

Factors of Food Inflation: Evidence from Time Series of Pakistan

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ABSTRACT

This study aims to analyze the factors affecting the food price inflation in Pakistan during the period of 1970 to 2017. Annual time series data has been taken for regression analysis. This study has used the independent determinants named as: GDP, food exports, food imports, taxes and money supply to analyze the food inflation. Simple regression technique has been used which employs that, all the determinants effect the food price positively and significantly except money supply which shows negative results. GDP, food export/import, and taxes have been a contributor towards high food inflation whereas money supply causes the reduction in the food prices. It is recommended that special attention has to be paid on exports and imports (food) along with excess money supply in order to overcome food inflation in Pakistan.

Keywords: Food prices; GDP; Food exports; Food imports; Pakistan

INTRODUCTION

Inflation has been a great problem for the developing countries. Pakistan is also facing the problem of high prices that is mostly related to increase in money supply which is brought by too much printing of currency notes by the State bank of Pakistan. In the 1980's Pakistan inflation rate is moderate which average of 7.2 % is, but after this time span the economy is challenged by increase of 10 % in inflation rate during 90's. This is all contributed by the number of factors, which cause sharp hike in food prices in Pakistan, (Hussain, 2006). The factors that are involved, may be changes in macroeconomic policies, increase in income level, and sudden rise in domestic demand of goods, rise of oil prices in international market, sharp rise in international commodities. Somehow increased demand of raw seeds for agriculture, increased agriculture subsidy, all are the factors which leads to the increase in food inflation in the economy.

"Inflation is always and everywhere a monetary phenomenon" (Friedman, 1956). Increase in money supply is the key to inflation, (Lim & Papi, 1997). In Pakistan money supply also playing its role in escalating price but there are other factors which makes the food prices to increase like food exports and food imports which are contributing in inflation, when food items are to be exported in bulk quantity then domestic need will be effected, this brings demand pull inflation, in which demand is more than total supply.

Every year numerous food items are exporting to other countries which bring impact on our economy. The purpose of this study is to analyze those factors which cause rise in the food price inflation. The study is going to analyze fiscal and monetary factors, the empirical results will indicate the relationship of inflation and its determinants. The inflation phenomenon in emerging markets attracted the policy makers to explore the factors, in order to deal with internal economic issues (Rehana, 2003). World bank reported that increased in food prices has adverse effect on family welfare, (Benson et al., 2008a, World Bank, 2008a and 2008b, Wodon & Zaman, 2008, Wodon et al., 2008). State government and different NGO's has been working to reduce the negative effects of inflation in poor group of class in the economy (Joseph & Wodon, 2008). Food prices has greatly influence the lower group of society which are not enough income to cope with the high food items. Food inflation occur when overall demand for food is greater than the total supply for a specific time period. It has seen that food inflation is caused by increased demand of consumption goods, fiscal policies, monetary policies (weesink et al. 2008).

Economies which are politically unstable, increased their taxation or borrow money from outside and if it prints too much currency notes, all this happens to lead food inflation (Mankiw, 2003 Aisen, & Viega, 2008). Many governments tried to reduce inflation by monetary reforms, regulation of wages and prices because inflation would decrease the purchasing power of man and it favor rich than poor (Hyun & Nanak, 2006)

Inflation in Pakistan

Inflation can be rephrased as, if the prices of commodities are increasing due to any factor for a specific time period then this is termed as inflation. Inflation can be classified into food inflation, in which the prices of food items are increased. It effects on the purchasing power of the individuals which ultimately impact on the economy. If there is stable inflation in the country, it would result in inefficient division of resources which would reduce the productivity of the economy. This adversely affect poor and low income groups which would create uncertainty in their lives (Shahid, 2014). Like other developing country, Pakistan is also hit by food inflation, which raised the cost of living, decline in consumption level, resulting in malnutrition which is affecting the life of workers hence the productivity decline to 10 % of earnings and gdp from 2 to 3 % (Alderman, 2005).

The only class that is most affected is poor or low income group as half of the budget is goes towards food. This income is redistributed from fixed income level to owners of the assets and the investors to fill the income gap (Khan et al, 2007). In order to determine inflation, CPI is used as an indicator, in this study CPI is taken as a food inflation indicator for the time span of 1970 to 2017. It was recorded that CPI in the year 1970 was 2.89 and in 1980 was 9.11 (WDI). The low rate of inflation was due to fiscal strategies, budget deficit, reduction in taxes, controlled money supply and exchange rate has been improved. Inflation has begun to pick up after the 1980 then raised continuously up to 100 in 2010 (Figure 1.).

Similarly the rise in prices because of variety of reasons like, sharp rise in oil prices, increased demand for domestic food. The inflation has since climbed up in 2017. The data was collected from World development Indicators. The graph below shows the trend of inflation in Pakistan for the time period 1970-2017, which depicts that the rate of inflation rises continuously with the period of time. Our study focused to analyze the determinants (factors) which leads to increase food inflation in Pakistan during the time from 1970 to 2017.

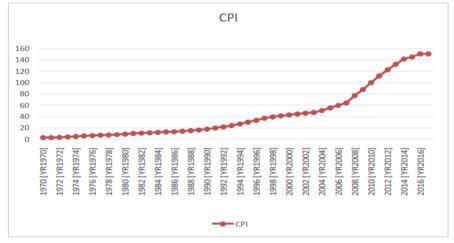


Figure 1. CPI Trend (1970-2017)

Objective of the study

The basic objective of this research work is to examine the main contributing factors in food price inflation on Pakistan's economy. Additionally, this study going to find out how different macroeconomic parameters play their role in the economic stability.

LITERATURE REVIEW

Several school of economics have carried out different theories on determinants of high food

prices (food inflation). Including international and national literature has been studied for analyzing the factors that leads to high food prices in the economy. A study has been done in 2011 for estimating the factors that led to rise in agriculture commodity prices. The author Hayes, D. J. (2011) has studied the link between volatile oil prices and food inflation, by using weekly time series data from 1998 to 2009. The study has used Stochastic volatility models to weekly crude oil, corn, and wheat futures prices. Different properties of oil prices are used, including mean-reversion, an asymmetry between returns and volatility, volatility clustering, and infrequent compound jumps. The technique he used in his study was stochastic volatility with merton jump in return (SVMJ) model. After thorough investigation, he found that volatility in oil prices induce a greater impact on rising food prices, including the case of corn and wheat after the year 2006.

Campiche, J. L., Bryant, H. L., (2007) explored the long run association between the crude oil prices and the agricultural products (corn, sugar, soya bean, palm oil), by using the weekly time series data from 2003 to 2007, and applied the integration analysis in order to find its impact. The results indicate that there is no long-run cointegration association between crude oil prices and the agricultural commodity prices. Gilbert (2010) in his study, used the Granger causality technique in quarterly time period (1969-2008). The results of the study illustrate that there are factors which have a causal impact on agro goods prices like fickle gdp growth, sharp oil prices, exchange rate and changes in supply of money. Research had been done in which exchange rate also been used as a determinant for food inflation. A study, Kwon & Koo (2009), has investigated the factors which induce impact on food prices including, energy prices and the exchange rate, using the monthly time series data from January 1998 to July 2008. Dolado-Lutkepohl Toda-Yamamoto and (TYDL) Granger causality test is applied. The results revealed that energy prices influence food price, found unidirectional causality.

Abdullah & Kaleem (2011), did research on Pakistan, using the time span of 1972 to 2008. Johansen co integration examination strategy has been applied to discover long-run relationship. The examination exhibits that per capita GDP, money supply, horticultural help costs, import and nourishment are the principle variables of expanding inflation cost.

Mitchell (2008), has analyzed the factors which influence the internationally traded food commodity prices taken into analysis of maize, wheat, rice, soybeans, etc. using the monthly time period 2002-2008. Reports revealed that the most leading factors that rise up the food inflation after late 2006 was the growth in both US and EU biofuels production which refers to ethanol and biofuel.Zhang & Reed (2008), explore the connection between the world China's unrefined petroleum costs and horticultural item costs (corn, soybean and pork) covering month to month time arrangement information from 2000 to 2007. They utilized the Granger causality investigation.

The consequences of paper demonstrated that although unrefined petroleum costs increase the cost of production, yet they are not critical at the costs of the chose agricultural commodities in China.Lim & Papi (1997), has explained the factors effecting food price inflation in Turkey during the time span of 1970- 1995. The explanatory variables used for this analysis are money growth, prices on exports and imports, and exchange rate. The estimated results shown that exchange rate found no impact on price level where as other variables effecting positively inflation turkey's on in economy. Abdoulaye et al. (2015) in his paper, tried to highlight the impact of important food crops on CPI in Mali, during 1993- 2014. The core objective was to examine the association between cereal prices and CPI. By applying integration technique, because of variables are integrated of order 1. The results shows the long-run and shot run analysis, according to which, there is long-run association exists between CPI and inputs variables, such as rice wheat and corn. Negative long-run association has been found between CPI and the variables except for millet prices. The error correction term is negative and highly significant which confirms the short-run causality.

Faiza (2013), also tried to investigate the factors which cause inflation in Pakistan, the time chosen for the analysis, was from 1990 to 2011. The study included following independent variables: GDP of Pakistan, unemployment level, fiscal deficit and rate of interest and dependent variable is CPI. After estimation of the variables. the study concluded that unemployment and fiscal variables bore negative impacts on inflation, whereas GDP and rate of interest have positive relation with inflation. The author suggested that government should focus on borrowing money, as it will increase the inflation rate in the economy. Government expenditures has to be carefully observed.

In Pakistan, political situation, is also the economic determinants which plays an important part in rising food prices.

A major factor across the border is smuggling, which is a threat to economy, a large quantity of wheat is smuggled across border, due to instability of government, hoarding by many stock holders, is another hectic problem for Pakistani economy. As these activities have greater impact in long term. Javed, (2016), has explored the above problems and found that the exports should be managed in order to cope with high food inflation in the country.

Some studies revealed that inflation is a monetary phenomenon while some referred it as fiscal operative. Hossain (1990), in his study has finalized inflation as monetary phenomenon in Pakistan, while empirically, Bilqees, F. (1988) declared that fiscal factors are more influencing in food price inflation. While some disagreed on the issue of money supply for determining the inflation [Khan and Siddique (1990) Vogal, (1974), DE Silva, (1977)].

Money plays an important role in the price stability, which leads to economic stability. It has been a major factor of income and prices. The monetarist's point of view that volatility in income level and in prices are mainly cause buy money factor. The Keynesians, on the other hand, said that money supply has no role in increasing income and level of prices in the economy (ECB, 2009).

A study on taxation and inflation has been done by Feldstein, (1983) in which it was stated that interest taxation policy implies the cost of capital and savings having negative relationship with inflation rate. The results of the study showed that present situation of the account imbalances was due to decline in taxes not about savings.

DATA VARIABLES AND METHODOLOGY

The time series data is used for estimating food price inflation in current study. The data consists of annual observations covering the period from 1970 - 2017 for Pakistan. The variables considered are consumer price index (CPI); proxy for food inflation, gross domestic product in GDP growth (annual %), food export (% of merchandise exports), Food imports (% of merchandise imports), money supply (credit on agricultures sector) and taxes (net taxes on products). All the data is taken from wdi, whereas the data for taxes is taken from SBP.

Econometric Methodology

In the econometric approach we will inspect the time series properties of the data, because our data set is in time series.

Unit root Test

This test is used to check the stationarity of time series data. To start our analysis is to find out, whether the variables are stationary at their levels I (0) or stationary at their first difference I(1) or stationary at their second difference I (2). However if variables are stationary then there is no need to test for co integration analysis. Other than if variables are not stationary and do contain a unit root than co integration test is applied to find out the co integration relationship. Standard test of Augmented Dickey Fuller (ADF) is applied.

The hypothesis for the unit root is given below.

Null hypothesis H0: $\delta = 0$ series is non stationary

Alternative hypothesis H1 : $\mathcal{S}_{<0}$ series is stationary.

The significance of null hypothesis can be checked by t-test. If calculated t-value is greater than the critical value of ADF test, we reject null hypothesis and the series is declared as stationary. On the other hand if calculated tvalue is less than critical value we do not reject the hypothesis and conclude that series is nonstationary.

The level of integration whether a series is I(0) or I(1) would be decided on the basis of acceptance and rejection of null hypothesis. In later case we have to check the order of integration in order to test for cointegration.

Ordinary Least Squares (OLS)

Ordinary least square (OLS) is a regression technique for linear model regression that can be used for a model in which the variables are stationary at level. This method is applied to single or multiple explanatory variables. As in this study all the variables are stationary at level I (0) so ordinary least square technique (OLS) is used for the regression analysis.

In this study we are going to apply OLS regression, which depend on the assumption that if all the variables are stationary at level i-e I(0), then OLS is used. When the stationary test give mixed results then we go for ARDL approach.

Empirical model

The center of this study is to find out the major determinants of food price inflation in Pakistan. For estimation process we have developed the general model.

Consumer Price Index = f (gross domestic product, food export, food import, money supply, taxes)......(1) This function says that whenever gross domestic product, food export, food import, money supply and taxes are changed then they will surely effect on the consumer price index.

Equation 1 as an econometric model:

 $\begin{aligned} CPIt &= \beta 0 + \beta 1 (GDP)t + \beta 2 (FX) \\ &+ \beta 3 (FM)t + \beta 4 (M2)t \\ &+ \beta 5 (TAX)t + \varepsilon \end{aligned}$

Where:

CPI is the consumer price index used as a proxy for food inflation (dependent variable)

GDP is the gross domestic product,

FX and FM are food exports and food imports respectively.

M2 is credit on agriculture sector

Tax are tax revenues all are independent variables.

B0 is intercept, showing exogenous variable's effect on the model in other words the effect of all other variable on the model that are not taken into consideration.

β1, β2, β3, β4, β5 are the slope coefficients of gross domestic product, food export, food **Table 2:** *Stationary Test*

import, money supply and taxes variables.

It shows per unit change in the consumer price index, when some other variable (gross domestic product for β 1, etc.) is changed by 1 unit.

 $\boldsymbol{\epsilon}$ is the standard error of regression. t Shows the data in time series.

EMPIRICAL RESULTS AND INTERPRETATION

This section describes the empirical results of the study and their interpretations. Unit root application is described in the section 4.1. And the section 4.2 describes the Ordinary Least Square (OLS) for the regression.

Unit root Results

The very first point of our analysis is to check whether or not the variables are stationary or not. . The study uses the conventional ADF Augmented Dickey Fuller test to check the unit root problem with two specifications: With intercept only at level, and at first difference. Table 2, shows the results of the test, which are indicating that all of the variables are stationary at level.

Variables	Test statistics	Critical value	P value	Conclusion
CPI	3.2290^{*}	2.9266	0.0246	I(0)
GDP	6.06914*	3.51074	0.0000	I(0)
FX	3.8052^{*}	2.9350	0.0058	I(0)
FM	3.7266**	3.5107	0.0303	I(0)
M2	5.6507^{*}	2.9266	0.0000	I(0)
TAX	5.4420^{*}	2.9266	0.0246	I(0)

*stationary at 1% significance level, **stationary at 5% significance level

The calculated ADF values of the variables are given in the table with their p-values. As the table shows, test values are higher than the critical values at 5 percent significance level. Our variables of study are stationary at level, rejecting the null hypothesis of unit root. All variables are integrated of order I(0) with intercept whereas GDP and FM are stationary with trend and intercept.

As all variables are stationary at level so for analysis, simple OLS is used. GDP, food export, food import taxes and money supply, covering time series data for the years 1970 to 2017.

The following table shows the result of estimation:

1	lab	le :	3:	OLS	Results	

Variables	Coefficients	T value	P value
Constant	2.001973	0.5914	0.5575
GDP	0.577579	1.9417**	0.0591
FM	0.201009	1.9933**	0.0232
FX	0.102534	1.8992	0.3737
Tax	0.338584	3.5786*	0.0009
M2	-0.23691	1.7615**	0.0749
\mathbb{R}^2	0.7689		
D.W	2.1299		
Significance level	5%		

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*1 % level of significant, **5 % level of significant

The estimated equation of our model is as:

$$\label{eq:cpi} \begin{split} CPI &= 2.002 + 0.577 GDP + 0.202 FM + 0.103 FX \\ &+ 0.338 Tax - 0.2 M2. \end{split}$$

$$R^2 = 76 \%$$

Explanatory power of the equation is shown by R^2 , which shows that 76 % variation in food prices is being explained by the independent variables. D.W stat shows the no autocorrelation. Significance of the variables (t-stat) has been checked at 5% level.

Relationship between Food Prices and GDP

The relationship between food price and GDP is positive and significant. Keeping all other variables constant, 1 percent increase in GDP increases the food prices by 57 percent. As it is observed in agriculture sector, high food prices helps the farmers to earn more, so if the GDP is increased it has direct impact on food inflation.

Relationship between Food Prices and Food Export/Imports

Estimation results shows that there is positive and significant relationship between food prices and export imports. Keeping all other variables constant, one percent increase in export imports causes food price to rise 10 percent and 20 percent respectively. As t-stat are also approximately near to 2 showing that these coefficients are significant. When food export increases, the supply within the country has declined and this would increase the demand for food in the country, which ultimately leads to rise in food inflation.

Relationship bBetween Food Prices and Taxes (Fiscal Indicator)

According to the analysis, the relationship between taxes and food prices is highly significant, which shows that both have an impact as, Keeping all other variables constant, 1 percent increase in taxes causes increase in food prices by 33 percent. When the taxation increased it will increased the commodity prices including agriculture products which rise the prices of food items.

Relationship between Food Prices and Money Supply (Monetary Indicator)

Although money supply shows a very small and negative relationship with food prices. Keeping all other variables constant, 10 percent increase in money supply causes a decrease in food inflation by only 2 percent. Thus more credit disbursed to agriculture sector leads the food prices to low in Pakistan.

Estimation results proved that, if there is 1 % change in independent variables; GDP, food imports, food exports, taxes and credit on agriculture sector, there would be increase of 57 %, 20 %, 10%, 33% and 2% respectively in the dependent variable (CPI).

This study also supports the evidence from previous literature in which GDP, food export, food import and taxes have been a great contributor in food inflation while money supply cause reduction in prices [joiya & shahzaad, (2013), boehlje & tweeten, (1980), freebairn, (1981), Imran et al., (2015), joydeb sasmal, (2015), fu rehman, (2015), Faiza, (2013), Abdullah & Kalim, (2009)].

CONCLUSION

The objective of the study is to identify the main predictors of food prices in Pakistan by using a last 40 years data. The variables considered are consumer price index (CPI); proxy for food inflation, gross domestic product in GDP growth (annual %), food export (% of merchandise exports), Food imports (% of merchandise imports), money supply (credit on agricultures sector) and taxes (net taxes on products). All the data is taken from World development indicators, whereas the data for taxes is taken from State bank of Pakistan. The study employed unit root test and multiple regression due to level stationary data series.

Estimation results shows that GDP is affecting food price inflation, as Pakistan's economy is agro based and most of the labor force involve in this sector. The reason for this is that the share of agriculture sector in GDP has shrinks as compared to industrial and services sector. When the prices of food crops increases, the poor farmer will get benefit from it, as they can earn more by selling their goods. Similarly food exports has positive impact on inflation level, which implies that when exports of food items has increased, there will be shortage in the domestic economy, which results in demand pull inflation for food products.

Importing of food products induces high food prices, because of balance of payment and low value of domestic currency. This Imports caused outflow of money which results in balance of payment problem. In order to cope with this situation, government has to borrow money from domestic as well as foreign resources, this further increased the level of money supply and inflation in the economy. In a nutshell, both, food export and food imports are causing high food prices in Pakistan.

On the basis of above results we can conclude that changes in taxes shaped the growth rate of prices to large extent, it resulted in increased inflation. Reconstruction of tax system towards an even distribution of taxation would help reducing the food inflation.

The last but not least determinant, money supply found to be negative, It is also concluded that subsidies help in reducing food prices in the long run but the impact of subsidy is very small, as credit on agriculture sector is increased now, so the farmers tend to use modern method for their production. They need less time for proper cultivation, hence the cost has been minimized by this transformation. Thus money supply does not effecting food inflation in case of Pakistan.

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