Measuring Real Income Using Consumer Price Index (Empirical Evidence)

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The paper examines the consumer price index (CPI) that is used as an official indicator at the domestic level, as it has been the basis of all official indexation, every month the CPI released by the National Bureau of Statistics provides comprehensive and detailed information regarding price development over time. It also can be used to reflect the overall change in the cost of goods and services purchased by a typical consumer and used as an indicator of the rate of inflation, adjust wages to compensate for lost purchasing power due to inflation, and converge a price or wage to a real price or real wage to show the equivalent amount in a base period after adjusting for inflation, despite the fact that there is such available information, little is known on how can be used to estimate the purchasing power of working population earnings of which is not available at presents. The CPI deflator can inform us about true inflation as wages could directly affect the well-being and living conditions of the working population, household consumption, and domestic demand due to rising prices of goods and services, thus using the CPI deflator measures how much would need to increase or decrease salary wage in order to make as well off as the subsequent period. This paper will use the data released by the National Bureau of Statistics in order to assess the degree of real wage adjustment needed to ascertain the real income gap, for example, it provides answers to the current purchasing power of the person's earnings in comparison to the previous period. The research findings will help planners and policymakers to adjust salaries for the working population in relation to the cost of living in the country
Keywords: Real incomes and CPI deflators

Introduction

The consumer price index is the country's representative data for the prices of goods and services and computes overall and group indices of consumer prices. The consumer price index (CPI) is the measure of the general relative change of the prices of goods and services by households for private (non-production) consumption and can be used to measure economic insecurity. It is defined as a "pure price change" index. The general consumer price index is applied in three main areas:

- Macroeconomic indicator as the official measure of inflation in the country
- Deflator the values of indicators, which do not their own price measure
- Tool for possible indexation of salaries, pensions, and other incomes from the Government when needed.
- Consumer Price Index (CPI) is a basic yet essential economic indicator and it is relevant to every citizen and fundamental for policymaking on consumption, trade, inequality, interest rate, and foreign exchange rate. CPI serves as a basis for various indicators under the Sustainable Development Goals (SDGs) and Agenda 2063 Goals and thus economic growth and development.

2. Prior Research on Economic Security

Many countries have recently observed an increase in variability in both household incomes and wealth, due to recessions, economic slowdown, unemployment, and instability. As a result of this, the issue of economic insecurity is currently drawing an increasing amount of attention.(Espinosa et al., 2014)

The Economic Security Index (ESI) is a new measure of economic security designed to foster research and policy analysis. Motivated by established findings concerning risk perception and loss aversion.(Hacker et al., 2014).

The basis for concern about economic security is the belief that uncertain economic prospects leave people worse off. This belief has two logical foundations: that individuals fear large economic losses; and that when individuals experience such losses without sufficient buffering, they suffer hardship, particularly (but not only) if those losses are unexpected. A growing body of theoretical and empirical research has investigated both foundations. Scholars in an array of disciplines—from economics and political science to social psychology and sociology—have demonstrated the impact of income instability.(Hacker et al., 2014)

It is a common perception that the level of economic insecurity has been rising since the 1990s, especially since the global crisis in 2008. The fear and anxiety felt by individuals living in an insecure world have negative consequences for their quality of life. For example, both well-being and consumption are lower in households that are faced with economic insecurity (Linz and Semykina, 2010) and it is harder for them to invest in housing and children's education (Stiglitz et al., 2009), generating permanent negative effects on the well-being of future generations. Children who are brought up in disadvantaged and stressful circumstances are more likely to have problems in school, drop out, become teen parents, and live in poverty when adults.(D'Ambrosio & Rohde, 2014)

Inequality at a point in time is of little intrinsic interest if incomes are changing rapidly or frequently; it is long-run income inequality that reflects disparities in life chances. Incomes may be changing due to short-lived transitory shocks, or more permanent changes, but either kind of change induces greater volatility in the income stream and greater relative1 mobility.(Nichols & Rehm, 2014)

Households' perceptions of the affordability of primary commodities (food, keeping home warm, clothing, and medication) and worries about the consumption of these commodities in the future—subjective, backward- and forward-looking measures of economic insecurity.(Ivlevs, 2014)

Earnings insecurity or risk is proxied by measuring earnings variability, which is a measure fundamental to risk or insecurity, as witnessed by the expanding literature on earnings and income volatility.(Sologon & O'Donoghue, 2014)

The Problem

The deprivation of primary commodity consumption arises from the inability to cope with and recover from the costly consequences of primary commodities such as food, clothing, housing and medical care.

4. Data

We rely on the Cost Price Index (CPI) with a base year 2015 derived by the National Bureau of Statistics and the administrative data to estimate the real incomes.

Methods

i) The structure and use of CPI

Sample Coverage

CPI compilation is based on four samples

- Consumer basket- sample of goods and services, offered at the consumer market
- Geographic coverage-sample of settlement, where observation points will be sampled
- Observation points- sample of stores, shops, restaurants, cafes, etc. in the sample of settlements
- Target number of prices-set of prices of goods and services to be priced at the sample observation points

Consumer basket

The consumer basket includes goods and services, which represent the final consumption of households and is mainly divided into four basic groups: Food, Non-foods, Services and Catering.

The goods and services are grouped into 12 basic division in accordance with the COICOP classification, Food and non-alcoholic beverages, Clothing and footwear, Housing, water, electricity, gas and other fuels, Furnishings, household equipment and routine maintenance of the house; health, transport, communication, recreation and culture, education, hotels, cafes and restaurant and Miscellaneous goods and services.

There are four stages in the calculation of CPI procedure

A: Calculation of imputed prices

The indices for all elementary aggregate are compiled and where necessary missing prices are imputed using the change in a matched sample of average prices. Where a matched sample is not available, prices are imputed with the help of an upper-level group index.

The index $I_{\frac{t}{t-1}}$ with which the imputation is done, compiles as:

$$I_{t/t-1} = \sqrt[m]{\prod_{i=1}^{m} \frac{P_t^i}{P_{t-1}^i}}, i \in S_{t-1} \cap S_t$$

Where:

P_t^i denotes available prices in period t;

P_{T-1}^I available (real and imputed) prices in period t-1

S_t set of available prices in period t:

S_{t-1} set of available prices in period t-1

M number of prices, which belong to sub-set $S_{t-1} \cap S_t$

B: Calculation of the aggregate CPI

The average price for every good or service in the consumer basket is compiled as the geometric mean of all prices (real and imputed)

$$P_t = \sqrt[n]{\prod_{i=1}^{n} P_t^I},$$

Where:

P_t^i denotes national price for the current month

P_t^I price of i-th item

n number of recorded and imputed prices

C: Calculation of base indices for the current month t

The base index for the elementary aggregate (5th level) is calculated as the ratio of geometric mean prices, that are part of a given aggregate

$$I_{ith} = \sqrt[n]{\prod_{i=1}^{n} \frac{P^I}{P_h^I}}, \quad i \in S_t$$

Where:
S_t denotes the set of all prices (real and imputed) in period t;
P_t^I i-th current prices for an elementary aggregate
P_h^i i-th base for an elementary aggregate:
n=number of prices in an elementary aggregate
Base indices for the group of 4th, 3rd, 2nd and 1st level are compiled as Laspeyres -type indices
$I_{t/h(m)} = \sum_{i=1}^{n} I_{t/h}.W^I_{(m+1)/\sum_{i=1}^{n} W^I_{(m+1)}}$
Where:
m is the hierarchical level (m=4 for group of goods, m=3 class, m=2, group, m=1 division and m=0 overall.
CPI:
n number of groups from (m+1)th hierarchical level, going into the group from m-th hierarchical level, $W^I_{(m+1)}$ base weights
D. Chain indices
Chain indices during one year for all levels are compiled as the ratio of the base indices for the current month and the relative base indices for the previous month,
$I_{\frac{t}{t-1(m)}} = I_{t/h(m)/I_{t-1/h(m)}}$

The chain index for January of the current year taking December of the previous year as 100 (refers to the general index and particularly to any hierarchical level) compiles as:
$I_{Dec01}^{Jan\ 02} = I_{01}^{J02} / I_{01}^{01}$

Where:
1_{01}^{J02} = is the base index for January 2022 as price and weight reference

I_{01}^{D01} amending base index, defining the change of prices in December 2022 taking the annual average prices in 2021 as 100, weighted with the monetary expenditures in 2021
The consumer price index is a chained Laspeyres in 2021

The application of CPI as a deflator to convert a wage to a real wage to show the equivalent amount in a base period after adjusting for inflation.
A worker was earning TZS 20,796,000 per year in December 2018, when the CPI was 112.23 (base year 2015) what was a worker real income in its 2015 equivalent?

Real income in period t= Income per T.100/CPI in period t.

Real earnings in 2018 = 20,796,000 * 100/112.23 =18,529,804.87 and

The same worker was earning 20,400,000 in 2016 when the CPI was 102.95 in its 2015 base year equivalent.
= Real earning in 2016 = 20,400,000*100/102.95 =TZS 19,815,444.39

Concluding Remarks

The purchasing power of the worker earnings was higher in the year 2016 than 2018 it implies that the wellbeing and consumption is lower in that worker and it becomes harder to invest

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