

# The Impact of World Food Price on Domestic Inflation: Evidence from Sri Lanka

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## Abstract

Food price contributes the largest share in the general price index in developing countries. Food prices have been increasing in Sri Lanka since 2003. The recent growth of global food prices affects the welfare of poor people, consumers and producers. In Sri Lanka large segment of the population spends more than 50 percent of their income on food; this study investigates and assesses how international food price surge affects domestic inflation process in Sri Lanka. The empirical statistical results are derived by using a battery of parametric and non-parametric econometric techniques using monthly data of price series for the period from 2003M1-2020M12. The Johansen's co-integration analysis results confirm that global food prices and domestic prices are co-integrated therefore Sri Lankan government needs to

develop a safety net program for the poor and a poverty reduction strategy. Policy attention needs to shift towards efforts to increase food production in Sri Lanka. The results of the study have various policy implications of monetary policy, food and agriculture policy and trade policy for Sri Lanka.

**Keywords:** Domestic Inflation, Food price, Co-integration, Error Correction Model, World Price transmission

## 1. Introduction

The level of interdependence among the countries has increased due to the scientific discoveries and technological advances that have taken place following the Industrial Revolution. The exchange of foodstuffs is seen as an essential part of international trade. Global food prices have been continuously rising for decades (FAO, GIEWS. 2007). The impact of inflation is felt in every country following the rise in food and oil prices in the world. Inflation is the continuous increase in the general price level of commodities in the market. Due to the impact of inflation, the purchasing power of goods in that country's currency is declining in the domestic market. Although domestic factors affect domestic food prices in each country, the impact of global food prices plays an important role. In that way, Sri Lanka is also seen as unexpectedly facing food price pressures and is being impacted by inflation. Food prices are generally measured by the Consumer Price Index and the Colombo Consumer Price Index is used as the main index in Sri Lanka. The FAO uses the World Food Price Index (WPI) as an indicator to measure the price of food globally, as well as a monthly measure of the average price of five commodities (vegetable oils, seeds, dairy products, meat and sweets -sugar).

Inflation is a common problem to all countries in the world. A group of the population living in each country is being badly affected due to rising food prices. Average food price fluctuations in the world and in Sri Lanka have been rising rapidly since 2003. High food prices and food inflation are seen as a major problem in developing countries. The impact of inflation is creating a recession in every country's economy. As Sri Lanka is a small open economy developing country, the relationship between world food prices and domestic food prices is important to our country. At the same time, the effects of inflation and the measurement of inflation depend on the nature of the price change. Food price change plays an important role in overall inflation. It is essential that policymakers are aware of the characteristics of food price change. The challenge for a central bank is the impact of food inflation; is to determine whether it is temporary or permanent.

Looking at the historical trend of inflation in Sri Lanka, inflation rose to 15.84 per cent in 2007, 6.22 per cent in 2010, 6.91 per cent in 2013 and 7.70 per cent in 2017. The UP index was 74.2, 100, 122.7 and 147.1 respectively during that period. Inflation eased to 5.4 per cent in March 2020. According to the Department of Statistics, the fall in food prices is the main reason for this situation. Also, the consumer price index fell by 0.9 percent to 134.6 points. Factors such as the surviving Sunday bombings, rising grain oil prices, climate change, currency devaluation and the Covid-19 are contributing to Sri Lanka's inflation.

Due to rising food prices, low-income families, net food buyers and the poor are unable to meet their basic needs. Instead the average family spends half of their income on food. Families with more children are being hit hard by rising food prices and the effects of hunger, starvation and poverty. Consumer price inflation in India in South Asian countries has been above 9% per annum. Sri Lanka also has a unique place in that way. The impact of rising food prices will have an impact on the political and economic affairs of each country and will lead to social unrest. Rising food prices have increased people's hunger and starvation (Ivanic & Martin 2008). Rising food prices have increased the number of malnourished people (Mahendra Dev>2013). The impact of rising food prices has hit Ethiopia and Somalia hard. The United Nations says 3.7 million people in Somalia are starving each year without food or water. Thus rising food prices have led to an increase in food insecurity and a decline in the health of the population.

Sri Lanka is a small country in the Indian Ocean with an open economy. Rising global food prices have led to higher prices for goods imported into Sri Lanka from other countries. There has been a long-standing relationship between world food prices and domestic food prices. At the same time based on countries such as Ethiopia, Latin America, India, China, Malaysia, and Thailand, they have studied the relationship between global food prices and domestic inflation. Further, some studies [Imai, Arab, Carrasco, and Mukhopadhyay (2012)] have been conducted on food prices in Sri Lanka and South Asia.

As world markets are interconnected with each other, price change in one country can affect other markets. Fluctuations in food price inflation can destroy economic stability. Rising food prices will reduce the incomes of farmers and the poor and cause long-term poverty. However, the relationship between domestic inflation and global food prices in Sri Lanka has not been deeply explored. So this issue needs to be explored in depth using econometric methods.

### *1.1 Research Hypothesis*

In order to achieve the objective of the study we formulate following hypotheses:

1. The global food prices have a significant impact on domestic inflation.
2. The global food prices have a significant impact on consumption price Index for food items.
3. The global Food Prices have a significant impact on consumer price index of non-food items.
4. There is a causal relation between above the variables.

## **2. Literature Review**

The review of theoretical literature helps to understand the real relationship between variables in a study. Since no direct theoretical explanations are found for this research topic, theories aimed at indirectly relating these variables are intended here.

Inflation is a continuous and significant increase in the general price level. Inflation can be classified into two types, demand-pull inflation and cost-push inflation. In particular, the consumer price index is seen as a key indicator used to measure inflation. The Colombo

Consumer Price Index is mainly used in Sri Lanka. Although Sri Lankan domestic inflation is determined by a number of factors such as the exchange rate, oil prices, interest rates, inflation and world food prices, rising wages. Among them only world food prices are taken into account here.

The equilibrium of an object is determined by its demand and consumption force. Price exchange integrates markets vertically and horizontally. Asymmetric exchange can have a significant impact on policy making. Competitive market system, government policies, efficient information system, inventory cost may cause asymmetric transactions. Foreign exchange transactions can be divided into two types, the exchange rate from the import price and the price changes from the exchange rate. World food prices come through the exchange rate when it comes to domestic. The theory behind it is LOP (Law of One Price).

Equation of LOP :  $P_{i,t}^d = ER_t P_{i,t}^w$

Statistical model of the equation shown above:  $P_{i,t}^d = ER_t * P_{i,t}^w * e^u$

The statistical model can be written as follows in the form of a natural logarithm:

$$\ln P_t^d = \beta_0 + \beta_1 \ln P^w + \beta_2 \ln ER_t + \mu_t$$

ER is seen as an external variable as Sri Lankans have no power to determine a good's price. The trade market and purchasing power equilibrium suggest that the prices of similar goods may differ in different markets in the short run. Although prices are not fixed, intermediaries can prevent different prices from going over long distances. The basic theoretical principle for price change is LOP. Without government intervention the price of a commodity would be equals everywhere. There are no transfer costs, no transportation costs and no legal restrictions. Neither sellers nor consumers handle price. Factors that explain horizontal price transfection (HPT) can be divided into economic and technical factors. Technical factors must be identified in structural and infrastructural factors. In fact they have to determine different price levels in different markets. Over time such a price dynamic is seen. Foremost among the economic factors is the presence of different demand prices depending on the location.

Further, the review of previous studies also aids in gaining a broader knowledge of the research being conducted, organizing the study, identifying the research methodology, and making recommendations. Although various studies have been conducted in this regard focusing on the impact of world food price on domestic inflation, only a few important studies that are most relevant to our research topic are reviewed here. In that regard, reviews of the previous studies can be viewed globally, nationally and regionally. Focusing on South Asia, Afrab et al. (2017) employed secondary data from 1980 to assess the cost of welfare caused by rising food prices. In this study, consumer welfare as the dependent variable and food prices as the independent variable were used as variables. The LA/AIDS model was used in this study to analyze the secondary data. The study concludes that a significant increase in food prices has resulted in a significant loss of consumer real income and a reduction in purchasing power in all countries in South Asia.

Barahona and Chulaphan (2017) conducted a study to examine the price exchange between world food prices and the different consumer food price index (average consumer, low-income consumer) using the secondary monthly data from 1995 January to 2015 November based on Thailand. The Auto Regressive Distributed Lagged Model, Error Correlation Model have been used to analyze the data. The results of the study show that the consumer price indices of both the average consumer and the low-income consumer are equally sensitive to variations in world food prices. Moreover, Chuah et al. (2015) aimed at to assess how global commodity prices are affecting inflation in Malaysia. The study used inflation as the dependent variable and global food prices as the independent-variable for the quarterly period 1992-2013. The VAR model was used to analyze the data and concluded that global commodity prices are having an adverse effect on domestic inflation in this study.

Next, Furceri et al. (2016) explored to assess the impact of food prices and inflation on the health of the population based on 44 countries. The study concludes that high food prices are having a detrimental effect on the health of people living in developing countries. Food prices and inflation have been used as dependent variables, as have independent variables such as nutrition of population, health and labor productivity in this study. The secondary data for the period 2000-2010 were used in this study and the data were analyzed using the Panel regression Analysis. Hoon et al. (2013) investigates to assess the internal and external factors influencing the site of food prices and inflation in 72 countries' data for the period 2000-2011. The data was analyzed using the Correlation analysis and fixed effect model, which has been concluded that global food price shocks have affected domestic food prices and inflation on different levels in different countries and regions. Further, Imai et al. (2008) conducted a study using annual time series data for 35 years (1966 to 2000) to assess the extent to which global commodity prices are influencing domestic food prices in India and China. Using a Generalized least squared method, OLS regression model, Error correction specification model, the study concluded that global food prices are affecting domestic prices in the short run and medium term.

Iqbal et al. (2016) examined how global diversified international prices have an impact on domestic producer prices of 104 countries. Time series data for the period 1991-2013 were employed in this study. Using nonlinear auto regressive distributed lagged model, Traditional two-step Engel-Grange co-integration test, and this study concluded that the international prices provide global diversified exchange flexibility between domestic producer prices. A study based on the Latin American country was conducted by Jalil and Tamayo zea (2011). This study aims to examine how international food price shocks affect local food prices. Using the VAR model, Impulse Response Function, and the study found that while the impact of international food prices was initially recession, it eventually had a high impact on domestic inflation and prices were shocking in every international food price index. As well as concluding that food prices are continuing to rise due to international inflationary pressures. Bhattacharya and Gupta (2017) examined about drivers and impact of food inflation in India. Time series data for the period 2006-2013 were employed in this study. This study concluded that the recent surge in food inflation in India is a result of various factors such as agricultural wage inflation, fuel, and international prices except for tradable.

Kelbore (2013) examined how global food prices are traded in the domestic market based on Italy from 2001 to 2011. Principal component analysis, Johansen's cointegration test, Simple regression model, simple correlation model, and unbiased regression analysis were used to analyzing the data. They concluded that price flexibility was greater than the similarity between world and domestic markets and that the Ethiopian market was seen as integrated with the global market. Lee et al. (2013) conducted a study to assess the impact of food prices and inflation on the health of the population based on 63 developing countries by adopting secondary data from 2001 to 2010 periods. The data were analyzed using the Panel regression Analysis. The study concludes that the high food prices are having a detrimental effect on the health of people living in developing countries.

By Sri Lankan monthly data for the period 2003-2013, Selliah et al. (2015) assessed how global food price rise is affecting Sri Lanka's domestic inflation process. The data was analyzed using the Johansen's Cointegration test, Vector Auto Regression Model and concluded that world food prices have a strong positive impact on domestic food prices and that domestic food prices are high compared to world food prices. Sol Garcia (2016) investigates to examine the assessment of the effects of rising global food prices on the well-being of consumers and households in Spain and using the secondary data 2003-2011 periods. Using the Dynamic model, Engel-Granger cointegration test, Augmented dickey-fuller(ADF) and pilling, QUAIDS model, population-average panel data model, Error correlation model, and this study concludes that the impact of increased food prices on consumers depends not only on the country but also on the population within the country considered in the estimate.

Although there have been many international studies on the relationship between domestic inflation and global food prices, very few studies have been conducted in Sri Lanka. At the same time, even those studies did not fully focus on the problem of domestic inflation caused by global food prices. Similarly, no comprehensive study has been conducted on the impact of global food inflation on Sri Lanka. Thus this study seeks to fill the gap by providing a comprehensive study of domestic inflation and world food prices in the case of Sri Lanka.

### **3. Trend of the World Food Prices and the Domestic Inflation**

Globally, food prices are fluctuating. The food items have been exported from Sri Lanka and imported from abroad since 2005 due to the government's adherence to an open economic policy. The export and import prices of goods are rising globally. This kind of foreign food price shock has a definite and direct impact on the domestic price level of Sri Lanka.

#### *3.1 The Indicators for Measuring the Inflation*

Mainly, the four indices used to measure inflation in Sri Lanka are the Wholesale Price Index, the Gross Domestic Product Deflator (GDPD), the Colombo Consumer Price Index (GCPI), and New Colombo Consumer Price Index. Of these, the Colombo Consumer Price Index has so far been used by the government as the official cost of living index. However, since 2003 it has been announced that the New Colombo Consumer Price Index will be used by the government as the official cost of living index. The Colombo Consumer Price Index should

be used based on the data available to fully analyze the inflation trend in Sri Lanka. The FAO uses the Global Food Pricing Index as a benchmark for measuring food prices worldwide.

### 3.2 Trend of Inflation in Sri Lanka

If we look at the trend of inflation in Sri Lanka, we can see that systemic factors, government policy changes and foreign shocks have all had a massive impact on inflation. Based on these, Sri Lanka's inflation experience can be divided into the following periods.

1. Low inflation period (1953-1967)
2. Period of moderate inflation (1968-1977)
3. The period with the highest inflation (1978-2007)
4. Inflationary period after 2007 (2008-2020)

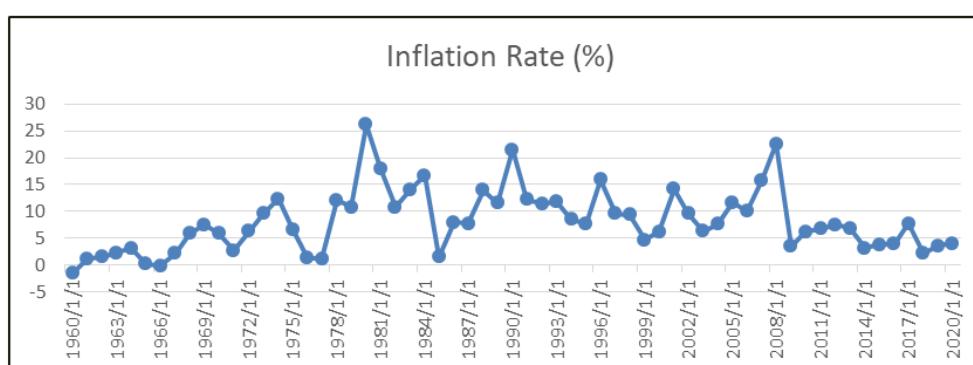


Figure 1. Trend of Inflation of Sri Lanka (1953-2020)

#### 3.2.1 The Period with Low Inflation

The period 1953-1967 is considered to be the period with the lowest inflation. The average annual inflation for the period was 0.9%. Many factors have contributed to the low inflation that prevailed during this period. It is important to note that Sri Lanka and the rest of the world have adopted a consistent exchange rate during this period. In addition, the country experienced lower inflation despite being more dependent on imports due to lower inflation in imported goods in Sri Lanka. The low growth rate of inflation and the domestic shortfall in essential commodities filled by imports did not lead to an increase in inflation. Further, price increases over time were offset by price controls on food and clothing, distribution and subsidies. The government's major role in the import and distribution of many essential commodities played a major role in controlling inflation during this period.

#### 3.2.2 Period with Moderate Inflation

This period is seen as a period of moderate but somewhat increased inflation with double digits compared to the previous period. The average annual inflation for the period 1968-1977 was 6.0 percent. The devaluation of 1967 and the first oil shock were the main reasons for the rise in inflation during this period. The JVP uprising of 1971 severely affected the country's productivity and the government had to spend large sums of money to rebuild

the affected infrastructure. The move set the stage for inflationary pressures.

In addition, during the period 1973-1974, due to the severe drought in the country and in the countries supplying food to Sri Lanka, the production of food items declined and there was a massive increase in their prices. This increase in global market prices for food items also led to a steady increase in domestic prices. Sri Lanka became completely dependent on foreign sources for petroleum needs; the first oil shock (in 1973) hit the economy hard. The sharp rise in oil prices pushed up the prices of all domestically produced goods as well as imported goods. This is why the country is experiencing high inflation during this period.

### 3.2.3 The Period with the Highest Inflation (1978-2007)

This period is seen by economists as a long-lasting period of double-digit high inflation. The inflation averaged 11.7 percent between the 1978-2007 periods. 1980 was the year of the highest inflation in the history of Sri Lanka. Inflation that year stood at 26.1 percent. The flexible exchange rate system was introduced after 1995. Thereafter the value of the Sri Lankan rupee gradually began to depreciate. This is because the inflow of foreign exchange was found to be less than its outflow. The depreciation of the currency had a major impact on inflation. There was an increase in the prices of wheat flour, kerosene and public transport. All of this led to a series of price increases.

Subsequent depreciation of the rupee, widening budget deficit offset by borrowings from banks and expansion in exports led to a significant increase in the cash flow. The prevailing high interest rates in the country encouraged high inflow of foreign capital. After all, the rise in world market prices for imports has had a significant impact on inflation in Sri Lanka. The combined effect of all this was a significant increase in the price level.

The government's investment in a number of major development projects (e.g., the Mahaweli Development Project) in the early 1980s increased the country's cash flow, while bad weather and political turmoil in the northeastern and southern parts of the country led to a decline in domestic production of goods and services. The overall consequence of this is that inflation is inevitable. A high inflation prevailed in the country in the late 1980s and early 1990s.

After 1988, the government launched the popular 'Janashakthi Poverty Alleviation Program' with the aim of helping low-income people. However, the budget deficit in 1988 was 15 percent of GDP and privatization was actively pursued during the so-called second liberalization period of 1988-1994. Hence the inflow of capital into the country increased. Due to this, inflation was relatively high during this period. In particular, inflation has been rising steadily since 2005. Rising defense spending, the sharp fall in agricultural production, fisheries and dairy production in the north and east of the country, the continuing rise in prices of imported commodities, especially petroleum, wheat flour and milk powder, and the continued rise in inflation are the main causes of the current rapid rise in inflation. The important point here is that monetary policy is currently being implemented by the central bank with the aim of raising interest rates and stimulating savings to reduce the amount of money in circulation and reduce inflation. Thus the interest rate is repeatedly increased. This process can have the opposite effect. That is, if the interest rate hike reduces investment and



gross domestic product falls, demand-pull inflation and prices are likely to rise further.

### 3.2.4 Inflationary Period after 2007

Inflation rose to 17.5 percent in 2007 on the back of persistent rise in global oil and fuel prices, increases in international commodity prices, a decline in paddy production in the North and East provinces and a decline in domestic production. Inflation eased to single-digit inflation of 3.4 per cent in 2009 due to terrorist activities and adverse weather conditions. The strict monetary policies adopted by the central bank have reduced inflation that year due to demand and supply factors such as the depreciation of international commodities and the exchange rate (CBSL, 2009).

The Inflation in 2010, 2011 and 2012 was 6.2 percent, 6.7 percent, 7.6 percent and 6.9 percent respectively. The increase in domestic food purchases, the central bank's monetary policy and lower tariff reforms on consumer goods led to lower inflation in 2011. At the same time, improved supply conditions in agricultural production and lower prices of imported goods contributed to lower inflation in 2012. The inflation in September 2015 was -0.3%. The Inflation increased slightly in 2017 and decreased in 2018 and 2019. However, inflation has shown a slight increase due to the bomb blasts in 2019 and the Covid-19 in 2020.

### 3.3 Trend of Inflation in Sri Lanka based on the Colombo Consumer Price Index

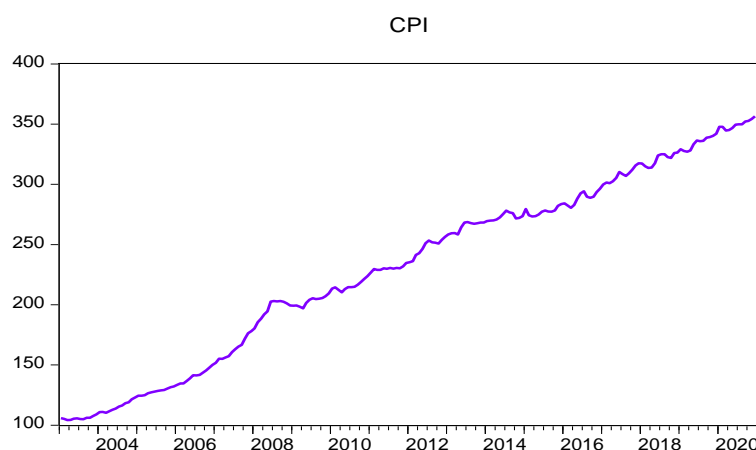


Figure 2. Trend of Inflation in Sri Lanka based on the Colombo Consumer Price Index

According to the recent official government price index, inflation based on the New Colombo Consumer Price Index will be Sri Lanka's official inflation for the foreseeable future. The index is based on the shortcomings of the Colombo Consumer Price Index and the need for the period, with the Department of Census and Statistics estimating 2002 as the base year. The new price index reflects the current buying scales and the pricing information are collected at 12 locations in the Colombo District, not just at the seven markets within the Colombo Municipal Council area, as per the Colombo Consumer Price Index. During the Colombo Consumer Price Index, 125 categories of items were taken into consideration. But during the New Colombo Consumer Price Index, 300 categories of items are taken into

consideration. As the number of categories of items increases, the weighted to them decreases.

Inflation rates calculated by both indices differ as the New Colombo Consumer Price Index includes certain commodities that are not included in the Colombo Consumer Price Index. For example, the Colombo Consumer Price Index (WPI) for fuel and light is based on kerosene only. Electricity and gas were not taken into consideration. However, the New Colombo Consumer Price Index focuses on electricity and gas. The New Colombo Consumer Price Index includes 10 groups and 83 sub-classes. But the Colombo Consumer Price Index covers only 10 groups and 38 sub-categories. In the new index, the weighted rate for food items has been reduced from 68.3 percent to 46.7 percent, while the weighted rate for non-food items has been increased from 31.7 percent to 53.3 percent. The highlight of the New Colombo Consumer Price Index is the high weighted rates for water, electricity, gas and other fuels (18.28%), transport (9.47%), communication (4.42%) and health (4.18m). According to the index, the sharp rise in prices of petroleum products and food items has contributed greatly to the country's high inflation rate, especially since 2006.

### *3.4 The Method of Food Cost in Sri Lanka*

Rice, bread and wheat flour are the most consumed food items in Sri Lanka. The urban people spend more on prepared food than on grain. At the same time states peoples spend little on prepared food. About  $\frac{1}{3}$  of the total food expenditure is on grains.

Table 1. Food Expenditure System in Sri Lanka (in %)

Main food type	Sri Lanka	city	Village	States
Cereals	16.3	12.1	16.9	27.4
Prepared food	11.8	17.4	10.6	5.9
Legumes	3.4	2.7	3.5	5.0
Vegetable	7.9	6.8	8.2	8.0
Meat	4.4	6.0	4.0	4.2
Fish	9.2	11.2	9.0	3.9
Embryo	4.0	2.9	4.3	2.6
Coconut	5.2	4.4	5.4	4.9
Sauces	8.8	7.5	9.1	9.2
Milk & Dairy	9.4	10.6	9.0	9.8
Fat & Oil	2.3	1.7	2.4	3.2
Sugar	3.1	2.6	3.2	3.2
Fruits	3.3	3.6	3.3	1.9
Other Food	10.7	10.4	10.8	10.8
Total	100	100	100	100

Source: HIES, Sri Lanka, 2017/2018

### *3.5 The Food Imports in Sri Lanka*

The south Asian economic countries, including Sri Lanka, import more goods compared to other developing countries. Sri Lanka is an open economy with a strong import base. Sri Lanka has long seen an unfavorable trade balance since the 1950s. Since 1977 the Sri Lankan

economy has become a liberalized economy and Sri Lanka has joined the globalized system.

The Sri Lankan economy has had a floating exchange rate since 2001. Sri Lanka has been a net importer since the 1940s. As a result global food prices have been affected by market developments. Sri Lankan food security situation is still dependent on global food market prices. Sri Lanka has been importing more than 25 percent of its products in recent years, including wheat, sugar, dairy and cereals. As Sri Lanka is an open economy, shocks in international food prices will affect Sri Lankan domestic food prices. And most of the food components in the food basket are imported.

During the period 2009-2012 about 50% of the total cost of imported consumer goods is the cost of importing food and beverages. Therefore, the cost of food plays a major role in the total import cost of Sri Lanka. Sugar, wheat flour, milk and dairy products, maize, large onions, potatoes and eggs are the major imports and about 9-12 percent of the total imports are wheat, beverages and maize. The above factors are seen as the primary drivers of inflation in Sri Lanka. Sri Lankan food imports account for 14 percent of trade imports. In 2007, Sri Lanka imported 1.5 billion American dollar worth of food items. The share of food and beverages in total imports in 2012, it has increased from 6.8 percent to 7.6 percent in 2013.

Table 2. Food Imports of Sri Lanka

Year	Value of imported goods	Value of imports of total consumer goods	Value of Food Imports Value of Imported Wholesale Consumer Goods (%)	Food Import/ Total import (%)
2010	1321.6	2476.3	53	9.8
2014	1634.0	3853.0	42	8.4

Source-Central Bank Annual Report-2014 (value-US\$)

Hence, the world food prices are seen as a major factor influencing Sri Lanka's inflation. The consumer price index is seen as an indicator of inflation. It comes through the exchange rate when importing goods from abroad into the country at the same time the imported items are mostly food items.

#### 4. Data, Variables, and Methodology

The Sri Lanka-based this study, which aims to identify the impact of global food prices on domestic inflation, uses monthly data from the 2003 January to the 2020 December. In this study, the global food price index (GFPI) is used as an independent variable, and the Colombo Consumer Price Index (CCPI), the consumer price index for food items (CCFPI), and consumer price index for the non-food items (CCNFPI) are used as dependent variables. At the same time, the variables used for this study have been transformed into a natural logarithmic form. In addition, the data of World Food Pricing Index was collected from the FAOSTAT website, data of domestic inflation indicators such as CCPI, CCFPI, and CCNFPI were obtained from the Department of Census Statistics, and data on the exchange rate was collected from the central bank annual reports. Graphic techniques are used to examine the relationship between domestic prices and global food pricing. As well as the following hypothetical econometrics study has been used to examine the relationship between world

food prices and domestic food prices.

Since this study includes more than two variables, the Johnson Combined Integration (JCI) test has been used to test the long-term equilibrium relationship between variables and to identify the number of co-integration equations. Accordingly, for the purpose of our study, this test is to be carried out separately on domestic consumer price indices. Thus, when the first is the Colombo Consumer Price Index as the dependent variable, the Johanson Co-integration test is defined as follows.

$$CCPI_t = \beta_0 + \beta_1 GFPI_t + \beta_2 ER_t + \mu_{1t} \quad (1)$$

Where,  $CCPI_t$  is the Colombo Consumer Price Index as the dependent variable,  $\beta_0$  is the intercept, and  $\beta_1, \beta_2$  are the slope of coefficients. As well as,  $\mu_{1t}$  is a white noise error term.

Next, When the Consumption Price Index for food items is the dependent variable; Johanson Cointegration Test is defined as follows:

$$CCFPI_t = \alpha_0 + \alpha_1 GFPI_t + \alpha_2 ER_t + \mu_{2t} \quad (2)$$

Here,  $CCFPI_t$  is the Consumption Price Index for food items as the dependent variable.

Next, when the non-food consumer price index is the dependent variable, the Johanson Cointegration test will be defined as follows:

$$CCNFPI_t = C_0 + C_1 GFPI_t + C_2 ER_t + \mu_{3t} \quad (3)$$

Here  $CCNFPI_t$  is the Consumer Price Index of non-food items as the dependent variable.

If no co-integration is found between the variables based on the results of the Johanson Cointegration test, then no long-run relationship or long-term equilibrium can be found between the variables. So we can use the VAR model to understand the short-run relationships between the variables. If there is evidence for co-integration between two or more variables according to the Granger representation theorem, then a definitive error correction model between those variables can be found.

When co-integration was found between the variables, Vector Error-Correction Model (VECM) is used to determine long-run adjustment from short-term imbalance and short-run relationship. The test is to be performed separately on consumer price indices.

Thus, the error correction model for the Colombo Consumer Price Index will be defined as follows:

$$\Delta LCCPI_t = \beta_0 + \rho LCCPI_{t-1} + \sum_{i=1}^{p-1} \rho_i^* \Delta LCCPI_{t-i} + U_t \quad (4)$$

Similarly, the error correction model, which is consumer price index for food items as the dependent variable, is defined as follows:

$$\Delta LCCFPI_t = \alpha_0 + \rho LCCFPI_{t-1} + \sum_{i=1}^{p-1} \rho_i^* \Delta LCCFPI_{t-i} + U_{2t} \quad (5)$$

The error correction model, which is consumer price index for non-food items as the dependent variable, is defined as follows:

$$\Delta LCCNFPI_t = C_0 + \Pi LCCNFPI_{t-1} + \sum_{i=1}^{p-1} \rho_i^* \Delta LCCNFPI_{t-i} + U_{3t} \quad (6)$$

Based on the above equations, if  $\Pi = 0$ , then there will be no co-integration.  $U_t, U_{2t}, U_{3t}$  Refer to white pure error elements.

We can define the granger causality test model between the domestic consumer price index and the global food price index as follows:

$$\Delta \ln CPI_t = C_{1t} + \sum_{i=1}^p \beta_i \Delta \ln CPI_{t-i} + \sum_{i=1}^p \alpha_i \Delta \ln GFPI_{t-i} + U_{1t} \quad (7)$$

The hypothesis test for the above model can be defined as follows:

$H_0: \alpha_1 = 0, \alpha_2 = 0$  Lag values of the Global Food Price Index do not have a causality impact on the domestic consumer price index.

$H_1: \alpha_1 \neq 0, \alpha_2 \neq 0$  Lag values of the Global Food Price Index have a causality impact on the domestic consumer price index.

The relationship between the two variables can be identified from the above hypothesis test. Similarly, do domestic consumer prices have a causal effect on the global food price index? Whether or not we can define the granger causality test model for knowing as follows:

$$\Delta \ln GFPI_t = C_{2t} + \sum_{i=1}^p \theta_i \Delta \ln CPI_{t-i} + \sum_{i=1}^p \delta_i \Delta \ln GFPI_{t-i} + U_{2t} \quad (8)$$

The hypothesis test for the above model can be defined as follows:

$H_0: \theta_1 = 0, \theta_2 = 0$  Lag values of the domestic consumer price index do not have a causality impact on Global Food Price Index.

$H_1: \alpha_1 \neq 0, \alpha_2 \neq 0$  Lag values of the domestic consumer price index have a causality impact on Global Food Price Index.

It is possible to know the relationship between these two variables as mentioned above. Thus, for each pair of variables used in our study, the granger causality relationship test is performed and the causality relationship between them is determined.

## 5. Results and Discussions

### 5.1 Results of Unit Root Test

In the first steps of the estimation procedure, we have to confirm the order of integration of all the series. The results of ADF and PP unit root tests are presented in Table 3.

Table 3. Results of Unit Root Test

Series	ADF test		PP test	
	Intercept	Intercept	Intercept	Intercept

	Level	first difference	Level	1st difference	
LGCPI	0.8986	0.0000***	0.9338	0.0002***	I (1)
LGCFPI	0.9891	0.0000***	0.9985	0.0000***	I (1)
LGCNFI	0.7535	0.0000***	0.7601	0.0000***	I (1)
LGGFPI	0.2108	0.0000***	0.2303	0.0000***	I (1)
LGER	0.9955	0.0000***	0.9970	0.0000***	I (1)

**Note:** Probability values are given in the Table. \*\*\* imply the rejection of the null hypothesis at 1% level of significance.

**Source:** Authors calculation

Both ADF and PP unit root test approaches confirm that all variables (LGCPI, LGCFPI, LGCNFI, LGGFPI and LGER) became stationary at their first difference form when we included intercept only in the model. Thus, ADF and PP unit root test approaches with intercept only in the model confirm the presence of I(1) variables (see Table 3 above).

Based on the AIC criteria, we selected 3 lags as optimum lag for the model. Optimum Lag Length results are given below in Figure 1:

Table 4. Results of Optimum Lag Length for Model

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-3979.762	NA	3.00e+10	38.31502	38.39524	38.34746
1	-2189.696	3476.857	1279.122	21.34323	21.82461	21.53788
2	-2115.493	140.5581	797.3033	20.87013	21.75265*	21.22697*
3	-2082.862	60.24124	741.660*	20.79675*	22.08042	21.31580
4	-2059.728	41.59677*	756.5457	20.81470	22.49951	21.49595
5	-2042.932	29.39462	821.1939	20.89357	22.97953	21.73703
6	-2027.479	26.29820	904.3160	20.98538	23.47249	21.99104
7	-2014.895	20.81235	1025.542	21.10476	23.99302	22.27262
8	-2001.655	21.26132	1158.162	21.21783	24.50723	22.54790

**Source:** Authors calculation

Although the study was conducted using criteria rules such as the AIC, SIC, HQIC, FPE and LR, the optimal level was selected based on the AIC criteria. Then the long-run relationship between the variables was tested.

### 5.2 Results of the Johansen Co-integration Test

In this context, the Johansen co-integration test was carried out on the domestic food price index for the purpose of our study. Let us first look at the results of the Johansen co-integration test conducted with the domestic consumer price index as the dependent variable, the global food price index as an independent variable, and the currency exchange rate as an external variable.

Table 5. Results of the Johansen co-integration test conducted with the domestic consumer price index as the dependent variable: Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistics	0.05 Critical Value	Prob.**
None **	0.249851	77.21553	35.19275	0.0000
At most 1	0.050958	16.26905	20.26184	0.1622

At most 2	0.024142	5.180959	9.164546	0.2642
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**Source:** Authors calculation

Note: The trace test indicates that a co-integration equation is found at the 5% significant level.

\*\* imply the rejection of the null hypothesis at 5% level of significance.

Generally in the Johansen co-integration test method

If  $P < \alpha$  (0.05)  $H_0$  will be rejected. (No co-integration)

If  $P > \alpha$  (0.05)  $H_0$  will be accepted. (Co-integration)

Based on these rules, the first hypothesis of rank test for the trace statistical value of the Johnson co-integration test conducted with the domestic consumer price index as the dependent variable can be defined as follows:

$H_0$ : Rank = 0

$H_1$ : Rank  $\geq 1$

Based on the above hypothesis test, the null hypothesis  $H_0$  is rejected as 0.0000 (P – Value)  $< 0.05$  ( $\alpha$ ) is found to be at the 5% significant level. In this case, there will be no co-integration between the variables.

Therefore, the second rank was conducted because  $H_0$  was rejected during the first test. Accordingly the hypothesis for the second test was defined as follows:

$H_0$ : Rank = 1

$H_1$ : Rank  $\geq 2$

Based on this hypothesis, the null hypothesis  $H_0$  is accepted as 0.1622(P – Value)  $> 0.05$  ( $\alpha$ ) at the 5% significant level. Thus, the long-run relationship between variables was confirmed. So we can stop rank test with this.

Based on the results of the Johansen co-integration test conducted with the domestic consumer price index as the dependent variable, it is concluded that there is a co-integration relationship at the 5% significant level. Therefore confirm the long-run relationship between the domestic food price index and independent variables.

In this context, let us look at the long-run relationship between the domestic consumer price index and independent variables.

Table 6. The long-run relationship between variables

Cointegrating Eq	LCPI	LGPI	LER	C
CointEq1	1.0000	-0.7574 (0.0724)	-1.0241 (0.0906)	3.4337
		[-10.4545]	[-11.2960]	

**Source:** Authors calculation

The results of a co-integration conducted with the aim of easily understanding the long-term

relationship between the domestic consumer price index and the other variables are given in the form of equations as follows:

$$LCPI_t = -3.4337 + 0.7574LGFPI_t + 1.0241LER_t$$

$t$  [10.4545]
[11.2960]

The intercept value (-3.4337) of the above-mentioned co-integration equation explains that the value of the consumer price index will remain at -3.4337 when other factors not change.

The regression coefficient of the exchange rate is positive [ER(1.0241)] and statistically significant at all the significant levels  $t_{cal}(11.2960) > 1.96(5\%)$ . So, there is a positive and significant long-run relationship between the exchange rate and the domestic consumer price index. Therefore, the exchange rate will increase by one percent while other factors remain unchanged, then domestic consumer price index of Sri Lanka will increase by 1.024125 % in the long run.

The regression coefficient of the Global Food Price Index is positive [GFPI(0.7574)], and statistically significant at 5% significant level [ $t_{cal}(10.4545) > 1.96(5\%)$ ]. So, there is a positive and significant long-run relationship between the Global Food Price Index and the domestic consumer price index. Therefore, the World Food Price Index will increase by one percent while other factors remain unchanged, then domestic consumer price index of Sri Lanka will increase by 0.7574 % in the long run. It has been concluded that variables such as the global food price index and the exchange rate have a statistically significant impact on the domestic consumer price index over the long-run at 5% significant level.

### 5.3 The Results Obtained by Vector Error Correction Model (VECM)

In this study there is evidence of co-integration according to the model of domestic consumer price index as the dependent variable, so Vector Error Correction Model (VECM) was used to identify the long-run adjustments from short-run imbalance, and short-run relationship. The Vector Auto regression (VAR) analysis technique has been used to diagnose short-run relationship between the variables.

#### 5.3.1 Long-run Adjustment between the Variables

The long-run adjustment results between variables obtained using the Error Correction analysis technique can be shown in the table below.

Table 7. Long-run adjustment results between variables

Error Correction	D(LCPI)	D(LGFPI)	D(LER)
CointEq1	-0.0302 (0.0063) [-4.7985]	0.0078 (0.0190) [0.4141]	0.0112 (0.0092) [1.2167]

**Source:** Authors calculation

The test statistic is given in parentheses. If the  $t_{cal} > t_{CV}, 1.96(5\%)$ , there is a long-run adjustment significantly. Meanwhile, the coefficient of speed of adjustment is statically



significant at 5% level and negative sign, which implies that the DCPI model move backward towards steady state line with the speed of 3.029% in each month one period after the exogenous shocks.

### 5.3.2 The Short Run Relationship between the Variables

The below table shows the results that can represent the short-term relationship between variables when the domestic consumer price index is the dependent variable.

Table 8. The short run relationship between the variables

Error Correction	D(LCPI)	D(LGFPI)	D(LER)
<b>D(LCPI(-1))</b>	0.149405 (0.06893) [ 2.16736]	-0.207490 (0.20820) [-0.99657]	-0.056420 (0.10059) [-0.56089]
<b>D(LCPI(-2))</b>	-0.148759 (0.06872) [-2.16457]	0.010827 (0.20757) [ 0.05216]	0.021513 (0.10028) [ 0.21452]
<b>D(LCPI(-3))</b>	-0.179228 (0.06626) [-2.70478]	0.025012 (0.20014) [ 0.12498]	0.008530 (0.09669) [ 0.08822]
<b>D(LGFPI(-1))</b>	0.053910 (0.02360) [ 2.28433]	0.514913 (0.07128) [ 7.22393]	-0.046996 (0.03444) [-1.36468]
<b>D(LGFPI(-2))</b>	0.029757 (0.02631) [ 1.13116]	0.121660 (0.07946) [ 1.53117]	-0.030494 (0.03839) [-0.79438]
<b>D(LGFPI(-3))</b>	0.034478 (0.02515) [ 1.37092]	0.014734 (0.07596) [ 0.19397]	0.025022 (0.03670) [ 0.68180]
<b>D(LER(-1))</b>	0.077320 (0.04845) [ 1.59582]	0.126139 (0.14634) [ 0.86196]	0.333948 (0.07070) [ 4.72329]
<b>D(LER(-2))</b>	0.012296 (0.05095) [ 0.24134]	-0.319268 (0.15388) [-2.07478]	-0.061008 (0.07435) [-0.82061]
<b>D(LER(-3))</b>	0.038064 (0.04796) [ 0.79368]	0.212949 (0.14485) [ 1.47011]	0.089275 (0.06998) [ 1.27566]
<b>C</b>	0.006029 (0.00078) [ 7.75669]	0.002307 (0.00235) [ 0.98278]	0.002329 (0.00113) [ 2.05356]

**Source:** Authors calculation

Note: The test statistics calculated here are given in parentheses [ ]. According to the above table, the short-run relationship between the domestic price index (dependent variable) and independent variables can be defined in the form of an equation as follows.

#### Equation-01

$$DCPI_t = 0.0060 + 0.1494DCPI_{t-1} + 0.0773DER_{t-1} + 0.0539DGFPI_{t-1}$$

According to the equation, the intercept value (0.0060) has shown above stands for the domestic consumer price index, while other factors remain the same.

Looking at the short-run relationship between the domestic consumer price index and the exchange rate, the Last period exchange rate doesn't have a significant impact on the current domestic consumer price index at a 5% significant level [ $t_{cal} (1.5958) < t_{CV} 1.96(5\%)$ ]. Looking at the short-run relationship between the domestic consumer price index and the global food price index, the last period global food price index have a significantly positive impact on current domestic consumption price index at 5% significant level [ $t_{cal} (2.28) > t_{CV} 1.96(5\%)$ ]. Based on this, the last month food price index increases by one percent while the domestic consumption price index will increase by 0.0539 percent in the short run.

### Equation-02

$$DCFPI_t = 0.0060 - 0.1487DCFPI_{t-1} + 0.0122DER_{t-1} + 0.0297DGFPI_{t-1}$$

According to the equation, the intercept value (0.0060) has shown above stands for the consumer price index for food items, while other factors remain the same. Looking at the short-run relationship between the consumer price index for food items and the global food price index, the Last period global food price index doesn't have a significant impact on the current consumer price index for food items at a 5% significant level [ $t_{cal}(1.1316) < t_{CV} 1.96(5\%)$ ].

### Equation-03

$$DCNFPI_t = 0.0060 - 0.1792CNFPI_{t-1} + 0.0380ER_{t-1} + 0.0345GFPI_{t-1}$$

According to the equation, the intercept value (0.0060) has shown above stands for the consumer price index for non-food items that does not change other factors. Looking at the short-run relationship between the consumer price index for non-food items and the exchange rate, the last month exchange rate doesn't have a significant impact on the current the consumer price index for non-food items at a 5% significant level [ $t_{cal}(0.7936) < t_{CV} 1.96(5\%)$ ].

Looking at the short-run relationship between the consumer price index for non-food items and global food price index, the last month global food price index doesn't have a significant impact on the current the consumer price index for non-food items at a 5% significant level.

### 5.4 The Results of the Granger Causality Test

For the purpose of our study, we have identified the causality relationship between world food prices and domestic inflation and the causality relationship between main consumer price indices.

Table 9. The results of the causality test

Null Hypothesis	F-Statistics	Probability
DLCNFPI does not Granger Cause DLCFPI	0.09771	0.9070
DLCFPI does not Granger Cause DLCNFPI	1.08942	0.3383
DLCPI does not Granger Cause DLCFPI	0.3846	0.6811
<b>DLCFPI does not Granger Cause DLCPI</b>	<b>5.0126</b>	<b>0.0075**</b>
<b>DLGFPI does not Granger Cause DLCFPI</b>	<b>7.6429</b>	<b>0.0006**</b>
DLCFPI does not Granger Cause DLGFPI	0.0094	0.9906

DLCPI does not Granger Cause DLCNFPI	2.2708	0.1058
<b>DLCNFPI does not Granger Cause DLCPI</b>	<b>6.9183</b>	<b>0.0012**</b>
<b>DLGFPI does not Granger Cause DLCNFPI</b>	<b>4.9689</b>	<b>0.0078**</b>
DLCNFPI does not Granger Cause DLGFPI	2.1952	0.1139
<b>DLGFPI does not Granger Cause DLCPI</b>	<b>11.3283</b>	<b>2.E-05**</b>
DLCPI does not Granger Cause DLGFPI	0.7088	0.4934

Source: Authors' calculation

The consumer price index for non-food items did not have a significant impact on the consumer price index for food. Also, the consumer price index for food items did not have a significant impact on the consumer price index for non-food items. Therefore, there is no causality relationship between the consumer price index for food items and the consumer price index for non-food items. The Domestic Consumer Price Index did not have a significant impact on the Consumer Price Index for food. In addition, the consumer price index for food items has a significant impact on the domestic consumption price index. So, there is a one-way causality relationship between the food price index and the domestic consumer price index. The world food price index has a significant impact on the consumer price index for food. But, the consumer price index for food items did not have a significant impact on the global food price index. So there is a one-way causality relationship between the consumer price index for food and the global food price index.

Further, the domestic consumer price index did not have a significant impact on the consumer price index for non-food items. At the same time, the consumer price index for non-food items has a significant impact on the domestic consumer price index. So there is a one-way causality relationship between the domestic consumer price index and the consumer price index for non-food items. The world food price index has a significant impact on the consumer price index for non-food items. Also, the consumer price index for non-food items did not have a significant impact on the global food price index. Therefore, there is a one-way causality relationship between the global food price index and the consumer price index for non-food items.

Finally, the world food price index has a significant impact on the domestic consumer price index. The domestic consumer price index did not have a significant impact on the global food price index. So, there is a one-way causality relationship between the global food price index and the domestic consumer price index. Hence, the world food prices have had an impact on the domestic food prices. The global food prices have had a significant impact on the domestic consumer price index, the consumer price index for food, and the consumer price index for non-food items in the long-run. Finally, the granger causality results, and Johansen's Granger co-integration test has confirmed the link between world food prices and domestic prices.

## 6. Conclusions

Food prices are rising globally and domestically. Sri Lanka is an open economy with a strong import base. Sri Lanka has long seen an unfavorable trade balance since the 1950s. The Sri Lankan economy has had a floating exchange rate since 2001. Sri Lanka has been a net

importer since the 1940s. The result is inflation in each country due to fluctuations in commodity prices in world food prices markets has been affected. Sri Lankan food security situation is still dependent on global food market prices. As such, the study aims to "identify the relationship between domestic inflation and world food prices."

The study is based on secondary data from January 2003 to December 2020. Also used in this study are variables such as the Domestic Consumer Price Index, the Consumer Price Index for food, and the Consumer Price Index for non-food items, the global food price index, and the exchange rate. As well as summarizing the main results obtained based on the results obtained by the analytical techniques used in this study, all the variables are found to be stationary with the logarithmic and 1<sup>st</sup> difference according to the overall results of the ADP and PP unit root tests. Three months lags have been used in this study as per the optimal lag level. Long-run, short-run, and causality relationships between variables are studied in two ways for the purpose of the study.

In conclusion, Johansen co-integration test results show that there is a long-run relationship between the domestic food price index and independent variables. The global food price index has a significantly positive impact on the domestic consumer price index in the short run. Granger causality test results indicate that there are causality relationships i) between the consumer price index for food items and the global food price index ii) between the global food price index and the consumer price index for non-food items, iii) between the global food price index and the domestic consumer price index.

So world food prices have had an impact on domestic food prices. Global food prices have had a significant impact on the domestic consumer price index, the consumer price index for food, and the consumer price index for non-food items in the long-run. Granger causality results support the relevance of Johnson's Granger co-integration test. Global food price volatility is having a greater impact on food prices in Sri Lanka than non-food prices in the short-run and long-run.

## **7. Recommendations**

This section makes policy recommendations based on the results obtained from the analysis. This study helps to understand changes in food prices, their fluctuations, and monetary policy design and policy response planning. High and volatile food prices pose significant challenges to developing countries, including Sri Lanka. In these countries, most families spend most of their income on food. Therefore, the results of this study may have several important policy implications for food production, trade, and monetary policy classifiers. Monitoring and forecasting food prices in Sri Lanka are some of the key implications of this study. The statistical characteristics of the food price chain in Sri Lanka show that food pricing movements are independent and consistently distributed in the study, using statistical analysis techniques.

The characteristics and variations of food price inflation seem to change over time. This study will be used to examine the characteristics of food prices, food price inflation, and food price inflation in Sri Lanka. All experiments showed that there was a long-term relationship

between food prices and inflation and that they were partially integrated. Therefore, the results suggest that food inflation has significant permanent components. These characteristics have several important implications for the environmental measurement analysis of food price change.

Food prices are at a higher rate than consumer food prices. The prolongation of food prices is creating price volatility and increasing uncertainty affecting ordinary people. Uncertainty will increase risks in production activities and weaken food security in developing countries such as Sri Lanka. Continued fluctuations in food prices can also have adverse economic consequences (Friedman-1976). High food inflation can lead to malnutrition and increase political insecurity, affecting the performance of the resource allocation and pricing system. Fluctuations in the inflation rate also determine the magnitude of the risks associated with investment opportunities. Granger's causality test results indicate that Sri Lanka is dependent on the global market, and that rising food inflation raises demands about its future uncertainty about food inflation, which in turn could lead to significant costs and mass losses.

As Sri Lanka is an open and dependent economy, Sri Lanka is considered to be the most vulnerable country to the shocks of global food prices. Also, most of the food items in the food consumption basket are imported. Food imports account for 40 percent of the total cost of imported goods. Sugar, wheat, milk and dairy products, pulses, large onions, potatoes and dried fish are the main food items imported. This is about 9-12 percent of the total import expenditure. Under the principle of comparative advantage, Sri Lanka's domestic resource expenditure on selected food items such as wheat, milk and sugar is found to be high. Efforts to increase domestic food production, investment in agricultural research, facilitation of grain trade, promotion of diversification into major consumption, etc. can all be offset by global food inflation.

The government of Sri Lanka must develop a protection net plan and relief facilities for the poor to prevent long-run poverty as 80 percent of Sri Lankans spend more than 40 percent of their income on food. Therefore, further policies should be pursued on the basis of short and long run policies to ensure price stability.

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