The New Chilean CPI

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Abstract

This document presents the new Chilean Consumer Price Index (CPI). The application will begin in January 1999. In the first section, we present an introduction, in which are described the main characteristics of the new Chilean CPI. The second section contains the main definitions of the index, its objectives and the definition of consumer expenditure. Next, in the third section, the structure of the new basket is discussed. In the fourth section, the Household Budget Survey and the Point-of-Purchase Survey are described. In the fifth section the formulae used in the calculation of the CPI are described. The last section enumerates the tasks of the Permanent Improvement Program of the CPI.

Introduction

The document presents the main characteristics of the new Chilean Consumer Prices Index (CPI). The design, discussion and construction of the CPI began in 1995 with the Household Budget Survey. This survey was conducted in from July'96 until August'97. It is the basis for updating of the basket of the CPI. However, the calculation of the new CPI will begin in January'99, including several methodological improvements. Among these improvements we can mention the classification of the items, the introduction of new varieties, the annual revision of the weights of items, the formulae of calculation of the index, the procedures for collecting prices, and the treatment of the seasonal adjustment.

With these improvements we are looking for a better statistical quality of the index. The new index will set higher requirements of research and a continually updating of the databases. These will be the tasks of the Permanent Improvement Program of the CPI.

Among the most important improvements of the new CPI we can point out:

- It presents an updated structure of the expenditures of the Chilean households.

- It considers a larger number of varieties and of outlets than the previous one.

- It permits the introduction of new goods and services of the market.

- It includes the effect of the substitution in the consumption between varieties, by means of the use of the geometric mean.

- It has a higher level of accuracy of the variations of prices, because for the month to month calculations of the price variations it uses only comparable pairs of "varieties-outlet".

- It represents appropriately the changes in the purchase habits, updating the sample of outlets with yearly Point-of-Purchase Survey. In the earlier version of the CPI this was carried out only every ten years, together with the Household Budget Survey.

- It considers the research of the effects of the technological change and the adjustment of quality of the items.

- It incorporates the seasonal changes of the consumption of fruits and vegetables, not only enlarging the basket to those that have a permanent presence along the year, but to those that have high participation in the consumption of the households, in at least two months of the year.

2. Main Definitions

2.1 Objectives of the CPI

The Chilean CPI is an index to measure the evolution of the prices of goods and services of consumed by the households; hence, it is a deflator of the consumption expenditures. Its main objective is to quantify the change, between two periods of time, of the prices of a certain basket of goods and services. This basket corresponds to the consumption pattern of the households, and therefore it reflects the consumer's preferences.

The Chilean CPI reflects the variations of prices of the goods and services acquired by the households. In the calculation of the new CPI we have introduced several methodological innovations that allow modifications or substitutions in the consumption, caused by changes in the relative prices. These will be apprehended through a larger number of varieties for products and the use of geometric mean. The CPI will measure approximately the evolution of the cost of life of the families.

The CPI is used for many purposes, for example, as a deflator of nominal wages (to estimate the evolution of its real value), and as an index for physical and financial assets. By construction the CPI is not similar to the deflator of the GDP, neither is an index of the evolution of the purchasing power of the poor or of the wage earners. The Chilean CPI is an index that reflects the evolution of the retail prices of a basket of goods and services. This basket is assumed to be representative of the consumption of the households.

2.2 Definition of Expenditure in Consumption

The expenditure concept used for the elaboration of the basket of the new CPI corresponds to the expenditure in final consumption of the households. The criterion to measure the expenditure is the acquired consumption. This corresponds with the cash price of the goods or services bought by the household in the period of reference. That means, that the credit price, in general, is not collected.

The CPI does not consider the investments (acquisition of real state, securities, bonds, and stocks, etc.), neither the savings of the households (social security payments and others). Initially, the new CPI will not include the homeowners' equivalent rent.

The expenditure of the households includes:

1. Final consumption of households bought with their income.

2. Payment of health insurance includes only the voluntary share of health insurance that some households pay above the legally mandatory health insurance. The payment of the legally mandatory health insurance will not be included as a product of the basket, but rather its weighting will be distributed in the health expenditures.

3. Housing Insurance payments.

4. Payment of services, indirect taxes (VAT), and specific taxes (alcohol, tobacco, etc.). It excludes the direct taxes, as the personnel revenue tax and taxes for personal certificates of the Identity Service.

5. Financial expenditure in payment of mortgage and consumer credits.

6. The games of chance included in the calculation of the CPI are those whose prices do not vary with the prize; otherwise, a change of the price will be related with a change of the prize.

3. The new basket of the CPI

3.1 Structure of the new basket.

The information for the structure of the new basket is obtained from the Households Budget Survey (HBS). The changes made in the groups and subgroups of the basket correspond to an updating of the behavior of the Chilean households.

As it is observed in the following figure, the weight of the group Food and Beverages falls from 33% in 1987 to 27% in 1997. The weight of Housing presents an increment from a 25 to 28% (including Communication). In this case, the group is divided in two groups: Housing (20%) and Household Services and Furnishings (8%). The weight of the group Apparel grows from 8% in 1987 to 9% in 1997. The group Transportation changed from 9% in 1987 to 13% in the new CPI. Finally, the expenditures represented in the group Others that weighted 16% of the expenditure of the households, would reach in the new CPI 22%. For this reason, it was split in the groups Health (9%), Education and Entertainment (10%), and Others (4%).

GROUPS AND WEIGHTS OF THE CPI: 1987 – 1997

Groups 1987	Weight	Groups 1997	Weights
Food and Beverages	33	Food and Beverages	27
Housing	25	Housing	20
		Household Services and Furnishings	8
Apparel	8	Apparel	9
Transportation and Communication	17	Transportation	13
		Medical Care and Upkeep	9
		Education and Entertainment	10
Other goods and services	17	Other goods and services	4
Total	100	Total	100

The aggregation of the items in the new CPI has been modified. The "articles" will be fixed in the CPI, as well as their weights; so long there is not another Household Budget Survey. The weights of the "products" (at least one in each "article") will be subject to changes on the base of market studies to be carried out annually.

The new terminology of the CPI is as following:
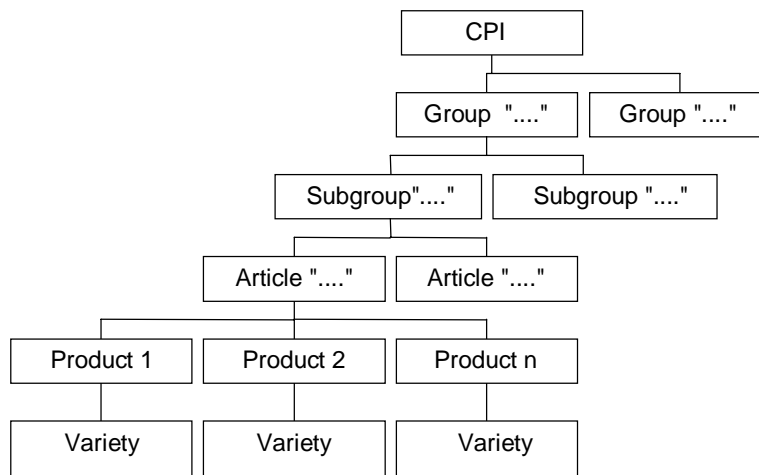
3.2 Criteria for the Construction of the Basket.

a) The first criterion is the weight that each product had separately in the expenditure in consumption, according to the Household Budget Survey. The minimum weight to be included is 0.025% of total expenditure of the household. In 1987 it was 0.0325%. This change could reflect the diversification in the consumption of the households, product of the increment of the incomes in the last years.

b) The second criterion is to consider the weights of groups and subgroups. It means it that if inside a group or subgroup no product fulfills the requirement of the minimum weight, but the whole group or subgroup does it, a representative of the group or subgroup is included in the basket.

c)   The following two general principles from 1988 continue to be valid: (1) A product whose price is not possible to be break down into P (unit price) * Q (quantity) will not be included, for example, the donations. (2) The weight of the products that were not included is distributed proportionally among the selected products.

3.3   Treatment of seasonal fresh products.

The seasonal price movements of fruits and fresh vegetables are a natural phenomenon. Their special productive cycles and their essentially perishable character cause these price variations. In general, the selection of a fixed basket yearly of products and their weights to represent the variations of prices, in the case of fruits and vegetables, can not be representative, since it is normal that along the year the consumption varies. For example, in the case of fruits, while in winter the number of available products in the market is rather reduced, in summer there is a large number of products. Moreover, for the group of fruits and vegetables is evident that along the year there is a cycle with initial prices that are very high and later, with an abundant offer, they begin to decay, and finally, they disappear of the market.

To treat adequately this seasonal price movements, in the new CPI the "articles" "fresh fruits" and "vegetables" are represented by a very large selection of fruits and vegetables. These articles will have fixed weights along the year. Their annual weights are obtained from the Households Budget Survey.

The articles are made up of 15 fruits and 27 fresh vegetables, respectively. The criterion used to include an item in these products was to select all those fruits and vegetables that fulfill the bench mark minimum 0.025% of the total expenditure, in at least two successive months.

4.   The Household Budget Survey and the Point-of-Purchase Survey.

4.1   The Household Budget Survey.

The Household Budget Survey collects data relating to household expenditure for goods and services. These data are used to define what is consumed, and to calculate the weights of "articles" and "products" in the total expenditure of the households. The sample of households was selected from a database of housing areas constructed by our Institute in 1995 for Santiago-de-Chile. The sampling method was a two-stages-random-sampling, with independent samples inside each one of the three strata in which the database was divided.

The Household Budget Survey was realized in Santiago-de-Chile's private households. The sample includes 8.300 households, which are distributed in three socioeconomic strata. The units of the first stage were blocks of 200 housings each one. The house is the unit of selection in the second stage. The Survey begins selecting the houses, and later, the blocks were updated. That allowed to identify and to register all the houses occupied by private households in the period immediately previous to the beginning of the realization of the survey. The unit of analysis corresponds to the particular household and to the persons that constitutes it. The total sample was distributed in 24 under-samples. Each under-sample corresponds to a two-week-period for the year of reference of the survey (from August 1996 to July 1997).

4.2   The Point-of-Purchase Survey

The purpose of the Point-of-Purchase Survey is to determine the main types of outlets where the households carry out their purchases, specifically of those products selected for the basket of the CPI. The survey included 1.360 households of Santiago-de-Chile. The criterion to select the types of outlets was defined according to the expenditure proportion of the households. In previous Point-of-Purchase Surveys the criterion of selection of outlets was according the frequency of purchase. Therefore, the selection of a representative outlet (as source of information for collecting prices of products) will depend where the households carry out the largest proportion of expenditure of that product.

The Point-of-Purchase Survey is used to select a sample of outlets: This sample will be the set of sources of information for the collecting of prices. The outlets selected were those that informed the largest sales of the products of the grouping to which it belonged. A complete sample of outlets was produced, including 30% more outlets, for cases when a replacement is necessary. The Permanent Improvement Program for the CPI includes annual Point-of-Purchase Surveys, in order to maintain updated the Outlet Sample.

4.3   Type of price used and frequency of price collecting.

The type of price used corresponds to the sale price to the final consumer. This price corresponds to the cash price, including VAT and other taxes. The period is the month. The frequency of collecting prices will be monthly, with the exception of the group Food and Beverages, and some fuels of high variability, for which the prices will be collected weekly.

The group Food and Beverages has a weekly frequency of collecting prices (to reflect especially the price variations of prices of perecibles). In the new CPI almost all prices will be collected on a monthly basis. In some special cases the frequency of the expenditure differs from the month; in these cases the prices will be calculated as the expenditure is carried out; for example: university registrations, city rights.

5.   The Calculation Methods for the CPI

5.1   The Laspeyres Index

The current CPI is calculated as a "pure" Laspeyres index. That supposes fixed weights for the products of the fixed basket for all the lifetime of the index. This methodology is adequate to the calculation, in a single index, of the variations of a heterogeneous group of prices. However, it has some limitations, for example, as indicator of the variations of cost of life, because it does not consider possible substitutions among products that impact the well being of the persons.

From a practical point of view, it is impossible to have all the benefits of a pure Laspeyres, without regretting this limitation. For that reason, the new CPI incorporates some technical refinements that allow balancing the coherence of the measurement of well being with those of variations of prices. It achieves in this way two objectives that do not coincide a priori.

The principal methodological modifications are the following:

A) The new CPI maintains the structure of Laspeyres to calculate the general index from the price variations of the articles. But, to avoid the eventual loss of representativeness of the expenditure structure through the years –due to the fixed weights- we will carry out Household Budget Survey for updating of the basket with a higher frequency (up to day, they are carried out every 10 years). This is more necessary than in previous periods, since the structure of expenditures has become more variable and dynamic, because of technological reasons, globalization of the economy and of growing incomes of the Chilean households.

B) The weights of the "articles" calculated from the Household Budget Survey will remain as long as it is not carried out a new survey. Because this structure will be more lasting in the time, the "article" concept that will be used in the new CPI is wider and more generic than that of the current one. Specifically, from a structure of 368 articles in the previous CPI, the new CPI will have only 156 articles, whose weights will stay fixed. A new concept is introduced, "product", of which the CPI includes 477.

C) The articles of the new CPI are the aggregates of "products". The "products" are aggregates of varieties. Variations of prices will be calculated for each variety. The price variations of the varieties will be added to build the variation of the index of the "products".

D) The aggregation from products to articles will be the arithmetic mean of the variations of prices, for the groups: Housing, Apparel, Transportation, Health, Education and Others. In the case of the group Food, the geometric mean will be used for the aggregation from product to article. It is assumed, (a) that their elasticity of substitution is nearer to 1 than to 0; (b) that the consumer behavior changes in the short term; and (c) that it is a high frequency substitution. In the case of the products that are included in other groups, it can exist or not a certain substitution degree in the consumption, but like it was pointed out in (C) the weights will be modified when appropriate statistical evidence exists. Geometric mean will only be used in the cases of the products from the articles "Fuels" and "Communications" in the group Housing, and for the products from the article "Automobile" and "Urban Transportation." The weights of the "products" will be revised annually. This revision of weights should be understood as a partial updating of the pattern of consumption of the households through the time. It will be carried out on the base of market studies and reflects important changes in the offer or demand for certain products.

E) The aggregation for all the "varieties" to the "product" will be carried out by the geometric mean. In this case, substitution exists among all the varieties of the products in the new CPI. In this case, the varieties represent different of marks, sizes or flavors, basically of "one and the same" product. The elemental level is the combination "variety-outlet". At this level, the price variations of one variety through all outlets are aggregated with the geometric mean. In this case, it is supposed that a variety (same article, same mark) in an outlet is a perfect substitute for that same variety in another outlet.

5.2   Use of comparable units for the monthly calculation of the CPI.

The calculation of the monthly variation will be carried out at the "variety-outlet" level. This increases the comparability of the prices between two months, and eliminates possible price variations due to the absence of data in some outlets in a particular month.

Indeed, it will be operated on the base of the comparison of the prices of the "variety-outlet" that are collected in both months (obviously, it is strictly comparable). Thus, the problems associated to quality variation, dependent on the outlet, are eliminated.

6.   Permanent Improvement Program.

The new methodology of the CPI supposes a permanent updating process. This can be done if a Permanent CPI Study Team is setup. In the previous CPI a major limitations was the impossibility to substitute specific varieties of goods or services. The products were maintained fixed for 10 years, even after they were obsolete. The sample of outlet after some years was outdated, too.

The outdating of the sample is a major limitation. The recovery of lost outlets was carried out in by price collectors, looking for outlet of the same type, size, location, and with similar prices. However, the changes in the structure of the market would have made advisable studies that would probably have revealed the necessity to substitute small outlets for supermarkets or chains, and not for similar business. The actual methodology supposes to realize Point-of-Purchase Surveys biannually.

Another important issue is the quality adjustment. Due to the speed of the technological change, the variations of prices of some products can be, partly, the result of improvements in the technical capacity of these, and partly net increment of prices. When there is a quality improvement due to technology, it should be considered when estimating the price of the variety and this quality adjustment should be reflected it in the CPI.

Finally, an issue that requires research, is the calculation of substitution elasticity of certain products. Especially, if we suffer impacts in critical situations (fuels, perecibles, etc.) the effect on the household expenditure should be foreseen. The case of tomato in 1997 was an example: when the tomato price increased dramatically, due to some plague, a consumption reduction should have been produced and a substitution by other vegetables. However, we do not know if the total expenditure of the households in tomato was increased or not.

The Permanent Improvement Program of the CPI should, at least, include:

1. Annual market studies in order to update the weights of the varieties and products. These will be the basis for changing the specifications of the varieties.

2. The change of weights of articles, subgroups and groups should be more frequent. It is suggested to realize the Household Budget Survey every 5 years.

3. The sample of outlets should be updated every two years. For that is necessary to carry out with that frequency the Point-of-Purchase.

4. The quality adjustment treatment should include:
   - Definition of criteria to carry out quality adjustments when collecting prices, with special emphasis in the group Apparel.
   - Definition of procedures in case of changes in measure unit, containers, marks or other.
   - Methodologies of adjustments of quality should be developed (Hedonic Method and other) for some goods that suffer strong price changes (automobiles, computers).

5. A methodology to calculate the homeowners' equivalent rent.

6. Studies of substitution elasticity (historical) of consumption, and possible incorporation of a CES Index that considers the automatic substitution in cases of price changes, at the level of varieties' index.

7. Treatment of price shocks in cause by economic, climatic, or other type of shocks.

References:

Aguilar R., "Error de Estimación de Precios Indices", Mimeo. Santiago de Chile.

Abraham K. (1996), "Statistics in the Spotlight: Improving the Consumer Price Index", Mimeo.

Bascher, Jérome and Thierry Lacroix (1998), "On the Use of Hedonic Methods in the CPI: An Application to Consumer Durables and Apparel". Ottawa Group Conference.

Boskin, Michael J., Ellen R. Dulberger, Robert J. Gordon, Zvi Griliches, and Dale W. Jorgensen (1998), "Consumer Prices, the Consumer Price Index, and the Cost of Living", en Economic Perspectives, Vol. 12, Nr. 1, Winter'.

Boskin R., "Estimation of Variance Components for the US-CPI via Gibbs Sampling", BLS Working Papers, Mimeo.

Bureau of Labor Statistic, U.S.
"The Experimental CPI Using Geometric Means", Mimeo, April 1997.
"Research Issues Related to Geometric Mean Formulae for Elementary Indexes", Mimeo.
"Measurement Issues in the Consumer Price Index", Mimeo, June 1997.
"Handbook of Methods", April 1997.

Dalén, J. (1994), "To New Functional Form for Price Indexes Elementary Aggregates", Journal Official Statistics.

Dalén, Jorgen (1998), "On the Statistical Objective of a Laspeyres' Price Index", Ottawa Group Conference

Central Statistical Office, United Kingdom. "A Short Guide to the Retail Prices Index", 1987.

INE (1975), "Metodología del IPC", Santiago de Chile.

Lefort, F. (1996), "Sesgos de Medición en el IPC", Mimeo. Santiago de Chile.

Liegey, Paul R. Jr. (1994), "Apparel Price Indexes: Effects of Hedonic Adjustment", Monthly Labor Review, May.

Lowe, Robin (1998), "Televisions: Quality Changes and Scanner Data", Ottawa Group Conference.

Mcclelland R. (1996), "Evaluating Formulae Bias in Various Indexes Using Simulations".

Menéndez P. "Notas sobre el Uso de Fórmulas en los Indices de Precios", Mimeo.

Moncada, J. (1997), "Aspectos Metodológicos y Operacionales del Indice de Precios al Consumidor Colombiano", Bogota.

Moulton, Brent (1996), "Bias in the Consumer Price Index: What Is the Evidence?"

Moulton, Brent R., Timothy J. LaFleur, and Karin E. Moses (1998), "Research on Improved Quality Adjustment in the CPI: The Case of Televisions", Ottawa Group Conference.

Reinsdorf, Marshall, Paul Liegey, and Kenneth Stewart (1996), "Avoiding Downward Bias from Linking in the U.S. Consumer Price Index", U.S. Bureau of Labor Statistics.

Reinsdorf, M., P. Liegey, and K. Stewart, (1996), "New Ways of Handling Quality Change in the U.S. Consumer Price Index".

Reinsdorf, M. and A. Dorfman (1996), "The Sato-Vartia Index and Monotonicity Axiom".

Reinsdorf, M. (1998), "Improving the Chilean CPI". Santiago de Chile.

Ryten, J., (1998), "El Mejoramiento del Indice of Precios al Consumidor de Chile". Informe de Consultoría. Santiago de Chile.

Shapiro, M., and D. Wilcox, (1996), "Mismeasurement in the Consumer Price Index: An Evaluation", National Bureau of Economic Research.

Statistics Canada (1997), "Selected Issues in the Seasonal Adjustment of Consumer Price Index Series", in "The Consumer Price Index".

Turvey, R. (1989), "Consumer Price Indices", International Labor Office, Geneva.