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**Working to Improve Price Indices
Development in Pakistan**

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ABSTRACT

Given the importance of Consumer Price Index (CPI), there has been long debate on its measurement issues. It is the best and most well-known indicator of inflation, which is further used for evaluating the monetary and fiscal policy of a country. Other uses of CPI for indexation are social security benefits, rents, contractual payments, taxation, deflating national income accounts, purchasing power parity index, inflation incidence for different income groups of population, impact of inflation on demographic composition of the population. Any measurement error in CPI may overstate or understate inflation that will have serious repercussions for monetary, fiscal and other economic policies. The report of the Boskin Commission [Boskin, *et al.* (1996)] has identified possible sources of bias in the CPI like substitution bias, outlet bias, quality bias, new product bias. In this paper we have tried to evaluate these biases and to start a debate on improving Consumer Price Index (CPI) construction in Pakistan. We found that there are biases of Commodity Substitution Bias, Outlet Substitution Bias, Quality Adjustment Bias, Index Calculation Bias and New Product Bias. Other limitations for the CPI index including; Issue of selecting a representative product (or good), Defining issue of average quality, Data collection, weights determination and Base year change were also found.

JEL classification: C43, E31, E52

Keywords: Consumer Price Index, Biases in CPI, CPI Formulae

1. INTRODUCTION

A Consumer Price Index (CPI) is an index number measuring the average price of consumer goods and services purchased by households. It is one of several price indices calculated by national statistical agencies. The percent change in the CPI is a measure of inflation. The CPI can be used to index (i.e., adjust for the effects of inflation) wages, salaries, pensions, or regulated or contracted prices. The CPI is, along with the population census and the National Income and Product Accounts, one of the most closely watched national economic statistics.

Two basic types of data are needed to construct the CPI: prices and consumption weighting data. The price data are collected for a sample of goods and services from a sample of sales outlets in a sample of locations for a sample of times. The weighting data are estimates of the shares of the different types of expenditure as fractions of the total expenditure covered by the index. These weights are usually based upon expenditure data obtained for sampled periods from a sample of households.¹

Relative prices of different goods and services change frequently, for example, in response to technological and other factors affecting costs and quality, which leads consumers to change their buying patterns. As there has been large increase in the lower and middle class, demand has increasingly shifted to services away from goods, and to characteristics of goods and services such as enhanced quality, more variety and greater convenience. But all these factors, plus others, mean a larger fraction of what is produced and consumed in an economy is harder to measure than couple of decades ago when a large fraction of economic activity consisted of a smaller number of easier to measure items such as flour and onions.² So the very first point is that inflation is inherently difficult to measure in a complex dynamic market economy. Rapidly changing behaviour of our economy puts tremendous pressure on a statistical system to keep up. There has been lot of research in this regard by the bureaus which are responsible for constructing CPI.

Theory of price indexes in our country is left to the specialists who mostly belong to international institutions like IMF, UN, World Bank etc. General guidelines suggested by the specialists are followed by the Federal Bureau of Statistics (FBS), which is the main agency for providing national

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¹ Wikipedia.

² Boskin, *et al.* *Journal of Economic Perspectives*. Vol. 12, No. 1, Winter 1998.

statistics. There is no research agenda by the FBS to improve the CPI. That is probably the reason that we failed to incorporate any remedial measure for several biases which were pointed out by the Boskin Commission more than a decade ago. The report of the Boskin Commission [Boskin, *et al.* (1998)] has focused a great deal of attention on the CPI program. This report has created an enormous amount of interest. It identified possible sources of bias in the CPI like substitution bias, outlet bias, quality bias, new product bias etc. This report has called into question the accuracy and relevancy of the CPI even when international standards are followed.

Since the release of this report, major revisions in the CPI are under consideration in the light of issues raised in Boskin Commission report. New Zealand, Australia, Canada, Japan and European countries are the ones which took lead in this regard. Many issues on CPI methodology, like outlet bias, substitution bias, etc. have been the centre of considerable research in these countries. On the contrary developing countries are facing two main constraints in revising the construction of the CPI. The first one is the lack of sufficient trained economists and statisticians in the area of price statistics, and secondly limited resources available to the central statistical agencies which could be used for financing studies on the CPI.

However if the CPI contains substantial amount of measurement errors and given that an upward trend in the last few years is not measured with accuracy, the cost of such bias can be substantial. Consider, for example, potential ramifications on heated debate over the monetary policy, especially on inflation targeting. It goes without saying that the very idea of inflation targeting hinges on the accurate and timely measure of inflation rate.³ As consumer price data collected by the Federal Bureau of Statistics are also used for national income statistics, miss-measurements in CPI can also lead to serious errors in GDP statistics as well. All these concern makes our study interesting with reference to Pakistan and demands for exploring the problem in detail.

In section two we shall discuss “who is covered and how is covered in CPI”, possible biases in CPI measurement and other technical issues. But the main focus of this chapter remains on pointing out substitution bias, outlet bias, formula bias, new product bias etc. In section three we shall discuss the results of our survey which we have carried in order to see whether these biases exist in consumers buying patterns or not. For this we surveyed more than 450 households mainly from urban area of Rawalpindi. In section four we shall highlight the importance of using geometric mean index formula instead of Laspeyres index. Finally in section five recommendations regarding formula use, whether one CPI or different CPI for different population segments, dealing with outlet bias, new product bias etc. will be made.

³Mismeasurement of CPI by Ariga, K., Matsui, K. NBER Working Paper No. 9436, Issued in January 2003.

This study will be a useful contribution in correctly measuring inflation in Pakistan and will serve as a guide to organisations using CPI for policy decisions. However it is also recommended that there is still need for a more comprehensive study on measuring inflation accurately.

2. STATISTICAL CONSTRUCTS OF CPI

2.1. Who is Covered?

The CPI market basket represents the purchases of people living in urban areas for different income groups. Currently all the rural population and those living in small towns are ignored altogether. This practice will most probably continue to hold for another 5-10 years as there has been no such plan on the part of the government to revise the CPI estimation for this major segment of population of the country.

2.2. Assumptions of the Consumer Price Index

The first question to answer is “What is the domain of the CPI to be covered?” The CPI focuses on consumer expenditure on goods and services out of disposable income. Hence, it excludes non-market activity, broader quality of life issues, and the cost of benefits of most government programs. It also excludes saving, which is invested to finance future consumption. Hence, when the forward price of future consumption; for example when returns available to savers improve because of market forces, deregulation, tax law changes or financial product innovation (such as widespread availability of low-cost mutual funds), no direct account is taken in the CPI.

Second, one has to define commodities and services the prices of which one wants to measure them, how to collect data on them, over what span of time and what interval, where and when to collect the data, and how to aggregate them into one or several overall summary statistics. At each of these levels various judgments and assumptions must be made to make practical headway [Boskin, *et al.* (1996)].

2.3. How is the Market Basket Chosen?

As per current practice for calculating CPI described by the Federal Bureau of Statistics, the CPI series covers 35 urban centers of Pakistan. Depending upon the size of the city, 1 to 13 markets have been selected from where the prices are obtained. The markets have been chosen keeping in view the volume of sales, assuming that majority of the category of employees for CPI make the purchases from these markets. Thus, the prices represent the actual consumer prices. The number of markets covered in 35 cities is 71. The names of the cities and number of markets in each city are given in Table 1 below.

Table 1

City and Market Coverage

Name of City	Name of Market	Name of City	Name of Market	Name of City	Name of Market
Lahore	7	Jhelum	1	Shahdadpur	1
Faisalabad	2	D.G Khan	1	Kunri	1
Rawalpindi	6	Mianwali	1	Peshawar	3
Multan	3	Attock	1	Mardan	1
Gujranwala	1	Samundri	1	Abbotabad	1
Sialkot	1	Vehari	1	D.I Khan	1
Sargodha	1	Karachi	13	Bannu	1
Islamabad	4	Hyderabad	4	Quetta	2
Jhang	1	Sukkur	2	Khuzdar	1
Bahawalpur	1	Nawabshah	1	Turbat	1
Bahawalnagar	1	Larkana	1	Loralai	1
Okara	1	Mirpurkhas	1	Total Markets	71

Source: http://www.statpak.gov.pk/depts/fbs/statistics/price_statistics/methodology_price_statistics.html

2.4. Income Groups and Occupational Categories

As the consumption pattern of individuals depends on their income level and occupation, the population under observation is therefore, categorised under various income groups and occupational categories. This serves to ascertain the impact of price changes of various commodities on their purchasing ability. The income groups covered in the CPI are given in Table 2 below. In the base 2000-2001, the occupational categories of employees have not been considered and only following four (4) income groups are covered.

Table 2

Income Groups

Groups: G1	Upto Rs 3000/-
G2	Rs 3001/ to Rs 5000/-
G3	Rs 5001/ to Rs 12000/-
G4	Above Rs 12000/-

Source: http://www.statpak.gov.pk/depts/fbs/statistics/price_statistics/methodology_price_statistics.html

2.5. Basket of Goods and Services

The current CPI covers 374 items in the basket of goods and services, which represent the taste, habits and customs of the people. This basket has been developed in the light of results generated through the Family Budget Survey conducted by the FBS in 2000-01. The basket of goods and services comprises on 10 major groups (2000-2001 base). The groups and number of items covered in each group and weights in 2000-2001 base year are given in table no three below.

Table 3

Consumption Groups and Consumption Weights

Sr. No	Group	Number of Items (2000-2001)	Weights
1	Food and Beverages	124	40.34
2	Apparel, Textile and Footwear	42	6.1
3	House Rent	1	23.43
4	Fuel and Lighting	15	7.29
5	Household, Furniture and Equipments	44	3.29
6	Transport and Communication	43	7.32
7	Recreation and Entertainment	16	0.83
8	Education	24	3.45
9	Cleaning, Laundry and Personal Appearance	36	5.88
10	Medicare	29	2.07
Total		374	100

Source: http://www.statpak.gov.pk/depts/fbs/statistics/price_statistics/methodology_price_statistics.html

2.6. Conceptual Basis of Consumer Price Collection

Consumer prices for computation of CPI are collected from retail stores and service establishments. These are the prices at which they are sold direct to the consumers. In other words, the FBS collects transaction prices as against list or tag prices fixed by the manufacturers or various price-monitoring agencies.

2.7. Method and Frequency of Data Collection

FBS staff located in 35 Regional/Field offices collects price data regularly on monthly basis. They personally visit shops, stores, and establishments according to a predetermined time schedule and collect the prices of the selected items. Prices are reported in schedules developed for this purpose. The contents of the schedules include name of the city, item, its specification and unit price quoted by four different shopkeepers. The time schedule for collection of prices is given in Table 4 below.

Table 4

Time Table for Collection of CPI Prices

Name of Schedule	Frequency Data	Date of Collection
Part-I Food and beverages	Monthly	11-14 of each month
Part-II Apparel, Textile, Footwear, Fuel and Lighting	Monthly	1-3 of each month
Part-III Household, Furniture and Equipment etc. and Transport and Communication	Monthly	4-6 of each month
Part-IV Recreation, Entertainment and Education Cleaning, Laundry and Personal Appearance and Medicare	Monthly	7-10 of each month

Source: http://www.statpak.gov.pk/depts/fbs/statistics/price_statistics/methodology_price_statistics.html

2.8. Supervision of Price Data Collection

One Statistical Officer in every Regional/Field office has been made responsible for the technical supervision of work done by the price collectors. He is required to ensure that technical aspects of price collection are clearly understood and instructions laid down in this regard are followed by the Price Collectors. For this purpose, he is required to visit the markets unannounced and check prices on sample basis. He also collects prices independently from the markets and compares to those collected by the Price Collectors. The Chief Statistical Officer of Regional office also undertakes field checking of price collected by the price collectors. Senior Officers also carry out field inspections.

2.8.1. Editing/Checking of Price Schedules at Headquarter

Price data are checked and scrutinised at the headquarters to ensure maximum accuracy. In the event of any doubt or abnormal variations, clarification is immediately obtained from the price reporting centers.

2.8.2. Calculation of Average Prices at Market, City and National Level

For each item, four quotations from different shops in a market are obtained. Average of these four quotations is taken as a representative price for that market in a city. The city average price for each item is obtained by averaging its prices in all the selected markets of the city. The National average price of an item is obtained by taking the average of its price in all the 35 cities or all the cities covered in CPI.

2.9. Weights

Data collected through Family Budget Survey provide the details of commodity-wise expenditure of households of different occupational categories and income groups. The results of Family Budget Survey provide the average percentage expenditure of households on commodities for each occupational category of employees and for each income group in each city. These average percentage expenditures on commodities and commodity groups are called weights and used in the computation of the CPI. These weights are different for different occupational categories and income groups.

2.10. Possible Biases in the CPI

Since the CPI is constructed by surveying prices of specific goods and services at specific outlets for a fixed consumption basket at a specified base period, it does not properly reflect changes in consumers' purchase behaviour in response to relative price changes. The CPI provides an estimate of 'representative' price change. The issue of 'bias' arises where the practices or decisions on which items to price, the weights, and where to price those items,

run the risk of becoming unrepresentative over time. Given limited resources and time constraint it is not possible by any statistical agency to get rid of all the biases in the CPI. There are inherent limitations in constructing CPI and these limitations are as follows:

- Substitution over time in the items purchased by consumers (item substitution bias).
- Substitution over time in the outlets where those purchases are made and new outlets entering the market where those prices are not being collected (outlet and new outlet substitution bias).
- New product entering market and not being incorporated in the CPI (new product bias).
- Making adjustment to reflect changes in the quality of products (quality change bias).

2.10.1. Substitution Bias

Substitution bias refers to the fact that consumers respond to price changes by substituting relatively cheaper goods for goods that have become more expensive. For example as the price of mutton rises, families may substitute chicken for mutton. The households' market baskets change (perhaps with no decline in utility) keeping expenditures down, but the CPI reports inflation of the original market basket. For example, suppose in one month the price of mutton is Rs 200 per kg and the price of chicken is Rs 150 per kg, and that the household consumes 1 kg of each for a total expenditure of 2 kg. Next suppose the next month the price of mutton rises to Rs 250 and the price of chicken remains the same. The fixed market basket would report an expenditure of Rs 400 (1 kg of each again), a 15 percent inflation rate. In fact, the household may cut back to 0.5 kg of mutton and 1.5 kg of chicken with an expenditure of $0.5 \times 250 + 1.5 \times 150 = 350$, yielding a 0 percent inflation rate. Thus the utility level of individual may or may not change at all.

Substitution bias can occur both within item categories (e.g., consumers might substitute golden delicious apples for kala kulu apples when the price of kala kulu rise) and across item categories (e.g., consumers might substitute oranges for apples if the price of apples rises). The former is called lower level substitution bias and the latter high level substitution bias.

Shiratsuka (1999) has divided these substitution effects into the following forms.

- (i) Substitution among item levels,
- (ii) Substitution in aggregating individual prices surveyed into item levels,
- (iii) Substitution among brands within the same category,
- (iv) Substitution among the outlets, and

- (v) Substitution induced by the emergence of new discount outlets (outlet substitution effects).

He has further elaborated his ideas as follows:

- (1) Substitution among item levels: This bias is induced by the fact that the weight used to calculate the weighted average of prices is fixed at that of the base period. For example, chicken and meat are generally thought to be substitutes, thus there will be a shift in household expenditure from meat to chicken when the prices of meat increases. Since the weights applied to meat and chicken in the CPI are those of the base period, an upward bias is introduced by the overvaluation of the price increase of meat.
- (2) Substitution in aggregating individual prices into item levels: This bias is introduced at the stage of aggregating individual prices, which are at a lower level than the publicised items, into the item levels.
- (3) Substitution among brands within the same category: This bias is induced by the fact that there exist many goods other than those surveyed which are close substitutes. For example there are several varieties of clothing, computers, shoes, educational institutions. How representative items for these categories are determined and how prices are collected is an issue which needs serious thought.
- (4) Outlets Substitution effects: There are many outlets which start its business in the market and takes over the others in terms of sale share. Since FBS collects prices from a specified outlet for a period of ten years, therefore, it fails to capture the effect of new outlets. It also fails to include most of the discount stores, thus not reflecting consumers' shift from retail shops and departmental stores to discount stores as well.

2.10.2. Formula Bias

Best practices guidelines, as set out in the ILO manual on the CPI, emphasise on the use of appropriate index formula. The formula recommended by the ILO is to use geometric mean index to calculate price movement of individual items in the CPI. However this formula is recommended only for those items which are close substitute of each other. The use of this formula will implicitly assume that consumers consume relatively more goods and services that are relatively cheaper. Currently FBS is using Laspeyres index which does not allow any substitution and it assumes that consumers will always have a fixed basket of goods and services which she will use independent of prices. This practice of assuming that no substitution takes place is basically contrary to what an introductory microeconomics student study in her classes. The theory of

consumer behaviour indicates that consumers will buy relatively more of the items that have become less expensive than the other items in their consumption bundle. We shall highlight the issue of appropriate index in more detail in a separate chapter.

2.10.3. *New Outlet Bias*

The opening of a new discount outlet may give consumers the opportunity to purchase the same goods at a lower price. The FBS ignores these price changes altogether. To take the price changes completely into account would bias the CPI downward, since purchasing at discount stores tends to be accompanied with lower levels of service; discount stores tend to have less knowledgeable sales staff, less variety, less convenient store hours and less liberal return policies. However, some economists believe that ignoring outlet switching effects altogether biases the CPI upward because price differentials are not totally offset by differences in service quality, especially as discount stores have taken advantage of more efficient technologies of distribution. For example, Wal-Mart, a discount chain, has the most sophisticated distribution system of any retailer. Wal-Mart has become the largest retailer in the US suggests that consumers do not consider the Wal-Mart's lower prices to be offset by inferior service.

2.10.4. *Quality Change Bias*

The Federal Bureau of Statistics does not make any attempt to adjust for quality changes. However there is a debate whether one can estimate the effect of quality on CPI properly or not. Quality improvements may not be completely factored in several items of the consumption basket e.g.; apparel, new and used cars, and professional medical services. We are not incorporating this issue in our report because it is yet difficult to incorporate quality issue in our CPI. This requires a separate and comprehensive treatment. On the quality issue Deaton (1998) is of the view that dealing with issues of quality bias are of utmost importance.

According to him: *“But the practical difficulties of making quality corrections are only the beginning; the analytical basis for such adjustments can be challenged even in principle. A useful way to think about quality is provided by Fisher and Shell’s (1971) ‘simple repackaging’ model. According to this, quality works by scaling up or down the ‘goodness’ of goods, so that ‘effective quantity’ is quantity multiplied by quality; one gallon of gasoline will now do what two gallons used to do, or one day in hospital now will yield the same benefit as five days a decade ago. New goods can be thought of as having always been present, but at a quality and price that made no one want to buy them”.*

2.10.5. *New Product Bias*

New products and new models of existing products tend to have a “product cycle.” A typical new product is introduced at a relatively high price with low sales volume. Improvements in manufacturing techniques and higher sales volumes usually allow prices to be reduced and quality to improve. Later, when the product “matures,” the price will tend to increase more rapidly than average. This pattern can be seen with many familiar products such as microwave ovens, VCR's, and cellular telephones. As with quality changes, the Bureau of Statistics has methods to continually incorporate new products into the market basket, because the interval between the major revisions of the market basket (approximately ten years) is too long. However, there tends to be lag between introduction of a new product and its inclusion in the market basket, so that new products tend to be included later in their product cycles. The result is that the CPI might be biased upward.

2.10.6. *Time of Month Bias*

The Bureau of Statistics does not collect prices on weekends and holidays when certain items are disproportionately put on sale in certain outlets. There is some evidence that the fraction of purchases made on weekends and holidays has increased as well. This effect would make the CPI less representative of the average consumer and bias it upward.

2.10.7. *The New Good Effect*

We have a very dynamic economy and new goods and services become part of consumption basket. These goods and services are not brought into the consumption basket for at least ten years when the next family budget survey takes place and basket is revised. New products and services are high in demand and are relatively less expensive than the old products on a quality adjusted basis. Unless these products are not reflected in the CPI, there are measurement problems in CPI. For example mobiles, internet, use of own transport, ovens etc are in wide use for the last 8-9 years but will not be reflected in our consumption basket until the next year. This time lag introduces bias in measuring CPI.

2.11. Problems with the CPI⁴

The CPI is widely used as a cost of living index, but technically it is not. The CPI measures the average change over time in the prices paid by urban consumers for a relatively fixed market basket of goods and services. A cost of living index would measure changes over time in the amount that consumers need to spend to reach a certain utility level or “standard of living.” The CPI

⁴For more detail <http://qrc.depaul.edu/djabon/cpi.htm>

completely ignores important changes in taxes, health care, water and air quality, crime levels, consumer safety, and educational quality. Furthermore, the experience of any individual may vary dramatically from what the CPI indicates, because an individual's purchasing patterns may differ considerably from the standard market basket. Families with many children have considerably different buying patterns than small households, for example. The CPI does not even attempt to represent the experience of people living in rural areas. Even accepting these limitations of application, the CPI has some possibly serious limitations in measurement. These limitations fall into two broad categories.

2.11.1. *Sampling Errors*

The CPI measures the prices of only a sample of items from pre-specified outlets in specific cities. The items are identified by household integrated economic survey. Then information about expenditure about these items is collected from the Family Budget Household survey. This survey is carried out after a period of ten years. It determines how much consumers spend for different classes of items and also how much they spend at each of the places from which the items were bought. Even after one has chosen a sample of items and specified outlets, one must choose which particular models or brands will be priced and on which day of the month prices will be collected. No attempt has been made so far to cover sale seasons and no sale seasons in their proper proportions.

2.11.2. *Non-sampling Errors*

More significant than sampling errors are possible sources of systematic error. Most of these errors are thought to bias the CPI upward, so that the CPI would tend to report more inflation than consumers are really experiencing.

2.12. *International Comparisons*

The calculation of CPI for each country is different but there are some international guidelines which are followed in order to make data comparable across the countries of the globe. These differences in methodology of the price construction can lead to biases. The most obvious of all the biases is the index bias related with Laspeyres index which assumes fixed basket of goods and services with zero substitution. Statistical agencies in most of the countries are responsible for properly estimating the CPI and reducing different biases. Extensive research has been carried out in this regards in developed world, and developing countries have also started following suit.

2.13. *Impact of Inflation on Economy*

CPI, one of the most important statistics, is released by the Federal Bureau of Statistics. Rising inflation can influence election and change

government's economic policy. It has link to large parts of the economy shared by other statistics. High inflation reduces buying power. Therefore, governments become under pressure to raise salary, pension and other social benefits. The CPI is also important both to the government and the individuals for future planning. Saving for the retirement age or for the education of children requires that we have to take account of our falling buying power of the rupee. The worst aspect of the weakening economy is a high inflation, growing at an alarming pace. It has stemmed from food shortage and cost push factors like high energy prices. The hardest hit is the poor. Sensitive price indicator which measures the price trend of 53 essential commodities mostly consumed by the poor has shown an increase of around 27 per cent in May, 2008.

The impact of inflation is not confined only to the poor but it has wide repercussions for the economy as a whole. It has exorbitantly increased the public debt, created uncertainty for the investor and eroded the competitiveness of exports. It has made difficult the task of maintaining the exchange rate stability and distorted the targets of monetary aggregates. Recently this has compelled the central bank to further tighten the monetary policy by raising the bank discount rate, CRR for some deposits and take other stringent measures which affects the business as a whole.⁵

2.14. Cost of Living Index and the CPI

There are two main approaches to measuring cost of living indexes. The first uses estimated system of demand equations to make exact utility comparison accounting for substitution estimated in the demand system. However, the number of parameters must be estimated in a full system of consumer demand series with the square of (one less than) the number of commodities and quickly becomes impossible to implement at any detailed level of desegregation.

The second approach uses mathematical formulas to calculate index numbers, usually at a more, often extremely, detailed level of disaggregating. The most common index number formula is Laspeyres index, which measures the change in the cost of a fixed basket of goods from a base period; that is, it assumes no substitution due to relative price change. Thus it, usually is an overestimate of a "true" cost-of-living index. At the other extreme is the Paasche Index, which weights more on current consumption pattern, and thus likely overstates substitution and understates the change in the cost-of-living index relative to an earlier base period.

2.15. Uses of the Consumer Price Index

Due to several complications like correcting for substitution bias, quality (the most serious) bias, outlet bias, new goods bias etc it becomes all the

⁵Dr Mushtaq Ahmed *The News* (02-06-08).

important for the government to use the CPI in a very careful way. The performance of the economy, the extent of the productivity slowdown, and the conduct of macroeconomic policy are all affected by the measurement of inflation. FBS should keep in mind the needs of the users in deciding on the group of households and range of consumption goods and services covered by a CPI. As the prices of goods and services do not all change at the same rate, or even all moves in the same direction, changing the coverage of the index will change the value of the index. Thus, there can be no unique CPI and a range of possible CPIs could be defined.

While there may be interest in a CPI which is as broadly defined as much as possible for covering all the goods and services consumed by all households, there are many other options for defining CPI covering particular sets of goods and services. It which may be more useful for particular analytic or policy purposes. There is no necessity of having a single CPI. When only a single CPI is compiled and published, there is a risk that it might be used for purposes for which it is not appropriate. More than one CPI could be published in order to meet different analytic or policy needs. It is important however, to recognise, that the publication of more than one CPI can be confusing to users who view consumer inflation as a pervasive phenomenon affecting all households equally. The coexistence of alternative measures could undermine their credibility for many users (CPI manual by the International Labour Organisation (ILO)).

CPI is also used for indexation purpose which is most commonly applied to monetary flows such as wages, rents, interest or taxes. The objective of indexation of money incomes may be either to maintain the purchasing power of those incomes in respect of certain kinds of goods and services, or to preserve the standard of living or welfare of the recipients of the incomes. When the indexation applies to monetary assets or liabilities, it may be designed to preserve the real value of the asset or liability relative to other assets or relative to the value of specified flows of goods and services.

Another main objective behind the compilation of the CPI is indexation of wages. In this case it has direct implications for the coverage of the index. First, it suggests that the index should be confined to expenditures made by households whose principal source of income is wages. Second, it may suggest excluding expenditures on certain type of goods and services which are considered to be luxurious or frivolous.

CPI is also used for indexing rent and interest payments. Bonds issued by the government should be indexed to the CPI in order to maintain their real wealth by compensating for rise in inflation.

Other uses of CPI for indexation are social security benefits, rents, contractual payments, taxation, deflating national income accounts, purchasing power parity index, inflation incidence for different income groups of population, impact of inflation on demographic composition of the population.

As discussed above whether one CPI will serve all these purpose or not? Should there be more than one CPI? Which CPI should be considered for the country as a whole? These are all very fundamental questions which are in need of serious thought. We shall comment on it now.

2.16. One CPI or More?

For monetary policy there should be only one CPI. But for indexation purpose and CPI to reflect cost of living index there should be more than one CPI. We think that CPI should be constructed separately for at least three groups of population: Urban, Rural and Poor. Obviously this will require additional resources and cost for the FBS. Whether CPI should reflect inflation or compensation? This is another important question. As SBP is one of the main users of CPI, therefore, we think that the CPI measuring inflation should be constructed at monthly frequency as is presently the case.

For poor and rural population another CPI should be constructed and it may have only an annual frequency. In this way FBS will save not only the cost but also construct an index which will reflect cost of living index cum compensation index.

2.17. Suggestion for Dealing with New Product

Much of the improvement in standards of living in modern world derives from new products, including major innovations such as in light, transportation, communications, and so on. [Nordhaus (1996)]. Therefore this should be given due consideration.

When a new product enters the market and if it fits fairly to an already existing category, then it may be rotated in. However, if a new product does not fit neatly into an existing category, or is “missed” for other reasons, it takes at least 10 years before the product is introduced into the CPI. It is a very difficult to handle the problem of new products but likely to be quantitatively very important.

3. SAMPLE SURVEY, DATA AND ANALYSIS

In order to see whether issues mentioned in chapter two are relevant to our CPI calculation or not, we have constructed a small survey from Rawalpindi and analysed its results in this chapter. For any good survey and research activity, well-developed tools, techniques, and methodologies are very important especially for research based on primary data. There are number of steps involved in any primary level empirical research. Brief description of each step is presented in the following paragraphs.

3.1. Sampling Technique

There are many sampling techniques for surveys; among them most popular and sound is the multi-stage sampling technique. Usually in first stage

clusters are selected randomly. On the basis of selected clusters, stratified proportional sampling techniques is used to select wards especially in urban areas. Finally, in household surveys, number of households is selected on population proportionate to size (PPS) criterion and sampling technique is usually systematic with random start, while in respondents/individual surveys number of individuals are selected randomly.

In this study, for the first stage random sampling technique was adopted for the selection of Union Councils (UCs) from the Rawalpindi city. From the selected UCs stratified proportional sampling techniques was used for the selection of wards. In the third stage the households have been interviewed randomly which belongs to that ward. The multi-stage systematic random sampling technique was used to collect the information of Four Hundred (488) individuals/respondents. Total Population of Rawal town is 9.4 million approximately. At first stage Ten (10) union councils were selected randomly out of Forty Seven (47) councils of Rawal Town. Then we have selected a sample of 48 to 50 households randomly from a randomly selected sample of 10 union councils are listed in Table 5 below.

Table 5

List of Union Councils Selected

Sr. No	Name of the Union Council	Sr. No	Name of the Union Council	Sr. No	Name of the Union Council
1	Waris Khan	4	Dhok Kashmirian	7	Muslim Town
2	Dhok Khaba	5	Kyaban-e-Sir Syed	8	Shah Khalid Colony
3	Dhok Ratta	6	Satellite Town	9	Gulzar-e-Quaid
				10	Imam Bargah

3.2. Team and Training

For field data collection a multidisciplinary team was constituted, which consisted of female and male enumerators and all were master degree holders. One day extensive training for field survey, data collection, questionnaire understanding, etc was conducted at Statistics Department Q.A.U. Islamabad. Objective of the training was to acquaint the field team with questionnaire. The team also visited different streets for field experience and questionnaire was also pre-tested. During and after the field visits, the observations, clarifications, suggestions, and explanations related to the questionnaire were discussed, explained and elaborated. Majority of the enumerator were experienced, belong to the city and were involved in different surveys.

3.3. Pre-testing

For examining the adequacy of questions and their proposed responses with respect to their clarity of language used in the questionnaire, relevance of

the question, response on questions related to their income and expected frequencies, we carried a pre-testing survey from 100 households of Islamabad and Rawalpindi. In the light of this survey some minor changes were made before launching of the actual survey. This pre-testing was carried out by the experienced enumerators who were well trained in conducting such surveys.

3.4. Field Work

There are different ways of collection of information, such as door to door or inter-face enumeration, mailing enquiry, searching of official record, exploration through electronic media etc. Data collection from individual households through visiting them is still the most preferable and reliable mechanism, so we followed this approach.

The role of supervision and monitoring in enhancing the quality and coverage of censuses and surveys cannot be ignored. Thus for continuous monitoring of the work a supervisor was there to monitor the enumerators. Logistic supplies were ascertained and proper facilities to the field staff were provided. This all was to ensure smooth flow of fieldwork.

One main problem faced by the field staff was that sometimes respondents refused to cooperate when almost more than two third part of the questionnaire was complete. For which we replaced the households in order to ensure complete information.

3.5. Processing of Data

Data processing is required in connection with the results of pre-test, pilot test, compilation of preliminary results, preparation of tabulations, evaluation of survey results, analysis of data, arrangements for storage and retrieval from database, identification and correction of errors and so on. Thus, plans for data processing are developed in the beginning as an integral part of the overall planning of the survey. Processing of data has an impact on all aspects of survey ranging from selection of topics and designing of questionnaires to the analysis of data. Therefore, data processing requirements in terms of space, equipment and manpower were identified and submitted to the PIDE as an essential pre-requisite for successful execution and implementation of the survey which was approved as such.

3.6. Data Entry and Coding

While developing questionnaire utmost care is given to make self-coded response categories. Data entry was made by the technical assistant and data cleaning was later on carried out by the Principal investigator. Now we come to the results and discussion.

3.7. Is the CPI Basket Representative?

FBS calculates CPI by collecting data either on one item or very few items and assumes that it is representative basket. Whether this item is representative or not is open to question. For example there are varieties of lawns available in the market particularly for ladies. Which of these is representative is hard to find out. Our survey results indicate that even for one city there are several responses regarding lawn choices what to talk about the whole country. To best of our information current method of collecting prices should be replaced with somewhat technical methods used in sampling theory and probability theory as is the practice in some advanced countries.

This problem of representative item selection exists in almost all the categories ranging from vegetables to electronics goods. How a price of TV which varies from few thousand to many thousand is collected is hardly justifiable by the FBS. Quality change is another issue. Even to collect a price on average quality apple is hard to define. Best mechanism is to collect few prices on the same kind of apple from the same market and then calculate the geometric mean index before calculating Laspeyres index.

The results for both shoe choice and cloth choice indicate that FBS mechanism of selecting one item as representative is clearly biased either upward or downward. FBS collects price only on one item among a group of items and claim that it picks average quality item which is very vague because how one good from a class of hundreds of goods can be classified as average quality is hard to define. This issue of selecting average quality goods exists for most items of the CPI basket. In our survey we have collected information from Rawalpindi about their choices regarding clothing and footwear and results indicate that FBS should use some advanced statistical mechanism for selecting a good to be included in the CPI basket.

3.7.1. Cloth

Our results show that one brand/variety for the cloth is not representative of whole cloth market in even this small sample then how it can represent the whole urban population. There are so many brands like AL-JANAT, AL KARAM, CLASSIC LAWN, GUL AHMED, FIRDOS LAWN, SITARA LAWN, COTTON and NON-BRANDED CLOTHS which take a solid percentage in the first priority for ladies garments. For gents AL KARAM, BONANZA, COTTON, GUL AHMED, GEANS, LATHA, WASH& WEAR AND NON BRANDED CLOTH have more market than others so it would be unjustifiable to take only one brand of cotton or lawn as representative items for cloth.

3.7.2. Footwear

As FBS has taken BATA as the representative footwear it is shown from our sample that 12 percent of the person take BATA as their first priority and for other brand for ladies it is METRO: 25.5 percent, LOCAL BRANDS: 5.6 percent, NONBRANDED: 12.5 percent, Service: 9.4 percent and STYLO: 8.5 percent as their first priority. Therefore, it is unfair to represent the shoe market with BATA shoes only. For gents even the BATA take 29.5 percent as first choice but other brand like SERVICE: 18.6 percent, METRO: 7 percent, NONBRANDED: 12.5 percent and HUSH PUPPIES: 3 percent is not that less that we can neglect it all along

So we can suggest that either the best possible market representative should be taken or mean value of more than two most popular in use brand shall be taken as representative.

3.8. Outlet Bias

FBS collects data on prices from the same outlet for a period of ten years and it has no mechanism to adjust for introducing outlets in the system. There is a chance of ignoring those outlets which captures a major share of consumer spending. Consumers prefer to purchase products depending on prices, quality, brand name etc. When we asked questions to capture outlet bias we found that this is a serious issue which needs to be addressed immediately. Although it is difficult for us to gauge the exact magnitude of such bias yet our descriptive analysis of survey indicate the existence of the issue.

Furthermore, it has been found that consumers are very clear in their perception about price differential from one outlet to another. They think that same item can be purchased with fewer prices by changing outlet. FBS does not incorporate any concession in prices in estimating the CPI which consumers often get during off seasons. This introduces bias in the CPI and thus reflects higher prices than actually the case.

When a new shop is opened in any locality most of the consumer visit that at least once. If the prices offered by that outlet are less than others then it attracts a lot of buyers in the market. Further even if the quality of the existing product is good many consumers will go for new outlets. The newly opened shops usually offers discounts in the beginning to attract the consumers thus the impact of the outlet in the month it is opened is the most and then reduces afterwards. That effect is to be captured as it can also cause an outlet bias in the data.

Following are graphs which shows the outlet bias for our the sample collected;

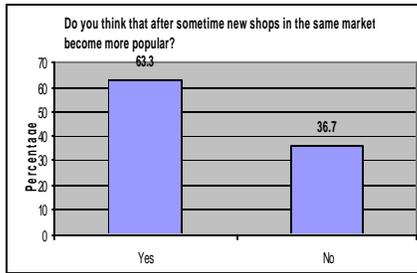
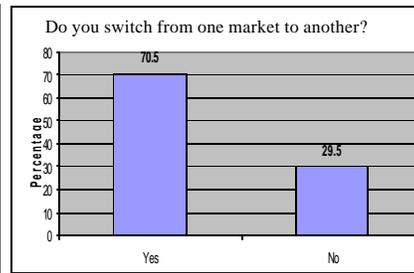
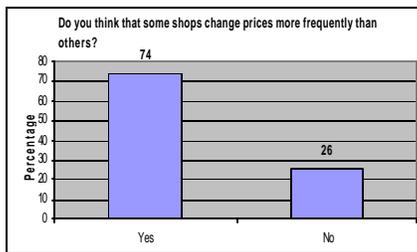
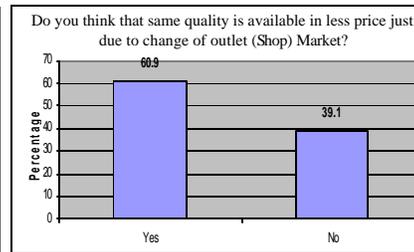
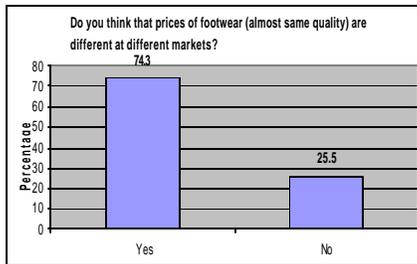
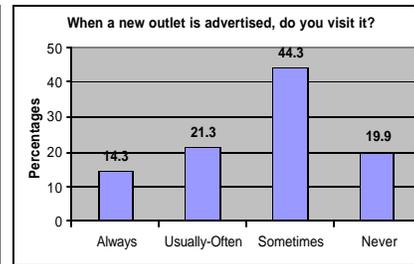
Fig. 3.1.**Fig. 3.2.****Fig. 3.3.****Fig. 3.4.****Fig. 3.5.****Fig. 3.6.**

Figure 3.1 shows that 63.3 percent of the consumers are of the view that after an interval of time new outlets become more important than the old ones. Whereas Figure 3.2 shows that almost 71 percent of people shift from one outlet to other if it causes even a little price difference. In Figure 3.3 results show that 74 percent of the consumers are of the view that some shops change their price more frequently than others, hence the consumer would switch accordingly. Results in figure 3.4 shows that 61 percent consumers are of the view that same quality is available in fewer prices on different outlets. The results in figure 3.5 show 74 percent of consumer says that same variety of footwear is available on different store at different price. While above graph in figure 3.6 shows that almost 80 percent of people visit the new outlet when it is

advertised. In which almost 14 percent always visit and 21 percent often visit whenever there is a new outlet.

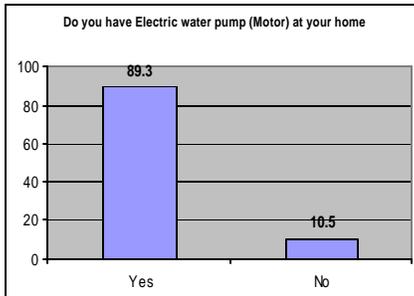
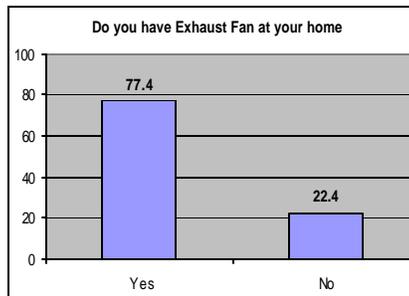
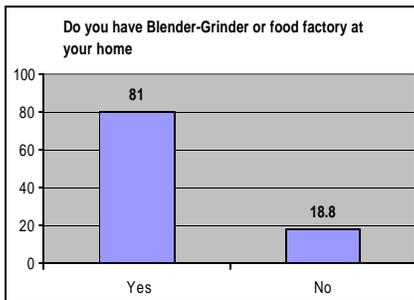
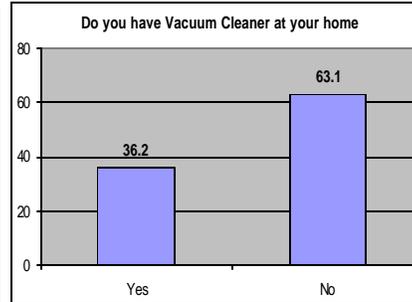
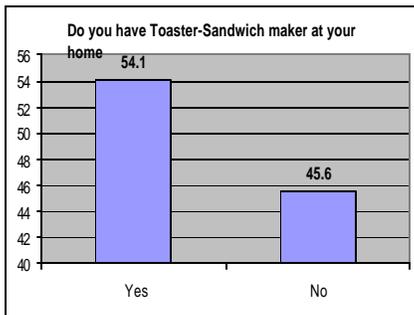
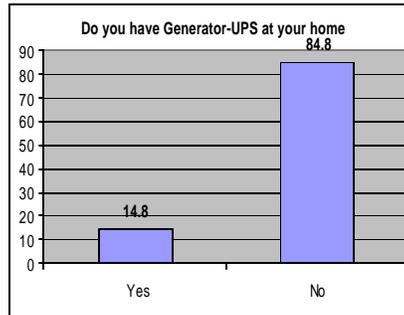
It can be shown from the above graphs regarding outlet bias that consumer do not bind them selves to one or two or some specific out lets in the market. As they are free to choose between different shops specially when a new one is introduced. The most serious issue associated with outlet bias is the new outlet bias. Usually the new shop in the market attract more consumer then the specified ones further more newly opened outlet often offers discounts thus the effect of new outlet on the market should be captured in time because it reduces with the lag difference.

So we can see from the above tables that as 63.3 percent of the respondents say that after some time new shop gets more market share than the old ones so ignoring such outlets for 10 years of validation of CPI introduces an outlet bias.70 percent people switch from one outlet to other so it is wrong to assume that one outlet as representative for such a long time.74 percent person says that prices changes with the outlet and 61 percent says that same quality will be available in less price just by changing shop marts so the person will naturally move for less price rather than sticking with the same outlet.74 percent of the persons have said that almost the same quality of footwear is available in different price in different market and most of the persons i.e. almost 80 percent visit the new outlet clearly indicating the outlet bias and the claim remains that the person will move to the outlet having less price for same quality.

3.9. New Product Bias

If a new product becomes part of consumption basket, its price would not be included in the CPI. For example our cell phone expenditures has not been part of CPI so far and when it will be included in the CPI, its prices will not be true reflection of consumer expenditure due to decrease in prices when product becomes very common. There are several other items which are missed altogether from our consumption basket although these items are major share of our monthly or annual budget. For example there has been no information collected on home generators or UPS in under progress family budget survey. These items will not be part of our consumption basket for a period of at least next six years.

Following Figures 3.7, 3.8, 3.9, 3.10, 3.11, and 3.12 show the results collected on some of the items which are not part of undergoing family budget survey, which are also part of our daily life:

Fig. 3.7.**Fig. 3.8.****Fig. 3.9.****Fig. 3.10.****Fig. 3.11.****Fig. 3.12.**

Above graphs shows that almost 89 percent of people have water pumps (motor) in their homes 77 percent have exhaust fans, 81 percent have blender grinder/food factory, 36 percent have vacuum cleaner, 54 percent have sandwich maker, and 15 percent have generator/ups in their homes. So there are so many new products which are frequently used in daily life and these items can not be ignored. So it is suggested that most of them should be incorporated in the electronic category of Family Budget Survey as far as urban population is concerned.

3.10. Substitution Effect

As we discussed earlier that due to the substitution bias the consumer shift from products having higher prices to items having lower prices when latter are considered as substitute of the former. In order to see whether there is substitution bias we analyse some of the questions which we asked in our survey. Our findings suggest that consumers switch from one item to another among the substitutable categories depending on the prices.

Moreover consumers use flexible basket of goods and services. It reflects that people substitute among different categories depending on the prices of these items. For example response to question number one indicates that almost 60 percent consumers shift to chicken and 16 percent to beef if price of mutton goes up. So ignoring other substitutions like less consumption, even more than two third consumers response indicates of substituting mutton with beef and chicken.

Similarly 40 percent consumers in our sample respond that they have fixed budget for buying fruit which is an indication that either they buy a small amount or they buy some other fruit that might not be a close substitute or they make a compromise on quality. 67 percent consumers change their mind while shopping if prices are not as per their expectations. Similarly in response to a question that if price of a vegetable goes up, 90 percent responded that they will substitute either with a cheaper vegetable or pulses or will purchase a small quantity.

Fig. 3.13.

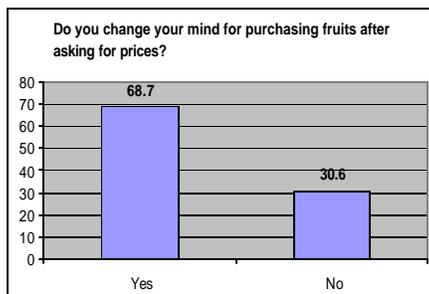


Fig. 3.14.

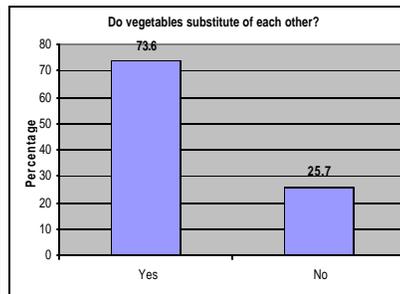


Fig. 3.15.

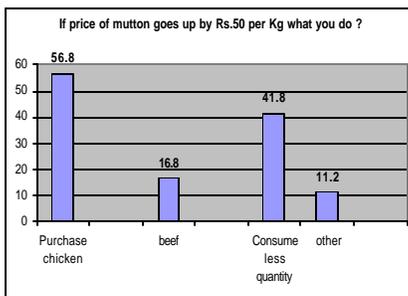


Fig. 3.16.



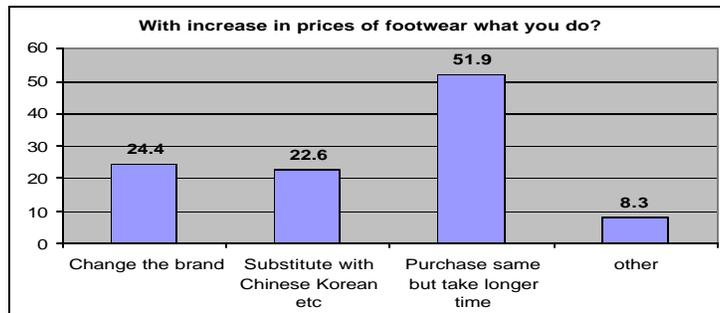
Fig. 3.17.

Figure 3.13 shows that 69 percent of the persons change their mind after asking for price of fruits either they go for any other fruit or they can buy any other edibles. Where as Figure 3.14 shows that 74 percent of the persons says that the vegetable are substitute to each other so if the price of one vegetable goes high people will go for the vegetable with less price. On the other hand Figure 3.15 shows that 57 percent consumer responded that they will buy beef and 17 percent will buy chicken in substitution if price of mutton goes up by Rs 50 per Kg. Further around 42 percent will buy less of mutton; hence the expenditure allocation share to meat will also go down.

Figure 3.16 shows that with increase in price 28 percent of people find substitute for the cloths with any other brand or with low quality but substitution occurs and it should not be ignored. Further those who do not substitute with different item they lessen the quantity use .i.e., purchase less (65 percent) or they substitute the time period of purchase. While Figure 3.17 results show that with increase in price almost 47 percent of people find substitute for the foot wears with any other brand or with low quality but substitution occurs and we cannot ignore it as it is. And who does not substitute with different item they substitutes the quantity i.e., purchase less or they substitute the time period (52 percent).

4. COST OF LIVING INDEX, LASPEYRES INDEX AND GEOMETRIC MEAN INDEX

The main objectives of this chapter are; first to discuss the relationship of the CPI to conceptual cost-of-living index; second, to discuss which of indexes i-e Laspeyres or Geometric mean index are closer to the true cost of living index; and third, to provide some empirical analysis of using both Laspeyres fixed basket and Geometric mean index. CPI is a measure of the average change in the prices paid by urban consumers for a fixed market basket of goods and services.

The CPI is computed using an index number formula, known as Laspeyres formula, that ensures the change in the cost of a fixed market basket. In this formula the quantities of the goods and services purchased by an urban consumers during a base period serve as the weights for the prices, so that the value of the market basket relative to its cost during a reference period. In other words, the Laspeyres price index answers the question: “What is the value of the base-period market basket in today’s prices?” An important underlying assumption in the comparison of market basket value is that the prices are measured net of any change in the quality of the goods and services that may have occurred.⁶

CPI is used for many purposes but measurement of changes in the cost of living is one of the most important of these. But so far this cost of living index is considered as a theoretical construct, and even developed countries have not been able to cope this problem properly. Basically cost of living index tries to address the following question:

“What is the minimum change in expenditure that would be required in order to leave a specified consumer unit indifferent (or as well off) between a specified reference period’s prices and a comparison period prices?”⁷

For more than a decade it’s been the issue that the basic index of the CPI encountered with bias .i.e. Substitution bias and functional form bias. For calculation of the cost of living index we construct index that account for the changes that consumer make in quantities of the goods and services they consume in response to change in relative prices by substituting goods that are cheaper by those which are expensive. Consumers then retain their living standards. The difference between an index that accurately account for this substitution and an index that does not is known as a substitution bias. Substitution can take several forms corresponding to the type of item and outlet specific prices used. These could be:

- Substitution among the brand of products .
- Substitution among the sizes of product.
- Substitution among outlet.
- Substitution across time .
- Substitution among type of item
- Substitution among specific items in different index categories.

The substitution bias reflects the failure of the fixed basket index to account for the fact that consumers will tend to substitute relatively less expensive items in place of items that have become relatively more expensive. Several empirical strategies have been employed to estimate the substitution

⁶ www.bls.gov

⁷ www.bls.gov

bias. A strategy that was frequently employed prior to 1980 was to estimate a system of demand equations and then, using this information about what substitution would occur as prices changed, to calculate directly the exact cost-of-living index associated with the demand system.

Recent literature has somehow avoided the difficulties of estimating a complete demand system by relying on the concept of superlative price indexes, which was introduced by Diewert (1976). In contrast to the Laspeyres index, which requires information on expenditures from only one period, and which for all subsequent periods can be calculated using price information only, superlative indexes generally require complete information on expenditures or quantities for each period. Diewert showed that certain superlative index numbers, for example, either the Fisher or the Törnqvist will closely approximate an exact cost-of-living index. Essentially, using quantity and price information from each time period allows the substitution to be taken into account.

Several recent empirical studies have compared a Laspeyres index (like the CPI) to superlative indexes. Sometimes Laspeyres index tends to grow 0.2 to 0.25 percentage points per year faster than alternative measures that allow for consumer substitution, such as the Fisher or Tornqvist superlative indexes.

4.1. G.M Index and Laspeyres Index

The use of the geometric mean estimator at the basic level of the index calculation in the CPI can be expected to produce an overall index that better reflects the impact of changing prices on the average consumer. Besides the priority of geometric mean, as it captures the substitution effect it is also noteworthy that it takes additional consideration as well.

Firstly it is not adversely affected from persistent functional form bias that affected the Laspeyres before the special correction measures implemented, which have not yet been carried out for Pakistani data. Thus using geometric mean uproots the need of that special specific procedure to be applied to calculate Laspeyres index.

Secondly, index calculation formulas are often evaluated with respect to how well they satisfy certain performance criteria often referred to as tests i.e., the context of the list of tests generally imposed on price indexes, the geometric mean formula performs at least as well as the Laspeyres index.

Thirdly, Forsyth and Fowler (1981) have studied the chaining of Laspeyres indexes. They showed that when the Laspeyres indexes are chained together, they can be subjected to “drift” that is chained Laspeyres may grow at a faster rate than an unchained index. The drift tends to be largest when price oscillates or bounces as its common for fresh fruits and vegetables but there is no such problem with geometric indexes.

Thus we can say that geometric mean measures the average change and lie below the Laspeyres index (unless all price change in the same proportion, in

which case both formulas yield the same answer) for a given set of expenditure weights and prices.

Let us understand the calculation with a very basic example following “the experimental CPI using the geometric means (cpi-u-xg)”. Suppose we have two equally weighted items sampled with in an individual item category golden apple and kala kulu assuming both at RS 1 in base time 0. We proceed as explained in Table 6 below:

Table 6

Example of Laspeyres and Geometric Mean Index

Types of Apple	Qo	po	p1	(Pt/P0) price Relative	(Qo*Po) base Period expend	(So)relative expenditure
Golden Apple	1	1	1	1.0	1.00	0.5
Kala Kulu Apple	1	1	1.50	1.5	1.00	0.5

The calculation for Laspeyres CPI will be:

$$[1.00*1 + 1.50*1]/[1.00*1+1.00*1]=2.50/2.00=1.25$$

Where as the calculation for geometric mean is:

$$(1.00/1.00)^{0.5}/(1.50/1.00)^{0.5}=1.0*1.225=1.225$$

Thus we can see from here that the price change by Laspeyres is 25 percent and that by geometric mean it is 22.5 percent.

It can be clarified from here that Laspeyres index can be thought of an upper bound for true cost of living index because it does not reflect the fact that consumer expenditure pattern changes with respect to the relative price pattern and if it so that the devoted expenditure for specific item remain same but consumer has responded to the change then geometric mean will give us the best approximation.

Following the basic component of CPI Estimation of the price changes by Moulton (1993).

“One characteristic that seems reasonable for a basic component index is that it should measure inflation correctly when the stratum of items is nearly homogeneous. By nearly homogeneous I mean that prices within the stratum are characterised by having a common trend although individual prices per se may deviate from the trend either permanently or temporarily”.

As explained by Reinsdorf (1996) let us suppose that common price trend is multiplicative and the price Pt has probability distribution function f(Pt) that is same of Ps except the multiplicative constant Ps=cPt then the rate of price change between period t and s is the multiplicative constant c. This c is an additive constant of logarithm of price distribution

$$\text{Log } P_t = \mu_t + \epsilon_t$$

under this model the inflation is $\exp(\mu_s - \mu_t)$ a consequence of the assumption of multiplicative inflation between period s which does not imply e.g.

$E(P_t) = \exp(\theta t)$, but also individual price oscillates with the rate variance $(e_s - e_t)$. Now suppose demand can be approximated by constant demand elasticity function

$$\log q_t = -\theta \log P_t + \theta t + v_i + w_t$$

The following is the expression for large sample limiting value of Laspeyres index

$$E(P_t Q_b) / E(P_b Q_b) = \exp(\theta t - \theta b) \exp[\theta (1 - \theta t - \theta b) t^2]$$

The second exponential factor on right hand side can be larger or smaller than 1. The true inflation rate is the $\exp(\theta t - \theta b)$ and the term following it is always greater than or equal to 1 so Laspeyres give an upper bound on the true inflation rate. The index measure inflation correctly when demand is perfectly inelastic that is $\theta = 0$ or there is no transitory variation.

4.2. Comparison of Geometric Mean and Laspeyres Price Index for Pakistan

We have calculated geometric mean index and Laspeyres' index by using data collected by the FBS. It can be shown from the data on prices for months that the geometric mean value at the aggregation level give better results than that of the Laspeyres index as in practice. For evidence let us have two years data for 2001 and 2002 for the inflation in food category for every month. In the first column we have shown the Laspeyres value and in the second column is the geometric mean value for the same months.

Table 7

	December		October		July	
	Laspeyres	G.M	Laspeyres	G.M	Laspeyres	G.M
2001	-0.17124	-1.01515	0.980861	-0.07112	3.605605	2.188498
2002	10.8918	9.447832	6.073435	5.314308	0.742872	0.392852

So from the above Table 7 we can easily see that the inflation value which is obtained by the G.M is less than that of we obtained from Laspeyres. Laspeyres mean give us the upper bound of the inflation as depicted by many authors.

Further we have also selected those categories which are considered as substitutes for each other. As mentioned above there are two level of substitution biases namely lower level (between same categories) and upper level (among the categories). We are incorporating only upper level substitution in the following graphs. Lower substitution can not be calculated due to non availability of data. Moreover while doing calculations we have also picked those sub-categories of CPI basket which are commonly considered as close substitutes of each other.

We see from graphs below that there is a difference between two indexes for the food category. As an example we concentrate on the data of March 2007 and March 2008 to calculate year on year inflation. Further we also restrict our self to lower income group it is clear that various categories give us substitutes i.e. vegetables and pulses are substitutes for each other and fruits category and vegetables are also substitutes of each other within category. We also see from above categorisation that Laspeyres index almost all times give value higher than geometric mean thus supporting the fact that it gives an upper bound but not a good approximation of true cost of living index. Nevertheless if prices of some of the items decrease and others' increase, we notice that these differences are not very large for some categories. But there are also categories for which these differences are quite significant. These differences indicate that there is need to think over the issue of using an appropriate statistical index for measuring the CPI.

Fig. 4.1.

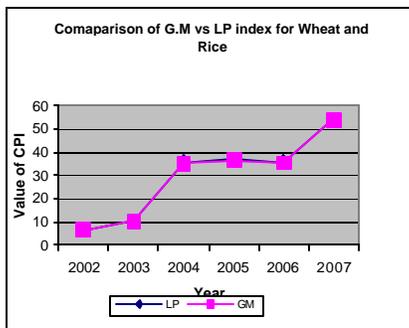


Fig. 4.2.

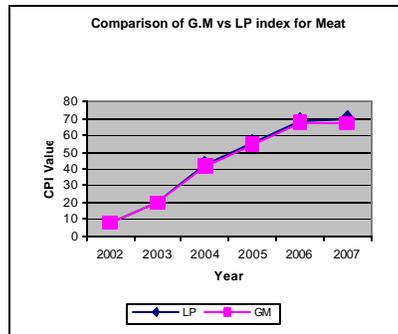


Fig. 4.3.

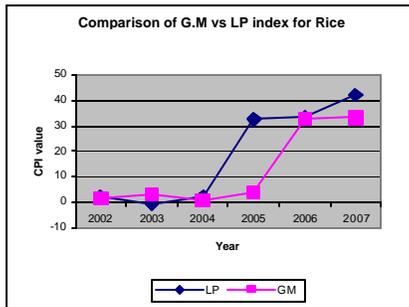
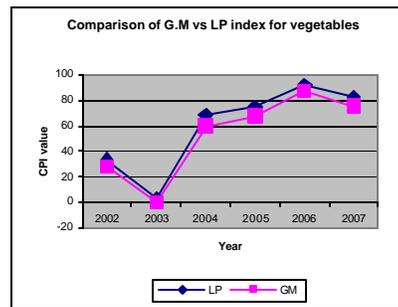


Fig. 4.4.



Further if we see the above Figures 4.1, 4.2, 4.3, 4.4 for the time series plot of the two methods to calculate CPI then the same points discussed above emerge.

The results show that:

- The Geometric Mean index exceeds the Laspeyres—consistent with other studies. Nevertheless, occasionally Laspeyres index is less than Geometric Mean index. This may happen where there is sudden fall and rise in prices as Laspeyres index overstate an increase and understate decrease in prices.
- The difference in inflation rates between the Laspeyres index and the Geometric index may vary from a very minor difference to 5 percent for the categories included in the tables. These results are also in line with the results for other countries.
- The differences between the Laspeyres and Geometric indexes accumulate over time. The longer the period between re-weighting the CPI basket, the larger the ‘bias’.
- The best solution to account for item substitution is to use Geometric mean index formula besides Laspeyres index. FBS should take guidelines for updating the procedure from ILO rather than weighting for the UN instructions.

Another drawback of Laspeyres index is that it shows upward bias in price change when prices go up and downward bias when the prices go down. For example when price of petrol jumped up from Rs 57 to Rs 87, a change in prices by Laspeyres index will be $(87-57)/57=53$ percent but when it has been back to Rs 57 from Rs 87, there is a price decrease of only $(57-87)/87= -34$ percent. Thus there is a difference of 19 percent which is actually a bias. This all shows that it is very important to calculate the change in prices correctly. Geometric mean index is also not free of limitations as elasticity of substitution in Geometric mean index is considered as unity, but at least it calculates the change in prices correctly when it goes up or goes down by the same amount.

Thus at the basic index level the calculation of CPI using geometric mean is the most potential mechanism for reflecting consumer substitution behaviour and there by eliminating the so called “lower level substitution bias” in the Laspeyres CPI. Superlative index cannot be constructed at the basic level because only the base period expenditure information is available at the basic level of aggregation. Sometimes there is an issue that we cannot measure and meet the assumption of constant expenditure share but it is more plausible than the assumption of fixed consumption quantities as taken by Laspeyres Index.

5. CONCLUSIONS AND POLICY RECOMMENDATIONS

We have applied an exploratory research approach to investigate and assess the issues mentioned in this report at a small scale. It is suggested that the Bureau of Statistics should conduct research on a larger scale in collaboration with some other research organisation like Pakistan Institute of Development Economics (PIDE) and State Bank of Pakistan (SBP) in order to have better

price indices. This exercise may be carried out on experimental basis. Although there is lot of research on the agenda of Bureaus of advanced countries, yet this area is new and requires a good deal and more research for a developing country like Pakistan.

The following are the main points emerging from the report:

- There should be a separate CPI for urban and rural population. For urban population, CPI should be calculated on monthly basis as is currently the practice. CPI-urban should be used for inflation targeting while rural CPI may be on annual basis. Latter one may be used for social security, income support programs and for measuring poverty etc.
- As weights and market basket of goods and services are available separately for each province, therefore, separate CPI for all the four provinces should be calculated.
- There is need to work on the formula used by the FBS for calculating the overall CPI from the price data which are collected by the FBS.
- Although issues like accounting for quality change and adjusting for new goods are very difficult to handle yet there is need to start working on them to improve CPI in future.
- Out of several statistical problems we may overcome some of the simple ones by following low hanging fruit principle on our statistical tree.
- FBS has almost spent four years for changing base from 2000-01 to 2005-06 and there is no chance that new base will be implemented in near future. This time lapse is open to several questions. There are several changes particularly related to IT products, high food and energy price volatility etc. Therefore, there is need to gauge the impact of these changes before the base is changed. Moreover, change of base requires very careful thought on issues like: resetting indices, revision of items, revision of weights etc. Most of the countries also calculate the level of bias between old and new base years.
- Revision of Base Year after every five years is open to serious limitations as 2005-6 base year will not be implemented earlier than 2009. Therefore, there is need to do analyse the impact of this time lag of base year change on the CPI. This becomes of immense concern as the dynamics of prices in the last four five years are very hard to grasp.
- Definition of representative goods needs to be elaborated. For example average quality cloth price may be calculated by having a random sample of few selected categories from a large number of cloth qualities available. Then calculate the geometric mean to find out the average price of a representative cloth.

- There is a need to establish a research cell on CPI at FBS which can work in cooperation with statisticians and economists.

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