Understanding Inflation and Revising National Price Data

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Report Type: Research Study

December 2012

Published by: Lebanese Economic Association
Beirut- Lebanon

105541
Upgrading Lebanon’s Economic Analytical Capacity
Lebanon
Lebanese Economic Association
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Abstract:
Lebanon is a small dependent economy with extreme vulnerability to external price shocks; yet no inflation targeting policy or good knowledge on price evolutions is available. The quality of statistics is hampered by severe technical problems as well as an acute shortage of human and material resources. This research study exposes the need for revising national price data in Lebanon especially after a recent wage adjustment episode revealed the lack of agreement on the magnitude and causes of inflation, and the predominance of political considerations when undertaking economic decisions in addition to the absence of a robust framework to monitor price increases and enforce compliance.
This study starts with contextual evidence, and then proceeds to review the theory of indices, followed by conceptual and operational issues in the CPI. It also surveys available price statistics in Lebanon and uses STATA to perform consistency and validity checks through regression and correlation analysis. The main findings of this analysis reveal a strong positive correlation between domestic & international inflation rates, and that several components of CPI do not capture reality. The study concludes with proposals for food-imports and real estate price indices to improve price monitoring and inflation targeting in Lebanon.

*Keywords: Inflation, price index, CPI, data and statistics, Lebanon, price monitoring, cost of living, inflation targeting policy*
ACKNOWLEDGEMENT

This report is the output of the project: Upgrading Lebanon’s Economic Analytical Capacity, which was supported by the International Development Research Center- Canada between June 2010 and December 2012.

The project aimed to upgrade Lebanon’s economic analytical capacity by focusing on key economic and social issues facing the Lebanese society. The project empowered key public officials with the necessary skills and tools to actively engage in tackling current issues, and contribute to putting them at the center of the public policy debate scene. The project focused on two central public policy issues: 1) promoting economic stability by tackling inflation and 2) safeguarding social security and medical care for the elderly through pension reform. Thus, the project established relationships with several related public entities including ministries and public institutions, who in turn selected their representatives. These public officials were divided into two thematic working groups and underwent training, research, regular workshops and seminars to participate in the write-up of the final reports and to engage in the suggested reforms.

The report was written by Rima Turk Ariss, Ph.D. (Associate Professor of Finance at the Lebanese American University and Project Working Group Coordinator for Inflation) on the basis of inputs and research done with the excellent support of several research assistants including Ariane Kesrouani, Nabil Abdo, Ali Dirany, and Pierre Mouganie.

The project team would also like to acknowledge the valuable comments of Prof. Alban Thomas and appreciated inputs of working group members Mireille Mouawad, Cathrina Antoun, Ali Daher, Mazen Baba, Nader Keirouz, Najwa Yaacoub, Rayan Dandache, Razi ElHage, Roula Awad.

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Chapter 1

Inflation and Wages Adjustment in Lebanon

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II- Lessons Learned

   a) Lack of Agreement on the Magnitude and Causes of Inflation

   b) Revival of the Price Index Committee and Expanding its Inclusiveness

   c) Introduction of the Social Wage Concept

   d) Predominance of Political Considerations when Undertaking Economic Decisions

   e) Absence of a Robust Framework to Monitor Price Increases and Enforce Compliance
I. Background

Following the end of the civil war and the stabilization of the domestic currency by the central bank, the first wages adjustment process took place in 1996, and a unique amendment in 2008 granted a lump sum increase of LBP 200,000 per month for both public and private sectors employees, bringing the minimum wage up to LBP 500,000 from LBP 300,000.\(^1\) For the next sixteen years, however, there were no wage increases even though inflation kept rising and reached a hundred percent and the purchasing power of the Lebanese people started to drop significantly.\(^2\)

In a study conducted by the Lebanese Federation of Consumer Protection, Lebanon was ranked first amongst 14 Arab countries in terms of high prices for meat, sugar, tea, and milk, and it ranked second when it came to tomato, potato, and vegetable oil prices. The study attributed these results to the presence of poorly competitive consumer markets (monopolies), and to the non-enforcement of regulations related to fixing commercial profit margins.\(^3\) These factors and others have contributed to a significant decrease in the share of wages in the Gross Domestic Product, which some entities claim to have reached a low of 30%.\(^4\)

By mid of 2011, talks started mounting about the low level of wages that is preventing Lebanese workers from satisfying their basic needs in light of rising food prices and the cost of basic services like electricity and transportation. Indeed, the issue of wages adjustment became one of the top priorities on the public scene over a five-month period between September 2011 and January 2012. These talks were initially favored by a “political opportunity” that was materialized by the formation of a new government in July 2011 and which declared placing social justice

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\(^3\) “Lebanon, first amongst 14 Arab countries in high cost of some food items”, August 26, 2011. Al-Hayat
\(^4\) Wehbe, Mouhamad. “Fixing the wages adjustment claim”, Id.
amongst its priorities. They were also timely because of the approaching of the new academic year that entails along the burden of rising school and university tuition fees.

The process started with a dialogue among various concerned parties, including the Presidency of the Council of Ministers, the Ministry of Labor, economic bodies, and labor unions. However, the debate escalated into a conflict that threatened the unity of the government before culminating in the adoption of the wage adjustment decree No. 7426 during the January 18, 2012 session of the Lebanese Cabinet.

This section summarizes the major lessons learned from the wages adjustment discussions on the economic and political fronts from mid-2011 to mid-2012.

II- Lessons Learned

a) Lack of Agreement on the Magnitude and Causes of Inflation

The events that unfolded during the intense discussions about the wages adjustment uncovered a lack of agreement on the magnitude and sources of rising inflation. In Lebanon, inflation is generally attributed to several factors, including an increase in the prices of non-tradable (or public services, even when delegated to private operators) goods such as transportation, electricity and education, in addition to the rise in domestic food prices by more

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5 The ministerial statement of the new government at the vote of confidence parliamentary session mentioned achieving “social justice” as well as consecrating “the social function of the government and establishing the citizens’ social rights system; notably for those with low income”.
than three times the global increase in food prices following the international food crisis, given that Lebanon is dependent to a great extent on imports to provide for its food needs.6,7

In parallel, official inflation statistics attribute inflation to other expenditure items. Whereas the figures provided by CAS registered a 6% inflation rate in June 2011 compared to June 2010, such inflation stemmed mainly from clothing and footwear prices that increased by 21.1% compared to the previous year. Inflation using CAS statistics was also reflected in water, gasoline, and fuel (13.1%), but to a much lower extent in food items and beverages (7.6%), education (6.7%), health (5.9%), and transportation (5.8%).8 In contrast, the rise in the CRI price index cannot be attributed to clothing and footwear (which actually decreased by 1.95% over the same period between June 2010 and June 2011) but rather to transportation costs (10.51%), notwithstanding an overall increase of 6.16% that is aligned with the one recorded by CAS.9

According to the General Labor Confederation (GLC), the wave of price increases intensified in 2011 compared to previous years, limiting the purchasing power of citizens and hindering the provision of basic needs.10 Some have blamed traders and monopolies in place for rises in domestic prices that exceed international prices.11 Economic bodies such as the Beirut Traders Association attributed price rises to imported inflation as a result of the drop in the value of the U.S. dollar and due to the rise in the prices of raw materials such as petroleum, as well as the rise in the prices of services following the deterioration of infrastructures in Lebanon.12

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7 This is also true of some Mashrek countries like Egypt, which are highly dependent on international agricultural markets.
8 Wehbe, Mouhamad. “Fixing the wages adjustment claim”, Id.
9 “Consumer Price Index Chart”, Consultation and Research Institute, www.crilebanon.com
10 “The issue of fixing the wages is more persistent today”, September 6, 2011. As-Safir.
12 Al-Haf, Hassan. “Beirut Traders Association: in order to return the wages file to the tripartite councils: the increase in wages requires requesting the working force to double the effort!”, September 15, 2011. As-Safir
people ascribed the rise in prices to the security condition in Syria that was preventing food products from entering Lebanon.

Separately, it is interesting to note that wages adjustment proposals rested on a 100% increase in prices between December 1996 and December 2011, whereas published inflation figures by the two leading entities producing price indexes in the country report at most a 50% rise in prices over this period (See Table 1).

**Table 1: Inflation Rates by CAS and CRI, December 1996-December 2011.**

<table>
<thead>
<tr>
<th>Annual Inflation Rate</th>
<th>CAS</th>
<th>CRI</th>
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<tr>
<td></td>
<td>Dec-97</td>
<td>6.73%</td>
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<td></td>
<td>Dec-98</td>
<td>5.84%</td>
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<td></td>
<td>Dec-99</td>
<td>0.73%</td>
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<tr>
<td></td>
<td>Dec-00</td>
<td>-0.96%</td>
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<td></td>
<td>Dec-01</td>
<td>1.36%</td>
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<td></td>
<td>Dec-02</td>
<td>4.23%</td>
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<tr>
<td></td>
<td>Dec-03</td>
<td>3.03%</td>
</tr>
<tr>
<td></td>
<td>Dec-04</td>
<td>1.69%</td>
</tr>
<tr>
<td></td>
<td>Dec-05</td>
<td>-2.62%</td>
</tr>
<tr>
<td></td>
<td>Dec-06</td>
<td>5.57%</td>
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<td></td>
<td>Dec-07</td>
<td>9.32%</td>
</tr>
<tr>
<td></td>
<td>Dec-08</td>
<td>-14.99%</td>
</tr>
<tr>
<td></td>
<td>Dec-09</td>
<td>3.40%</td>
</tr>
<tr>
<td></td>
<td>Dec-10</td>
<td>4.60%</td>
</tr>
<tr>
<td></td>
<td>Dec-11</td>
<td>3.10%</td>
</tr>
<tr>
<td><strong>Dec-96 to Dec-11</strong></td>
<td>-</td>
<td><strong>49.73%</strong></td>
</tr>
<tr>
<td><strong>Dec-99 to Dec-11</strong></td>
<td><strong>18.46%</strong></td>
<td><strong>37.16%</strong></td>
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Representatives from the CRI reconciled the discrepancy by stating that, when changing the basket weights in their calculations to reflect the results of the 2004 household budget surveys instead of the 1997 survey, the increase in prices between 1996 and 2011 actually amounts to 120%.
b) Revival of the Price Index Committee and Expanding its Inclusiveness

As Cabinet members confirmed that wages in Lebanon were “low” and pledged to work on adjusting them, the decision was made to rehabilitate the Price Index Committee (PIC) that is composed of the Minister of Labor and representatives of workers and employers, and which has the official mandate to examine the wages adjustment in the country. The PIC had been established by decree number 4206 on 08/08/1981 to assess price evolution and the reasons for price increases, monitor the cost of living, analyze relevant statistics produced by CAS, study wage policies, and make recommendations to limit price increases and losses of purchasing power. However, the PIC had remained dormant over the past decades, and no framework was put in place to ensure relative increases in the official minimum wage in relation to the cost of living.

The decision to rehabilitate the PIC is important in the sense that the Cabinet officially recognized the importance of making wage adjustment recommendations based on inflation data in consultation with the concerned economic and labor bodies and the Ministry of Labor. These stakeholders include, in addition to the Minister of Labor, representatives from the economic bodies as well as CAS and CRI, and workers’ representatives not only from the GLC but also from the Coordination Committee of Syndicates (CCS). The CCS is not represented within the GLC and its presence as a fourth party had no precedent in similar tripartite negotiations of the PIC (Ministry of Labor, economic bodies, and GLC), thereby implicitly acknowledging that bodies other than the GLC also represent workers’ interests.

Despite the fact that the final decision by the Lebanese Cabinet bypassed the recommendations of the PIC in its adoption of the wage adjustment decree No. 7426 on January

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13 Wehbe, Mouhamad. “Fixing the wages adjustment claim”, Id.
18, 2012 (See Appendix A for details on the wages adjustment decree), it is noteworthy that discussions within the PIC may have paved the way for similar and more empowered scientific discussions among stakeholders to gradually set aside political consideration in making future wages adjustments.

c) Introduction of the Social Wage Concept

Labor representatives were encouraged to move forward with their demands to include on top of their request for wages adjustment, other social and economic procedures related to the tax system and social welfare. Early wage adjustment proposals considered including transportation expenses as an integral part of the salary, as well as extending health coverage to all Lebanese citizens. Whereas informal workers are not likely to benefit from any official wage adjustment and additional transportation allowances, extending health coverage to all Lebanese citizens would have had a significant impact in terms of improving the social safety net of the country.

However, legal considerations (and probably political tensions as well) prevented the inclusion of transportation allowances into workers’ salaries because of the treatment of these cash flows as expenses, and the Cabinet mentioned that the transportation allowance will be addressed in a separate decree. Also, an upcoming proposal by the Ministry of Health about a national health coverage plan opposed the consideration of health coverage aspects in the wages adjustment process, thereby gearing talks in different directions. In reaction to the Cabinet’s lack of consideration of social aspects of adjustments to wages, the CCS considered that decree No. 7426 “does not guarantee the rights of the workers” and several other syndicates have expressed their

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14 Statement issued by the meeting of the Bureau committee, July 20, 2011. The General Labor Confederation
16 “Price Index Committee: No agreement between Nahas and the economic bodies”, January 12, 2012, New TV’s website.
outrage, including union employees at the Electricité du Liban and the Water Authority in North Lebanon.\textsuperscript{17}

Still, by bringing the concept of the “Social Wage” to the forefront of the discussions, greater attention was given in terms of attempting to reduce inequality gaps among the Lebanese population and towards strengthening the social safety net.

\textit{d) Predominance of Political Considerations when Undertaking Economic Decisions}

Throughout the public debate around the adjustment to workers’ wages between September 2011 and January 2012, political rather than economic conditions were predominant and at the forefront of discussions. Before decree No. 7426 was signed, five other wages adjustment proposals were discussed and circulated among concerned parties and stakeholders. Appendix B summarizes these different proposals, their champion, supporters, opposing parties, and the reasons for failing to adopt any of them. The lengthy discussions even threatened the unity of the Cabinet whose members belong to the same political coalition.

In the end, the Lebanese Cabinet placed political considerations ahead of economic aspects of wages adjustments, adopting a decree based on a “consensus” that was signed between the General Labor Confederation and the economic bodies in the presidential palace in Baabda, despite opposition from the Minister of Labor, the CCS, and without consideration to the recommendation of the PIC.\textsuperscript{18} The Beirut Traders Association even declared that the GLC and economic bodies have established a social partnership and become “inseparable”.\textsuperscript{19} The decree was consensual in the sense that it had been passed in the Cabinet without voting; the unanimity in

\textsuperscript{17} El-Hage, George. “Positions of 6 trade unionists of the wage adjustment decision: “The Arms are ready for the next battle”, January 28, 2012, Al-Akhbar.
\textsuperscript{18} “The Cabinet adjusts the wages: The majority wins in favor of Nahas” January 22, 2011, Al-Akhbar
\textsuperscript{19} “The authorities and the union celebrate the wages file with a positive spirit”, February 8, 2012, An-Nahar.
adopting the consensual formula was mainly intended at safeguarding unity within the Cabinet. It should be noted, however, that the consensual decision effectively moved away from the GLC’s original demands and was more aligned with the first proposal by the Cabinet that did not account for the recommendations of the PIC but which claimed to reflect the ability of the government to sustain the wage increases while maintaining market competitiveness and tackling the negative impact of inflation.

e) Absence of a Robust Framework to Monitor Price Increases and Enforce Compliance

As soon as talks about wages adjustment began during the fall of 2011, the prices of some goods registered sudden increased according to the Technical Office for Pricing Policies (TCPP) at the Ministry of Economy and Trade (3.8% for raw vegetables, 3% for eggs, and 2% for powder milk). According to the Consumer Protection Directorate within the Ministry of Economy and Trade, there 410 fines were given for merchants in October 2011 who illegally increased the prices of products, but no further legal action was undertaken. In addition, following the signing of the wages adjustment decree, transportation costs of the largest companies rose, under the pretext of wages increase, and hospitals asked for higher hospitalisation tariffs, a demand that was positively met by the Ministry of Health.

In response to some unfounded rising prices, the Ministry of Economy and Trade formed a Price Monitoring Committee composed of the Director-General of the Ministry of Economy, of traders’ union representatives, Syndicate of the Importers of Foods representatives, Syndicate of

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20 “The Cabinet adopts the consensus formula and Nahas does not exclude resignation”, Id.
21 October 11, 2011, LBC. www.youtube.com/watch?v=HgD7VJ6oySI
22 Aridi’s meeting with the Transport Unions led to a commitmen to the Labor fees”, February 16, 2012, An-Nahar.
23 “Hospitals demand modifying the fees before the end of the month in conjunction with the wage increase”, February 8, 2012, An-Nahar.
the Importers of Frozen Meats and Poultry representatives, Syndicate of Food Industries representatives, and four representatives from the Syndicate of Poultry and Livestock Traders. However, all members of this committee were traders and no consideration was given to the law that stipulates that the National Council for Consumer Protection ought to be in charge of monitoring prices.\textsuperscript{25} Separately, a Bank Audi economic report indicated that the estimated inflation rate for 2012 was 8 percent up from 5.9\% in 2011\textsuperscript{26}, and which exceeds the upward wages adjustment of 6.5 percent in 2012.\textsuperscript{27}

Against this background, there is much need for an efficient and sound framework for the monitoring of prices as well as the necessity of having in place a system that ensures compliance with governmental laws related to pricing.

The next chapter reviews the theory of indices, followed by Conceptual and Operational Issues in the CPI in chapter 3. Chapter 4 surveys available price statistics with consistency and validity checks. Chapter 5 concludes with proposals for new price indices.

\textsuperscript{25} “The members of the price monitoring committee are traders”, October 14, 2011, Al-Akhbar. www.al-akhbar.com/node/25587
\textsuperscript{26} The Audi Bank Economic Report of the Lebanese Economy (Chapter 4, 2011)”, February 18, 2012, As-Safir.
\textsuperscript{27} El Amin, Mohamad, Ibid.
Chapter 2

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I-Introduction

Inflation is a rise in the general level of prices of goods and services in an economy over a period of time. Economists distinguish between the level of inflation and the volatility of prices. The first has to do with purchasing power erosion and is the subject matter of this study.\textsuperscript{28} As price levels rise, each unit of currency buys fewer goods and services which may lead to decay in the purchasing power of individuals. The second, however, which is in relation with aversion to risk and uncertainty and the difficulty to construct future investment plans, is not addressed herein.

Economists generally agree that high rates of inflation are caused by an excessive growth in the money supply. Other causes of inflation are attributed to fluctuations in the demand of goods and service, as well as changes in available supplies of a product (scarcity, including war economies, and following, e.g., natural disasters). However, long sustained periods of inflation are generally caused by the money supply growing faster than economic growth (Mankiw, 2006).

A low rate of inflation is generally favored in the economy (as opposed to high, zero, or negative). Indeed, a moderate degree of inflation reduces the severity of economic recessions by enabling the labor market to adjust more quickly to a downturn, and it also prevents falling into a liquidity trap.\textsuperscript{29}

The task of keeping the rate of inflation low and stable is usually given to monetary authorities (central bank) that achieve this goal by using monetary policy tools, although monetarists and Keynesians do not concur on the optimal role of the government (Rule versus Discretion debate). Monetarists favor price stability as the main role of monetary authorities whereas Keynesians favor interventionist policies, trying to control short term fluctuations in real

\textsuperscript{28} Purchasing power is the number of goods/services that can be purchased with a unit of currency.
\textsuperscript{29} A liquidity trap is a term used in Keynesian economics to refer to a situation where monetary policy is unable to stimulate the economy.
Gross Domestic Product (GDP). In the 1970s and early 1980s, the interventionist policies lead to high fiscal deficits due to increasing government expenditures. Since then, the goal of developed countries has been to focus on price stability. However, the current global financial crisis has reverted the trend again with more interventionist policies due to different global stimulus packages that may lead to inflationary pressures in the long run as economies expand. It must be noted that effective and sustainable monetary policies are not an easy task due to a) uncertainty, b) living in a stochastic not deterministic world, and c) time lags in the economy (dynamic versus static effects).

The monetary policy rule set forth by monetarists is derived from quantity theory of money:

\[ MV = PY, \]  

where \( M \) is money supply, \( V \) is the velocity of money, \( P \) is the price level, and \( Y \) is Gross Domestic Product. By taking the logs of equation 1 and considering small changes over time (the derivative), the following equation obtains:

\[ \Delta M \over M + \Delta V \over V = \Delta P \over P + \Delta Y \over Y \]  

Assuming that the velocity of money is constant (\( \Delta V \over V = 0 \)), and that the goal of monetary policy is price stability (\( \Delta P \over P = 0 \)), equation (2) becomes \( \Delta M \over M = \Delta Y \over Y \). Thus, the role of monetary authorities is to adequately bring about changes to the money supply (\( \Delta M \)) in order to keep up with the expansion of contraction of the economy (\( \Delta Y \)).

The interest in inflation is due to its severe implications on our daily life as workers, investors, government officials, politicians, etc... Inflation lowers the value of money and ultimately reduces real wages. It diminishes the value of savings as inflation rates become higher than interest rates as well as causes a strain on fixed pension fund schemes. Inflation also leads to a
redistribution of wealth by increasing the gap between the rich and the poor. It can affect the
government budget by increasing the cost of subsidized goods and widening the fiscal deficit. High
rates of inflation also contribute to a decrease in the real rate of economic growth.

However, inflation also has its uses and can prove to be very beneficial for the state and the
economy. For example, higher inflation reduces the real value of a currency as well as the actual
value of debts, benefiting leveraged businesses and private individuals as well as highly indebted
countries. Alternatively, if inflation falls to 0%, the fear of deflationary pressures may cause a
sharp fall in consumer spending.

This discussion highlights the importance of measuring inflation and the remainder of this
chapter overviews price index theory and calculation.\textsuperscript{30}

\section*{II- Historical Overview of Price Indexes}

Index numbers are used to aggregate detailed information on prices and quantities into
scalar measures of their levels or their growth. Indexation is used as a reference in making policy
as well as firm decisions. A notable example of an index number is the Consumer Price Index
(CPI), which is closely monitored by different entities in an economy including different
ministries, the central bank, consumer groups, unions, management, senior citizens, etc... Heavily
quoted indexes other than the CPI include, among others, stock market indexes such as the Dow
Jones Industrial Average and the S&P 500 for the United States.

There is no clear consensus pertaining to the origin of the first price index (Chance 1966),
although the earliest research on this topic is attributed to Rice Vaughn. In his 1675 book “A
Discourse of Coin and Coinage”, Vaughan compares labor statutes from his own time to similar

\textsuperscript{30} One must distinguish between the overall inflation (country level, all sectors) and sector-specific price increases. Generally speaking, inflation concerns the economy as a whole, but it is also important to compute measures of price changes for specific categories or sectors (households, private firms, etc.).
ones dating back to the reign of Edward III. He concludes that price levels in England had risen six
to eightfold over the preceding century (Vaughan, 1675).

However Vaughan’s analysis did not actually involve calculating an index. It wasn’t until
1707 that William Fleetwood created what came to be known as the first official price index.
Fleetwood utilized a large amount of price data dating back to hundreds of years in order to create
an index that consisted of average prices. His method showed that the value of five pounds had
changed immensely over a period of 260 years. These findings are published in a volume entitled
‘Chronicon Preciosum’. Carli (1764) and Jevons (1863; 1865) are the earlier pioneers to
implement an unweighted stochastic approach to index number theory, where the price index is an
evenly weighted average of the \( n \) price relatives or ratios.\(^3\)

While the use of index numbers dates back to the 18\(^{th}\) century, the economic theory of
indexes is much more recent. Interest in the theory and application of indexing witnessed
captures the essence of indexing as: “Most people have at least a rudimentary idea of a high cost of
living or of a low level of prices, but usually have very little idea of how the height of the high cost
or the lowness of the low level is to be measured. It is to measure such magnitudes that index
numbers were invented.”

The theory underlying the Cost of Living Indexes (COLI) was developed by A. Konuš in
1924. A COLI is defined as the ratio of minimum expenditure required to attain a particular (and
identical) level of satisfaction in two price situations, a comparison period and a base period (Cage
et al., 2003). This conceptual idea developed into the CPI-U (Urban), which is based on a modified
Laspeyres index (a fixed-based index discussed further below) that allows prices to vary but
quantities to remain fixed.

\(^3\) Carli uses the arithmetic average of the price relatives and Jevons endorses the geometric and harmonic average.
The CPI is the first official and monitored price index that was published, followed by other indexes such as the Producer Price Index and the Import/Export Price Index. The US Bureau of Labor Statistics started publishing the CPI in 1919, and it brought comprehensive revisions to the index in 1940, 1953, 1964, 1978, 1987 and 1998. The objective of these adjustments is to give the CPI a more accurate representation of contemporaneous buying habits and consumption goods (Cage et al., 2003).

In the next sections, we briefly present the conceptual framework for computing price indexes followed by an overview of major price indexes and common related issues.

III- Conceptual Framework

In constructing a simple price index denoted \( P \), the price in a selected year \( P_t \) is divided by the price in the base year \( P_0 \) as \( P = \frac{P_t}{P_0} \times 100 \). However, in many situations, it is desirable to combine several items and develop an index to compare the cost of the aggregation of these items across different time periods. For example, one may be interested in a college student index, which includes tuition expenses, cost of books, housing, meals, and entertainment. Such an index can be formed by computing the average of the individual simple price indexes or through a simple aggregate index using the formula: \( P = \frac{\sum P_t}{\sum P_0} \times 100 \). Because the value of a simple aggregate index is influenced by the units of measurement, it is not used frequently. Rather, it is more adequate to weigh the items according to their relative importance.

There are two methods for computing a weighted price index, the Laspeyres method and the Paasche method, and they differ only in the period used for weighting.\textsuperscript{32} The Laspeyres method

\textsuperscript{32} These indexes are named after the German economists Etienne Laspeyres and Hermann Paasche.
uses the weights of the base period, whereas the Paasche method uses the weights in the current year.

The weighted **Laspeyres index** is computed as:

\[ P_L = \frac{\sum_{c=1}^{M} (P_{c,t_n} \cdot Q_{c,t_0})}{\sum_{c=1}^{M} (P_{c,t_0} \cdot Q_{c,t_0})} \]

where

- **M**: Number of goods (indexes by \( c \))
- **P**: Change in price level
- **\( t_0 \)**: Base period year
- **\( t_n \)**: Period when index is calculated.
- **\( p_{c,t} \) and \( q_{c,t} \)**: Current price and current quantity levels, respectively.

The major disadvantage of the Laspeyres index is that it assumes that the base-period quantities are still applicable in the current period. Alternatively, the Paasche index uses current-period quantities as weights to reflect any change in the quantities consumed since the base period. It is computed as:

\[ P_P = \frac{\sum_{c=1}^{M} (P_{c,t_n} \cdot Q_{c,t_n})}{\sum_{c=1}^{M} (P_{c,t_0} \cdot Q_{c,t_n})} \]

The Laspeyres index does not reflect changes in buying patterns over time, thereby overweighing goods whose prices have increased, whereas the Paasche index tends to overweigh goods whose prices have declined.\(^{33}\) Since the only difference between the two methods is that the Laspeyres index uses base period (period \( t0 \)) quantities whereas the Paasche index uses period \( t_n \) quantities, the Laspeyres index tends to overstate inflation whereas the Paasche index understates it. The Marshall-Edgeworth index attempts to overcome the problems of under and over stating

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\(^{33}\) The Laspeyres index does not account for the fact that consumers typically react to price changes by changing the quantities purchased, and it is impossible to attribute changes in the Paasche index to changes in price alone because different quantities are used each year.
inflation by using the arithmetic means of the quantities. Mathematically, this is represented as follows:\(^{34}\)

\[ P_{ME} = \frac{\sum_{c=1}^{M} P_{c,t} - 1}{\sum_{c=1}^{M} P_{c,t} - 1} \left( q_{c,t0} + q_{c,t1} \right) = \frac{\sum_{c=1}^{M} \left( P_{c,t} \cdot (q_{c,t0} + q_{c,t1}) \right)}{\sum_{c=1}^{M} \left( q_{c,t0} + q_{c,t1} \right)} \]

Alternatively, the Fisher ideal index balances the effects of the Laspeyres and Paasche indexes, and is the most preferred index among economists (Dorman, 1996). It is calculated as the geometric average of the Laspeyres and Paasche indexes.\(^{35}\)

\[ P_F = \sqrt{P_L \cdot P_P} \]

However, the Fisher ideal index is rarely used in reality because it has the same problems that are inherent in the Paasche index and which require that a new set of quantities be determined each period. Since data on quantities consumed are generally not available at each period, proxies may be derived from estimated expenditure shares.

The Tornqvist index represents an alternate geometric index and is computed as:

\[ T = \prod_{j=1}^{M} \left( \frac{P_{j2}}{P_{j1}} \right)^{W_{j,1,2}} \]

Where \( P_{ji} \) is the price of good \( j \) in period \( i \)

\( W_{ji} \) is the estimated expenditure shares of good \( j \) in period \( i \), and

\( W_{j,1,2} = (w_{j1} + w_{j2})/2 \).

The Fisher and Tornqvist indexes are known as superlative indexes and are able to approximate a cost of living index in a more accurate way compared to other indexes (Diewert 1987).

Finally, instead of using a fixed-based index, other methods employ non-fixed bases for price index calculations. One example are chain-weighted indexes (C-CPI), which are hybrids of non-fixed-based indexes and superlative indexes (Fisher and Tornqvist indexes) that consider as

\(^{34}\) This index is named after economists Alfred Marshall and Francis Ysidro Edgeworth.

\(^{35}\) The Fisher ideal index is named after economist Irving Fisher.
base period the year immediately preceding the current time period. Chain-weighted indices are still a work in progress that the BLS started publishing in 2002, it has not yet substituted the CPI as the main measure of inflation in the US. Here is an example of a Laspeyres chained weight index:

\[
P_{tn} = \frac{\sum_{c=1}^{M} (p_{c,t_n} \cdot q_{c,t_0}) \times \sum_{c=1}^{M} (p_{c,t_0} \cdot q_{c,t_1}) \times \ldots \times \sum_{c=1}^{M} (p_{c,t_{n-1}} \cdot q_{c,t_n-1})}{\sum_{c=1}^{M} (p_{c,t_0} \cdot q_{c,t_0}) \times \sum_{c=1}^{M} (p_{c,t_1} \cdot q_{c,t_1}) \times \ldots \times \sum_{c=1}^{M} (p_{c,t_{n-1}} \cdot q_{c,t_{n-1}})}
\]

Each term in this equation attempts to quantify the effect of a price increase between period \( t_{n-1} \) and \( t_n \). By multiplying all these terms together, we obtain the overall rise in prices from the beginning period to the \( n^{th} \) period.

**IV- Major Price Indexes**

Price indexes are designed to track inflation changes in an economy by measuring the price level or cost of living at a particular date. They are a normalized weighted average of prices for a given class of goods and services during a certain period of time (month, year, decade, etc…). They serve as a measurement tool to enable policymakers compare prices between different time periods and/or across regions, sectors, etc.

The Consumer Price Index (CPI) is closely monitored by most nations because it is usually linked to wage adjustments and other key economic decisions. Other notable measurements of inflation that governmental and non-governmental agencies publish include, but are not restricted to, the Producer Price Index (PPI), the Import/ Export Price Index, the Real Estate Price Index, and the GDP deflator.

*a) The Consumer Price Index*

The Consumer price index (CPI) is a measure of the average change in prices paid by urban consumers for a market basket of consumer goods and services, and is derived from the ‘fixed-
weight Laspeyres price index’ (Fixler and Jaditz, 2002). The “CPI attempts to measure the minimum level of expenditures need by a representative consumer to achieve a given level of utility in a given base period” (Bureau of Labor Statistics (BLS), 1997). The CPI considers a representative basket of goods and services that are purchased to meet the consumption needs of the population.

In the US, expenditures are classified into 200 categories, which are arranged into eight major groups. In addition to these eight major groups, various government taxes and fees as well as sales tax (VAT) are included in the calculations. However, the CPI excludes income and social security taxes, as well as investments (stocks, bonds, real estate, insurance, etc…), because these items are savings-related and are not intended for day to day consumption.

Over the past 80 years, the methodology for producing CPIs has been refined by way of improvements in price data collection techniques, adjustments in estimation methods, and continuous surveys of consumer spending behavior to determine which goods and services to include in the CPI basket (Cage et al., 2003). For example, a consumer expenditure survey is allocated throughout the US to about 7,000 different families each quarter. Based on the results of the survey, each product is given a different weight and the aggregate CPI is calculated using all items in the basket following a Laspeyres index for every major city in the country as

$$P_L = \frac{\sum (p_t \cdot q_0)}{\sum (p_0 \cdot q_0)}.$$  It is the percentage change in the CPI that measures inflation over a certain period of time. In addition to measuring changes in the prices of goods and services, the CPI is used to determine real disposable income, deflate sales or other variables, find the purchasing power of the domestic currency, and establish cost-of-living indexes.

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36 The eight major categories are: Food and Beverages, Housing, Apparel, Transportation, Medical care, Recreation, Education and Communication, Other goods and services.
37 In some countries, statistical offices also compute CPI indexes excluding gasoline or tobacco.
38 Note that this particular example is exclusive to the USA in the year 2003 and different surveying years may include a different number of households and stratas.
In the US, the BLS also computes another price index called the ‘Personal Consumption Expenditure Deflator’ (PCE Deflator). The PCE deflator uses the Fisher ideal quantity index. It takes the ratio of two PCE over two periods and deflates it by a quantity index. The main difference between the CPI and the PCE is that the CPI measures the prices of goods paid by urban consumers, whilst the PCE measures the prices paid by consumers, no matter where these goods are bought.

b) The Producer Price Index (PPI)

Another widely used and published measure of price change is the Producer Price Index, which evaluates price fluctuations at all stages of production. Specifically, the PPI measures the average change over time in the selling prices received by domestic producers of goods and services. Whereas, the CPI evaluates price changes from the purchaser’s point of view, the PPI considers the perspective of the producer. Sellers’ and producers’ prices differ mainly due to government subsidies, sales taxes, and distribution costs, even though these two indexes are highly correlated.

The PPI is mostly calculated in developed countries. In the US for example, over 10,000 PPIs for individual products and groups of products are released on a monthly basis. The PPI index was formerly known as the WPI (Wholesale Price Index) from 1902 till 1978. Its calculation follows a modified Laspeyres index as:

\[
I_t = \left[ \frac{\sum Q_0 P_t}{\sum Q_0 P_0} \right] \times 100
\]
where $P_0$ is the price of a commodity (used in the production) in the base period;

$P_{ti}$ is the price of the commodity in the current period; and

$Q_o$ is the quantity of the commodity shipped during the base period.

Thus, the PPI index is the weighted average of relative prices (price ratios for each item $(\frac{P_t}{P_0})$), and the expression $\sum Q_o P_0$ represents the weights in value form.

The PPI plays a vital role in the regulation and monitoring of consumer prices. It is also a leading determinant for the introduction of new companies in a country, since the PPI provides potential investors with information pertaining to the investment climate (BLS website).

c) The Export/Import Price Index

Import and Export Price Indexes measure the variations in the prices of imported and exported goods, respectively. For the U.S., the BLS constructs and publishes these indexes on a regular basis. The data are taken from a sample of establishments chosen by the International Price Program (IPP) according to their trade value during the year. The BLS then selects from each establishment the items for which the prices are going to be taken into consideration in the estimation for every month. The Import and Export Price Indexes are calculated using a modified Laspeyres index, which assumes that there are no new goods introduced in the model and that the quality of services and goods is held constant. The IPP tries to maintain the quality of the goods fixed$^{39}$, but if a characteristic of a good changes and it affects its price, then a “link” price will be created in order to compare the price of the good before and after the change occurs.

$^{39}$ The issue of quality is discussed further below in chapter 3, section e.
d) The Real Estate Price Index

When estimating real estate price indexes, two methods are utilized, the hedonic model and the repeat sales model. Hedonic models link the selling prices of dwellings or houses to some of their characteristics, such as location, physical features, and time held on market. The models are developed from cross-sectional samples of housing surveys which are documented by multiple listing services (Quigley, 1994).

The second method of estimating real estate price indexes is the repeat sales model. This particular technique studies the selling price of the same dwelling over time without considering the characteristics of the house. It also assumes that prices follow a random walk, that real estate markets are efficient, and that current market values fully reflect the future discounted value of the housing. However, a drawback of this method is that it reduces the sample size, and may not give a comprehensive illustration of the local markets of the dwellings, especially in the short and medium terms.

e) The GDP Deflator

The GDP deflator approximates the level of prices of all final goods and services in an economy. It is calculated as the ratio of nominal GDP (measured at current prices) to the real GDP (measured relative to a specific base year), and can be expressed as follows:

\[ GDP_{\text{deflator}} = \frac{GDP_{\text{Nominal}}}{GDP_{\text{Real}}} \times 100 \]

\[ \text{A hedonic price index is a price index that derives from hedonic regressions, which are econometric models that attempt to describe how product prices can be explained solely by their characteristics. By doing so, specific monetary values are associated to each attribute of the product (“marginal values”). This technique is extremely useful in the field of Information and Computer Technology (ICT) as well as the Real Estate market. For example, hedonic pricing allows for the assessment of the value of a particular website based entirely on its functions and characteristics.} \]
Unlike most price indexes, the GDP deflator does not rely on a fixed basket of goods and services. In contrast with the CPI and PPI, the basket is allowed to change with people’s consumption and investment patterns.

As such, new expenditure patterns are allowed to be introduced in the deflator as people start responding to changes in prices. The clear advantage of this measure is that it allows for an up-to-date reflection of pricing and expenditure patterns. Empirically, the difference between the CPI and the GDP deflator is minimal. However, this minimal difference can often prove costly, especially due to the importance of such measures in the implementation of fiscal and monetary decisions (Mankiw, 2004).

V- Common Price index Issues

Each of the previously mentioned price indexes is subject to different issues that range from calculation bias to data availability. The CPI and the PCE Deflator generally attempt to measure the same output, but they differ due to calculation methodologies. In contrast to the CPI, which is derived from a simple Laspeyres formula, the PCE Deflator is derived from a Fisher index, which is the geometric average of the Paasche and Laspeyres indexes. Generally, the Paasche index tends to lie below the Laspeyres index and as such we expect the PCE Deflator to underestimate inflation. Jackman (1993) documents that inflation rates reported by the PCE deflator index are generally lower than those that are calculated from the CPI. Fixler and Jaditz (2002) argue that the discrepancy between the two indexes is due to differences in formula and to the different measures of price change.

Another notable weakness of the CPI is that it is generally unchained, unlike the PCE Deflator. However, in August 2002 the BLS began publishing a CPI known as that Chained
Consumer Price Index (C-CPI) to overcome the upper level substitution bias of the old CPI index. In essence, the substitution bias reflects the failure of the fixed basket index to account for consumer substitution between relatively less expensive items for those that have become relatively more expensive. This chained CPI is derived from a Tornqvist formula and is designed to be a closer approximation of the ‘cost of living’ than the current CPI used by the BLS (Cage et al., 2003).41

The CPI has some weaknesses other than the substitution bias. It ignores the fact that household preferences extend to choices between labor and leisure. It also makes the simplifying assumption of taking a single period index (static model as opposed to a dynamic one). Furthermore, it ignores the impact of both the environment and government goods on household welfare (BLS Website).

Similarly, the Producer Price Index (PPI) suffers from some setbacks. Even though the PPI is thought of as the most accurate indicator of future CPI, it is subject to volatile predictions (BLS Website). The prices of items such as food and energy are quite volatile thus skewing the data, not all industries are covered, and not all countries (specifically the developing nations) can provide such a statistic. For these reasons, the PPI cannot be used as the main benchmark of inflation as is the case with the CPI.

The Import/Export Price index is subject to exchange rate fluctuations that may lead to faulty conclusions in the basket of imported/exported goods. It also suffers from time lags in the economy, as exports and imports are slow to react to currency fluctuations. Furthermore, it utilizes a Laspeyres index, and is likely to overstate inflation, just like the CPI.

41 The theory on a chained CPI is loosely based on the works of Erwin Diewert who first proposed the use of a superlative index-based CPI (1976). It is beyond the scope of this introduction to give detailed descriptions of the CPI and the C-CPI.
The Real Estate Price Index is the least used indicator of all price aggregates, and few countries publish data on it. It is mainly used as a tool for forecasting future real estate prices. Economists generally agree that real estate prices should not be included in inflation measurement since real estate spending is regarded as a part of investments and savings. According to Quigly (1994), including real estate prices in inflation measurement, would encourage the formation of a virtual economy heavily based on speculation.

To sum, producing several price indexes is likely to provide a better picture about the reality of the changes in prices in an economy compared to relying on a single measure like the CPI.
Chapter 3

Conceptual and Operational Issues in the Consumer Price Index (CPI)

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I-Introduction

The most commonly reported measure of the consumer price levels in the United States and all other developed/developing nations is the Consumer Price Index (CPI). In the US, the CPI is published by the U.S. Department of Labor’s Bureau of Labor Statistics (BLS). It is a fixed-weight price index using a fixed basket of goods that are representative of what a typical consumer purchases each month.

There are many different CPIs that are calculated by region, types of products, types of consumers, etc. The most commonly reported CPI is the CPI-U, which is the CPI for all urban consumers. Increases in the CPI level serve as a measure of a nation’s inflation rate. The rate of inflation over a period of time is simply the percentage increase in the CPI over the period, often reported on an annualized basis.

The CPI also has other potential uses that are often disregarded. It serves as a vital economic indicator of the current and future welfare of a country as well as its people. It is also an importance reference for escalation agreements (labor contracts, pension funds, etc…). The CPI can often be used as a deflator for economic series and as such is integral in the calculation of ‘real’ values in the economy.

In the US, the Bureau of Labor Statistics (BLS) started publishing the CPI index in 1919, and it brought comprehensive revisions to the index in 1940, 1953, 1964, 1978, 1987 and 1998. In the US, the CPI is divided into two main subgroups; the CPI-U which focuses on urban consumers and the CPI-W which focuses on urban wage earners and clerical workers. As of August 2002, the BLS began publishing a CPI known as that Chained Consumer Price Index (C-CPI). This new measure is derived from a Tornqvist formula (as opposed to the traditional Laspeyres formula) and
is designed to be a closer approximation of the ‘cost of living’ than the current CPI used by the BLS (Cage et al., 2003).

The reason the BLS prompted to create this new C-CPI is mostly attributed to conceptual and operational issues attributed to the CPI. The C-CPI is based on a Tornqvist superlative index and, according to most economists; the ideal price index is one that is based on such an index (Diewert, 1976). A superlative index in its most broad definition and in accordance with the BLS can be defined as: "An index that is exact for a flexible functional form that can provide a second-order approximation to other twice-differentiable functions around the same point" (BLS website). The problem with these forms of indexes is that they assume that prices and expenditure shares are taken as known with certainty, as if there were only one consumer in society whose buying behavior would change in response to the observed prices. The CPI, however, is based on distinct samples of outlets and consumers. Sampling variation and the independence of the sampling errors hinder the ability of constructing a superlative price index.

Since the CPI is the main price index in the US (CPI-U) and in most of the world, the rest of this section is devoted to pinpointing the various biases (errors) that stem from the CPI, as well as looking into proposed reforms set forth by the BLS to mitigate the bias in the CPI. These errors can be divided into sampling and non-sampling errors

II-Sampling and collection methodology issues in the CPI

The earliest research on index numbers typically devoted a great deal of attention to matters such as formula choice and weighting schemes, failing to acknowledge that price indexes are derived from samples and are as such subject to sampling errors. (Wilkerson, 1967). Mitchell (1921) discusses a price index as an average of price relatives derived from a selection of price
relatives without investigating the issue further, and Frisch (1936) merely added that a measure of price levels is essentially stochastic. It wasn’t until 1951 that Mudgett (1951) emphasized the need for some measure of the precision of index numbers, although Von Hofsten (1959) acknowledged that there is no such thing as a statistical precision of a price index.

The sampling error essentially derives from the fact that the CPI measures the prices of only a sample of items from a sample of outlets in a sample of cities, based on a Consumer Expenditure Survey (CES). In the US, the survey is conducted quarterly for 5000 households, collecting data on expenditures, assets, liabilities, incomes, large item purchases, and household expenses. Further, in the CES each sample household is asked to make a complete record of all expenses for a two-week period. Another survey called the Point of Purchase Survey (POPS) is used to determine which outlets are used for collecting prices. Administered to 16,800 individuals each year, it determines how much consumers spend for different classes of items and how much they spend at each of the places from which the items are bought (BLS Website). Even after choosing a sample of items and outlets, two problems remain: choosing which particular model or brand to price and selecting the day of the month for taking the samples.

Finally, the largest cities in the US are sampled, and an attempt is made to choose samples from cities of intermediate and smaller sizes. The problem with a sample from large cities only is that the price of some items is expected to be rather different from the price of the same goods in smaller cities (because, e.g., of a higher degree of competition in larger cities). In addition, the consumption behavior of residents may not be the same in all kinds of cities, implying that expenditure shares (or quantities) used to compute price indexes might also be different. However,

---

42 This introduces the problem of low-frequency purchases, particularly for durable goods which are typically bought less than every year. For that reason, CES questionnaires often include a separate section on durable goods (cars, housing appliances, etc.) Dedicated statistical (econometric) techniques are also devoted to the treatment of “zero expenditures” in consumer surveys.

43 In the US, attempts are made to represent sales days as well as non sales days in the CPI reports.
this complicated stratified sampling incorporates errors simply because one cannot feasibly record the price of every item purchased by every household and in every urban area. The all items CPI can be computed as a weighted average of all the separate 50 city indexes. The 50 sample places in the CPI sample consist of the urban portions of 33 Standard Metropolitan Statistical Areas and 17 small urban places (Refer to Appendix C for more details on CPI construction).

The BLS has long been aware of the sampling error inherent to the CPI. In 1964, it initiated a replication procedure to detect any persistent bias in CPI sampling (Wilkerson, 1967).

The CPI replication design included two replicated samples and, when appropriate, two outlet samples per city. Each priced item carries an index weight reflecting its importance in the consumer expenditures of the index population. Each sample city also had a population weight relative to all U.S. index families. The CPI weights are updated for price changes at each period.

The replication program initiated by the BLS was extremely helpful in terms of time and cost because it found that the sampling error is relatively small, thus satisfying concerns previously raised by statisticians (Wilkerson, 1977).

In fact, problems of price data collection and comparison, difficulties in handling the problems of quality change, and difficulties in defining basic concepts of measurement and their operational implementation, bring about problems which are far worse than the problem of sampling error. Hence, the BLS has emphasized how to resolve non sampling problems, focusing on improving the CPI pricing methods, handling quality change problems, as well as trying to minimize substitution bias.
III-Non- Sampling bias (errors) in the CPI

Non-sampling errors or biases are of equal (if not of more) importance than sampling issues. Non-sampling errors can be subdivided into six main categories: *New product bias, substitution bias, formula bias, new outlet bias, quality change bias, and time of month bias.*

\[44\]

\[a)\] *New Product Bias*

Sometimes new goods provide services similar to existing ones but with higher quality or lower prices. For instance, a compact disc offers the same service previously produced by vinyl records but at a higher recording quality. In other cases, these new goods may offer an additional variety of choices without altering any service produced as is the case with a new line of clothing. Finally, some goods provide services previously unheard of as is the case with the introduction of interactive video gaming and wireless technology services. For the CPI construction, the introduction of new goods presents two main issues: bringing new goods into the samples on a timely basis, and accounting for differences in prices between the old goods and new ones that provide similar services (Armknecht et. al, 1996).

In 1981, the BLS introduced the concept of periodic sample rotation in an attempt to solve the issues related to introduction of new goods as well as new outlet stores. One fifth of the sample was rotated every year based on geographical locations up until 1999. In 1999, the BLS began shifting from area sample rotation to item category rotation using telephone Point-of-Purchase Surveys (BLS). However, sample rotation did not resolve the problem of introducing new goods into the CPI because this method does not appropriately account for improvements in consumer well-being (Moulton, 1996). The sample rotation creates a link between the old and new samples

---

\[44\] In 1996 the USA estimated the non sampling errors to be at around 1.1% of total CPI. Please refer to Appendix D (The Boskin Report).
and as such the implicit assumption is that prices in both samples fully reflect quality differences, especially if the prices of old goods fall as a result of introducing new goods. However, if the new sample includes items that provide the same service at a cheaper price or a new service that was previously nonexistent, then the benefits of these improvements will not be fully reflected in the price change and may thus lead to a bias.

The actual measurement of the new goods bias has proved to be very inconsistent and lacking much basis. Hicks (1940) indicates that, for consistency with the economic theory underlying a true cost of living index, the consumer’s surplus attained from the introduction of new goods should be measured in reference to reservation prices. However, these estimates prove to be a tricky econometric problem. The Hicksian consumer surplus from the introduction of new goods is known as the ‘pure new goods effect’, but the introduction of new goods is almost always accompanied by a change in quality and price declines. Clearly, one can see the difficulties in separating the pure new goods effect from changes due to quality and substitution bias. According to Moulton (1996), most recent estimates of the new goods bias in the CPI are based on “shaky” and “fragile” calculations. Moulton further emphasizes that most of what is being counted as new goods bias is also being considered as quality and substitution bias, resulting in a double counting effect that overstates the upward bias of the CPI even further.

Recent papers suggest that the CPI is indeed missing gains in consumer welfare because of the new goods problem. Using an econometric estimation of demand, Hausman (1994) estimated the Hicksian consumer surplus resulting from the introduction of new breakfast cereals. He finds that there is an increase in consumer surplus that is not represented in the CPI, overstating the cereals price index. Nordhaus (1994), on the other hand, sees no bias with the introduction of new goods. He uses the example of indoor illumination to show that there have been dramatic
reductions in the price of lighting over the past years as new technologies are introduced. He further argues that these product innovations are linked into the CPI as the sample rotation picks up, rather than appearing as price declines in an existing product.

Many economists are skeptical about any bias resulting from the introduction of new goods. The consensus is that the current state of empirical research has not done much to narrow down the set of plausible theories and beliefs associated with the cost of new goods problem.

b) Substitution Bias

An economic cost of living index is supposed to measure the change in the cost of obtaining a fixed level of economic well-being or utility (Moulton, 1996). However, the CPI uses a fixed basket of goods to calculate price changes, and it might not be a good reflection of the Cost of Living Index (COLI). In essence, the substitution bias reflects the failure of the fixed basket index to account for consumer substitution between relatively less expensive items and those that have become relatively more expensive. An implicit assumption behind the construction of the CPI is that consumers do not react (at least, not in the short run) to changes in the prices used to construct the index, by modifying their consumption of each good in terms of quantity.

Substitution bias can occur within item categories (e.g., consumers might substitute local apples for imported apples when the price of imported apples rises) 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 is known as higher level substitution bias.

Several empirical models are employed to estimate this bias. A rather popular strategy before 1980 was to estimate a system of demand equations to calculate directly the exact cost of living associated with the demand system (Braithwart, 1980).
More recent literature avoids the difficulties of constructing demand equations by relying on superlative price indexes. Unlike the Laspeyres index that requires information on expenditures in one period only, superlative indexes require complete information on expenditures or quantities for each period. Diewert (1976) shows that superlative indexes such as the Tornqvist index or Fisher index closely approximate a cost of living. Using quantity and price information from each time period allows for substitution to be taken into account.

Several studies and papers have compared Laspeyres and superlative indexes. Manser and MacDonald (1988) rely on Personal Consumption Expenditure data from 1959-1985 to show that the Laspeyres index tends to outgrow the superlative indexes by 0.2-0.25 percentage points per year. A similar study by Aizcorbe and Jackman (1993) incorporating data using the Consumer Expenditure Survey from 1982 to 1991 reports similar findings of overestimating inflation. To sum, the substitution bias problem is associated with the use of a Laspeyres index, and it can be resolved using a superlative index.

c) Formula Bias

Most economists believe that the CPI suffers from a measurement and weighting bias because it is derived from a fixed-weight Laspeyres index (See Wynee and Sigalla, 1993). According to Bryan and Cecchetti (2003), to understand the bias in fixed-weighted indexes, inflation should be defined as a constant expenditure index of price change from period $t-1$ to period $t$. The authors design a theoretical model inspired by the works of Stock and Watson (2002) in time series econometrics. Consider

$$\pi_t = \sum_j w_{0j} \hat{p}_{jt}$$
where \( w_{jo} \) is a set of base period expenditure weights and \( \hat{p}_{jt} \) is the percentage change in the price of good \( j \) from period \( t-1 \) to period \( t \). Changes in the individual good prices (\( \hat{p}_{1j} \)) share a common inflation component and an idiosyncratic relative price movement:

\[
\hat{p}_{jt} = \hat{m}_t + \hat{x}_{jt},
\]

where \( \hat{m}_t \) is the inflation component and \( \hat{x}_{jt} \) is a relative, or real, price disturbance.

Substituting equation (2) into (1) and noting that \( \sum w_{jo} = 1 \), the price index can be rewritten as:

\[
\pi_t = \hat{m}_t + \sum_j w_{jo} \hat{x}_{jt},
\]

which states that the growth rate of a standard fixed weight price statistic sums inflation and a weighted average of relative price disturbances. For the index to correctly approximate inflation rates, the right-hand side of equation (3) needs to be equal to \( \hat{m}_t \) or mathematically \( E \left( \sum_j w_{jo} \hat{x}_{jt} \right) = 0 \).

Bryan and Ceccheti (1993) argue however that this is not the case and that \( E \left( \sum_j w_{jo} \hat{x}_{jt} \right) \neq 0 \). There are two reasons for this bias. First, individual prices may, on average, be measured incorrectly thus leading to a measurement bias. Also, actual expenditure shares \( w_{jt} \) and \( \hat{x}_{jt} \) are correlated thereby producing a weighting bias. In either case, the expectation of \( \hat{x}_{jt} \) is different from zero. The authors solve for the measurement and weighting bias using a dynamic factor approach, which is beyond the scope of the current report.

In 1993, Reinsdorf, a BLS researcher set out to explain a striking empirical finding pertaining to the discrepancy between food item prices and the average price series calculated using the same data. Reinsdorf first attributes this result to outlet substitution effects, but later research shows that much of the difference between the CPI and average prices is attributable to formula bias (Reinsdorf, 1994). Conceptually, the base price for a sample item should represent its average price over that year. However, due to sampling rotation, in some cases, the sample item is
not selected during the base period, and as such neither the base period price nor the base period quantity is observable.

From 1978 until 1996, the BLS used the following procedure to correct for any errors that might occur as a result of this bias. The BLS simply takes the price of the sample item during the sample replacement or “link” month, and deflates it as the base period using the overall price index for the stratum (Moulton, 1996). However, this procedure causes items that are on sale or that have a lower than usual price to receive a disproportional large weight, because the expenditure weight is divided by an atypically low base price for items on sale. These items are also likely to be off sale the next month and will show a relative increase in prices. The net effect of this correction procedure is that the new estimator will apply too much weight to price increases and too little weight on price decreases immediately following from the introduction of a new sample.

Numerous procedures have been studied by the BLS in order to improve this estimation procedure. The earliest research called for the use of alternative estimation formulas like the geometric mean as opposed to the arithmetic mean (Moulton, 1993; Moulton and Reinsdorf 1995). However, studies by McClelland (1996) show that if the objective is to estimate a modified Laspeyres index, then the geometric mean tends to produce inflation estimates that are systematically too small.

In 1996, the BLS adopts a new method for addressing this estimation issue. The approach entails holding out the new samples for three to four months after the base prices are estimated (Moulton and Stewart, 1995; McClelland, 1996). Simulation and research has shown that the formula bias is concentrated in the first month or two after the introduction of a sample, and as such holding out the new sample for several months alleviates the problem. The magnitude of
formula bias for 1993-1994 was estimated to be about 0.24 percent; however the changes in 1996 almost entirely reduced this bias.

d) New Outlet Bias (Outlet Substitution)

Reinsdorf (1993) mentions another problem associated with sample rotation, and which is related to the treatment of new discount outlets in sampling and estimation procedures. Discount outlets are selected for CPI samples in proportion to consumption as reported by the Point of Purchase Survey. New outlets are linked to the survey, but the linkage procedure does not allow prices in the old and new outlet to be compared directly. Accordingly, savings achieved from switching outlets are not recorded by the CPI.

The problem of new outlets is very close to the problem of introducing new goods (the comparison is immediate if new outlets and existing ones supply separate product ranges). Empirical evidence on the effects of discount outlets is quite scarce. Reinsdorf (1993) conducted a study which involved comparing food prices between old and new samples within a new discount outlet. His results show that there is a 0.25% percent upward bias per year assuming that price differences are not offset by any declines in quality. Reinsdorf’s results, however, are barely statistically significant.

MacDonald and Nelson (1991) approach this issue from another angle by simply utilizing price differentials between warehouse outlets and traditional outlets. Their study finds that prices in warehouses tend to be 13.4% lower on average relative to prices at traditional outlets. Furthermore, the rate of growth of warehouse stores in the USA between 1983 and 1991 was about 0.7% per annum\(^{45}\). Combining the 13.4% price difference with the 0.7% growth per year results in a maximum bias of \(0.134 \times 0.7 = 0.1\%\) per year, assuming no quality differential. By incorporating

\(^{45}\) According to data published by the “Progressive Grocer”.
quality adjustment and assuming that warehouses tend to have lower quality goods, the bias further reduced below the 0.1% mark. MacDonald and Nelson conclude from their study that the problem of outlet bias is not so grave.

There is no clear solution or adjustment to the outlet substitution bias. Many of the categories that go into the CPI are service oriented (rent, utilities, college tuition) which are probably not much affected by outlet substitution bias. In any case, outlet substitution should not be ignored in estimating a price index.

e) Quality Change Bias

Many of the procedures used by the BLS in processing data are designed to separate price changes from quality changes. The issue of quality adjustment starts off with data collection. Detailed checklists are compiled in order to assure that the same item is the one being priced from period to period. If, however, the sample item has changed in an observable way, then three general procedures may be applied to the current data. An economist with specialized knowledge of the item examines information on the two items and sees whether a) this change did not result in any significant quality adjustment, and as such the prices of the old and new item can be compared head to head; b) a change in quality has occurred and can be translated into a dollar value; and c) a change in quality has occurred but this cannot be translated into a dollar value.

Usually, manufacturers of a product represent the source of information on quality cost change. However, alternative techniques do exist when the former is hard to come by. Hedonic regressions are a good way of estimating price-quality relationships by running regressions of prices based solely on characteristics. The coefficients of these regressions can then be used in order to estimate the value brought about by a change in characteristics of a certain item.
When hedonic regressions prove unpractical, then some other method must be utilized in order to link the effect of quality change on price. To understand how such a linkage works, consider the following illustration. Suppose a phone that is available one month is being replaced the next month by a similar phone of different quality. In a linkage calculation, we simply calculate the rate of inflation during that month for the category of goods the product belongs to (phones, in this example) and calculate an average price increase. If for example the average price increase for phones was at 2%, but the new phone introduced was marked at 5% higher than the former, then 2/5 of the price can be attributed to overall price increase and 3/5 of the price is due to quality improvement.

However, some economists believe that the BLS systematically underestimates quality improvements, thereby biasing the CPI upward. Recognizing the problems associated with the linking approach, the BLS has taken steps in recent years to increase the use of direct comparisons rather than using linkages.

Over the past decades, quality adjustments have been significant in the US. For example, between the years 1967 and 1980 the change in car price indexes would have been 80% higher if it were not for quality control. Still Gordon (1990) finds that the BLS linkage indexes were off by about 1.5% per year (biased upwards) from the years 1947-1983 and they failed to capture quality improvements fully. In contrast, Reinsdorf, Liegey, and Stewart (1996) find that linking may have led to a downward bias.

There are many sectors within the economy and specifically the services sector for which quality adjustments have been ignored. Little research is available on the direction and magnitude of quality control bias in the service sector. This could be attributed to the tedious and difficult nature attributed to quantifying this bias whether it be through hedonic regressions, linkages, or
direct comparisons. Moulton (1999) notes that further research is needed on the subject in order to fill more gaps.

f) *Time of Month Bias*

The Bureau of Labor statistic does not collect prices on weekends and holidays when some items may rarely be on sale for that period. Recent empirical evidence also suggests that the fraction of purchases on weekends and holidays has increased (Moulton 2003). This effect would lead the CPI to be less representative of the general consumer and bias the CPI upward. There is no real literature on this topic and perceived remedies, even though the obvious critique is that the BLS start measuring for items on holidays and weekends to get a more general overall representative sample that is in line with the average consumer.

IV-**Concluding Remarks**

Most bias issues that are associated with the CPI are related to a budget constraint on price analysis. Since data collection at the individual level is costly, researchers and practitioners have been looking for statistical indicators of inflation which requires as few real data as possible.

Another issue raised by Moulton (1996) and Fixler (2002) has to do with buying patterns across various demographic groups. These economists argue that buying patterns among social security recipients differ from other people and as such should not share the same demographic group. The CPI advisory commission (1995) found little to no difference for price indexes between various groups based on several studies. However, biases themselves could change amongst different demographic groups and should be studied in more detail. The consensus is that more
detailed research is needed on inflation differences between the elderly and non-elderly, the poor and non-poor, and other groups with different expenditure patterns.\textsuperscript{46}

Knowledge pertaining to the issues of substitution and formula biases in the CPI has increased substantially, and recent changes by the BLS have effectively eliminated the formula bias. However, the other categories of CPI bias still require more attention. Although the net effect of outlet substitution bias may not be large, the topic still requires vast research to completely assess it from all angles. Many researchers have effectively tackled the quality adjustment bias, but this is true for selected items only. Finally, even though the new-good problem is the hardest to quantify, it still deserves attention and must be approached from a new academic standpoint.

The most revolutionary and encouraging outcome to date is the rise of research on price measurement issues. New data sources, such as supermarket scanners and micro-data from retail outlets have allowed the BLS to acquire detailed information that was previously either too costly or unattainable.\textsuperscript{47} This also enables researchers to have access to more detailed and accurate data in order to further research on the issues of quality and new goods bias which as of now are probably the two most undealt with issues in price index construction.

\textsuperscript{46} Note that when computing superlative indexes, it is possible to affect to a particular category its own expenditure shares, thereby obtaining a category-specific (CPI) price index.

\textsuperscript{47} While these data are much more detailed, they remain costly to acquire by researchers or public authorities. Furthermore, the raw data collected from individuals need to be corrected for recording bias (omission of some purchases, data inputting errors, etc.)
Chapter 4

Survey of Available Price Statistics in Lebanon, with Consistency and Validity Checks

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I- Introduction

As mentioned in the previous chapters, price indexes are designed to track inflation by measuring the change in the level of prices, and monetary authorities use this indexation as a key reference to control inflation. Similar to other countries, the price index commonly used in Lebanon to track inflation is the Consumer Price Index (CPI), which is the average price paid by consumers for a basket of goods and services.

Table 2 shows the trend in GDP, the exchange rate of the LBP vis-à-vis the US Dollar and the inflation index estimated by the International Monetary Fund (IMF) for Lebanon using 2000 as a base year.

Table 2: Historical and Forecast Evolution of Key Indicators for Lebanon.

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP in billions of LBP</td>
<td>14</td>
<td>59.3</td>
<td>1,973</td>
<td>18,028</td>
<td>25,143</td>
<td>33,243</td>
<td>55,837</td>
<td>78,117</td>
</tr>
<tr>
<td>US Dollar Exchange to LBP</td>
<td>3.43</td>
<td>16.4</td>
<td>695</td>
<td>1,621.33</td>
<td>1,507.46</td>
<td>1,507.48</td>
<td>1,508</td>
<td>1,508</td>
</tr>
<tr>
<td>Inflation Index (2000=100)</td>
<td>0.07</td>
<td>0.21</td>
<td>18</td>
<td>81</td>
<td>100</td>
<td>106</td>
<td>134</td>
<td>151.28</td>
</tr>
</tbody>
</table>

Source: IMF Data and Forecasts

In the 1980s, as the national currency depreciated against the US Dollar, the country experienced hyperinflation with staggering inflation rates. Following the end of the civil war in 1990 and to control inflation, Lebanon adopted a fixed exchange rate policy that stabilized the value of the US Dollar around 1,500 Lebanese Pounds (LBP). Price stability was declared a major objective by the central bank to contain inflation. By pegging the Lebanese Pound to the US
Dollar, inflation rates in Lebanon become mainly determined by the US inflation rates. As the reference currency rises or falls, so does the currency that is pegged to it since goods and services are priced in foreign currency.

The official body entrusted with the publication of the CPI, the Central Administration of Statistics (CAS), started producing a CPI at the end of the 1990s, and it upgraded its methodology in 2008. In parallel, other public and private bodies also publish CPI price statistics or have done so over some periods in the past, including the Ministry of Economy and Trade (MoET), the Consultation and Research Institute (CRI) and the Chamber of Commerce, Industry and Agriculture (CCIB) in Lebanon. Similarly, the IMF publishes data on inflation in Lebanon based on figures that are estimated by the Central Bank of Lebanon and IMF employees, and not using the figures of either the MOET or CAS.48

This chapter reviews available price information in Lebanon, official and otherwise. It also produces a series of consistency and validity checks on these price series.

II- Central Administration of Statistics (CAS) CPI

a) Overview

The CAS is a public administration within the Presidency of the Council of Ministers of the Lebanese government and it is entrusted with the publication of national price indices as well as being the provider and supervisor of official national social and economic statistics. Its establishment was made official with the Statistical Law number 1793 of February 22, 1979. Although the organization of CAS was detailed in February 1980 by the government decree number 2728, CAS effectively initiated its work only in 1994 because of the war and the damage to its offices.

48 The IMF has recently adopted the official CPI that is produced by CAS.
The first step towards conducting statistical studies was introduced by CAS in 1997 with the initiation of the full Census of Buildings, Dwellings and Establishments that covered Beirut and its suburbs only, and the results were aggregated on the level of Cazas and Mohafazats. The Census allowed for conducting the National Survey of Living Conditions of Households in 1997. A few years later, CAS conducted a new census to revise the old database and the outcome was the 2004 National Living Conditions and Household Budget Survey that was jointly completed with the Ministry of Social Affairs and the United Nations Development Program (UNDP). Being a national statistical database, the 2004 survey served as a basis for many economic indicators covering all Lebanese regions.

In 2008, CAS introduced updates to the 2004 database and brought changes to the existing CPI basket using the "price updating the weights" method.\footnote{The “price updating the weights” method is also known as the Lowe index. Following the completion of a household budget survey, expenditure weights are typically available with a considerable time lag compared to the price reference period. Expenditure shares are price-updated by measuring the change in expenditures from buying the same basket of goods and services in the current period compared to the base period.} Since there is no recent available household budget survey, the 2004 weights were reallocated according to market prices and demand changes (UN WSD, 2010). In September 2011, CAS officially launched the field work for the 2011 National Household Budget Survey in cooperation with the World Bank (CAS website).

CAS has published a quarterly CPI since 1999, but the Administration started issuing a monthly CPI starting January 2008 with the assistance of the IMF. The revised monthly CPI covers not only Beirut but also outside regions and is considered to be the official price data series for the country.

CAS has had plans to publish a Producers Price Index (PPI) for some time, and members of the administration assert that they are ready to go ahead with these plans; however, no details are communicated either on the methodology to calculate a PPI or on the proposed launching date.
b) Methodology

The CPI in Lebanon, denoted $I^t$, is computed using the following geometric Laspeyres index for different levels of expenditure divisions.

$$I^t = \prod_{d=1}^{12} \left( I^t_d \right)^{w^0_d}$$

where $t$ denotes a given time interval, $d$ denotes 12 category groups according to the UN’s “Classification of Individual Consumption by Purpose” (see Appendix E) that are included in the CPI basket. $w^0_d$ denotes the expenditure on a group $d$ in the base period 0 of December 2007, as updated from the “The National Survey of Household Living Conditions and Budget 2004-2005”. The main category groups are the following: food and non-alcoholic beverages, alcoholic beverages and tobacco, clothing and footwear, housing water electricity and gas, furnishing and household equipment, health, transportation, communication, recreation and amusement, education, restaurants and hotels, and miscellaneous goods and services.

Goods and services appear in the CPI basket according to two criteria: the weight of the good or service in the living consumption budget and its weight in the group division that it belongs to. The consumption weights show the average household expenditures on goods and services without taking into account specific household’s size, income, and social status. The reason is that the CAS CPI aims at generating an inflation index and not a cost of living index. Thus, it does not select or exclude some income brackets, since inflation catches up with the whole population at all levels.
The CAS team comprises 44 workers who compile monthly prices of more than 36,000 goods from 2,000 points of sales covering most of the Lebanese territory. The frequency of collecting prices varies by product type. Prices that change recurrently such as fruits and vegetables are gathered on a weekly basis; prices that change infrequently are collected once a month; and prices that vary seasonally or according to fashion are collected quarterly (e.g., travel expenses and entertainment). Other prices are gathered on a half-yearly basis (e.g., rents and housing expenses) and educational expenses are collected on a yearly basis.

Prices are congregated under all conditions and circumstances. They are adjusted to ensure coherence and comparability across products and outlets, taking into consideration sales and discounts, promotions and reward points, refunds and indirect taxes, tips and returns, out of stock goods, missing goods, changes in the weight of a good, and closure of an outlet (See appendix F for an example of price adjustments). In case an outlet disappears, it is merely replaced by another because a larger number of price collections increases the convergence of the data set.

Additionally, the CAS team applies controls and verification checks to ensure quality and consistency of the information at the data entry level, whether during the field work or while using data management and statistical treatment. Simple price changes are first calculated for each category on a Mohafazat level, and then changes in prices are generated for each category on a national scale before calculating the CPI.

c) Recent Trends

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An average of 4 varieties of an item is collected for 360 items by 25 CAS data collectors, resulting in a total of 36,000 prices. To facilitate the data collection process, CAS has devised a common template comprising three parts: common features for the goods (weight, brand, origin), important features (features that affect the price of the good), and non-important features (features that do not affect the purchase decision).
The CAS website provides extensive information on its mandate, activities, and publications. As of September 2011, the monthly CPI is published online in an excel format as well as a portable document format (PDF). However, historical data series are published in individual pdf files and not in a single excel file to allow researchers and policy makers to extract the data in an efficient manner. Table 3 shows a sample CPI report published monthly by CAS.

**Table 3: Sample CPI published monthly by CAS**

<table>
<thead>
<tr>
<th>Expenditure Divisions</th>
<th>Inflation, Dec 2011 – Nov 2011</th>
<th>Dec 2011 Index</th>
<th>Nov 2011 Index</th>
<th>Weights</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food and non-alcoholic beverages</td>
<td>1.1%</td>
<td>132.4</td>
<td>131.0</td>
<td>19.9</td>
</tr>
<tr>
<td>Alcoholic beverages, tobacco</td>
<td>0.5%</td>
<td>121.0</td>
<td>120.4</td>
<td>2.1</td>
</tr>
<tr>
<td>Clothing and footwear</td>
<td>0.4%</td>
<td>118.2</td>
<td>117.7</td>
<td>6.2</td>
</tr>
<tr>
<td>Housing water, electricity, gas &amp; other fuels</td>
<td>0.0%</td>
<td>111.2</td>
<td>111.2</td>
<td>25.7</td>
</tr>
<tr>
<td><strong>Housing</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Water, electricity, gas and other fuels</strong></td>
<td>-0.4%</td>
<td>112.7</td>
<td>113.1</td>
<td>9.5</td>
</tr>
<tr>
<td>Furnishings, household equipment and routine household maintenance</td>
<td>0.1%</td>
<td>110.6</td>
<td>110.5</td>
<td>3.9</td>
</tr>
<tr>
<td>Health</td>
<td>0.0%</td>
<td>107.2</td>
<td>107.2</td>
<td>6.8</td>
</tr>
<tr>
<td>Transportation</td>
<td>-2.0%</td>
<td>121.3</td>
<td>123.7</td>
<td>12.3</td>
</tr>
<tr>
<td>Communication</td>
<td>0.0%</td>
<td>86.3</td>
<td>86.3</td>
<td>4.8</td>
</tr>
<tr>
<td>Recreation, amusement, and culture</td>
<td>1.1%</td>
<td>111.3</td>
<td>110.1</td>
<td>3.7</td>
</tr>
<tr>
<td>Education</td>
<td>0.0%</td>
<td>130.9</td>
<td>130.9</td>
<td>7.7</td>
</tr>
<tr>
<td>Restaurant &amp; hotels</td>
<td>0.1%</td>
<td>143.4</td>
<td>143.2</td>
<td>2.7</td>
</tr>
<tr>
<td>Miscellaneous goods &amp; services</td>
<td>0.2%</td>
<td>109.6</td>
<td>109.3</td>
<td>4.2</td>
</tr>
<tr>
<td>Consumer price index</td>
<td>0.0%</td>
<td>117.6</td>
<td>117.6</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: CAS website.

Table 4 shows the historical trend in the CAS CPI, and Figure 1 graphs its evolution.

**Table 4: Evolution of the CPI produced by CAS.**

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<tbody>
<tr>
<td>CAS – CPI</td>
<td>100.4</td>
<td>100.8</td>
<td>102.6</td>
<td>103.3</td>
<td>104.4</td>
<td>106.2</td>
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<tbody>
<tr>
<td>CAS – CPI</td>
<td>107.2</td>
<td>107.5</td>
<td>108.3</td>
<td>107.7</td>
<td>106.2</td>
<td>105.5</td>
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<tbody>
<tr>
<td>CAS – CPI</td>
<td>104.4</td>
<td>105.4</td>
<td>104.8</td>
<td>105.2</td>
<td>104.9</td>
<td>105.5</td>
</tr>
<tr>
<td>------------</td>
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<td>---------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>CAS – CPI</td>
<td>106.2</td>
<td>106.5</td>
<td>106.7</td>
<td>107.8</td>
<td>108.8</td>
<td>109.1</td>
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</tr>
</thead>
<tbody>
<tr>
<td>CAS – CPI</td>
<td>107.9</td>
<td>108.4</td>
<td>109.5</td>
<td>110.1</td>
<td>110</td>
<td>109.1</td>
</tr>
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</table>

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</tr>
</thead>
<tbody>
<tr>
<td>CAS – CPI</td>
<td>109.3</td>
<td>110.1</td>
<td>111</td>
<td>113</td>
<td>113.5</td>
<td>114.1</td>
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</tbody>
</table>

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</tr>
</thead>
<tbody>
<tr>
<td>CAS – CPI</td>
<td>114.1</td>
<td>114.7</td>
<td>114.9</td>
<td>115.9</td>
<td>116.2</td>
<td>115.7</td>
</tr>
</tbody>
</table>

<table>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CAS – CPI</td>
<td>115.6</td>
<td>116.2</td>
<td>116.2</td>
<td>117</td>
<td>117.5</td>
<td>117.6</td>
</tr>
</tbody>
</table>

**Figure 1**: Evolution of the CAS CPI.

Source: CAS website.

### III- Consultations and Research Institute (CRI) CPI

#### a) Overview

With the breakout of the Lebanese civil war in April of the year 1975, the official production of the CPI under the umbrella of The Central Bank of Lebanon (Banque du Liban, BDL) was ceased. To fill in this gap, the privately-owned Consultation and Research Institute (CRI) started producing a CPI for Beirut and its suburbs.
To calculate the CPI, the CRI first used the 1966 technical methodology of BDL, considering the same items, weights, points of sale, etc. The first monthly CPI was produced by the CRI in March 1977, after individually collecting prices and using a simple calculator. In 1979, the government that had lost its entire CPI database because of the outbreak of the war wanted to reinstate the publication of a public or national CPI, not wanting to leave this major task to a private institution. A deal was reached whereby the government would buy the methods and resources that CRI had maintained during the war and entrust them to a new governmental body called the Central Administration of Statistics, even if the CRI maintained the production of its own CPI.\(^{51}\) However and over the next 12 years, there was no reference for the CPI but the one produced by CRI.\(^{52}\) By using 1996 as a reference year, the CRI index was distorted following the hyperinflation levels of the late 1980s. In 1988, the structure of the CPI was modified after the conduction of the 1985 survey that was funded by the Deutsche Gesellschaft für Technische (GTZ) and the General Federation of Labor.\(^{53}\) The weights were upgraded a second time following the 1997 household expenditure survey.

\(b\) Methodology

Amidst a period of war and continuous political tensions in a country where efficient price monitoring is absent, the price collection mechanism to calculate a CPI proved to be a tedious and challenging assignment for CRI. The same employee was hired to collect prices to build familiarity, expertise, and trust in Beirut’s marketplace.

\(^{51}\) The method sold to CAS consisted of a Laspeyres index of 780 item, 12 price columns, 5 family income brackets covering Beirut and its suburbs.

\(^{52}\) Starting mid 1980 a monthly subscription was charged to obtain the monthly figure from CRI.

\(^{53}\) The GTZ is a German organization in Lebanon that supports and advises reforms and emerging economic systems. It joined other German agencies to become part of the GIZ (Gesellschaft für Internationale Zusammenarbeit) in 2011.
CRI uses a distinct CPI market basket that represents all goods and services purchased for consumption in the Lebanese markets using 2004 as a base-year. Further, the CRI considers the 1997 budget shares of the average of higher and lower income brackets, excluding the lowest and highest income brackets, to reflect an index of mass consumption (69% of households of Greater Beirut area).

CRI classifies expenditure levels into 230 categories (including 720 items) which are divided into nine major groups (refer to Appendix G). The index has not witnessed any severe distortion since 2004, given that no new survey was conducted since then and that inflation has been relatively stable.

The price collection team comprises five field workers. Data are collected using templates on a monthly basis from a number of representative pre-selected retail establishments and institutions, recording around 600 items prices that are adjusted for consistency and comparability at a later stage. Thus, the CRI produces a monthly average of changes in prices per outlet, lessening the effect of exogenous factors. All CPI components are updated on a monthly basis except for apparel and healthcare items that are updated on a quarterly basis, and education which is usually updated annually.\footnote{Since 1978, the CRI encountered and resolved various bias problems for some items. For example, if a certain clothing brand disappears, data collectors would visit the apparel store providers to study the composition of clothing and replace the old brand with a new similar one.} The CPI includes direct taxes (Value Added Tax, VAT) that are associated with the prices of specific goods and services, but it excludes indirect taxes (income tax and NSSF contributions). It does not include investment purchases or savings, such as stocks, bonds, and real estate, or life insurance premiums.

During an in-person interview, the head of the CRI recommended that the CPI be divided into an imported products index and a local products index. The head of the CRI showed interest in studying the correlation between items included in the CPI basket and corresponding
international figures, as well as the sensitivity of the price index to imported vs. local goods (how to distribute weights between imported and domestic goods) and to different income brackets. A different structure of weights should also be used according to family income, producing a separate CPI for different income group categories. Additionally, a joint venture between the two major bodies that are producing a CPI for Lebanon, CAS and CRI, is likely to result in a major improvement of the published price series.

c) Recent Trends

Table 5 shows a sample CPI report published by CRI.

**Table 5: Sample CPI published by CRI**

<table>
<thead>
<tr>
<th>Item of Consumption</th>
<th>Weight</th>
<th>Nov-11</th>
<th>Dec-11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food &amp; Beverages</td>
<td>35.40%</td>
<td>1.05%</td>
<td>-3.26%</td>
</tr>
<tr>
<td>Clothing &amp; Shoes</td>
<td>6.55%</td>
<td>0.00%</td>
<td>7.01%</td>
</tr>
<tr>
<td>Housing</td>
<td>6.49%</td>
<td>0.22%</td>
<td>1.23%</td>
</tr>
<tr>
<td>Durable Consumer Goods</td>
<td>8.18%</td>
<td>0.10%</td>
<td>0.22%</td>
</tr>
<tr>
<td>Health</td>
<td>9.82%</td>
<td>1.26%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Transport and Telecommunication</td>
<td>14.39%</td>
<td>-0.42%</td>
<td>2.00%</td>
</tr>
<tr>
<td>Education</td>
<td>12.45%</td>
<td>6.63%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Leisure</td>
<td>2.70%</td>
<td>-0.05%</td>
<td>2.67%</td>
</tr>
<tr>
<td>Personal Care &amp; other Products</td>
<td>4.02%</td>
<td>0.20%</td>
<td>-5.21%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>100.00%</td>
<td>1.29%</td>
<td>-0.73%</td>
</tr>
</tbody>
</table>

Source: CRI

Table 6 shows the historical values of the CPI produced by the CRI, and Figure 2 plots their trend.

**Table 6: Evolution of the CPI produced by CRI**

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>CRI - CPI</td>
<td>100</td>
<td>99.88</td>
<td>99.74</td>
<td>102.2</td>
<td>102.5</td>
<td>102.94</td>
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</thead>
<tbody>
<tr>
<td>CRI - CPI</td>
<td>103.5</td>
<td>105</td>
<td>105.2</td>
<td>105.22</td>
<td>103.8</td>
<td>102.8</td>
</tr>
</tbody>
</table>

|------------|--------|--------|--------|--------|--------|--------|
CRI - CPI  |  104  |  102.7  |  103.2  |  104.26  |  104.4  |  106.37  

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</thead>
<tbody>
<tr>
<td>CRI - CPI</td>
<td>106</td>
<td>106.6</td>
<td>107.3</td>
<td>106.97</td>
<td>108.4</td>
<td>107.14</td>
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</tr>
</thead>
<tbody>
<tr>
<td>CRI - CPI</td>
<td>109.2</td>
<td>108.9</td>
<td>108.5</td>
<td>108.92</td>
<td>109.2</td>
<td>110.6</td>
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</table>

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</tr>
</thead>
<tbody>
<tr>
<td>CRI - CPI</td>
<td>110.1</td>
<td>110</td>
<td>112.7</td>
<td>114.37</td>
<td>115</td>
<td>113.76</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>CRI - CPI</td>
<td>116.8</td>
<td>114.5</td>
<td>116</td>
<td>116.06</td>
<td>117.1</td>
<td>117.41</td>
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</tbody>
</table>

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>CRI - CPI</td>
<td>117</td>
<td>117.1</td>
<td>118.61</td>
<td>117.96</td>
<td>119.48</td>
<td>118.61</td>
</tr>
</tbody>
</table>

**Figure 2:** Trend in the CPI.

Source: CRI.

**IV- Ministry of Economy and Trade (MOET) Price Index**

*a) Overview*

The Consumer Protection division within the MOET monitors prices and the Technical Center for Pricing Policies (TCPP) is a subdivision that provides price reports and proposals for
the Ministry to support its pricing policy. Producing a CPI does not fall within the objective or capacity of the MOET and when the Ministry needs a CPI, the reference is always the CAS. Still, the TCPP has been producing since late 1999 a simple monthly price index for a basket of goods that are sold in supermarkets. The index is used to prepare a special pricing analysis for the Minister to pinpoint seasonality in the simple monthly price indicator as well as its correlation between domestic prices and international prices. Thus, the purpose of the MOET price index is assistance in pricing policy rather than being for individual use.

Although the simple price index produced by the TCPP is mainly intended for internal use and cannot be labeled as a CPI, it is nonetheless a pricing reference. The index is posted on the MOET website, and its summary, monthly fluctuations, analysis, and trends are also published in newspapers.

According to the TCPP, a trend in the MOET price index is noticeable. When international prices increase, local prices first increase suddenly as a provision of fear of higher increases in the future then they start to decrease gradually as international prices stabilize. In 2011, for example, prices in Lebanon witnessed a sharp decrease because prices in 2010 had reached high records for some products like meat.

The TCPP team comprises 5 employees who have direct contact with 20 supermarkets from Beirut and other regions. The price index produced by the TCPP is thus specific to supermarket items only, and it includes 650 nutritious and consumption goods. However, only 10 supermarkets remain on the list after the selection of common items and brands is made: 6 supermarkets are chosen from Beirut and Mount Lebanon, 1 from the north, 1 from the south, 1 from Nabatieh and 1 from the Bekaa Zahle. In cases where supermarkets have different branches, the choice of the outlet is made by the TCPP employee and can be biased. Some supermarkets
report the same prices for all branches but others do not. The main problem that the TCPP team faces is the shortage of staff, budget, and technology, as well as some deficiency in cooperation between different entities within governmental agencies.

b) Methodology

On the first week of every month, the TCPP receives from each of the supermarkets a faxed list that includes the needed prices. For each item in the basket of consumer products, most selling brands are considered to calculate the price index. The TCPP then initiates an extensive manual investigation to identify price irregularities, notably whether an item is missing from the list, mistakenly typed, or its price deviates from the past trend in prices to ensure coherence. In the case where the monthly price of an item is less than its past value, an enquiry with the data provider is made to check whether the entry is a mistake or the item is itself sold at a discount. In the event of a mistake, the price is amended but it is kept as is in case it is a discount.

The basket of consumer items is generated according to the United Nations Classification of Individual Consumption by Purpose (COICOP, see appendix E) with some exclusions like seafood and tobacco. The weights that are used to compute the price index for this basket of items are taken from the earlier 1997 household survey and not the more recent 2004 survey. According to the MOET, the weights from the old household budget survey are used because proprietary rights prevent them from accessing the weights of the 2004 survey where CAS was a main partner. As the consumption of an item changes over time, its weight is updated in the basket. The base month and year are December 1999.

55 Interestingly, however, the detailed results of the 2004 household budget survey are widely available, suggesting that, had the MOET enjoyed some expertise in the field, the weights in the price index would have been updated.
The calculation of the index is very simple involving cross multiplication and division:

\[ P_t = \frac{(W_b \times P_b)}{W_i} \]

where \( P \) is the Price Index at time \( t \), \( W_b \) is the weight or proportion of item \( b \) in the basket, \( P_b \) is the average price of item \( b \) and \( W_i \) is the weight in kilograms, by pack or by count \( i \).

\[ I = 100 \times \Delta P = 100 \times \frac{P_t-P_{t-1}}{P_{t-1}} \]

where \( I \) is the price index, \( \Delta P \) is the rate of change in price, \( P_t \) is the current price and \( P_{t-1} \) is the previous price.

Among the methodological issues involved are the subjective handlings of records by employees and providers, the dependency on supermarket data where prices can change daily, and the manual data validation procedure itself. More importantly, the manipulation of prices at the supermarket level is possible. Some supermarkets benefit from very high discounts that allow them to lower prices and thus distort the price level.\(^{56}\)

In line with its task of monitoring price fluctuations, the TCPP produces additional sets of reports and indices. \textit{Info Price} is a supermarket report that used to publish the name of the cheapest supermarket for leading brands; but since the year 2000, it publishes the list of the 10 cheapest supermarkets. The TCPP also produces the \textit{Fattouch Index} on a daily basis during the month of Ramadan.\(^{57}\) Around 30 supermarkets fax the prices of the ingredients of the Lebanese \textit{Fattouch} platter for a one-person portion and index weights are applied following the actual ingredients’ weights in the \textit{Fattouch} platter. The \textit{Fattouch Index} is benchmarked to the prices of the same ingredients one week before the beginning of the month of Ramadan. Additionally, the TTCP has issued a \textit{Mini Basket} every Thursday since August 2011. The \textit{Mini Basket} is generated using the

\(^{56}\) In general, the supermarket is the least profitable outlet in the marketing chain. When compared to the invoice of imports, the additional margin on items decreases gradually from the importer to the wholesaler and last to the retailer.

\(^{57}\) The \textit{Fattouch} is a traditional Lebanese salad that is prepared on a daily basis when breaking the fast during the month of Ramadan. Its main ingredients include tomatoes, cucumbers, lettuce, parsley, lemon, garlic, olive oil, salt, and bread, all of which are produced locally.
prices of 60 fruit and vegetable items from 10 supermarkets (6 from Beirut and 4 from other regions). Finally, the TCPP has plans to issue a new *Monthly Basket* to compare the prices of small stores in different regions with those of big supermarkets.

c) Recent Trends

Table 7 below provides a sample of *Info Price* (Panel A), the *Fattouch Index* (Panel B), and the *Mini Basket* (Panel C).

**Table 7: Sample Reports Produced by the TCCP, MoET.**

<table>
<thead>
<tr>
<th>Supermarket Name</th>
<th>City</th>
<th>Number of Cheapest Good</th>
<th>Number of Goods Below Average Price</th>
<th>Number of Goods Above Average Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aoun</td>
<td>Zouk</td>
<td>7</td>
<td>41</td>
<td>59</td>
</tr>
<tr>
<td>Assahat</td>
<td>Hazmieh</td>
<td>9</td>
<td>54</td>
<td>46</td>
</tr>
<tr>
<td>Bou Khalil</td>
<td>Baabda</td>
<td>6</td>
<td>23</td>
<td>77</td>
</tr>
<tr>
<td>Caliprix</td>
<td>Maamelten</td>
<td>22</td>
<td>80</td>
<td>20</td>
</tr>
<tr>
<td>Fahd</td>
<td>Jounieh</td>
<td>36</td>
<td>90</td>
<td>10</td>
</tr>
<tr>
<td>Marche Pieton</td>
<td>Jbeil</td>
<td>1</td>
<td>10</td>
<td>90</td>
</tr>
<tr>
<td>Marche Du Rond Point</td>
<td>Dekwene</td>
<td>4</td>
<td>54</td>
<td>46</td>
</tr>
<tr>
<td>Metro</td>
<td>Maamelten</td>
<td>6</td>
<td>58</td>
<td>42</td>
</tr>
<tr>
<td>Spinneys</td>
<td>Antelias</td>
<td>0</td>
<td>25</td>
<td>75</td>
</tr>
<tr>
<td>Storium Saliba</td>
<td>Kornet Shehwen</td>
<td>16</td>
<td>73</td>
<td>27</td>
</tr>
</tbody>
</table>

Panel B: *Fattouch Index (during the month of Ramadan)*

-63-
Panel C: Weekly Mini Basket

<table>
<thead>
<tr>
<th>Category</th>
<th>Item</th>
<th>Weight</th>
<th>Average Price Jan-2012</th>
<th>Average Price at 23/02/2012</th>
<th>Annual % Change</th>
<th>Average Price at 16/01/2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresh vegetables</td>
<td>Tomato</td>
<td>1kg</td>
<td>2181</td>
<td>1401</td>
<td>-36%</td>
<td>1596</td>
</tr>
<tr>
<td>Fruits</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meat</td>
<td></td>
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<td></td>
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<tr>
<td>Dairies</td>
<td></td>
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<tr>
<td>Seeds</td>
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<tr>
<td>Oil</td>
<td></td>
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<td></td>
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<tr>
<td>Can food</td>
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<tr>
<td>Other</td>
<td></td>
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</tr>
</tbody>
</table>

V- Chamber of Commerce and Industry in Beirut (CCIB) CPI\(^{58}\)

In early 1981 and in the absence of the publication of official price indices by the CAS, the CCIB took the initiative to use the results of the 1966 household survey and produce a CPI in a systematic way.\(^{59}\) The working team was comprised of five people who collected market prices on 1,300 items each month, applied consumption weights to the basket, and produced a CPI. The index was calculated for Beirut and its suburbs and was made publicly available. When a product disappeared, a substitute would replace it. The basket of goods was consistently being changed but not the weights that were applied to calculate the CPI. However, this index was discontinued in 2009 and the focus of CCIB is currently on producing opinion surveys and a business confidence index.

One of the main reasons for discontinuing the CCIB CPI is that the weights used from the household survey of 1966 were outdated, thus rendering the CPI deficient. From the perspective of the CCIB, it was too costly to gain access to the results of the 1997 or 2004 household surveys or even to the 1985 General Federation of Labor and GTZ survey.\(^{60}\) Instead, the CCIB had aimed at initiating a new household spending survey with a span of one month spending to get the most

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\(^{58}\) The contents of this section are based on an interview that was conducted with Mr. Albert Nasr, the Director of the Center for Economic Research who was directly responsible for the production of the CPI at the CCIB.

\(^{59}\) The only household survey that was available in 1981 was the 1966 survey.

\(^{60}\) According to the Director of the Center for Economic Research at CCIB, there was internal resistance to use the surveys weights that CAS had implemented.
recent weights and produce a more reflective CPI. A more recent household survey would have been essential for promoting social welfare, studying the impact of subsidies on items is the basket, or lobbying for the review of taxes. However, conducting such a survey turned out to be a costly and the project was abandoned.61

VI- Consistency and Validity Checks

Disagreement on the inflation rate sends mixed signals to policy-makers and does not ensure common grounds for formulating policies that foster economic development and growth. To illustrate how different inflation rates may have different implications on key economic and financial variables, the annual real rate of return for an investor in a one-year Treasury Bills in Table 8 is close to zero between September 2010 and 2011 using the CAS CPI, while it is a loss of 0.45% using the CRI CPI.

<table>
<thead>
<tr>
<th>Table 8: CAS and CRI Inflation Rate vs. Government Treasury Bill Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAS inflation Rate, September 2011/September 2010</td>
</tr>
<tr>
<td>CRI Inflation Rate, September 2011/September 2010</td>
</tr>
<tr>
<td>Yields on 1 year Treasury Bills, September 2011</td>
</tr>
<tr>
<td>Yields on 1 year Treasury Bills, September 2010</td>
</tr>
</tbody>
</table>

Sources: CAS, CRI, and BDL.

In this section, a series of consistency and validity checks are run across the different inflation measures produced in and for Lebanon. We then correlate the latter with inflation figures for other world regions, provided by international institutions. We first compare all domestic inflation figures prior to and after the revision of the CAS methodology in 2008, and then explain the differences between the CPIs produced by CAS and CRI. Second, we correlate monthly and

---

61 The CCIB estimate for a new survey was about 250,000 USD but there were no domestic or international funds to finance it.
yearly CPI figures with data from the Organization for Economic Cooperation and Development (OECD) for Europe and US, as well as with the change in energy prices.

a) Consistency among Domestic Inflation Rates

First, it is interesting to investigate how different national inflation measures compare with each other and with international figures. Graph 3 displays annual inflation rates that were produced by different bodies between 2004 and 2006, including CAS, MoET, CCIB, and CRI, as well as figures provided by the International Monetary Fund (IMF) for Lebanon

**Figure 3: Comparison between different inflation indices for Lebanon.**

Since January 2008 and after revising its computational methodology, the CAS started producing a CPI on a monthly basis, similar to the other leading price statistics in the country that is published by the CRI. Figure 4 shows a comparative charting of the monthly inflation rates provided by CAS and CRI.
Figure 4: Comparative inflation rate evolution, CAS vs. CRI.

Figure 4 shows that there is low or possibly even negative correlation between the inflation rates that are produced by CAS and CRI. The lack of concordance between the CAS and CRI price series results from the use of different methodologies and assumptions to compute the CPI each month. They are reviewed in the section below.

b) CPI Discrepancy: CAS vs. CPI

The discrepancy between the CPIs produced by CAS and CRI is well documented and recent proposals were made to publish the differences in the two methodologies. First of all, CAS numbers cover numerous points of sale from all over the Lebanese territory whereas CRI figures are collected from selected outlets in Beirut and its suburbs. A wider coverage of regions is likely to be more representative of price conditions nationwide, especially if one suspects the household consumption patterns (and/or income distribution) to be different across Lebanese regions, but the higher number of observations might also skew the average.

Second, CRI excludes the lowest and highest income category from the CPI calculation, producing an index that is closer to a cost of living index compared to the CPI of CAS that
considers all categories of income groups and is more concerned with publishing an index to track inflation.

Third, CAS uses weights that are derived from the results of the 2004 household survey whereas CRI still extracts its weights directly from the 1997 household survey results. CRI chose not to adopt the 2004 budget shares because it questions some of the findings of this survey, among which is the decrease in the Lebanese population from around 4 million in 1997 to 3.8 million in 2004. Relatedly, CRI disagrees with some of the budget shares that are used by CAS. Table 9 compares the consumption weights of CAS drawn from the 1997 and 2004 surveys with the CRI weights drawn from the 1997 survey.

**Table 9: Consumption weights comparison, CAS vs. CRI**

<table>
<thead>
<tr>
<th>Expenditure Category</th>
<th>CAS 1997 weights %</th>
<th>CAS 2004 weights %</th>
<th>CRI 1997 weights %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food and non-alcoholic beverage</td>
<td>32.3</td>
<td>19.9</td>
<td>35.4</td>
</tr>
<tr>
<td>Tobacco and Alcohol</td>
<td>2.3</td>
<td>2.1</td>
<td></td>
</tr>
<tr>
<td>Clothing and Footwear</td>
<td>6.3</td>
<td>6.2</td>
<td>6.55</td>
</tr>
<tr>
<td>Housing</td>
<td>1.6</td>
<td>16.2</td>
<td>1.68</td>
</tr>
<tr>
<td>Water, Electricity</td>
<td>7.2</td>
<td>9.5</td>
<td>4.81</td>
</tr>
<tr>
<td>Furniture and Household Maintenance</td>
<td>7.9</td>
<td>3.9</td>
<td>8.18</td>
</tr>
<tr>
<td>Health Care</td>
<td>8.8</td>
<td>6.8</td>
<td>9.82</td>
</tr>
<tr>
<td>Transportation</td>
<td>9.8</td>
<td>12.3</td>
<td></td>
</tr>
<tr>
<td>Communication</td>
<td>1.5</td>
<td>4.8</td>
<td>14.39</td>
</tr>
<tr>
<td>Recreation</td>
<td>2</td>
<td>3.7</td>
<td></td>
</tr>
<tr>
<td>Restaurants and Hotels</td>
<td>3.4</td>
<td>2.7</td>
<td>2.7</td>
</tr>
<tr>
<td>Education</td>
<td>13.4</td>
<td>7.7</td>
<td>12.45</td>
</tr>
<tr>
<td>Other goods and services</td>
<td>3.5</td>
<td>4.2</td>
<td>4.02</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
<td><strong>100</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

For example, when switching from 1997 to 2004 weights, the food component share of the CAS CPI was reduced to 19.9% down from 35%. According to the CRI, the new food component weight of CAS is unrealistically low because it is close to a country like France that has a considerably higher standard of living compared to Lebanon. According to INSEE (Institut National de la Statistique et des Etudes Economiques), the food component weight was estimated...
at 15.5% in 2006, from the national survey “Budget des Familles”. Since food consumption is negatively correlated with the wealth of a country, it would instead be expected that consumers spend around 30% of their income on food items in a middle-income country like Lebanon. Another weight disagreement is the share of real estate expenditures in the budget. Real estate data and studies seriously lack in the country and there is no reference year to benchmark real estate prices. For those reasons, the CRI dropped real estate from its basket whereas CAS imputes a rent component in its CPI, although it is unclear what methodology it uses to that end. In the CRI CPI, the weight of housing is spread to all other items in the basket to keep a balance of 100%. For the health weight component, the CAS and CRI weight for healthcare items diverge by 3%. To collect healthcare information, the CRI had initially set customized "actes médicaux" (medical treatments) with doctors to select the type of medicine that is prescribed to patients, but it later made a deal with a private company to collect the prices of medications. Another issue is the seasonality of fruits and vegetables that regularly distorts prices. The frequency and level of averaging (brands, prices, points of sale or regions) remain a divergence area for CAS and CRI, especially in light of the lack of disclosure on the methods and solutions to the mutual problems faced. For instance, during the Israeli war on Lebanon in 2006, it was difficult to collect data in an accurate and timely manner; the divergence between the two CPIs widened, affecting the evolution and consistency of the index over the following years.

\[ c) \text{ Domestic vs. International Inflation Rates} \]

Since the Lebanese currency is pegged to the US dollar and that most of the Lebanese imports are from Europe (according to the General Directorate of Customs, 23.75% of imports in 2009 originated from the EU compared to 10.86% from the US), we inspect whether domestic
inflation is imported from abroad by comparing the trend between CAS and CRI monthly CPIs and each of the OECD inflation rate for the euro area (Figure 5) and the U.S. inflation rate (Figure 6). These figures point to a weak correlation between the CAS and CRI CPIs, and to a relatively more stable (less erratic) inflation rate using the OECD data.

**Figure 5:** Comparison between monthly inflation rates, CRI and CAS vs. OECD Europe.

![Figure 5](image1)

**Figure 6:** Comparison between monthly inflation rates, CRI and CAS vs. OECD U.S.

![Figure 6](image2)
However, correlating monthly inflation rates is by default likely to mask any underlying relation between the inflation rates considered, especially that no common base year is chosen. Figures 7 and 8 show the same comparative yearly inflation rates (instead of monthly) as above, using 2008 as a reference year and yearly inflation rates.

**Figure 7**: Comparison between yearly inflation rates, CRI and CAS vs. OECD Europe.

**Figure 8**: Comparison between yearly inflation rates, CRI and CAS vs. OECD U.S.
Both figures 7 and 8 point to the high correlation between the considered inflation rates, suggesting that published domestic inflation rates are in line with international inflation rates. However, the CRI annual inflation figures are generally higher than those of the CAS, and local rates are always above the international rates. They are also closer to the inflation rate prevailing in Europe than to that of the US.

\[d\] \textit{Domestic vs. International Food Inflation Rates}

Figure 9 compares the recent trend in the food component of the monthly CPI by CAS, the IMF food inflation rate, and the FAO inflation rate. As expected, the FAO and IMF food inflation rates show very similar fluctuations across time. Interestingly, the CAS food inflation rate seems positively correlated with the inflation rates by the IMF and the FAO, notwithstanding lower rates for the CAS CPI compared to the other two rates.

\textbf{Figure 9:} Food component: CAS, IMF & FAO inflation rates.

Similarly, Figure 10 compares the recent trend in the food component of the monthly CPI by CRI, the IMF food inflation rate, and the FAO inflation rate. Here again, the CRI food inflation rate also seems to positively correlate with international food inflation rates since November 2010.
**Figure 10:** Food component: CRI, IMF & FAO inflation rates.

![Graph showing FAO, IMF, and CRI food inflation rates over time](image)

**e) Domestic vs. International Energy Inflation Rates**

The last validity check compares the change in oil prices in Lebanon with the transportation inflation rate components produced by CAS and CRI. Data on 95/98 octane prices is retrieved from the Ministry of Energy and Water website and the corresponding domestic inflation rate is calculated and plotted against the transportation inflation rate components of CAS (Figure 11) and CRI (Figure 12).

![Graph showing transportation inflation rates for CAS and Ministry of Energy and Water](image)

62 The 95/98 octane change in prices is checked with international petroleum prices (using the World Bank Crude price) and the two series are found to be highly correlated.
The figures above indicate that the transportation component of the CAS inflation rate strongly and positively correlates with the petroleum price changes that were calculated from figures by the Ministry of Energy and Water. However, the same cannot be established for the CRI transportation component which seems to negatively correlate with the Ministry of Energy and Water energy inflation rate, probably because the CRI CPI combines transportation and communication in a single category.

To sum, the official price statistics producing entity in Lebanon is the CAS, although the CRI is widely considered as a reliable source of inflation data as well. Indeed and as discussed in the last chapter, the CRI was present in the preliminary discussions to determine the wages adjustment that would account for loss of purchasing power. Since January 2008 when CAS updated its methodology and started producing a monthly CPI, the figures produced by CAS and CRI have become more congruent. Discrepancies remain, however, in light of the different weights distribution that is allocated to item categories in their consumer basket, the main differences residing in food consumption items, housing, and education. The series of validity checks revealed that, even though the major trading partner of the Lebanese economy is Europe,
domestic inflation rates are more correlated with U.S. inflation rates, in light of the peg of the Lebanese currency to the U.S. dollar. Further, domestic food inflation using the CRI figures is more in line with international food inflation compared to CAS figures. However, the transportation inflation component of CAS is more aligned than CRI figures with the Ministry of Energy and Water change in octane prices.
Chapter 5

Proposals for New Price Indices

I- Food Imports Price Index 75
II- Real Estate Index 78
In this chapter, we propose additional but simple and feasible new price indices to complement existing inflation rates. Section I computes a price index for food imports, derives the corresponding inflation rate, and correlates it with other food inflation rates. Section II estimates a proxy for a real estate price index and compares its trend with the housing component of CAS.

I- Food Imports Price Index

We compute in this section a price index for food imports and derive the corresponding inflation rate for imported food items in Lebanon, which we also correlate with CAS and CPI inflation rates as well as the IMF food component inflation.

We extract data on Lebanese agro-food commodities and products imports between 2008 and 2011 from the Lebanese Customs website (www.customs.gov.lb). The items selected correspond to the first four sections (HS2 = 1 to HS 2 =24) of the detailed taxonomy of agro-food sections of the Harmonized Commodity Description and Coding System (HS, see Appendix H).

We first compute the unit price of imported goods per kilogram and then derive an imports price index using a monthly Laspeyres price index as follows: 

$$\frac{\sum_{i=1}^{M} p^n_i \times Q^0_i}{\sum_{i=1}^{M} p^0_i \times Q^0_i}$$

where $i$ represents the commodity (or group of commodities), $n$ represents the period, $P$ represents the price and $Q$ represents the weight. From the Lebanese food imports price index

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63 A Producer Price Index is not among the suggested price indices in this section because of the scarcity of data on producers as well as the absence of business surveys.

64 Another possibility would be to account for different quality levels, possibly depending on the country of origin, computing weights by exporting country when calculating the unit price.

65 Food imports include indirect taxes (e.g., VAT) tax.
calculated above, we compute a monthly food imports inflation rate and correlate it with the food component inflation rates of CAS, CRI, and the IMF. The results are displayed in Table 10.

**Table 10:** Correlation Matrix between the Lebanese Food Imports Inflation and Food Component Inflation rates of CAS, CRI, and IMF

<table>
<thead>
<tr>
<th>Correlation Matrix</th>
<th>CRI Food Component Inflation</th>
<th>CAS Food Component Inflation</th>
<th>IMF Food Component Inflation</th>
<th>Lebanese Food Imports Inflation</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRI Food Component Inflation</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAS Food Component Inflation</td>
<td>0.3226</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IMF Food Component Inflation</td>
<td>-0.3280*</td>
<td>-0.0081</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Lebanese Food Imports Inflation</td>
<td>0.0085</td>
<td>0.0220</td>
<td>0.0527</td>
<td>1</td>
</tr>
</tbody>
</table>

*Statistically significant correlation at 5% confidence level.

It is clear from the matrix above that the Lebanese food imports inflation rates poorly correlate with all other food inflation rates considered. Interestingly, CAS and CRI food inflation rates are weakly positively correlated, but the CRI significantly negatively correlates with the IMF food component index. However, these findings are perhaps not so surprising, given that the above table correlates inflation rates instead of the level of each price index. Table 11 shows instead the correlation between the CPI of the constructed Lebanese Food Imports Index and the same other CPIs using the year 2008 as a base year.

**Table 11:** Correlation Matrix between the Lebanese Food Imports CPI and Food Component CPI of CAS, CRI, and IMF

<table>
<thead>
<tr>
<th>Correlation Matrix</th>
<th>CRI Food Component CPI</th>
<th>CAS Food Component CPI</th>
<th>IMF Food Component CPI</th>
<th>Lebanese Food Imports Inflation</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRI Food Component CPI</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAS Food Component CPI</td>
<td>0.8380*</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IMF Food Component CPI</td>
<td>0.2406</td>
<td>-0.0018</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Lebanese Food Imports CPI</td>
<td>0.4909*</td>
<td>0.3384*</td>
<td>0.6621*</td>
<td>1</td>
</tr>
</tbody>
</table>
* Statistically significant correlation at 5% confidence level.

The correlation figures in Table 11 are higher and much more significant compared to those reported in Table 10, thus making it possible to use a simple Lebanese Food imports CPI as a means to cross check the validity of the domestically produced food component CPI.

Figures 13 and 14 also depict the trend in the levels of the Lebanese food imports CPI with each of the food components of CAS and CRI.

Figure 13: Trend of the CAS Food Component CPI and Lebanese Food Imports CPI

Figure 14: Trend of the CRI Food Component CPI and the Lebanese Food Imports CPI
Figures 13 and 14 clearly indicate that there is a strongly aligned common trend between each of the constructed Lebansese Food Imports CPI and the food component CPI of CAS and CRI. To double check the validity of the Lebanese Food Imports Index, we also plot its trend in comparison to the trend of the IMF food component in Figure 15.

Figure 15: Trend of the IMF Food Component CPI and the Lebanese Food Imports CPI

Figure 15 similarly shows that the trend in both the Lebanese Food Imports CPI and IMF Food Component CPI are strongly aligned over time and highly correlated, thus validating the manually constructed and simple Lebanese Food Imports CPI. Thus, the food components of each of CAS and CRI are in line with international food prices, suggesting little error measurement in food price inflation using any of those indices.

II- Real Estate Index

This section constructs a real estate price index to compare it with the rent component of the CAS CPI. Data on real estate prices is scarce in Lebanon and no official entity collects such
information, thus rendering the task of preparing a real estate price index practically impossible. CAS imputes a rent component in its CPI but does not disclose the methodology that it uses, and CRI ignores housing in its CPI calculation. However, several Lebanese households typically spend a large share of their income on housing expenses, and failing to adequately capture these expenditures in the CPI may cast doubts on the usefulness of the price index.

To construct a real estate price index, we use hedonic price estimation techniques. Real estate prices for new apartment listings are first collected from a leading local real estate magazine, Lebanon Opportunities, which has been publishing new apartment listings regularly since the second quarter of 2009. Such data provide us with an opportunity to estimate a real estate price index.

The geographical areas of apartment listings include Beirut and suburbs, Baabda, Aley, Metn, and Keserouan. Understandably, the reported prices of apartments are not market equilibrium prices but asked (or demand) prices that are likely to be overstated by apartment sellers. However, to the extent that changes in the value of a real estate index that is constructed based on asked prices reflect changes in real estate conditions, the adverse effect of using asked prices is lessened. In particular, if sellers propose prices systematically above the (unobserved) equilibrium price, but that the difference is roughly a constant proportion of the selling price, such a systematic difference should not play a significant role in the variation of the real estate index, if computed in logs.

Table 12 below displays the apartment listing information that is available from Lebanon Opportunities and Table 13 shows the number of these listings by season.
Table 12: Summary of Real Estate Data, Lebanon Opportunities

<table>
<thead>
<tr>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Region</td>
</tr>
<tr>
<td>Sub-region</td>
</tr>
<tr>
<td>Price/Square Meter</td>
</tr>
<tr>
<td>Surface (Square Meter)</td>
</tr>
<tr>
<td>Delivery Date</td>
</tr>
<tr>
<td>Living Rooms Number</td>
</tr>
<tr>
<td>Bedrooms Number</td>
</tr>
</tbody>
</table>

Table 13: Apartment Listings by Season, Lebanon Opportunities

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Number of Apartment Listings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall-Winter 2009</td>
<td>533</td>
</tr>
<tr>
<td>Winter-Spring 2010</td>
<td>580</td>
</tr>
<tr>
<td>Summer-Autumn 2010</td>
<td>505</td>
</tr>
<tr>
<td>Winter-Spring 2011</td>
<td>701</td>
</tr>
<tr>
<td>Summer-Autumn 2011</td>
<td>990</td>
</tr>
<tr>
<td>Winter-Spring 2012</td>
<td>1110</td>
</tr>
</tbody>
</table>

A hedonic price estimation technique is run to estimate the relationship between the selling price per square meter $\text{Price}_{ijt}$ for apartment $i$ in region $j$ during season $t$ as a function of a relevant characteristic of the apartment such as its area in square meters $\text{Surface}_{ijt}$ (Nicholson, 2005).\textsuperscript{66} Formally,

$$\text{Price}_{ijt} = \alpha_t + \beta_t \text{Surface}_{ijt} + \gamma_t \text{Beirut} + \delta_t \text{Metn} + \varphi_t \text{Baabda} + \omega_t \text{Kesrouan} + \epsilon_{ijt} \quad (1)$$

where $\text{Beirut}$, $\text{Metn}$, $\text{Kesrouan}$, and $\text{Baabda}$ are four dummy variables for these regions, omitting the region of $\text{Aley}$ to avoid falling into the dummy variable trap.\textsuperscript{67} From equation (1), each square meter of living space adds $\beta_t$ to the value of the house, parameters $\gamma_t, \delta_t, \varphi_t, \text{and } \omega_t$ capture the location premium for apartments in Beirut, Metn, Baada, and

\textsuperscript{66} Another alternative would be to use the \textquote{`real'} (deflated by inflation rate) price of dwellings.

\textsuperscript{67} Note that equation (1) is expressed in a panel data form, but the sample is in fact a pseudo-panel, because the majority of apartments are not identical from one quarter to the next.
Kesrouan as compared to the Aley area captured by \( \alpha \), and \( \varepsilon_{ijt} \) includes all other non-size characteristic of the apartment (the amenities of the neighborhood, number of parking spots, time to delivery, number of rooms, etc.) are (Nicholson, 2005).

We use the data from Lebanon Opportunities to run a simple linear regression and compute a linear estimate \( \bar{P}rice_{ijt} \) from equation (1) for each apartment \( i \) in season \( t \) and region \( j \), average this predicted variable into \( \overline{\bar{P}rice}_{jt} \) across regions, and then calculate the change in \( \overline{\bar{P}rice}_{jt} \) from one quarter to the other across each region. We thus obtain a proxy for the seasonal rate of change of real estate prices in Lebanon by region.

Table 14 shows the estimation results of the coefficients and their standard errors for variables entering equation (1) across each season.

**Table 14: Hedonic Regression Results**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface</td>
<td>2.617</td>
<td>1.67</td>
<td>4.400</td>
<td>3.357</td>
<td>3.484</td>
<td>4.74</td>
</tr>
<tr>
<td></td>
<td>0.255***</td>
<td>0.267***</td>
<td>0.257***</td>
<td>0.226***</td>
<td>0.202***</td>
<td>0.215***</td>
</tr>
<tr>
<td>Aley</td>
<td>530.829</td>
<td>274.910</td>
<td>347.441</td>
<td>682.886</td>
<td>819.755</td>
<td>519.546</td>
</tr>
<tr>
<td></td>
<td>196.330***</td>
<td>144.964*</td>
<td>138.093**</td>
<td>132.502***</td>
<td>124.767***</td>
<td>113.637***</td>
</tr>
<tr>
<td>Beirut</td>
<td>1,640.758</td>
<td>2,020.204</td>
<td>1,302.740</td>
<td>1,318.105</td>
<td>1,491.643</td>
<td>1,360.208</td>
</tr>
<tr>
<td></td>
<td>207.810***</td>
<td>154.644***</td>
<td>146.720***</td>
<td>140.273***</td>
<td>132.999***</td>
<td>116.802***</td>
</tr>
<tr>
<td>Metn</td>
<td>245.415</td>
<td>23.081</td>
<td>300.226</td>
<td>301.963</td>
<td>159.537</td>
<td>147.310</td>
</tr>
<tr>
<td></td>
<td>210.756</td>
<td>160.369</td>
<td>202.699</td>
<td>189.708</td>
<td>166.364</td>
<td>143.961</td>
</tr>
<tr>
<td>Baabda</td>
<td>414.998</td>
<td>482.719</td>
<td>163.682</td>
<td>421.785</td>
<td>438.340</td>
<td>462.650***</td>
</tr>
<tr>
<td></td>
<td>225.675*</td>
<td>172.504***</td>
<td>189.679</td>
<td>175.984**</td>
<td>162.727***</td>
<td>144.272</td>
</tr>
<tr>
<td>Kesrouan</td>
<td>140.647</td>
<td>346.108</td>
<td>147.776</td>
<td>285.870</td>
<td>254.512</td>
<td>78.109</td>
</tr>
<tr>
<td></td>
<td>251.610</td>
<td>181.217*</td>
<td>168.710</td>
<td>163.262*</td>
<td>148.778*</td>
<td>132.234</td>
</tr>
</tbody>
</table>

***, **, and * indicate significance at the 1, 5, and 10%, respectively.

---

68 It is possible to consider features other than the number of square meters to account for the value of an apartment, thereby adding additional parameters or intercepts \( \alpha_1, \alpha_2, \alpha_3, \text{etc.} \) to the hedonic equation.
The results in Table 14 indicate that apartment surface and other apartment characteristics are significant determinants of the selling price. Also apartments in Beirut area are significantly higher prices relative to apartments in other areas, as well as apartments in Baabda that are generally priced higher than other apartments. In terms of economic significance of the estimated parameters, the geographical location premium is highest in Beirut area as expected, followed by Baabda.

Table 15 summarizes the average predicted apartment price per region over the last six seasons.

**Table 15:** Average Apartment Price $\bar{Price}_jt$ across regions Predicted by Hedonic Regressions

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Aley</td>
<td>1,017</td>
<td>1,196</td>
<td>1,278</td>
<td>1,354</td>
<td>1,504</td>
<td>1,496</td>
</tr>
<tr>
<td>Beirut</td>
<td>3,002</td>
<td>3,659</td>
<td>3,144</td>
<td>3,076</td>
<td>3,410</td>
<td>3,266</td>
</tr>
<tr>
<td>Metn</td>
<td>1,509</td>
<td>1,569</td>
<td>1,842</td>
<td>1,966</td>
<td>1,976</td>
<td>2,069</td>
</tr>
<tr>
<td>Baabda</td>
<td>1,758</td>
<td>1,946</td>
<td>1,860</td>
<td>2,037</td>
<td>2,306</td>
<td>2,468</td>
</tr>
<tr>
<td>Kesrouan</td>
<td>1,358</td>
<td>1,834</td>
<td>1,685</td>
<td>1,820</td>
<td>1,904</td>
<td>1,816</td>
</tr>
</tbody>
</table>

Tables 16 and 17 respectively show both the seasonal and yearly change in the apartment price estimate $\bar{Price}_jt$.

**Table 16:** Seasonal Changes in $\bar{Price}_jt$

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Aley</td>
<td>18%</td>
<td>7%</td>
<td>6%</td>
<td>11%</td>
<td>-1%</td>
</tr>
<tr>
<td>Beirut</td>
<td>22%</td>
<td>-14%</td>
<td>-2%</td>
<td>11%</td>
<td>-4%</td>
</tr>
<tr>
<td>Metn</td>
<td>4%</td>
<td>17%</td>
<td>7%</td>
<td>0%</td>
<td>5%</td>
</tr>
<tr>
<td>Baabda</td>
<td>11%</td>
<td>-4%</td>
<td>9%</td>
<td>13%</td>
<td>7%</td>
</tr>
<tr>
<td>Kesrouan</td>
<td>35%</td>
<td>-8%</td>
<td>8%</td>
<td>5%</td>
<td>-5%</td>
</tr>
</tbody>
</table>
Table 17: Yearly Changes in $\text{Price}_{jt}$

<table>
<thead>
<tr>
<th>Region</th>
<th>Winter-Spring 2010-2011</th>
<th>Summer-Autumn 2010-2011</th>
<th>Winter-Spring 2011-2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aley</td>
<td>13%</td>
<td>18%</td>
<td>10%</td>
</tr>
<tr>
<td>Beirut</td>
<td>-16%</td>
<td>8%</td>
<td>6%</td>
</tr>
<tr>
<td>Metn</td>
<td>25%</td>
<td>7%</td>
<td>5%</td>
</tr>
<tr>
<td>Baabda</td>
<td>5%</td>
<td>24%</td>
<td>21%</td>
</tr>
<tr>
<td>Kesrouan</td>
<td>-1%</td>
<td>13%</td>
<td>0%</td>
</tr>
</tbody>
</table>

From Tables 16 and 17, it is clear that inflation was at its peak in the first quarter of 2010 for Beirut and Kesrouan regions. It then decreased throughout the rest of the year and the first quarter of 2011 even witnessed a deflation in real estate prices. Between the first quarter of 2010 and the first quarter of 2012, the annual real estate price index records a 16% deflation for these same regions. It is interesting to see how the prices in different regions do not move in the same direction as prices in Baabda picked up throughout the study period while Metn real estate witnessed a decrease in prices.

In comparison, the corresponding housing component of the CPI reported by CAS was reportedly unchanged at 111.2 over the same period, pointing to no fluctuation in the rent price imputation component. However, not only is it unlikely for housing prices to remain the same over 2 years, but the increase in housing prices derived from the hedonic regressions above suggest major fluctuation in real estate prices. Therefore, it appears that the CAS housing component might not be an adequate reflection of households’ expenditures on this major component of the goods basket.

The above validity checks in this chapter and the one preceding it suggest that current CPI measures in Lebanon may need to be revised either in terms of collecting a more representative data sample or improving the methods involved in its calculation, as well as conducting a more recent household budget survey to better reflect household consumption patterns.
References


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Fixler D. and P. Jaditz “An examination of the difference between the CPI and the PCE Deflator”, *BLS working papers*, June 2002.

Food and Agriculture Organization Website http://www.fao.org/worldfoodsituation/wfs-home/foodpricesindex


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Vaughan, R. “A Discourse of Coin and Coinage”, 1675


The decree was signed by the President of the Republic on January 25, 2012 and it became effective as of February 1st, 2012. The decree determines the adjustment by increasing a minimum of 175,000 LBP and a maximum of 299,000 LBP according to the following table.

<table>
<thead>
<tr>
<th>Current wage</th>
<th>Wage after deducting the lump sum amount of increase in 2008 of 200,000 LBP</th>
<th>100% increase on the 1st bracket up to LBP 400,000 and not less than 375,000 LBP</th>
<th>9% increase to the 2nd bracket between LBP 400,000 and 1,500,000 LBP</th>
<th>Value of wage after adjustment</th>
<th>Value of net increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>300</td>
<td>375</td>
<td>-</td>
<td>675</td>
<td>175</td>
</tr>
<tr>
<td>600</td>
<td>400</td>
<td>400</td>
<td>-</td>
<td>800</td>
<td>200</td>
</tr>
<tr>
<td>700</td>
<td>500</td>
<td>400</td>
<td>9</td>
<td>909</td>
<td>209</td>
</tr>
<tr>
<td>800</td>
<td>600</td>
<td>400</td>
<td>18</td>
<td>1018</td>
<td>218</td>
</tr>
<tr>
<td>900</td>
<td>700</td>
<td>400</td>
<td>27</td>
<td>1127</td>
<td>227</td>
</tr>
<tr>
<td>1000</td>
<td>800</td>
<td>400</td>
<td>36</td>
<td>1236</td>
<td>236</td>
</tr>
<tr>
<td>1100</td>
<td>900</td>
<td>400</td>
<td>45</td>
<td>1345</td>
<td>245</td>
</tr>
<tr>
<td>1200</td>
<td>1000</td>
<td>400</td>
<td>54</td>
<td>1454</td>
<td>254</td>
</tr>
<tr>
<td>1300</td>
<td>1100</td>
<td>400</td>
<td>63</td>
<td>1563</td>
<td>263</td>
</tr>
<tr>
<td>1400</td>
<td>1200</td>
<td>400</td>
<td>72</td>
<td>1672</td>
<td>272</td>
</tr>
<tr>
<td>1500</td>
<td>1300</td>
<td>400</td>
<td>81</td>
<td>1781</td>
<td>281</td>
</tr>
<tr>
<td>1600</td>
<td>1400</td>
<td>400</td>
<td>90</td>
<td>1890</td>
<td>290</td>
</tr>
<tr>
<td>1700</td>
<td>1500</td>
<td>400</td>
<td>99</td>
<td>1999</td>
<td>299</td>
</tr>
<tr>
<td>1800</td>
<td>1600</td>
<td>400</td>
<td>99</td>
<td>2099</td>
<td>299</td>
</tr>
<tr>
<td>1900</td>
<td>1700</td>
<td>400</td>
<td>99</td>
<td>2199</td>
<td>299</td>
</tr>
<tr>
<td>2000</td>
<td>1800</td>
<td>400</td>
<td>99</td>
<td>2299</td>
<td>299</td>
</tr>
</tbody>
</table>

Source: "Increase in wages between LBP 175,000 and LBP 299,000 – January 19, 2012, Al-Akhbar"

The decree includes five articles that stipulate how to determine the minimum wage and how to grant a cost of living adjustment. According to the first article, the decree has removed the 200,000 LBP increase that was added to the wages in 2008, to compute the new adjustment after deducting 200,000 LBP off the current wage. And based on the decree, the increase in the wages to compensate the rise in the cost of living is computed as per two brackets: the first bracket, which does not exceed 400,000 LBP and the second bracket, which exceeds 400,000 LBP but falls below
1,500,000 LBP. 100% is added to the first bracket, provided the increase does not drop below 375,000 LBP, therefore the minimum wage becomes 675,000 LBP. For example, if the worker was paid the minimum wage prior to the adoption of the decree, which was 500,000 LBP, the increase adopted in 2008 (which is 200,000 LBP) is deducted from his wage so that it becomes 300,000 LBP. Then the increase in the cost of living is computed, which is 100% for the first bracket but not less that 375,000 LBP, so the adjusted wage becomes 675,000 LBP. As for the second bracket, 9% of it is considered a compensation for the rise in the cost of living, in addition to the 100% increase for the first bracket. For example, if an employee was paid 1,700,000 LBP, the 2008 increase is deducted from his wage so it becomes 1,500,000 LBP and then 100% is added to the first bracket, i.e. 400,000 LBP and 9% to the second bracket, i.e. to 1,100,000 LBP, thus the wage becomes, after the increase in the cost of living, 1,999,000 LBP. So according to the Decree, the amount of the wage increase is the difference between the total amount (i.e. 1,999,000) and the wage that the employee used to get on 31/12/2011 (i.e. 1,700,000); which is 299,000 LBP. The Decree also determines that any increase in the salary because of the increase in the cost of living that the employee has been benefitting from since 1/1/2010 is deducted from the increase that has been adopted.
## Appendix B-Comparative Tables of All Proposals to Government

### FIRST ROUND

**PM Mikati’s 1st Proposal (October 11, 2011)**

**First Proposal**

**PM Mikati 1**

- Raising the minimum wage up to 700,000 LBP and adding a lump sum of 200,000 LBP to wages below 1,000,000 LBP, and a lump sum of 300,000 LBP to wages between 1,000,000 LBP and 1,800,000 LBP, in addition to increasing the transportation allowance up to 10,000 LBP per day and the educations grants to 1,500,000 LBP per year.

**Proposed by**

Prime Minister Najib Mikati

**Supporting Parties**

- PM Najib Mikati and his ministerial bloc
- The President of the Republic and his ministerial bloc
- The ministerial blocs of Amal Movement and Hizbollah
- The General Labor Confederation, with reservations (since it called for including in the project the employees whose wages exceed 1,800,000 LBP)

**Opposing Parties and Reason of Objection**

- 5 ministers from the Change and Reform Bloc: Minister of Labor Charbel Nahas, Minister of Energy and Water Resources Gebran Bassil, Minister of Justice Chakib Kortbawi, Minister of Tourism Fadi Abboud and Minister of Industry Frej Sabonjian.
- The economic bodies
- Manufacturers, artisans, owners of small and medium enterprises and store owners.
- Union Coordination Committee, National Federation of Lebanese Trade Unions, Federation of Unions of Bank Employees, General Service Employees’ Trade Union, Professional Union of Syndicates for Workers and Employees of Chemical Materials and Similar Products of Lebanon, Federation of Building and Wood Workers’ Unions, Insurance and Security Unions, Lebanese Federation of Labor Unions, Federation of Bekaa Workers Union, Federation of Unions of Workers in Modern Technology, Federation of Food Products/Workers Union.

**Was the proposal adopted?**

It was put to vote at the Cabinet but rejected by the State Council.

**Why?**

The State Council’s rejection of the wage increase draft was due to several considerations, mainly:

- It violates the ratified Arab and International Labor Agreements
- Wage adjustment was not based on the price fluctuations tables
- It did not determine the percentage of increase in the cost of living
- It excludes the workers whose wages exceed 1,800,000 LBP
- It does not take into account the principle of equality among citizens, which is preserved by the Constitution

### SECOND ROUND

**PM Mikati’s 2nd Proposal Versus Minister Nahas’ 1st Proposal (December 7th, 2011)**

**Second Proposal**

**Minister Nahas 1**

- Increasing the minimum wage up to 861,000 LBP, including the transportation allowance.
- Adding a direct subsidy by the government to the wage, equal to the value of subscriptions paid by the employees and employers to the sickness and maternity fund, i.e. 9% of part of the actual wage that is 1,500,000 LBP, thus the minimum wage will be increased up to 938,500 LBP.

**Proposed by**

Minister of Labor Charbel Nahas

**Supporting Parties**

- The Change and Reform Ministerial Bloc
- Union Coordination Committee

**Opposing Parties and Reason of Objection**

- PM Najib Mikati and his ministerial bloc
- Speaker Nabih Berri's ministerial bloc
- Hizbollah's ministerial bloc
- The President of the Republic and his ministerial bloc
- The economic bodies and the General Labor Confederation
<table>
<thead>
<tr>
<th>Was the proposal adopted?</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Why?</td>
<td>It was rejected during the meeting of the Council of Ministers whereas the proposition of PM Mikati was presented against it and was adopted by the majority of the ministers.</td>
</tr>
</tbody>
</table>

**Third Proposal:**

**PM Mikati**

Increase the minimum wage up to 600,000 LBP and grant a 30% increase on wages between 500,000 LBP and 1,000,000 LBP provided the increase does not fall below 150,000 LBP and does not exceed 200,000 LBP, and a 20% increase on wages exceeding 1,000,000 LBP provided the increase does not exceed 275,000 LBP

**Proposed by**

PM Najib Mikati

**Supporting Parties**

- PM Najib Mikati and his ministerial bloc
- The President of the Republic and his ministerial bloc
- Amal Movement's ministerial bloc
- Hizbollah's ministerial bloc
- Leader of the Progressive Party Walid Jumblat's ministerial bloc
- The economic bodies

**Opposing Parties and Reason of Objection**

- Ministers of the Reform and Change Bloc
- Union Coordination Committee, several parties and unions and youth groups notably the Free Patriotic Movement, Future Movement, March 14 Forces, Communist Party and several Labor Union Confederations

<table>
<thead>
<tr>
<th>Was the proposal adopted?</th>
<th>It was adopted by the Cabinet but was brought up again and never enforced.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Why?</td>
<td>Hizbollah's bloc altered their point of view and requested re-broaching the project. In addition, the Union Coordination Committee's strike on the 15th of December, in rejection of the decision, has supported the opposing Ministers. Finally, it was approved by the State Council, with major remarks, meaning an implicit rejection. The most important remarks were:</td>
</tr>
</tbody>
</table>

- The wage adjustment was not based upon the price fluctuations tables and inflation indices.
- It did divide the employees into categories but did not divide the wages into brackets. |

**THIRD ROUND**

**Fourth Proposal**

Minister Nahas’ 2nd Proposal (December 21, 2011)

**Minister Nahas**

Considering the monthly transportation allowance, after raising it up to 236,000 LBP, as part of the wage, then adjust the wage by 18% for the first bracket, up to 1,500,000 LBP, and by 10% for the second bracket between 1,500,000 LBP and 2,500,000 LBP.

**Proposed by**

Minister of Labor Charbel Nahas

**Supporting Parties**

- The Change and Reform Ministerial Bloc
- Amal Movement's ministerial bloc
- Hizbollah's ministerial bloc
- Union Coordination Committee

**Opposing Parties and Reason of Objection**

- The Prime Minister and his ministers, the President of the Republic and his ministers and Walid Jumblat's ministerial bloc (except for Wael Abou Faour).
- The economic bodies
- The General Labor Confederation

<table>
<thead>
<tr>
<th>Was the proposal adopted?</th>
<th>It was adopted by the Cabinet by a vote of 15 ministers out of 27 voting for it, but was later rejected by the State Council.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Why?</td>
<td>The State Council rejected the decree for several reasons, namely:</td>
</tr>
</tbody>
</table>

- The government's interference in determining the rate of increase in the cost of living despite the fact that the collective deliberations had reached a consensus.
- Considering the transportation allowance as a compensation for the employee and not an income resulting from work or in return for work, therefore it should not be incorporated into the wage |

**FOURTH ROUND**

The economic bodies + GLC Consensual Agreement Versus Minister Nahas’ 3rd Proposal (January 18, 2012)
### Fifth Proposal
The economic
Minister Nahas

<table>
<thead>
<tr>
<th>Proposed by</th>
<th>Minister of Labor Charbel Nahas on (January 18, 2012)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supporting Parties</td>
<td>The Union Coordination Committee and the unions opposing the General Labor Confederation's orientation</td>
</tr>
</tbody>
</table>
| Opposing Parties and Reason of Objection | - All the ministerial blocs  
- General Labor Confederation and the authorities |
| Was the proposal adopted? | No |
| Why? | A political settlement between Aoun, Mikati and Berri for the adoption of the "Consensual Agreement". During the Cabinet's meeting, Nahas proposed two formulas: The formula adopted by the Minister (which requires the legalization of the "Consensual Agreement" so that the Transportation Allowance is compensated by computing the increase in the cost of living based on the year 1996), and the Agreement between the General Labor Confederation and the economic bodies formula, excluding the transportation allowance. The Cabinet, except for Minister Nahas who objected solely, voted for the second formula. |

### Sixth Proposal
GLC/Economic Bodies

<table>
<thead>
<tr>
<th>Proposed by</th>
<th>General Labor Confederation and economic bodies and was entitled &quot;Consensual Agreement&quot; on (January 18, 2012)</th>
</tr>
</thead>
</table>
| Supporting Parties | - The Cabinet  
- General Labor Confederation  
- The economic bodies |
| Opposing Parties and Reason of Objection | - Minister Charbel Nahas  
- The Union Coordination Committee and the Union Opposition |
| Was the proposal adopted? | Was endorsed unanimously by the Cabinet but was opposed by Minister Charbel Nahas only |
| Why? | As a result of the coalition between the General Labor Confederation and the economic bodies who visited the political authorities to exert pressure as well as the political forces' call for adopting the "Consensual Agreement". A political settlement also took place between Aoun, Mikati and Berri for the adoption of the "Consensual Agreement". |
Appendix C - Construction of the CPI index

The CPI is built in two stages. The first stage, price changes of 80,000 specific items per month are averaged in order to prices 8,018 estimated of price change. This stage has come to be known as “lower level aggregation”, or “elementary level aggregation”. It is referred to as such because it attempts to average the most fundamental components of the index. For example, the prices of approximately ten brands of watches are averaged out over a month. These prices are compared to the previous month, and averaged together to produce an index for price change in watches. This methodology differs for most areas within the USA and as such watch prices in the United States are state specific. Watches are one of the 211 ‘elementary items’ divided into 38 ‘elementary states’ in order to produce 8,018 (211 x 38) elementary indexes produced in the first stage of CPI construction (Cage 2003).

In the second stage, the elementary indexes are then averaged to produce various aggregate indexes and ultimately the All-Items US average index as reported by news agencies globally.

Within these two stages, consumer substitution is bound to happen and indeed it does. But how is this remedied? Ideally, and as discussed above, a superlative index could mitigate this problem that may occur at both stages of construction. This could account for consumer substitution that could occur intra-item\(^{69}\) or inter-item\(^{70}\). However, a superlative index is not currently used in the first stage of CPI construction due to sampling errors that may occur with the 80,000 distinct products. For the first stage of construction and as an alternative to a superlative index, the BLS started using a combination of geometric mean and Laspeyres indexes (Dalton 1998) in order to address intra-item substitution. For the second stage, a superlative formula is used in order to address the issue of inter-item substitution.

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\(^{69}\) That is among specific products within the same elementary item (Exchanging a gold watch for a leather one)

\(^{70}\) Across elementary items (Video rentals as opposed to Theatre tickets)
Appendix D- The Boskin Report

In 1996, the Senate Finance Committee appointed an advisory commission to study the consumer price index. It was headed by Micheal J. Boskin and came to be known as the Boskin report. The report recommended downward adjustments in the CPI of 1.1% broken down as follows:

<table>
<thead>
<tr>
<th>Sources of Bias</th>
<th>Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Level Substitution</td>
<td>0.15</td>
</tr>
<tr>
<td>Lower Level Substitution</td>
<td>0.25</td>
</tr>
<tr>
<td>New Products/Quality Change</td>
<td>0.60</td>
</tr>
<tr>
<td>New Outlets</td>
<td>0.10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1.10</strong></td>
</tr>
</tbody>
</table>

Plausible range (0.80-1.60)
Appendix E - UN's Classification of Individual Consumption by Purpose (COICOP)

- 01-12 - Individual consumption expenditure of households
- 01 - Food and non-alcoholic beverages
  - 01.1 - Food
  - 01.2 - Non-alcoholic beverages
- 02 - Alcoholic beverages, tobacco and narcotics
  - 02.1 - Alcoholic beverages
  - 02.2 - Tobacco
  - 02.3 - Narcotics
- 03 - Clothing and footwear
  - 03.1 - Clothing
  - 03.2 - Footwear
- 04 - Housing, water, electricity, gas and other fuels
  - 04.1 - Actual rentals for housing
  - 04.2 - Imputed rentals for housing
  - 04.3 - Maintenance and repair of the dwelling
  - 04.4 - Water supply and miscellaneous services relating to the dwelling
  - 04.5 - Electricity, gas and other fuels
- 05 - Furnishings, household equipment and routine household maintenance
  - 05.1 - Furniture and furnishings, carpets and other floor coverings
  - 05.2 - Household textiles
  - 05.3 - Household appliances
  - 05.4 - Glassware, tableware and household utensils
  - 05.5 - Tools and equipment for house and garden
  - 05.6 - Goods and services for routine household maintenance
- 06 - Health
  - 06.1 - Medical products, appliances and equipment
  - 06.2 - Outpatient services
  - 06.3 - Hospital services
- 07 - Transport
  - 07.1 - Purchase of vehicles
  - 07.2 - Operation of personal transport equipment
  - 07.3 - Transport services
- 08 - Communication
  - 08.1 - Postal services
  - 08.2 - Telephone and telefax equipment
  - 08.3 - Telephone and telefax services
- 09 - Recreation and culture
  - 09.1 - Audio-visual, photographic and information processing equipment
• 09.2 - Other major durables for recreation and culture
• 09.3 - Other recreational items and equipment, gardens and pets
• 09.4 - Recreational and cultural services
• 09.5 - Newspapers, books and stationery
• 09.6 - Package holidays

• 10 - Education
  • 10.1 - Pre-primary and primary education
  • 10.2 - Secondary education
  • 10.3 - Post-secondary non-tertiary education
  • 10.4 - Tertiary education
  • 10.5 - Education not definable by level

• 11 - Restaurants and hotels
  • 11.1 - Catering services
  • 11.2 - Accommodation services

• 12 - Miscellaneous goods and services
  • 12.1 - Personal care
  • 12.2 - Prostitution
  • 12.3 - Personal effects n.e.c.
  • 12.4 - Social protection
  • 12.5 - Insurance
  • 12.6 - Financial services n.e.c.
  • 12.7 - Other services n.e.c.

• 13 - Individual consumption expenditure of non-profit institutions serving households (NPISHs)
  • 13.1 - Housing
  • 13.2 - Health
  • 13.3 - Recreation and culture
  • 13.4 - Education
  • 13.5 - Social protection
  • 13.6 - Other services

• 14 - Individual consumption expenditure of general government
  • 14.1 - Housing
  • 14.2 - Health
  • 14.3 - Recreation and culture
  • 14.4 - Education
  • 14.5 - Social protection
Appendix F - CAS Price Adjustment for changes in features of a good in the CPI Basket

Assume a juice bottle in the CPI Basket was of 300ml and for promotion purposes 30ml (or 10%) were added to it without any public announcement about this increase. CAS adjusts the price of the bottle to keep the CPI Basket coherent and draw the real change in prices. The table below shows an example about the periods of sales adjustments in percentage made to the initial first period price of 550.

<table>
<thead>
<tr>
<th>2(^{nd}) period prices compared to 1(^{st}) period prices</th>
<th>3(^{rd}) period prices compared to 2(^{nd}) period prices</th>
<th>3(^{rd}) period prices compared to 1(^{st}) period prices</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\frac{500 - 550}{550} \times 100)</td>
<td>(\frac{545 - 500}{500} \times 100)</td>
<td>(\frac{545 - 550}{550} \times 100)</td>
</tr>
<tr>
<td>-9.09%</td>
<td>+9.0%</td>
<td>-0.82%</td>
</tr>
</tbody>
</table>
Appendix G- CRI Expenditure Groups

• Food and Beverages (e.g. bread, milk, coffee, chicken, snacks);

• Apparel (e.g. men’s clothing, women’s clothing, footwear);

• Housing (e.g. electricity, gas);

• Durable Consumer Goods (bedroom furniture, household cleaning products, household paper products);

• Healthcare (prescription drugs and medical supplies, physicians’ services, hospital services);

• Transportation and Telecommunications (new vehicles, gasoline, telephone services);

• Education (school tuition and fees, school books);

• Recreation (newspapers, magazines, photographers and film processing);

• Other Goods and Services (cosmetics, perfume, haircuts, jewellery, financial services).
## Appendix H - Agro-food Sections of the Harmonized Commodity Description and Coding System (HS)

<table>
<thead>
<tr>
<th>Agro-food Sections (HS1 = 1 to HS1 = 4)</th>
<th>Agro-food Chapters (HS2 = 1 to HS2 = 24)</th>
</tr>
</thead>
<tbody>
<tr>
<td>01- Live animals; animal products</td>
<td>01- Live animals.</td>
</tr>
<tr>
<td></td>
<td>02- Meat and edible meat offal.</td>
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<tr>
<td></td>
<td>03- Fish and crustaceans, mollusks</td>
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<tr>
<td></td>
<td>04- Dairy produce; birds' eggs; natural honey</td>
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<tr>
<td></td>
<td>05- Products of animal origin</td>
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<tr>
<td>02- Vegetable products</td>
<td>06- Live trees and other plants; bulbs, roots</td>
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<td></td>
<td>07- Edible vegetables and certain roots and tubers.</td>
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<td></td>
<td>08- Edible fruit and nuts; peel of citrus fruit</td>
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<td></td>
<td>09- Coffee, tea, maté and spices.</td>
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<td></td>
<td>10- Cereals.</td>
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<tr>
<td></td>
<td>11- Products of the milling industry; malt; starches;</td>
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<tr>
<td></td>
<td>12- Oil seeds and oleaginous fruits; seeds and fruit</td>
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<tr>
<td></td>
<td>13- Lac; gums, resins and vegetable saps and extracts</td>
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<tr>
<td></td>
<td>14- Vegetable plaiting materials; vegetable products</td>
</tr>
<tr>
<td>03- Animal or vegetable fats and oils</td>
<td>15- Animal or vegetable fats and oils</td>
</tr>
<tr>
<td>04- Prepared foodstuffs; beverages, tobacco</td>
<td>16- Preparations of meat, of fish or of crustaceans</td>
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<td></td>
<td>17- Sugars and sugar confectionery.</td>
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<tr>
<td></td>
<td>18- Cocoa and cocoa preparations.</td>
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<tr>
<td></td>
<td>19- Preparations of cereals, flour, starch or milk</td>
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<tr>
<td></td>
<td>20- Preparations of vegetables, fruit, nuts</td>
</tr>
<tr>
<td></td>
<td>21- Miscellaneous edible preparations.</td>
</tr>
<tr>
<td></td>
<td>22- Beverages, spirits and vinegar.</td>
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<tr>
<td></td>
<td>23- Residues and waste from the food industries</td>
</tr>
<tr>
<td></td>
<td>24- Tobacco and manufactured tobacco substitutes.</td>
</tr>
</tbody>
</table>