DEVELOPMENT OF THE VENEZUELAN CONSUMER PRICE INDEX

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I. Introduction

In Venezuela, Consumer Price Indexes are produced for major urban areas. Caracas has had a CPI since 1945, and indexes have been constructed in twelve other cities since the mid 1960's. The Central Bank of Venezuela is responsible for the indexes for Caracas and certain additional cities, but in other cities the indexes are produced by local universities or regional development agencies. The Venezuelan Guayana Corporation (CVG) is such an institution; it is responsible for planning development in the eastern region of Venezuela and produces the indexes for Ciudad Guayana and Ciudad Bolivar.

The system of consumer price indexes in Venezuela is now undergoing substantive revision and expansion. The revision program began in 1974 under the coordination of the Central Bank, after rapid increases in prices were experienced in 1973. Objectives of the revision program included the updating of weights to reflect changing consumption patterns, the production of a "national" index covering all 18 major urban areas, and the production of indexes for different socio-economic levels of the population. In accordance with these objectives, new consumer expenditure surveys have been or will be conducted, and additional cities are being included in the index program. Increased use of probabilistic sampling methods and greater computerization of processing also characterize the revision. A significant innovation is the calculation of cost weights, selection of item and outlet samples, and production of indexes separately for the population in each quartile of per capita income.

One factor affecting both methodological development and survey timing in the Venezuelan CPI revision is the division of responsibility for city indexes among different institutions. Although their work is coordinated in an effort to achieve procedural consistency, some differences in approach do exist. More importantly, the revision process is not being done simultaneously in all cities, but is being spread out over a span of several years.

This paper will describe the work done to date by the Central Bank on the Caracas index and by the CVG on the indexes for Ciudad Guayana and Ciudad Bolivar, since the revision of the indexes for those three cities is the farthest advanced. The paper will discuss the area design, expenditure surveys, item and outlet sample design, price data collection, data processing and index estimation with particular attention to the production of quartile indexes and the adaptation of conventional statistical procedures to the realities of a developing country. The authors acknowledge as a principal source of data about the Venezuelan indexes the paper by Beatriz de Khan and Carlos Leon, "Experiencias en la Realizacion y Utilizacion de las Encuestas de Presupuestos Familiares en la Construccion de un Nuevo Indice de Precios al Consumidor para las Areas Urbanas Mayores de Venezuela" (ISI, 1979)

II. Area Design

The Venezuelan CPI is planned to be priced in 18 large urban areas which will cover approximately 52% of the total population. The pricing areas are selected subjectively by selecting the areas of 100,000 population or more except in the Andean Region where the cutoff was 70,000 population. Thus, the national Venezuelan CPI will only represent the areas priced and not be representative of the rest of the country. This contrasts with the U.S. CPI which is a probability selection of areas covering all urban population in places of 2,500 or more.

At this time only Caracas, Guayana and Bolivar have produced revised CPI's. The indexes for the remaining 15 cities are in earlier stages of development. This is illustrative of the approach to problems of limited resources taken by Venezuela. Since there is not a central source of funding, control, or processing, the decentralization leads to dislocations in the timing of the implementation of the surveys and, as will be seen, different approaches to sample implementation.

The program began to be developed in 1974-75 in Caracas by the Central Bank of Venezuela and in Maracaibo by the University of Zulia, and in 1975-76 in Ciudad Guayana and Ciudad Bolivar by the Venezuelan Guayana Corporation (CVG). Later, in 1978, it was started in the cities of Merida, San Cristobal, Barinas, Valera and Acarigua-Araure by the University of the Andes in cooperation with the Central Bank of Venezuela, and in Barquisimeto by the Central Bank of Venezuela. Nevertheless, only the cities of Caracas, Guayana and Bolivar have reached the advanced stages of computation and analysis; the rest are beginning the processing stage.

III. Indexes for Quartiles of Per Capita Income

One of the innovative aspects of the Venezuelan CPI is the intention to produce separate indexes for each quartile by income class and the total population for each area and the nation. Since the data for sample areas come "on stream" at different times, the quartile is defined at the local level only and thus may not be strictly definitionally consistent across pricing areas. But for the local level, these indexes are in response to an awareness that price increases may affect distinct social classes of the population differently because of their different purchasing patterns. The use of quartiles defined by per capita income factors out the effect of family size in the determination of income and thus provides a more stable and potentially (but not strictly) comparable definition across pricing areas. Since the quartiles by definition are mutually exclusive, the total index is the sum of the parts and therefore is more reliable than each quartile.

In contrast the U.S. produces two population indexes of which one population (wage earners and clerical workers) is a strict subset of the second (all urban consumers). The structure of the costweights is not additive over the two populations. This was done because each index was required to be of equal reliability. The wage earners and clerical workers index is the continuation of the old series while the all urban consumers index is essentially a new series. Since the median incomes for the two populations of the U.S. CPI are almost identical, the differences between the expenditure distributions are small and thus the differences in values of the index are also small. In fact as of March 1980 they were only 0.1 index point different which is not significant.

Thus the Venezuelan use of quartiles is a much more sensible analytical breakdown of the population for the local areas. However, the national quartile indexes may be somewhat loosely defined since the actual per capita income levels are different between cities. The

national index is constructed only at the four major group levels by quartile and the all items index.

IV. Consumer Expenditure Surveys

Prerequisite to the production of a CPI is a survey of consumer expenditures, also known in many countries as a family budget survey. Such a survey provides data on the relative importance of the goods and services in the consumer market basket and thus the index weights. The Venezuelan expenditure surveys have historically been conducted with index weights as the primary objective, but also to provide data for the analysis of consumption patterns, income distribution, income adequacy, income elasticities, and propensities to save and consume. Additlonally, expenditure data from the Venezuelan surveys are used as measures of size in allocating and selecting the sample of items to be priced.

In 1974, a series of "Surveys of Family Income and Expenditures" was begun in Venezuela to provide weights for the revised consumer price indexes. Surveys have been conducted in nine cities thus far.

Survey Design:

Within each city, a sample of housing units was selected using a multi-stage probabilistic design such that each housing unit had an equal probability of selection. Sample sizes were determined by optimization of resources and variability. The precise design and frame used varied from city to city according to the types of frames available.

In Caracas, a two stage design was employed, using as primary sampling units the segments defined for the sampling frame used in the Household Survey on the Labor Force conducted by the National Statistics and Census Office under the Planning Ministry. Of these PSU's, 591 were selected systematically with PPS, taking as a measure of size the number of housing units in the segments according to the 1971 Census of Population. The sample of PSU's was augmented by areas of new construction since the census. From a list of housing units in each selected segment, four or more units were selected, depending on the growth which had occurred in the segment since 1971 and the corresponding sampling rate. The design size of sample for Caracas was 2400 housing units.

The survey design in Maracaibo was similar to that used in Caracas, but with three stages. First, 240 PSU's were selected from the household survey frame and augmented for new construction. Each selected segment was then divided into blocks, from which two were selected PPS. Housing units in each selected block were listed and sample housing units selected systematically; the sampling fraction depended on the measure of size used in the earlier stages of selection and generally yielded a sample of four or five units per block, for a total of 2400 units.

Stratified sampling with proportional allocation was used in Ciudad Guayana and Ciudad Bolivar. Current lists of existing housing units formed the sampling frame; the lists were stratified according to characteristics of the housing and neighborhood. In each of these two cities, 1500 housing units were selected systematically from the stratified lists.

Stratified sampling with proportional allocation was also used in Merida, using available information on family income to stratify the sample units by income levels; selection was done systematically.

In the remaining cities, the 1971 Census data provided lists of structures in each segment. Selection of housing units was done by procedures similar to those used in Caracas, including augmentation for new construction. The sample sizes in Merida and the other cities ranged from 720 to 1000 housing units.

Because consumer expenditures and income are subject to seasonal variation, the conduct of the survey in each city was spread out over the span of one year. To accomplish this and to make efficient utilization of field staff resources, the sample in each city was divided into subsamples to be interviewed in different months.

The samples in Caracas, Maracaibo, Ciudad Guayana and Ciudad Bolivar were divided into 48 subsamples, four of which were interviewed in a given month. In the remaining cities there were eight subsamples, two of which were surveyed each quarter during a representative month. The allocation of sample housing units to the various subsamples was done randomly.

Although the housing unit was the unit for selection, the survey unit was the household or family, comprised of persons living in a particular household. Members of the institutional population, those in hospitals, jails, student dormitories, military barracks, and places with more than two lodgers, were excluded from eligibility.

Data Collection:

In order to obtain sufficient information to construct a CPI by per capita income quartiles, it is necessary to obtain from respondents not only detailed information on all expenditures, but also on income and family characteristics in order to classify each record of microdata on expenditures to the appropriate quartile. The questionnaires used in the Venezuelan expenditure surveys provided very detailed data on these and other socio-economic characteristics, which also facilitates further analysis of consumption and income. Although the sample design varied from city to city, the various agencies responsible for conducting the surveys coordinated their efforts so that data collection methodologies and the data obtained would be consistent across all cities.

Reference periods for the reporting of expenditures and income on the Venezuelan surveys varied for different types of items. For food, beverages, tobacco, personal care items and other frequently purchased low cost items, the reference period was seven to ten days, depending on the subsample to which the sample household belonged. For clothing, services and semidurable goods, a one-month reference period was used. One year was the reference period for durable goods. Income data was obtained using both a one-month and one-year reference period. The same reference periods are used in the various cities.

The questionnaire design takes into account both the reference periods for the reporting of expenditures on different items and the classification structure of all items in the consumer expenditure universe. The reporting of expenditures on the questionnaires is organized first according to reference period and then, within each reference period, by the expenditure classification. For each item of expenditure, space is provided on the schedule to enter not only the amount spent but also the brand or quality, form, unit of measurement, quantity and place of purchase of the item, which provided a frame for the selection of the outlet sample.and provides space to enter each day's quantity and expense plus the total for the reference period. While the "Daily Questionnaire" provides a logical way for respondents to report their expenses, generally in the sequence of purchase, the more detailed questionnaire is used to code each reported expense according to the established classification structure.

Personal interviews were used to collect the data. All ten sections of the questionnaire were used in each

sample household, such that each reporting unit supplied data on all aspects of expenditures and income. This is in contrast to the design used in expenditure surveys in the U.S. since 1972, where two separate samples of households are selected, one of which reports on frequently purchased items using a diary format within a 2-week interval, and the other which reports on the rest of the expenditure classes on a quarterly basis with recall varying from a quarter to a year depending on the item. The reason the U.S. uses separate surveys is to reduce respondent burden in the hope of improving cooperation and reducing underreporting of expenditures. In addition, for the U.S. quarterly survey, which requires that a household be visited once each quarter for a year, the intent is to reduce the effect of telescoping of information reported and thus control this component of non-sampling error.

In Venezuela, the timing of interviews depended on subsampling and the type of questionnaire. Household characteristics and expenditures for items with short reference periods were collected from each subsample by daily visits during an assigned period during the month. In those cities (Caracas, Ciudad Guayana, Ciudad Bolivar and Maracaibo) where the sample of households had been divided into 48 subsamples, four subsamples were allocated for interviewing each month, one during each week of the month but covering the entire month. The first three subsamples were interviewed daily for seven-day periods, and the fourth for a period of seven to ten days depending on the number of days in the month; hence the reference period for food and other frequently purchased items is defined as "seven to ten days". In the remaining cities, where four subsamples had been drawn, each was assigned to a quarter of the year and data collection took place in a representative month of the quarter. The subsamples were further divided into two parts, each of which was interviewed daily over a fifteen day period.

In all cities, collection of data for the other six parts of the schedule took place after the end of the month. The "Inventory of Durable Goods" schedule was left with the family for at least a week and was then picked up by the interviewer; very simple, explicit instructions were printed on the back of this form so the family could help fill it out. In the final interview, the recall method was used to obtain data on expenditures during the past month for clothing, household goods and services, expenditures during the past year for durable goods and other infrequent purchases, and on housing costs, income and assets. Because no bounding interview was conducted, telescoping was not controlled.

In cases where respondents did not furnish complete reporting of income and/or housing costs, attempts were made to obtain data on earnings from employers and on housing costs from either the National Housing Institute or a financial institution, whichever financed the house.

It is interesting to note that although in Venezuela all data on expenditures for items with one-month or one-year recall periods were obtained in one interview per family, and in the U.S. the quarterly survey (which included essentially the same item categories) involved five interviews per family, the sample sizes in Venezuela were sufficiently large that at least as many observations were obtained per PSU as in the U.S.

Processing and Estimation:

The data from the questionnaires were reviewed and entered into computer facilities for processing, using either keypunch or key-to-tape data entry. Estimation of the cost weights for each quartile of income included adjustments for non-response and for differences in length of reference periods (i.e., all expenditures and income reported were converted to a uniform reference period).

A computer program was developed by the CVG and shared with the Central Bank, by which data from the survey can be used to analyze consumption functions and income distribution.

V. CPI Item Sample

For the VCPI for each quartile the estimation of relative importances of each market basket of goods and services as well as the selection of items and varieties by establishment were conducted independently within each pricing area. The different goods and services consumed by the families were classified into four major groups: 1) Foods, beverages and tobacco, 2) Apparel and footwear, 3) Housing expenses and 4) Other expenses. These in turn were divided into subgroups or independent item strata and the selection of items within a subgroup was PPS to the relative importance of the item within the subgroup. Items having less than 1% of expenditures in the subgroup were not given a chance of selection. The item strata (subgroups) and major groups are defined consistently across quartiles and pricing areas, but what is priced to represent the subgroup is not the same for each PSU or quartile within PSU.

The concept of the definitionally identical item strata priced for both populations of the USCPI is similar to the VCPI. Minor details as to number of major groups exist but the major difference is the goal of interpretation, and the sampling technique to achieve it. The USCPI wished to minimize the random effects of price movement between the two populations to determine if there were inherent differences in the CPI movement and to determine this at minimum cost. Therefore, a sampling technique which maximizes the overlapping of items priced between the two populations was used.

Because of several design factors, the adoption of new within-outlet selection procedures, and the use of maximizing overlap, the USCPI workload for two populations remained essentially the same for the same accuracy as the old USCPI for the Wage Earners and Clerical Workers. If the improvements in design had not been instituted, the sample for the USCPI for two populations would have increased one third. In contrast, for the VCPI, the workload in terms of items priced has increased fourfold to support the quartile indexes versus the old VCPI.

VI. Selection of Outlet Samples

Both the USCPI and the VCPI attempt to price in a sample of outlets in which the appropriate populations have made purchases, as reported in a housing survey of some sort. For the VCPI, the names and addresses of outlets were collected in the expenditure survey, whereas the USCPI had a separate survey to collect outlet information. The resultant effect of the outlet sample design differs in the potential degree of specification one can achieve in the initial selection of items in a subgroup. However, because the indexes are produced by semi-independent organizations in Venezuela, the use of the same type of information was treated differently.

In Caracas the outlet sampling frame was created at the major group level and the outlets were selected PPS to frequency of reporting for the major group, for each quartile. For each outlet selected all sample items

were attempted to be priced. For a few specific items, special selection frames were selected: butcher shops, fruit markets, hairdressers and shoe stores.

For the cities of Guayana and Bolivar the greater flexibility inherent in the collection of the outlet information was more fully utilized. An outlet frame was constructed for each sampled item and selection was independent for each quartile PPS to frequency of reporting a purchase in the outlet. Outlets which were reported only once or were outside of the chosen city were not given a chance of selection.

For the USCPI, the procedure for outlet selection was in effect a modified blend of the two approaches used in Venezuela. Outlet frames were created for one or more selected items (although not as specifically defined as in Venezuela) and selection was made PPS to expenditures reported for the category of items with a procedure to maximize the overlap between the two populations rather than the independent approach used in Venezuela. All outlets reported by HU's in the sample area including outlets anywhere in the U.S. are given a chance of selection.

For the outlet selection categories which were created for more than one selected item, the USCPI required an internal weight adjustment for calculating the price relative to be collected from the outlet to reflect the differential proportion of sales a selected item might have from the category of selected items. For the Guayana and Bolivar outlet selection procedures this internal weight adjustment is not necessary since each selected item had its own frame. This internal weight should have been collected in the Caracas approach but was not because actual selection was not done strictly within the outlet.

Sample Maintenance Procedures:

For any CPI there is a sample attrition of outlets and specifications priced within an outlet. In the VCPI the process of supplementation is presently a judgemental one for both outlets and specifications. In Ciudad Guayana, plans are underway to implement an ongoing, brief, annual household survey on points of purchase of major categories of items. The outlet frame which can be constructed from this survey, in conjunction with the expenditure survey data and an existing directory of businesses, will provide the ability to select replacement outlets or updated outlet samples with probability proportional to frequency. Because the Guayana region is a fast growing area of Venezuela, it is seen as particularly important to incorporate new outlets into the sample.

In contrast for the USCPI, there is an ongoing wholesale replacement of the sample of outlets and items priced in 1/5 of the pricing areas each year. In this replacement process, the initiation process is fully repeated. In addition, in the intermediate years, sample size is monitored and supplementation is done as needed from alternative samples of the outlet frame. For changes of items priced within an outlet, judgemental substitution to the most similar item is permitted within a limited range within an outlet. Resampling for items within an outlet is required if items within a restricted set of characteristics are not available.

VII. Price Data Collection

As in most countries, prices used in estimating the CPI's in Venezuela are generally collected by personal visit to the sample outlets. The frequency of pricing differs according to type of item and type of outlet such that prices of items of great weight in the market basket and/or characterized by more volatile price movement are measured more frequently. The questionnaire design likewise differs by type of outlet and item category; further differences exist in the questionnaire formats used in Caracas and in Ciudad Guayana/Ciudad Bolivar.

Specifications:

Because the objective of a Laspeyres-type price index is to measure the changes in price of a fixed market basket over time, it is essential that prices be recorded for identical items from pricing period to pricing period. Detailed specifications of the sample items are provided to assist the data collectors in locating the exact items to be priced. Specifications include whatever characteristics uniquely define the item, such as material, construction, size, quality, brand and unit of measurement.

In Venezuela, the specifications to be priced for a given item are determined during the initial visit to the selected outlets by a multistage modified PPS sampling procedure. In this procedure the interviewer obtains from the outlet respondent a listing of the different varieties of the assigned item sold in the outlet, e.g., a list of the various sizes and brands sold, and an estimate of the percentage of sales (in the monetary unit Bolivares) for each unit listed. Taking the percentages as a measure of size, units are selected PPS. When respondents are unable to estimate sales percentages, percentages may be imputed based on rank order of sales; in the absence of ranks equal probability is used.

Data collectors are instructed to record a complete description of each item. Lists of important characteristics of various types of items are furnished as a guide. For example, specifications of all apparel items include fabric, style, brand and style number, color, and quality; additional specification factors are listed for individual items, such as sleeves, collar type, pockets and length in the case of a man's bathrobe. From the information thus provided by the data collectors, unique specifications to be priced are selected and questionnaires prepared.

The procedures used in Venezuela are based on those employed in the 1978 revision of the USCPI, with some modifications. In the U.S., the sampling procedure resulted in different unique specifications being priced in each outlet; this is true to a considerable extent in Ciudad Guayana, but in Caracas the disaggregation procedure was used to select specifications that would be priced in all outlets where a given item is priced for a given quartile. While the probabilistic selection of different specifications for different outlets is expected to result in a more representative sample with lower variance, the modification used in Caracas is still a probabilistic design that is more representative of the population's experience than the purposive judgment selection of specifications that is practiced in the construction of most other price indexes around the world, including the unrevised indexes in Venezuela and in the U.S. prior to the 1978 revision.

Questionnaires Used:

The schedules on which prices are collected in Venezuela generally consist of a face sheet identifying the collecting agency, the outlet, its address, identifying codes, quartile, date of pricing and names of interviewer and supervisor. On subsequent pages appear in columns the names of items to be priced, their specifications, units of measurement, seven digit item code and spaces in which to record the price. A supply of the schedules for an outlet is maintained so that a new but identical form is used each month. The basic format used is essentially similar to that used in the unrevised indexes in Venezuela.

In Caracas, because the same specifications are priced in each outlet where a given item is priced and because outlets were selected at the level of large groups of items, identical schedules are used in all outlets of similar types that are priced with the same frequency, for each quartile. For example, there are only four separate schedules for supermarkets, one per quartile, each containing all the specifications for food items selected for the quartile; likewise there are four bakery schedules, four apparel and footwear schedules, etc.

In Ciudad Guayana and Ciudad Bolivar, since the wider application of the disaggregation process resulted in different specifications being selected for each outlet, a separate schedule is prepared for each outlet containing the specifications of the items priced therein. The general format, however, is consistent for outlets of the same type and frequency of pricing.

Frequency of Pricing:

In Venezuela, prices for food, beverages, tobacco and other frequently purchased items are obtained weekly; prices for apparel, footwear and household articles are collected monthly. Prices for other types of goods and services are obtained in special questionnaires called "Unique Monthly" schedules; the frequency of pricing for these items varies from monthly to annually. Pricing of these items is scheduled so as to distribute the data collection workload throughout the year such that different classes of items are priced in different cycles. Although this results in greater collection efficiency, it reduces the number of observations per year for a given item class. Medical care services, for example, are collected in February, May, August and November in both Caracas and Guayana.

Pricing Procedures:

Data collectors are instructed to report the price in effect on the day of pricing of each item. Items priced must be regularly carried by the outlet and in good condition, and available in normal quantity. The interviewers are cautioned to assure that items correspond to the specification. Any discrepancies, substitutions, unusual price changes, or nonresponse are noted by the data collectors on the schedules.

The Venezuelan schedules do not indicate the prices obtained for the items the previous month; such independent pricing is felt to reduce response bias. By contrast, dependent pricing is practiced in the U.S. as an aid in item identification.

Transmittal of schedules to supervisors is done daily for food and beverage schedules and the last week of the month for other schedules.

Rent and Homeownership:

Data used in calculating price relatives for rent in Venezuela are collected on the semiannual National Household Survey, the same survey on whose design the expenditure survey sample was based. Sample households, grouped by blocks (SSU's), are divided into six panels and a different panel is interviewed each month of the period. The NHS sample has a rotation pattern whereby one-sixth of the sample households are replaced during each six-month period.

Although the NHS is primarily a labor force survey similar to the USCPS, housing characteristics and monthly rent are also obtained. In computing the price relatives for rent only the rents reported by 5/6 of the sample households included in both periods t and t-6 are used. The relatives are computed only twice a year, as averages of the relatives for each month in a 6-month period. A further lag of six months is introduced because of time required for processing the NHS data, so that the average relative between, say, the second half of 1979 and the first half of 1980 would not be reflected in the CPI until the second half of 1980. Interpolation is used to smooth back the relatives over the intervening six months.

The rent relatives are used to move not only the cost weights for rental expenditures but also for homeownership costs. No direct collection of data is done in Venezuela for items such as mortgage interest or home maintenance expense.

In contrast the USCPI has a monthly survey of renter units. The survey is divided into 6 panels, one panel interviewed every month. Each month a renter is asked the rent for the current and previous month. A composite estimator of one month and six month changes is used to estimate one month change.

For the owner portion of housing, officially BLS is publishing a concept of measurement which reflects the price faced by the consumer (for that proportion of the population which purchased a house in the reference year). In addition, BLS is publishing four experimental alternative conceptual estimators of the cost of housing, reflecting different approaches to measuring a user cost of owning a home (not just purchasing). One of the methods is a rental equivalency approach.

VIII. Editing and Processing of Price Data

Completed schedules are reviewed by the supervisors. Review includes a comparison of prices reported for the current month with the list of the previous month's prices; any unusual price changes are verified. The in-office review also includes any necessary coding, conversions of multiple-unit prices to per-unit prices, etc. The supervisors review all substitutions; new item-variety codes are assigned to the substitute specifi-cations that are not comparable, which triggers the computer to link the relatives.

At the end of the month the schedules are sent to be keypunched and processed by computer. Two review listings are produced at this time, one a complete list of all prices collected, by item, for the month and the other a report of errors found during the computer edit check, by outlet. Both listings are reviewed in the officeand sent back with corrections to the data processing department. The next listing produced, the Preliminary Price Report, shows for each specification the current and previous month prices in each outlet, along with the relative. Average prices and the average relative are also listed, along with the variance, standard deviation and CV of the mean of the current month prices. Another complete price listing is then produced, similar to the first list, for verification of entry of any necessary corrections. A second Preliminary Price Report summarizes the previous and current average prices, absolute change and price relatives, for each specification priced. If any further discrepancies are noted, the analyst may request a partial listing of prices for those items he wishes to analyze. The final listings produced show the index calculation for each item, subgroup, major group and all items; the cost weights for the base period ($p_o q_o$), previous month ($p_{t-1} q_o$), and current month ($p_t q_o$) are shown along with the price relative $R_{t,t-1}$ and the indexes I_{t-1} and I_t. These index listings are produced separately for each quartile and for the whole population.

IX. Estimation Procedures

The calculation of the Venezuelan index is of the Laspeyres formula type which defines an index of items of constant quantities to measure the change in prices across time for the same item outlet.

For the Consumer Price Index a set of cost weights or expenditures for each item is tabulated for each quartile of per capita income. These weights are updated by multiplying them by the estimates of price change called price relatives, which are obtained from the ongoing survey of pricing. The price relatives are obtained for each outlet and are computed by taking the sum of price ratios, including imputed price movements, between time period t and t-1 for a given item stratum.

$$(1) \qquad R_{i,j,t,t-1} = \frac{\sum_{j=1}^{n_i} \frac{P_{ti,j}}{P_{t-1,j,j}}}{n_j}$$

where $R_{i,j,t,t-1}$ is the relative of prices for product i in the jth outlet for the period t,t-1 and n_j is the number of outlets over which the relative is computed.

This computation of price relatives is not the same as used in the USCPI, but is similar to that which was used in the U.S. prior to the last revision. Operationally, equation (1) is a simple formula to use, and as long as the sample sizes for an item quartile are reasonably large (25 prices +) as in the Venezuelan CPI, the inherent upward bias of this type of formula is small. The USCPI uses the sum of price ratios of the current period divided by the sum of price ratios from the previous period where the ratios are the prices for a given variety/outlet for the current time t to a fixed base period price. Inherent in the USCPI is a set of internal weights proportional to the probability of selection of dimension equal to an expenditure. This is a consistent estimator which converges to unbiasedness faster than the previous estimator and is strictly derivable when selecting proportional to expenditures.

$$(2) \qquad R_{i,t,t-1} = \frac{\sum_{j=1}^{n_i} \frac{W_i P_t}{P_o}}{\sum_{j=1}^{n_i} \frac{W_i P_{t-1}}{P_o}}$$

For both the USCPI and VCPI, once the price relative has been estimated for a given item stratum (subgroup), it is multiplied by its appropriate cost weight $C_{i,t-1}$ from the previous period, to get an estimate of the current period cost weight $C_{i,t}$. Any summary cost weight can be computed by summing the updated cost weights. An index is computed by dividing the appropriately summed cost weights by the appropriate base period cost weight $C_{i,0}$ at the same level of aggregation. Thus the USCPI index is computed as follows:

$$(3) \qquad I_t = \frac{C_{i,t-1} R_{i,t,t-1}}{C_{i,o}}$$

Strictly speaking the Venezuelan CPI index is computed as an estimate of price change times the previous index which is basically the same.

$$(4) \qquad I_t = \frac{I_{t-1} \; C_{i,t-1} R_{i,t,t-1}}{C_{i,t-1}}$$

X. Analysis and Summary

The revised indexes for Caracas, Ciudad Guayana and Ciudad Bolivar are in more advanced stages of processing than the other cities. When publication of the revised series begins it will be in the form of monthly bulletins and annual reports for each city, as is the case with the unrevised indexes. The present bulletins contain not only tables of the index numbers, but also written analysis of the price movements observed.

Indexes at the city level, by quartile, will be published at a more disaggregated level than the "national" index. Indexes for an aggregate of the cities, by quartile and for the total population, will be constructed only at the major group and all-items levels using cost weights weighted for population size. Due to the differences in quartile definitions and sample designs between the cities, further disaggregation would not be meaningful. This is in contrast to the USCPI, where much greater detail is available at the national level than at the local level due to cell size constraints. For Venezuela, however, given the multiple agencies responsible for the indexes and some differences in methodology, analysis at the city level is perhaps more pertinent, although the national level summary indexes are useful as long as one is cognizant of their limitations.

The production of indexes by quartile is an innovation worthy of note; having observed the differences in consumption patterns among different income classes of the population and realizing that price changes would thus affect those groups to different degrees, the Venezuelan agencies have developed what appears to be a very workable and practical approach to measuring the differential impact of inflation. Once the indexes are published and analyzed it will be of interest to study the magnitude and effect of the inter-quartile differences in price movement.

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