7	100.9
Sep	100.0	107.7	106.1
Oct	100.0	102.3	98.9
Nov	100.0	100.3	99.2
Dec	100.0	103.0	103.0
Year	100.0	100.0	100.0
- - - - - - - - - -			
1971			
Jan	105.2	104.4	105.1
Feb	110.8	107.5	107.4
Mar	114.8	108.3	107.2
Apr	115.0	110.3	109.5
May	111.8	110.3	112.4
Jun	108.8	111.4	114.7
Jul	111.6	111.8	113.1
Aug	111.1	107.5	112.1
Sep	110.0	118.4	116.6
Oct	115.3	117.9	114.0
Nov	115.8	116.1	114.9
Dec	115.5	118.9	119.0
Year	111.9	111.9	112.1

Indexes With Seasonally Variant Baskets and Base Month Prices for Fresh Fruit (continued)

Date	Simple	Dutch	Köves
1972			
Jan	121.2	120.3	121.1
Feb	124.8	121.0	120.9
Mar	130.8	123.4	122.1
Apr	128.0	122.8	121.9
May	122.2	120.6	123.0
Jun	118.1	120.9	124.5
Jul	124.4	124.7	126.1
Aug	125.2	121.1	126.3
Sep	121.0	130.3	128.3
Oct	131.3	134.2	129.8
Nov	131.7	132.0	130.6
Dec	128.4	132.2	132.3
Year	125.3	125.3	125.5
- - - - - - - - - -			
1973			
Jan	133.0	132.0	132.9
Feb	138.4	134.2	134.1
Mar	146.6	138.3	136.8
Apr	144.8	138.9	137.9
May	136.2	134.4	137.0
Jun	129.4	132.5	136.4
Jul	138.8	139.1	140.6
Aug	144.4	139.6	145.6
Sep	133.7	143.9	141.8
Oct	149.3	152.6	147.6
Nov	150.7	151.1	149.5
Dec	142.4	146.6	146.7
Year	140.3	140.3	140.5
- - - - - - - - - -			
Coefficient of Variation	.133	.135	.133

Table 3.3: SEASONAL RATIOS FOR 1970 USING THE NETHERLANDS METHODOLOGY

Month	Apples	Peaches	Grapes	Strawberries	Oranges
Jan	.890		1.579		.955
Feb	.934		1.891		.933
Mar	.943		2.958		.929
Apr	1.039		3.107		.967
May	1.144		2.906	1.497	1.008
Jun	1.192	2.485	2.824	.931	1.041
Jul	1.234	1.737	2.116	.919	1.099
Aug	1.265	1.097	1.243		1.128
Sep	.983	.813	.856		1.125
Oct	.852	.749	.834		1.140
Nov	.839		1.054		1.128
Dec	.796		1.209		.935

3.6 Endnotes

[1] The United Kindgom incorporates such a quality adjustment for potato prices in its Retail Prices Index, as described in Central Statistical Office [1967; p.11]. All potatoes from October to April are taken to be old potatoes of the same quality, so even in this case there is not a one-to-one correspondence between months and varieties, or, more precisely, between months and grades.

[2] Turvey [1984] has suggested a modification of a seasonal-basket index with base month prices. Rather than basing an index on 12 monthly baskets he would calculate separate baskets for each combination of in-season commodities. In terms of his fresh fruit example, there would be 4 different baskets: November-April (apples, grapes and oranges), May (all fruits except peaches), June-July (all five fruits) and August-October (all fruits except strawberries). The advantage of this type of seasonal-basket index is that monthly index changes for months within the span of a basket will be measures of pure price change. Its disadvantage is that a weighted average of monthly index num-

bers will not yield the ideal annual index.

[3] If all months of the base year have prices, there will be 13 ratios, including the ratio for January of the next year. If only one month of the base year is priced, the problem of trend adjustment does not arise, since the base month price of the sole in-season month will also be the base year price. Thus the minimum number of ratios per year will be 3, for 2 in-season months plus the first in-season month of the next year.

[4] Because data was not available for the years preceding 1970, the trend adjustment of the 1970 prices was based on 1970–1973 prices, rather than 1967–1970 prices. The last price ratio for 1973 is based on the price of the first in-season month for 1974. This was estimated by projecting the 12-month movement for the same month in 1973, that is:

$$P^j_{1974m} = P^j_{1973m} \times (P^j_{1973m} / P^j_{1972m})$$

[5] The method actually used by the Netherlands Central Bureau of Statistics is equivalent to the method just described, but involves the calculation of provisional base prices. I think the procedure described above is easier to perform and to understand.

[6] The number 78 in (3.8) is the sum of the digits from 1 to 12.

[7] The seasonally adjusted estimates may be benchmark adjusted to match the calendar year annual estimates, but they will not match all possible fiscal year annuals. The only series that will do this is the original unadjusted series.

[8] OAS benefits are not adjusted downward if there is a decline in the CPI so it is possble that payments might be adjusted upward indefinitely even if the CPI movement represented a seasonal movement around a stable price level. Given the current inflationary environment, such a scenario is purely hypothetical.

[9] They should not be revised for errors in the unadjusted series for which the unadjusted series cannot be revised.

Chapter 4

CUMULATIVE AND MOVING AVERAGE INDEXES

4.1 The Mudgett Formula

The index suggested by Mudgett [1955] has the formula

$$I_{ym/0} = \sum_{i}^{m} \sum_{j} P^{j}_{yi}\, Q^{j}_{ci} \Big/ \sum_{i}^{m} \sum_{j} P^{j}_{0}\, Q^{j}_{ci} \qquad (4.1)$$

where P^{j}_{yi} is the price of commodity j in month i of year y.

Q^{j}_{ci} is the quantity purchased of commodity j in the same month of basket reference period c.

It can be seen than this formula defines a cumulative index over the months of a year, with the January value based on January prices, the February value based on January and February prices, the March values based on prices for January through March, in each case compared to average base year prices. The December value, based on prices for January through December, also represents the annual value of the index.

(4.1) is the cumulative variant of (2.7), the Rothwell formula, although a cumulative index could be based on any other price index formula. Mudgett [1955; p.94] mentions the possibility of seasonal Paasche and Fisher cumulative indexes. One could also calculate a cumulative variant of the Balk formula.

Why Mudgett would wish to calculate CPIs for seasonal commodities cumulatively and CPIs for non-seasonal commodities non-cumulatively he does not say, although such an inconsistency in approach seems to require an explanation. In Chapter 2, it was explained that if all 12 monthly baskets are identical, the Rothwell formula reduces to the fixed-basket formula. Therefore, given identical monthly baskets, the Mudgett formula, being the cumulative variant of the Rothwell formula, reduces to the cumulative variant of the fixed-basket formula. The monthly movements of a Mudgett index indicate the change in the price level for all months of the calendar year up to and including the given month compared to all months of the same year up to and including the previous month. For example, the July change would indicate the change in prices for January-July compared to the first half of the year. The use of the Mudgett formula for seasonal commodities in the CPI would be inconsistent with the use of the fixed-basket formula for non-seasonal commodities.

The monthly changes of the Mudgett index fail the identity test. If prices of all commodities are the same in June and July, the Mudgett index will generally show non-zero index change for July, since the June to July movement of the index is based on the difference between January-June and January-July price levels. And even if prices of all commodities are the same for all months from January through July, the Mudgett index will still generally show non-zero index change for July. The Mudgett formula fails the identity test even when it is redefined for a cumulative index, since weight shifts between the periods being compared will cause the index to change even when there is no price movement. This is to be expected, since the Mudgett formula is the cumulative variant of the Rothwell formula, which fails the identity test for monthly index change.

The 12-month change for July 1985 in a Mudgett index provides a measure of pure price change for the change in price levels between January-July 1984 and January-July 1985. If prices are the same for each commodity in corresponding months of the two years, the change in the Mudgett index from July 1984 to July 1985 will be zero.

The Mudgett formula can be defended on the grounds that a seasonal-basket index might as well be designed to measure the cumulative monthly movement of the seasonal commodity group, since the monthly movement will be largely meaningless anyway, due to the distortion created by seasonal weight shifts. The latter will influence the measured cumulative monthly movement but for the most part, they will not have the same influence that they have on monthly movements.[1] Also, a Mudgett index would be a much smoother series than the corresponding Rothwell index because it is a cumulative index. This might be seen as an advantage, especially if no seasonally adjusted CPIs are to be published. And while the use of the Mudgett formula cannot be construed as a form of seasonal adjustment, a Mudgett index will have a smaller seasonal amplitude than the corresponding Rothwell index.

Against this, one must consider that in the Mudgett formula 12-month changes disappear along with monthly changes because it is a cumulative index. The 12-month change for July 1985 really measures the change from January-July 1984 to January-July 1985. One cannot argue, as one can for monthly changes, that 12-month changes are irrelevant for seasonal commodities.[2]

The Mudgett formula is not consistent in aggregation. Because it is a cumulative index, a Mudgett aggregate index cannot be calculated indifferently from basic group indexes or Mudgett subaggregates. It can be calculated indifferently from basic group indexes or Rothwell subaggregates.

Finally, there is a certain loss of information in going from an index to its cumulative variant. All values of a Mudgett index could be readily calculated from the corresponding Rothwell index but the contrary is not true. Or to put it another way it is easy to calculate cumulative price changes, given a Rothwell index, but it is impossible to calculate 12-month price changes given a Mudgett index. This, also favours the use of the Rothwell formula over the Mudgett formula.

4.2 The Diewert-French Formula

The Diewert-French index has the formula

$$I_{ym/0} = \left(\sum_{i=m+1}^{12} \sum_j P^j_{y-1i} \, Q^j_{ci} + \sum_{i=1}^{m} \sum_j P^j_{yi} \, Q^j_{ci}\right) / \tag{4.2}$$

$$= \sum_m^{12} \sum_j P^j_{0m} \, Q^j_{cm} \; ; \; m=1 \quad \text{to} \quad 11$$

For December (m=12), the index formula is

$$I_{y12/0} = \sum_m^{12} \sum_j P^j_{ym} \, Q^j_{cm} \Big/ \sum_m^{12} \sum_j P^j_{0m} \, Q^j_{cm} \tag{4.3}$$

which is also the formula for the ideal annual index, so that the December value represents an annual value. The Diewert-French index is thus based on a 12-month weighted moving average of prices centred on the given month. In fact, a Diewert-French index can be calculated as a simple 12-month moving average of the corresponding Old Canadian index or as a weighted 12-month moving average of the corresponding Rothwell index.[3]

In France, the CPIs for seasonal food groups and also flowers and plants are based on a 12-month moving average formula, although the calculation of the French indexes is complicated by their adoption of a 3-year base period, as described by Turvey [1979]. Another country which has adopted the same approach to seasonal commodities in the CPI is Luxembourg. A 12-month moving average index has recently been championed by Professor Diewert [1983], whence the name Diewert-French index.

Note that a 12-month moving average may be applied to price indexes calculated according to many different formulas. Diewert [1983] calculates series based on Paasche, Fisher and translog formulas as well as the Laspeyres formula. One might also apply a 12-month moving average to a Balk index.

The Diewert-French formula can be rewritten in terms of expenditure weights and component index numbers as

$$I_{ym/0} = \sum_{i=m+1}^{12} \sum_j {}_{oi}W^j_{ci} \, I^j_{y-1i/0}$$

$$+ \sum_{i=1}^{m} \sum_j {}_{oi}W^j_{ci} \, I^j_{yi/0} \; ; \; m = 1 \quad \text{to} \quad 11$$

$$I_{y12/0} = \sum_i^{12} \sum_j {}_{oi}W^j_{ci} \, I^j_{yi/0} \tag{4.4}$$

From (4.4) it can be readily seen that a Diewert-French index is really a special kind of fixed-basket index. Its weights are constant from month to month because each month incorporates prices for the last 12 months, weighted by same month expenditures. The Diewert-French index thus has the distinction of being a fixed-basket index which nonetheless has no difficulty in handling seasonally disappearing commodities.

Given identical monthly baskets, the Diewert-French formula reduces to a 12-month moving average of the fixed-basket formula. As with the Mudgett formula, there is a certain inconsistency in using the Diewert-French formula for seasonal commodity groups in the CPI and a fixed-basket formula for other commodity groups.

Again, like the Mudgett formula, the Diewert-French formula does not provide a measure of monthly or 12-month price changes. The monthly index change for July 1985 really represents price change from July 1984-June 1985 to August 1984-July 1985. The 12-month index change for July 1985 really represents an annual average index change from 1984 to 1985 for a fiscal year ending in July.

The Diewert-French formula is not consistent in aggregation. Because it is a moving average index a Diewert-French aggregate index cannot be calculated indifferently from basic group indexes or Diewert-French subaggregates; a Diewert-French aggregate index can be calculated indifferently from basic group indexes or Rothwell subaggregates.

If there is a loss of information in cumulating an index series, there is also a loss of information involved in taking a moving average. A Diewert-French index can be calculated from a Rothwell index but not vice-versa. The annual average price changes provided by the 12-month index changes of a Diewert-French series can also be calculated from a Rothwell series, but the 12-month price changes provided by a Rothwell index cannot be calculated from a Diewert-French index.

4.3 Comparison of Mudgett and Diewert-French Indexes

Table 4.1 shows the Mudgett and Diewert-French indexes calculated from Turvey's fresh fruit data. Both series are quite smooth, with coefficients of variation of .1071 and .1025 respectively.[4] The Diewert-French index, as one would expect, is the smoother of the two because it is a moving average index.

Note that the Mudgett index has the same January values as the Rothwell index (see Table 2.1). In a cumulative index based on the calendar year, January values will be identical with those of the corresponding non-cumulative index, which in the case of the Mudgett series is the Rothwell index. Note also that the Mudgett index falls in January, indicating that January's price level is lower than that of the preceding year, while the Rothwell index rises sharply in the same month, indicating that January's price level is higher than December's.

The Rothwell index peaks in August and so does the Mudgett index but its seasonal amplitude is considerably less than that of the Rothwell index, because it is its cumulative variant. The Diewert-French index has no seasonal pattern but forms a monotonically increasing series.

For both the Mudgett and Diewert-French series, the December monthly values are also the annual values. Both formulas have the same annual series, the ideal annual index.

Note the 12-month percent changes of the Mudgett and Diewert-French indexes in Table 4.2. The 12-month changes of the Diewert-French index form a smooth series, rising till March 1972, then falling through March 1973, and rising thereafter. Because it is a cumulative index each 12-month change in a Mudgett index is a different animal from that of the preceding or subsequent month and there is no pattern in its 12-month changes.

There is little doubt that, between the Mudgett and the Diewert-French formula, the latter is the more useful. The Mudgett formula has never been employed in the CPI of any country, as has the Diewert-French formula. Only the second formula can claim to be a fixed-basket formula, albeit of a special kind. It can also claim to provide a seasonally adjusted price index series; the Mudgett formula creates a smooth series, but without eliminating seasonal variation.

4.4 The Lag in the Diewert-French Index

Using a 12-month moving average of the data amounts to its seasonal adjustment; in fact, both seasonal and irregular price movements will tend to be washed out by taking a 12-month moving average, yielding a trend-cycle series. There is a lag in the index because this moving average is centred on the final month, e.g., the average of January-December is assigned to December, rather than to June or July.

This is necessary in the French CPI because its estimates are never revised. If the January-December average were assigned to June or July there would have to be a 5 or 6 month revision period. In any case, a 12-month moving average centred on June or July would still not be centred in the middle of the year; one would have to take a 12-month moving average of a 12-month moving average, e.g., a 13-month centred moving average to obtain such centred estimates. Then the annual values would not match those of the ideal annual index.

The lag in reflecting changes in price movements and their dampening by averaging them with those of other months are two controversial features of the Diewert-French formula. They have been criticized from time to time in France, where the CPI is used very widely as an escalator.[5] One such occasion arose in the aftermath of a severe drought that hit Europe in the summer of 1976. The drought destroyed much of the vegetable crop, pushing up fresh vegetable prices. (See Boursin [1979; pp.118-123]). The next year there was a normal harvest and prices fell.

In September 1977 the 12-month percent change of fresh vegetables in the French CPI was 30.7% as opposed to -32.0% in the CPI of the Federal Republic of Germany. This was in spite of the fact that most fresh vegetables fell in price between September 1976 and September 1977, as can be seen from Table 4.3.

The CPI for the FRG does not employ a moving average formula for seasonal food groups, so changes in food prices have their full impact in the month they occur. The FRG index thus shows a steep drop in prices with the September 1977 harvest. In the French index the movement from September 1976 to September 1977 is based on a comparison of prices in October 1976-September 1977 to those in October 1975-September 1976. Thus, the unusually high prices brought about by the failure of the 1976 crop caused the French index to register a large 12-month increase, although prices in September 1977 were much lower than they were a year ago.

Boursin notes that such anomalies tend to undermine the credibility of an official series and concludes: *"the contractual use of the index, in our opinion, turns the scale against this correction"* [6], i.e., against the use of the Diewert-French formula. One might add that the use of the CPI as a deflator would seem even less compatible with such a formula. Because the French CPI for vegetables rises instead of falls from September 1976 to September 1977 a constant dollar series for vegetable sales calculated using that series as a deflator would estimate the September-to-September change in vegetable consumption with a severe downward bias.

The Diewert-French formula also suffers from being inconsistent with the fixed-basket formula used for non-seasonal commodities. If the CPI for seasonal commodities is based on the Diewert-French formula it is a 12-month moving average of a Rothwell index. To be consistent, the CPI for non-seasonal commodities should be a 12-month moving average of a fixed-basket index. If the All-items CPI were constructed in this way, only annual average comparisons of price movement could be made, but at least they would be made consistently. One might even argue that a CPI constructed in such a way as to make comparisons of price movement between two single months impossible would be a salutary development in terms of the CPI's primary role as an escalator. Users would thus effectively be prevented from making escalation adjustments for every blip in the measured rate of inflation. But the CPI should not be calculated partly based on a 12-month moving average and partly on some other basis. This is why statisticians at the INSEE (Institut national de la Statistique et des Etudes economiques) in France are reviewing the present French methodology for seasonal commodities in the CPI with a view to its replacement.

In the last chapter (see 3.5), it was argued that both unadjusted and seasonally adjusted CPI series are useful and both should be calculated, the latter with a sufficient revision period to allow for data revisions arising from the seasonal adjustment method. A Diewert-French index is essentially a trend-cycle series, with most seasonal and irregular variation in price movement removed. If one is interested in trend-cycle estimates for the price movement of a seasonal commodity group, a better trend-cycle series could be derived by calculating the aggregate index using the Rothwell formula and then using a standalone program such as X11-ARIMA to derive its trend-cycle. Such a series would not be distorted by a 6-month lag and would also be better calculated in other ways.

Like the seasonal-basket indexes with monthly base prices, moving average indexes have been the official CPIs for seasonal commodities in several foreign countries due to the historical evolution of the CPI as a non-revisable series for which only one set of estimates are published. There would be no reason for the use of these moving average indexes if both unadjusted and seasonally adjusted CPIs were published, with the seasonally adjusted estimates subject to revision.

4.5 Other Moving Average Indexes

Italy uses a 13-month moving average of price relatives in calculating its fresh fruit CPI. The mean price of the cheapest fruits in each month of the base period is calculated to obtain monthly base prices. For the current months the mean price of the cheapest fruits in each month is calculated. These fruits are not necessarily the same as the cheapest fruits in the same month of the base year. The ratios of simple mean price in each month to the same month of the base year are estimated and a 13-month backward moving average gives the final index. This method, which really does resemble a true cost-of-living index in its allowance for substitutability among fruits, requires no expenditure weights since the index basket may change from month to month.

This method neatly solves the same problem of seasonal instability of purchases that Balk dealt with in creating the Balk formula, without requiring revision of the index series. A fruit that is normally priced in a given month may be dropped from the basket if there has been a poor harvest that year; a fruit that is normally not priced in a given month may be included in the basket if there is an unusually good harvest or an unusually abundant supply of imports. One may wonder, however, if taking the average of the prices of the cheapest fruits is not too crude a paradigm of consumer choice, especially since the Italian CPI, like the official CPI, refers to all urban households and not just to wage earners or low-income families. As to the moving average procedure itself, the Italian index is subject to the same criticisms as the French index.

In Belgium and in the Netherlands, a 3-month backward moving average of index numbers is calculated for seasonal food groups, that is, a seasonal-basket index for a seasonal food group is first calculated and then transformed by taking a 3-month moving average. This use of moving averages relates to the irregularity and unstable seasonality of the price movement of many seasonal food commodities.

The use of a moving average of 3 months is subject to the same criticisms as the use of one of 12 months. It is inconsistent to transform some but not all commodities by a 3-month moving average, and the moving average index will lag actual price change. On the other hand, there is only a 1-month lag using a 3-month moving average, as opposed to a 5 1/2-month lag using a 12-month moving average. The distortion created by this lag may be more than compensated by the removal of noise from the index series. It may well be safer to base a series on a 3-month moving average if the seasonal pattern is highly variable. Suppose that a sudden frost at the end of August pushed up peach prices in September. The large and unusual increase in peach prices in that month would receive a considerable weight in a seasonal-basket index because usually purchases would be substantial. In this case, though, the value of purchases would not be large, since it is the limited supply of peaches that are pushing up the price. In a Balk price index, the given year's seasonal pattern would be adopted and there would be no great harm, but the Balk formula cannot be used in an official CPI (see 2.8). At least, if a 3-month moving average index were calculated, the September price increase would be dampened by averaging with July and August.[7]

The use of 3-month moving averages does, however, have certain other inconveniences, notably, that if weighting is based on basket reference period quantities then the sum of monthly expenditure weights based on 3-month moving average prices would not equal the annual expenditures at annual prices. Given the logic of the situation, it would probably be best to calculate the annual weights as the sum of the monthly weights, but their divergence from actual annual expenditures would certainly be a drawback to the use of 3-month moving average indexes.[8]

It is likely that much of the noise in seasonal food series that one might remove using moving averages comes from quality variations from month to month in the varieties priced. Waugh [1929] has shown that much of the quality variation in fresh produce stems from quantifiable attributes to which shadow prices may be assigned using hedonic regression techniques. A more careful and scientific adjustment for quality variation might render unnecessary the use of moving averages in price indexes for fresh fruit and vegetables.

Table 4.1: MOVING AVERAGE INDEXES FOR FRESH FRUIT

Date	Mudgett	Diewert-French
1970		
Jan	93.7	—
Feb	92.3	—
Mar	91.0	—
Apr	92.1	—
May	96.0	—
Jun	98.7	—
Jul	100.6	—
Aug	102.3	—
Sep	101.7	—
Oct	100.8	—
Nov	100.6	—
Dec	100.0	100.0
Year	100.0	100.0
- - - - - - - - - - - -		
Jan	98.5	100.4
Feb	99.6	101.2
Mar	100.2	102.2
Apr	102.3	103.0
May	106.8	103.9
Jun	109.3	103.9
Jul	111.5	105.9
Aug	113.4	107.1
Sep	112.7	108.1
Oct	112.1	109.2
Nov	112.4	110.7
Dec	111.9	111.9
Year	111.9	111.9

Moving Average Indexes for Fresh Fruit (continued)

Date	Mudgett	Diewert-French
1972		
Jan	113.6	113.2
Feb	113.5	114.2
Mar	114.1	115.2
Apr	116.0	116.0
May	120.2	116.8
Jun	121.9	117.7
Jul	124.4	118.9
Aug	126.8	120.4
Sep	125.6	121.5
Oct	125.2	122.8
Nov	125.8	124.2
Dec	125.3	125.3
Year	125.3	125.3
- - - - - - - - - - - -		
1973		
Jan	124.6	126.2
Feb	125.1	127.2
Mar	126.5	128.2
Apr	129.1	129.2
May	133.8	130.2
Jun	135.3	131.4
Jul	138.2	132.7
Aug	141.7	134.8
Sep	140.2	136.0
Oct	140.0	137.4
Nov	141.0	139.2
Dec	140.3	140.3
Year	140.3	140.3
- - - - - - - - - - - -		
Coefficient of Variation	.1071	.1025

Table 4.2: MOVING AVERAGE INDEXES FOR FRESH FRUIT

Date	Monthly Percent Change: Mudgett	Monthly Percent Change: Diewert-French	12-Month Percent Change: Mudgett	12-Month Percent Change: Diewert-French
1970				
Jan	—	—	—	—
Feb	-1.5	—	—	—
Mar	-1.3	—	—	—
Apr	1.2	—	—	—
May	4.3	—	—	—
Jun	2.8	—	—	—
Jul	1.9	—	—	—
Aug	1.6	—	—	—
Sep	- .6	—	—	—
Oct	- .9	—	—	—
Nov	- .2	—	—	—
Dec	- .6	—	—	—
1971				
Jan	-1.5	.4	5.1	—
Feb	1.1	.8	7.9	—
Mar	.6	1.0	10.1	—
Apr	2.1	.8	11.1	—
May	4.4	.8	11.2	—
Jun	2.3	.9	10.6	—
Jul	2.1	1.0	10.8	—
Aug	1.7	1.1	10.9	—
Sep	- .7	.9	10.7	—
Oct	- .5	1.1	11.2	—
Nov	.3	1.4	11.7	—
Dec	- .4	1.1	12.0	11.9

Moving Average Indexes for Fresh Fruit (continued)

Date	Monthly Percent Change: Mudgett	Monthly Percent Change: Diewert-French	12-Month Percent Change: Mudgett	12-Month Percent Change: Diewert-French
1972				
Jan	1.5	1.1	15.3	12.7
Feb	- .1	.9	13.9	12.8
Mar	.6	.9	13.9	12.8
Apr	1.6	.7	13.3	12.6
May	3.6	.6	12.5	12.4
Jun	1.5	.8	11.6	12.3
Jul	2.1	1.0	11.6	12.3
Aug	1.9	1.3	11.8	12.5
Sep	- .9	.9	11.5	12.4
Oct	- .3	1.0	11.8	12.4
Nov	.4	1.2	12.0	12.2
Dec	- .4	.8	11.9	11.9
1973				
Jan	- .5	.7	9.7	11.5
Feb	.4	.8	10.3	11.4
Mar	1.1	.8	10.9	11.2
Apr	2.1	.8	11.4	11.4
May	3.6	.8	11.4	11.5
Jun	1.1	.9	11.0	11.6
Jul	2.1	1.0	11.1	11.9
Aug	2.5	1.6	11.8	11.9
Sep	-1.0	.9	11.6	11.9
Oct	- .1	1.0	11.8	11.9
Nov	.7	1.3	12.1	12.0
Dec	- .5	.8	12.0	12.0

Table 4.3: PRICES IN THE PARIS METROPOLITAN AREA (Francs per kg)

Food Item	September 1976	September 1977	% Change
Carrots	2.85	1.57	-44.9
Cauliflower	3.88	3.34	-13.9
Green beans	10.02	10.85	8.3
Lettuce	6.74	4.94	-26.7
Pears	5.59	3.04	-45.6
Old Potatoes	2.62	.65	-75.2
Tomatoes	3.89	4.28	10.0

4.6 Endnotes

[1] The exception is the January movement, where the shift from the annual weighting pattern to the January weighting pattern is likely more violent than any monthly weight shift.

[2] In a Mudgett index, the January values are identical to those in the corresponding Rothwell index, so the January-to-January change provides a measure of pure price change.

[3] The weights used in deriving a Diewert-French index from a Rothwell index are the same weights used to derive the ideal annual index from the Rothwell index.

[4] To ensure comparability, the coefficients of variation for both the Mudgett and Diewert-French indexes were calculated from December 1970, the first month for which the Diewert-French index can be calculated. The coefficient of variation of the Mudgett index from January 1970 is .1314.

[5] Among other things it is used to index the S.M.I.C. (salaire mininum interprofessionel de croissance), the French minimum wage, to which many other contracts are linked. (See Courtheoux [1974; pp.64-67]).

[6] "L'utilisation contractuelle de l'indice, fait a notre avis, pencher la balance contre cette correction". (Boursin[1979; p.123])

[7] In the official CPI, there has also been averaging of prices of seasonal commodities over several months. Until 1985, when they were dropped from the CPI basket, prices for fresh corn and fresh strawberries were collected from the several months of the year that they were in-season. The index for each item was changed in one month each year to reflect the change in average in-season price for that year compared to the previous year.

[8] There is nothing sacrosanct about a moving average span of 3 months. 2-month and 4-month spans might also be considered. A 5-month span would probably be too long, imposing a 2-month lag on the index.

Chapter 5

COMPARATIVE PRICE INDEXES FOR FRUIT AND VEGETABLES

5.1 Scope of the Indexes

In Chapters 2-4, Turvey's fictive data for fresh fruit was used to calculate price indexes for the different formulas that were discussed. This chapter shows comparisons based on actual Canadian data foı fruit and vegetables. It indicates some of the choices that must be made in implementing a seasonal-basket price index. It also gives some idea of the empirical importance of differences in index formulas, although, as noted below, in some ways the data used tends to understate the differences between formulas, due to the treatment of seasonally disappearing items.

The formulas for which indexes are calculated include the standard fixed basket formula, whose series are shown under the label *"official concept"* in the table since this is the formula now used by Statistics Canada for all commodities, seasonal and non-seasonal. The other formulas shown are the Old Canadian and Rothwell from Chapter 2 and the Diewert-French from Chapter 4.

The price indexes used to generate the comparative series are Laspeyres indexes with a 1978 base period. These are not the official CPI series, since the official CPI is a chain fixed-basket series, but they were linked to the official CPI values for March 1982 to obtain the CPI series for April 1982 to December 1984. December 1984 was the link month for updating the CPI from a 1978 to a 1982 basket. The 1978-based series was calculated for 1978-1984, which explains why this is the estimation period of the comparative price indexes.

Monthly expenditure data for Canadian households is available only for food, so that any seasonal-basket indexes calculated based on Canadian data must be restricted to seasonal food groups, barring special enquiries.

Of the seasonal food groups, fresh fruit and vegetables show the most pronounced seasonality in their purchases. These are the only commodity groups given the special treatment reserved to seasonal commodity groups in every official CPI where the distinction is made, and so comparative indexes were calculated for each of these groups.

It may be less obvious why indexes should be calculated for total fruit and vegetables, including processed fruit and vegetables, rather than for fresh fruit and vegetables only. The seasonality in purchases of processed foods is much less pronounced than that of fresh foods; there is negligible price seasonality for most processed fruit and vegetable items. However there is substitution between fresh and processed fruit and vegetables in different months of the year, and the month of peak seasonal purchases for a fresh item will correspond to the seasonal trough of its processed counterpart. The monthly purchases of total fruit and vegetables are thus more stable than those of fresh fruit and vegetables only. This is important to the inclusion of a seasonal-basket index in the CPI, since in most countries, the seasonal-basket index will itself have a fixed weight at the group level, with seasonal variations only in the weighting of components within the seasonal group. It is therefore desirable that the seasonal group's total expenditures should not rise or fall dramatically from month to month. In the United Kingdom (see Retail Prices Index Advisory Committee [1975]) all fruit and vegetables, including processed items, are calculated according to a seasonal-basket formula because of this consideration.

5.2 Expenditure Weights

Monthly expenditure weights for the fruit and vegetable series were derived using estimates from the Urban Family Food Expenditure Survey program conducted by Consumer Income and Expenditure Division of Statistics Canada. The Urban Family Food Expenditure Survey is a diary survey; for each month of a survey year an equal number of respondents are asked to keep diaries of their food expenditures over a 2-week period. Respondents record both dollar expenditures and quantities purchased, e.g. the number of grapefruit or the number of kilograms of potatoes purchased.

Two sets of monthly expenditures were calculated, based on the seasonal patterns for 1 year and for 3 non-contiguous years. In both cases, the annual expenditures corresponded to estimates from the 1978 Urban Family Food Expenditure Survey (1978 FFEX). Only the distribution of these expenditures over the months of the year was different.

The first set of expenditures was based exclusively on the 1978 FFEX. The average weekly food quantities per month were multiplied by the 1978 unit prices to derive monthly expenditure estimates in 1978 constant dollars.

For the second set of expenditure estimates average weekly food quantities from the 1978 FFEX were pooled with those from the 1974 FFEX and the 1976 FFEX. An average of the three sets of estimates was taken, weighted by the number of households in each sample. These quantities were then multiplied by the 1978 unit prices and prorated to 1978 annual expenditures to derive monthly expenditures in 1978 constant dollars. The 1976 FFEX covered only 8 cities, since 1976 was never intended to be a CPI basket reference year.[1] These changes in the number of cities from one year to another may influence the seasonal pattern of expenditures, but no adjustment was made for this in deriving pooled estimates of average quantities purchased.

At least two countries already publish official seasonal-basket indexes whose monthly expenditure weights are based on a multi-year seasonal pattern. For the fresh fruit and vegetables component of its CPI, the Israel Central Bureau of Statistics combines annual Family Expenditure Survey data with monthly data on marketings by licensed wholesalers. The latter estimates are pooled for a period of 3 contiguous years that overlap the year of the Family Expenditure Survey (see Israel [1968; pp.72-73]). The Central Statistical Office of the United Kingdom takes the annual weights for the British agricultural prices indices from the values for one year's marketing but the monthly weights are distributed over the annual weights using quantities marketed for 4 years up to and including the basket reference year of the annual series (see Carter and Richards [1975]).

Neither set of monthly estimates was wholly satisfactory but the 3-year average estimates seem more reliable than those derived from 1978 alone. The results for all series will not be reproduced here, but Table 5.1 shows comparative monthly estimates for 3 important items in fruit and vegetables. For apples, the amplitude of monthly expenditures is not so large for the 3-year estimates as for the 1-year estimates; there is an anomalous fall to below average purchase levels in February for the 1-year estimates which one does not see in the 3-year estimates. For pears and tomatoes, the 3-year average estimates again show a smaller amplitude than the 1-year estimates. The September values for tomatoes are particularly striking. The 1-year estimate for September is 3.5 times the average monthly value; the 3-year estimate is only one third larger. However, the differences between the two sets of estimates should not be exaggerated; they both show similar seasonal patterns.

All comparative indexes were calculated according to both sets of weights, but only those indexes based on a 3-year average seasonal expenditure pattern are reproduced here. The other series are available on request.

5.3 Description of Indexes

Appendix B contains a computer listing of the series calculated. Separate indexes were calculated for fruit and vegetables and its 4 major groups, fresh fruit, processed fruit, fresh vegetables and processed vegetables.

The X11-ARIMA program was used to calculate both seasonally adjusted and trend-cycle series for the price indexes. The tables for the seasonally adjusted series are shown in Appendix B; those for the trend-cycle series are available on request. The Diewert-French formula's 12-month moving average tends to eliminate both the seasonal and irregular components of price change from the indexes, so that they are not strictly comparable with the indexes based on other formulas. The Diewert-French series are more comparable with the seasonally adjusted versions of these series and more comparable still with their trend-cycle estimates. In the three sets of tables for the original series, the seasonally adjusted series and the trend-cycle series, the original Diewert-French index is used for all tables, it being basically a trend-cycle series.[2] For the seasonally adjusted and trend-cycle tables the Diewert-French series is shown twice, once as a December-centred moving average series and once as a June-centred moving average series, e.g. the June index number equals the annual. The latter series is more in phase with the other indexes, although it could not be the basis of an official CPI series, unless CPI estimates could be revised 6 months backward.

First, consider the tables for the original series. Of all the series, the Old Canadian index shows by far the greatest amplitude in its seasonal movement, and a much different seasonal pattern from the official concept and Rothwell indexes. The seasonal peaks of its series correspond more to the seasonal pattern of purchases than of prices. The fresh fruit index peaks in September and the fresh vegetables index in August. These are months that see sharp price declines in the official concept and Rothwell series.

Only the Old Canadian index shows a pronounced seasonal pattern for the processed fruit and processed vegetable series. The first series peaks in March or May, the second in January. Again these seasonal peaks correspond to months of peak purchase volumes rather than months of peak prices.

The official concept and Rothwell indexes are, on the other hand, remarkably similar in their seasonal pattern, exhibiting the same seasonal peaks and troughs for all series. Notice, however, that the Rothwell indexes for fresh fruit and fresh vegetables are smoother series than the official concept series, with reduced seasonal amplitudes. Most seasonal food items show more extreme price variations in their off-season months, when they are in short supply. By giving the same weight to seasonal commodities in these months as in the months when they are in good supply, a fixed-basket index tends to be more volatile than a seasonal-basket index; one might add more volatile than is justified. Smoothness in a statistical series is not a virtue in itself, but here the greater smoothness of the Rothwell series compared to the official concept series is a point in its favour.

The tables showing the percent change for the annual indexes point up, among other things, the loss involved in calculating a Rothwell annual index as a simple rather than as a weighted average of the monthly index. This can be particularly clearly seen for fresh vegetables. In 4 out of 6 years, there is more than .5% difference between the percent changes shown for the Rothwell and Old Canadian indexes (the Old Canadian and Diewert-French annual indexes are of course identical with the ideal annual index). In 1979, 1982, 1983 and 1984, the official concept index actually comes closer to the percent changes of the ideal annual index than does the Rothwell index. To the author these results indicate the practical value of calculating the annual index for a monthly Rothwell index as a weighted average of the monthly index numbers rather than a simple average, but others might not draw the same conclusions from the data. It could be argued that a gap of almost 1% in the percentages recorded for fresh vegetables in 1984 is acceptable when the percentages for both series are in the range of 12%.

The month over same month of preceding year percent changes of the Old Canadian and Rothwell indexes should be identical but are sometimes slightly different in the tables due to rounding error.

There is not much difference between the seasonally adjusted series whether based on a fixed-basket, Old Canadian or Rothwell formula. None of these indexes are as smooth as the Diewert-French index, however. No seasonally adjusted tables are shown for processed vegetables, since there was no evidence of seasonality in that series for either the official concept index or the Rothwell index.

The trend-cycle estimates provide series with which the Diewert-French series are really comparable. In comparing the trend-cycle series for any of the first 3 indexes with the December-centred Diewert-French index, its lag in incorporating price changes is obvious, but the June-centred index is in phase with the other index series. Comparing the Diewert-French indexes with their counterparts suggests that the former may have squeezed out some of the cyclical movement of prices along with the seasonal and irregular movement. For example, from June 1982 to February 1983 the fruit and vegetables trend-cycle index shows a steady decline for all three indexes (official, Old Canadian and Rothwell); the Diewert-French index only declines from July 1982 to October 1982.

5.4 Under-representation of Highly Seasonal Items in the Official CPI

One might ask why the differences between seasonal-basket and fixed-basket indexes are not greater than they are. The discrepancies between the Rothwell and official concept indexes for fresh fruit are very small compared to the differences between corresponding indexes generated from Turvey's fresh fruit data. (For instance, compare the values for Japan and Canada.)

Partly, this is due to the underrepresentation of seasonally disappearing items among priced items in the fresh fruit CPI. Table 5.2 shows the average 1978 expenditures on fresh fruit items, with " x " designating priced items and seasonally disappearing items. (A commodity that showed nil purchases in at least one month of the year is considered to be seasonally disappearing, although in some cases it may disappear from the FFEX sample without disappearing altogether from the market.) Of 4 seasonally disappearing commodities comprising 10% of fresh fruit expenditures, not one is priced. Futhermore, grapes and melons, not seasonally disappearing items, but important fruits with highly seasonal purchases, are also not priced. Except for strawberries, highly seasonal and seasonally disappearing items are unrepresented in the priced sample, although they account for over a quarter of fresh fruit expenditures.[3]

The selection of priced items within a commodity group is judgemental in the Canadian CPI. There is not, as there is in the United States, a random selection with probability of selection proportional to size of expenditures. Thus the exclusion of highly seasonal items is probably deliberate and is a reflection of the unsuitability of a fixed-basket index for dealing with highly seasonal items. If the fixed-basket formula were well-suited to such items, official statisticians would not deliberately exclude them from the pricing sample.

The changes in the pricing sample for the official CPI is most indicative. Highly seasonal commodities such as turkey, grapes and fresh peaches, strawberries and corn became priced items only with the updating to a 1957 basket, when the seasonal-basket formula was modified. (See Dominion Bureau of Statistics [1961] and Foster [1960a]). All of these commodities except turkey and grapes were deleted from pricing when the fixed-basket formula was extended to seasonal food groups with the updating for 1967 expenditures; lamb was also dropped from the price sample. There have been additions and deletions of highly seasonal items for pricing in subsequent updatings, but they have never been as well represented in the CPI as they were when a seasonal-basket formula was employed for seasonal food groups.

Table 5.1: COMPARISON OF AVERAGE WEEKLY EXPENDITURE IN 1978 CONSTANT DOLLARS

	APPLES		PEARS		TOMATOES	
DATE	1-YEAR	3-YEAR AVG	1-YEAR	3-YEAR AVG	1-YEAR	3-YEAR AVG
Jan	.707	.670	.197	.150	.215	.300
Feb	.612	.670	.063	.090	.271	.340
Mar	.691	.710	.096	.090	.264	.340
Apr	.618	.620	.074	.090	.280	.370
May	.535	.630	.103	.090	.289	.420
Jun	.542	.480	.033	.040	.412	.520
Jul	.320	.370	.028	.070	.468	.580
Aug	.314	.330	.110	.130	.485	.680
Sep	.756	.710	.444	.370	1.480	.570
Oct	.907	.950	.197	.210	.236	.290
Nov	.806	.710	.100	.130	.235	.330
Dec	.575	.580	.068	.090	.285	.310
Year	.620	.620	.130	.130	.420	.420

Table 5.2: PRICING OF FRESH FRUIT ITEMS IN THE CPI (1978 BASKET)

Item	Average Weekly Expenditure	Seasonally Disappearing Item	Priced Item
Oranges	.44		x
Bananas	.31		x
Apples	.62		x
Grapefruit	.12		x
Strawberries	.08		x
Raspberries	.01	x	
Grapes	.37		
Peaches	.12	x	
Melons	.12		
Cherries	.05	x	
Plums	.08	x	
Pears	.13		x
Lemons	.04		
Pineapples	.01		
Other & Unspecified Fresh Fruit	.18		
Total Fresh Fruit	2.68		

5.5 Endnotes

[1] The 1974 FFEX covered 14 cities. The 1978 FFEX covered the same 14 cities plus Charlottetown and Summerside in Prince Edward Island, to provide a weighting pattern for the Charlettetown-Summerside CPI. Both 1974 and 1978 were basket reference years for the official CPI.

[2] The Diewert-French series were seasonally adjusted using the X11-ARIMA program. The fresh vegetables and fruit and vegetables series failed the quality control test; e.g. they were marked as series in which identifiable seasonality is not present. The other three series passed quality control, which suggests that the 12-month moving average left residual seasonality in the series. However, it is only fair to add that the first of these series, fresh fruit, failed the F test for stable seasonality. For the other two series, processed fruit and processed vegetables, the computer printout contained the following warning message: **"due to the small residual mean square error all the analysis of variance tests for this series may be invalid"**. For none of these series was it judged appropriate to replace the original series by its seasonally adjusted counterpart in the tables of seasonally adjusted series.

[3] For fresh vegetables, there does not seem to be a deliberate exclusion of highly seasonal items from the priced sample. Fresh corn, the only seasonally disappearing item in the group, is priced; cucumber, which is highly seasonal, is also priced.

Chapter 6

SEASONAL CHAIN INDEXES

6.1 Chain Index Drift

In many ways the problems involved in calculating a monthly CPI over different months of the year are similar to the problems involved in calculating an annual CPI over the course of many years. In both cases, the changes in relative quantities purchased from one period to another undermine the appropriateness of a fixed-basket formula. But the changing trend of consumer purchases over many years never exhibits such strong shifts as can be found within the months of a single year, particularly in a country with such pronounced seasons as Canada. It takes time for new products to achieve a significant market penetration, whether they be microwave ovens, video cassette decks or home computers. Similarly, sales of wringer washing machines and black and white TV sets only gradually decline as their markets are taken over by electric washers and colour TV sets. But within a matter of months, every year, purchases of motorcycles, lawnmowers, fertilizer, baseball bats and sandals virtually cease, to be replaced by purchases of snowmobiles, snowblowers, rock salt, hockey sticks and snowboots.[1]

The continuity of the CPI over many years is preserved by calculating it as a chain index, linking in series based on updated expenditures every so many years. One might think that the problem of seasonal commodities can be solved in a similar way, linking every month. Unfortunately, this is not so, for two reasons:

1. a chain fixed-basket index will have the same problems that a direct fixed-basket index has in handling seasonally priced commodities;

2. if there is a strong correlation between price and quantity movements, a chain index will tend to drift above or below the corresponding direct index, generating an implausible index movement.

Regarding the first point, consider a chain Laspeyres index applied to Turvey's fruit price data. Since July weights would apply to August, strawberries would have a considerable influence on the August index movement, although they are out-of-season in that month. Similarly, since October weights would apply to November, peaches would have some influence on the November index, although peaches are then out-of-season. This creates the same problem of imputation as exists for a direct fixed-basket index.

That problem, however, is not as serious for a chain index as it is for a direct index. If one rejects the assignment of fictive prices in calculating a direct fixed-basket index one must exclude both peaches and strawberries from the aggregate altogether. If one does the same thing in calculating a chain fixed-basket index one need only exclude strawberries from the August movement and peaches from the November movement. They can still be included in the index for other months.[2]

Regarding the second point, Zarnowitz [1961] has supplied an excellent example of how seasonal chaining can cause a price index to drift upwards or downwards although there is no trend in prices whatsoever, only a seasonal movement. Table 6.1 shows the price and quantity data for the 2 items in his model, with corresponding direct and chain price indexes calculated according to the Laspeyres, Paasche and Fisher formulas.

It can be seen that none of the chain price indexes satisfy the proportionality axiom (see Eichhorn [1983; p.417]) of a price index. Although the prices are the same in the same quarter of each year, the quarterly values for year 2 are not equal to those of year 1. The chain Laspeyres index shows a pronounced upward drift, being almost 50% higher in the third quarter of the second year than in the same quarter of the first. The chain Paasche index shows just as pronounced a downward drift, falling 70% between the third quarter of one year and the next. The chain Fisher index, being an average of the other two chain indexes, does not show such a dramatic difference from its direct counterpart. Still it does not satisfy the proportionality axiom either, and drifts slightly, like the chain Paasche index, in a downward direction.

Zarnowitz did not develop any theoretical apparatus to indicate that his specific example illustrated a general property of chain indexes, but lately Szulc [1983] has done so. Without going into the details of his paper, he concludes that if there is a negative correlation between prices and quantities and if relative prices of commodities reverse their movement from link period to link period, then

1. the chain Laspeyres index will drift above its direct counterpart,

2. the chain Paasche index will drift below its direct counterpart.

The reversal of relative price movements among commodities and a large negative correlation between prices and quantities are of course characteristics of seasonal commodities; therefore one would generally expect seasonal chain indexes to drift as they do in Zarnowitz's model.

Obviously, a chain price index, whatever its formula type, would not reduce to a direct fixed-basket index in the case where all of its monthly baskets are equal. This is another reason the use of seasonal chain indexes would seem ill-advised in the CPI.

6.2 Chain Indexes for Fresh Fruit

Table 6.2 shows seasonal chain indexes calculated using Turvey's fresh fruit data according to Laspeyres, Paasche and Fisher formulas.[3] It can be seen that the seasonal chain Paasche index drifts downward as expected, but the seasonal chain Laspeyres index does not drift upward as does its counterpart in Zarnowitz's model; in fact, its level as of December 1973 is below 100, and barely above the level for the same month in 1973. Consequently the seasonal chain Fisher index also declines, but at a slower rate than the chain Paasche index.[4] This downward drift of the chain Fisher and chain Laspeyres indexes, so contrary to expectations, requires some explanation. There are two main reasons for this.

First, no imputation was made for the prices of seasonally disappearing items in their out-of-season months in calculating these seasonal chain indexes. The August chain Laspeyres link relative is based on July expenditures. Strawberries have a positive expenditure in July but are out-of-season in August so they were excluded in calculating the August chain Laspeyres movement. Similarly, the May chain Paasche link relative is based on May expenditures. These were positive for strawberries in May, but because strawberries were out-of-season in the base month (April) of the May link relative they were excluded in calculating the May chain Paasche movement.

Table 6.3 shows what the seasonal chain Laspeyres index would look like with a price imputation for the first out-of-season month for seasonally disappearing items. The price imputed is the highest in-season price previously recorded, which is, of course, a lower bound on the true price at which the out-of-season fruit might be available. (See Chapter 8 for a discussion of imputation for seasonally disappearing items). In spite of this conservative assumption concerning the price movement for the first out-of-season month, the second seasonal chain Laspeyres index shows the expected upward drift from year to year, with the index level more than doubling over 4 years.

But the treatment of seasonally disappearing items does not alone explain the downward drift of the first seasonal chain Laspeyres index. Table 6.3 shows that if seasonally disappearing fruits are excluded from the comparison, a seasonal chain Laspeyres index still falls below a direct Laspeyres index. The second reason for the downward drift of the chain series is that although there is a strong negative correlation between prices and quantities sold looking at all months of the year, in the peak month of sales and the months immediately following such a relationship hardly exists. This can be most clearly seen for oranges, the most important fruit in terms of expenditures. The volume of sales peaks in January but prices don't hit bottom until February (or until March in 1970). Similarly, for apples, sales peak in November, but prices reach their trough the following month (except in 1970). Sales of grapes peak in September, but prices are lowest in October (except in 1972). This lag between sales and prices is reasonable since some fruit sold in a given month will not be consumed until the next. But it has the effect of making the seasonal chain Laspeyres index drift below the corresponding direct index, since in the months with the largest weights there is a positive correlation between price change and quantity change.

6.3 The Rothwell Index and the Seasonal Chain Laspeyres Index

From the preceding discussion, one can conclude that the use of seasonal chain indexes in the official CPI would be ill-advised. This is not to say that such indexes would not have considerable interest as analytical series that supplement the official series. In particular, if the official CPI for seasonal commodity groups is based on the Rothwell formula, a seasonal chain Laspeyres index would prove quite useful. The relationship between the two indexes has already been mentioned in Chapter 2. If the monthly change in the Rothwell index is decomposed between price change and weight change, and the price change portion is expressed as a percentage of the index number for the earlier month, one obtains, from (2.13)

$$100 \times \sum_j {}_0W^j_{cm} \left(I^j_{ym+1/0} - I^j_{ym/0} \right) / I_{ym/0}$$

$$= 100 \times \left(\sum_j P^j_{ym+1} Q^j_{cm} - \sum_j P^j_{ym} Q^j_{cm} \right) / \sum_j P^j_{ym} Q^j_{cm}$$

This, it can be seen, is identical to the monthly percent change of a seasonal chain Laspeyres index. The monthly change in a Rothwell index due to weight shifts can be derived by subtracting this price change percentage from the percent change in the Rothwell index.

6.4 The Choice of a Link Month

While on the subject of chain indexes, it might be useful to mention a somewhat different problem, the problem of what month should serve as the link month in updating a CPI. All official CPIs are chain indexes over an extended period of time; eventually, the expenditure weights from the basket reference period become outdated and must be replaced. In some countries, notably France, Sweden and the United Kingdom, this updating of the CPI basket is done every 12 months. In Canada, the updating is performed every 4 years, but never, since the 4-year cycle has been adopted, in the same link month. (The change in the link month from one updating to another has reflected a reduction in the time required to calculate and implement an updated weighting pattern; there has been no official policy to randomize the link month.)

Szulc [1983] points out that chain index drift can occur with periodic linking at frequencies of 12 months or more if the link months coincided with non-seasonal cycles. For example, an index for meat prices would be in trouble if the link months coincide with the peaks and troughs of the beef cycle. Otherwise the link month does not have a great deal of importance.

Other things being equal, a December link month would be preferable. The 12-month percent change for December is a commonly examined measure of the annual inflation rate. Only if December is chosen as the link month will this percent change never be distorted by updating of the index basket. It is not possible to calculate component contributions to percent change that will sum to the aggregate 12-month percent change for December if there is a chain link between Decembers.

If the seasonal commodity groups in the CPI were based on a seasonal-basket formula, there would be even greater advantages to choosing December as a link month. Ideally, the annual index numbers would be weighted averages of the monthly index numbers. However, the calculation of an annual value would be problematic if the index basket were updated in a month in the middle of the year. Should the annual average be based on weights from the old or the new basket or on some combination of the two? But there is no problem in calculating calendar year annuals if the link month is always December.

There is no need to exclude seasonally priced commodities from the index basket if they are not priced in the link month (fortunately, since many items are unpriced in December). When a seasonal-basket approach to fruit and vegetables was adopted in the British Retail Prices Index two seasonally priced vegetables, fresh peas and runner beans, were dropped from the index because they were out-of-season in January, the RPI link month (see Retail Prices Index Advisory Committee [1975; p.36-40]). The remaining seasonally priced vegetable, brussel sprouts, which is still part of the RPI, is priced in January. The Central Statistical Office of the United Kingdom chose to calculate seasonal-basket indexes with a January base period. Because no January price is available for items out-of-season in January, such items must be excluded from the index. If the indexes had been based on the 12 months ending in January rather than January, then any seasonally priced item might be included in the RPI. A seasonal-basket index will show the same monthly movement, calculated over the same commodities, with either base period, so there is no reason not to adopt an annual base period. Thus the choice of a link month ought to have no influence on which seasonal commodities are included in a chain index.

Table 6.1: DIRECT AND SEASONAL CHAIN INDEXES FOR ZARNOWITZ'S HYPOTHETICA DATA

	1961				1962			
Quarter	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Item 1								
Price	3	5	6	4	3	5	6	4
Quantity	40	20	10	30	40	20	10	30
Item 2								
Price	1	4	2	3	1	4	2	3
Quantity	25	5	15	10	25	5	15	10
Indexes								
Laspeyres	100.0	206.9	200.0	162.1	100.0	206.9	200.0	162.1
Paasche	100.0	184.6	200.0	150.0	100.0	184.6	200.0	150.0
Chain Laspeyres	100.0	206.9	224.1	211.7	141.1	292.0	316.3	298.7
Chain Paasche	100.0	184.6	151.0	113.3	69.9	129.0	105.6	79.2

Table 6.2: SEASONAL CHAIN PRICE INDEXES FOR FRESH FRUIT

Date	Chain Laspeyres	Chain Paasche	Chain Fisher
1970			
Jan	95.9	97.0	96.8
Feb	93.7	94.9	94.7
Mar	92.0	93.1	92.9
Apr	98.7	102.2	100.8
May	109.8	146.4	127.3
Jun	106.7	127.9	117.2
Jul	107.1	127.3	117.3
Aug	108.5	99.9	104.5
Sep	96.3	84.7	90.6
Oct	95.9	78.3	87.0
Nov	101.4	79.3	90.0
Dec	94.0	69.2	80.9
Year	100.0	100.0	100.0
- - - - - - - - - -			
1971			
Jan	100.6	72.9	86.0
Feb	103.2	75.0	88.3
Mar	104.6	75.8	89.4
Apr	113.0	83.0	97.2
May	123.1	116.3	120.1
Jun	117.8	99.2	108.5
Jul	121.2	100.2	110.6
Aug	121.6	78.7	98.2
Sep	105.1	66.2	83.7
Oct	104.8	62.9	81.5
Nov	111.7	64.1	84.9
Dec	103.5	56.9	77.0
Year	110.8	79.3	93.8

Seasonal Chain Price Indexes for Fresh Fruit (continued)

Date	Chain Laspeyres	Chain Paasche	Chain Fisher
1972			
Jan	110.4	60.0	81.7
Feb	110.7	60.3	82.0
Mar	113.2	61.7	83.9
Apr	120.0	65.8	89.2
May	128.6	90.6	108.4
Jun	123.1	76.6	97.4
Jul	129.7	78.5	101.3
Aug	127.3	61.1	88.5
Sep	106.5	50.2	73.4
Oct	105.7	48.7	72.0
Nov	112.6	49.7	75.1
Dec	103.8	43.7	67.6
Year	116.0	62.2	85.0
- - - - - - - - - -			
1973			
Jan	109.5	45.6	71.0
Feb	110.5	46.1	71.7
Mar	113.7	47.4	73.7
Apr	122.2	50.6	79.0
May	129.2	68.7	94.6
Jun	122.2	57.0	83.8
Jul	130.8	58.6	87.9
Aug	127.5	45.5	76.5
Sep	102.4	36.2	61.2
Oct	100.9	35.9	60.4
Nov	107.7	36.8	63.2
Dec	96.9	31.8	55.7
Year	114.5	46.7	73.2
- - - - - - - - - -			
Coefficient of Variation	.098	.360	.183

Table 6.3: DIRECT AND SEASONAL CHAIN LASPEYRES INDEXES

Date	Seasonally Disappearing Items Excluded		Seasonally Disappearing Items Imputed
	Direct	Chain	Chain
1970			
Jan	87.8	92.7	88.7
Feb	87.5	90.6	86.7
Mar	92.3	88.9	85.1
Apr	99.2	95.4	91.3
May	108.4	106.2	101.6
Jun	112.9	111.9	98.6
Jul	116.2	117.7	99.1
Aug	118.1	122.9	117.6
Sep	101.8	98.6	104.4
Oct	95.0	90.5	104.0
Nov	94.9	95.8	115.7
Dec	85.7	88.7	107.3
Year	100.0	100.0	100.0
1971			
Jan	93.7	94.9	114.8
Feb	98.7	97.4	117.8
Mar	105.5	98.7	119.3
Apr	114.1	106.7	129.0
May	121.9	116.2	140.5
Jun	126.0	121.2	134.4
Jul	128.3	126.3	138.2
Aug	129.3	130.6	160.4
Sep	114.4	107.7	138.6
Oct	108.6	101.5	138.2
Nov	109.2	108.2	159.1
Dec	99.4	100.3	147.4
Year	112.4	109.1	136.5

Direct and Seasonal Chain Laspeyres Indexes (continued)

Date	Seasonally Disappearing Items Excluded		Seasonally Disappearing Items Imputed
	Direct	Chain	Chain
1972			
Jan	107.7	107.0	157.2
Feb	111.8	107.3	157.6
Mar	119.8	109.7	161.2
Apr	127.9	116.3	170.9
May	133.9	124.6	183.1
Jun	139.3	130.4	175.3
Jul	142.4	136.1	184.8
Aug	139.7	137.5	208.1
Sep	126.3	115.8	174.1
Oct	122.5	111.9	172.9
Nov	123.5	119.1	206.3
Dec	111.7	109.8	190.2
Year	125.5	118.8	178.5
- - - - - - - - - -			
1973			
Jan	120.0	115.8	200.6
Feb	125.9	116.9	202.5
Mar	134.0	120.3	208.4
Apr	144.5	129.2	223.9
May	149.4	136.7	236.8
Jun	154.2	141.7	223.9
Jul	155.5	146.4	239.7
Aug	151.9	146.8	265.9
Sep	139.0	126.7	213.6
Oct	138.8	125.5	210.3
Nov	140.9	134.0	265.0
Dec	124.8	120.6	238.5
Year	139.9	130.0	227.4

6.5 Endnotes

[1] It should not be assumed that all of these items mentioned by way of example are priced in the official CPI, although most of them are.

[2] Peaches would be reflected in a chain Laspeyres index for the months July to October, which account for over 99% of their 1970 volume of purchases, and strawberries for the months June and July, which account for 87% of their 1970 volume of purchases.

[3] The chain Paasche index uses expenditure weights from the same month for the base year 1970 in calculating the link relative for a given month. The chain Laspeyres index uses expenditure weights from the previous month of the base year. Strictly speaking, a monthly chain Paasche or Laspeyres index uses weights from the same or previous month of the given year, but it would unnecessarily burden the discussion to use a longer, more precise term for the indexes shown in Table 6.2.

[4] The direction of drift is here defined with respect to the corresponding direct index, whose calculation depends on the treatment of seasonally disappearing commodities, e.g., are they excluded or included with imputation for out-of-season months. Table 17 shows a direct Laspeyres index based on excluding seasonally disappearing items. A direct Paasche index is not shown but there is less reason in the case of a Paasche index to exclude seasonally disappearing items. The remarks concerning index drift should hold whichever way the direct indexes are calculated.

Chapter 7

A REGRESSION-DERIVED PRICE INDEX

7.1 Estimation

For any price index, the index formula applies only to a certain level of detail. Below this level one ceases to consider the proper calculation of the index as an index number problem. Instead, it becomes a sampling problem. An elemental index can be defined as the index at the lowest level of aggregation to which the index formula is applicable. It does not generally have any subindexes, or, if it does, they are not published series.[1] It therefore makes a great difference whether the index for a seasonal commodity group is a higher level aggregate or an elemental index. If the former, the consistency and coherence of the overall CPI would be best served by basing the series on a fixed-basket formula, or the Rothwell formula, which reduces to the fixed-basket formula with identical monthly baskets. If the latter, the fixed-basket formula does not constrain one's choice in the index calculation, and a wider range of approaches may be considered.

One such approach is a regression-derived price index, suggested by Balk [1980c]. Summers [1973] and Kravis et al. [1975] developed a solution for handling international price comparisons when prices for some commodities are missing for some countries. Transferring this approach from the spatial to the time domain, Balk has shown how their method can be used to calculate a price index when prices for some seasonally priced commodities are missing in some months of the year.[2]

The price index is derived by estimating a weighted linear regression of the form:

$$\log (P_t^j) = B_2X_2^j + \ldots + B_mX_m^j + V_1Y_{1t} + \ldots + V_AY_{At} + E_{jt} \qquad (7.1)$$

where

$$X_k^j = 1 \quad \text{if} \quad k = i,$$

otherwise, $X_k^j = 0$

$$Y_{kt} = 1 \text{ if } k = j,$$

otherwise, $Y_{k/t} = 0$

The regression coefficients represent dummy variables standing for each month of the estimation period and for each commodity. To avoid a dummy variable trap, a dummy variable for the first month is not included in (7.1). The sense of the equation is that the price change between any two periods for a commodity is a function of the overall tendency of prices in that period, an industry effect for the particular commodity, and random disturbances.

The estimated price index is derived by calculating the exponents of the B coefficients. Exp $\{B_1\}=1$ so the index has the first month as its base period.

There are as many observations as there are prices in the data set. For Turvey's fresh fruit data, there would be 176 observations. (There are 3 fruits with complete monthly data, strawberries is priced 3 months of the year, peaches 5 months of the year, so the total observations are 4 x (3 x 12 + 3 + 5) = 176).

7.2 Weighting of Observations

The observation for commodity j in month t is weighted by

$$W_t^j = (\sum_t P_t^j Q_t^j / \sum_j \sum_t P_t^j Q_t^j)\ (Q_t^j / \sum_t Q_t^j) \tag{7.2}$$

that is, the commodity's share in total purchases of all commodities over the estimation period multiplied by month t's share of quantities purchased of the commodity in question. It is obvious that if $Q_t^j = 0$ then $W_t^j = 0$ so there is no harm in omitting observations for seasonally disappearing items.

Like the Balk price index described in Chapter 3, the calculation of this index assumes that data for quantities purchased will be available for the same months and with the same regularity as price data, a condition that is hardly ever met for consumer price indexes.

Fortunately, such detailed quantity data is not essential to the calculation of a regression-derived price index, as it is to the calculation of a Balk price index. Suppose that quantity data were available only for the first year 0. The weights for the observations could be re-expressed as

$$W_{ym}^j = (\sum_m P_{0m}^j Q_{0m}^j / \sum_j \sum_m P_{0m}^j Q_{0m}^j)\ (Q_{0m}^j / \sum_m Q_{0m}^j) \tag{7.3}$$

that is, the commodity's share in purchases of all commodities in year 0 multiplied by the month's share of quantities purchased for the commodity in year 0 would be the weight for all that commodity's observations for the same month of each calendar year.

In some respects the use of a single year basket would be preferable even if continuous monthly quantity data did exist, since it is more consistent with practice in the calculation of the official CPI.

7.3 Indexes with an Annual Base Period

If one would rather have a regression-derived price index with the base period the initial year rather than the initial month, the following formula will rebase the series:

$$I_t = \exp\left(B_t - \sum_{m=2}^{12} V^m B_m\right) \qquad (7.4)$$

with

$$V_m = \sqrt{\sum_j W_m^j} \Big/ \sum_{m=1}^{12} \sqrt{\sum_j W_m^j}$$

Or one could obtain an index with the same base period more simply by omitting dummy variables for all the months of the initial year, rather than the initial month only.

7.4 Relationship to Geometric Mean Indexes

If there are no missing prices for any commodities, that is, none of the seasonal commodities is seasonally priced, then the solution can be shown to reduce to

$$I_{t/1} = \exp(B_i) = \prod_j (P_t^j / P_1^j)^{W^j} \qquad (7.5)$$

where $W^j = \sum_t P_t^j Q_t^j \Big/ \sum_j \sum_t P_t^j Q_t^j$

The solution thus reduces to a geometric mean of price relatives, weighted by component shares of total expenditures over the estimation period. One can see that a simple geometric mean of the monthly index numbers gives the annual series that is consistent with the monthly series.

One of the useful properties of (7.5) is transitivity. Dividing $I_{t/1}$ by $I_{k/1}$ gives the same result as directly calculating $I_{t/k}$ using (7.4).

This is then quite an odd special index to calculate for a seasonal commodity group. Although it requires monthly quantity data, there is really no seasonal weighting of price relatives, anymore than there is in a fixed-basket index. In fact, the nice transitivity property of (7.4) is just the consequence of calculating a geometric mean index with constant weights; a geometric mean index with seasonal weighting would not be transitive.

The only real advantage of the regression-derived index over a fixed-basket index as far as seasonal commodities is concerned is that if there are seasonally priced commodities in the commodity group one can still generate a price index without imputation for missing prices.

7.5 Example of Fresh Fruit Index

Table 7.1 shows regression-derived indexes for Turvey's fresh fruit data generated with January 1970=100 and rebased to 1970=100. Weighted regressions were estimated with weights based on expenditures for base year 1970 only and for the entire estimation period. It can be seen that neither for the original series nor for the rebased series is there much difference between the series based on 1970 and the series based on 1970-73 weights.

Table 7.2 shows the corresponding indexes calculated with a 1970 base period to begin with. There are no monthly estimates for base year 1970. It is obvious from comparing these series, and one sees the same thing in the examples included in Balk's paper, that the series rebased to 1970 show a much greater seasonal amplitude than those calculated with a 1970 base period.[3]

A comparison of the Balk price indexes from Chapter 3 with Balk's regression-derived price indexes is not flattering to the latter series, although Balk's paper concerning regression-derived indexes was published after the paper containing the Balk formula. In May 1970, the price increases for fresh fruit prices from the previous month range from -.4% to 17.1%. The Balk price index went up by 18.8% in that month (as did the Rothwell index) violating the mean value test of an index number. But Balk's regression-derived indexes violate it to an even greater extent. Any of the indexes shown in Table 7.1 has an increase of about 21% in May 1970.

The seasonal amplitude of the regression-derived index is again substantially greater than that of the Balk price index. January is the low monthly value of the regression-derived index for 1973 at 121.2 (referring to the index based on a 1970-73 basket, rebased to 1970=100) and August is the high value at 166.8. The corresponding values for the Balk price index are 124.6 and 161.0. Does this necessarily mean that the seasonal amplitude of the regression-derived index is larger than it should be? One can judge by making a comparison with the 1973 monthly values for the countries that took part in Turvey's study; of all these countries only two, Canada and Finland, have larger seasonal amplitudes than the regression-derived index. Both countries use fixed-basket formulas, carrying forward the last in-season price of seasonally disappearing items, a method that Balk [1980a] regards as theoretically unsound.

Everything considered, the advantages of a regression-derived price index for seasonal commodities seem to be outweighted by the disadvantages. Among the latter, not yet mentioned, is the possibility of a discontinuity in the index series. The estimates for all months will be altered when the latest monthly values are estimated, but they cannot be revised, or at least they cannot all be revised. Also, the logic of treating the calculation of a seasonal group index as a sampling problem rather than an index number problem seems to require that the index be an elementary commodity group. If so, one could not publish subindexes of the seasonal group, which could be a considerable disadvantage in some cases.

One byproduct of regression-derived indexes mentioned by Kravis et al. [1975] but not by Balk, is imputed prices for seasonally disappearing commodities. The use of regression-derived indexes in imputation is discussed in the next chapter.

Table 7.1: BALK'S REGRESSION-DERIVED PRICE INDEXES FOR FRESH FRUIT WITH INITIAL MONTH AS BASE PERIOD

	JAN 70=100		1970=100	
Date	1970 Basket	1970-73 Basket	1970 Basket	1970-73 Basket
1970				
Jan	100.0	100.0	90.8	91.0
Feb	97.3	97.3	88.4	88.5
Mar	94.9	94.8	86.2	86.3
Apr	103.9	103.8	94.4	94.5
May	125.8	125.6	114.3	114.4
Jun	125.2	125.1	113.7	113.9
Jul	126.8	126.7	115.2	115.4
Aug	126.2	126.1	114.7	114.8
Sep	109.8	109.1	99.8	99.3
Oct	99.5	98.8	90.4	89.9
Nov	105.2	105.0	95.6	95.5
Dec	99.3	100.7	90.2	90.4
1971				
Jan	105.2	105.2	95.6	95.8
Feb	107.9	107.8	98.0	98.2
Mar	109.0	108.9	99.0	99.2
Apr	119.6	119.5	108.6	108.8
May	141.2	142.0	128.3	129.3
Jun	136.3	136.0	123.8	123.8
Jul	142.1	142.1	129.1	129.4
Aug	140.6	140.6	127.8	128.0
Sep	120.7	120.3	109.6	109.5
Oct	115.5	114.8	104.9	104.5
Nov	122.7	117.6	111.5	107.1
Dec	114.8	115.4	104.3	105.0

Balk's Regression-Derived Price Indexes for Fresh Fruit
With Initial Month as Base Period (continued)

Date	JAN 70=100 1970 Basket	JAN 70=100 1970-73 Basket	1970=100 1970 Basket	1970=100 1970-73 Basket
1972				
Jan	121.3	121.2	110.2	110.3
Feb	121.4	121.4	110.2	110.5
Mar	124.1	124.1	112.8	112.9
Apr	133.1	133.0	121.0	121.1
May	154.6	156.3	140.5	142.3
Jun	147.7	146.4	134.2	133.3
Jul	158.8	158.5	144.2	144.3
Aug	158.9	158.8	144.3	144.6
Sep	132.7	132.4	120.5	120.6
Oct	131.8	131.3	119.8	119.5
Nov	140.0	139.5	127.2	127.0
Dec	127.7	127.4	116.0	115.9
1973				
Jan	133.2	133.2	121.0	121.2
Feb	134.6	134.7	122.2	122.6
Mar	139.0	138.9	126.3	126.5
Apr	150.7	150.6	136.9	137.1
May	172.5	174.5	156.7	158.8
Jun	161.7	160.8	146.9	146.4
Jul	177.2	176.7	160.9	160.8
Aug	183.9	183.3	167.0	166.8
Sep	146.5	146.4	133.1	133.3
Oct	150.0	149.6	136.3	136.2
Nov	160.9	160.4	146.2	146.0
Dec	141.8	141.7	128.8	129.0

Table 7.2: BALK'S REGRESSION-DERIVED PRICE INDEXES FOR FRESH FRUIT WITH INITIAL YEAR AS BASE PERIOD

Date	1970-Basket	1970-73 Basket
1971		
Jan	97.5	97.5
Feb	99.9	99.9
Mar	100.8	100.8
Apr	110.4	110.4
May	129.1	130.1
Jun	122.7	122.9
Jul	128.2	128.8
Aug	127.4	127.8
Sep	109.7	109.8
Oct	106.0	105.6
Nov	113.2	108.4
Dec	106.3	106.9
1972		
Jan	112.4	112.3
Feb	112.4	112.4
Mar	114.8	114.8
Apr	122.9	122.9
May	141.3	143.1
Jun	133.0	132.3
Jul	143.2	143.6
Aug	143.9	144.4
Sep	120.6	120.8
Oct	121.0	120.7
Nov	129.2	128.8
Dec	118.2	117.8

Balk's Regression-Derived Indexes for Fresh Fruit
With Initial Year as Base Period (continued)

Date	1970-Basket	1970-73 Basket
1973		
Jan	123.3	123.4
Feb	124.6	124.8
Mar	128.6	128.6
Apr	139.1	139.1
May	157.6	159.7
Jun	145.6	145.2
Jul	159.8	159.9
Aug	166.5	166.7
Sep	133.2	133.5
Oct	137.7	137.5
Nov	148.4	148.1
Dec	131.2	131.1

7.6 Endnotes

[1] For example, an elemental CPI might be a weighted average of separate indexes for chain and independent retail stores; these sub-elemental indexes would not be published.

[2] A similar method, also devised by Balk, is discussed in Balk [1981].

[3] Balk's indexes were rebased to a 1969 base period.

Chapter 8

IMPUTATION FOR SEASONALLY PRICED COMMODITIES

8.1 The Importance of Imputation

Imputation for seasonally priced commodities is probably the most important topic in the treatment of seasonal commodities. It has been left to the end of this paper, not because it is of secondary interest, but because it can only be properly considered in the context of the index number problem for seasonal commodities. It is not like, say, the problem of imputation of a price movement for non-response, which may usually be considered as a problem related to sampling within an elemental index, unrelated to the calculation of the overall index. The approach taken to the imputation for seasonally priced commodities is or should be determined by the index formula adopted for the CPI aggregate.

If the group index is calculated according to a seasonal-basket formula, then it makes sense to try to approximate the actual price movement of each seasonally priced commodity in making imputations. If it is calculated according to a fixed-basket formula, imputation is more of an exercise in papering over the flaws in the fixed-basket formula, and the imputed price movement should not necessarily bear any relationship with the actual price movement of the seasonally priced commodity.

From Chapter 1 it will be remembered that a seasonally disappearing commodity is a commodity that households do not purchase, and a seasonally priced commodity one that index makers do not price, during certain months of the year. All seasonally disappearing commodities are, of course, also seasonally priced commodities, but there are many seasonally priced commodities that are not also seasonally disappearing.

For example, hockey skates are a seasonally priced commodity in the Canadian CPI, priced only from October to December. Hockey skates are not a seasonally disappearing commodity; many Canadians play hockey year round, so that some hockey skates are sold in every month of the year. They may, however, disappear from most of the retail outlets in which they are priced for the CPI, so that a reliable price sample cannot be obtained unless the number of outlets is increased. (In smaller centres, the option of increasing the outlet sample is not available.) Some outlets may exhaust their stock of hockey skates, but will occasionally order a pair at the request of a customer. Some may bring up skates from storerooms on demand, but will not put skates on display in the off-season. Some may have skates on display but not what the CPI pricing officer considers a reasonable volume of skates. In all of these cases, hockey skates would not be priced at these retail outlets during the month in question, although skate purchases are still being made there. One can hardly say that prices for skates do not exist at any of the outlets; for each of them there is a price at which skates can be purchased in the off-season, but prices are not collected.

It should be added that in the official CPI the same pricing policy is followed for a commodity in every urban centre where it is priced. In a certain month the volume of sales for a given commodity may be far too low to permit pricing in most Canadian cities, but in a few urban centres the sales volume may be more than adequate for pricing. This makes no difference to the pricing policy for that urban centre: if a commodity cannot be priced in most urban centres it will not be priced in any of them. This is an additional reason why a commodity may not be priced in a CPI in a given month of the year although it is price-able.

Imputation for seasonally priced commodities is a much more serious problem in fixed-basket indexes than in seasonal-basket indexes, but it is a problem in both cases. If a seasonally priced commodity is included in a fixed-basket index then there must be an imputation for it in each of its unpriced months. This imputed index movement has considerable importance since the commodity retains its full annual weight in its unpriced months. If a seasonally priced commodity is included in a seasonal-basket index then there must be an imputation for it only in those months for which there are positive monthly weights. If there are no expenditures on a commodity for certain unpriced months in the basket reference period then there is no need to impute an index movement in those months. And in most cases where imputation is required, the monthly weight will be less than, sometimes much less than, the annual weight, so the impact of the imputation on the annual index for the commodity and on higher level aggregates will not be large.

8.2 Methods of Imputation in Fixed-Basket Indexes

There are 3 basic methods of imputation for seasonally priced items in fixed-basket CPIs:

1. carrying forward a previous in-season index number,
2. substituting the price of another commodity,
3. extrapolating the price movement from the last in-season price based on a related indicator.

The first method is the simplest to implement and has the advantage of relying only on price information for the commodity in question. It is the method currently used in the official CPI, where the last in-season index number is carried forward through the out-of-season months. The same method is used in several foreign countries, including Finland, Sweden and the Republic of Korea. In the Norwegian CPI, the average index number of the commodity in its in-season months is carried forward (see Turvey [1979; p.xvii]).

Using Turvey's fruit price data as an example, if the last in-season price were carried forward, the July 1970 strawberry price of 3.27 would be maintained from August 1970 through April 1971; in May the price would rise to 5.68. Another possibility is to carry forward the average in-season price, which is 3.96 calculated as a simple average, 3.62 as a weighted average. Of course, in calculating a price index for strawberries it is more likely that index numbers themselves would be imputed rather than imputing missing prices which would then be indexed, but this is only an operational difference; whichever way it is done the result will be the same.

Substitution of a missing item's price by that of another commodity is not usually a realistic possibility, especially if one is dealing with non-food items. The first series in Table 8.1 shows the substitution of grape prices for strawberry prices when strawberries are out-of-season. The imputed series falls improbably in the first out-of-season months, August to

October, and falls again in the first in-season month, when one would expect the price to fall. No other substitution would give a much better result since strawberries have the highest average price of any of the 5 fruits, and their month of peak purchases, June, is the earliest of any fruit from the start of the spring.

The third method, extrapolation, may use the price movement of a single commodity or of a commodity group as a related indicator.[1] Table 8.1 shows strawberry prices extrapolated based on the price movement of grapes, continuously available fruits and in-season fruits. The continuously available fruits are apples, grapes and oranges. The price movement of in-season fruits is based on the same 3 fruits, plus peaches for August through October.

Rather than extrapolating from the last in-season month, one might use a related indicator to interpolate between the last in-season month and the first in-season month of the next season. This form of imputation was recommended by the U.S. Price Statistics Review Committee (see Stigler [1961; p.45]) because it would not create a break in the series between the last out-of-season month and the first in-season month. This discontinuity at the first in-season month can be seen for all of the imputed series in Table 8.1, but it is worst for the extrapolation based on grape prices. Interpolation would require that the CPI series be revisable, since one would have to wait for the next in-season price for a seasonally priced commodity to become available before interpolating. One of the other recommendations of the Stigler Committee was an annual revision policy for the CPI.

Ideally, a seasonally priced commodity such as strawberries that is not priced for 9 months would require a 10-month revision policy to interpolate a related indicator, but a much shorter revision period, of only 2-3 months, would suffice to eliminate discontinuities in the series.

Table 8.2 and Table 8.3 show fixed-basket price indexes for fresh fruit based on 5 different types of imputation for seasonally priced items. The differences between the series are not particularly large because the weight of seasonally priced items in the index is not large. (Peaches and strawberries together account for 19.0% of 1970 expenditures on fruit). It was mentioned in Chapter 1 that the fixed-basket formula satisfies all of the main axioms and tests of a price index stipulated by Eichorn and Voeller. This is, strictly speaking, only true of the fixed-basket formula if there are no seasonally priced items in the basket. If there are, some of the tests of a price index will be violated whatever method of imputation is adopted for missing price movements.

The mean value test specifies that the changes in a price index should always lie between the smallest and largest price change recorded over that period. This test may be violated by whatever imputation is adopted for a seasonally priced item, and none of the indexes shown in Table 8.2 satisfy it. In no month, for any of the indexes, does a monthly percent change fall below the smallest recorded price change, but in several cases, for each of the indexes, the monthly percent change exceeds the greatest recorded price change. In every case, it does so either in May, the first in-season month for peaches, or, June, the first in-season month for strawberries.

For example, in June 1973, strawberries came into season and their price surely fell from the level at which they would have been available in May. The other 4 fruits were available in both May and June, and oranges had the largest price increase at 4.1%. The increases of the fixed-basket price indexes range from 9.2% (carrying forward the simple average price for the in-season months) to 13.0% (carrying forward the last in-season price), well above the maximum price increase of any item in the index. The violation occurs, because for all series a large price increase was imputed for strawberries in June, rather than a price decrease.

If imputation is based on carrying forward an average price the fixed-basket index will also fail the identity test, that is, if all items show no price change between two periods, the index will still show a change. Obviously if imputation is based on carrying forward the last in-season price, the identity test is passed. If imputation is based on the movement of in-season or continuously available items in the seasonally priced commodity's group then the identity test is also passed, but only at that level of aggregation and not at a lower level. For example, if grapefruit are imputed based on continuously available fresh fruit then the fresh fruit index would never violate the identity test. However, a citrus fruit subindex comprising grapefruit and oranges might violate the test. When grapefruit are out-of-season, oranges may not change in price but the citrus price index would still show some movement due to changing prices of non-citrus fruit, which would be imputed to grapefruit.

8.3 The Extrapolation Method as Seasonal Weighting

Turvey [1979; p.xix] and Zarnowitz [1961; p.261] have noted that a fixed-basket index where the movement of a seasonally priced item is extrapolated based on that of the in-season or continuously available items in its group can be considered as a form of seasonal weighting. This is not to say that there is an equivalence, even in a single month, between a fixed-basket formula with this type of imputation for seasonally priced items and one of the seasonal-basket formulas described in Chapters 2 or 3. Far from it. The monthly relative for a fixed-basket index for the first month that a commodity is dropped from pricing is

$$\sum_{j=1}^{n-1} P^j_{ym} Q^j_c \Big/ \sum_{j=1}^{n-1} P^j_{ym-1} Q^j_c \qquad (8.1)$$

One can see that this is a long way from the corresponding Rothwell monthly relative which would be

$$\frac{\left(\sum_{j=1}^{n-1} P^j_{ym} Q^j_{cm} \Big/ \sum_{j=1}^{n} P^j_{ym-1} Q^j_{cm-1}\right)}{\left(\sum_{j=1}^{n-1} P^j_{0} Q^j_{cm} \Big/ \sum_{j=1}^{n} P^j_{0} Q^j_{cm-1}\right)} \qquad (8.2)$$

Expression (8.1) differs from (8.2) in 3 ways:

1. Summation is over the same number of elements for month **m** and month **m-1**; in (8.2) the summation is over **n-1** items in month **m**, **n** items in month **m**. (This assumes that the seasonally priced item is seasonally disappearing.)

2. Annual weights and not monthly weights are used.

3. There is no seasonal correction factor for the use of monthly weights in (8.1), monthly weights not being used.

Actually, a fixed-basket index with this type of imputation is closer to what a Rothwell index would be like if there were no information available on the monthly expenditures of different items. Then one might obtain proxy monthly weights by using the annual weight in priced months, a zero weight in unpriced months.[2] It can be seen that with such monthly proxy weights, the Rothwell monthly movement would be

$$\frac{\left(\sum_{j}^{n-1} P_{ym}^{j} Q_{c}^{j} \Big/ \sum_{j}^{n} P_{ym-1}^{j} Q_{c}^{j}\right)}{\left(\sum_{j}^{n-1} P_{0}^{j} Q_{c}^{j} \Big/ \sum_{j}^{n} P_{0}^{j} Q_{c}^{j}\right)} \qquad (8.3)$$

which should not be very different from that of the fixed-basket index.

A Rothwell index calculated according to the above proxy weights would show virtually the same movement as a fixed-basket index for those months where there is no change in the number of priced items. For a month where an item comes back into season they would again be very close because in the Rothwell index the weighting would explicitly, and in the fixed-basket index, would implicitly, undergo a seasonal shift to include the item coming into season.

Thus extrapolation based on the in-season items in a group represents a very crude approximation to seasonal weighting based on monthly expenditures. Still, if good monthly expenditure estimates are unavailable, it is a very defensible procedure, arguably superior to the use of a seasonal-basket formula using proxy weights. (See 8.5 for a further discussion of this point.)

Given a commodity subject to seasonal demand, imputation based on the group price movement may lead to an index decrease rather than an index increase for the next in-season month. This is not necessarily so; in fact, in Table 8.1 it can be seen that it is the series with imputation based on in-season fruits that registers the greatest price increases in May, the first in-season month for strawberries. Still, it may happen, and is particularly likely to happen if the seasonal price peak of another commodity in the group just precedes the first in-season month of the seasonally priced commodity.

If one accepts the seasonal weighting interpretation of imputation based on a group price movement, there is nothing disturbing in such a decline. If there is a weight shift from commodities that have experienced larger price increases to those that have experienced smaller price increases then this tends to lower the group index. It does not make sense in terms of the actual price movement of the seasonally priced commodity that it should decline, but in the seasonal weighting interpretation, the movement of the component price index for the seasonally priced commodity is a secondary consideration. It is the movement of the group index that is of primary importance.

8.4 The Choice of an Extrapolator

Is it preferable to base an imputation on the in-season items in a group rather than the continuously priced items? Imputation based on all in-season items is more in keeping with the seasonal weighting interpretation of extrapolation. In a proxy-weighted seasonal basket index, the weight of a seasonally priced commodity would go to all in-season commodities in an out-of-season month, not just to those commodities that are continuously priced.

For some groups, only an imputation based on in-season items may be possible, because all items may be seasonally priced. This is the case, for example, with the outdoor recreation equipment series in the official CPI. Some items are priced May to July, other items October to December, but no items are continuously priced in every month of the year.

On the other hand, seasonally priced commodities are likely to be extemely volatile in their price movement, which can be a problem if they are to be part of an indicator used in extrapolation. Zarnowitz [1961; pp.298-299] reports that the Bureau of Labor Statistics was dissatisfied with its imputation for seasonally priced fresh fruits, including strawberries, peaches and watermelons, which was based on all in-season fresh fruit items. It was judged to create an unacceptably large increase in the index in the month of introduction of a seasonally priced commodity. For this reason BLS contemplated switching to imputation based on continuously priced items only, which was the procedure currently used for seasonally priced clothing items.[3]

The example of the fresh fruit indexes in Table 8.1 corroborates the experience of BLS. Note that the series with extrapolation based on in-season items shows a substantially larger increase than the series based on continuously priced items in May of every year, the month of introduction for strawberries.[4] Note also that the coefficient of variation of the series with imputation based on in-season items is the highest of any series in the table. Finally, the greater simplicity of imputation based on continuously available items recommends it when it is feasible. It is easier to calculate an index on a continuing basis for continuously available items than for in-season items.

In the official CPI, all basic groupings have weights assigned to them but not all are priced. Some elemental indexes are assigned the movement of other CPI series. The latter series may themselves be elemental indexes, or they may be simple or weighted averages of several elemental indexes. The seasonal weighting interpretation of imputation based on a group index favours imputed as well as priced series being included in the extrapolator for a seasonally priced commodity. But one would have to avoid circularity in imputation: the group index should not include an imputed series that is itself the target of a group index that has the series for the seasonally disappearing commodity as one of its components.

There remains the question of the level of aggregation to which one should go in obtaining an indicator for a seasonally priced commodity. In the case of a seasonally priced fruit, one might use as an indicator an index based on other items in fresh fruit, fresh and processed fruit, fruit and vegetables or even food processed at retail stores.

Because a group index may fail the mean value test if one of its seasonally priced components was imputed using a higher level aggregate, there is a strong presumption in favour of choosing the lowest level of aggregation feasible. If, for example, the seasonally priced items in fresh fruit in their unpriced months are imputed based on food purchased at retail stores, the mean value test would be satisfied for food purchased at retail stores, but might be violated for total fruit (fresh and processed) and fresh fruit indexes. If they are imputed based on the continuously available items for fresh fruit, the mean value test would be satisfied for all three levels of aggregation. (Whatever group index was the basis of imputation, the mean value test might be violated for the first in-season month of a seasonally priced item.) Or, to look at it another way, imputing for seasonally disappearing fruit using food at retail stores can be interpreted as a type of seasonal weighting with respect to the food at retail stores index, but not the total fruit and fresh fruit indexes, because the price movements of commodities that are not part of the latter series are weighted in the imputation. Imputing for seasonally disappearing fruit using the fresh fruit index can be interpreted as a type of seasonal weighting for fresh fruit, total fruit and food purchased at retail stores.

One might argue that not too much can be made of this because there are many ways of classifying the official CPI besides the primary classification. In general, however, this is not so, because a low-level aggregate in the primary classification will seldom overlap groupings in a secondary classification. For example, besides its primary classification the official CPI has a secondary durability classification. All fresh fruit items, indeed all food items, would fall into the non-durable group. If imputation for seasonally priced fresh fruit items is based on the fresh fruit group, the mean value test will be satisfied for non-durables as well.

On the other hand, an indicator based on a higher level aggregate may provide a more stable indicator. Certainly, in the case of seasonally priced fruit, there is a strong arguement for basing an imputation on a group index including fresh and processed fruit together, the latter series being much more stable than fresh fruit by itself. Zarnowitz [1961; p.262] states that *"there is no reason why canned and frozen fruits should be excluded from the role of substitutes for seasonal fresh fruits, when one would expect them to be, on the contrary, quite important"*. It may be acceptable then to impute the price movement of peaches from continuously priced fresh and processed fruit items or corn from continuously priced fresh and processed vegetables. However, it would not be acceptable to impute the price movement of fresh peaches from canned peaches, or fresh corn from canned and frozen corn. It makes no sense in terms of seasonal weighting nor in terms of establishing a true indicator of price movement; there is not a close relationship between the price movement of any fresh fruit or vegetable and its processed counterpart.

8.5 A Seasonal-Basket Index with Proxy Weights

The principal arguement for imputation based on the group price movement is that a fixed-basket price index with such an imputation for its seasonally priced components approximates a seasonal-basket index. This might make one wonder if one would not be better off with a seasonal-basket index based on proxy expenditure weights. One set of proxy expenditures was described in Chapter 8, where a weight of one twelfth of annual expenditure is assigned to a priced month and a zero weight is assigned to an unpriced month. This has the effect of rendering the annual weight of a seasonally priced item in the index lower than its annual expenditure. A slightly different set of proxy expenditures would be generated if one calculated monthly expenditures for a priced month as the annual expenditure multiplied by the reciprocal of the number of priced months. In this case the sum of the monthly expenditures for a seasonally priced commodity would equal its annual expenditure. The latter set of expenditures are logically more appealing than the former, but there is a danger in assigning large weights to a seasonally priced commodity with its highly volatile seasonal price movements. This is particularily true if the seasonally priced commodity is actually purchased in every month of the year so that most if not all priced months are overweighted.

Table 8.5 shows seasonal-basket indexes for fresh fruit calculated according to the Rothwell formula based on 3 sets of expenditures; actual monthly expenditures, proxy expenditures 1 (seasonally priced commodities' monthly expenditures sum to the annual expenditure), and proxy expenditures 2 (monthly expenditures do not sum to the annual expenditure). Note that neither index based on proxy expenditures comes very close to the index based on actual expenditures. Notice, for example, that both of the proxy series register decreases in July, while the Rothwell series registers increases. Both peaches and grapes register strong declines in that month, and their proxy expenditures on these fruits exceed actual expenditures in both June and July. The Rothwell index based on actual expenditures gives greater weight to the price increases for apples and oranges. The second proxy series is more stable than the first but both show much greater seasonal amplitudes than the Rothwell index.

The simple correlation coefficients of the proxy series with the true Rothwell series are .899 and .910 respectively compared with a coefficient of .925 for the fixed-basket series with imputation for seasonally disappearing fruits based on continuously available fruits. Thus, in this case at least, a fixed-basket price index with group imputation provides a closer approximation to the true Rothwell index than a Rothwell index based on proxy expenditures. Given the many advantages of the fixed-basket formula it would seem advisable if reliable monthly expenditures are not available to stick to a fixed-basket formula for seasonal commodities with group imputation for seasonally priced items.[5]

8.6 The Price Behaviour of Seasonally Priced Commodities

For a seasonal-basket index, the situation is quite different. A highly seasonal commodity receives a representative weight in every month of the year and a large seasonal price change in an off-season month will not have a ridiculously large impact on the movement of the group index. For a seasonal-basket index, it does make sense to try to approximate the actual price movement for a seasonally priced commodity.

The actual price movement of a seasonally priced commodity in its out-of-season months is likely to follow one of two basic patterns depending on whether the seasonal fluctuations in its purchase reflect seasonal shifts in supply or demand.

Most seasonally priced produce is subject to seasonal shifts in supply. Prices will decline rapidly during and after the harvest months and rise steeply thereafter. Purchases through the rest of the year will come from greenhouses and from abroad. From either source supplies will be dearer than were the domestic field-grown supplies.

Most other seasonally priced items are subject to seasonal shifts in demand. There are spring and fall lines of clothing, recreational vehicles like motorcycles and snowmobiles are associated with different seasons of the year, and so on. Any of these commodities could be, and in most cases are, produced by factories 12 months of the year, but they are only in demand during certain months.[6] These commodities will typically rise in price during their in-season months and drop sharply in price when the retailers try to get rid of their stock with post-season sales.

Besides these two basic patterns of seasonal price movement there are other special patterns for particular commodities. For example, in 1.2 it was mentioned that turkey prices tend to fall when turkey is in highest demand because turkey is used as a loss leader by grocery stores. There are also complications of these basic patterns; for example, the domestic production cycles of countries of importation will tend to impose secondary seasonal cycles on the seasonal pattern of purchases for a produce item.

Whether prices are seasonally high or low in the off-season, the amplitude of seasonal price movements for seasonally priced commodities is likely to be extremely large. Table 8.7 shows calculated monthly unit values for strawberries derived from the 1978 Family Expenditure Survey. Strawberries were a seasonally priced commodity in the official CPI when it was based on a 1978 basket. In the Turvey data, strawberries are a seasonally disappearing commodity, available only from May to June. From Table 8.7 it can be seen than strawberries are not truly a seasonally disappearing commodity in Canada since there were some purchases in every month of the year. But more than 85% of these purchases were from May to July and in some months purchases were so low that unit values could not be calculated from tabulated data.

The seasonal fluctuations of strawberry prices reflect seasonal shifts in supply, with higher prices in the off-season than in the in-season months. From February to May, if these crude data are to be trusted, strawberry prices are cut in half. In a fixed-basket index that incorporated actual prices for strawberries in every month of the year, this huge decline in prices would be assigned the fruit's annual weight in the index, although February purchases account for less than 1% of the annual volume of strawberry purchases. Regardless of whether the CPI is regarded as primarily an escalator of incomes, a deflator of expenditures, or an indicator of inflation, such an overweighting of this seasonal decline makes no sense. This is why one should not even try to impute a realistic price movement for a highly seasonal commodity that is seasonally priced if the CPI series is based on a fixed-basket formula. Imputation, as was noted previously, is then more of an exercise in papering over the flaws in the fixed-basket formula. Imputation based on the group index movement should be seen in this way and not as an attempt to approximate the seasonally priced commodity's true price movement.

The case is different for a seasonal-basket index. Since each month has a representative weight there is no reason that large seasonal price declines should not be reflected in a seasonal-basket index. And because of the seasonal shift towards commodities whose relative prices have declined, the index movement of a seasonal-basket index will not display the exaggeratedly large seasonal amplitude displayed by a fixed-basket index.

The same conclusion emerges if we consider the annual movement of the series. In a fixed-basket CPI for fresh fruit, the annual index for strawberries would be based on a simple average of its monthly index numbers; three quarters of these index numbers are for months that represent less than 15% of annual strawberry purchases. Considering the violent oscillations of strawberry prices in their off-season months it would not seem reasonable to base the annual series on estimates of actual off-season prices, especially if they move differently from the in-season prices from one year to the next. In a seasonal-basket CPI for fresh fruit, the annual index for strawberries is based on a weighted average of its monthly index numbers. Since each month is appropriately weighted, one would like the index movement to be based on the most accurate estimates possible of actual monthly price movements in every month of the year.

This is why the imputation for seasonally priced commodities to reflect their actual price behaviour properly relates to seasonal-basket indexes, not to fixed-basket indexes. However, in some cases, where the seasonal amplitude of a seasonally priced commodity's index movement is not too great, one may also wish to make a realistic imputation for a seasonally priced commodity that is part of a fixed-basket index.

8.7 Methods of Imputation in Seasonal-Basket Indexes

The somewhat rigid sampling procedures that now prevail in the official CPI create the need for imputation for some seasonally priced items and limit the possibilities of imputation for others. In the official CPI, the same pricing frequency is used for a commodity in each outlet in each city, so that if a commodity is generally unavailable in a given month it is not priced in any outlets in that month, although it may be available in some outlets from which price quotes are regularly collected. In the extreme case, a commodity may not be priced at a given outlet for most of the months of the year even though it is available in all months of the year.

More flexible sampling procedures in the official CPI would improve the calculation of its indexes for seasonal commodity groups, and would not be unprecedented. In the U.S. CPI, a pricing frequency is now separately determined for each outlet in the pricing survey (BLS[1981; p.14]). A commodity may be seasonally priced in some cities but continuously priced in others. Even if a commodity is seasonally priced in all cities one may reduce the number of unpriced months of the year in certain cities whose mild or harsh climate extends the in-season period for the commodity beyond the national norm.

One advantage of determining pricing frequency at the outlet level is that if an item cannot be priced in some outlets, its price movement can be imputed from other outlets. Such imputation is already practiced in the official CPI if a commodity is unavailable in an outlet where it is normally priced, but it would become more common if the priced months for a commodity could be different for each outlet in which it is priced. Such imputation should probably be limited to imputations within a city, unless it is the case of a chain of stores known to follow a common pricing policy. In a country as large as Canada, with cities in so many different climatic zones, there can be a difference of at least a month between the end of the season in one city and another.[7] For many goods subject to seasonal demand, imputations from one city to another might exaggerate seasonal price swings. For example, suppose that prices for winter clothing were imputed from Ottawa and Sudbury outlets to Toronto outlets, when such clothing is no longer priced in Toronto. The Toronto index might register a strong decline in prices at the end of the Toronto season, then another at the end of the Ottawa season, then still another at the end of the Sudbury season.

One can see that much the same advantages that accrue from determining pricing frequency at the outlet level also accrue from determining pricing frequency at the city level. In certain cases, the latter policy might be more efficient; there is no point in collecting price quotes from some outlets in a city for a given month if the number of quotes is so small that a city index cannot be calculated, especially if the outlet's price movement cannot be imputed to outlets in other cities.

Some consideration should also be given to special collections of prices for seasonally priced commodities every so many years to establish their seasonal price pattern in unpriced months. Special benchmark surveys are often conducted every so many years to provide more detailed or reliable estimates on employment or expenditures, but not on price movements. This is largely due to the revision policy for most official price indexes, which does not permit the adjustment of published values to benchmark estimates. But a special survey for prices of highly seasonal commodities would have value even if the estimates for the benchmark year could not be changed. Assuming that the seasonal pattern of most commodities is stable, the monthly movement of the latest special survey estimates could be used as the indicator for extrapolating or interpolating over the commodity's unpriced months.[8]

If special benchmark estimates are unavailable, one is left with the same options as described for fixed-basket priced indexes; imputation based on a related indicator or carrying forward some previous in-season index level.

It is often difficult to find a related indicator for a seasonally priced item. It is just because they have a more pronounced seasonality than other items that some items are seasonally priced. Usually, the best that one can hope for in an indicator is a continuously available series with the same seasonal peak and trough as the target seasonally priced series, but a milder seasonal pattern.

Even such a series is difficult to find. For example, most continuously available clothing items at the basic grouping level incorporate both spring and fall lines. Their seasonal price pattern has a bimodal distribution, with prices peaking in spring, dropping in summer, peaking again in fall and dropping in winter. Such an index would be inappropriate as an indicator of the price movement for a seasonally priced item that is in-season in spring or fall.

In a fixed-basket series, a group index is preferred as the related indicator in imputation because its use amounts to a kind of seasonal weighting. In a seasonal-basket series, a group index must be preferred on the grounds that it more reliably approximates the actual price movement of a seasonally priced commodity in its unpriced months. A stable, broadly based series may provide a more reliable indicator than a unique series over a number of years, even if for a period of time the latter's price movement is more highly correlated with that of the target series. Special factors unique to a commodity may cause it to move in the opposite direction from the target series in any month of the year. These special movements would be dampened in a group index. A group index for in-season items would be more broadly-based, but also, because of its greater seasonality, less stable than one for continuously available items.

The appropriateness of a series as a related indicator is something that should be tested for, not assumed. Generally, one would have to accept the closeness with which an indicator followed the movement of a seasonally priced index between the last in-season month of one year and the first in-season month of the next as evidence of its suitability as an indicator. If for some benchmark years, monthly price movements were available for what are normally unpriced months then an even better estimate of the appropriateness of alternative indicators can be obtained. Given the existence of benchmark estimates one may choose to base the imputation on either the benchmark seasonal pattern or a related series or some combination of the two according to circumstances.

If a good related indicator can be found for a seasonally priced series then one would prefer to interpolate rather than extrapolate over the unpriced months to prevent a discontinuity at the first in-season month. More than in a fixed-basket index, it is in a seasonal-basket index that interpolation exhibits a real advantage over extrapolation. In most cases, interpolation alleviates the weaknesses of an indifferent indicator, bringing the index movement of the indicator more into line with the true price movement of the series.

Given a rising trend in prices for a seasonally priced commodity, carrying forward an average in-season price may roughly approximate the seasonal price movement of a commodity subject to seasonal demand, declining in the first out-of-season month and rising in the first in-season month. Carrying forward the last in-season price is less satisfactory, since the index would not drop in the first out-of-season month. Neither imputation would be at all satisfactory for a commodity subject to seasonal supply, since the index would rise in the first in-season month when it should fall.

An advantage of carrying forward the last or average in-season price is that an annual movement for a year starting with the first in-season month will be based only on prices for the seasonally priced commodity. Imputation based on the average in-season price is superior to imputation based on the last in-season price from this point of view, because the latter imputation gives too large a weight to the last in-season price.

No official statistical agency carries forward minimum or maximum in-season prices, although it is just as simple as carrying forward the last in-season price and provides a better approximation of the actual movement of the series. For a seasonally priced commodity subject to seasonal supply the maximum in-season price can be carried forward so that the index falls (or at least does not rise) in the first out-of-season month, and likely falls in the first in-season month. For a seasonally priced commodity subject to seasonal demand, the minimum in-season price can be carried forward so that the index rises (or at least does not fall) in the first out-of-season month and probably rises in the first in-season month as well.

It was mentioned in Chapter 7 that the same regression equations used to calculate Balk's regression-derived price index could be used to impute prices for seasonally priced commodities. Taking the exponent of the sum of the regression coefficients of a seasonally disappearing commodity and a month when it is out-of-season gives the estimated price of the seasonally priced commodity in that month.

Table 8.4 shows the imputations for strawberry and peach prices based on the regression coefficients used to obtain a January 1970 based index weighted with 1970-73 expenditures. The actual prices of both fruits are shown for their in-season months. It can be seen that the imputations do not seem terribly realistic; for each fruit there is a big jump in price in the first in-season month. One would expect the prices in the out-of-season months to be at least as high as the highest price during the previous in-season, but this is not the case in any month for either series. Table 8.6 shows a fixed-basket price index that incorporates these imputed price series for peaches and strawberries. The aggregate index is only a reflection of the weaknesses of its seasonally priced components. It is a highly seasonal series with a large coefficient of variation. On this evidence then, imputation from the coefficients of a regression equation does not seem to have any advantages over other simpler methods of imputation.

Table 8.1: IMPUTATION FOR STRAWBERRY PRICES BASED ON SUBSTITUTION AND EXTRAPOLATION

		Extrapolation Based On		
Date	Substitution Based On Grape Prices	Grape Prices	Continuously Available Prices	In-Season Prices
1970				
July	3.27	3.27	3.27	3.27
Aug	2.07	1.95	3.33	3.08
Sep	1.42	1.33	2.87	2.66
Oct	1.39	1.31	2.67	2.48
Nov	1.75	1.64	2.67	2.48
Dec	2.02	1.90	2.41	2.24
- - - - - - - - - -				
Jan	2.80	2.63	2.64	2.44
Feb	3.32	3.12	2.78	2.57
Mar	5.48	5.15	2.97	2.75
Apr	5.67	5.33	3.21	2.98
May	5.68	5.68	5.68	5.68

Table 8.2: FIXED-BASKET PRICE INDEXES FOR FRESH FRUIT WITH DIFFERENT IMPUTATION PROCEDURES

Date	Carry Forward: Last Price	Carry Forward: Simple Average Price	Carry Forward: Weighted Average Price	Extrapolation: Continuously Available Fruits	Extrapolation: In-season Fruits
1970					
Jan	87.4	88.9	87.9	86.7	86.9
Feb	87.3	88.7	87.7	86.8	86.7
Mar	91.2	92.6	91.6	91.7	91.5
Apr	96.8	98.2	97.2	98.6	98.3
May	109.9	109.1	109.1	113.3	114.0
Jun	117.4	114.6	116.9	117.8	118.2
Jul	116.2	113.8	115.6	116.6	117.0
Aug	113.6	113.2	113.9	114.3	114.0
Sep	100.3	99.8	100.5	99.6	99.4
Oct	95.9	95.3	96.2	94.7	94.4
Nov	95.8	96.7	95.4	94.6	94.4
Dec	88.3	89.2	87.9	85.4	85.2
Year	100.0	100.0	100.0	100.0	100.0
- - - - - - - - - -					
1971					
Jan	94.8	95.6	94.3	93.3	93.1
Feb	98.8	99.7	98.4	98.3	98.1
Mar	104.3	105.2	103.9	105.1	104.8
Apr	111.3	112.2	110.9	113.7	113.4
May	123.9	122.4	122.2	127.9	128.7
Jun	132.0	128.8	131.4	132.2	132.7
Jul	129.1	126.3	128.4	129.5	130.0
Aug	125.1	124.2	125.0	125.9	125.5
Sep	112.2	111.4	112.0	111.6	111.4
Oct	108.2	107.4	108.1	107.2	106.9
Nov	108.7	110.3	108.6	107.8	107.5
Dec	100.8	102.5	100.7	98.2	97.9
Year	112.4	112.2	112.0	112.6	112.5

Fixed-Basket Price Indexes for Fresh Fruit With Different Imputation Procedures (continued)

	Carry	Forward		Extrapolation	
Date	Last Price	Simple Average Price	Weighted Average Price	Continuously Available Fruits	In-season Fruits
1972					
Jan	107.6	109.2	107.5	106.4	106.1
Feb	110.8	112.5	110.8	110.4	110.1
Mar	117.3	118.9	117.2	118.3	118.0
Apr	123.9	125.5	123.8	126.3	125.9
May	135.1	134.5	134.0	138.7	139.5
Jun	148.4	144.6	147.7	148.5	149.1
Jul	144.3	141.2	143.6	144.8	145.4
Aug	136.6	135.2	136.1	137.1	136.7
Sep	123.7	122.5	123.1	123.1	122.8
Oct	120.9	119.7	120.4	120.0	119.7
Nov	121.8	124.7	122.3	121.0	120.7
Dec	112.2	115.1	112.8	109.4	109.1
Year	125.2	125.3	124.9	125.3	125.3
- - - - - - - - - - -					
1973					
Jan	119.0	121.9	119.5	117.6	117.3
Feb	123.7	126.7	124.3	123.4	123.0
Mar	130.3	133.2	130.9	131.3	131.0
Apr	138.8	141.7	139.3	141.6	141.2
May	149.5	150.4	149.4	153.2	154.1
Jun	168.9	164.3	168.2	168.9	169.4
Jul	160.6	156.9	159.8	161.2	161.8
Aug	150.9	148.8	149.9	151.3	150.8
Sep	136.4	134.7	135.4	135.8	135.3
Oct	136.0	134.3	135.0	135.4	134.9
Nov	137.7	142.9	139.5	137.5	137.0
Dec	124.6	129.8	126.4	121.7	121.3
Year	139.7	140.5	139.8	139.9	139.8
- - - - - - - - - - -					
Coefficient of Variation	.164	.157	.163	.169	.171

Table 8.3: FIXED-BASKET PRICE INDEXES FOR FRESH FRUIT WITH DIFFERENT IMPUTATION PROCEDURES

	Carry Forward			Extrapolation	
Date	Last Price	Simple Average Price	Weighted Average Price	Continuously Available Fruits	In-season Fruits
1970					
Feb	- .2	- .2	- .2	.1	- .3
Mar	4.5	4.4	4.4	5.6	5.5
Apr	6.1	6.0	6.1	7.5	7.5
May	13.5	11.2	12.3	14.9	15.9
Jun	6.9	5.0	7.1	4.0	3.7
Jul	- 1.1	- .8	- 1.1	- 1.0	- 1.0
Aug	- 2.2	- .5	- 1.5	- 1.9	- 2.5
Sep	-11.8	-11.8	-11.7	-12.8	-12.8
Oct	- 4.4	- 4.5	- 4.4	- 5.0	- 5.0
Nov	.0	1.4	- .8	- .1	- .1
Dec	- 7.8	- 7.7	- 7.9	- 9.7	- 9.7
1971					
Jan	7.3	7.2	7.3	9.3	9.3
Feb	4.3	4.2	4.3	5.3	5.3
Mar	5.6	5.5	5.6	6.9	6.9
Apr	6.7	6.7	6.7	8.2	8.2
May	11.3	9.1	10.2	12.5	13.4
Jun	6.5	5.2	7.5	3.4	3.2
Jul	- 2.2	- 1.9	- 2.2	- 2.1	- 2.1
Aug	- 3.0	- 1.6	- 2.6	- 2.8	- 3.4
Sep	-10.4	-10.4	-10.4	-11.3	-11.3
Oct	- 3.5	- 3.6	- 3.5	- 4.0	- 4.0
Nov	.4	2.8	.5	.5	.5
Dec	- 7.3	- 7.1	- 7.3	- 8.9	- 8.9

Fixed-Basket Price Indexes for Fresh Fruit With Different Imputation Procedures (continued)

	Carry	Forward		Extrapolation	
Date	Last Price	Simple Average Price	Weighted Average Price	Continuously Available Fruits	In-season Fruits
1972					
Jan	6.7	6.6	6.7	8.4	8.4
Feb	3.1	3.0	3.1	3.8	3.8
Mar	5.8	5.7	5.8	7.1	7.1
Apr	5.6	5.5	5.6	6.8	6.8
May	9.1	7.2	8.3	9.9	10.8
Jun	9.8	7.5	10.2	7.1	6.8
Jul	- 2.7	- 2.4	- 2.8	- 2.5	- 2.5
Aug	- 5.4	- 4.3	- 5.3	- 5.4	- 6.0
Sep	- 9.5	- 9.4	- 9.5	-10.2	-10.2
Oct	- 2.2	- 2.3	- 2.2	- 2.5	- 2.5
Nov	.7	4.2	1.6	.8	.8
Dec	- 7.9	- 7.7	- 7.8	- 9.6	- 9.6
1973					
Jan	6.0	5.9	6.0	7.5	7.5
Feb	4.0	3.9	4.0	4.9	4.9
Mar	5.3	5.2	5.3	6.4	6.4
Apr	6.5	6.4	6.5	7.8	7.8
May	7.7	6.1	7.2	8.2	9.2
Jun	12.9	9.2	12.6	10.2	9.9
Jul	- 4.9	- 4.5	- 5.0	- 4.5	- 4.5
Aug	- 6.1	- 5.2	- 6.2	- 6.1	- 6.8
Sep	- 9.6	- 9.5	- 9.7	-10.3	-10.3
Oct	- .3	- .3	- .3	- .3	- .3
Nov	1.3	6.4	3.4	1.5	1.5
Dec	- 9.5	- 9.2	- 9.4	-11.5	-11.5

Table 8.4: IMPUTED FRUIT PRICES BASED ON BALK'S REGRESSION PROCEDURE

Date	Peaches	Strawberries
1970		
Jan	1.49	2.85
Feb	1.45	2.77
Mar	1.42	2.70
Apr	1.55	2.96
May	1.88	5.13
Jun	3.15	3.48
Jul	2.53	3.27
Aug	1.76	3.60
Sep	1.73	3.11
Oct	1.94	2.82
Nov	1.57	2.99
Dec	1.48	2.83
1971		
Jan	1.57	3.00
Feb	1.61	3.08
Mar	1.63	3.11
Apr	1.78	3.41
May	2.12	5.68
Jun	3.77	3.72
Jul	2.85	3.78
Aug	1.98	4.01
Sep	1.80	3.43
Oct	1.95	3.27
Nov	1.76	3.35
Dec	1.72	3.29

Imputed Fruit Prices Based on Balk's
Regression Procedure (continued)

Date	Peaches	Strawberries
1972		
Jan	1.81	3.46
Feb	1.81	3.46
Mar	1.85	3.54
Apr	1.99	3.79
May	2.34	6.21
Jun	4.69	3.98
Jul	3.32	4.30
Aug	2.29	4.53
Sep	1.90	3.78
Oct	1.97	3.74
Nov	2.08	3.98
Dec	1.90	3.63
1973		
Jan	1.99	3.80
Feb	2.01	3.84
Mar	2.08	3.96
Apr	2.25	4.29
May	2.61	6.89
Jun	6.10	4.32
Jul	4.08	4.91
Aug	2.80	5.23
Sep	2.06	4.18
Oct	2.01	4.27
Nov	2.40	4.58
Dec	2.12	4.04

Table 8.5: ROTHWELL INDEXES FOR FRESH FRUIT BASED ON ACTUAL AND PROXY EXPENDITURES

Date	Actual Expenditures	Proxy Expenditures 1	Proxy Expenditures 2
1970			
Jan	93.7	87.3	87.3
Feb	90.8	87.6	87.6
Mar	88.3	97.0	97.0
Apr	96.5	103.3	103.3
May	114.5	117.1	113.5
Jun	108.8	114.0	116.2
Jul	111.2	107.4	112.8
Aug	111.4	105.5	110.1
Sep	98.0	93.0	95.7
Oct	92.7	90.7	91.3
Nov	99.2	92.6	92.6
Dec	93.1	84.4	84.4
Year	100.0	100.0	100.0
1971			
Jan	98.5	93.5	93.5
Feb	100.7	99.2	99.2
Mar	101.4	110.1	110.1
Apr	110.7	118.6	118.6
May	128.0	130.8	127.1
Jun	118.4	128.4	130.6
Jul	124.1	120.3	125.4
Aug	123.8	116.3	121.1
Sep	107.8	102.9	106.8
Oct	106.8	100.6	102.9
Nov	114.9	106.6	106.6
Dec	107.5	97.9	97.9
Year	111.9	112.2	112.3

Rothwell Indexes for Fresh Fruit Based on Actual and Proxy Expenditures (continued)

Date	Actual Expenditures	Proxy Expenditures 1	Proxy Expenditures 2
1972			
Jan	113.6	107.5	107.5
Feb	113.3	113.0	113.0
Mar	115.5	124.7	124.7
Apr	123.3	133.4	133.4
May	139.9	143.5	139.6
Jun	128.5	145.8	146.9
Jul	138.4	135.8	140.6
Aug	139.6	127.8	132.2
Sep	118.6	112.8	117.6
Oct	121.7	111.0	114.9
Nov	130.7	120.7	120.7
Dec	119.6	110.6	110.6
Year	125.3	125.7	125.8
- - - - - - - - - - -			
1973			
Jan	124.6	119.6	119.6
Feb	125.7	127.5	127.5
Mar	129.4	138.9	138.9
Apr	139.5	150.5	150.5
May	155.9	159.6	155.4
Jun	140.8	168.6	166.9
Jul	154.4	153.6	156.4
Aug	160.9	142.7	145.6
Sep	131.0	123.8	129.3
Oct	138.3	123.1	128.9
Nov	149.6	137.6	137.6
Dec	132.5	123.2	123.2
Year	140.3	141.3	140.7
- - - - - - - - - - -			
Coefficient of Variation	.153	.170	.167

Table 8.6: FIXED-BASKET PRICE INDEX FOR FRESH FRUIT WITH REGRESSION-DERIVED IMPUTATION PROCEDURE

Date	Index	Date	Index
1970		1971	
Jan	87.2	Jan	92.8
Feb	86.6	Feb	97.3
Mar	90.1	Mar	103.0
Apr	97.1	Apr	111.7
May	112.3	May	126.1
Jun	118.7	Jun	133.4
Jul	117.2	Jul	130.2
Aug	115.3	Aug	126.7
Sep	100.6	Sep	112.1
Oct	95.5	Oct	107.8
Nov	93.9	Nov	107.4
Dec	85.4	Dec	99.1
Year	100.0	Year	112.3
1972		1973	
Jan	106.8	Jan	118.7
Feb	110.1	Feb	123.7
Mar	117.0	Mar	131.0
Apr	125.1	Apr	141.3
May	138.5	May	154.4
Jun	150.1	Jun	171.0
Jul	145.7	Jul	162.3
Aug	138.3	Aug	153.0
Sep	123.2	Sep	135.5
Oct	120.4	Oct	135.3
Nov	122.5	Nov	140.1
Dec	111.0	Dec	123.9
Year	125.7	Year	140.9

Coefficient of Variation .173

Table 8.7: MONTHLY UNIT VALUES FOR STRAWBERRIES 1978

Month	Average Weekly Expenditure	Average Weekly Quantity (litres)	Unit Value
Jan	-	.001	-
Feb	.01	.005	2.00
Mar	.03	.020	1.50
Apr	.09	.079	1.14
May	.15	.150	1.00
Jun	.27	.281	.96
Jul	.40	.467	.86
Aug	.02	.020	1.00
Sep	.02	.021	.95
Oct	.01	.007	1.43
Nov	-	.001	-
Dec	-	.002	-
Year	.08	.081	.99

8.8 Endnotes

[1] Carrying forward the last in-season price can be seen as extrapolation where the related indicator chosen is a constant series.

[2] This is actually what is done in India (Turvey [1979]).

[3] Before 1953, the BLS carried forward the last in-season price for seasonal commodities. Rather than abandoning imputation for seasonally priced fruit based on in-season items, BLS [1983; p.4] now imputes in this way for all seasonally priced items.

[4] This is not surprising when one examines Table 8.1 and sees how the inclusion of the strong downward movement of peaches in August and September influences the extrapolated strawberry price for April, and leads to a large, counterfactual price increase in May. Strawberries are in-season from May to June, peaches from June to October, so peaches have a considerable impact on the imputed price movement for strawberries, but not vice versa.

[5] The exception to this principle would occur if there were some reason to believe that the proxy monthly expenditures are roughly equivalent to the actual monthly expenditures, i.e., that the volume of purchases is roughly the same in every month a commodity is priced, and is virtually nil in every other month. I can think of no practical instance where this might be the case.

[6] A commodity for which there is a seasonal demand may be produced in all months of the year by manufacturers. Seasonal purchases then have their greatest impact on the accumulation or depletion of retail or wholesale inventories, and not on production. In many cases, it may be possible to collect price quotes from manufacturers on their prices to wholesalers or retailers for products that cannot be reliably priced at retail outlets. This is why seasonal commodities pose a lesser problem for producer price indexes for manufacturing than they do for consumer price indexes.

[7] Because of this one would prefer that the monthly expenditure weights for a given urban centre's seasonal-basket index be based on its own rather than the Canadian seasonal pattern. Unfortunately, the FFEX estimates are not based on nearly a large enough sample to derive reliable monthly estimates by city, even for the major centres Toronto, Montreal and Vancouver.

[8] Such benchmark information exists already for food items in the monthly unit prices that can be calculated from the Family Expenditure Survey estimates of expenditures and quantities purchased. There were previously discussed with reference to the example of strawberries (see Table 8.7). But these unit prices are generally based on too small samples and are too subject to quality variation to be very reliable.

Chapter 9

COMPARISONS OF IMPUTATION FOR CPI SEASONALLY PRICED CLOTHING ITEMS

9.1 Purposes of Comparisons

In the last chapter it was argued on theoretical grounds that it is better to use the price movement of a higher level aggregate to impute for a seasonally priced commodity in a fixed-basket price index than to follow the official practice of keeping the commodity's index unchanged during its unpriced months. This chapter compares different methods of imputation based on actual CPI data. Since one may wonder what purpose can be served by such comparisons when there are good theoretical reasons for preferring one method to another, the objectives of the comparisons should be clearly stated. First, extrapolation may cause a spurious decline in the index for the seasonally priced commodity in some years in the first in-season month. This, it has been argued, is not so serious if one considers this kind of imputation to be a substitute seasonal weighting. Still, the desire to avoid such spurious declines has been one reason why imputation is not based on extrapolation in the official CPI. Thus, there is some interest in the empirical question of how often extrapolation will in fact generate such declines.

Second, there is the related question of to what extent the carry-over method imposes a spurious seasonal pattern on the index of a seasonally priced series, by imputing a large price increase to the commodity in the first in-season month of every year.

Third, there is the question of which type of imputation will give the more normal movement to the index of the seasonally priced commodity and its higher level aggregate. This is only a nebulous question until the normal price movement is somehow defined, at which point it also becomes a question that can be empirically investigated. For this study, the normal price movement is assumed to be the price movement of the continuously priced items in the group to which the seasonally priced item belongs.

No attempt was made to test the appropriateness of these imputation methods in terms of approximating the actual price movement of a seasonally priced commodity in its non-priced months. Such an experiment would be difficult to design in an acceptable fashion.

One could, of course, take an item that was priced in every month of the year, pretend that it was seasonally priced, and test the accuracy of different methods in predicting the price movement in its designated off-season months. But then one has chosen as a test case a much simpler problem than one is faced with in real situations; there are probably many other commodities with a mild seasonal price pattern similar to that of the test commodity. An actual seasonal priced commodity is like to have a far more pronounced seasonal pattern than that of its continuously priced counterparts. In many cases, not only the seasonal amplitude but the seasonal turning points of the series will be different from those of continuously priced items.

9.2 Methodology

Articles of clothing account for about a third of the CPI's seasonally priced items by weight. From these, 3 clothing groups were selected for detailed study. Each contains at least one seasonally priced good (listed in brackets after the group name):

1. women's footwear (women's snowboots),

2. girls' wear (girls' winter coats, girls' all-weather coats, girls' ski jackets and snowsuits, girls' leotards),

3. boys' wear (boys' ski jackets, boys' lightweight jackets).

For each group an index of continuously available items was calculated, that is, an aggregate index containing all components except the seasonally priced ones just listed (hereafter referred to as the non-seasonal aggregate).

Then each seasonally priced item was recalculated for its out-of-season months by extrapolation on the basis of a related indicator. Two related indicators were used:

1. the non-seasonal aggregate or the continuously available component of the group whose movement over the spans between the last in-season month and the first out-of-season month most closely matched that of the seasonally priced good,

2. the non-seasonal aggregate.

The first and second indicators are identical if the non-seasonal aggregate is more highly correlated with the index for the seasonally priced good than any individual component index. This was the case for the non-seasonal aggregate for girls' wear for all three of its seasonally priced items. The index imputed from the first type of indicator will be called test series 1; the index imputed from the non-seasonal aggregate will be called test series 2.

These indexes are compared to price indexes that carry over the last in-season price of a seasonally priced good in the out-of-season months. The latter indexes, hereafter called carry-over indexes, impute the out-of-season price movement in the same way as the official CPI, and serve to test the appropriateness of the official imputation procedure.[1] The seasonally priced series were also interpolated over their out-of-season months using both indicators, and group indexes were calculated based on the interpolated series. There were altogether 5 different group indexes that could be generated based on different imputations of the seasonally priced components, carrying over the last in-season price, and extrapolating or interpolating each of the two possible related indicators.

9.3 Results

The results of this study show a substantial number of cases where imputation based on extrapolation induces a spurious decline in an index in its first in-season month. In fact there are 14 such declines out of 50 possible cases (where extrapolation is based on test series 2). A decline is considered to be spurious only if the non-seasonal aggregate rises in the same month. If it should drop instead then the decline in the extrapolated series is considered to accurately reflect a true price decrease for the commodity. (The percent changes for the seasonally priced series are shown in Table 9.1 to Table 9.5 for the first in-season month of each year. Although a pricing frequency is established for all seasonally priced items, it is modified to meet special market conditions, so in some years, the first in-season month may be later or earlier than in others.) The interpolated series registered a spurious increase only once.

The non-seasonal aggregate declines in the first in-season month in 6 cases altogether for 4 out of the 7 series. In only 2 out of the 6 cases does the extrapolated series show a positive rather than a negative movement, as opposed to 5 out of 6 cases for the carry-over series. Thus, these results do provide some support for the belief that extrapolation may lead to spurious declines in the imputed series in the first priced month of the year, but also suggest that use of the carry-over method may lead to spurious increases.

The practice of carrying over the last in-season index number through the unpriced months does indeed impose a spurious seasonal pattern on the indexes for seasonally priced items. The test statistics of the X11-ARIMA seasonal adjustment program indicate that each of the unadjusted carry-over indexes has significant seasonality (not so for every one of the extrapolated indexes) and in all cases the seasonal pattern is similar.[2] Seasonal factors decline from the last priced month or a previous month until the last unpriced month. The seasonal factor for the last unpriced month is always the lowest for the year, although the first unpriced months have seasonal factors above 100. The series of seasonal factors rises sharply in the first priced month to above 100 and keeps rising for at least another month.

At the bottom of Tables 9.1 to 9.7 is indicated the sum of squared deviations between the percent changes of the imputed series and the non-seasonal aggregate for the first in-season month of each year. This provides a measure of the divergence of the monthly movement of the imputed series from a normal index movement. As can be seen the sum of squared deviations is largest for the carry-over series, smallest for the interpolated series, with the extrapolated series in between.

Tables 9.8 to 9.10 are similar to Tables 9.1 to 9.7 only they represent the three clothing groups to which the seasonally priced elemental indexes belong. In spite of aggregation with continuously priced series, the group indexes incorporating extrapolated series show some spurious declines and the group indexes incorporating carry-over series show some spurious increases. Once again the sum of squared deviations between the percent changes of the imputed series and the non-seasonal aggregate is lowest for the interpolated series, and highest for the carry-over series, with the extrapolated series in the middle.

Table 9.11 shows the sum of squared deviations for group indexes based on different imputations, calculated in the same way as for Table 9.8 to Table 9.10 but for all months of the estimation period. This really constitutes a more conclusive test of the methods of imputation, since one is concerned with the appropriateness of the imputed price movements for all months imputed. Table 9.11 also shows the sum of squared deviations increasing from interpolation to extrapolation to the carry-over method.

In Table 9.11 the differences due to the use of one related indicator rather than another are negligible compared to the differences due to extrapolating rather than interpolating but test series 2 gives a smaller sum of squared deviations for both women's footwear and boys' wear. This is hardly surprising since the related indicator and the series used to exemplify a normal price movement is in both cases the non-seasonal aggregate. In Table 9.11 the differences between the results for the different series are not more dramatic partly because for each group index seasonally priced items accounted for less than a quarter of the index weight.

Table 9.12 is similar to Table 9.11 only sums of squared deviations are based on the monthly movements of seasonally adjusted series rather than series unadjusted for seasonal variation.[3] Although one might expect seasonal adjustment to eliminate much of the difference between the imputed series, the results show that, even after seasonal adjustment, the series based on interpolation show a more normal index movement than the series based on extrapolation and the latter series a more normal movement than the series based on interpolation.

In conclusion an imputed series based on extrapolation will show declines in the first priced month more frequently than a series based on carrying over the last index number for a priced month. On the other hand, the latter series will frequently show price increases in the same month that are perverse given a decline in prices in the same month for the commodity group to which the seasonally priced item belongs. The carry-over method also introduces a spurious seasonal pattern into the price index of a seasonal commodity which can distort the true seasonal pattern of higher level aggregates. Extrapolation produces a more normal index movement than the carry-over method, but it is inferior in this regard to interpolation, which is the best imputation method of the three.

Table 9.1: MONTHLY MOVEMENTS OF INDIVIDUAL SERIES - WOMEN'S SNOWBOOTS (391400)

		Month to Month Percent Change				
		Extrapolated		Interpolated		
Month	Carry-over	Test 1	Test 2	Test 1	Test 2	Non-seasonal
7410	2.2	1.4	0.9	0.9	0.7	0.7
7510	5.4	2.7	3.3	0.5	1.3	0.9
7611	5.9	3.1	1.5	0.7	0.7	0.4
7710	6.4	- 1.8	- 1.9	0.0	0.0	0.3
7810	6.4	3.5	3.3	3.7	3.0	2.9
7910	14.5	6.9	2.0	2.2	2.0	1.2
8010	4.6	- 4.0	- 4.3	- 0.3	- 0.3	0.3
8110	5.4	1.5	1.7	- 0.1	0.1	- 0.2
Sum of Squared Deviations	328.95	67.66	37.42	2.39	1.44	

Table 9.2: MONTHLY MOVEMENTS OF INDIVIDUAL SERIES - GIRLS' WINTER COATS (321100)

Month	Carry-over	Month to Month Percent Change Extrapolated	Interpolated	Non-seasonal
7410	7.2	0.2	1.4	.6
7510	2.7	2.2	1.3	0.5
7690	3.6	1.1	0.8	0.5
7710	5.4	2.9	1.5	1.3
7810	6.1	3.2	1.3	1.2
7910	3.5	- 1.1	0.9	1.2
8010	5.7	0.5	1.4	1.5
8110	4.2	0.6	1.8	2.0
Sum of Squared Deviations	114.4	20.2	0.96	

Table 9.3: MONTHLY MOVEMENTS OF INDIVIDUAL SERIES - GIRLS' ALL WEATHER COATS (321300)

Month	Carry-over	Month to Month Percent Change Extrapolated	Interpolated	Non-seasonal
7504	2.6	- 0.9	0.2	0.4
7603	6.3	3.9	1.0	0.7
7703	5.0	0.8	0.3	0.2
7804	0.7	- 3.4	- 2.4	- 2.2
7904	8.3	2.4	0.4	0.2
8004	8.1	1.0	0.3	0.2
8104	0.4	- 5.3	- 1.1	- 0.6
- - - - - - - - - - -				
Sum of Squared Derivations	196.67	41.30	0.48	

Table 9.4: MONTHLY MOVEMENTS OF INDIVIDUAL SERIES - GIRLS' SKI JACKETS AND SNOWSUITS (323600)

Month	Carry-over	Month to Month Percent Change Extrapolated	Interpolated	Non-seasonal
7410	3.7	- 3.1	1.0	1.6
7510	3.6	2.6	1.2	0.5
7610	3.1	0.4	0.5	0.5
7710	5.2	2.9	1.6	1.3
7810	5.9	3.0	1.3	1.2
7910	4.4	- 0.3	0.9	1.2
8010	5.8	2.2	1.6	1.5
8110	3.6	0.1	1.7	2.0
Sum of Squared Deviations	89.37	38.66	1.14	

Table 9.5: MONTHLY MOVEMENTS OF INDIVIDUAL SERIES - GIRLS' LEOTARDS (325300)

Month	Carry-over	Month to Month Percent Change Extrapolated	Interpolated	Non-seasonal
7410	5.8	- 2.0	1.3	1.6
7511	- 0.5	- 2.5	0.2	0.5
7610	0.5	- 0.9	0.2	0.5
7710	2.7	0.3	1.1	1.3
7810	4.6	1.9	1.3	1.2
7910	9.1	4.3	1.7	1.2
8010	8.3	5.4	2.1	1.5
8110	4.0	0.4	1.6	2.0
Sum of Squared Deviations	144.81	52.79	1.09	

Table 9.6: MONTHLY MOVEMENTS OF INDIVIDUAL SERIES - BOYS' PARKAS & SKI JACKETS (341400)

Month	Carry-over	Month to Month Percent Change Extrapolated Test 1	Test 2	Interpolated Test 1	Test 2	Non-seasonal
7410	8.2	4.0	0.1	0.1	0.4	0.4
7510	2.1	3.4	1.2	0.7	0.7	0.7
7612	- 1.6	- 2.8	- 7.2	- 0.9	- 1.0	- 0.2
7709	6.5	5.1	4.2	3.4	2.2	1.8
7810	6.5	3.7	3.1	1.1	1.9	1.7
7911	11.5	6.8	6.3	1.9	2.2	0.8
8010	6.0	4.9	3.8	1.9	3.6	3.6
8110	4.2	0.2	1.4	2.0	3.2	3.4
Sum of Squared Deviations	230.78	80.47	70.72	9.96	2.84	

Table 9.7: MONTHLY MOVEMENTS OF INDIVIDUAL SERIES - BOYS' LIGHTWEIGHT JACKETS (341500)

Month	Carry-over	Month to Month Percent Change: Extrapolated Test 1	Extrapolated Test 2	Interpolated Test 1	Interpolated Test 2	Non-seasonal
7504	3.9	- 1.5	- 0.8	0.7	0.1	0.3
7604	1.3	0.7	- 1.1	0.1	0.7	0.9
7704	3.7	2.5	1.0	1.3	1.6	1.7
7804	2.4	1.8	- 0.6	2.0	- 1.4	- 1.5
7904	5.5	- 1.2	0.5	0.5	- 0.3	- 0.4
8004	7.2	4.9	- 0.3	2.2	0.3	0.4
8104	5.3	- 1.5	- 0.2	0.0	0.9	0.9
Sum of Squared Deviations	132.74	41.46	9.02	0.12	0.12	

Table 9.8: MONTHLY MOVEMENTS OF GROUP INDEXES - WOMEN'S FOOTWEAR

		Month to Month Percent Change				
		Extrapolated		Interpolated		
Month	Carry-over	Test 1	Test 2	Test 1	Test 2	Non-seasonal
7410	1.0	0.8	0.7	0.7	0.7	0.6
7510	1.9	1.3	1.4	0.8	1.0	0.9
7611	0.5	0.4	0.6	0.5	0.4	0.4
7710	1.7	- 0.2	- 0.2	0.3	0.3	0.4
7810	3.7	3.1	2.7	3.1	3.0	3.0
7910	4.0	2.5	2.4	1.4	1.4	1.2
8010	1.2	- 0.7	- 0.7	0.2	0.2	0.3
8110	1.0	0.2	0.2	- 0.1	- 0.1	- 0.2
Sum of Squared Deviations	13.44	3.42	3.35	0.11	0.09	

Table 9.9: MONTHLY MOVEMENTS OF GROUP INDEXES - ALL GIRLS' WEAR

Month	Carry-over	Month to Month Percent Change Extrapolated	Interpolated	Non-seasonal
7410	2.5	1.0	1.5	1.6
7504	0.6	0.4	0.4	0.4
7510	1.3	1.3	1.2	1.1
7603	0.7	0.6	0.7	0.7
7610	0.5	0.5	0.6	0.5
7703	0.3	0.2	0.2	0.2
7710	1.9	1.5	1.3	1.3
7804	- 2.3	- 2.2	- 2.2	- 2.2
7810	2.0	1.6	1.3	1.3
7904	0.2	0.2	0.1	0.2
7910	1.8	0.9	1.1	1.2
8004	0.2	0.2	0.2	0.2
8010	2.3	1.5	1.5	1.5
8104	- 0.7	- 0.7	- 0.7	- 0.6
8110	2.3	1.6	1.9	2.0
Sum of Squared Deviations	2.86	0.84	0.07	

Table 9.10: MONTHLY MOVEMENTS OF GROUP INDEXES - ALL BOYS' WEAR

Month	Carry-over	Month to Month Percent Change Extrapolated Test 1	Extrapolated Test 2	Interpolated Test 1	Interpolated Test 2	Non-seasonal
7410	1.4	0.8	0.4	0.5	0.4	- 0.4
7504	0.4	0.2	0.3	0.3	0.3	0.3
7510	0.8	1.0	0.7	0.7	0.7	0.7
7604	0.8	0.9	0.9	0.9	0.8	0.9
7612	1.1	- 0.5	- 1.0	- 0.2	- 0.3	- 0.2
7703	1.6	1.5	1.6	1.5	1.5	1.7
7709	2.2	2.1	2.0	1.9	1.8	1.8
7804	- 1.5	- 1.6	- 1.6	- 1.6	- 1.4	- 1.5
7810	1.9	1.8	1.8	1.5	1.6	1.6
7904	- 0.1	- 0.6	- 0.2	- 0.4	- 0.3	- 0.4
7911	2.1	1.4	1.5	0.9	0.9	0.8
8004	0.5	0.5	0.6	0.5	0.4	0.4
8010	3.4	3.4	3.2	3.0	3.2	3.1
8104	0.9	0.7	1.1	0.7	0.9	0.9
8110	2.9	2.6	2.6	2.8	2.8	2.8
Sum of Squared Deviations	4.87	1.11	1.40	0.15	0.10	

Table 9.11: SUM OF SQUARED DEVIATIONS BETWEEN MONTHLY PERCENT CHANGES OF NON-SEASONAL AGGREGATE AND AGGREGATES CALCULATED USING DIFFERENT IMPUTATIONS (UNADJUSTED SERIES)

Group	Carry-over	Extrapolated Test 1	Extrapolated Test 2	Interpolated Test 1	Interpolated Test 2
Women's Footwear	34.39	17.97	22.63	14.53	14.07
Girls' Wear	13.58	-	11.45	-	9.98
Boys'	7.845	6.40	5.49	5.84	3.80

Table 9.12: SUM OF SQUARED DEVIATIONS BETWEEN MONTHLY PERCENT CHANGES OF NON-SEASONAL AGGREGATE AND AGGREGATES CALCULATED USING DIFFERENT IMPUTATIONS (SEASONALLY ADJUSTED)

Group	Carry-over	Extrapolated Test 1	Extrapolated Test 2	Interpolated Test 1	Interpolated Test 2
Women's Footwear	17.616	10.813	15.169	8.791	8.423
Girls' Wear	7.536	-	6.916	-	5.572
Boys' Wear	6.032 (33.994)	3.774	2.913	4.141	2.153

9.4 Endnotes

[1] All indexes are 1974-based Laspeyres indexes running from January 1974 to December 1981. The carry-over indexes were used in the official CPI when it was based on a 1974 basket; to this extent, they are official series.

[2] In the X-11 seasonal adjustment program seasonal factors average to 100. Months with seasonally high values have seasonal factors greater than 100, those with low values have factors less than 100.

[3] For boys' wear, the carry-over index did not exhibit significant seasonality so one might argue that the unadjusted series should be compared to the adjusted non-seasonal aggregate. The number in brackets for this index in Table 9.12 is the sum of squared deviations between the unadjusted carry-over index and the adjusted non-seasonal aggregate and this value is much larger than the sum for the extrapolated series.

Chapter 10

REMARKS

10.1 The Larger Class of Weighting Problems

How a problem is perceived to a large extent determines how it is dealt with. In Chapter 1 a seasonal commodity was defined as any commodity with significant seasonality in its purchases. This definition is consistent with a perception of seasonal commodities as part of that larger group of commodities which tend to be under- or over-weighted in a fixed basket index because the volume of expenditures on such commodities is not a stable proportion of the total. This may be due to a rising or falling trend, cyclical swings, or seasonal oscillations. Whatever the reason, the logical approach to the index number problem that it creates is to generalize the fixed-basket formula in a way that allows for representative weighting of component series. This means that in the special case where the volume of purchases for each commodity is constant over time, the generalized formula reduces to a fixed-basket formula.

Chain indexes are designed to allow for changes in the basic trend of expenditure patterns. The official CPI is calculated as a chain fixed-basket series, with an index based on an updated basket being linked every 4 years to the last month of the official series. For example, if the index were linked at month **t-1**, updating it to a period **n** basket from a period c basket, the formula would be:

$$I^{ch}_{t/0} = I^{ch}_{t-1/0}\ I_{t/t-1}$$

$$= (\sum_j P^j_{t-1} \cdot Q^j_c \ / \ \sum_j P^j_0\ Q^j_c\ ) \times \sum_j P^j_t\ Q^j_n \ / \ \sum_j P^j_{t-1}\ Q^j_n$$

If $Q^j_c = Q^j_n$ for all **j**, that is, if the baskets for years **c** and **n** are identical, then the chain fixed-basket index reduces to a fixed-basket index. Chaining can allow new goods and disappearing goods to be included in a price index in a reasonable way, as a seasonal-basket index permits the inclusion of seasonally disappearing commodities. A new good could not be included in a fixed-basket index if it was not yet on the market in the basket reference year. A disappearing good, which goes off the market due to technical obsolescence, could only be included if an index movement were imputed for it in the years following its disappearance.

A multi-year basket reference period is sometimes adopted for those commodities whose purchase volumes are subject to strong cyclical swings.[1] If a 3-year basket reference period were adopted for such commodities, one would have a new fixed-basket formula, that could be expressed as

$$I_{t/0} = \sum_j P_t^j \, (Q_{c-2}^j + Q_{c-1}^j + Q_c^j) \;/\; \sum P_0^j \, (Q_{c-2}^j + Q_{c-1}^j + Q_c^j)$$

If $Q_{c-2}^j = Q_{c-1}^j = Q_c^j$ for all j, that is, if the baskets for the three years ending with year c are all identical, then the above fixed-basket formula reduces to the formula based on a single year basket. The use of a multi-year basket reference period prevents a commodity from being unfairly excluded or underrepresented in an aggregate index because it disappeared or was reduced to a very low purchase volume in a given year. It also prevents the overweighting of other commodities on which there might have been quite unnaturally large expenditures in the same year. The use of a multi-year basket reference period in an index to guard against cyclical instability is analogous to the use of a multi-year seasonal pattern in a Rothwell index to guard against seasonal instability (see 6.2).

Another approach to cyclical commodities is the use of a chain fixed-basket formula with annual changes of basket so that the basket reference year and the year of estimation are always one and the same. This approach has never been used, to the author's knowledge, in an official series,[2] but in some respects it is superior to the previous approach: there will be much less need for imputation of cyclically priced commodities, the cyclical equivalent of seasonally priced commodities, in such a chain index than in any fixed-basket index. Again, this chain index reduces to a direct fixed-basket index if the baskets for all years are the same.

A seasonal-basket index at annual prices allows for seasonal oscillations in purchases. Each component in a monthly series is fairly weighted for each month of the year according to its share of monthly expenditures. If all monthly baskets are identical, then a seasonal-basket index reduces to a fixed-basket index.

None of the other approaches to seasonal commodities share this important property. Given identical monthly baskets, a seasonal-basket index at monthly base prices reduces to a fixed-basket index at monthly base prices (Bean and Stine's Type B index) rather than a standard fixed-basket index at annual prices. A Mudgett index reduces to a cumulative fixed-basket index and a Diewert-French index to a 12-month moving average of a fixed-basket index.

A consideration of the seasonal commodities problem as one of a larger class of weighting problems makes these other approaches to its solution appear suspect. A cumulative price index calculated on an annual basis would not have any difficulty handling new or disappearing commodities, but such an index is nowhere used. A series based on a multi-year moving average of prices, with weighting for each year based on its own expenditures, would be one way of dealing with cyclical commodities, but this approach also is nowhere used. Why then, should they be considered appropriate in the treatment of seasonal commodities? And the failure of these formulas to reduce to a fixed-basket formula is the more serious because the non-seasonal commodities in the CPI are based on a fixed-basket formula. If the internal coherence and consistency of the CPI is to be maintained, the seasonal commodity CPIs must be based on either a fixed-basket formula or a seasonal-basket formula with annual base prices.

Putting the seasonal commodities problem into its larger context also allows one to put the deficiencies of the seasonal-basket approach into perspective. True, a seasonal-basket index fails the identity and mean value tests for monthly index changes but a chain index will also fail both tests for certain monthly or annual index changes. The seasonal-basket index numbers themselves will always satisfy the mean value test, not so for chain index numbers. Chain indexes are generally recognized as being useful for the calculation of longrunning price series, in spite of their failure to satisfy all the properties and tests of a price index. The failure of seasonal-basket indexes to satisfy the same properties and tests should not then be considered as a serious obstacle to their use as official series.

10.2 The Implementation of a Seasonal-Basket Approach

The advantage of a seasonal-basket formula is that it provides representative weighting for each month of the year and that it does not require imputation of fictive prices for seasonally disappearing commodities. The seasonal-basket formula is the obvious choice if a commodity group is highly seasonal and there are important seasonally priced commodities in the group. If a commodity group is less seasonal and all of its priced items are priced every month then the disadvantages of the fixed-basket formula are not as great, and the inconveniences of a seasonal-basket formula are such that its use may not be justified.

Statistical agencies do not all draw the line between commodities that should be given special treatment in the same place. Table 10.1 shows the food commodity groups calculated using seasonal-basket formulas for several countries, including Canada from 1961-April 1973. In every country, seasonal-basket indexes are or were calculated for fresh fruit and vegetables, and in the United Kingdom and Canada for processed fruit and vegetables as well. Canada and Japan calculate or calculated seasonal-basket indexes for fish and seafood, and only Canada calculated seasonal-basket indexes for meat, poultry, dairy products, eggs, fats and oils.

If a seasonal-basket approach is to be adopted in an official series only the Balk and Rothwell formula merit consideration, the other formulas being unacceptable. Because of its onerous data requirements and the long revision period that its calculation on an ongoing basis requires, the Balk formula is unsuitable for use in the official CPI. Any implementation of a seasonal-basket approach in the CPI must therefore be based on the Rothwell formula.

If the consumer price series for some seasonal commodity groups are based on the Rothwell formula, at higher levels of aggregation the CPI will remain a fixed-basket index. In other words, each seasonal-basket index for a seasonal commodity group will have a fixed weight in the all items CPI. For a seasonal commodity group containing several basic groupings, the use of the Rothwell formula ensures the representativeness of the weighting for its components in every month of the calendar year. For a seasonal commodity group that consists of a single basic grouping, for example, package holiday trips in the official CPI, the seasonal basket approach only ensures that the annual movement of the series appropriately reflects the importance of different months in annual expenditures.

This assumes that the annual series is calculated as a weighted average of the monthly values. This gives an annual series based on the ideal annual formula. It is easier to calculate the annual series as a simple average of its monthly values. It also is more in conformity with the practice for non-seasonal commodities if not with the logic that lies behind that practice. But if the seasonality in the volume of purchases is so pronounced that the fixed-basket approach is unacceptable, it is difficult to understand how the use of simple averages to calculate the annual series could remain acceptable. It should also be remembered that the implicit price indexes for Gross National Expenditure are based on the Paasche formula. The annual implicit price series are therefore weighted rather than simple averages of the quarterly series but this has not prevented them from being widely accepted indicators of price change. All things considered, one would be ill-advised to adopt a seasonal-basket approach to seasonal commodities only to throw away part of the advantage of such an approach by calculating annual indexes based on simple averages.

The chain calculation of the official CPI also raises some issues with regard to the implementation of seasonal baskets, which were previously discussed in 6.4.

10.3 Some Weighting Problems With the Seasonal-Basket Approach

Consumer expenditures on all goods and services are part of the CPI basket, including commodities that are not priced as part of the Consumer Price Survey. The index movement of these unpriced commodities is imputed from the indexes of priced commodities. (These unpriced items are not to be confused with seasonally priced commodities, which are part of the Consumer Price Survey, but which are not priced in every month of the year.) In choosing source series for imputation one usually looks for a commodity whose attributes seem to match those of the target commodity. In a seasonal-basket index one should be careful that the seasonal pattern of the source and target items are similar, or one may obtain perverse results. For example, any fresh produce item will usually have a seasonal purchase pattern that is basically determined by supply factors. Therefore, one expects a negative correlation between monthly prices and this quantities and implies that the simple average of the 12 monthly index numbers for a produce item should exceed the weighted average with weighting by target commodity expenditures. It it does not, then this must be considered a perverse result.

In the official CPI, the poultry series includes the unpriced basic grouping other fowl as well as the priced groupings chicken and turkey. In terms of their attributes one may not be able to say which priced item provides a better indicator for the price movement of other fowl. But the seasonal pattern of purchases of other fowl is much more like turkey's than chicken's; both turkey and other fowl purchases peak in December when chicken purchases are below normal. In a seasonal-basket index turkey rather than chicken should probably be used as the imputation source for other fowl.[3]

It may happen that the seasonal pattern of an unpriced item is quite different from that of any priced item in a commodity group so that there is no satisfactory source series for an imputation. One might then omit that item from the basket but that reduces the weight of its commodity group in the aggregate. Or one might choose a source series for imputation, and force the seasonal pattern of the target series to match it, recalculating the target series' monthly expenditures by prorating the monthly expenditures of the source item to the annual expenditures on the target item. But this would distort the monthly volume of expenditures for the commodity group. It is better to live with a poor imputation than to distort an index's seasonal basket.

The Rothwell indexes described in Chapter 5 were determined using monthly expenditure weights where the expenditures are in base year constant dollars. These expenditure weights are calculated by multiplying monthly quantities purchased in the basket reference year by average base year prices. A different, and not necessarily inferior, set of expenditures could be calculated by deflating monthly expenditures in the basket reference period by a price index. Which method is better relates to the more general question of whether a unit value series or a price index is a superior deflator.

There are now quite a large number of studies examing this issue.[4] Unit value series reflect changes in product mix. Price indexes, if designed around one or more narrowly defined item specifications, do not. Changes in product mix, that is, changes in the relative share of different varieties, can make a unit value series an erratic and unreliable deflator. On the other hand, a unit value series may reflect a broader and more representative range of items than a price index and may more frequently pick up market discounts or premiums that make transaction prices diverge from list prices.

It is not necessarily a bad thing that a unit value series reflects changes in product mix for a seasonal commodity, if its varieties show different seasonal patterns. Ideally, a unit value series would then approximate a Paasche deflator, yielding a Laspeyres volume series. Anyway, the price index for such a series might well be based on a seasonal-basket formula, so that the price index also would be sensitive to changes in product mix. There are also many seasonal commodities that are unpriced; for these a unit value series may be superior to a price index imputed from another commodity. One may also wish to use a unit value series as a deflator for seasonally priced commodities that are not out-of-season in some of their unpriced months.

10.4 True Cost-of-Living Indexes

This paper has been entirely concerned with the calculation of CPIs and not with true cost-of-living indexes but it should be mentioned that the treatment of seasonal commodities in such indexes should also be a matter of debate. Most of the literature on the true cost-of-living index has only avoided the subject because empirical series have generally been calculated annually or at a high level of aggregation.

Consider, for example, two possible definitions for a true cost-of-living index for a given month. First,

$$I_{ym/0} = I\ (P_{ym},\ U_0)\ /\ I\ (P_0,\ U_0)$$

where

$$I\ (P_0\ U_0\ )$$

is the expenditure in year 0 to attain the utility level of year 0

$I(P_{ym}, U_0)$ is the expenditure in month m of year y to attain the same utility level.

Second, $I_{ym/0} = I(P_{ym}, U_{0m}) / I(P_0, \bar{U}_{0m})$

where V_{0m} is the utility level in month m of year 0.

A further variant would be

$I(P_{ym}, U_{0m}) / I(P_{0m}, U_{0m})$

the true cost of living equivalents of the monthly base price indexes discussed in Chapter 3. The monthly base prices might be adjusted for trend, providing another variant.

Seasonally disappearing commodities do not pose any great theoretical problem to the calculation of a true cost of living index. They should be approached in the same way as new goods and disappearing goods, which have already been analyzed by Fisher and Shell [1972; pp.22-26]. A seasonally disappearing commodity should be assigned its demand reservation price[5] in its out-of-season months, that is, the price at which the target population would be willing to make some purchases of the commodity. This may be lower than the supply reservation price, the price at which suppliers would be willing to make a commodity available for sale. For example, if the lowest price at which a consumer wishes to buy fresh corn is $2 per dozen, and the lowest price at which they could be produced in greenhouses in the out-of-season months is $3.50 a dozen, it is the first price and not the second that is relevant to a true cost of living index, since it is the former price that relates to the deprivation of the consumer due to the unavailability of fresh corn. The supply reservation price is only relevant if one is constructing a national output deflator (see Fisher and Shell [1972; p.101-104]).

10.5 The Future of Seasonal Commodities

Is the treatment of seasonal commodities likely to be a problem of diminishing importance in future? There are some valid reasons for believing so. With respect to seasonal food commodities, the expansion of domestic and international trade had greatly increased the availability of products in months of the year when they were previously unobtainable. Moreover, the growth of greenhouse cultivation has made possible the provision of fruits and vegetables from domestic sources in all months of the year. With respect to seasonal non-food commodities, climate-controlled buildings have made it less important to dress for the weather outside. They also permit people to play tennis in the winter and hockey in the summer.

On reflection, it seems more doubtful that the treatment of seasonal commodities is a problem of diminishing importance. With respect to imports of seasonal food commodities, the imported varieties of a product may be sufficiently different from the domestic varieties to be considered different commodities. The official CPI, like the Dutch CPI, might treat MacIntosh apples and Granny Smith apples as separate basic groupings. Both basic groupings would probably be seasonally priced, although apples are purchased and priced throughout the year.[6]

The increased opportunities to travel have not affected winter and summer clothing symmetrically, since many people take winter vacations in the tropics but few take summer vacations in the Arctic. And package trips to southern climes are also seasonal commodities, so that increasing foreign travel, if it tends to dampen the seasonal amplitude of purchases for some seasonal commodities, also creates new ones.

If hockey is played in summer and tennis is played in winter, it is nonetheless true that most participants play those sports in-season, and that hockey and tennis equipment both tend to disappear from sports outlets in their out-of-season months. Nor is this likely to change in the foreseeable future.

Many commodities are seasonal due to cultural factors that resist technological change. One thinks of items that are popular as Christmas presents, including most toys and games, and of holiday food items like eggnog, pumpkin pie and turkey. Consumption of wine and spirits is also highly seasonal due to the Christmas and New Year's holidays. Old traditions may die, and some seasonal fluctuations due to cultural factors may tend to fade. Even in predominantly Catholic countries, for example, the period of Lent does not much influence food consumption with the decline in the practice of fasting by the lay population. But new traditions, if they can be dignified by such a name, tend to take their place. Witness the concentration of flower sales in May due to the successful commercial exploitation of Mother's Day.

10.6 The Future of Seasonal-Basket Indexes

Finally, there may be a decrease in the seasonality of consumer purchases without a corresponding decrease in the importance of seasonal commodities in the official CPI. With respect to imports of seasonal food commodities, the imported varieties of a product may be sufficiently different from the domestic varieties as to be considered distinct commodities. Although a fruit or vegetable itself may be increasingly available in all months of the year, its domestic and imported varieties may still be seasonally disappearing. The consumer may feel that his spending on the commodity group is not so seasonally restricted as it was before, but the statistician must feel that the fixed-basket approach to that commodity group remains as unacceptable as always.

It is probable that the problem posed by seasonal commodities for the CPI will be essentially comparable twenty years from now with what it is today, and it certainly will not shrivel up into something negligible. By contrast, the treatment of seasonal commodities is likely to be very much changed, with the seasonal-basket approach readopted by the official CPI for seasonal food commodities and extended to seasonal non-food commodities. There are several factors that will be responsible for this.

First, the automation of data collection. is likely to transform the Family Expenditure Surveys, which until now has been the source of virtually all expenditure weights. *"The interviewer's clipboard and pen [will be] replaced by a hand-held computer, programmed with the appropriate questionnaire layout on which the responses are keyed directly and immediately recorded on a cassette. The advantages of immediate credibility checking and bypassing the data preparation stage should improve the accuracy and speed of availability of the results"* (Boreham [1984], p.180). These changes would tend to improve the monthly food expenditures coming from the Family Food Expenditure Survey. They would also make more likely a switch to a more restricted time range than a calendar year for the Family Expenditure Survey, from which monthly or at least subannual expenditure estimates could be derived for non-food commodities.

A series of subannual surveys covering all the months of a calendar year are more expensive to conduct, other things being equal, than a single annual survey. Therefore any reduction in the marginal cost per interview, especially if it is accompanied by increasing accuracy of the estimates, should make subannual surveys more attractive. (This is not to deny that there are valid reasons for adopting a calendar year time range for family expenditure surveys besides economic ones.) The U.S. Bureau of Labor Statistics has already switched from annual recall to quarterly recall for many items in their Consumer Expenditure Survey. (BLS [1983], p.1)

Second, with the automation of retailing, bar codes are being attached to commodities, and bar code readers in grocery stores and in shops attached to computers identify the commodities sold at the checkout counter. Since the manufacturers apply the codes they are standardized over retail outlets. In the future, computer estimates derived by the retail outlets themselves may provide monthly retail sales estimates at a highly disaggregated level, and these outlet estimates can be lumped together to obtain estimates by city, province or region.

The disadvantages of using such estimates to derive monthly CPI weights are that there is no separation of business and personal expenditures, surely a minor problem for most commodities, and that there is no demographic information attached to the transactions.[7] These are not important problems if the retail sales data is used only to derive a monthly pattern of purchases and the annual expenditure weights continue to be derived from the Family Expenditure Survey.

Third, and most important, there is a trend to substitute probability sampling for judgemental sampling in both industrial and consumer price indexes that is likely to alter the sampling methodology of the official CPI. Probability sampling has already been implemented in the U.S. CPI and in the U.S. Producer Price Indexes. Although the official CPI still relies on judgemental sampling, Statistics Canada has recently adopted probability sampling for industry price indexes.

Under judgemental sampling, highly seasonal commodities can be deliberately eliminated from the list of priced items. In Chapter 6 it was shown that the fresh fruit CPI is not at all representative of highly seasonal fruits, and one may detect the same bias at work elsewhere in the official index.

If probability proportional to size sampling were adopted, such a bias could not exist. One would choose the elementary commodity groups to be priced at a regional level by random selection, with probability of selection greater the larger the average household expenditure on the commodity. A highly seasonal commodity with a large expenditure weight would have a better chance of selection than a less seasonal commodity with a smaller expenditure weight. Grapes and peaches, highly seasonal fruits not priced in the official CPI, would have a better chance of being priced than less seasonal items currently priced, such as grapefruit and pears.

With sampling procedures no longer permitting the avoidance of highly seasonal elementary commodity groups in the priced sample, the importance of seasonally priced items in the official CPI will be increased, and the drawbacks of the fixed-basket approach for seasonal commodity groups much more apparent.

Below the basic grouping level, probability sampling will tend to raise the percentage of seasonally priced varieties and again make a fixed-basket approach appear unattractive. Commodity specifications for elementary commodity groups tend to avoid specifications appropriate to highly seasonal varieties; and the same commodity specification is applied in all surveyed retail outlets in Canada. For example, the commodity specification for the elementary commodity group fresh and frozen salmon refers to frozen salmon only, wherever it is priced. If probability sampling were adopted, the varieties of fresh and frozen salmon sold in any retail outlet and their volume of sales would be determined by the pricing officer, and a variety or varieties to be priced chosen by random selection with probability of selection proportional to sales. Seasonally available fresh salmon could, and almost certainly would, be chosen as the priced variety at some retail outlets.

If probability sampling leads to the selection of several varieties, some seasonally priced, others continuously priced, for a given city, there is an aggregation problem for the elemental commodity group index that may be better solved using a seasonal-basket formula than using a fixed-basket formula.[8] If probability sampling leads to the selection of only seasonally priced varieties without continuous overlap in their in-season months, then the elementary commodity group index will also be a seasonally priced series, and the fixed-basket formula is put in doubt for calculating group indexes. To stay with the fish example, it is possible that in some cities only fresh fish varieties will be chosen for pricing in all retail outlets and so several elementary commodity groups, not previously seasonally priced, would become so. This would make the use of a fixed-basket formula for the fish CPI of that city less acceptable than it is now.

One can already see this process at work in the United States. The Bureau of Labor Statistics has rejected a seasonal-basket approach to the CPI for years, although that approach has been ably promoted by two of its employees, Bruce Mudgett and Doris P. Rothwell. With the switch to probability sampling, the BLS is again giving serious consideration to seasonal weighting of seasonal commodities (BLS [1983; p.4]).

Not only is a move towards a seasonal-basket approach to seasonal commodities in the official CPI desirable, it is probably inevitable. Despite the controversy surrounding many subjects in index number theory, there is such a thing as progress in index number construction. The first price indexes were simple or geometric averages of price relatives; now all practitioners recognize the superiority of weighting by expenditures. In early CPIs, only priced commodities were assigned expenditure weights; now every commodity in household expenditure is assigned an expenditure weight and the price movement of an appropriate priced commodity is imputed to an unpriced commodity. These improvements were controversial when they were made; now they are considered standard procedure. In the same way, the weighting of seasonal commodities using monthly expenditures at annual base period prices is likely to be part of the standard procedure of the future.

Table 10.1: CPI FOOD COMMODITY GROUPS CALCULATED USING SEASONAL BASKET FORMULA AT ANNUAL BASE PRICES

Commodity Group	Canada (1961-April 1973)	Israel	Japan	United Kingdom
Meat	x			
Poultry	x			
Fish	x		x	
Seafood	x		x	
Dairy Products	x			
Eggs	x			
Fresh Fruit	x	x	x	x
Processed Fruit	x			x
Fresh Vegetables	x	x	x	x
Processed Vegetables	x			x
Fats and Oils	x			

10.7 Endnotes

[1] The British Retail Prices Index has a 3-year basket reference period for furniture and floor coverings (see Retail Prices Index Advisory Committee [1975; p.16]). The U.S. CPI used a 1968-73 basket reference period for home purchase when its homeownership series was based on a net purchase concept, and a 1972-73 basket reference period for most other expenditures (see U.S. Bureau of Labor Statistics [1980]).

[2] This approach to cyclical commodities is comparable to the use of the Balk formula for seasonal commodities. In both cases, reliable expenditure data is required for every year, and the index cannot be properly calculated without a revision period of at least 11 months. There is also the danger of upward or downward drift in the chain index if the link periods correspond to business cycle turning points (see Szulc [1983]).

[3] In the official CPI, the imputation for other fowl is based on a simple average of chicken and turkey indexes.

[4] The arguements on both sides can be found in a series of articles in the Review of Income and Wealth. See Gordon [1971], Gordon [1973], Holmes [1973], Interagency Committee on Measurement of Real Output [1973], Popkin and Gillingham [1971].

[5] Turvey [1984] has suggested the imputation of scarcity prices for seasonally priced commodities. These are not unlike demand reservation prices as he defines them.

[6] Similarily, greenhouse produce may be qualitatively different from field-harvested produce, although here it is more doubtful that the difference is sufficient to create an index number problem between basic groupings, rather than a quality adjustment problem within basic groupings.

[7] It is technically possible to have each transaction computer-registered according to both consumer and commodity, but such a system is nowhere in place, and any efforts to implement it would probably encounter stiff resistance from those concerned with the invasion of their privacy. If such a system were in place it would largely eliminate the need for family expenditure surveys.

[8] Monthly expenditure weights could possibly be obtained for the retail outlet being priced.

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GLOSSARY OF TERMS

Aggregate price index: An index designed to express, in one number, price changes that affect a range of commodities.

All-items: The general total (the highest-level aggregate) in the CPI classification of commodities.

Base period (of a price index): The period chosen as the basis of comparison with given period prices; in other words, the period for which an index expressed in percentage form is defined as 100, and for which an index expressed in ratio form is defined as 1. The term "time base" is a synonym.

Basic grouping: The lowest-level grouping of commodities for which a set of weights is available (normally derived from the family expenditure surveys) that is consistent with the fixed-basket concept of the CPI.

Basket: A set of commodities with specified quantitive proportions among its constituent goods and services.

Basket reference period: The period from which the specified quantitive proportions of the basket are derived.

Chain index: An index resulting from one or more applications of the linking procedure.

Commodities: Goods and services.

Continuously priced commodity: A commodity for which price quotes are collected, in every month of the year in order to calculate a price index.

Deflator: A price index divided into a value series to obtain a volume series; if the deflator has year 0 as its base period then the volume series can also be described as an expenditure series in terms of year 0 constant dollars.

Direct index: An unlinked index.

Elemental index: An index for the lowest level grouping of commodities to which the index formula may be said to apply; in the CPI, it is an index for a basic grouping.

Fixed basket: A set of commodities with specified and unchanging quantitative proportions among its constituent goods and services.

Fixed-basket price index: A price index based on the ration of the cost of a specified basket in the given period to its cost in the base period.

Given period (of a price index): The period whose prices are compared to those of the base period.

In-season months: The months in which purchases of a commodity are at or above their average monthly levels.

Judgemental sampling (selection): A procedure for selecting a sample that is based on specific criteria established by sample designers; more particularly, the term "judgemental sampling" is used in this research paper to stress that the selection of priced commodities and outlets is not a probability sample, i.e. that it is not based on random chance.

Laspeyres price index: A fixed-basket price index for which the basket reference period is also the base period.

Linking procedure: A procedure for connecting, in a certain link period, two price index series that relate to different baskets or base period; indexes of a new series with the link period as the time base are multiplied by the corresponding index of the old series for the link period.

Link period: The period in which the new index series is connected to the old one by the application of the linking procedure.

Off-season months: The months in which purchases of a commodity fall below their average monthly levels.

Out-of-season months: The months in which purchases of a commodity are nil.

Pure price change: Price change that is not attributable to changes in either the quality or the quantity of priced goods and services.

Seasonal commodity: A commodity subject to significant seasonality in its unit purchases.

Seasonally disappearing commodity: A commodity that in unavailable in some months of the year.

Seasonally priced commodity: A commodity for which price quotes are collected only in some months of the year in order to calculate a price index.

Time base: A synonymous term for the *base period* of an index.

Updating of fixed baskets: The replacement of a basket by one that is more recent.

Weight: The value assigned to each commodity category, which indicates its importance in the fixed basket; in the computation of a specific weighted average of price indexes (i.e., in the aggregation of these indexes), the value of each commodity category is multiplied by its corresponding price index, hence the weight determines the degree of influence exerted by the price change of each commodity category on the specific aggregate price index.

Weight base: A synonymous term for the basket reference period of an index.

APPENDIX 'A'

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)

ITEM	YEAR	MONTH	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH
FRUITS AND VEGETABLES	1978	JANUARY	92.0	86.4	92.7	.
		FEBRUARY	93.2	87.6	94.5	.
		MARCH	97.0	96.4	97.7	.
		APRIL	98.0	92.7	98.9	.
		MAY	105.9	102.1	106.6	.
		JUNE	102.9	101.8	102.2	.
		JULY	118.9	123.6	116.3	.
		AUGUST	111.3	117.9	108.8	.
		SEPTEMBER	95.3	127.4	95.9	.
		OCTOBER	96.3	89.9	94.4	.
		NOVEMBER	94.7	86.7	94.4	.
		DECEMBER	94.5	87.5	95.4	100.0
			-------	-------	-------	-------
			100.0	100.0	99.8	100.0
FRUITS AND VEGETABLES	1979	JANUARY	98.4	92.8	99.5	100.5
		FEBRUARY	101.3	95.2	102.7	101.2
		MARCH	106.0	105.9	107.4	102.0
		APRIL	107.1	100.6	107.3	102.6
		MAY	107.1	103.0	107.6	102.7
		JUNE	112.1	111.0	111.4	103.4
		JULY	120.3	126.7	119.2	103.7
		AUGUST	114.2	122.6	113.2	104.1
		SEPTEMBER	105.2	141.8	106.7	105.3
		OCTOBER	105.0	97.2	102.0	105.9
		NOVEMBER	103.3	94.3	102.8	106.6
		DECEMBER	105.8	97.2	106.0	107.4
			-------	-------	-------	-------
			107.2	107.4	107.1	107.4

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)

ITEM	YEAR	MONTH	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH
FRUITS AND VEGETABLES	1980	JANUARY	102.8	96.4	103.4	107.7
		FEBRUARY	104.6	97.8	105.5	107.9
		MARCH	104.4	104.1	105.5	107.7
		APRIL	110.7	103.7	110.6	108.0
		MAY	116.1	111.5	116.4	108.7
		JUNE	122.0	121.0	121.4	109.5
		JULY	126.2	131.7	124.0	110.0
		AUGUST	127.2	135.0	124.7	111.0
		SEPTEMBER	118.6	158.2	119.1	112.4
		OCTOBER	116.8	110.7	116.2	113.5
		NOVEMBER	114.3	105.6	115.1	114.4
		DECEMBER	118.4	110.0	119.9	115.5
			-------	-------	-------	-------
			115.2	115.5	115.1	115.5
FRUITS AND VEGETABLES	1981	JANUARY	117.9	112.5	120.7	116.8
		FEBRUARY	127.4	119.4	128.8	118.6
		MARCH	129.4	128.3	130.0	120.6
		APRIL	137.2	130.0	138.7	122.8
		MAY	130.5	125.2	130.7	124.0
		JUNE	140.8	139.3	139.8	125.5
		JULY	142.2	148.3	139.6	126.9
		AUGUST	137.8	145.1	133.9	127.7
		SEPTEMBER	132.0	172.3	129.7	128.9
		OCTOBER	129.5	123.7	129.8	130.0
		NOVEMBER	128.3	119.0	129.7	131.1
		DECEMBER	128.5	119.7	130.5	131.9
			-------	-------	-------	-------
			131.8	131.9	131.8	131.9

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)

ITEM	YEAR	MONTH	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH
FRUITS AND VEGETABLES	1982	JANUARY	134.3	127.8	137.1	133.2
		FEBRUARY	146.7	138.4	149.2	134.8
		MARCH	144.6	144.4	146.4	136.1
		APRIL	145.1	138.1	147.3	136.8
		MAY	148.2	143.1	149.4	138.3
		JUNE	156.5	154.6	155.1	139.5
		JULY	161.3	168.2	158.3	141.2
		AUGUST	149.7	157.5	145.4	142.2
		SEPTEMBER	140.2	182.9	137.7	143.1
		OCTOBER	134.5	125.7	131.9	143.3
		NOVEMBER	136.3	124.9	136.0	143.8
		DECEMBER	134.9	125.8	137.2	144.3
			-------	-------	-------	-------
			144.4	144.3	144.2	144.3
FRUITS AND VEGETABLES	1983	JANUARY	133.1	127.0	136.2	144.2
		FEBRUARY	135.5	127.9	138.0	143.3
		MARCH	137.8	137.3	139.2	142.7
		APRIL	144.8	137.3	146.5	142.7
		MAY	153.7	148.0	154.5	143.1
		JUNE	155.4	154.9	155.4	143.1
		JULY	158.9	166.1	156.3	142.9
		AUGUST	156.0	164.8	152.1	143.6
		SEPTEMBER	145.0	189.1	142.3	144.1
		OCTOBER	148.6	141.8	148.8	145.4
		NOVEMBER	142.4	132.6	144.4	146.0
		DECEMBER	145.1	136.2	148.6	146.9
			-------	-------	-------	-------
			146.4	146.9	146.9	146.9

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)

ITEM	YEAR	MONTH	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH
FRUITS AND VEGETABLES	1984	JANUARY	155.4	148.9	159.6	148.7
		FEBRUARY	163.7	155.0	167.2	151.0
		MARCH	165.9	166.2	168.5	153.4
		APRIL	165.6	158.3	168.8	155.2
		MAY	161.2	155.8	162.7	155.8
		JUNE	169.6	168.2	168.8	156.9
		JULY	175.3	181.4	170.7	158.2
		AUGUST	169.8	180.5	166.6	159.5
		SEPTEMBER	155.8	205.4	154.6	160.8
		OCTOBER	154.2	143.6	150.7	161.0
		NOVEMBER	151.8	139.3	151.7	161.6
		DECEMBER	145.6	135.6	147.9	161.5
			161.2	161.5	161.5	161.5

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN BASED ON 1974, 1976 AND 1978)

ITEM	YEAR	MONTH	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH
FRESH FRUIT	1978	JANUARY	84.9	68.8	85.8	.
		FEBRUARY	88.2	69.0	90.3	.
		MARCH	93.8	83.5	95.2	.
		APRIL	93.6	75.9	34.7	.
		MAY	98.2	85.7	98.2	.
		JUNE	101.6	98.1	99.2	.
		JULY	118.4	140.9	112.7	.
		AUGUST	120.3	136.9	114.6	.
		SEPTEMBER	106.8	194.3	103.5	.
		OCTOBER	104.3	92.1	99.6	.
		NOVEMBER	95.4	80.2	93.9	.
		DECEMBER	94.6	74.6	94.0	100.0
			-------	-------	-------	-------
			100.0	100.0	98.5	100.0
FRESH FRUIT	1979	JANUARY	92.1	74.5	92.9	100.5
		FEBRUARY	96.7	74.9	98.0	101.0
		MARCH	100.6	89.4	102.0	101.5
		APRIL	105.7	85.7	106.9	102.3
		MAY	110.4	96.5	110.5	103.2
		JUNE	119.3	116.3	117.6	104.7
		JULY	128.7	157.3	125.8	106.1
		AUGUST	130.7	151.8	127.0	107.3
		SEPTEMBER	124.1	225.9	120.4	109.9
		OCTOBER	115.7	101.4	109.6	110.7
		NOVEMBER	110.1	92.6	106.4	111.7
		DECEMBER	106.9	84.1	106.0	112.5
			-------	-------	-------	-------
			111.8	112.5	110.4	112.5

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)

ITEM	YEAR	MONTH	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH
FRESH FRUIT	1980	JANUARY	102.1	81.0	101.1	113.1
		FEBRUARY	107.8	81.8	107.1	113.6
		MARCH	106.0	92.6	105.7	113.9
		APRIL	116.2	93.3	116.4	114.6
		MAY	117.2	101.1	115.8	114.9
		JUNE	125.7	122.3	123.7	115.4
		JULY	131.7	158.6	126.8	115.6
		AUGUST	136.1	157.2	131.6	116.0
		SEPTEMBER	128.4	236.8	126.2	116.9
		OCTOBER	117.4	105.0	113.4	117.2
		NOVEMBER	108.8	91.6	107.2	117.1
		DECEMBER	109.1	85.8	108.0	117.3
			-------	-------	-------	-------
			117.2	117.3	115.3	117.3
FRESH FRUIT	1981	JANUARY	101.8	81.1	101.1	117.3
		FEBRUARY	109.1	81.6	106.8	117.2
		MARCH	109.8	95.5	109.0	117.5
		APRIL	114.0	91.5	114.2	117.3
		MAY	114.6	98.2	112.5	117.1
		JUNE	124.5	122.1	123.5	117.1
		JULY	125.4	158.0	126.3	117.0
		AUGUST	129.8	152.6	127.8	116.6
		SEPTEMBER	133.5	243.2	129.6	117.2
		OCTOBER	129.8	118.6	128.2	118.3
		NOVEMBER	123.0	105.5	123.6	119.5
		DECEMBER	122.5	97.0	122.2	120.4
			-------	-------	-------	-------
			119.8	120.4	118.7	120.4

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)

ITEM	YEAR	MONTH	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH
FRESH FRUIT	1982	JANUARY	124.0	99.7	124.4	122.0
		FEBRUARY	132.1	102.7	134.5	123.7
		MARCH	136.7	121.3	138.4	125.9
		APRIL	139.6	113.3	141.4	127.7
		MAY	145.2	126.9	145.4	130.1
		JUNE	154.6	149.6	151.3	132.4
		JULY	166.3	199.3	159.3	135.8
		AUGUST	163.7	188.7	157.[illegible]	138.8
		SEPTEMBER	151.6	271.7	144.8	141.2
		OCTOBER	134.3	118.0	127.6	141.1
		NOVEMBER	134.1	112.7	132.0	141.7
		DECEMBER	125.2	98.2	123.7	141.8
			-------	-------	-------	-------
			142.3	141.8	140.1	141.8
FRESH FRUIT	1983	JANUARY	121.7	96.2	120.1	141.6
		FEBRUARY	122.9	92.1	120.6	140.7
		MARCH	121.8	105.3	120.2	139.3
		APRIL	132.8	106.3	132.6	138.8
		MAY	140.7	120.6	138.2	138.2
		JUNE	147.2	144.6	146.2	137.8
		JULY	157.3	193.4	154.6	137.3
		AUGUST	153.5	182.2	152.5	136.8
		SEPTEMBER	144.8	266.3	141.9	136.4
		OCTOBER	140.3	128.2	138.5	137.2
		NOVEMBER	124.4	106.3	124.5	136.7
		DECEMBER	129.6	102.6	129.3	137.0
			-------	-------	-------	-------
			136.4	137.0	134.9	137.0

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)

ITEM	YEAR	MONTH	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH
FRESH FRUIT	1984	JANUARY	133.9	107.7	134.4	138.0
		FEBRUARY	140.9	108.4	141.9	139.3
		MARCH	138.9	123.4	140.8	140.6
		APRIL	146.1	119.3	148.9	141.9
		MAY	148.3	130.2	149.2	142.7
		JUNE	168.0	165.8	167.7	144.5
		JULY	174.0	210.0	167.9	145.9
		AUGUST	177.7	207.0	173.3	148.0
		SEPTEMBER	174.0	313.5	167.1	151.9
		OCTOBER	166.2	148.0	160.0	153.5
		NOVEMBER	153.4	130.0	152.3	155.5
		DECEMBER	143.4	113.6	143.0	156.4
			155.4	156.4	153.9	156.4

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)

ITEM	YEAR	MONTH	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH
PROCESSED FRUIT	1978	JANUARY	94.7	95.2	94.5	.
		FEBRUARY	95.2	108.6	95.2	.
		MARCH	96.6	111.7	96.8	.
		APRIL	97.8	97.4	97.9	.
		MAY	98.9	110.8	99.0	.
		JUNE	100.1	98.4	100.3	.
		JULY	100.8	89.9	101.0	.
		AUGUST	101.3	84.0	101.5	.
		SEPTEMBER	101.8	88.5	101.8	.
		OCTOBER	102.0	94.8	101.7	.
		NOVEMBER	103.7	102.4	103.7	.
		DECEMBER	107.2	118.3	107.7	100.0
			-------	-------	-------	-------
			100.0	100.0	100.1	100.0
PROCESSED FRUIT	1979	JANUARY	109.3	110.3	109.4	101.3
		FEBRUARY	110.0	125.3	109.9	102.6
		MARCH	111.1	128.2	111.1	104.0
		APRIL	112.7	111.9	112.6	105.2
		MAY	113.7	126.9	113.4	106.6
		JUNE	113.7	111.2	113.4	107.6
		JULY	114.7	100.8	113.2	108.6
		AUGUST	115.0	94.7	114.5	109.4
		SEPTEMBER	116.5	101.6	116.9	110.5
		OCTOBER	116.7	108.7	116.7	111.7
		NOVEMBER	117.2	116.7	118.2	112.9
		DECEMBER	119.6	132.1	120.2	114.0
			-------	-------	-------	-------
			114.2	114.0	114.1	114.0

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 197[illegible] AND 1978)

ITEM	YEAR	MONTH	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH
PROCESSED FRUIT	1980	JANUARY	120.2	122.2	121.2	115.0
		FEBRUARY	121.2	138.5	121.5	116.1
		MARCH	122.2	141.6	122.7	117.2
		APRIL	123.0	122.5	123.2	118.1
		MAY	122.8	137.6	122.9	119.0
		JUNE	124.5	122.2	124.7	119.9
		JULY	125.7	110.9	124.6	120.8
		AUGUST	126.5	104.4	126.2	121.6
		SEPTEMBER	127.1	110.8	127.4	122.3
		OCTOBER	127.3	117.7	126.4	123.1
		NOVEMBER	127.7	126.6	128.2	123.9
		DECEMBER	128.9	142.4	129.7	124.8
			-------	-------	-------	-------
			124.8	124.8	124.9	124.8
PROCESSED FRUIT	1981	JANUARY	129.9	132.4	131.3	125.6
		FEBRUARY	130.6	149.4	131.0	126.5
		MARCH	134.4	156.4	135.5	127.8
		APRIL	138.7	138.6	139.4	129.1
		MAY	140.3	157.0	140.2	130.7
		JUNE	142.5	140.4	143.2	132.2
		JULY	143.0	126.4	142.0	133.5
		AUGUST	143.3	118.3	143.0	134.7
		SEPTEMBER	145.9	126.9	146.0	136.0
		OCTOBER	147.2	136.2	146.2	137.6
		NOVEMBER	149.2	147.1	149.0	139.3
		DECEMBER	149.6	164.7	149.9	141.[illegible]
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			141.2	141.1	141.4	141.[illegible]

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)

ITEM	YEAR	MONTH	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH
PROCESSED FRUIT	1982	JANUARY	149.8	152.8	151.5	142.8
		FEBRUARY	153.9	176.3	154.6	145.1
		MARCH	156.7	181.5	157.3	147.2
		APRIL	158.4	158.2	159.1	148.8
		MAY	159.4	179.0	159.9	150.6
		JUNE	159.5	157.0	160.1	152.0
		JULY	160.9	142.5	160.1	153.4
		AUGUST	161.1	133.0	160.7	154.6
		SEPTEMBER	163.3	142.2	163.6	155.9
		OCTOBER	163.2	150.8	161.8	157.1
		NOVEMBER	163.0	160.2	162.3	158.2
		DECEMBER	162.5	178.7	162.7	159.3
			-------	-------	-------	-------
			159.3	159.3	159.5	159.3
PROCESSED FRUIT	1983	JANUARY	163.7	167.2	165.9	160.5
		FEBRUARY	162.6	186.4	163.5	161.4
		MARCH	160.0	186.3	161.4	161.8
		APRIL	161.1	161.2	162.2	162.0
		MAY	161.2	181.1	161.8	162.2
		JUNE	161.9	159.4	162.7	162.4
		JULY	162.3	143.8	161.6	162.5
		AUGUST	162.2	133.6	161.5	162.6
		SEPTEMBER	162.5	141.4	162.7	162.5
		OCTOBER	162.8	150.4	161.4	162.5
		NOVEMBER	162.2	159.6	161.7	162.4
		DECEMBER	162.9	179.2	163.2	162.5
			-------	-------	-------	-------
			162.1	162.5	162.5	162.5

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)

ITEM	YEAR	MONTH	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH
PROCESSED FRUIT	1984	JANUARY	164.1	167.9	166.6	162.5
		FEBRUARY	164.3	188.4	165.2	162.7
		MARCH	167.9	195.4	169.3	163.5
		APRIL	171.7	171.8	172.8	164.4
		MAY	174.3	195.3	174.5	165.5
		JUNE	174.3	171.8	175.2	166.6
		JULY	176.5	157.5	177.0	167.7
		AUGUST	175.9	145.3	175.7	168.7
		SEPTEMBER	176.0	152.5	175.5	169.6
		OCTOBER	175.3	161.8	173.7	170.6
		NOVEMBER	174.9	171.0	173.2	171.5
		DECEMBER	174.9	191.0	173.9	172.5
			172.5	172.5	172.7	172.5

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)

ITEM	YEAR	MONTH	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH
FRESH VEGETABLES	1978	JANUARY	95.3	85.1	94.4	.
		FEBRUARY	95.7	87.6	96.2	.
		MARCH	100.2	94.1	100.4	.
		APRIL	102.8	101.0	103.4	.
		MAY	121.0	114.9	123.7	.
		JUNE	107.3	109.4	107.2	.
		JULY	137.4	138.0	134.8	.
		AUGUST	111.8	132.6	108.3	.
		SEPTEMBER	76.9	97.9	79.7	.
		OCTOBER	82.3	84.8	82.8	.
		NOVEMBER	85.7	80.0	85.7	.
		DECEMBER	83.6	74.6	83.8	100.0
			-------	-------	-------	-------
			100.0	100.0	100.0	100.0
FRESH VEGETABLES	1979	JANUARY	96.4	87.0	96.4	100.2
		FEBRUARY	99.9	91.4	100.5	100.5
		MARCH	109.5	104.2	111.2	101.3
		APRIL	106.0	102.9	105.3	101.5
		MAY	100.5	94.2	101.3	99.8
		JUNE	105.8	107.8	105.7	99.6
		JULY	120.0	121.2	118.4	98.2
		AUGUST	98.9	122.6	100.1	97.4
		SEPTEMBER	77.2	98.4	80.1	97.4
		OCTOBER	85.4	86.7	84.6	97.6
		NOVEMBER	85.2	78.9	84.5	97.5
		DECEMBER	94.5	83.0	93.2	98.2
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			98.3	98.2	98.5	98.2

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)

ITEM	YEAR	MONTH	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH
FRESH VEGETABLES	1980	JANUARY	89.7	80.1	88.8	97.6
		FEBRUARY	88.1	80.4	88.4	96.7
		MARCH	88.4	82.8	88.4	94.9
		APRIL	96.2	94.0	96.2	94.2
		MAY	111.3	104.5	112.5	95.0
		JUNE	118.3	120.8	118.5	96.1
		JULY	123.8	125.0	122.0	96.4
		AUGUST	121.2	145.0	118.4	98.3
		SEPTEMBER	102.2	127.2	103.5	100.7
		OCTOBER	107.7	113.4	110.7	102.9
		NOVEMBER	108.5	103.0	110.4	104.9
		DECEMBER	119.3	107.8	121.1	107.0
			-------	-------	-------	-------
			106.2	107.0	106.6	107.0
FRESH VEGETABLES	1981	JANUARY	124.6	115.5	128.0	109.9
		FEBRUARY	144.1	132.6	145.8	114.3
		MARCH	146.2	136.5	145.6	118.8
		APRIL	162.2	157.5	161.2	124.1
		MAY	139.7	129.5	139.4	126.2
		JUNE	158.6	158.4	155.3	129.3
		JULY	160.3	158.5	154.8	132.1
		AUGUST	141.2	164.2	134.0	133.7
		SEPTEMBER	117.3	145.9	118.7	135.2
		OCTOBER	111.9	118.9	116.2	135.7
		NOVEMBER	114.2	107.9	115.6	136.1
		DECEMBER	114.3	102.2	114.9	135.6
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			136.2	135.6	135.8	135.6

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)

ITEM	YEAR	MONTH	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH
FRESH VEGETABLES	1982	JANUARY	129.4	118.2	131.0	135.9
		FEBRUARY	155.7	142.4	156.5	136.7
		MARCH	141.0	131.8	140.6	136.3
		APRIL	137.3	135.7	138.9	134.5
		MAY	139.2	129.8	139.7	134.5
		JUNE	153.7	155.4	152.3	134.2
		JULY	154.2	156.8	153.1	134.1
		AUGUST	120.1	146.4	119.5	132.6
		SEPTEMBER	103.0	130.8	106.5	131.4
		OCTOBER	104.4	109.0	106.4	130.5
		NOVEMBER	109.7	101.5	108.7	130.0
		DECEMBER	115.1	101.6	114.2	129.9
			-------	-------	-------	-------
			130.2	129.9	130.6	129.9
FRESH VEGETABLES	1983	JANUARY	~~112.1~~	100.3	111.2	128.5
		FEBRUARY	118.4	106.9	117.5	125.5
		MARCH	128.8	116.7	124.5	124.2
		APRIL	137.8	133.3	136.5	124.0
		MAY	156.2	146.3	157.4	125.4
		JUNE	153.9	157.1	154.0	125.6
		JULY	153.0	153.0	149.4	125.2
		AUGUST	148.1	174.2	142.2	127.6
		SEPTEMBER	123.0	153.3	124.8	129.4
		OCTOBER	138.6	145.2	141.8	132.4
		NOVEMBER	137.1	130.0	139.3	134.8
		DECEMBER	138.5	126.1	141.6	136.9
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			137.1	136.9	136.7	136.9

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)

ITEM	YEAR	MONTH	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH
FRESH VEGETABLES	1984	JANUARY	164.4	151.6	168.1	141.1
		FEBRUARY	181.2	167.8	184.4	146.2
		MARCH	187.9	176.7	188.5	151.2
		APRIL	177.4	174.1	178.2	154.6
		MAY	160.0	148.4	159.7	154.8
		JUNE	163.9	164.4	161.1	155.4
		JULY	173.6	171.0	167.0	156.9
		AUGUST	153.5	186.5	152.2	157.9
		SEPTEMBER	115.1	145.5	118.4	157.3
		OCTOBER	120.2	122.9	120.0	155.4
		NOVEMBER	126.4	118.1	126.5	154.4
		DECEMBER	118.2	105.4	118.4	152.7
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			153.5	152.7	153.6	152.7

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)

ITEM	YEAR	MONTH	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH
PROCESSED VEGETABLES	1978	JANUARY	99.1	121.0	99.1	.
		FEBRUARY	97.4	105.7	97.5	.
		MARCH	98.1	112.8	98.2	.
		APRIL	98.3	108.5	98.4	.
		MAY	98.7	100.8	98.8	.
		JUNE	99.3	97.9	99.4	.
		JULY	99.9	92.1	100.0	.
		AUGUST	100.2	82.2	100.3	.
		SEPTEMBER	100.9	83.7	100.9	.
		OCTOBER	101.9	90.2	102.0	.
		NOVEMBER	102.6	97.4	102.7	.
		DECEMBER	103.7	107.9	103.8	100.0
			-------	-------	-------	-------
			100.0	100.0	100.1	100.0
PROCESSED VEGETABLES	1979	JANUARY	104.3	127.7	104.6	100.6
		FEBRUARY	104.8	113.9	105.0	101.2
		MARCH	104.9	120.6	105.1	101.9
		APRIL	105.4	116.4	105.6	102.6
		MAY	105.8	108.3	106.1	103.2
		JUNE	106.7	105.3	107.0	103.8
		JULY	106.9	98.7	107.2	104.3
		AUGUST	107.4	88.3	107.7	104.8
		SEPTEMBER	108.4	90.2	108.8	105.4
		OCTOBER	108.9	96.6	109.3	105.9
		NOVEMBER	110.7	105.1	110.9	106.6
		DECEMBER	111.8	116.4	112.0	107.3
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			107.2	107.3	107.4	107.3

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)

ITEM	YEAR	MONTH	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH
PROCESSED VEGETABLES	1980	JANUARY	113.0	138.1	113.1	108.2
		FEBRUARY	113.7	123.4	113.8	109.0
		MARCH	114.8	131.9	114.9	109.0
		APRIL	114.9	127.0	115.2	110.8
		MAY	116.0	118.6	116.2	111.6
		JUNE	118.2	116.5	118.4	112.6
		JULY	118.3	109.2	118.6	113.4
		AUGUST	119.5	98.3	119.9	114.3
		SEPTEMBER	121.5	101.2	122.1	115.2
		OCTOBER	122.9	109.2	123.5	116.2
		NOVEMBER	124.6	118.5	125.0	117.4
		DECEMBER	126.0	131.2	126.3	118.6
			118.6	118.6	118.9	118.6
PROCESSED VEGETABLES	1981	JANUARY	127.8	156.1	127.8	120.1
		FEBRUARY	130.1	141.1	130.1	121.6
		MARCH	132.6	152.2	132.6	123.2
		APRIL	134.6	148.6	134.8	125.0
		MAY	136.2	139.3	136.5	126.8
		JUNE	137.7	135.8	138.0	128.4
		JULY	140.9	130.0	141.3	130.1
		AUGUST	142.8	117.7	143.5	131.7
		SEPTEMBER	145.0	120.7	145.6	133.4
		OCTOBER	147.7	130.8	148.0	135.2
		NOVEMBER	148.5	140.9	148.7	137.0
		DECEMBER	150.1	156.1	150.3	139.1
			139.5	139.1	139.8	139.1

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)

ITEM	YEAR	MONTH	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH
PROCESSED VEGETABLES	1982	JANUARY	152.2	185.8	152.1	141.6
		FEBRUARY	152.9	165.9	153.0	143.6
		MARCH	157.8	181.0	157.7	146.0
		APRIL	160.5	177.4	160.9	148.4
		MAY	163.0	166.6	163.2	150.7
		JUNE	164.5	161.7	164.3	152.9
		JULY	166.4	153.0	166.2	154.8
		AUGUST	169.5	139.3	169.9	156.6
		SEPTEMBER	169.6	141.0	170.1	158.3
		OCTOBER	169.6	150.0	169.7	159.9
		NOVEMBER	171.0	162.3	171.2	161.7
		DECEMBER	171.7	179.2	172.5	163.6
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			164.1	163.6	164.2	163.6
PROCESSED VEGETABLES	1983	JANUARY	172.8	210.7	172.6	165.7
		FEBRUARY	173.8	187.1	172.5	167.4
		MARCH	171.8	198.3	172.8	168.9
		APRIL	171.7	190.6	172.9	170.0
		MAY	171.4	175.0	171.5	170.7
		JUNE	171.8	169.1	171.8	171.3
		JULY	173.2	159.4	173.2	171.8
		AUGUST	173.5	141.7	172.8	172.0
		SEPTEMBER	175.4	146.5	176.7	172.5
		OCTOBER	175.6	155.4	175.8	173.0
		NOVEMBER	176.1	167.2	176.4	173.4
		DECEMBER	177.4	184.9	178.0	173.8
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			173.7	173.8	173.9	173.8

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)

ITEM	YEAR	MONTH	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH
PROCESSED VEGETABLES	1984	JANUARY	177.8	217.2	177.9	174.4
		FEBRUARY	180.1	194.9	179.7	175.0
		MARCH	180.4	207.8	181.0	175.8
		APRIL	179.4	198.8	180.3	176.5
		MAY	179.9	183.7	180.0	177.2
		JUNE	181.2	178.5	181.4	178.0
		JULY	181.1	167.0	181.5	178.6
		AUGUST	180.7	148.0	180.4	179.2
		SEPTEMBER	180.1	150.2	181.2	179.5
		OCTOBER	177.0	156.7	177.2	179.6
		NOVEMBER	178.3	169.5	178.8	179.8
		DECEMBER	178.5	186.2	179.3	179.9
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			179.5	179.9	179.9	179.9

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)
% CHANGES BETWEEN ANNUAL INDEXES

TITLE=140000 FRUITS AND VEGETABLES

DATE	OFFICIAL	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH DEC.-CENTRED
197912	7.2	7.4	7.3	7.4
198012	7.5	7.5	7.5	7.5
198112	14.4	14.2	14.5	14.2
198212	9.6	9.4	9.4	9.4
198312	1.4	1.8	1.9	1.8
198412	10.1	9.9	9.9	9.9

TITLE=141000 FRESH FRUIT

DATE	OFFICIAL	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH DEC.-CENTRED
197912	11.8	12.5	12.1	12.5
198012	4.8	4.3	4.4	4.3
198112	2.2	2.6	2.9	2.6
198212	18.8	17.8	18.0	17.8
198312	-4.1	-3.4	-3.7	-3.4
198412	13.9	14.2	14.1	14.2

TITLE=143000 PROCESSED FRUIT

DATE	OFFICIAL	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH DEC.-CENTRED
197912	14.2	14.0	14.0	14.0
198012	9.3	9.5	9.5	9.5
198112	13.1	13.1	13.2	13.1
198212	12.8	12.9	12.8	12.9
198312	1.8	2.0	1.9	2.0
198412	6.4	6.2	6.3	6.2

TITLE=151000 FRESH VEGETABLES

DATE	OFFICIAL	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH DEC.-CENTRED
197912	-1.7	-1.8	-1.5	-1.8
198012	8.0	9.0	8.2	9.0
198112	28.2	26.7	27.4	26.7
198212	-4.4	-4.2	-3.8	-4.2
198312	5.3	5.4	4.7	5.4
198412	12.0	11.5	12.4	11.5

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)
% CHANGES BETWEEN ANNUAL INDEXES

TITLE=155000 PROCESSED VEGETABLES

DATE	OFFICIAL	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH DEC.-CENTRED
197912	7.2	7.3	7.3	7.3
198012	10.6	10.5	10.7	10.5
198112	17.6	17.3	17.6	17.3
198212	17.6	17.6	17.5	17.6
198312	5.9	6.2	5.9	6.2
198412	3.3	3.5	3.5	3.5

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)
MONTH TO MONTH % CHANGES

TITLE=140000 FRUITS AND VEGETABLES

DATE	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH
197802	1.3	1.4	1.9	.
197803	4.1	10.0	3.4	.
197804	1.0	-3.8	1.2	.
197805	8.1	10.1	7.8	.
197806	-2.8	-0.3	-4.1	.
197807	15.5	21.4	13.8	.
197808	-6.4	-4.6	-6.4	.
197809	-14.4	8.1	-11.9	.
197810	1.0	-29.4	-1.6	.
197811	-1.7	-3.6	0.0	.
197812	-0.2	0.9	1.1	.
197901	4.1	6.1	4.3	0.5
197902	2.9	2.6	3.2	0.7
197903	4.6	11.2	4.6	0.8
197904	1.0	-5.0	-0.1	0.6
197905	0.0	2.4	0.3	0.1
197906	4.7	7.8	3.5	0.7
197907	7.3	14.1	7.0	0.3
197908	-5.1	-3.2	-5.0	0.4
197909	-7.9	15.7	-5.7	1.2
197910	-0.2	-31.5	-4.4	0.6
197911	-1.6	-3.0	0.8	0.7
197912	2.4	3.1	3.1	0.8
198001	-2.8	-0.8	-2.5	0.3
198002	1.8	1.5	2.0	0.2
198003	-0.2	6.4	0.0	-0.2
198004	6.0	-0.4	4.8	0.3
198005	4.9	7.5	5.2	0.6
198006	5.1	8.5	4.3	0.7
198007	3.4	8.8	2.1	0.5
198008	0.8	2.5	0.6	0.9
198009	-6.8	17.2	-4.5	1.3
198010	-1.5	-30.0	-2.4	1.0
198011	-2.1	-4.6	-0.9	0.8
198012	3.6	4.2	4.2	1.0
198101	-0.4	2.3	0.7	1.1
198102	8.1	6.1	6.7	1.5
198103	1.6	7.5	0.9	1.7
198104	6.0	1.3	6.7	1.8
198105	-4.9	-3.7	-5.8	1.0
198106	7.9	11.3	7.0	1.2
198107	1.0	6.5	-0.1	1.1
198108	-3.1	-2.2	-4.1	0.6
198109	-4.2	18.7	-3.1	0.9
198110	-1.9	-28.2	0.1	0.9
198111	-0.9	-3.8	-0.1	0.8
198112	0.2	0.6	0.6	0.6
198201	4.5	6.8	5.1	1.0
198202	9.2	8.3	8.8	1.2
198203	-1.4	4.3	-1.9	1.0

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
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MONTH TO MONTH % CHANGES

TITLE=140000 FRUITS AND VEGETABLES

DATE	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH
198204	0.3	-4.4	0.6	0.5
198205	2.1	3.6	1.4	1.1
198206	5.6	8.0	3.8	0.9
198207	3.1	8.8	2.1	1.2
198208	-7.2	-6.4	-8.1	0.7
198209	-6.3	16.1	-5.3	0.6
198210	-4.1	-31.3	-4.2	0.1
198211	1.3	-0.6	3.1	0.3
198212	-1.0	0.7	0.9	0.3
198301	-1.3	1.0	-0.7	-0.1
198302	1.8	0.7	1.3	-0.6
198303	1.7	7.3	0.9	-0.4
198304	5.1	0.0	5.2	0.0
198305	6.1	7.8	5.5	0.3
198306	1.1	4.7	0.6	0.0
198307	2.3	7.2	0.6	-0.1
198308	-1.8	-0.8	-2.7	0.5
198309	-7.1	14.7	-6.4	0.3
198310	2.5	-25.0	4.6	0.9
198311	-4.2	-6.5	-3.0	0.4
198312	1.9	2.7	2.9	0.6
198401	7.1	9.3	7.4	1.2
198402	5.3	4.2	4.8	1.5
198403	1.3	7.2	0.8	1.6
198404	-0.2	-4.8	0.2	1.2
198405	-2.7	-1.6	-3.6	0.4
198406	5.2	8.0	3.7	0.7
198407	3.4	7.8	1.1	0.8
198408	-3.1	-0.5	-2.4	0.8
198409	-8.2	13.8	-7.2	0.8
198410	-1.0	-30.1	-2.5	0.1
198411	-1.6	-3.0	0.7	0.4
198412	-4.1	-2.7	-2.5	-0.1

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)
MONTH TO MONTH % CHANGES

TITLE=141000 FRESH FRUIT

DATE	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH
197802	3.9	0.3	5.2	.
197803	6.3	21.0	5.4	.
197804	-0.2	-9.1	-0.5	.
197805	4.9	12.9	3.7	.
197806	3.5	14.5	1.0	.
197807	16.5	43.6	13.6	.
197808	1.6	-2.8	1.7	.
197809	-11.2	41.9	-9.7	.
197810	-2.3	-52.6	-3.8	.
197811	-8.5	-12.9	-5.7	.
197812	-0.8	-7.0	0.1	.
197901	-2.6	-0.1	-1.2	0.5
197902	5.0	0.5	5.5	0.5
197903	4.0	19.4	4.1	0.5
197904	5.1	-4.1	4.8	0.8
197905	4.4	12.6	3.4	0.9
197906	8.1	20.5	6.4	1.5
197907	7.9	35.3	7.0	1.3
197908	1.6	-3.5	1.0	1.1
197909	-5.0	48.8	-5.2	2.4
197910	-6.8	-55.1	-9.0	0.7
197911	-4.8	-8.7	-1.1	0.9
197912	-2.9	-9.2	-2.2	0.7
198001	-4.5	-3.7	-4.6	0.5
198002	5.6	1.0	5.9	0.4
198003	-1.7	13.2	-1.3	0.3
198004	9.6	0.8	10.1	0.6
198005	0.9	8.4	-0.5	0.3
198006	7.3	21.0	6.8	0.4
198007	4.8	29.7	2.5	0.2
198008	3.3	-0.9	3.8	0.3
198009	-5.7	50.6	-4.1	0.8
198010	-8.6	-55.7	-10.1	0.3
198011	-7.3	-12.8	-5.5	-0.1
198012	0.3	-6.3	0.7	0.2
198101	-6.7	-5.5	-6.4	0.0
198102	7.2	0.6	5.6	-0.1
198103	0.6	17.0	2.1	0.3
198104	3.8	-4.2	4.8	-0.2
198105	0.5	7.3	-1.5	-0.2
198106	8.6	24.3	9.8	0.0
198107	0.7	29.4	2.3	-0.1
198108	3.5	-3.4	1.2	-0.3
198109	2.9	59.4	1.4	0.5
198110	-2.8	-51.2	-1.1	0.9
198111	-5.2	-11.0	-3.6	1.0
198112	-0.4	-8.1	-1.1	0.8
198201	1.2	2.8	1.8	1.3
198202	6.5	3.0	8.1	1.4
198203	3.5	18.1	2.9	1.8

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
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MONTH TO MONTH % CHANGES

TITLE=141000 FRESH FRUIT

DATE	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH
198204	2.1	-6.6	2.2	1.4
198205	4.0	12.0	2.8	1.9
198206	6.5	17.9	4.1	1.8
198207	7.6	33.2	5.3	2.6
198208	-1.6	-5.3	-0.9	2.2
198209	-7.4	44.0	-8.3	1.7
198210	-11.4	-56.6	-11.9	-0.1
198211	-0.1	-4.5	3.4	0.4
198212	-6.6	-12.9	-6.3	0.1
198301	-2.8	-2.0	-2.9	-0.1
198302	1.0	-4.3	0.4	-0.6
198303	-0.9	14.3	-0.3	-1.0
198304	9.0	0.9	10.3	-0.4
198305	5.9	13.5	4.2	-0.4
198306	4.6	19.9	5.8	-0.3
198307	6.9	33.7	5.7	-0.4
198308	-2.4	-5.8	-1.4	-0.4
198309	-5.7	46.2	-7.0	-0.3
198310	-3.1	-51.9	-2.4	0.6
198311	-11.3	-17.1	-10.1	-0.4
198312	4.2	-3.5	3.9	0.2
198401	3.3	5.0	3.9	0.7
198402	5.2	0.6	5.6	0.9
198403	-1.4	13.8	-0.8	1.1
198404	5.2	-3.3	5.8	0.8
198405	1.5	9.1	0.2	0.6
198406	13.3	27.3	12.4	1.3
198407	3.6	26.7	0.1	1.0
198408	2.1	-1.4	3.2	1.4
198409	-2.1	51.4	-3.6	2.6
198410	-4.5	-52.8	-4.2	1.1
198411	-7.7	-12.2	-4.8	1.3
198412	-6.5	-12.6	-6.1	0.6

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)
MONTH TO MONTH % CHANGES

TITLE=143000 PROCESSED FRUIT

DATE	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH
197802	0.5	14.1	0.7	.
197803	1.5	2.9	1.7	.
197804	1.2	-12.8	1.1	.
197805	1.1	13.8	1.1	.
197806	1.2	-11.2	1.3	.
197807	0.7	-8.6	0.7	.
197808	0.5	-6.6	0.5	.
197809	0.5	5.4	0.3	.
197810	0.2	7.1	-0.1	.
197811	1.7	8.0	2.0	.
197812	3.4	15.5	3.9	.
197901	2.0	-6.8	1.6	1.3
197902	0.6	13.6	0.5	1.3
197903	1.0	2.3	1.1	1.4
197904	1.4	-12.7	1.4	1.2
197905	0.9	13.4	0.7	1.3
197906	0.0	-12.4	0.0	0.9
197907	0.9	-9.4	-0.2	0.9
197908	0.3	-6.1	1.1	0.7
197909	1.3	7.3	2.1	1.0
197910	0.2	7.0	-0.2	1.1
197911	0.4	7.4	1.3	1.1
197912	2.0	13.2	1.7	1.0
198001	0.5	-7.5	0.8	0.9
198002	0.8	13.3	0.2	1.0
198003	0.8	2.2	1.0	0.9
198004	0.7	-13.5	0.4	0.8
198005	-0.2	12.3	-0.2	0.8
198006	1.4	-11.2	1.5	0.8
198007	1.0	-9.2	-0.1	0.8
198008	0.6	-5.9	1.3	0.7
198009	0.5	6.1	1.0	0.6
198010	0.2	6.2	-0.8	0.7
198011	0.3	7.6	1.4	0.6
198012	0.9	12.5	1.2	0.7
198101	0.8	-7.0	1.2	0.6
198102	0.5	12.8	-0.2	0.7
198103	2.9	4.7	3.4	1.0
198104	3.2	-11.4	2.9	1.0
198105	1.2	13.3	0.6	1.2
198106	1.6	-10.6	2.1	1.1
198107	0.4	-10.0	-0.8	1.0
198108	0.2	-6.4	0.7	0.9
198109	1.8	7.3	2.1	1.0
198110	0.9	7.3	0.1	1.2
198111	1.4	8.0	1.9	1.2
198112	0.3	12.0	0.6	1.3
198201	0.1	-7.2	1.1	1.2
198202	2.7	15.4	2.0	1.6
198203	1.8	2.9	1.7	1.4

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
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MONTH TO MONTH % CHANGES

TITLE=143000 PROCESSED FRUIT

DATE	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH
198204	1.1	-12.8	1.1	1.1
198205	0.6	13.1	0.5	1.2
198206	0.1	-12.3	0.1	0.9
198207	0.9	-9.2	0.0	0.9
198208	0.1	-6.7	0.4	0.8
198209	1.4	6.9	1.8	0.8
198210	-0.1	6.0	-1.1	0.8
198211	-0.1	6.2	0.3	0.7
198212	-0.3	11.5	0.2	0.7
198301	0.7	-6.4	2.0	0.8
198302	-0.7	11.5	-1.4	0.6
198303	-1.6	-0.1	-1.3	0.2
198304	0.7	-13.5	0.5	0.1
198305	0.1	12.3	-0.2	0.1
198306	0.4	-12.0	0.6	0.1
198307	0.2	-9.8	-0.7	0.1
198308	-0.1	-7.1	-0.1	0.1
198309	0.2	5.8	0.7	-0.1
198310	0.2	6.4	-0.8	0.0
198311	-0.4	6.1	0.2	-0.1
198312	0.4	12.3	0.9	0.1
198401	0.7	-6.3	2.1	0.0
198402	0.1	12.2	-0.8	0.1
198403	2.2	3.7	2.5	0.5
198404	2.3	-12.1	2.1	0.6
198405	1.5	13.7	1.0	0.7
198406	0.0	-12.0	0.4	0.7
198407	1.3	-8.3	1.0	0.7
198408	-0.3	-7.7	-0.7	0.6
198409	0.1	5.0	-0.1	0.5
198410	-0.4	6.1	-1.0	0.6
198411	-0.2	5.7	-0.3	0.5
198412	0.0	11.7	0.4	0.6

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
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MONTH TO MONTH % CHANGES

TITLE=151000 FRESH VEGETABLES

DATE	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH
197802	0.4	2.9	1.9	.
197803	4.7	7.4	4.4	.
197804	2.6	7.3	3.0	.
197805	17.7	13.8	19.6	.
197806	-11.3	-4.8	-13.3	.
197807	28.1	26.1	25.7	.
197808	-18.6	-3.9	-19.7	.
197809	-31.2	-26.2	-26.4	.
197810	7.0	-13.4	3.9	.
197811	4.1	-5.7	3.5	.
197812	-2.5	-6.8	-2.2	.
197901	15.3	16.6	15.0	0.2
197902	3.6	5.1	4.3	0.3
197903	9.6	14.0	10.6	0.8
197904	-3.2	-1.2	-5.3	0.2
197905	-5.2	-8.5	-3.8	-1.7
197906	5.3	14.4	4.3	-0.2
197907	13.4	12.4	12.0	-1.4
197908	-17.6	1.2	-15.5	-0.8
197909	-21.9	-19.7	-20.0	0.0
197910	10.6	-11.9	5.6	0.2
197911	-0.2	-9.0	-0.1	-0.1
197912	10.9	5.2	10.3	0.7
198001	-5.1	-3.5	-4.7	-0.6
198002	-1.8	0.4	-0.5	-0.9
198003	0.3	3.0	0.0	-1.9
198004	8.8	13.5	8.8	-0.7
198005	15.7	11.2	16.9	0.8
198006	6.3	15.6	5.3	1.2
198007	4.6	3.5	3.0	0.3
198008	-2.1	16.0	-3.0	2.0
198009	-15.7	-12.3	-12.6	2.4
198010	5.4	-10.8	7.0	2.2
198011	0.7	-9.2	-0.3	1.9
198012	10.0	4.7	9.7	2.0
198101	4.4	7.1	5.7	2.7
198102	15.7	14.8	13.9	4.0
198103	1.5	2.9	-0.1	3.9
198104	10.9	15.4	10.7	4.5
198105	-13.9	-17.8	-13.5	1.7
198106	13.5	22.3	11.4	2.5
198107	1.1	0.1	-0.3	2.2
198108	-11.9	3.6	-13.4	1.2
198109	-16.9	-11.1	-11.4	1.1
198110	-4.6	-18.5	-2.1	0.4
198111	2.1	-9.3	-0.5	0.3
198112	0.1	-5.3	-0.6	-0.4
198201	13.2	15.7	14.0	0.2
198202	20.3	20.5	19.5	0.6
198203	-9.4	-7.4	-10.2	-0.3

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
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MONTH TO MONTH % CHANGES

TITLE=151000 FRESH VEGETABLES

DATE	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH
198204	-2.6	3.0	-1.2	-1.3
198205	1.4	-4.3	0.6	0.0
198206	10.4	19.7	9.0	-0.2
198207	0.3	0.9	0.5	-0.1
198208	-22.1	-6.6	-21.9	-1.1
198209	-14.2	-10.7	-10.9	-0.9
198210	1.4	-16.7	-0.1	-0.7
198211	5.1	-6.9	2.2	-0.4
198212	4.9	0.1	5.1	-0.1
198301	-2.6	-1.3	-2.6	-1.1
198302	5.6	6.6	5.7	-2.3
198303	8.8	9.2	6.0	-1.0
198304	7.0	14.2	9.6	-0.2
198305	13.4	9.8	15.3	1.1
198306	-1.5	7.4	-2.2	0.2
198307	-0.6	-2.6	-3.0	-0.3
198308	-3.2	13.9	-4.8	1.9
198309	-16.9	-12.0	-12.2	1.4
198310	12.7	-5.3	13.6	2.3
198311	-1.1	-10.5	-1.8	1.8
198312	1.0	-3.0	1.7	1.6
198401	18.7	20.2	18.7	3.1
198402	10.2	10.7	9.7	3.6
198403	3.7	5.3	2.2	3.4
198404	-5.6	-1.5	-5.5	2.2
198405	-9.8	-14.8	-10.4	0.1
198406	2.4	10.8	0.9	0.4
198407	5.9	4.0	3.7	1.0
198408	-11.6	9.1	-8.9	0.6
198409	-25.0	-22.0	-22.2	-0.4
198410	4.4	-15.5	1.4	-1.2
198411	5.2	-3.9	5.4	-0.6
198412	-6.5	-10.8	-6.4	-1.1

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)
MONTH TO MONTH % CHANGES

TITLE=155000 PROCESSED VEGETABLES

DATE	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH
197802	-1.7	-12.6	-1.6	.
197803	0.7	6.7	0.7	.
197804	0.2	-3.8	0.2	.
197805	0.4	-7.1	0.4	.
197806	0.6	-2.9	0.6	.
197807	0.6	-5.9	0.6	.
197808	0.3	-10.7	0.3	.
197809	0.7	1.8	0.6	.
197810	1.0	7.8	1.1	.
197811	0.7	8.0	0.7	.
197812	1.1	10.8	1.1	.
197901	0.6	18.4	0.8	0.6
197902	0.5	-10.8	0.4	0.6
197903	0.1	5.9	0.1	0.7
197904	0.5	-3.5	0.5	0.7
197905	0.4	-7.0	0.5	0.6
197906	0.9	-2.8	0.8	0.6
197907	0.2	-6.3	0.2	0.5
197908	0.5	-10.5	0.5	0.5
197909	0.9	2.2	1.0	0.6
197910	0.5	7.1	0.5	0.5
197911	1.7	8.8	1.5	0.7
197912	1.0	10.8	1.0	0.7
198001	1.1	18.6	1.0	0.8
198002	0.6	-10.6	0.6	0.7
198003	1.0	6.9	1.0	0.8
198004	0.1	-3.7	0.3	0.8
198005	1.0	-6.6	0.9	0.7
198006	1.9	-1.8	1.9	0.9
198007	0.1	-6.3	0.2	0.7
198008	1.0	-10.0	1.1	0.8
198009	1.7	3.0	1.8	0.8
198010	1.2	7.9	1.1	0.9
198011	1.4	8.5	1.2	1.0
198012	1.1	10.7	1.0	1.0
198101	1.4	19.0	1.2	1.3
198102	1.8	-9.6	1.8	1.2
198103	1.9	7.9	1.9	1.3
198104	1.5	-2.4	1.7	1.5
198105	1.2	-6.3	1.3	1.4
198106	1.1	-2.5	1.1	1.3
198107	2.3	-4.3	2.4	1.3
198108	1.3	-9.5	1.6	1.2
198109	1.5	2.5	1.5	1.3
198110	1.9	8.4	1.6	1.3
198111	0.5	7.7	0.5	1.3
198112	1.1	10.8	1.1	1.5
198201	1.4	19.0	1.2	1.8
198202	0.5	-10.7	0.6	1.4
198203	3.2	9.1	3.1	1.7

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
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BASED ON 1974, 1976 AND 1978)
MONTH TO MONTH % CHANGES

TITLE=155000 PROCESSED VEGETABLES

DATE	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH
198204	1.7	-2.0	2.0	1.6
198205	1.6	-6.1	1.4	1.5
198206	0.9	-2.9	0.7	1.5
198207	1.2	-5.4	1.2	1.2
198208	1.9	-9.0	2.2	1.2
198209	0.1	1.2	0.1	1.1
198210	0.0	6.4	-0.2	1.0
198211	0.8	8.2	0.9	1.1
198212	0.4	10.4	0.8	1.2
198301	0.6	17.6	0.1	1.3
198302	0.6	-11.2	-0.1	1.0
198303	-1.2	6.0	0.2	0.9
198304	-0.1	-3.9	0.1	0.7
198305	-0.2	-8.2	-0.8	0.4
198306	0.2	-3.4	0.2	0.4
198307	0.8	-5.7	0.8	0.3
198308	0.2	-11.1	-0.2	0.1
198309	1.1	3.4	2.3	0.3
198310	0.1	6.1	-0.5	0.3
198311	0.3	7.6	0.3	0.2
198312	0.7	10.6	0.9	0.2
198401	0.2	17.5	-0.1	0.3
198402	1.3	-10.3	1.0	0.3
198403	0.2	6.6	0.7	0.5
198404	-0.6	-4.3	-0.4	0.4
198405	0.3	-7.6	-0.2	0.4
198406	0.7	-2.8	0.8	0.5
198407	-0.1	-6.4	0.1	0.3
198408	-0.2	-11.4	-0.6	0.3
198409	-0.3	1.5	0.4	0.2
198410	-1.7	4.3	-2.2	0.1
198411	0.7	8.2	0.9	0.1
198412	0.1	9.9	0.3	0.1

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)
MONTH OVER SAME MONTH OF PRECEDING YEAR % CHANGES

------------------------------------ TITLE=140000 FRUITS AND VEGETABLES ------------------------------------

DATE	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH
197901	7.0	7.4	7.3	.
197902	8.7	8.7	8.7	.
197903	9.3	9.9	9.9	.
197904	9.3	8.5	8.5	.
197905	1.1	0.9	0.9	.
197906	8.9	9.0	9.0	.
197907	1.2	2.5	2.5	.
197908	2.6	4.0	4.0	.
197909	10.4	11.3	11.3	.
197910	9.0	8.1	8.1	.
197911	9.1	8.8	8.9	.
197912	12.0	11.1	11.1	7.4
198001	4.5	3.9	3.9	7.2
198002	3.3	2.7	2.7	6.6
198003	-1.5	-1.7	-1.8	5.6
198004	3.4	3.1	3.1	5.3
198005	8.4	8.3	8.2	5.8
198006	8.8	9.0	9.0	5.9
198007	4.9	3.9	4.0	6.1
198008	11.4	10.1	10.2	6.6
198009	12.7	11.6	11.6	6.7
198010	11.2	13.9	13.9	7.2
198011	10.6	12.0	12.0	7.3
198012	11.9	13.2	13.1	7.5
198101	14.7	16.7	16.7	8.4
198102	21.8	22.1	22.1	9.9
198103	23.9	23.2	23.2	12.0
198104	23.9	25.4	25.4	13.7
198105	12.4	12.3	12.3	14.1
198106	15.4	15.1	15.2	14.6
198107	12.7	12.6	12.6	15.4
198108	8.3	7.5	7.4	15.0
198109	11.3	8.9	8.9	14.7
198110	10.9	11.7	11.7	14.5
198111	12.2	12.7	12.7	14.6
198112	8.5	8.8	8.8	14.2
198201	13.9	13.6	13.6	14.0
198202	15.1	15.9	15.8	13.7
198203	11.7	12.5	12.6	12.9
198204	5.8	6.2	6.2	11.4
198205	13.6	14.3	14.3	11.5
198206	11.2	11.0	10.9	11.2
198207	13.4	13.4	13.4	11.3
198208	8.6	8.5	8.6	11.4
198209	6.2	6.2	6.2	11.0
198210	3.9	1.6	1.6	10.2
198211	6.2	5.0	4.9	9.7
198212	5.0	5.1	5.1	9.4
198301	-0.9	-0.6	-0.7	8.3
198302	-7.6	-7.6	-7.5	6.3

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
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MONTH OVER SAME MONTH OF PRECEDING YEAR % CHANGES

-- TITLE=140000 FRUITS AND VEGETABLES ------------------------------

DATE	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH
198303	-4.7	-4.9	-4.9	4.8
198304	-0.2	-0.6	-0.5	4.3
198305	3.7	3.4	3.4	3.5
198306	-0.7	0.2	0.2	2.6
198307	-1.5	-1.2	-1.3	1.2
198308	4.2	4.6	4.6	1.0
198309	3.4	3.4	3.3	0.7
198310	10.5	12.8	12.8	1.5
198311	4.5	6.2	6.2	1.5
198312	7.6	8.3	8.3	1.8
198401	16.8	17.2	17.2	3.1
198402	20.8	21.2	21.2	5.4
198403	20.4	21.0	21.0	~~7.5~~
198404	14.4	15.3	15.2	8.8
198405	4.9	5.3	5.3	8.9
198406	9.1	8.6	8.6	9.6
198407	10.3	9.2	9.2	10.7
198408	8.8	9.5	9.5	11.1
198409	7.4	8.6	8.6	11.6
198410	3.8	1.3	1.3	10.7
198411	6.6	5.1	5.1	10.7
198412	0.3	-0.4	-0.5	9.9

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
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BASED ON 1974, 1976 AND 1978)
MONTH OVER SAME MONTH OF PRECEDING YEAR % CHANGES

TITLE=141000 FRESH FRUIT

DATE	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH
197901	8.5	8.3	8.3	.
197902	9.6	8.6	8.5	.
197903	7.2	7.1	7.1	.
197904	12.9	12.9	12.9	.
197905	12.4	12.6	12.5	.
197906	17.4	18.6	18.5	.
197907	8.7	11.6	11.6	.
197908	8.6	10.9	10.8	.
197909	16.2	16.3	16.3	.
197910	10.9	10.1	10.0	.
197911	15.4	15.5	15.4	.
197912	13.0	12.7	12.8	12.5
198001	10.9	8.7	8.8	12.5
198002	11.5	9.2	9.3	12.5
198003	5.4	3.6	3.6	12.2
198004	9.9	8.9	8.9	12.0
198005	6.2	4.8	4.8	11.3
198006	5.4	5.2	5.2	10.2
198007	2.3	0.8	0.8	9.0
198008	4.1	3.6	3.6	8.1
198009	3.5	4.8	4.8	6.4
198010	1.5	3.6	3.5	5.9
198011	-1.2	-1.1	-1.1	4.8
198012	2.1	2.0	1.9	4.3
198101	-0.3	[illegible].1	0.0	3.7
198102	1.2	-0.2	-0.3	3.2
198103	3.6	3.1	3.1	3.2
198104	-1.9	-1.9	-1.9	2.4
198105	-2.2	-2.9	-2.8	1.9
198106	-1.0	-0.2	-0.2	1.5
198107	-4.8	-0.4	-0.4	1.2
198108	-4.6	-2.9	-2.9	0.5
198109	4.0	2.7	2.7	0.3
198110	10.6	13.0	13.1	0.9
198111	13.1	15.2	15.3	2.0
198112	12.3	13.1	13.1	2.6
198201	21.8	22.9	23.0	4.0
198202	21.1	25.9	25.9	5.5
198203	24.5	27.0	27.0	7.1
198204	22.5	23.8	23.8	8.9
198205	26.7	29.2	29.2	11.1
198206	24.2	22.5	22.5	13.1
198207	32.6	26.1	26.1	16.1
198208	26.1	23.7	23.6	19.0
198209	13.6	11.7	11.7	20.5
198210	3.5	-0.5	-0.5	19.3
198211	9.0	6.8	6.8	18.6
198212	2.2	1.2	1.2	17.8
198301	-1.9	-3.5	-3.5	16.1
198302	-7.0	-10.3	-10.3	13.7

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TITLE=141000 FRESH FRUIT

DATE	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH
198303	-10.9	-13.2	-13.2	10.6
198304	-4.9	-6.2	-6.2	8.7
198305	-3.1	-5.0	-5.0	6.2
198306	-4.8	-3.3	-3.4	4.1
198307	-5.4	-3.0	-3.0	1.1
198308	-6.2	-3.4	-3.4	-1.4
198309	-4.5	-2.0	-2.0	-3.4
198310	4.5	8.6	8.5	-2.8
198311	-7.2	-5.7	-5.7	-3.5
198312	3.5	4.5	4.5	-3.4
198401	10.0	12.0	11.9	-2.5
198402	14.6	17.7	17.7	-1.0
198403	14.0	17.2	17.1	1.1
198404	10.0	12.2	12.3	2.2
198405	5.4	8.0	8.0	3.3
198406	14.1	14.7	14.7	4.9
198407	10.6	8.6	8.6	6.3
198408	15.8	13.6	13.6	8.2
198409	20.2	17.7	17.8	11.4
198410	18.5	15.4	15.5	11.9
198411	23.3	22.3	22.3	13.8
198412	10.6	10.7	10.6	14.2

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
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MONTH OVER SAME MONTH OF PRECEDING YEAR % CHANGES

-- TITLE=143000 PROCESSED FRUIT --

DATE	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH
197901	15.4	15.9	15.8	.
197902	15.5	15.4	15.4	.
197903	15.0	14.8	14.8	.
197904	15.2	14.9	15.0	.
197905	15.0	14.5	14.5	.
197906	13.6	13.0	13.1	.
197907	13.8	12.1	12.1	.
197908	~~13.5~~	12.7	12.8	.
197909	14.4	14.8	14.8	.
197910	14.4	14.7	14.7	.
197911	13.0	14.0	14.0	.
197912	11.6	11.7	11.6	14.0
198001	10.0	10.8	10.8	13.5
198002	10.2	10.5	10.6	13.2
198003	10.0	10.5	10.4	12.7
198004	9.1	9.5	9.4	12.3
198005	8.0	8.4	8.4	11.6
198006	9.5	9.9	10.0	11.4
198007	9.6	10.0	10.1	11.2
198008	10.0	10.2	10.2	11.2
198009	9.1	9.1	9.0	10.7
198010	9.1	8.3	8.3	10.2
198011	9.0	8.5	8.5	9.7
198012	7.8	7.8	7.9	9.5
198101	8.1	8.3	8.3	9.2
198102	7.8	7.9	7.8	9.0
198103	10.0	10.5	10.4	9.0
198104	12.8	13.1	13.1	9.3
198105	14.3	14.1	14.1	9.8
198106	14.5	14.9	14.8	10.3
198107	13.8	14.0	14.0	10.5
198108	13.3	13.3	13.3	10.8
198109	14.8	14.5	14.6	11.2
198110	15.6	15.7	15.7	11.8
198111	16.8	16.2	16.2	12.4
198112	16.1	15.7	15.6	13.1
198201	15.3	15.4	15.4	13.7
198202	17.8	18.0	18.0	14.7
198203	16.6	16.0	16.1	15.2
198204	14.2	14.1	14.1	15.3
198205	13.6	14.0	14.1	15.2
198206	11.9	11.8	11.8	15.0
198207	12.5	12.7	12.7	14.9
198208	12.4	12.4	12.4	14.8
198209	11.9	12.1	12.1	14.6
198210	10.9	10.7	10.7	14.2
198211	9.2	8.9	8.9	13.6
198212	8.6	8.5	8.5	12.9
198301	9.3	9.4	9.5	12.4
198302	5.7	5.7	5.8	11.2

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TITLE=143000 PROCESSED FRUIT

DATE	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH
198303	2.1	2.6	2.6	9.9
198304	1.7	1.9	1.9	8.9
198305	1.1	1.2	1.2	7.7
198306	1.5	1.5	1.6	6.8
198307	0.9	0.9	0.9	5.9
198308	0.7	0.5	0.5	5.2
198309	-0.5	-0.6	-0.6	4.2
198310	-0.2	-0.3	-0.2	3.4
198311	-0.5	-0.4	-0.4	2.7
198312	0.2	0.3	0.3	-2.0
198401	0.2	0.4	0.4	1.2
198402	1.0	1.1	1.0	0.8
198403	4.9	4.9	4.9	1.1
198404	6.6	6.6	6.5	1.5
198405	8.1	7.8	7.8	2.0
198406	7.7	7.8	7.7	2.6
198407	8.7	9.5	9.5	3.2
198408	8.4	8.8	8.8	3.8
198409	8.3	7.9	7.9	4.4
198410	7.7	7.6	7.6	5.0
198411	7.8	7.1	7.1	5.6
198412	7.4	6.6	6.6	6.2

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
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MONTH OVER SAME MONTH OF PRECEDING YEAR % CHANGES

TITLE=151000 FRESH VEGETABLES

DATE	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH
197901	1.2	2.2	2.1	.
197902	4.4	4.3	4.5	.
197903	9.3	10.7	10.8	.
197904	3.1	1.9	1.8	.
197905	-16.9	-18.0	-18.1	.
197906	-1.4	-1.5	-1.4	.
197907	-12.7	-12.2	-12.2	.
197908	-11.5	-7.5	-7.6	.
197909	0.4	0.5	0.5	.
197910	3.8	2.2	2.2	.
197911	-0.6	-1.4	-1.4	.
197912	13.0	11.3	11.2	-1.8
198001	-7.0	-7.9	-7.9	-2.6
198002	-11.8	-12.0	-12.0	-3.8
198003	-19.3	-20.5	-20.5	-6.3
198004	-9.2	-8.6	-8.6	-7.2
198005	10.7	10.9	11.1	-4.8
198006	11.8	12.1	12.1	-3.5
198007	3.2	3.1	3.0	-1.8
198008	22.5	18.3	18.3	0.9
198009	32.4	29.3	29.2	3.4
198010	26.1	30.8	30.9	5.4
198011	27.3	30.5	30.7	7.6
198012	26.2	29.9	29.9	9.0
198101	38.9	44.2	44.1	12.6
198102	63.6	64.9	64.9	18.2
198103	65.4	64.9	64.7	25.2
198104	68.6	67.6	67.6	31.7
198105	25.5	23.9	23.9	32.8
198106	34.1	31.1	31.1	34.5
198107	29.5	26.8	26.9	37.0
198108	16.5	13.2	13.2	36.0
198109	14.8	14.7	14.7	34.3
198110	3.9	4.9	5.0	31.9
198111	5.3	4.8	4.7	29.7
198112	-4.2	-5.2	-5.1	26.7
198201	3.9	2.3	2.3	23.7
198202	8.0	7.4	7.3	19.6
198203	-3.6	-3.4	-3.4	14.7
198204	-15.4	-13.8	-13.8	8.4
198205	-0.4	0.2	0.2	6.6
198206	-3.1	-1.9	-1.9	3.8
198207	-3.8	-1.1	-1.1	1.5
198208	-14.9	-10.8	-10.8	-0.8
198209	-12.2	-10.3	-10.3	-2.8
198210	-6.7	-8.3	-8.4	-3.8
198211	-3.9	-5.9	-6.0	-4.5
198212	0.7	-0.6	-0.6	-4.2
198301	-13.4	-15.1	-15.1	-5.4
198302	-24.0	-24.9	-24.9	-8.2

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
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TITLE=151000 FRESH VEGETABLES

DATE	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH
198303	-8.7	-11.5	-11.5	-8.9
198304	0.4	-1.8	-1.7	-7.8
198305	12.2	12.7	12.7	-6.8
198306	0.1	1.1	1.1	-6.4
198307	-0.8	-2.4	-2.4	-6.6
198308	23.3	19.0	19.0	-3.8
198309	19.4	17.2	17.2	-1.5
198310	32.8	33.2	33.3	1.5
198311	25.0	28.1	28.2	3.7
198312	20.3	24.1	24.0	5.4
198401	46.7	51.1	51.2	9.8
198402	53.0	57.0	56.9	16.5
198403	45.9	51.4	51.4	21.7
198404	28.7	30.6	30.5	24.7
198405	2.4	1.4	1.5	23.4
198406	6.5	4.6	4.6	23.7
198407	13.5	11.8	11.8	25.3
198408	3.6	7.1	7.0	23.7
198409	-6.4	-5.1	-5.1	21.6
198410	-13.3	-15.4	-15.4	17.4
198411	-7.8	-9.2	-9.2	14.5
198412	-14.7	-16.4	-16.4	11.5

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
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BASED ON 1974, 1976 AND 1978)
MONTH OVER SAME MONTH OF PRECEDING YEAR % CHANGES

TITLE=155000 PROCESSED VEGETABLES

DATE	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH
197901	5.2	5.5	5.5	.
197902	7.6	7.8	7.7	.
197903	6.9	6.9	7.0	.
197904	7.2	7.3	7.3	.
197905	7.2	7.4	7.4	.
197906	7.5	7.6	7.6	.
197907	7.0	7.2	7.2	.
197908	7.2	7.4	7.4	.
197909	7.4	7.8	7.8	.
197910	6.9	7.1	7.2	.
197911	7.9	7.9	8.0	.
197912	7.8	7.9	7.9	7.3
198001	8.3	8.1	8.1	7.6
198002	8.5	8.3	8.4	7.7
198003	9.4	9.4	9.3	7.9
198004	9.0	9.1	9.1	8.0
198005	9.6	9.5	9.5	8.1
198006	10.8	10.6	10.7	8.5
198007	10.7	10.6	10.6	8.7
198008	11.3	11.3	11.3	9.1
198009	12.1	12.2	12.2	9.3
198010	12.9	13.0	13.0	9.7
198011	12.6	12.7	12.7	10.1
198012	12.7	12.7	12.8	10.5
198101	13.1	13.0	13.0	11.0
198102	14.4	14.3	14.3	11.6
198103	15.5	15.4	15.4	12.1
198104	17.1	17.0	17.0	12.8
198105	17.4	17.5	17.5	13.6
198106	16.5	16.6	16.6	14.0
198107	19.1	19.0	19.1	14.7
198108	19.5	19.7	19.7	15.2
198109	19.3	19.3	19.2	15.8
198110	20.2	19.8	19.8	16.4
198111	19.2	18.9	19.0	16.7
198112	19.1	19.0	19.0	17.3
198201	19.1	19.0	19.0	17.9
198202	17.5	17.6	17.6	18.1
198203	19.0	18.9	18.9	18.5
198204	19.2	19.4	19.4	18.7
198205	19.7	19.6	19.6	18.8
198206	19.5	19.1	19.1	19.1
198207	18.1	17.7	17.6	19.0
198208	18.7	18.4	18.4	18.9
198209	17.0	16.8	16.8	18.7
198210	14.8	14.7	14.7	18.3
198211	15.2	15.2	15.1	18.0
198212	14.4	14.8	14.8	17.6
198301	13.5	13.4	13.5	17.0
198302	13.7	12.8	12.7	16.6

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)
MONTH OVER SAME MONTH OF PRECEDING YEAR % CHANGES

TITLE=155000 PROCESSED VEGETABLES

DATE	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH
198303	8.9	9.6	9.6	15.7
198304	7.0	7.4	7.5	14.6
198305	5.2	5.0	5.1	13.3
198306	4.4	4.6	4.6	12.0
198307	4.1	4.2	4.2	11.0
198308	2.4	1.7	1.7	9.8
198309	3.4	3.9	3.9	9.0
198310	3.5	3.6	3.6	8.2
198311	3.0	3.0	3.0	7.2
198312	3.3	3.2	3.2	6.2
198401	2.9	3.1	3.1	5.3
198402	3.6	4.2	4.2	4.5
198403	5.0	4.8	4.7	4.1
198404	4.5	4.3	4.3	3.8
198405	5.0	5.0	5.0	3.8
198406	5.5	5.6	5.6	3.9
198407	4.6	4.8	4.8	4.0
198408	4.1	4.4	4.4	4.2
198409	2.7	2.5	2.5	4.1
198410	0.8	0.8	0.8	3.8
198411	1.2	1.4	1.4	3.7
198412	0.6	0.7	0.7	3.5

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
SEASONALLY-ADJUSTED SERIES
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)

ITEM	YEAR	MONTH	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DECEMBER CENTRED DIEWERT-FRENCH	JUNE CENTRED DIEWERT-FRENCH
FRUITS AND VEGETABLES	1978	JANUARY	97.2	96.9	96.8	.	.
		FEBRUARY	96.4	96.6	96.4	.	.
		MARCH	97.5	97.8	97.6	.	.
		APRIL	97.6	98.1	97.8	.	.
		MAY	102.9	102.6	102.3	.	.
		JUNE	96.9	97.0	96.7	.	100.0
		JULY	106.5	105.9	105.7	.	100.5
		AUGUST	103.3	103.1	103.0	.	101.1
		SEPTEMBER	97.6	98.3	98.4	.	101.9
		OCTOBER	100.6	100.3	100.2	.	102.5
		NOVEMBER	101.3	101.0	100.9	.	102.7
		DECEMBER	101.4	101.5	101.4	100.0	103.4
			--------	--------	--------	--------	--------
			99.9	99.9	99.8	100.0	100.0
FRUITS AND VEGETABLES	1979	JANUARY	104.0	103.9	103.8	100.5	103.7
		FEBRUARY	104.3	104.5	104.3	101.1	104.1
		MARCH	106.3	107.4	107.2	101.9	105.7
		APRIL	106.6	106.2	105.9	102.5	106.2
		MAY	104.3	103.7	103.5	102.7	106.8
		JUNE	105.2	105.3	105.1	103.4	107.7
		JULY	108.2	109.1	108.9	103.7	107.9
		AUGUST	106.6	107.8	107.8	104.1	108.1
		SEPTEMBER	107.5	109.4	109.6	105.7	107.9
		OCTOBER	109.8	108.3	108.3	106.2	108.2
		NOVEMBER	110.3	109.7	109.6	106.8	108.9
		DECEMBER	113.5	112.8	112.7	107.7	109.8
			--------	--------	--------	--------	--------
			107.2	107.3	107.2	107.7	107.7

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
SEASONALLY-ADJUSTED SERIES
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)

ITEM	YEAR	MONTH	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DECEMBER CENTRED DIEWERT-FRENCH	JUNE CENTRED DIEWERT-FRENCH
FRUITS AND VEGETABLES	1980	JANUARY	108.7	107.8	107.7	107.9	110.2
		FEBRUARY	107.0	106.8	106.5	108.1	111.1
		MARCH	104.6	105.3	105.1	107.9	112.7
		APRIL	109.8	109.1	108.9	108.2	113.9
		MAY	113.5	112.7	112.5	108.9	114.8
		JUNE	114.1	114.4	114.1	109.8	115.9
		JULY	114.1	114.0	113.9	110.2	117.2
		AUGUST	119.6	119.9	119.8	111.1	118.8
		SEPTEMBER	121.2	122.4	122.5	112.7	120.8
		OCTOBER	122.1	123.0	122.9	113.9	122.9
		NOVEMBER	121.8	122.6	122.5	114.8	124.0
		DECEMBER	127.2	127.6	127.5	115.9	125.6
			115.3	115.5	115.3	115.9	115.9
FRUITS AND VEGETABLES	1981	JANUARY	124.4	125.2	125.2	117.2	127.1
		FEBRUARY	129.5	129.4	129.2	118.8	127.9
		MARCH	129.4	129.5	129.3	120.8	129.2
		APRIL	135.8	136.1	135.9	122.9	130.2
		MAY	128.0	127.0	126.8	124.0	131.3
		JUNE	131.4	131.3	131.1	125.6	132.2
		JULY	129.3	129.2	129.1	127.1	133.5
		AUGUST	130.4	129.7	129.7	127.9	135.1
		SEPTEMBER	135.0	133.8	133.9	129.2	136.3
		OCTOBER	135.3	137.3	137.2	130.2	137.0
		NOVEMBER	136.5	137.9	137.9	131.3	138.5
		DECEMBER	138.4	139.0	139.0	132.2	139.8
			132.0	132.1	132.0	132.2	132.2

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
SEASONALLY-ADJUSTED SERIES
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)

ITEM	YEAR	MONTH	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DECEMBER CENTRED DIEWERT-FRENCH	JUNE CENTRED DIEWERT-FRENCH
FRUITS AND VEGETABLES	1982	JANUARY	141.4	141.6	141.6	133.5	141.3
		FEBRUARY	147.9	148.9	148.7	135.1	142.4
		MARCH	144.3	145.2	145.0	136.3	143.4
		APRIL	143.0	143.7	143.5	137.0	143.5
		MAY	145.8	145.7	145.6	138.5	143.9
		JUNE	146.1	145.6	145.4	139.8	144.5
		JULY	147.3	147.3	147.2	141.3	144.4
		AUGUST	142.4	141.6	141.6	142.4	143.6
		SEPTEMBER	143.7	142.8	142.8	143.4	142.9
		OCTOBER	140.4	139.3	139.2	143.5	142.8
		NOVEMBER	144.8	144.5	144.6	143.9	143.2
		DECEMBER	145.8	146.4	146.4	144.5	143.2
			144.4	144.4	144.3	144.5	144.5
FRUITS AND VEGETABLES	1983	JANUARY	139.6	139.9	139.9	144.4	143.0
		FEBRUARY	135.8	136.9	136.7	143.6	143.6
		MARCH	137.2	137.5	137.4	142.9	144.2
		APRIL	142.4	142.3	142.2	142.8	145.6
		MAY	151.4	150.9	150.9	143.2	146.3
		JUNE	145.3	146.1	146.0	143.2	147.1
		JULY	145.3	145.9	145.8	143.0	148.9
		AUGUST	148.6	148.5	148.5	143.6	151.0
		SEPTEMBER	149.1	148.3	148.3	144.2	153.4
		OCTOBER	155.2	157.3	157.2	145.6	155.2
		NOVEMBER	151.0	153.3	153.3	146.3	155.8
		DECEMBER	157.4	158.9	158.9	147.1	157.0
			146.5	147.2	147.1	147.1	147.1

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
SEASONALLY-ADJUSTED SERIES
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)

ITEM	YEAR	MONTH	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DECEMBER CENTRED DIEWERT-FRENCH	JUNE CENTRED DIEWERT-FRENCH
FRUITS AND VEGETABLES	1984	JANUARY	162.4	163.3	163.3	148.9	158.3
		FEBRUARY	163.5	165.2	165.1	151.0	159.6
		MARCH	165.0	165.9	165.8	153.4	161.4
		APRIL	162:4	163.5	163.4	155.2	161.4
		MAY	159.0	159.1	159.1	155.8	161.8
		JUNE	159.0	159.0	158.9	157.0	161.9
		JULY	160.4	159.5	159.5	158.3	
		AUGUST	161.9	162.7	162.7	159.6	
		SEPTEMBER	160.7	161.7	161.7	161.4	
		OCTOBER	160.8	159.3	159.3	161.4	
		NOVEMBER	160.9	161.0	161.0	161.8	
		DECEMBER	158.4	158.3	158.4	161.9	
			161.2	161.5	161.5	161.9	161.9

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
SEASONALLY-ADJUSTED SERIES
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)

ITEM	YEAR	MONTH	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DECEMBER CENTRED DIEWERT-FRENCH	JUNE CENTRED DIEWERT-FRENCH
FRESH FRUIT	1978	JANUARY	96.6	97.4	96.2	.	.
		FEBRUARY	96.2	97.8	96.5	.	.
		MARCH	100.2	100.9	99.2	.	.
		APRIL	96.4	97.2	95.5	.	.
		MAY	98.4	99.4	97.7	.	.
		JUNE	95.3	95.0	93.3	.	100.0
		JULY	104.3	102.9	101.1	.	100.5
		AUGUST	104.5	102.4	100.9	.	101.0
		SEPTEMBER	98.6	99.0	97.9	.	101.5
		OCTOBER	103.2	102.5	101.3	.	102.3
		NOVEMBER	101.9	101.3	100.2	.	103.1
		DECEMBER	103.1	102.9	101.8	100.0	104.5
			99.9	99.9	98.5	100.0	100.0
FRESH FRUIT	1979	JANUARY	104.7	105.5	104.2	100.5	105.9
		FEBRUARY	105.1	106.0	104.6	101.0	107.2
		MARCH	107.3	107.9	106.2	101.5	110.3
		APRIL	108.7	109.4	107.6	102.3	111.0
		MAY	110.8	112.0	110.1	103.1	111.9
		JUNE	111.9	112.4	110.5	104.5	112.8
		JULY	113.6	115.2	113.3	105.9	113.3
		AUGUST	113.9	113.8	112.1	107.2	113.8
		SEPTEMBER	114.9	115.2	113.9	110.3	114.1
		OCTOBER	114.6	112.6	111.3	111.0	114.7
		NOVEMBER	117.7	116.8	115.5	111.9	115.0
		DECEMBER	116.4	115.9	114.6	112.8	115.6
			111.6	111.9	110.3	112.8	112.8

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
SEASONALLY-ADJUSTED SERIES
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)

ITEM	YEAR	MONTH	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DECEMBER CENTRED DIEWERT-FRENCH	JUNE CENTRED DIEWERT-FRENCH
FRESH FRUIT	1980	JANUARY	115.8	114.6	113.2	113.3	115.6
		FEBRUARY	116.8	115.8	114.2	113.8	116.0
		MARCH	113.0	111.8	110.0	114.1	117.2
		APRIL	119.2	118.9	116.9	114.7	117.4
		MAY	117.8	117.4	115.4	115.0	117.4
		JUNE	117.8	118.0	116.1	115.6	117.5
		JULY	116.2	116.2	114.4	115.6	117.5
		AUGUST	119.1	118.3	116.6	116.0	117.6
		SEPTEMBER	119.2	120.9	119.7	117.2	117.8
		OCTOBER	116.3	116.2	114.9	117.4	117.6
		NOVEMBER	116.2	115.4	114.1	117.4	117.4
		DECEMBER	119.0	118.4	117.1	117.5	117.3
			117.2	116.8	115.2	117.5	117.5
FRESH FRUIT	1981	JANUARY	114.9	114.3	112.9	117.5	117.4
		FEBRUARY	117.8	115.2	113.6	117.6	117.0
		MARCH	117.0	115.4	113.6	117.8	117.6
		APRIL	116.8	116.5	114.6	117.6	118.6
		MAY	115.4	114.0	112.1	117.4	119.9
		JUNE	116.5	117.4	115.5	117.3	120.8
		JULY	110.7	115.9	114.1	117.4	122.4
		AUGUST	114.1	115.3	113.7	117.0	124.1
		SEPTEMBER	124.2	124.4	123.2	117.6	126.1
		OCTOBER	128.4	130.8	129.4	118.6	127.9
		NOVEMBER	131.4	132.8	131.3	119.9	130.0
		DECEMBER	134.0	134.3	132.9	120.8	132.4
			120.1	120.5	118.9	120.8	120.8

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
SEASONALLY-ADJUSTED SERIES
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)

ITEM	YEAR	MONTH	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DECEMBER CENTRED DIEWERT-FRENCH	JUNE CENTRED DIEWERT-FRENCH
FRESH FRUIT	1982	JANUARY	139.2	139.9	138.3	122.4	135.6
		FEBRUARY	142.1	144.9	142.8	124.1	138.7
		MARCH	146.0	146.8	144.6	126.1	141.2
		APRIL	143.0	144.1	141.9	127.9	141.2
		MAY	146.5	147.3	144.9	130.0	141.6
		JUNE	144.2	143.2	141.0	132.4	141.8
		JULY	146.7	146.1	144.0	135.6	141.5
		AUGUST	144.5	143.1	141.2	138.7	140.6
		SEPTEMBER	141.4	139.4	137.9	141.2	139.4
		OCTOBER	132.6	129.7	128.3	141.2	138.8
		NOVEMBER	143.1	141.6	140.1	141.6	138.4
		DECEMBER	137.7	136.8	135.4	141.8	138.0
			142.2	141.9	140.0	141.8	141.8
FRESH FRUIT	1983	JANUARY	135.8	134.4	132.9	141.5	137.5
		FEBRUARY	131.8	129.5	127.6	140.6	136.9
		MARCH	130.3	127.8	125.9	139.4	136.6
		APRIL	136.3	135.4	133.4	138.8	137.4
		MAY	142.2	140.1	137.8	138.4	137.0
		JUNE	136.8	137.9	135.9	138.0	137.3
		JULY	138.7	141.6	139.6	137.5	138.4
		AUGUST	135.9	138.4	136.6	136.9	139.7
		SEPTEMBER	135.1	137.0	135.5	136.6	141.1
		OCTOBER	138.1	140.5	139.0	137.4	142.2
		NOVEMBER	132.8	133.5	132.0	137.0	142.8
		DECEMBER	143.3	143.6	142.2	137.3	144.6
			136.4	136.6	134.9	137.3	137.3

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
SEASONALLY-ADJUSTED SERIES
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)

ITEM	YEAR	MONTH	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DECEMBER CENTRED DIEWERT-FRENCH	JUNE CENTRED DIEWERT-FRENCH
FRESH FRUIT	1984	JANUARY	148.7	149.9	148.2	138.4	146.1
		FEBRUARY	150.9	152.4	150.2	139.7	148.2
		MARCH	148.9	150.1	147.9	141.1	152.6
		APRIL	150.1	152.2	150.0	142.2	154.0
		MAY	149.9	151.0	148.5	142.8	155.8
		JUNE	155.8	157.9	155.5	144.6	156.8
		JULY	153.3	153.3	151.1	146.1	
		AUGUST	157.6	157.3	155.4	148.2	
		SEPTEMBER	162.4	161.5	159.7	152.6	
		OCTOBER	163.4	162.1	160.4	154.0	
		NOVEMBER	163.6	163.1	161.4	155.8	
		DECEMBER	159.1	159.3	157.8	156.8	
			155.3	155.8	153.8	156.8	156.8

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
SEASONALLY-ADJUSTED SERIES
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)

ITEM	YEAR	MONTH	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DECEMBER CENTRED DIEWERT-FRENCH	JUNE CENTRED DIEWERT-FRENCH
PROCESSED FRUIT	1978	JANUARY	94.7	94.0	93.8	.	.
		FEBRUARY	95.1	95.0	94.9	.	.
		MARCH	96.3	96.1	96.1	.	.
		APRIL	97.1	97.0	97.1	.	.
		MAY	98.3	98.4	98.5	.	.
		JUNE	99.7	99.8	100.0	.	100.0
		JULY	100.5	101.3	101.4	.	101.2
		AUGUST	101.5	102.0	102.0	.	102.5
		SEPTEMBER	102.1	102.0	101.9	.	103.7
		OCTOBER	102.7	103.4	103.2	.	105.0
		NOVEMBER	104.9	105.0	104.8	.	106.4
		DECEMBER	107.2	108.0	107.7	100.0	107.6
			--------	--------	--------	--------	--------
			100.0	100.2	100.1	100.0	100.0
PROCESSED FRUIT	1979	JANUARY	109.4	109.0	108.8	101.2	108.5
		FEBRUARY	110.0	109.7	109.5	102.5	109.4
		MARCH	110.8	110.4	110.4	103.7	110.6
		APRIL	111.9	111.5	111.6	105.0	111.7
		MAY	113.0	112.6	112.8	106.4	112.8
		JUNE	113.2	112.8	112.9	107.6	113.9
		JULY	114.4	113.6	113.7	108.5	114.8
		AUGUST	115.2	115.0	115.0	109.4	115.9
		SEPTEMBER	116.7	116.9	116.8	110.6	116.9
		OCTOBER	117.4	118.4	118.3	111.7	117.8
		NOVEMBER	118.4	119.6	119.3	112.8	118.6
		DECEMBER	119.8	120.6	120.3	113.9	119.6
			--------	--------	--------	--------	--------
			114.2	114.2	114.1	113.9	113.9

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
SEASONALLY-ADJUSTED SERIES
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)

ITEM	YEAR	MONTH	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DECEMBER CENTRED DIEWERT-FRENCH	JUNE CENTRED DIEWERT-FRENCH
PROCESSED FRUIT	1980	JANUARY	120.5	120.8	120.6	114.8	120.5
		FEBRUARY	121.3	121.3	121.2	115.9	121.4
		MARCH	122.0	121.9	122.0	116.9	122.3
		APRIL	122.2	122.0	122.2	117.8	122.9
		MAY	122.0	122.1	122.3	118.6	123.6
		JUNE	123.9	123.9	124.1	119.6	124.5
		JULY	125.3	125.0	125.1	120.5	125.3
		AUGUST	126.7	126.8	126.8	121.4	126.2
		SEPTEMBER	127.1	127.3	127.2	122.3	127.3
		OCTOBER	127.8	128.0	127.8	122.9	128.7
		NOVEMBER	128.9	129.6	129.4	123.6	130.3
		DECEMBER	129.4	130.3	130.0	124.5	132.0
			124.8	124.9	124.9	124.5	124.5
PROCESSED FRUIT	1981	JANUARY	130.4	131.0	130.8	125.3	133.4
		FEBRUARY	130.8	131.0	130.9	126.2	134.6
		MARCH	134.3	134.8	134.8	127.3	136.2
		APRIL	137.9	138.1	138.2	128.7	137.6
		MAY	139.4	139.2	139.4	130.3	139.1
		JUNE	141.9	142.3	142.5	132.0	141.1
		JULY	142.4	142.3	142.4	133.4	142.7
		AUGUST	143.3	143.5	143.5	134.6	144.9
		SEPTEMBER	145.6	145.7	145.6	136.2	146.8
		OCTOBER	147.5	147.9	147.7	137.6	148.5
		NOVEMBER	150.4	150.6	150.4	139.1	150.4
		DECEMBER	150.5	151.0	150.7	141.1	151.8
			141.2	141.4	141.4	141.1	141.1

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
SEASONALLY-ADJUSTED SERIES
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)

ITEM	YEAR	MONTH	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DECEMBER CENTRED DIEWERT-FRENCH	JUNE CENTRED DIEWERT-FRENCH
PROCESSED FRUIT	1982	JANUARY	150 6	151.3	151.1	142.7	153.3
		FEBRUARY	154.4	154.7	154.7	144.9	154.7
		MARCH	156.8	156.7	156.7	146.8	156.1
		APRIL	157.6	157.6	157.7	148.5	157.2
		MAY	158.3	158.7	158.9	150.4	158.2
		JUNE	158.7	158.9	159.1	151.8	159.4
		JULY	160.0	160.2	160.3	153.3	160.5
		AUGUST	160.9	161.1	161.2	154.7	161.3
		SEPTEMBER	162.8	163.2	163.1	156.1	161 7
		OCTOBER	163.4	163.6	163.4	157.2	161.9
		NOVEMBER	164.2	164.1	163.9	158.2	162.1
		DECEMBER	163.8	164.2	164.0	159.4	162.3
			159.3	159.5	159.5	159.4	159.4
PROCESSED FRUIT	1983	JANUARY	164.7	165.7	165.5	160.5	162.5
		FEBRUARY	163.3	163.8	163.7	161.3	162.5
		MARCH	160.3	160.9	161.0	161.7	162.4
		APRIL	160.3	160.6	160.8	161.9	162.4
		MAY	160.0	160.4	160.6	162.1	162.3
		JUNE	161.0	161.3	161.5	162.3	162.4
		JULY	161.1	161.4	161.5	162.5	162.5
		AUGUST	161.9	161.7	161.7	162.5	162.6
		SEPTEMBER	161.9	162.2	162.1	162.4	163.3
		OCTOBER	162.9	163.1	162.9	162.4	164.2
		NOVEMBER	163.3	163.7	163.5	162.3	165.4
		DECEMBER	164.4	164.9	164.7	162.4	166.5
			162.1	162.5	162.5	162.4	162.4

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
SEASONALLY-ADJUSTED SERIES
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)

ITEM	YEAR	MONTH	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DECEMBER CENTRED DIEWERT-FRENCH	JUNE CENTRED DIEWERT-FRENCH
PROCESSED FRUIT	1984	JANUARY	165.2	166.4	166.2	162.5	167.7
		FEBRUARY	165.2	165.7	165.7	162.6	168.7
		MARCH	168.4	168.9	169.0	163.3	169.7
		APRIL	170.9	171.2	171.3	164.2	170.6
		MAY	173.0	172.9	173.1	165.4	171.4
		JUNE	173.3	173.6	173.8	166.5	172.4
		JULY	175.0	176.6	176.7	167.7	
		AUGUST	175.4	175.8	175.8	168.7	
		SEPTEMBER	175.3	175.0	174.9	169.7	
		OCTOBER	175.4	175.4	175.3	170.6	
		NOVEMBER	176.1	175.5	175.3	171.4	
		DECEMBER	176.6	175.9	175.7	172.4	
			172.5	172.7	172.7	172.4	172.4

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
SEASONALLY-ADJUSTED SERIES
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)

ITEM	YEAR	MONTH	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DECEMBER CENTRED DIEWERT-FRENCH	JUNE CENTRED DIEWERT-FRENCH
FRESH VEGETABLES	1978	JANUARY	98.1	97.1	97.1	.	.
		FEBRUARY	96.5	96.4	96.3	.	.
		MARCH	97.8	99.3	99.9	.	.
		APRIL	98.9	99.2	99.2	.	.
		MAY	110.4	110.0	110.2	.	.
		JUNE	95.6	96.6	96.1	.	100.0
		JULY	113.0	113.9	113.7	.	100.2
		AUGUST	104.1	102.6	102.8	.	100.4
		SEPTEMBER	92.6	93.3	93.5	.	101.4
		OCTOBER	94.4	93.7	93.8	.	101.5
		NOVEMBER	97.5	97.0	97.1	.	99.9
		DECEMBER	94.9	94.7	94.7	100.0	99.8
			99.5	99.5	99.5	100.0	100.0
FRESH VEGETABLES	1979	JANUARY	99.5	99.4	99.4	100.2	98.3
		FEBRUARY	100.2	100.1	100.1	100.4	97.4
		MARCH	106.5	109.5	110.0	101.4	98.1
		APRIL	101.9	100.9	100.9	101.5	98.3
		MAY	92.3	90.7	90.9	99.9	98.2
		JUNE	93.7	94.7	94.2	99.8	98.9
		JULY	98.9	100.1	100.0	98.3	98.3
		AUGUST	92.5	95.8	95.9	97.4	97.4
		SEPTEMBER	92.7	93.6	93.8	98.1	95.6
		OCTOBER	98.3	95.9	96.1	98.3	94.9
		NOVEMBER	96.8	95.5	95.7	98.2	95.7
		DECEMBER	107.5	105.5	105.5	98.9	96.8
			98.4	98.5	98.5	98.9	98.9

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
SEASONALLY-ADJUSTED SERIES
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)

ITEM	YEAR	MONTH	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DECEMBER CENTRED DIEWERT-FRENCH	JUNE CENTRED DIEWERT-FRENCH
FRESH VEGETABLES	1980	JANUARY	93.0	91.7	91.7	96.3	97.1
		FEBRUARY	87.7	87.3	87.3	97.4	98.8
		MARCH	85.3	86.3	86.7	95.6	101.6
		APRIL	91.8	91.4	91.4	94.9	104.0
		MAY	103.4	102.1	102.3	95.7	106.0
		JUNE	103.9	105.1	104.8	96.8	108.0
		JULY	102.8	103.9	103.7	97.1	110.9
		AUGUST	114.5	115.0	115.2	98.8	114.8
		SEPTEMBER	122.0	120.5	120.7	101.6	119.2
		OCTOBER	124.0	125.1	125.4	104.0	124.4
		NOVEMBER	123.5	124.7	125.0	106.0	126.3
		DECEMBER	136.2	137.4	137.4	108.0	129.5
			107.3	107.5	107.6	108.0	108.0
FRESH VEGETABLES	1981	JANUARY	129.4	131.9	132.1	110.9	132.5
		FEBRUARY	142.1	142.7	142.8	114.8	134.0
		MARCH	139.8	140.8	141.3	119.2	135.6
		APRIL	153.5	151.8	152.0	124.4	136.2
		MAY	130.9	128.2	128.3	126.3	136.6
		JUNE	138.5	136.7	136.5	129.5	136.2
		JULY	134.7	133.0	132.9	132.5	136.4
		AUGUST	134.3	131.9	132.1	134.0	137.4
		SEPTEMBER	139.8	138.0	138.3	135.6	137.0
		OCTOBER	129.1	131.1	131.5	136.2	135.4
		NOVEMBER	130.0	130.5	130.9	136.6	135.4
		DECEMBER	131.1	130.6	130.7	136.2	135.0
			136.1	135.6	135.8	136.2	136.2

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
SEASONALLY-ADJUSTED SERIES
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)

ITEM	YEAR	MONTH	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DECEMBER CENTRED DIEWERT-FRENCH	JUNE CENTRED DIEWERT-FRENCH
FRESH VEGETABLES	1982	JANUARY	134.9	135.0	135.2	136.4	134.6
		FEBRUARY	151.9	151.3	151.5	137.4	133.2
		MARCH	133.0	134.2	134.5	137.0	132.1
		APRIL	128.6	129.2	129.5	135.4	131.1
		MAY	132.1	130.5	130.6	135.4	130.5
		JUNE	133.9	133.6	133.7	135.0	130.4
		JULY	130.8	132.9	132.8	134.6	129.0
		AUGUST	114.9	118.7	118.9	133.2	126.1
		SEPTEMBER	122.7	123.9	124.1	132.1	124.7
		OCTOBER	120.5	120.1	120.4	131.1	124.3
		NOVEMBER	124.8	122.5	122.8	130.5	125.4
		DECEMBER	133.0	130.5	130.6	130.4	125.5
			130.1	130.2	130.4	130.4	130.4
FRESH VEGETABLES	1983	JANUARY	116.7	114.2	114.5	129.0	125.2
		FEBRUARY	114.6	112.6	112.8	126.1	127.5
		MARCH	120.2	117.5	117.7	124.7	129.7
		APRIL	128.3	126.2	126.5	124.3	133.0
		MAY	149.0	148.3	148.5	125.4	135.4
		JUNE	134.5	135.4	135.5	125.5	137.3
		JULY	130.2	130.3	130.2	125.2	141.4
		AUGUST	141.9	141.6	141.9	127.5	146.1
		SEPTEMBER	147.3	145.7	146.0	129.7	151.2
		OCTOBER	160.5	160.4	160.8	133.0	154.7
		NOVEMBER	155.3	156.0	156.5	135.4	155.0
		DECEMBER	161.1	162.7	162.8	137.3	155.7
			138.3	137.6	137.8	137.3	137.3

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
SEASONALLY-ADJUSTED SERIES
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)

ITEM	YEAR	MONTH	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DECEMBER CENTRED DIEWERT-FRENCH	JUNE CENTRED DIEWERT-FRENCH
FRESH VEGETABLES	1984	JANUARY	171.1	172.4	172.9	141.4	157.3
		FEBRUARY	174.7	176.0	176.3	146.1	158.0
		MARCH	173.9	176.7	177.0	151.2	158.2
		APRIL	164.6	164.0	164.4	154.7	156.2
		MAY	153.4	151.5	151.7	155.0	155.1
		JUNE	143.4	141.9	142.0	155.7	153.5
		JULY	147.6	145.5	145.4	157.3	
		AUGUST	147.4	152.1	152.4	158.0	
		SEPTEMBER	138.7	138.8	139.2	158.2	
		OCTOBER	139.0	135.7	136.1	156.2	
		NOVEMBER	142.5	141.0	141.5	155.1	
		DECEMBER	138.0	136.3	136.5	153.5	
			152.9	152.7	153.0	153.5	153.5

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
SEASONALLY-ADJUSTED SERIES
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)

ITEM	YEAR	MONTH	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DECEMBER CENTRED DIEWERT-FRENCH	JUNE CENTRED DIEWERT-FRENCH
PROCESSED VEGETABLES	1978	JANUARY	94.7	98.8	99.1	.	.
		FEBRUARY	95.2	97.5	97.5	.	.
		MARCH	96.6	98.2	98.2	.	.
		APRIL	97.8	98.4	98.4	.	.
		MAY	98.9	98.9	98.8	.	.
		JUNE	100.1	99.4	99.4	.	100.0
		JULY	100.8	100.1	100.0	.	100.5
		AUGUST	101.3	100.5	100.3	.	101.2
		SEPTEMBER	101.8	101.0	100.9	.	101.8
		OCTOBER	102.0	102.2	102.0	.	102.5
		NOVEMBER	103.7	102.7	102.7	.	103.1
		DECEMBER	107.2	103.7	103.9	100.0	103.8
			100.0	100.1	100.1	100.0	100.0
PROCESSED VEGETABLES	1979	JANUARY	109.3	104.3	104.6	100.5	104.3
		FEBRUARY	110.0	105.1	105.0	101.2	104.8
		MARCH	111.1	105.0	105.1	101.8	105.3
		APRIL	112.7	105.6	105.6	102.5	105.8
		MAY	113.7	106.2	106.1	103.1	106.5
		JUNE	113.7	107.0	107.0	103.8	107.2
		JULY	114.7	107.2	107.3	104.3	108.0
		AUGUST	115.0	107.9	107.7	104.8	108.8
		SEPTEMBER	116.5	108.8	108.8	105.3	109.7
		OCTOBER	116.7	109.5	109.3	105.8	110.6
		NOVEMBER	117.2	111.0	110.9	106.5	111.5
		DECEMBER	119.6	112.0	112.0	107.2	112.5
			114.2	107.5	107.4	107.2	107.2

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
SEASONALLY-ADJUSTED SERIES
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)

ITEM	YEAR	MONTH	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DECEMBER CENTRED DIEWERT-FRENCH	JUNE CENTRED DIEWERT-FRENCH
PROCESSED VEGETABLES	1980	JANUARY	120.2	113.1	113.1	108.0	113.4
		FEBRUARY	121.2	113.9	113.8	108.8	114.2
		MARCH	122.2	114.8	114.9	109.7	115.0
		APRIL	123.0	115.1	115.2	110.6	116.1
		MAY	122.8	116.2	116.2	111.5	117.3
		JUNE	124.5	118.4	118.4	112.5	118.7
		JULY	125.7	118.5	118.6	113.4	120.0
		AUGUST	126.5	120.0	119.9	114.2	121.4
		SEPTEMBER	127.1	121.9	122.1	115.0	123.0
		OCTOBER	127.3	123.7	123.5	116.1	124.9
		NOVEMBER	127.7	125.2	125.0	117.3	126.7
		DECEMBER	128.9	126.4	126.3	118.7	128.4
			124.8	118.9	118.9	118.7	118.7
PROCESSED VEGETABLES	1981	JANUARY	129.9	128.0	127.8	120.0	130.2
		FEBRUARY	130.6	130.1	130.1	121.4	131.7
		MARCH	134.4	132.3	132.6	123.0	133.2
		APRIL	138.7	134.5	134.8	124.9	135.0
		MAY	140.3	136.6	136.5	126.7	137.1
		JUNE	142.5	138.0	138.0	128.4	139.4
		JULY	143.0	141.0	141.3	130.2	141.6
		AUGUST	143.3	143.6	143.5	131.7	143.6
		SEPTEMBER	145.9	145.1	145.6	133.2	145.8
		OCTOBER	147.2	148.4	148.0	135.0	148.4
		NOVEMBER	149.2	149.0	148.7	137.1	150.8
		DECEMBER	149.6	150.4	150.3	139.4	153.1
			141.2	139.8	139.8	139.4	139.4

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
SEASONALLY-ADJUSTED SERIES
(*1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)

ITEM	YEAR	MONTH	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DECEMBER CENTRED DIEWERT-FRENCH	JUNE CENTRED DIEWERT-FRENCH
PROCESSED VEGETABLES	1982	JANUARY	149.8	152.5	152.1	141.6	155.0
		FEBRUARY	153.9	153.1	153.0	143.6	156.7
		MARCH	156.7	157.3	157.7	145.8	158.3
		APRIL	158.4	160.4	160.9	148.4	159.8
		MAY	159.4	163.4	163.2	150.8	161.8
		JUNE	159.5	164.4	164.3	153.1	163.9
		JULY	160.9	165.9	166.2	155.0	165.8
		AUGUST	161.1	169.9	169.9	156.7	167.5
		SEPTEMBER	163.3	169.4	170.1	158.3	168.9
		OCTOBER	163.2	170.2	169.7	159.8	170.1
		NOVEMBER	163.0	171.6	171.2	161.8	170.8
		DECEMBER	162.5	172.7	172.5	163.9	171.4
			159.3	164.2	164.2	163.9	163.9
PROCESSED VEGETABLES	1983	JANUARY	163.7	173.1	172.6	165.8	171.8
		FEBRUARY	162.6	172.6	172.5	167.5	171.9
		MARCH	160.0	172.2	172.8	168.9	172.3
		APRIL	161.1	172.4	172.9	170.1	172.7
		MAY	161.2	171.8	171.5	170.8	173.1
		JUNE	161.9	171.9	171.8	171.4	173.6
		JULY	162.3	172.9	173.2	171.8	174.1
		AUGUST	162.2	172.8	172.8	171.9	174.7
		SEPTEMBER	162.5	175.9	176.7	172.3	175.5
		OCTOBER	162.8	176.4	175.9	172.7	176.2
		NOVEMBER	162.2	176.9	176.4	173.1	177.0
		DECEMBER	162.9	178.0	178.0	173.6	177.8
			162.1	173.9	173.9	173.6	173.6

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
SEASONALLY-ADJUSTED SERIES
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)

ITEM	YEAR	MONTH	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DECEMBER CENTRED DIEWERT-FRENCH	JUNE CENTRED DIEWERT-FRENCH
PROCESSED VEGETABLES	1984	JANUARY	164.1	178.4	177.9	174.1	178.4
		FEBRUARY	164.3	179.8	179.7	174.7	178.9
		MARCH	167.9	180.4	181.0	175.5	179.2
		APRIL	171.7	179.8	180.3	176.2	179.3
		MAY	174.3	180.4	180.0	177.0	179.4
		JUNE	174.3	181.4	181.4	177.8	179.6
		JULY	176.5	181.1	181.5	178.4	
		AUGUST	175.9	180.6	180.4	178.9	
		SEPTEMBER	176.0	180.2	181.2	179.2	
		OCTOBER	175.3	177.9	177.2	179.3	
		NOVEMBER	174.9	179.3	178.8	179.4	
		DECEMBER	174.9	179.2	179.3	179.6	
			172.5	179.9	179.9	179.6	179.6

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
SEASONALLY-ADJUSTED SERIES
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)
MONTH TO MONTH % CHANGES

TITLE=140000 FRUITS AND VEGETABLES

DATE	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH DEC.-CENTRED	DIEWERT-FRENCH JUNE-CENTRED
197802	-0.8	-0.3	-0.4	.	.
197803	1.1	1.2	1.2	.	.
197804	0.1	0.3	0.2	.	.
197805	5.4	4.6	4.6	.	.
197806	-5.8	-5.5	-5.5	.	.
197807	9.9	9.2	9.3	.	0.5
197808	-3.0	-2.6	-2.6	.	0.6
197809	-5.5	-4.7	-4.5	.	0.8
197810	3.1	2.0	1.8	.	0.6
197811	0.7	0.7	0.7	.	0.2
197812	0.1	0.5	0.5	.	0.7
197901	2.6	2.4	2.4	0.5	0.3
197902	0.3	0.6	0.5	0.6	0.4
197903	1.9	2.8	2.8	0.8	1.5
197904	0.3	-1.1	-1.2	0.6	0.5
197905	-2.2	-2.4	-2.3	0.2	0.6
197906	0.9	1.5	1.5	0.7	0.8
197907	2.9	3.6	3.6	0.3	0.2
197908	-1.5	-1.2	-1.0	0.4	0.2
197909	0.8	1.5	1.7	1.5	-0.2
197910	2.1	-1.0	-1.2	0.5	0.3
197911	0.5	1.3	1.2	0.5	0.6
197912	2.9	2.8	2.8	0.8	0.8
198001	-4.2	-4.4	-4.4	0.2	0.4
198002	-1.6	-0.9	-1.1	0.2	0.8
198003	-2.2	-1.4	-1.3	-0.2	1.4
198004	5.0	3.6	3.6	0.3	1.1
198005	3.4	3.3	3.3	0.6	0.8
198006	0.5	1.5	1.4	0.8	1.0
198007	0.0	-0.3	-0.2	0.4	1.1
198008	4.8	5.2	5.2	0.8	1.4
198009	1.3	2.1	2.3	1.4	1.7
198010	0.7	0.5	0.3	1.1	1.7
198011	-0.2	-0.3	-0.3	0.8	0.9
198012	4.4	4.1	4.1	1.0	1.3
198101	-2.2	-1.9	-1.8	1.1	1.2
198102	4.1	3.4	3.2	1.4	0.6
198103	-0.1	0.1	0.1	1.7	1.0
198104	4.9	5.1	5.1	1.7	0.8
198105	-5.7	-6.7	-6.7	0.9	0.8
198106	2.7	3.4	3.4	1.3	0.7
198107	-1.6	-1.6	-1.5	1.2	1.0
198108	0.9	0.4	0.5	0.6	1.2
198109	3.5	3.2	3.2	1.0	0.9
198110	0.2	2.6	2.5	0.8	0.5
198111	0.9	0.4	0.5	0.8	1.1
198112	1.4	0.8	0.8	0.7	0.9
198201	2.2	1.9	1.9	1.0	1.1
198202	4.6	5.2	5.0	1.2	0.8

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
SEASONALLY-ADJUSTED SERIES
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
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MONTH TO MONTH % CHANGES

TITLE=140000 FRUITS AND VEGETABLES

DATE	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH DEC.-CENTRED	DIEWERT-FRENCH JUNE-CENTRED
198203	-2.4	-2.5	-2.5	0.9	0.7
198204	-0.9	-1.0	-1.0	0.5	0.1
198205	2.0	1.4	1.5	1.1	0.3
198206	0.2	-0.1	-0.1	0.9	0.4
198207	0.8	1.2	1.2	1.1	-0.1
198208	-3.3	-3.9	-3.8	0.8	-0.6
198209	0.9	0.8	0.8	0.7	-0.5
198210	-2.3	-2.5	-2.5	0.1	-0.1
198211	3.1	3.7	3.9	0.3	0.3
198212	0.7	1.3	1.2	0.4	0.0
198301	-4.3	-4.4	-4.4	-0.1	-0.1
198302	-2.7	-2.1	-2.3	-0.6	0.4
198303	1.0	0.4	0.5	-0.5	0.4
198304	3.8	3.5	3.5	-0.1	1.0
198305	6.3	6.0	6.1	0.3	0.5
198306	-4.0	-3.2	-3.2	0.0	0.5
198307	0.0	-0.1	-0.1	-0.1	1.2
198308	2.3	1.8	1.9	0.4	1.4
198309	0.3	-0.1	-0.1	0.4	1.6
198310	4.1	6.1	6.0	1.0	1.2
198311	-2.7	-2.5	-2.5	0.5	.
198312	4.2	3.7	3.7	0.5	.
198401	3.2	2.8	2.8	1.2	.
198402	0.7	1.2	1.1	1.4	.
198403	0.9	0.4	0.4	1.6	.
198404	-1.6	-1.4	-1.4	1.2	.
198405	-2.1	-2.7	-2.6	0.4	.
198406	0.0	-0.1	-0.1	0.8	.
198407	0.9	0.3	0.4	0.8	.
198408	0.9	2.0	2.0	0.8	.
198409	-0.7	-0.6	-0.6	1.1	.
198410	0.1	-1.5	-1.5	0.0	.
198411	0.1	1.1	1.1	0.2	.
198412	-1.6	-1.7	-1.6	0.1	.

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
SEASONALLY-ADJUSTED SERIES
(1978 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
BASED ON 1974, 1976 AND 1978)
MONTH TO MONTH % CHANGES

TITLE=141000 FRESH FRUIT

DATE	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH DEC.-CENTRED	DIEWERT-FRENCH JUNE-CENTRED
197802	-0.4	0.4	0.3	.	.
197803	4.2	3.2	2.8	.	.
197804	-3.8	-3.7	-3.7	.	.
197805	2.1	2.3	2.3	.	.
197806	-3.2	-4.4	-4.5	.	.
197807	9.4	8.3	8.4	.	0.5
197808	0.2	-0.5	-0.2	.	0.5
197809	-5.5	-3.3	-3.0	.	0.5
197810	4.5	3.5	3.5	.	0.8
197811	-1.3	-1.2	-1.1	.	0.8
197812	1.2	1.6	1.6	.	1.4
197901	1.6	2.5	2.4	0.5	1.3
197902	0.4	0.5	0.4	0.5	1.2
197903	2.1	1.8	1.5	0.5	2.9
197904	1.3	1.4	1.3	0.8	0.6
197905	1.9	2.4	2.3	0.8	0.8
197906	1.0	0.4	0.4	1.4	0.8
197907	1.5	2.5	2.5	1.3	0.4
197908	0.3	-1.2	-1.1	1.2	0.4
197909	0.9	1.2	1.6	2.9	0.3
197910	-0.3	-2.3	-2.3	0.6	0.5
197911	2.7	3.7	3.8	0.8	0.3
197912	-1.1	-0.8	-0.8	0.8	0.5
198001	-0.5	-1.1	-1.2	0.4	0.0
198002	0.9	1.0	0.9	0.4	0.3
198003	-3.3	-3.5	-3.7	0.3	1.0
198004	5.5	6.4	6.3	0.5	0.2
198005	-1.2	-1.3	-1.3	0.3	0.0
198006	0.0	0.5	0.6	0.5	0.1
198007	-1.4	-1.5	-1.5	0.0	0.0
198008	2.5	1.8	1.9	0.3	0.1
198009	0.1	2.2	2.7	1.0	0.2
198010	-2.4	-3.9	-4.0	0.2	-0.2
198011	-0.1	-0.7	-0.7	0.0	-0.2
198012	2.4	2.6	2.6	0.1	-0.1
198101	-3.4	-3.5	-3.6	0.0	0.1
198102	2.5	0.8	0.6	0.1	-0.3
198103	-0.7	0.2	0.0	0.2	0.5
198104	-0.2	1.0	0.9	-0.2	0.9
198105	-1.2	-2.1	-2.2	-0.2	1.1
198106	1.0	3.0	3.0	-0.1	0.8
198107	-5.0	-1.3	-1.2	0.1	1.3
198108	3.1	-0.5	-0.4	-0.3	1.4
198109	8.9	7.9	8.4	0.5	1.6
198110	3.4	5.1	5.0	0.9	1.4
198111	2.3	1.5	1.5	1.1	1.6
198112	2.0	1.1	1.2	0.8	1.8
198201	3.9	4.2	4.1	1.3	2.4
198202	2.1	3.6	3.3	1.4	2.3

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
SEASONALLY-ADJUSTED SERIES
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MONTH TO MONTH % CHANGES

-- TITLE=141000 FRESH FRUIT --

DATE	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH DEC.-CENTRED	DIEWERT-FRENCH JUNE-CENTRED
198203	2.7	1.3	1.3	1.6	1.8
198204	-2.1	-1.8	-1.9	1.4	0.0
198205	2.4	2.2	2.1	1.6	0.3
198206	-1.6	-2.8	-2.7	1.8	0.1
198207	1.7	2.0	2.1	2.4	-0.2
198208	-1.5	-2.1	-1.9	2.3	-0.6
198209	-2.1	-2.6	-2.3	1.8	-0.9
198210	-6.2	-7.0	-7.0	0.0	-0.4
198211	7.9	9.2	9.2	0.3	-0.3
198212	-3.8	-3.4	-3.4	0.1	-0.3
198301	-1.4	-1.8	-1.8	-0.2	-0.4
198302	-2.9	-3.6	-4.0	-0.6	-0.4
198303	-1.1	-1.3	-1.3	-0.9	-0.2
198304	4.6	5.9	6.0	-0.4	0.6
198305	4.3	3.5	3.3	-0.3	-0.3
198306	-3.8	-1.6	-1.4	-0.3	0.2
198307	1.4	2.7	2.7	-0.4	0.8
198308	-2.0	-2.3	-2.1	-0.4	0.9
198309	-0.6	-1.0	-0.8	-0.2	1.0
198310	2.2	2.6	2.6	0.6	0.8
198311	-3.8	-5.0	-5.0	-0.3	
198312	7.9	7.6	7.7	0.2	
198401	3.8	4.4	4.2	0.8	
198402	1.5	1.7	1.3	0.9	
198403	-1.3	-1.5	-1.5	1.0	
198404	0.8	1.4	1.4	0.8	
198405	-0.1	-0.8	-1.0	0.4	
198406	3.9	4.6	4.7	1.3	
198407	-1.6	-2.9	-2.8	1.0	
198408	2.8	2.6	2.8	1.4	
198409	3.0	2.7	2.8	3.0	
198410	0.6	0.4	0.4	0.9	
198411	0.1	0.6	0.6	1.2	
198412	-2.8	-2.3	-2.2	0.6	

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
SEASONALLY-ADJUSTED SERIES
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TITLE=143000 PROCESSED FRUIT

DATE	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH DEC.-CENTRED	DIEWERT-FRENCH JUNE-CENTRED
197802	0.4	1.1	1.2	.	.
197803	1.3	1.2	1.3	.	.
197804	0.8	0.9	1.0	.	.
197805	1.2	1.4	1.4	.	.
197806	1.4	1.4	1.5	.	.
197807	0.8	1.5	1.4	.	1.2
197808	1.0	0.7	0.6	.	1.3
197809	0.6	0.0	-0.1	.	1.2
197810	0.6	1.4	1.3	.	1.3
197811	2.1	1.5	1.6	.	1.3
197812	2.2	2.9	2.8	.	1.1
197901	2.1	0.9	1.0	1.2	0.8
197902	0.5	0.6	0.6	1.3	0.8
197903	0.7	0.6	0.8	1.2	1.1
197904	1.0	1.0	1.1	1.3	1.0
197905	1.0	1.0	1.1	1.3	1.0
197906	0.2	0.2	0.1	1.1	1.0
197907	1.1	0.7	0.7	0.8	0.8
197908	0.7	1.2	1.1	0.8	1.0
197909	1.3	1.7	1.6	1.1	0.9
197910	0.6	1.3	1.3	1.0	0.8
197911	0.9	1.0	0.8	1.0	0.7
197912	1.2	0.8	0.8	1.0	0.8
198001	0.6	0.2	0.2	0.8	0.8
198002	0.7	0.4	0.5	1.0	0.7
198003	0.6	0.5	0.7	0.9	0.7
198004	0.2	0.1	0.2	0.8	0.5
198005	-0.2	0.1	0.1	0.7	0.6
198006	1.6	1.5	1.5	0.8	0.7
198007	1.1	0.9	0.8	0.8	0.6
198008	1.1	1.4	1.4	0.7	0.7
198009	0.3	0.4	0.3	0.7	0.9
198010	0.6	0.5	0.5	0.5	1.1
198011	0.9	1.2	1.3	0.6	1.2
198012	0.4	0.5	0.5	0.7	1.3
198101	0.8	0.5	0.6	0.6	1.1
198102	0.3	0.0	0.1	0.7	0.9
198103	2.7	2.9	3.0	0.9	1.2
198104	2.7	2.4	2.5	1.1	1.0
198105	1.1	0.8	0.9	1.2	1.1
198106	1.8	2.2	2.2	1.3	1.4
198107	0.4	0.0	-0.1	1.1	1.1
198108	0.6	0.8	0.8	0.9	1.5
198109	1.6	1.5	1.5	1.2	1.3
198110	1.3	1.5	1.4	1.0	1.2
198111	2.0	1.8	1.8	1.1	1.3
198112	0.1	0.3	0.2	1.4	0.9
198201	0.1	0.2	0.3	1.1	1.0
198202	2.5	2.2	2.4	1.5	0.9

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
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TITLE=143000 PROCESSED FRUIT

DATE	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH DEC.-CENTRED	DIEWERT-FRENCH JUNE-CENTRED
198203	1.6	1.3	1.3	1.3	0.9
198204	0.5	0.6	0.6	1.2	0.7
198205	0.4	0.7	0.8	1.3	0.6
198206	0.3	0.1	0.1	0.9	0.8
198207	0.8	0.8	0.8	1.0	0.7
198208	0.6	0.6	0.6	0.9	0.5
198209	1.2	1.3	1.2	0.9	0.2
198210	0.4	0.2	0.2	0.7	0.1
198211	0.5	0.3	0.3	0.6	0.1
198212	-0.2	0.1	0.1	0.8	0.1
198301	0.5	0.9	0.9	0.7	0.1
198302	-0.9	-1.1	-1.1	0.5	0.0
198303	-1.8	-1.8	-1.6	0.2	-0.1
198304	0.0	-0.2	-0.1	0.1	0.0
198305	-0.2	-0.1	-0.1	0.1	-0.1
198306	0.6	0.6	0.6	0.1	0.1
198307	0.1	0.1	0.0	0.1	0.1
198308	0.5	0.2	0.1	0.0	0.1
198309	0.0	0.3	0.2	-0.1	0.4
198310	0.6	0.6	0.5	0.0	0.6
198311	0.2	0.4	0.4	-0.1	
198312	0.7	0.7	0.7	0.1	
198401	0.5	0.9	0.9	0.1	
198402	0.0	-0.4	-0.3	0.1	
198403	1.9	1.9	2.0	0.4	
198404	1.5	1.4	1.4	0.6	
198405	1.2	1.0	1.1	0.7	
198406	0.2	0.4	0.4	0.7	
198407	1.0	1.7	1.7	0.7	
198408	0.2	-0.5	-0.5	0.6	
198409	-0.1	-0.5	-0.5	0.6	
198410	0.1	0.2	0.2	0.5	
198411	0.4	0.1	0.0	0.5	
198412	0.3	0.2	0.2	0.6	

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
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MONTH TO MONTH % CHANGES

TITLE=151000 FRESH VEGETABLES

DATE	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH DEC.-CENTRED	DIEWERT-FRENCH JUNE-CENTRED
197802	-1.6	-0.7	-0.8	.	.
197803	1.3	3.0	3.7	.	.
197804	1.1	-0.1	-0.7	.	.
197805	11.6	10.9	11.1	.	.
197806	-13.4	-12.2	-12.8	.	.
197807	18.2	17.9	18.3	.	0.2
197808	-7.9	-9.9	-9.6	.	0.2
197809	-11.0	-9.1	-9.0	.	1.0
197810	1.9	0.4	0.3	.	0.1
197811	3.3	3.5	3.5	.	-1.6
197812	-2.7	-2.4	-2.5	.	-0.1
197901	4.8	5.0	5.0	0.2	-1.5
197902	0.7	0.7	0.7	0.2	-0.9
197903	6.3	9.4	9.9	1.0	0.7
197904	-4.3	-7.9	-8.3	0.1	0.2
197905	-9.4	-10.1	-9.9	-1.6	-0.1
197906	1.5	4.4	3.6	-0.1	0.7
197907	5.5	5.7	6.2	-1.5	-0.6
197908	-6.5	-4.3	-4.1	-0.9	-0.9
197909	0.2	-2.3	-2.2	0.7	-1.8
197910	6.0	2.5	2.5	0.2	-0.7
197911	-1.5	-0.4	-0.4	-0.1	0.8
197912	11.1	10.5	10.2	0.7	1.1
198001	-13.5	-13.1	-13.1	-0.6	0.3
198002	-5.7	-4.8	-4.8	-0.9	1.8
198003	-2.7	-1.1	-0.7	-1.8	2.8
198004	7.6	5.9	5.4	-0.7	2.4
198005	12.6	11.7	11.9	0.8	1.9
198006	0.5	2.9	2.4	1.1	1.9
198007	-1.1	-1.1	-1.0	0.3	2.7
198008	11.4	10.7	11.1	1.8	3.5
198009	6.6	4.8	4.8	2.8	3.8
198010	1.6	3.8	3.9	2.4	4.4
198011	-0.4	-0.3	-0.3	1.9	1.5
198012	10.3	10.2	9.9	1.9	2.5
198101	-5.0	-4.0	-3.9	2.7	2.3
198102	9.8	8.2	8.1	3.5	1.1
198103	-1.6	-1.3	-1.1	3.8	1.2
198104	9.8	7.8	7.6	4.4	0.4
198105	-14.7	-15.5	-15.6	1.5	0.3
198106	5.8	6.6	6.4	2.5	-0.3
198107	-2.7	-2.7	-2.6	2.3	0.1
198108	-0.3	-0.8	-0.6	1.1	0.7
198109	4.1	4.6	4.7	1.2	-0.3
198110	-7.7	-5.0	-4.9	0.4	-1.2
198111	0.7	-0.5	-0.5	0.3	0.0
198112	0.8	0.1	-0.2	-0.3	-0.3
198201	2.9	3.4	3.4	0.1	-0.3
198202	12.6	12.1	12.1	0.7	-1.0

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
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TITLE=151000 FRESH VEGETABLES

DATE	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH DEC.-CENTRED	DIEWERT-FRENCH JUNE-CENTRED
198203	-12.4	-11.3	-11.2	-0.3	-0.8
198204	-3.3	-3.7	-3.7	-1.2	-0.8
198205	2.7	1.0	0.8	0.0	-0.5
198206	1.4	2.4	2.4	-0.3	-0.1
198207	-2.3	-0.5	-0.7	-0.3	-1.1
198208	-12.2	-10.7	-10.5	-1.0	-2.2
198209	6.8	4.4	4.4	-0.8	-1.1
198210	-1.8	-3.1	-3.0	-0.8	-0.3
198211	3.6	2.0	2.0	-0.5	0.9
198212	6.6	6.5	6.4	-0.1	0.1
198301	-12.3	-12.5	-12.3	-1.1	-0.2
198302	-1.8	-1.4	-1.5	-2.2	1.8
198303	4.9	4.4	4.3	-1.1	1.7
198304	6.7	7.4	7.5	-0.3	2.5
198305	16.1	17.5	17.4	0.9	1.8
198306	-9.7	-8.7	-8.8	0.1	1.4
198307	-3.2	-3.8	-3.9	-0.2	3.0
198308	9.0	8.7	9.0	1.8	3.3
198309	3.8	2.9	2.9	1.7	3.5
198310	9.0	10.1	10.1	2.5	2.3
198311	-3.2	-2.7	-2.7	1.8	
198312	3.7	4.3	4.0	1.4	
198401	6.2	6.0	6.2	3.0	
198402	2.1	2.1	2.0	3.3	
198403	-0.5	0.4	0.4	3.5	
198404	-5.3	-7.2	-7.1	2.3	
198405	-6.8	-7.6	-7.7	0.2	
198406	-6.5	-6.3	-6.4	0.5	
198407	2.9	2.5	2.4	1.0	
198408	-0.1	4.5	4.8	0.4	
198409	-5.9	-8.7	-8.7	0.1	
198410	0.2	-2.2	-2.2	-1.3	
198411	2.5	3.9	4.0	-0.7	
198412	-3.2	-3.3	-3.5	-1.0	

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
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TITLE=155000 PROCESSED VEGETABLES

DATE	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH DEC.-CENTRED	DIEWERT-FRENCH JUNE-CENTRED
197802	0.5	-1.3	-1.6	.	.
197803	1.5	0.7	0.7	.	.
197804	1.2	0.2	0.2	.	.
197805	1.1	0.5	0.4	.	.
197806	1.2	0.5	0.6	.	.
197807	0.7	0.7	0.6	.	0.5
197808	0.5	0.4	0.3	.	0.7
197809	0.5	0.5	0.6	.	0.6
197810	0.2	1.2	1.1	.	0.7
197811	1.7	0.5	0.7	.	0.6
197812	3.4	1.0	1.2	.	0.7
197901	2.0	0.6	0.7	0.5	0.5
197902	0.6	0.8	0.4	0.7	0.5
197903	1.0	-0.1	0.1	0.6	0.5
197904	1.4	0.6	0.5	0.7	0.5
197905	0.9	0.6	0.5	0.6	0.7
197906	0.0	0.8	0.8	0.7	0.7
197907	0.9	0.2	0.3	0.5	0.7
197908	0.3	0.7	0.4	0.5	0.7
197909	1.3	0.8	1.0	0.5	0.8
197910	0.2	0.6	0.5	0.5	0.8
197911	0.4	1.4	1.5	0.7	0.8
197912	2.0	0.9	1.0	0.7	0.9
198001	0.5	1.0	1.0	0.7	0.8
198002	0.8	0.7	0.6	0.7	0.7
198003	0.8	0.8	1.0	0.8	0.7
198004	0.7	0.3	0.3	0.8	1.0
198005	-0.2	1.0	0.9	0.8	1.0
198006	1.4	1.9	1.9	0.9	1.2
198007	1.0	0.1	0.2	0.8	1.1
198008	0.6	1.3	1.1	0.7	1.2
198009	0.5	1.6	1.8	0.7	1.3
198010	0.2	1.5	1.1	1.0	1.5
198011	0.3	1.2	1.2	1.0	1.4
198012	0.9	1.0	1.0	1.2	1.3
198101	0.8	1.3	1.2	1.1	1.4
198102	0.5	1.6	1.8	1.2	1.2
198103	2.9	1.7	1.9	1.3	1.1
198104	3.2	1.7	1.7	1.5	1.4
198105	1.2	1.6	1.3	1.4	1.6
198106	1.6	1.0	1.1	1.3	1.7
198107	0.4	2.2	2.4	1.4	1.6
198108	0.2	1.8	1.6	1.2	1.4
198109	1.8	1.0	1.5	1.1	1.5
198110	0.9	2.3	1.6	1.4	1.8
198111	1.4	0.4	0.5	1.6	1.6
198112	0.3	0.9	1.1	1.7	1.5
198201	0.1	1.4	1.2	1.6	1.2
198202	2.7	0.4	0.6	1.4	1.1

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TITLE=155000 PROCESSED VEGETABLES

DATE	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH DEC.-CENTRED	DIEWERT-FRENCH JUNE-CENTRED
198203	1.8	2.7	3.1	1.5	1.0
198204	1.1	2.0	2.0	1.8	0.9
198205	0.6	1.9	1.4	1.6	1.3
198206	0.1	0.6	0.7	1.5	1.3
198207	0.9	0.9	1.2	1.2	1.2
198208	0.1	2.4	2.2	1.1	1.0
198209	1.4	-0.3	0.1	1.0	0.8
198210	-0.1	0.5	-0.2	0.9	0.7
198211	-0.1	0.8	0.9	1.3	0.4
198212	-0.3	0.6	0.8	1.3	0.4
198301	0.7	0.2	0.1	1.2	0.2
198302	-0.7	-0.3	-0.1	1.0	0.1
198303	-1.6	-0.2	0.2	0.8	0.2
198304	0.7	0.1	0.1	0.7	0.2
198305	0.1	-0.3	-0.8	0.4	0.2
198306	0.4	0.1	0.2	0.4	0.3
198307	0.2	0.6	0.8	0.2	0.3
198308	-0.1	-0.1	-0.2	0.1	0.3
198309	0.2	1.8	2.3	0.2	0.5
198310	0.2	0.3	-0.5	0.2	0.4
198311	-0.4	0.3	0.3	0.2	
198312	0.4	0.6	0.9	0.3	
198401	0.7	0.2	-0.1	0.3	
198402	0.1	0.8	1.0	0.3	
198403	2.2	0.3	0.7	0.5	
198404	2.3	-0.3	-0.4	0.4	
198405	1.5	0.3	-0.2	0.5	
198406	0.0	0.6	0.8	0.5	
198407	1.3	-0.2	0.1	0.3	
198408	-0.3	-0.3	-0.6	0.3	
198409	0.1	-0.2	0.4	0.2	
198410	-0.4	-1.3	-2.2	0.1	
198411	-0.2	0.8	0.9	0.1	
198412	0.0	-0.1	0.3	0.1	

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
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MONTH OVER SAME MONTH OF PRECEDING YEAR % CHANGES

TITLE=140000 FRUITS AND VEGETABLES

DATE	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH DEC.-CENTRED	DIEWERT-FRENCH JUNE-CENTRED
197901	7.0	7.2	7.2	.	.
197902	8.2	8.2	8.2	.	.
197903	9.0	9.8	9.8	.	.
197904	9.2	8.3	8.3	.	.
197905	1.4	1.1	1.2	.	.
197906	8.6	8.6	8.7	.	7.7
197907	1.6	3.0	3.0	.	7.4
197908	3.2	4.6	4.7	.	6.9
197909	10.1	11.3	11.4	.	5.9
197910	9.1	8.0	8.1	.	5.6
197911	8.9	8.6	8.6	.	6.0
197912	11.9	11.1	11.1	7.7	6.2
198001	4.5	3.8	3.8	7.4	6.3
198002	2.6	2.2	2.1	6.9	6.7
198003	-1.6	-2.0	-2.0	5.9	6.6
198004	3.0	2.7	2.8	5.6	7.3
198005	8.8	8.7	8.7	6.0	7.5
198006	8.5	8.6	8.6	6.2	7.6
198007	5.5	4.5	4.6	6.3	8.6
198008	12.2	11.2	11.1	6.7	9.9
198009	12.7	11.9	11.8	6.6	12.0
198010	11.2	13.6	13.5	7.3	13.6
198011	10.4	11.8	11.8	7.5	13.9
198012	12.1	13.1	13.1	7.6	14.4
198101	14.4	16.1	16.2	8.6	15.3
198102	21.0	21.2	21.3	9.9	15.1
198103	23.7	23.0	23.0	12.0	14.6
198104	23.7	24.7	24.8	13.6	14.3
198105	12.8	12.7	12.7	13.9	14.4
198106	15.2	14.8	14.9	14.4	14.1
198107	13.3	13.3	13.3	15.3	13.9
198108	9.0	8.2	8.3	15.1	13.7
198109	11.4	9.3	9.3	14.6	12.8
198110	10.8	11.6	11.6	14.3	11.5
198111	12.1	12.5	12.6	14.4	11.7
198112	8.8	8.9	9.0	14.1	11.3
198201	13.7	13.1	13.1	13.9	11.2
198202	14.2	15.1	15.1	13.7	11.3
198203	11.5	12.1	12.1	12.8	11.0
198204	5.3	5.6	5.6	11.5	10.2
198205	13.9	14.7	14.8	11.7	8.6
198206	11.2	10.9	10.9	11.3	9.3
198207	13.9	14.0	14.0	11.2	8.2
198208	9.2	9.2	9.2	11.3	6.3
198209	6.4	6.7	6.6	11.0	4.8
198210	3.8	1.5	1.5	10.2	4.2
198211	6.1	4.8	4.9	9.6	3.4
198212	5.3	5.3	5.3	9.3	2.4
198301	-1.3	-1.2	-1.2	8.2	1.2

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------------------------------------- TITLE=140000 FRUITS AND VEGETABLES -------------------------------------

DATE	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH DEC.-CENTRED	DIEWERT-FRENCH JUNE-CENTRED
198302	-8.2	-8.1	-8.1	6.3	0.8
198303	-4.9	-5.3	-5.2	4.8	0.6
198304	-0.4	-1.0	-0.9	4.2	1.5
198305	3.8	3.6	3.6	3.4	1.7
198306	-0.5	0.3	0.4	2.4	1.8
198307	-1.4	-1.0	-1.0	1.2	3.1
198308	4.4	4.9	4.9	0.8	5.2
198309	3.8	3.9	3.9	0.6	7.3
198310	10.5	12.9	12.9	1.5	8.7
198311	4.3	6.1	6.0	1.7	
198312	8.0	8.5	8.5	1.8	
198401	16.3	16.7	16.7	3.1	
198402	20.4	20.7	20.8	5.2	
198403	20.3	20.7	20.7	7.3	
198404	14.0	14.9	14.9	8.7	
198405	5.0	5.4	5.4	8.8	
198406	9.4	8.8	8.8	9.6	
198407	10.4	9.3	9.4	10.7	
198408	9.0	9.6	9.6	11.1	
198409	7.8	9.0	9.0	11.9	
198410	3.6	1.3	1.3	10.9	
198411	6.6	5.0	5.0	10.6	
198412	0.6	-0.4	-0.3	10.1	

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
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TITLE=141000 FRESH FRUIT

DATE	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH DEC.-CENTRED	DIEWERT-FRENCH JUNE-CENTRED
197901	8.4	8.3	8.3	.	.
197902	9.3	8.4	8.4	.	.
197903	7.1	6.9	7.1	.	.
197904	12.8	12.6	12.7	.	.
197905	12.6	12.7	12.7	.	.
197906	17.4	18.3	18.4	.	12.8
197907	8.9	12.0	12.1	.	12.7
197908	9.0	11.1	11.1	.	12.7
197909	16.3	16.4	16.3	.	12.4
197910	11.0	9.9	9.9	.	12.1
197911	15.5	15.3	15.3	.	11.5
197912	12.9	12.6	12.6	12.8	10.6
198001	10.6	8.6	8.6	12.7	9.2
198002	11.1	9.2	9.2	12.7	8.2
198003	5.3	3.6	3.6	12.4	6.3
198004	9.7	8.7	8.6	12.1	5.8
198005	6.3	4.8	4.8	11.5	4.9
198006	5.3	5.0	5.1	10.6	4.2
198007	2.3	0.9	1.0	9.2	3.7
198008	4.6	4.0	4.0	8.2	3.3
198009	3.7	4.9	5.1	6.3	3.2
198010	1.5	3.2	3.2	5.8	2.5
198011	-1.3	-1.2	-1.2	4.9	2.1
198012	2.2	2.2	2.2	4.2	1.5
198101	-0.8	-0.3	-0.3	3.7	1.6
198102	0.9	-0.5	-0.5	3.3	0.9
198103	3.5	3.2	3.3	3.2	0.3
198104	-2.0	-2.0	-2.0	2.5	1.0
198105	-2.0	-2.9	-2.9	2.1	2.1
198106	-1.1	-0.5	-0.5	1.5	2.8
198107	-4.7	-0.3	-0.3	1.6	4.2
198108	-4.2	-2.5	-2.5	0.9	5.5
198109	4.2	2.9	2.9	0.3	7.0
198110	10.4	12.6	12.6	1.0	8.8
198111	13.1	15.1	15.1	2.1	10.7
198112	12.6	13.4	13.5	2.8	12.9
198201	21.1	22.4	22.5	4.2	15.5
198202	20.6	25.8	25.7	5.5	18.5
198203	24.8	27.2	27.3	7.0	20.1
198204	22.4	23.7	23.8	8.8	19.1
198205	26.9	29.2	29.3	10.7	18.1
198206	23.8	22.0	22.1	12.9	17.4
198207	32.5	26.1	26.2	15.5	15.6
198208	26.6	24.1	24.2	18.5	13.3
198209	13.8	12.1	11.9	20.1	10.5
198210	3.3	-0.8	-0.9	19.1	8.5
198211	8.9	6.6	6.7	18.1	6.5
198212	2.8	1.9	1.9	17.4	4.2
198301	-2.4	-3.9	-3.9	15.6	1.4

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TITLE=141000 FRESH FRUIT

DATE	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH DEC.-CENTRED	DIEWERT-FRENCH JUNE-CENTRED
198302	-7.2	-10.6	-10.6	13.3	-1.3
198303	-10.8	-12.9	-12.9	10.5	-3.3
198304	-4.7	-6.0	-6.0	8.5	-2.7
198305	-2.9	-4.9	-4.9	6.5	-3.2
198306	-5.1	-3.7	-3.6	4.2	-3.2
198307	-5.5	-3.1	-3.1	1.4	-2.2
198308	-6.0	-3.3	-3.3	-1.3	-0.6
198309	-4.5	-1.7	-1.7	-3.3	1.2
198310	4.1	8.3	8.3	-2.7	2.4
198311	-7.2	-5.7	-5.8	-3.2	
198312	4.1	5.0	5.0	-3.2	
198401	9.5	11.5	11.5	-2.2	
198402	14.5	17.7	17.7	-0.6	
198403	14.3	17.4	17.5	1.2	
198404	10.1	12.4	12.4	2.4	
198405	5.4	7.8	7.8	3.2	
198406	13.9	14.5	14.4	4.8	
198407	10.5	8.3	8.2	6.3	
198408	16.0	13.7	13.8	8.3	
198409	20.2	17.9	17.9	11.7	
198410	18.3	15.4	15.4	12.1	
198411	23.2	22.2	22.3	13.7	
198412	11.0	10.9	11.0	14.2	

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TITLE=143000 PROCESSED FRUIT

DATE	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH DEC.-CENTRED	DIEWERT-FRENCH JUNE-CENTRED
197901	15.5	16.0	16.0	.	.
197902	15.7	15.5	15.4	.	.
197903	15.1	14.9	14.9	.	.
197904	15.2	14.9	14.9	.	.
197905	15.0	14.4	14.5	.	.
197906	13.5	13.0	12.9	.	13.9
197907	13.8	12.1	12.1	.	13.4
197908	13.5	12.7	12.7	.	13.1
197909	14.3	14.6	14.6	.	12.7
197910	14.3	14.5	14.6	.	12.2
197911	12.9	13.9	13.8	.	11.5
197912	11.8	11.7	11.7	13.9	11.2
198001	10.1	10.8	10.8	13.4	11.1
198002	10.3	10.6	10.7	13.1	11.0
198003	10.1	10.4	10.5	12.7	10.6
198004	9.2	9.4	9.5	12.2	10.0
198005	8.0	8.4	8.4	11.5	9.6
198006	9.5	9.8	9.9	11.2	9.3
198007	9.5	10.0	10.0	11.1	9.1
198008	10.0	10.3	10.3	11.0	8.9
198009	8.9	8.9	8.9	10.6	8.9
198010	8.9	8.1	8.0	10.0	9.3
198011	8.9	8.4	8.5	9.6	9.9
198012	8.0	8.0	8.1	9.3	10.4
198101	8.2	8.4	8.5	9.1	10.7
198102	7.8	8.0	8.0	8.9	10.9
198103	10.1	10.6	10.5	8.9	11.4
198104	12.6	13.2	13.1	9.3	12.0
198105	14.3	14.0	14.0	9.9	12.5
198106	14.5	14.9	14.8	10.4	13.3
198107	13.6	13.8	13.8	10.7	13.9
198108	13.1	13.2	13.2	10.9	14.8
198109	14.6	14.5	14.5	11.4	15.3
198110	15.4	15.5	15.6	12.0	15.4
198111	16.7	16.2	16.2	12.5	15.4
198112	16.3	15.9	15.9	13.3	15.0
198201	15.5	15.5	15.5	13.9	14.9
198202	18.0	18.1	18.2	14.8	14.9
198203	16.8	16.2	16.2	15.3	14.6
198204	14.3	14.1	14.1	15.4	14.2
198205	13.6	14.0	14.0	15.4	13.7
198206	11.8	11.7	11.6	15.0	13.0
198207	12.4	12.6	12.6	14.9	12.5
198208	12.3	12.3	12.3	14.9	11.3
198209	11.8	12.0	12.0	14.6	10.1
198210	10.8	10.6	10.6	14.2	9.0
198211	9.2	9.0	9.0	13.7	7.8
198212	8.8	8.7	8.8	13.0	6.9
198301	9.4	9.5	9.5	12.5	6.0

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MONTH OVER SAME MONTH OF PRECEDING YEAR % CHANGES

TITLE=143000 PROCESSED FRUIT

DATE	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH DEC.-CENTRED	DIEWERT-FRENCH JUNE-CENTRED
198302	5.6	5.9	5.8	11.3	5.0
198303	2.2	2.7	2.7	10.1	4.0
198304	1.7	1.9	2.0	9.0	3.3
198305	1.1	1.1	1.1	7.8	2.6
198306	1.4	1.5	1.5	6.9	1.9
198307	0.7	0.7	0.7	6.0	1.2
198308	0.6	0.4	0.3	5.0	0.8
198309	-0.6	-0.6	-0.6	4.0	1.0
198310	-0.3	-0.3	-0.3	3.3	1.4
198311	-0.5	-0.2	-0.2	2.6	
198312	0.4	0.4	0.4	1.9	
198401	0.3	0.4	0.4	1.2	
198402	1.2	1.2	1.2	0.8	
198403	5.1	5.0	5.0	1.0	
198404	6.6	6.6	6.5	1.4	
198405	8.1	7.8	7.8	2.0	
198406	7.6	7.6	7.6	2.6	
198407	8.6	9.4	9.4	3.2	
198408	8.3	8.7	8.7	3.8	
198409	8.3	7.9	7.9	4.5	
198410	7.7	7.5	7.6	5.0	
198411	7.8	7.2	7.2	5.6	
198412	7.4	6.7	6.7	6.2	

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
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MONTH OVER SAME MONTH OF PRECEDING YEAR % CHANGES

TITLE=151000 FRESH VEGETABLES

DATE	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH DEC.-CENTRED	DIEWERT-FRENCH JUNE-CENTRED
197901	1.4	2.4	2.4	.	.
197902	3.8	3.8	3.9	.	.
197903	8.9	10.3	10.1	.	.
197904	3.0	1.7	1.7	.	.
197905	-16.4	-17.5	-17.5	.	.
197906	-2.0	-2.0	-2.0	.	-1.1
197907	-12.5	-12.1	-12.0	.	-1.9
197908	-11.1	-6.6	-6.7	.	-3.0
197909	0.1	0.3	0.3	.	-5.7
197910	4.1	2.3	2.5	.	-6.5
197911	-0.7	-1.5	-1.4	.	-4.2
197912	13.3	11.4	11.4	-1.1	-3.0
198001	-6.5	-7.7	-7.7	-1.9	-1.2
198002	-12.5	-12.8	-12.8	-3.0	1.4
198003	-19.9	-21.2	-21.2	-5.7	3.6
198004	-9.9	-9.4	-9.4	-6.5	5.8
198005	12.0	12.6	12.5	-4.2	7.9
198006	10.9	11.0	11.3	-3.0	9.2
198007	3.9	3.8	3.7	-1.2	12.8
198008	23.8	20.0	20.1	1.4	17.9
198009	31.6	28.7	28.7	3.6	24.7
198010	26.1	30.4	30.5	5.8	31.1
198011	27.6	30.6	30.6	7.9	32.0
198012	26.7	30.2	30.2	9.2	33.8
198101	39.1	43.8	44.1	12.8	36.5
198102	62.0	63.5	63.6	17.9	35.6
198103	63.9	63.2	63.0	24.7	33.5
198104	67.2	66.1	66.3	31.1	31.0
198105	26.6	25.6	25.4	32.0	28.9
198106	33.3	30.1	30.2	33.8	26.1
198107	31.0	28.0	28.2	36.5	23.0
198108	17.3	14.7	14.7	35.6	19.7
198109	14.6	14.5	14.6	33.5	14.9
198110	4.1	4.8	4.9	31.0	8.8
198111	5.3	4.7	4.7	28.9	7.2
198112	-3.7	-4.9	-4.9	26.1	4.2
198201	4.3	2.4	2.3	23.0	1.6
198202	6.9	6.0	6.1	19.7	-0.6
198203	-4.9	-4.7	-4.8	14.9	-2.6
198204	-16.2	-14.9	-14.8	8.8	-3.7
198205	0.9	1.8	1.8	7.2	-4.5
198206	-3.3	-2.3	-2.1	4.2	-4.3
198207	-2.9	-0.1	-0.1	1.6	-5.4
198208	-14.4	-10.0	-10.0	-0.6	-8.2
198209	-12.2	-10.2	-10.3	-2.6	-9.0
198210	-6.7	-8.4	-8.4	-3.7	-8.2
198211	-4.0	-6.1	-6.2	-4.5	-7.4
198212	1.4	-0.1	-0.1	-4.3	-7.0
198301	-13.5	-15.4	-15.3	-5.4	-7.0

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
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------------------------------ TITLE=151000 FRESH VEGETABLES ------------------------------

DATE	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH DEC.-CENTRED	DIEWERT-FRENCH JUNE-CENTRED
198302	-24.6	-25.6	-25.5	-8.2	-4.3
198303	-9.6	-12.4	-12.5	-9.0	-1.8
198304	-0.2	-2.3	-2.3	-8.2	1.4
198305	12.8	13.6	13.7	-7.4	3.8
198306	0.4	1.3	1.3	-7.0	5.3
198307	-0.5	-2.0	-2.0	-7.0	9.6
198308	23.5	19.3	19.3	-4.3	15.9
198309	20.0	17.6	17.6	-1.8	21.3
198310	33.2	33.6	33.6	1.4	24.5
198311	24.4	27.3	27.4	3.8	
198312	21.1	24.7	24.7	5.3	
198401	46.6	51.0	51.0	9.6	
198402	52.4	56.3	56.3	15.9	
198403	44.7	50.4	50.4	21.3	
198404	28.3	30.0	30.0	24.5	
198405	3.0	2.2	2.2	23.6	
198406	6.6	4.8	4.8	24.1	
198407	13.4	11.7	11.7	25.6	
198408	3.9	7.4	7.4	23.9	
198409	-5.8	-4.7	-4.7	22.0	
198410	-13.4	-15.4	-15.4	17.4	
198411	-8.2	-9.6	-9.6	14.5	
198412	-14.3	-16.2	-16.2	11.8	

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
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MONTH OVER SAME MONTH OF PRECEDING YEAR % CHANGES

TITLE=155000 PROCESSED VEGETABLES

DATE	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH DEC.-CENTRED	DIEWERT-FRENCH JUNE-CENTRED
197901	15.4	5.6	5.5	.	.
197902	15.5	7.8	7.7	.	.
197903	15.0	6.9	7.0	.	.
197904	15.2	7.3	7.3	.	.
197905	15.0	7.4	7.4	.	.
197906	13.6	7.6	7.6	.	7.2
197907	13.8	7.1	7.3	.	7.5
197908	13.5	7.4	7.4	.	7.5
197909	14.4	7.7	7.8	.	7.8
197910	14.4	7.1	7.2	.	7.9
197911	13.0	8.1	8.0	.	8.1
197912	11.6	8.0	7.8	7.2	8.4
198001	10.0	8.4	8.1	7.5	8.7
198002	10.2	8.4	8.4	7.5	9.0
198003	10.0	9.3	9.3	7.8	9.2
198004	9.1	9.0	9.1	7.9	9.7
198005	8.0	9.4	9.5	8.1	10.1
198006	9.5	10.7	10.7	8.4	10.7
198007	9.6	10.5	10.5	8.7	11.1
198008	10.0	11.2	11.3	9.0	11.6
198009	9.1	12.0	12.2	9.2	12.1
198010	9.1	13.0	13.0	9.7	12.9
198011	9.0	12.8	12.7	10.1	13.6
198012	7.8	12.9	12.8	10.7	14.1
198101	8.1	13.2	13.0	11.1	14.8
198102	7.8	14.2	14.3	11.6	15.3
198103	10.0	15.2	15.4	12.1	15.8
198104	12.8	16.9	17.0	12.9	16.3
198105	14.3	17.6	17.5	13.6	16.9
198106	14.5	16.6	16.6	14.1	17.4
198107	13.8	19.0	19.1	14.8	18.0
198108	13.3	19.7	19.7	15.3	18.3
198109	14.8	19.0	19.2	15.8	18.5
198110	15.6	20.0	19.8	16.3	18.8
198111	16.8	19.0	19.0	16.9	19.0
198112	16.1	19.0	19.0	17.4	19.2
198201	15.3	19.1	19.0	18.0	19.0
198202	17.8	17.7	17.6	18.3	19.0
198203	16.6	18.9	18.9	18.5	18.8
198204	14.2	19.3	19.4	18.8	18.4
198205	13.6	19.6	19.6	19.0	18.0
198206	11.9	19.1	19.1	19.2	17.6
198207	12.5	17.7	17.6	19.0	17.1
198208	12.4	18.3	18.4	19.0	16.6
198209	11.9	16.7	16.8	18.8	15.8
198210	10.9	14.7	14.7	18.4	14.6
198211	9.2	15.2	15.1	18.0	13.3
198212	8.6	14.8	14.8	17.6	12.0
198301	9.3	13.5	13.5	17.1	10.8

CPI SERIES BASED ON SEASONALLY-VARIANT WEIGHTS
SEASONALLY-ADJUSTED SERIES
(1976 BASKET REFERENCE PERIOD WITH MONTHLY PATTERN
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MONTH OVER SAME MONTH OF PRECEDING YEAR % CHANGES

-- TITLE=155000 PROCESSED VEGETABLES --

DATE	OFFICIAL CONCEPT	OLD CANADIAN	ROTHWELL	DIEWERT-FRENCH DEC.-CENTRED	DIEWERT-FRENCH JUNE-CENTRED
198302	5.7	12.7	12.7	16.6	9.7
198303	2.1	9.5	9.6	15.8	8.8
198304	1.7	7.5	7.5	14.6	8.1
198305	1.1	5.1	5.1	13.3	7.0
198306	1.5	4.6	4.6	12.0	5.9
198307	0.9	4.2	4.2	10.8	5.0
198308	0.7	1.7	1.7	9.7	4.3
198309	-0.5	3.8	3.9	8.8	3.9
198310	-0.2	3.6	3.7	8.1	3.6
198311	-0.5	3.1	3.0	7.0	
198312	0.2	3.1	3.2	5.9	
198401	0.2	3.1	3.1	5.0	
198402	1.0	4.2	4.2	4.3	
198403	4.9	4.8	4.7	3.9	
198404	6.6	4.3	4.3	3.6	
198405	8.1	5.0	5.0	3.6	
198406	7.7	5.5	5.6	3.7	
198407	8.7	4.7	4.8	3.8	
198408	8.4	4.5	4.4	4.1	
198409	8.3	2.4	2.5	4.0	
198410	7.7	0.9	0.7	3.8	
198411	7.8	1.4	1.4	3.6	
198412	7.4	0.7	0.7	3.5	