Understanding the Consumer Price Index

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INTRODUCTION

The Consumer Price Index, commonly referred to as the CPI, is one of the most used of the statistical series produced by the Statistical Institute of Jamaica (STATIN). In its many applications, it directly or indirectly affects all residents in Jamaica.

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

The CPI is relevant to all persons who earn and spend money. When prices rise the purchasing power of money is reduced and consequently, people are able to buy less with the same amount of money. It is therefore 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.

This information pamphlet serves to give the many 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 best economic instrument to use when determining the effect of changes in retail prices on household budgets and expenditure. Additionally, the CPI is the single most widely used current measure of inflation in Jamaica.

THE CPI DOES NOT MEASURE CHANGES IN THE STANDARD OF LIVING

Measuring the change in the standards of living would be difficult as living standards vary from individual to individual. For example, if your mode of transportation used to be by bus up to last year and it has changed because you have now acquired a motor vehicle; your transportation expenses in the current year are expected to increase as the cost of maintaining a vehicle is more than the costs of the bus fares that were paid in the previous year.

Another example is that if you used to rent a two-bedroom house but you are now renting a three-bedroom house, your housing expenses have naturally increased.

These increases in your living expenses, however, have not been brought about by increases in the cost of transportation or rent but are due to the fact that your living standards have changed, they have been increased. You are now driving a motor vehicle and living in more physical space.

The Consumer Price Index measures changes in the general level of prices of consumer goods and services purchased by private households.

THE CPI MEASURES CHANGES IN THE PRICES OF SPECIFIED ITEMS THAT PEOPLE PURCHASE

The "Basket" of consumer goods and services

The Consumer Price Index measures price movements of a given quantity of consumer goods and services. The goods and services included within the scope of the index can be figuratively thought of as a "basket".

The "basket" represents a mix of consumer products purchased by the typical household. No two households are exactly alike in their spending habits. Each household purchases a different combination of goods and services for consumption. Generally speaking, the CPI "basket" includes those goods and services which are important in terms of the size of expenditure made on them by households.

*The "**basket**" represents a mix of consumer products purchased by the typical household.*

The items in the "basket", in addition to being representative of households' spending habits, must also have their prices associated with specific quantities. Without the quantity/price relation, it is extremely difficult to measure pure price changes.

Pure Price Change

A pure price change is a change in the price of a good or service whose characteristics do not change over time.

For example, if a 1 kilogram package of `Tasty' rice was priced in December 2006, the price of that same 1 kilogram package of `Tasty' rice must be collected for the next period in order to reflect a pure price change.

Once the "basket" is selected, the quantity of the items is kept constant. However, the total cost of this "fixed basket" will vary from one period of time to another, as

the prices of the items change. Price changes resulting from such a "constant or fixed basket" are defined as "pure" price movements, which is what the CPI, in essence, measures. Thus, the CPI gives the percentage change in the cost of purchasing the contents of the basket.

The Need to Up-date the CPI "Basket"

Since the CPI assumes the purchase of a fixed "basket" of goods and services, it must be updated periodically to ensure its continued relevance to the actual spending habits of the households to which it relates. For this reason STATIN undertakes Household Expenditure Surveys (HES) to collect information on how households spend their money. The HES collects data from the households on expenditure at item level over a period. The 2004/2005 HES covered the period June 2004 to March 2005. The data collected are used to update the "basket" on which the CPI is based. This update allows for new goods and services that have become significant in household expenditure to be included in the "basket", and items which have lost importance to be excluded.

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STRUCTURE OF THE "BASKET"

Applying the Classification of Individual Consumption According to Purpose (COICOP) System

In organising the CPI "basket", the selected items of goods and services are grouped together according to various categories. They are first grouped by commodity type. Related commodity types are then grouped into sub-components which are then assigned to a major expenditure Division. All goods and services in the CPI basket are divided into twelve (12) major expenditure Division that are based on a consumption classification system developed by the United Nations.

The classification system is the Classification of Individual Consumption According to Purpose (COICOP), and the 12 broad expenditure divisions are:

01 Food and Non-Alcoholic Beverages
02 Alcoholic Beverages and Tobacco
03 Clothing and Footwear
04 Housing, Water, Electricity, Gas and Other Fuels
05 Furnishings, Household Equipment and Routine Household Maintenance
06 Health
07 Transport
08 Communication
09 Recreation and Culture
10 Education
11 Restaurants and Accommodation Services
12 Miscellaneous Goods and Services

The individual expenditure on similar items in the "basket" is summed to obtain a total expenditure, which is referred to as the "class weight".

The COICOP classification system breaks the 12 ***Divisions*** into smaller groups of related items, termed ***Groups.*** These Groups are further broken down into ***Classes,*** which are the combination of similar items. At each level of the classification system the category of items are assigned number codes. Divisions are assigned 2 digit codes, Groups 3 digit codes and Classes 4 digit codes. The structure of the COICOP Classification System for use in the presentation for CPI tables is provided in ***Table 4***.

Weighting Pattern

The individual expenditure on similar items in the

"basket" is summed to obtain a total expenditure, which is referred to as the "class weight". The "class weights" are then summed to form the "group weight". The group weights are then summed to become the "division weight". The allocation of "group weights" to each major expenditure division within the index is called the weighting pattern of the CPI. For example, in the food group of the index, the expenditure on bread, buns, cakes, biscuits, cereals and similar items are summed. The total expenditure on these items represents the "class weight" for Bread and Cereals. The aggregate of all such "group weights" represents the weight for the Food and Non-alcoholic Beverages Division of the CPI.

The individual expenditure on similar items in the "basket" is summed to obtain a total expenditure, which is referred to as the "class weight". The "class weights" are then summed to form the "group weight".

Relative Importance of Items in the CPI "basket"

The amount spent on each item in the CPI "basket" is compared to total household spending to obtain the relative importance or "weight" of the commodities in the "basket". The twelve major divisions of the CPI each have representative "division weights". The weights, which indicate the relative importance of the commodities in the basket, establish the impact that a particular price change will have on the overall index. For example, a 5% rise in the price of electricity would have a much greater impact on the household budget than a 5% increase in the price of newspaper. This is due to the fact that, in any given period, households spend more on electricity than they do on newspapers. ***Table 1*** shows the weights applicable to the twelve COICOP Divisions in the CPI. The weights associated with each of the divisions are shown as percentages and represent the current weighting pattern for the CPI.

Table 1. **Weight Structure in the Revised CPI**

DIVISIONS		Weights* as Percentages (%)
01	Food and Non-Alcoholic Beverages	37.4
02	Alcoholic Beverages and Tobacco	1.4
03	Clothing and Footwear	3.3
04	Housing, Water, Electricity, Gas and Other Fuels	12.8
05	Furnishings, Household Equipment and Routine, Household Maintenance	4.9
06	Health	3.3
07	Transport	12.8
08	Communication	4.0
09	Recreation & Culture	3.4
10	Education	2.1
11	Restaurants & Accommodation Services	6.2
12	Miscellaneous Goods & Services	8.4
	Total Expenditure	**100**

* The weights applied are based on the 2004/2005 Household Expenditure Survey.

The weight associated with each division is calculated by taking the ratio of expenditure in each division to total spending of all divisions and multiplying by 100.

PRICE COLLECTION

The CPI is designed to measure price changes for a fixed basket of consumer goods and services. Price movements must be monitored in several retail outlets from which households do their shopping and also from various business organizations which provide services to households. Monthly, quarterly and 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, schools, insurance companies and barber and beauty salons among others.

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Additionally, price data for labour rates, telephone and electricity charges, education and hospital fees are all collected from the appropriate authorities. In total, over 10,000 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 involves calculating a series of index numbers at the detailed or item level of the index and adding them to derive an aggregate index number.

The computation of the CPI is done in three phases, viz : (i) price collection, (ii) editing and averaging and (iii) index computation. Once the prices for goods and services have been collected, they are examined individually to ensure the validity of the data being used in the calculations. The phase of editing and averaging involves comparing the prices in the current month with the previous month's data in an effort to monitor price

fluctuations and maintain consistency from month to month. The geometric mean of the prices from the various outlets is then computed. The Laspeyre's weighted formula is then used for computing the index.

The Laspeyre's formula:

$$P_{LA} = \frac{\sum \frac{P_n}{P_o} W}{\sum W}$$

Where: P_n = Current Price

P_o = Base Price

W = Weight

Note!!

The index is based on the average price of a number of items combined. Therefore, a rise in the price of one item may be compensated by a fall in another. Consequently, the effect of the price increase on the index may not be marked. For example, a housewife confronted with a sudden rise in the price of bread is concerned to find only a small change in the index for "**FOOD**", as bread is only a small part of the total number of items used in the index or it may be that decreases in other items compensated for the increase in the price of bread.

USING THE INDEX NUMBERS

The Jamaica Consumer Price Index is published on a monthly basis. The Statistical Institute of Jamaica receives numerous calls daily requesting 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 everyday computations requested by users.

The index numbers listed in ***Table 2***, CPI Schedule for 2000–2006, are based on the revised calculations using the new series that have been linked to the 2004/2005 HES. These index numbers provide 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 index. Changes calculated from these averages represent average annual changes for the calendar year.

Table 2	**All Jamaica CPI Schedule for 2000–2006**						
Month	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
January	52.8	55.8	60.9	64.8	74.6	84.1	94.7
February	53.0	56.5	60.9	64.4	75.0	84.5	94.8
March	53.3	56.6	61.0	64.7	75.4	85.3	94.9
April	53.8	57.0	61.3	65.7	75.7	86.9	96.0
May	54.1	57.4	61.5	66.8	76.2	88.7	96.3
June	54.5	58.3	62.0	68.5	76.8	90.0	97.6
July	55.0	58.9	62.9	69.5	77.6	91.4	98.9
August	55.5	59.4	63.1	70.4	78.6	91.5	99.2
September	56.1	59.9	63.4	71.5	79.0	93.8	99.9
October	56.1	60.4	63.9	72.7	81.6	94.3	99.8
November	56.2	60.4	64.6	73.4	83.6	94.6	99.6
December	55.8	60.6	65.0	73.9	84.1	94.6	100.0
Annual Average	54.7	58.4	62.5	68.9	78.2	90.0	97.6
Annual Percentage Change		8.5	7.2	13.8	13.7	12.6	5.7

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

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 goods and services change over time or, in other words, the rate of inflation.

a. Measuring a Month-to-Month Price Change

The price change between May and June 2006 is calculated as follows:

$$\frac{\text{June 2006 index - May 2006 index}}{\text{May 2006 index}} \times 100$$

$$= \frac{97.6 - 96.0}{96.0} \times 100$$

$$= 0.0167 \times 100$$

$$= 1.67\%$$

b. Measuring a Price Change for a Particular Period

Some users request the rate of price change for a particular period in order to determine how much prices have risen since the last increase in the price of their product or wages, as the case may be. In such cases users will have to decide which monthly index is most suitable for their requirements.

The price change between March 2000 and April 2005 is calculated as follows:

$$\frac{\text{April 2005 index} - \text{March 2000 index}}{\text{March 2000 index}} \times 100$$

$$= \frac{85.3 - 53.8}{53.3} \times 100$$

$$= 0.5910 \times 100$$

$$= 59.10\%$$

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 Deflation Tool

Nominal figures can be very misleading when they are used to compare dollar values over the 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 value or constant dollar value. This technique is shown in the following example:

Table 3

Gross Annual Sales of Company X					Percentage change %			
Year	Nominal Sales $'000	Price Index December	Deflator Base Year 2002 %	Sales at 2002 Constant prices 0	Nominal Sales	Price Index	Deflator	Sales at 2002 Constant prices
2002	20800	65	100	20800	-	-	-	-
2003	21500	73.9	113.7	18911	3.4	13.7	13.7	-9.1
2004	22900	84.5	130	17615	6.5	14.3	14.3	-6.8
2005	23300	94.6	145.5	16010	1.7	12	12	-9.1

The nominal dollar sales for 2002 to 2005 do not reflect sales volume for Company X, primarily because the prices of goods and services sold by Company X have also increased during these years. Company X can use the price index and derive volume sales for each year to obtain a true indication of sales growth. The price index is thus used as a deflating tool to hold prices constant over the period. When the price index is applied to the

nominal dollar sales for Company X, the effect of price increases is removed and a constant dollar sales figure is obtained. The constant dollar value is a better reflection of the quantities of goods sold by the Company. In the example provided at ***Table 3***, the sales for Company X are being held constant at 2002 as a measure of the results achieved.

The year 2002 is referred to as the base year and deflators (expressed in percentage terms) for each year, are first calculated (i.e. deflator for year n = Price index for year n ÷ Price index for the base year x 100). The deflators are then applied to the nominal dollar values (i.e. nominal values ÷ deflator x 100 = constant dollar values).
The detailed calculations are as follows:

(i) For 2002: deflator = $\frac{65.0}{65.0} \times 100 = 100$

Sales for 2002 at constant 2002 price = $\frac{20800}{100} \times 100 = 20800$

Note that since 2002 is the base year the nominal and constant dollar values are the same.

(ii) For 2003: deflator = $\frac{73.9}{65.0} \times 100 = 113.7$

Sales for 2003 at constant 2002 price = $\frac{21500}{113.7} \times 100 = 18911$

(iii) For 2004: deflator = $\frac{84.5}{65.0} \times 100 = 129.8$

Sales for 2004 at constant 2002 price = $\frac{22900}{129.8} \times 100 = 17615$

(iv) For 2005: $23300 \times \frac{94.6}{65} \times 100 = 145.5$

Sales for 2005 at constant 2002 price = $\frac{23300}{145.5} \times 100 = 16010$

The real value of economic activity for Company X for 2002 through to 2005 should be assessed using the constant dollar sales values.

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 1st October 2005, the contract will provide an increase in basic wages equal to the percentage increase in the Jamaica CPI from August 2001 to August 2005."

Example:

Given the CPI for August 2001 =59.4 and for August 2005 = 91.5 then $\frac{91.5}{59.4} \times 100 = 154.0\%$

The percentage increase in the CPI from August 2001 to August 2005 is 54.0%.

Weekly wage for electrician = $850

Adjusted weekly wage for October, 2005

$$= 850 \times \frac{91.5}{59.4} = 850 \times 1.540$$

$$= 1309$$

Determining the Purchasing Power of Money

The buying power of the Jamaican dollar changes over time as the prices of goods and services change. The CPI is used widely 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 usually required when an amount of money has been specified in a will, a trust deed, or some other legal document. For example, if $150,000 were a stated amount in a will drawn up in 2000, the recipient may wish to know what the equivalent amount of money is in 2005 dollars. This is calculated as follows:

2005 Annual Average CPI = 90.0
2000 Annual Average CPI = 54.7

$$= 150{,}000 \times \frac{90.0}{54.7}$$
$$= 150{,}000 \times 1.6453$$
$$= \$246{,}800$$

This means that $246,800 had the same buying power in 2005 that $150,000 had in 2000. On the other hand, the question may be reversed. For instance, what sum of money in 2000 had the same purchasing power as $150,000 in 2005? The method is primarily the same with the exception that the base year is reversed to 2005. Hence:

$$= 150{,}000 \times \frac{54.7}{90.0}$$
$$= 150{,}000 \times 0.6078$$
$$= \$91{,}167$$

Thus a total of $91,167 in 2000 had the same purchasing power as $150,000 in 2005. The sum of money is lower because prices were lower in 2000.

Table 4 STRUCTURE OF THE COICOP CLASSIFICATION

DIVISIONS	GROUPS AND Classes	
01 FOOD & NON-ALCOHOLIC BEVERAGES	**01.1**	**Food**
	01.1.1	Bread and Cereals
	01.1.2	Meat
	01.1.3	Fish and Seafood
	01.1.4	Milk, Cheese and eggs
	01.1.5	Oils and Fats
	01.1.6	Fruit
	01.1.7	Vegetables and Starchy Foods
	01.1.8	Sugar, Jam, Honey, Chocolate and Confectionery
	01.1.9	Food Products not elsewhere classified (n.e.c.)
	01.2	**Non-Alcoholic Beverages**
	01.2.1	Coffee, tea and cocoa
	01.2.2	Mineral waters, soft drinks, fruit & vegetable juices
02 ALCOHOLIC BEVERAGES AND TOBACCO		
03 CLOTHING AND FOOTWEAR	**03.1**	**Clothing**
	03.2	**Footwear**
04 HOUSING, WATER, ELECTRICITY, GAS & OTHER FUELS	**04.1**	**Rentals for Housing**
	04.3	**Maintenance and Repair of the Dwelling**
	04.4	**Water Supply and Miscellaneous Services Relating to the Dwelling**
	04.5	**Electricity, Gas and other Fuels**
05 FURNISHINGS, HOUSEHOLD EQUIPMENT & ROUTINE HOUSEHOLD MAINTENANCE	**05.1**	**Furniture and Furnishings, Carpets and Other Floor Coverings**
	05.2	**Household Textiles**
	05.3	**Household Appliances**
	05.4	**Glassware, Tableware and Household Utensils**
	05.5	**Tools and Equipment for House and Garden**
	05.6	**Goods and Services for Routine Household Maintenance**
06 HEALTH	**06.1**	**Medical Products, Appliances and Equipment**
	06.2	**Health Services**
07 TRANSPORT		
08 COMMUNICATION		
09 RECREATION AND CULTURE		
10 EDUCATION		
11 RESTAURANTS AND HOTELS (includes Meals Away from Home and Hotel Accommodation)		
12 MISCELLANEOUS GOODS AND SERVICES		

Glossary of Terms

Annual Average Index The arithmetic mean of the monthly indices for a year.

Average Price A representative measure of a range of prices that is calculated by taking the sum of the prices of a given item and dividing it by the number of prices being examined and or the number of locations from which prices were collected (the arithmetic mean). However, for the revised Consumer Price Index, the average price is calculated by taking the geometric mean of a set of prices for a given item. The geometric mean is the nth root of the product of items. The geometric mean of a data set ($a_1 \times a_2 \times .....a_n$) is calculated using the formula:

$$\sqrt[n]{a_1 \times a_2 \times .....a_n}$$

Basket A specified set of quantities of goods and services that consumers purchase for day-to-day living. The average prices of these are tracked over time for the purpose of measuring changes in the level of prices in an economy.

Classification System The process by which goods and services are organized into categories.

COICOP Classification	A structured system of classification published by the United Nations Statistics Division that organizes the goods and services purchased by households according to their purposes.
Collective Bargaining Agreement	An agreement resulting from a process of negotiation between employees (or their representatives) and their employers setting forth their wages and other conditions of employment during a particular period.
Constant Dollar Value	The dollar value of goods and services reported in terms of the value of a previous time period. This allows for the comparison of dollar values over different time periods and is used in determining the real value of economic activity.
Consumer Goods	Goods and services that satisfy human desires through their direct consumption or use (for example food and clothing).
Consumer Price Index	A monthly or quarterly price index compiled and published by an official statistical agency that measures changes in the prices of consumption goods and services acquired or used by households.
Deflation	A persistent price decline of goods and services – the inverse of inflation. It also refers to the division of the current value of an aggregate by a price index

	(described as a deflator) in order to revalue its quantities at the prices of the price reference period.
Escalation	The provision made for future **for inflationary increases in the costs of goods and services, over those specified in** a **contract.**
Household	Households may either be individual persons living alone or groups of persons living together who make common provision for food and or other essentials for living. Groups of persons living in large institutional households (barracks, nursing homes, etc) are excluded from the CPI.
Household Expenditure Survey	The collection, examination and tabulation of data on expenditure by households on final consumption goods and services over a specified period of time.
Inflation	A process of continuously rising prices, or equivalently, of a continuously falling value of money.
Monthly Price Surveys	The monthly collection of the prices of the goods and services included in the basket.
Nominal Value	The dollar value of goods or services at the time of purchase or at the time of the occurrence of an event.

Purchasing Power of Money	The quantities of goods and services, which a given sum of money can purchase. Purchasing power decreases as price levels rise and increases as price levels fall.
Pure Price Change	The change in the price of a good or service of which the characteristics are unchanged; or the change in the price after adjusting for any change in the quality.
Rate of Inflation	The ratio of the increase in the average price level of a fixed set of goods and services in an economy.
Real Value	Real values are values adjusted for differences in the price levels for the relevant time period to remove the price effect as if prices were constant for the periods under review.
Weights	Are a set of factors summing to one hundred percent (100%) that are used to calculate averages. In the CPI context, the weights are expenditure shares that sum to 100% and indicate the level of importance of each item within their respective division.

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