



GOVERNMENT OF BERMUDA  
Cabinet Office

**Department of Statistics**

# Understanding the Consumer Price Index





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Consumer Price Index numbers are published in the Bermuda Consumer Price Index – Monthly report which is readily available on [www.gov.bm](http://www.gov.bm).

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Detailed technical information about the CPI is available upon request.



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# Understanding The Consumer Price Index

## Introduction

Commonly referred to as the CPI, the Consumer Price Index, is one of the most widely-used statistical series produced by the Department of Statistics. It has many applications which directly or indirectly affect all residents in Bermuda.

The CPI is used extensively in collective bargaining by labour unions and employers for the adjustment of wages and salaries. Rental agreements, insurance premiums, pensions, alimony and child support payments are all forms of contractual and price-setting arrangements, very often tied to movements in the CPI.

It serves as a gauge for assessing the current performance of the economy and it is an important tool used by government in formulating and evaluating economic policy. Additionally, private researchers, students and the public use the CPI for social and economic studies of the economy, school projects and general information.

*“Understanding the Consumer Price Index”* is designed to give users of the CPI a general understanding of how it is calculated, and how to use it more efficiently and effectively for day-to-day practical applications.

## What is the Consumer Price Index?

The Consumer Price Index measures changes in the general level of prices of consumer goods and services purchased by private households. It is the appropriate economic instrument to use when determining the effect of changes in retail prices on the average household budget. Additionally, the CPI is the most used measure of inflation in Bermuda.

The CPI was discontinued in Bermuda at the end of World War II but re-introduced in 1961. Rapid changes in the consumption and expenditure patterns by private households during the post-war period made it sufficiently impracticable to produce a CPI representative, on a continuous basis, of household spending patterns. Since 1961, however, the calculation of the index has changed to include generally accepted standards of best practice.

## Contents and Structure of the CPI

The Consumer Price Index measures price movements of a given quality and quantity of goods and services. The goods and services included within the scope of the index can be figuratively thought of as a ‘shopping basket.’ Since the quality and quantity of the goods and services in the ‘shopping basket’ do not change over the life of the basket it is also referred to as a ‘fixed’ basket of goods and services.

The 'shopping basket' is comprised of a broad cross-section of consumer products and services that typically are purchased by the households. No two households are exactly alike in their spending habits. Each purchases a different combination of goods and services for consumption. For example, it would be very unusual to find a single household using both a gas stove and an electric stove to prepare meals in the home. However, both types of ranges are included in the shopping basket since both are purchased by large numbers of Bermuda households. Generally speaking, the CPI 'basket' includes those goods and services which are important to households based on the amount of expenditure made on them by households. The CPI is a measurement of pure price change in the sense that every item in the 'basket,' has a price association fixed with a specific quantity and quality. If the quality and quantity to price relationship is not maintained, it is difficult to measure pure price changes.

Since the CPI is calculated using a fixed shopping basket of goods and services, it must be updated periodically to ensure its continued relevancy to the actual spending habits of the households to which it relates. For this reason the Department of Statistics undertakes Household Expenditure Surveys (HES) to collect information on how households spend their money on a periodic basis. The data collected are used to update the 'basket'. Spending Information collected during the 2013 HES was used to update the shopping basket. This update allows for new goods or services that have become significant in household budgets to be included in the 'basket,' and other items upon which household spending has waned to be downgraded or excluded.

In constructing this 'shopping basket,' the selected goods and services are organized first by commodity type. They are then divided into sub-components and assigned to a major expenditure group. The Bermuda CPI is divided into nine major expenditure groups (commonly referred to as 'sectors'), namely:

- 1.** Food
- 2.** Rent (Housing)
- 3.** Clothing and Footwear
- 4.** Tobacco and Liquor
- 5.** Fuel and Power
- 6.** Household Goods, Services and Supplies
- 7.** Transport and Foreign Travel
- 8.** Education, Recreation, Entertainment and Reading
- 9.** Health and Personal Care

The average amount spent by all households in the HES on individual items in the basket are added to obtain a total cost. Within each of the sectors mentioned above, the average household spending on similar individual items are grouped. For example, in the food sector the average amounts spent on bread, rolls, cakes and biscuits are added. The aggregate amount spent on food by households divided by the total spending in all nine sectors of the index represents the weight for the CPI food sector. The following table shows the weighting pattern for the nine sectors.

Sectors	2013 HES Average Weekly Expenditure <sup>1</sup> (\$)	Weights as Percentages <sup>1</sup> (%)
Food	209.83	11.53
Rent (Housing)	486.07	26.71
Clothing and Footwear	45.47	2.50
Tobacco and Liquor	56.60	3.11
Fuel and Power	71.15	3.91
Household Goods, Services and Supplies	211.03	11.59
Transport and Foreign Travel	236.73	13.01
Education, Recreation, Entertainment and Reading	267.17	14.68
Health and Personal Care	236.00	12.97
<b>Total Expenditure</b>	<b>1,820.05</b>	<b>100.00</b>

<sup>1</sup> Average weekly expenditure and CPI group weights reflect values for the CPI target group of households and therefore differ from those reported in table A5 of the 2013 Household Expenditure Survey Report.

The weight associated with each sector is calculated by taking the ratio of expenditure in each sector to total spending of all sectors and multiplying by 100. For example, the weight for the Rent sector is calculated as follows:

$$\frac{\text{Average weekly expenditure on Rent} \times 100}{\text{Total expenditure (all sectors)}} = \frac{\$486.07 \times 100.00}{\$1,820.05} = 26.71\%$$



## Price Collection

The CPI is designed to measure price changes for a fixed basket of goods and services. Price movements are monitored in many retail stores from which households do their shopping and also at various types of businesses which provide services to households. Monthly, quarterly and bi-annual pricing surveys are carried out at outlets such as: grocery stores, clothing and footwear stores, furniture and appliance shops, garages, doctors, dentists, law offices, and beauty and barber salons. Additionally, price data for bus, ferry and taxi fares, telephone equipment and services and electricity charges, education and hospital fees are all collected from establishments and government agencies that provide these services. In total, over 4,065 individual price quotations are either collected and or reviewed each month to compile the Consumer Price Index.

## Computation of the CPI

The computation of the monthly CPI begins with the collection of price data from retail stores and household service providers. Once the prices of goods and services have been collected, they are scrutinized to ensure validity of the data being used in the CPI calculations. Prices are compared with the previous month's price data in an effort to monitor price fluctuations and maintain consistency from month to month. A step-by-step procedure is given below, explaining how price index numbers are calculated for each sub-group of the CPI.

**Example:** The Food sector of the CPI is divided into two sub-components: food purchased from grocery stores and ready-to-eat food bought, from restaurants and grocery store delicatessens. The grocery store component consists of various sub-groups such as bakery products, meat products, dairy products, vegetables and fruits. To derive a price index number for the sub-group bakery products the following steps are taken.

### STEP 1

The Department of Statistics collects prices of different types of baked goods such as bread, cakes, rolls and biscuits each month from various grocery stores to obtain an average price that consumers paid for bakery products. The prices are also reviewed to ensure that they refer to the same quality and quantity of baked goods observed in the previous month.

### STEP 2

A price relative is computed by taking the ratio of the current month's average price and the previous month's average price for all bakery products. For example, if the average price paid for bakery products during January and February was \$4.75 and \$4.80 respectively, then the price relative for February is calculated as:

$$\frac{\text{Average price paid in February} = \$4.80}{\text{Average price paid in January} = \$4.75} = 1.01005$$

This price relative tells us that the average price of bakery products increased by just over 1.0% from January to February.

### STEP 3

- (a) The price relative is multiplied by the previous month's weight for baked goods to derive the weight for the current period.

$$\begin{aligned} \text{Current month's weight} &= 0.77100 \times 1.01005 \\ &= 0.77875 \end{aligned}$$

- (b) Since the CPI is calculated using a base-weighted formula, the cost of bakery products in the base period is needed.

$$\text{Base period weight} = 0.70200$$

- (c) The price index number for bakery products is computed as follows:

$$\begin{aligned} &\frac{\text{Current month's weight} \times 100}{\text{Base period weight}} \\ &= \frac{0.77875}{0.70200} \times 100 \\ &= 1.10933 \times 100 \\ &= 110.93 \end{aligned}$$

If the base period were April 2013 and the index number were being calculated for the current period March 2015, then the index is saying that it costs \$110.93 in March 2015 to purchase the same quantity of bakery products that cost \$100 in April 2013.

### STEP 4

Weights and price indexes are computed for each sub-group (meat products, dairy products, etc.) in the same manner, including prepared meals in the food bought out sub-group. The current month's sub-group weights are summed to obtain the sector weight; and the index number for the Food sector is calculated using Step 3.

## STEP 5

Once index numbers have been derived for each of the nine major sectors of the CPI, the average price movement for all goods and services in the 'basket' is computed by taking the ratio of the current month's all-items index number and the index number for the same month in the previous year. This movement or average change in prices is identified as the 'All-items CPI' and represents the headline measure of inflation.

### Using the Index Numbers

The CPI is published on a monthly basis and the Department receives numerous requests for CPI information. These requests come from a diverse group of users such as researchers, students, employers and business organizations. The following calculations are presented to illustrate some of the every-day computations requested by users. The index numbers used in the examples are shown in the table below and are taken directly from the monthly CPI Release.

<b>Bermuda Consumer Price Index All Items Index – April 2015 = 100</b>					
<b>Month</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>
January	91.0	93.7	95.5	97.2	98.7
February	91.5	93.7	95.7	97.4	98.9
March	91.4	94.0	96.0	97.9	99.0
April	92.5	94.8	96.5	98.3	100.0
May	92.3	95.0	96.6	98.6	99.8
June	92.5	95.0	96.8	98.6	100.7
July	92.8	95.1	96.8	98.7	100.6
August	92.8	95.6	96.9	99.0	100.4
September	93.9	95.6	97.4	99.7	100.7
October	94.4	96.0	97.5	100.0	100.6
November	93.8	95.6	96.9	99.1	100.5
December	93.6	95.3	97.1	98.7	100.5
Annual Average	92.7	95.0	96.6	98.6	100.0

# 1. Determining Price Changes Between Specified Periods

The CPI is an important economic indicator in that it is used primarily to measure the rate at which the average prices of consumer goods and services change over time; this is the rate of consumer inflation.

## (a) Measuring a Month-to-Month Price Change

The price change between February and March, 2015 is calculated as follows:

$$\frac{\text{Mar 2015 index} - \text{Feb 2015 index}}{\text{Feb 2015 index}} \times 100$$

$$\frac{99.0 - 98.9}{98.9} \times 100 = 0.1\%$$

## (b) Measuring a Year-to-Year Price Change

The price change between January, 2014 and January, 2015 is calculated as follows:

$$\frac{\text{Jan 2015 index} - \text{Jan 2014 index}}{\text{Jan 2014 index}} \times 100 = \frac{98.7 - 97.2}{97.2} \times 100 = 1.5\%$$

The 1.5% represents the rate of price increase or the rate of inflation for the period between January 2014 and January 2015.

## (c) Measuring a Price Change for a Particular Period

Some users request the rate of price change for a particular day of the month, for example, 1 February. In such cases users will have to decide which monthly index is most suitable for their requirements.

The price change between 4 October 2013 and 31 October 2015 is calculated as follows:

$$\frac{\text{Oct 2015 index} - \text{Oct 2013 index}}{\text{Oct 2013 index}} \times 100 = \frac{97.5 - 94.4}{94.4} \times 100 = 3.3\%$$

The method of calculation used in each of the above examples is the same and can be used to measure price changes over any specified period of time.

## 2. Using the CPI as an Economic Tool

In many practical situations, the CPI is used either as a deflation tool or an escalation tool.

### (a) A Deflation Tool

Nominal or current values (with inflation) can be very misleading when they are used to compare dollar values over different periods of time. When inflation exists, money actually loses its value. Thus to determine the effect of inflation on nominal values, it is necessary to deflate the nominal value by the rate of inflation. The resulting value is the real or constant dollar value (without inflation). The formula to convert nominal values to constant values is shown below:

$$\frac{\text{Nominal Sales \$}}{\text{Price Index}} \times 100 = \text{Constant Sales \$}$$

The price index is used as a deflating tool to hold prices constant. The constant dollar value is a better reflection of the quantities of goods sold by a company than the nominal dollar sales because nominal dollar sales growth includes price increases. Below is the gross annual sales and prices index data for company X:

Gross Annual Sales of Company X			
Year	Nominal Sales \$ 000	Price Index (2015 = 100)	Constant Sales \$ 000
2011	16,800	92.7	18,123
2012	17,500	95.0	18,421
2013	17,900	96.6	18,530
2014	19,300	98.6	19,574

Examples of the calculations to derive the constant sales for company X for 2011 and 2012 are as follows:

(i) For 2011:  $\frac{\$16,800}{92.7} \times 100 = \$18,123$

(ii) For 2012:  $\frac{\$17,500}{95.0} \times 100 = \$18,421$

The constant dollar sales values can be used to assess the sales volume for company X for 2011 to 2014.

**(b) An Escalation Tool**

One of the most common uses of the CPI as an escalation tool is through wage contracts. These contracts are generally known as collective bargaining agreements and are negotiated between employers and labour unions. The escalation rule is called a cost of living adjustment clause which is written into the contract such that the wage to be paid in the future is adjusted automatically by changes in the CPI. An example of such a clause is as follows:

“Effective 1 October 2015, the contract will provide an increase in basic wages equal to the percentage increase in the Bermuda CPI from August 2014 to August 2015.”

**Example:** August 2015 the rate of inflation = 1.5%  
Weekly wage for electrician = \$1,045.00  
Adjusted weekly wage October 2015 =  $\frac{\$1,045.00 \times 101.5}{100}$   
  
= \$1,060.67

**3. Determining the Purchasing Power of Money**

The buying power of the Bermuda dollar changes over time as the prices of goods and services change. The CPI is used to determine the amount of money that would be needed in the present to have the same purchasing power as an amount that was specified in the past. This type of calculation is needed when an amount of money has been specified in a will, a trust deed, or some other legal document. For example, if \$50,000 was a stated amount in a will drawn up in 2004, the recipient may wish to know the equivalent amount of money to be received in 2014 dollars. This is calculated as follows:

**2014 Annual Average CPI = 98.6**

**2004 Annual Average CPI = 74.9**

$$\frac{\$50,000 \times 98.6}{74.9} = \$50,000 \times 1.31642 = \$65,821$$

This means that \$65,281 had the same buying power in 2014 that \$50,000 had in 2004.

On the other hand, the question may be reversed. For instance, what sum of money in 2004 had the same purchasing power as \$50,000? The method is primarily the same with the exception that the base year is reversed to 2014.

$$\text{Hence, } \$50,000 \times \frac{74.9}{98.6} = \$50,000 \times 0.75963 = \$37,982$$

Thus a total of \$37,982 in 2004 had the same purchasing power as \$50,000 in 2014. The sum of money is lower because prices were lower in 2004.

## Historical Series of the Bermuda CPI

The following table provides an historical series of the CPI on a monthly basis. The monthly indexes are averaged over the 12 calendar months of the year to arrive at an annual average. Changes calculated from these averages represent average annual changes for the calendar year.

Bermuda All-Items Consumer Price Index – Base: April 2015 = 100.0										
Month	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Jan	78.3	80.5	83.7	87.9	89.0	91.0	93.7	95.5	97.2	98.6
Feb	78.5	81.0	83.8	87.5	88.7	91.5	93.7	95.7	97.4	98.9
Mar	78.7	81.5	84.9	87.2	89.2	91.4	94.0	96.0	97.9	99.0
Apr	79.4	81.8	86.2	87.8	90.4	92.5	94.8	96.4	98.3	100.0
May	79.0	82.5	86.4	87.7	90.1	92.3	95.0	96.6	98.6	99.8
Jun	79.8	83.0	86.7	87.7	90.0	92.5	95.0	96.8	98.6	100.7
Jul	79.8	83.3	87.1	88.2	90.2	92.8	95.1	96.8	98.7	100.6
Aug	80.1	83.3	87.4	88.7	90.6	92.8	95.6	96.9	99.0	100.4
Sep	80.5	83.4	88.3	88.5	91.5	93.9	95.6	97.4	99.7	100.7
Oct	80.2	83.7	88.3	89.0	91.7	94.4	96.0	97.5	100.0	100.6
Nov	80.2	84.0	88.3	88.9	91.0	93.8	95.6	96.9	99.1	100.5
Dec	80.6	83.6	87.7	88.6	91.0	93.6	95.3	97.1	98.7	100.5
Annual Average	79.6	82.6	86.6	88.1	90.3	92.7	95.0	96.6	98.6	100.0
Annual Change	3.1	3.8	4.8	1.8	2.4	2.7	2.4	1.8	2.0	1.5

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