Pakistan Journal of Social Sciences 5 (1): 1-9, 2008
ISSN: 1683-8831

Relative Price Variability and Inflation: Evidence from Agricultural Sector in Nigeria

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Abstract: The main objective of this study is to establish quantitative relationships among relative price volatility of agricultural commodities and inflation in Nigeria. The data for the study were obtained from the publications of Central Bank of Nigeria, Federal Office of Statistics, Federal Ministry of Agriculture and Rural Development. The data covered the period 1970-2003. Our results show that the effect of inflation on relative price variability among agricultural commodities in Nigeria is non-neutral. Inflation has a significant positive impact on relative price variability both in the long-run and the short –run. The findings suggest the implementation of policies which will buffer the agricultural sector from the effects of inflation in the short-run and in addition the crops sub-sector from the Long-run effect of inflation. Similarly, policies which reduce the rate of inflation will minimize relative price variability among agricultural commodities and consequently reduce inefficiency, distortions and misallocation of resources in agriculture, that might be caused by inflation. No data points in the study period showed negative inflation. As a result of this, the data could not provide evidence for the effect of deflation on relative price variability.

Key words: Agricultural, inflation, relative price, sector, variability, Nigeria

INTRODUCTION

General inflation affects the farm economy most directly through the cost of inputs. Compared with any other major sector in the economy, because it is highly competitive and most of the output are perishable, agriculture is the least able to pass input cost increases through into higher output prices.

In Nigeria, there is an observed variability in agricultural commodity prices which accompanies inflation. For instance, the rate of inflation increased from 10.28 percent in the period 1970-1974, fluctuating over the years to 25.44 percent in 1995-1999 and declined to 13.18% in 2000-2003 (CBN, 2004). The price deflator for agriculture and the prices of most food crops seem to exhibit a similar trend behaviour with inflation. Figure 1 illustrates the variability of inflation and agricultural price deflator. The movements of agricultural price deflator have a similar trend with the rate of inflation.

The removal of all relative price variability is not an objective of any rational policy. Relative price adjustments associated with changes in demand shift variables, resources, weather and technology are essential for the efficient allocation of resources.

But when relative prices within agriculture vary because of inflation, such movements may decrease economic welfare for society as a whole and the agricultural sector in particular. Efficiency of resource allocation decreases because decision makers have less useful information on prices to guide them in decision making. The risk associated with choosing which commodities to produce increases with inflation. Producers (farmers) may suffer loss of real income due to inflation. For example, Tweeten (1983) found that inflation brings cycles to farm prices, expenses, receipts and balance sheets. A major social cost is incurred for adjustments and for risk management strategies that would be unnecessary in a more stable economy.

The study is necessary because agriculture plays an important role in rapid growth and development of Nigeria. It provides food for the growing population, employment for over 65% of the population, raw materials and foreign exchange earnings for the development of the industrial sector (Ajibefun, 2004).

The objective of this study is therefore to derive the link between inflation and agricultural price variability and determine the impact of inflation on relative agricultural prices; and show the impact of agricultural policies on relative agricultural prices.

Review of empirical literature: The controversy over whether or not inflation affects relative agricultural prices

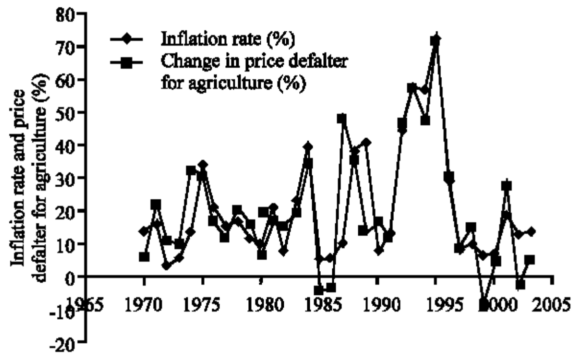

Fig. 1: Variability of Inflation Rates and Price Deflator for Agriculture, 1970-2003 (%)

has generated a vast empirical literature. A number of empirical studies have found a relationship between the level of anticipated future inflation rates and changes in relative prices of particular products (Parks, 1978; Cukierman, 1979; Fischer, 1981; Stockton, 1988). Within this literature, change in relative prices has been labelled relative price volatility and has been identified as an indicator of the real costs of inflation. Real costs of inflation occur due to changes in relative prices that result from a differential transmission of inflation across particular products or markets. The resulting price structure is distorted from initial cost and preference fundamentals and may induce resource misallocation and welfare loss (Fisher, 1981). However, relative price adjustments associated with changes in demand shift variables, resources, weather and technology are essential for the efficient allocation o resources.

Lapp and smith (1992) tested this for United States and extended the study to United Kingdom (Smith and Lapp, 1993). The results obtained for US data were tentative. For example no evidence was found to support or reject the hypothesis that variations in inflation affect relative price variability among agricultural commodities. However, the results support the hypothesis that the variability of relative prices in agriculture is related to the average rate of nominal price change among agricultural commodities and actual and unexpected aggregate inflation. Nevertheless, the effect of aggregate inflation appears random across individual commodities. On the contrary, different results were obtained for United Kingdom. The results support the hypothesis that relative price variability is positively related to actual inflation. Unexpected inflation does not affect relative price variability in agriculture.

The whole analytical structure of the previous studies reviewed in the preceding paragraphs is to test for causal structure, which shows only the direction of causality. An attempt to fill this gap was made by zanias (1997) when he studied the relationship between agricultural prices and the general price level in Greece. He used econometric methods for non-stationary variables, preceded by cointegration and unit root tests. Agricultural price deflator was regressed on GDP deflator and the per caput volume of agricultural production. The results show that agricultural prices overshoot in the short-run, while the adjustment speed to the long-run inflation neutrality is slow.

Gregorio *et al*. (1994) analysed sectoral inflation in 14 OECD countries, classifying the commodities into tradables and nontradables. They regressed the relative price of non-tradables to tradables on the difference of total factor productivity across sectors, the ratio of government expenditure to GDP, per capita income and expected inflation. The results show that inflation in non-tradable goods exceeds inflation in tradables. Demand shift toward nontradables and faster growth of total factor productivity in the tradable goods sector were identified as the prime cause of the differential inflation.

Furthermore, Loy and Weaver (1998) carried out a time series analysis of retail food prices in Russian markets to determine the effects of anticipated and unanticipated inflation, as well as inflation uncertainty on relative agricultural price volatility. The results indicate that distortions in relative prices were induced by the anticipated inflation rate, rather than by unanticipated inflation or a measure of inflation uncertainty. Contrary to Lucas hypothesis, there was no positive relationship between the relative price structure and the unanticipated rate of inflation.

Caglayan and Filiztekin (2001) investigated the link between inflation and relative price variability and the impact of structural changes in the behaviour of inflation in Turkey, using panel data techniques to control for aggregate shocks. The results show that the effect of inflation is non-neutral and lower in magnitude during the high inflationary period. Relative price variability increased in inflationary as well as deflationary periods.

Jaramillo (1991) analyzed time series relationship between inflation and relative price variability using U.S. data. A significant positive association was obtained between inflation and relative price variability, allowing for an asymmetrical response of relative prices to episodes of positive and negative inflation.

Inspite of the extensive studies done elsewhere on the relationship between inflation and relative price variability within the agricultural sector, adequate studies have not been done for Nigeria. Rather, most studies on inflation have focused on explaining the Nigeria's inflationary process (See Nwade and Oke, 1977; Asogu, 1991; Egwaikhide *et al.*, 1994; Ojo, 1982; and Afolabi and Efunwoye, 1995). Only a few studies analyzed the effects of inflation on the economy. Example of such studies include CBN (1974) and Osakwe (1982). Both studies focused on the impact of inflation on output growth and other macroeconomic variables, namely, gross fixed investment, savings, imports, inventories, residential investment, exports and foreign capital inflow. Inconclusive results were obtained because the coefficients were not statistically significant. Again, the studies did not analyze the effect of inflation on Agricultural prices. Thus, there is a research need to investigate the effects of inflation on the relative prices of agricultural commodities as this will fill the existing research gap.

Theoretical framework: In order to investigate the effect of inflation on relative price variability, we need to discuss briefly the menu cost, signal extraction and search models. Menu cost models predict that due to costs associated with changing the price of a product, monopolistically competitive firms will set prices as close as possible to a chosen target level while making infrequent adjustments Caglayan and Filiztekin (2001). Sheshinski and Weiss (1977, 1983) and more recently Ball and Romer (1993) proposed that firms follow one-sided (S, s) pricing rules when faced with inflation. According to this approach, firms keep the nominal price of their product unchanged until the real price hits the lower bound s. Thereafter, firms increase the real price of the product to the upper bound. The model predicts that the optimal (S,s) band widens with the expected inflation leading to a greater dispersion of prices simultaneously. The menu-cost models emphasize the positive effect of expected inflation and therefore address the price setting behaviour of different sellers of the same good and their predictions are more about intra-market variability.

The signal extraction model says that relative price variability should rise in an inflationary environment as unexpected inflation causes misperceptions on absolute and real price changes (Lucas, 1973, Barro, 1976). Since firms cannot differentiate between real and nominal shocks in these models, individual firms adjust prices more often than output levels in response to all shocks, including real demand shocks. Thus, as inflation uncertainty increases, the signal extraction models predict a positive effect of unexpected inflation on relative price variability. Therefore, the signal extraction models are more relevant for the variability of prices of different goods around an aggregate price level or inter-market variability.

The search models state that consumers accumulate information only on a subset of all existing prices, but due to deterioration in consumers' price information during inflationary periods, the stock of information a person holds declines and consequently the dispersion of prices widens (Caglayan and Filiztekin, 2001). However, Benabou and Gertner (1993) have shown that in a search model with learning, inflationary noise induce search and consequently, a reduction in price dispersion depending on the size of information costs.

In the case of agricultural prices, their short-run overshooting can be explained by the relatively greater flexibility of agricultural, compared to non-agricultural markets. Among the reasons frequently offered for this relative flexibility are the relatively long production and gestation periods of agricultural production. Thus, changes in economic environment may result in significant price swings in the short-run (Gardner, 1981). This explanation also presupposes that trade flows cannot be altered sufficiently in the short-run in response to price changes and/or sufficient stocks are not being held. The role of stocks is important, even in a (supposed) absence of biological delays in production, because agricultural commodities are usually less storable than non-agricultural commodities, thereby justifying greater price variability (Chambers, 1985). Furthermore, Bordo (1980) proposed the existence of long-term contracts as a source of relative price variability, with long-term contracting in agricultural product markets being unimportant compared to the non-agricultural sector.

From the preceding discussion, it could be understood that the link between inflation and volatility of agricultural prices is found in the framework of demand and supply of agricultural products.

The link between inflation and relative price variability is found in the framework of supply and demand (Jaramillo, 1999). A Lucas (1973) type of model assumes that quantity supplied, q_{it} in an industry, of commodity i in period t consists of trend output q^n_{it} and cyclical output q^c_{it}. That is:

$$q_{it} = q^n_{it} + q^c_{it} \qquad (1)$$

All variables are expressed in logs. From Lucas (1972), the cyclical component of output is further decomposed into the lagged value of the cyclical component of output q^c_{it-1} (persistence effects), plus a relative price effect, which is proportional to the deviation from the mean price level P_t of the relative price P_{it}, which firms in the industry receive.

The supply equation becomes:

$$q_{it} = q^n_{it} + \rho q^c_{it-1} + b(P_{it} - P_t) \quad (2)$$

Where $/\rho/ <1$ and b are constant parameters (b is price elasticity of supply), P_t is the mean price level and represents the anticipated price level in period t from the perspective of period t-I and P_{it} is the price of output i.

Demand is a function of relative prices and income (Jaramillo, 1999);

$$q_{it} = a(P_{it} - P_t) + dm_{it} \quad (3)$$

Where m_t is income, d is the income elasticity of demand for good i and a is the price elasticity of demand for the same good. Equating demand to supply and rearranging terms, an expression for the commodity-specific rate of price change is given by:

$$P_{it} - P_{it-1} = (\sqrt{b-a})\,[d(m_t - m_{t-1}) - (q^n_{it} - q^n_{it-1}) - \rho(q^c_{it-1} - q^c_{it-2}) + (P_t - P_{t-1})] \quad (4)$$

In this framework, commodity inflation rates are a result of demand shocks and the anticipated aggregate inflation rate transmitted through sector-specific elasticities. Aggregate demand shocks have an effect in each market that is identical for positive or negative changes in income. Consequently, an increase in demand has the same aggregate effect on inflation and relative price variability as an equivalent variation of opposite sign. While symmetric price responses to shocks are a feature of most simple linear models of supply and demand interaction, its real world relevance has often been questioned within the tradition of downward price rigidity (Fischer, 1981; Cagan, 1979; and Akerloff, Dickens and Perry, 1996). The downward price rigidity in some markets will produce an asymmetrical response in the rigid sector, which makes the new aggregate level of relative price variability higher than that obtained under the positive shock (Jaramillo, 1999). In addition, the absolute value of inflation will be lower than for a positive shock, reinforcing the fact that negative inflation rates will be associated with higher variations by working through the asymmetric price responses to shocks in some markets arising from downward price rigidity in those markets. In this study, we analyzed the change in relative agricultural prices from inflation due to rigidities and government policies that impact on prices.

Measuring relative price variability: The change in relative prices is called relative price variability or volatility and is used as an indicator of the real costs of inflation in relation to its effect on commodity price changes (Loy and Weaver, 1998). Real costs of inflation occur due to changes in relative prices that result from a differential transmission of inflation across particular products or markets. The resulting price structure is distorted from initial cost and preference fundamentals and may induce resource misallocation and welfare loss (Fisher, 1981). Domberger (1987) extended the consideration of the real costs of inflation by noting that through disrupting the relative price structure between products within a particular market, inflation could also induce real costs by affecting changes in intramarket relative price volatility.

Relative price variability is measured by constructing an index to show changes over time in relative prices among a commodity group. A commodity's relative price is defined as its nominal price divided by the average price of all commodities in the group. Relative price variability is defined as the variance, across a set of commodities of the rates of change of individual nominal prices (Lapp and Smith, 1992).

The nominal rate of price change of each commodity can be decomposed into an aggregate component, interpreted as the inflation rate and a relative price component. That is,

$$P_{i,t} = P^*_t + Z_{i,t} \quad (5)$$

Where $P_{i,t}$ is defined as the natural logarithm of the nominal price of the i'th commodity in period t, P^*_t is the natural logarithm of a price index for the N commodities in period t and $Z_{i,t}$ is the natural logarithm of the relative price of commodity i in period t,

$$Pt = \sum_{i=I}^{N} W_{i,t} P_{i,t} \quad (6)$$

Where the $W_{i,t}$'S are price index weights that sum to one. Taking first differences of (6) and rearranging terms, the rate of commodity i's relative price,

$$Z_{i,t} - Z_{i,t-1} = (P_{i,t} - P_{i,t-1}) - (P^*_t - P^*_{t-1}) \quad (7)$$

The weighted sum of each commodity's relative price, using $W_{i,t}$ as weight is:

$$\sum_{i=I}^{n} W_{i,t}\,(Z_{i,t} - Z_{i,t-1}) = \sum_{i=I}^{n} W_{i,t}\,\{(P_{i,t} - P_{i,t-1}) - (P^*_t - P^*_{t-1})\} \quad (8)$$

is always Zero. The weighted sum of squares of each commodity's relative price change,

$$V_t = \sum_{i=1}^{n} W_{i,t} [(P_{i,t} - P_{i,t-1}) - (P^*_{t-} P^*_{t-1})]^2 \qquad (9)$$

is always positive when nominal rates of change differ among individual commodities. As the differences increase, V_t also increases. Therefore, V_t, which is an approximation of the variance of relative price changes from period t-1to t for the N commodities, is used as the measure of relative price variability.

Measuring V_t requires data on actual commodity prices and the weights attached to each commodity. Parks (1978), Lapp and Smith (1992) used income shares as the weight attached to each commodity. Domberger (1987) used both income shares and 1/N as weight and reported that his results were unaffected by choice. Smith and Lapp (1993) used output as weight. In this study we used income shares as the weight attached to each commodity. Lasperes price index was used in computing price indices.

MATERIALS AND METHODS

The empirical model: The empirical models were specified below according to the objectives of the study.

Relative price variability equations: To analyze objective (1), we specified a relative price variability equation for food crops [Eq. 10] and another price equation for cash crops (Eq. 11). (Jaramillo, 1999; Caglayan Filiztekin, 2001) and Eq. 4 in this study.

$$VF_t = \lambda_o + \lambda_1 \pi_t + \lambda_2 (D_* \pi)_t + U_t \qquad (10)$$

$$Vc_t = \theta_o + \theta_1 \pi_t + \theta_2 (D_* \pi)_t + \Sigma_t \qquad (11)$$

Where: VF_t and VC_t are relative prices of food and cash crops, respectively, as developed in section 2.2.2

λ_1's and θ_1's	=	Constants,
π	=	Absolute value of inflation,
D	=	A dummy variable (D= 1 when inflation is negative and O otherwise),
$D^*\pi$	=	Product of D_1 and π which allow for a different slope of the relationship during deflationary periods.
U_t and Σ_t	=	Error terms.

The term $D_1{}^*\pi$ helps to test the hypothesis that the relationship between inflation and relative price variability exhibits an asymmetry stemming from downward price rigidity in some markets. If the coefficient (λ_2) or θ_2 on this term is significantly different from zero, then the hypothesis of an asymmetrical relationship is accepted, otherwise it is rejected.

Data were obtained from the publications of central bank of Nigeria, Federal Office of Statistics and Federal Ministry of Agriculture and Natural resources. The data covered the period 1970-2003.

Estimation technique: All the equations were estimated by Ordinary Least Squares method. The Augmented Dickey-Fuller (ADF), was carried out to determine the time series properties of the variables. The variables (relative price variability and inflation) were integrated and therefore error-correction models and long-run static models were specified and estimated.

RESULTS AND DISCUSSION

This section presents and discusses the results obtained from data analysis. The analyses in this study are based on fourteen agricultural commodities as presented on Table 1. These commodities are the major food crops and cash crops in Nigeria.

Unit roof test results: Table 2 reports the ADF tests for the order of integration of our variables provided by PC Give 10 Econometric software. The data used for the test and subsequent analysis are presented in the appendix 1. Inflation (π) is not stationary at the level, but stationary in the first difference. Food price Variability (VF) is stationary at the level for the first and zero lags. Cash crops price Variability (VC) is stationary at zero lag.

Table 1: Commodities in sample

Food crops	Cash crops
Cassava	Groundnut
Yam	Palm oil
Rice	Cotton
Beans	
Maize	Palmkernel
Millet	Cocoa
Sorghum	Benniseed
Soyabeans	

Table 2: Unit root test results

	ADF Statistics			
Variable	Lag	Level	1st Difference	Order of integration
π	2	-2.459	-3.923***	1(1)
	1	-3.298	-5.238***	1(1)
	0	-2.866	-5.27***	1(1)
VF	2	-2.956	-4.924***	1(1)
	1	-3.811***	-6.841***	1(0)
	0	-4.35***	-7.675***	1(1)
VC	2	-2.434	-3.58**	1(1)
	1	-2.174	-4.578***	1(1)
	0	-4.474***	-11.13***	1(0)

Note: (i) The variables are as defined in equations (10) and (11). (ii) *** and ** indicate significant at 1% and 5% probability levels, respectively

Table 3: Test for order of Integration of Residuals from static Regressions of Equations 10 and 11 on Table 5

Equation	lag	ADF statistics	Order of integration
e_{10}	2	-3.124***	1(0)
	1	-3.868***	1(0)
	0	-5.101***	1(0)
e_{11}	2	-3.365**	1(0)
	1	-3.882***	1(0)
	0	-6.892***	1(0)

Note: *** and ** mean significant at the 1% and 5% probability levels, respectively. e_{10} and e_{11} are error terms from Eq. 10 and 11, respectively

Table 4:OLS Estimation Results of the long-run cointegrated Equilibrium models

	Equation 11 (Dependent variable = VC)		Equation 10 (Dependent variable = VF)	
Regressor	Coefficient	t-value	Coefficient	t-value
Constant	-0.1235	-1.53	1.4263***	15.5
π	0.0124***	4.19	0.0037***	3.52
Adj R^2	0.34		0.27	
F-Statistic	17.6***		12.4***	
DW	2.51		1.92	
Normality test	68.24(0.0000)***		45.91(0.0000)***	
Hetero test	2.87(0.0736)		6.91(0.0036)***	
Hetero-X test	2.87(0.0736		6.91(0.0036)***	
Reset test	3.94(0.0564)		3.87(0.0585)	

Note: *** indicates significant at the 1% probability level

We cannot therefore specify Eq. (10) and (11) in the levels of the variables without the risk of obtaining spurious regressions.

Empirical issues and estimation results: The existence of cointegration between the regressands VC (relative price variability of cash crops) and VF (relative price variability of food crops) and the regressor π (inflation) was determined. The Engle-Granger two-step procedure was adopted to test for cointegration. The unit root tests on the individual variables have already been conducted in the preceding section. The next stage is that the order of integration of the residuals generated from static models, namely Eq. (10) and (11) were evaluated for their order of integration and were found significant (Table 3). Consequently, the existence of cointegration with respect to the regressands and regressors in each of Eq. (10) and (11) could not be rejected. Table 4 presents the results of the long-run (static) regression while Table 3 shows the order of integration of the residuals generated from static models.

The results on Table 3 suggest that the variables in the equations are cointegrated. A confirmation test was performed using the Johansen multivariate cointegration technique. Test results confirm that the variables in each of Eq 10 and 11 are indeed cointegrated. What this suggests is that an error correction specification would provide a better fit than would be the case without it. Eq 7 presents the result of estimation of error correction models for Eq. 10 and 11.

Table 5: Parsimonious Error Correction model estimates for Eq 10 and 11

Equation 10 (Dependent variable = ΔVC)			Equation 10 (Dependent variable = ΔVF)		
Regressor	Coefficient	t-value	Regressor	Coefficient	t-value
Constant	-0.0349	-0.415	Constant	0.0024	0.046
$\Delta\pi_t$	-0.0043***	5.81	$\Delta\pi_t$	0.0127***	3.891
$\Delta\pi_{t-3}$	-0.0012*	-1.77	ECM_{t-1}	-1.2597***	-6.78
ECM_{t-1}	-1.0281***	-5.82			
AdjR^2	0.64			0.60	
F-statistic	17.31***			25.38***	
Hetero test	0.58(0.75)			1.89(0.15)	
Normality test	20.52 (0.00)***			48.54(0.00)***	
RESET test	0.67(0.42)			1.13(0.30)	
ARCH I-1 test	0.09(0.77)			0.17(0.84)	
AR1-2 test	2.1(0.15)			0.03(0.86)	
DW	1.52			1.97	
Hetero-X test	6.75(0.0007)***			1.89(0.14)	

Note: ***, ** and * represent significant at 1%, 5% and 10% probability levels, respectively

Table 6: Impact of inflation on relative price variability

	Elasticity with respect to inflation	
Price variability.	Long-run elasticity.	Short-run elasticity
1.Food price variability (VF)	0.68	0.14
2.Cash crops price variability (VC)	2.28	0.045

Source: The long-run elaticities were computed from the coefficients of π (inflation) on table 5 and the mean values of π, VF and VC. Similarly, the short-run elasticities were computed form the coefficients of $\pi\Delta$ (1st difference of inflation) on table 7 and the mean values of $\pi\Delta$, ΔVF and ΔVC

Table 5 shows that the model have good explanatory powers as shown by the values of the adjusted r-squared. Furthermore, the RESET test results indicate that the equations are not misspecified and that the assumption of linearity is correct. Besides, the ARCH test suggests absence of autocorrelation in the residuals.

The link Inflation between and relative price variability: The results of all the estimated equations show that inflation has a positive impact on relative price variability across agricultural commodities (Table 4 and 5). The coefficients of inflation in all the equations are all significant at the 1 percent level and are positive in sign. This result is similar to that obtained by Caglayan and Filiztekin (2001), Smith and Lapp (1993) and Jaramillo (1999).

Table 4 shows that inflation explains 27% and 34% of adjusted total variations in food crops and cash crops prices, respectively, in the long-run. On the other hand, inflation accounts for 64 and 60% of the short-run volatility of the prices of food and cash crops, respectively (Table 5). The Error Correction Term (ECM_{t-1}) is negative in sign and statistically significant at 1 percent probability level in the estimated short-run relative price variability equation (Table 5). The error correction

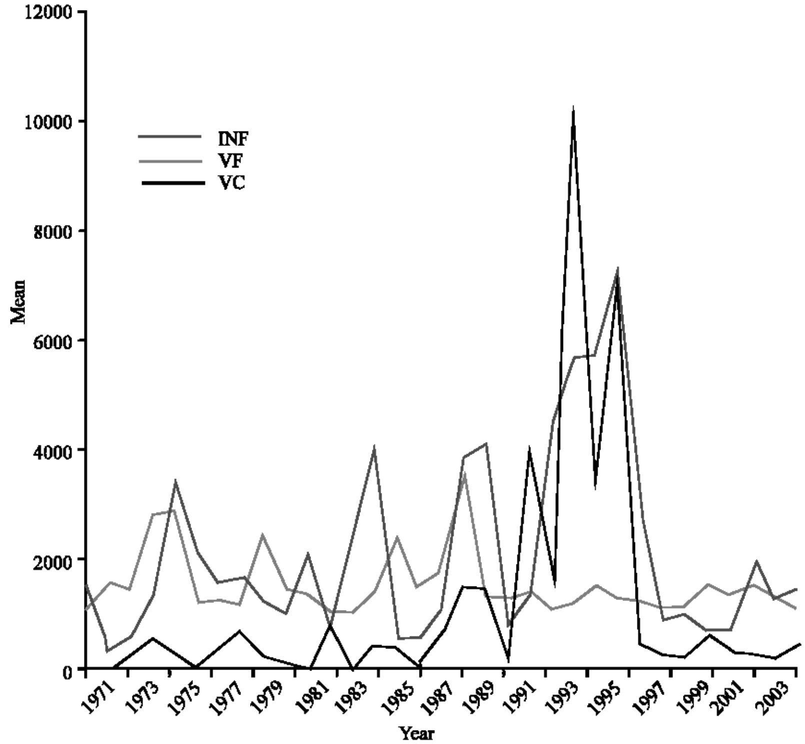

Fig. 2: Relationship between Inflation, Food Price Variability and Cash Crops Price Variability, Note: INF = Inflation, VF = Food Price Variability and VC = Cash Crops Price Variability

estimate indicates quick convergence to equilibrium in each period, with intermediate adjustments captured by the differenced terms.

On the impact of inflation in the long-run, Table 6 shows that a 10% increase in the rate of inflation causes a 6.8 percent and 22.8% increase in price variability among food crops and cash crops, respectively. Thus, the impact of inflation is higher among cash crops than among food crops, in the long-run. This is probably because food is a necessity and most food producers in the country are small scale farmers who produce mainly for subsistence and may not readily alter their enterprises in response to changes in inflation.

The ECM model shows the short-run effects of changes in inflation rate on relative price variability among agricultural commodities. The short-run elasticities on Table 6 reveal that a 10% increase in the rate of inflation increases food price and cash crops price variability by 1.4 and 0.45%, respectively. Thus food prices response more to inflation in the short-run than cash crops prices. The reason is probably because most cash crops are less perishable and their buffer stock help to stabilize prices in the short –run.

A visual picture of the relationship between inflation and relative price variability is shown in Fig. 2. The rate of inflation had a rising trend from 1971-1996, fluctuating greatly with peak values in 1975, 1981, 1984, 1989 and 1995 and slowed down from 1996-2003. Similarly, food prices fluctuated and moved in the same direction with inflation. On the other hand, cash crops prices fluctuated tremendously from 1971-1996 and slowed down thereafter following the same trend with inflation. High peak values of cash crops price variations were recorded in the SAP and post-SAP periods, namely in 1991, 1993 and 1995. These result indicate that Nigerian agricultural commodity prices become more volatile relative to one another when the economy-wide inflation rate increases. This finding suggests that Nigerian farmers experience increased risk and uncertainty in their production during periods of inflation. In other words, the effect of inflation is non-neutral and there is a considerable impact of inflation on price variability.

Furthermore, no data points in the study period showed negative inflation. As a result of this, the data could not provide evidence for the effect of deflation on relative price variability. That is the reason why the variable which captures the effect of deflation, denoted by $D_*\pi$ in Eq. (10) – (11), does not have any entry on Table (4) and (5) where the results of estimation of these equations are presented.

Appendix 1: Computed data on food price variability, cash crops price variability and inflation

Year	Food producer price variability (VF)	Cash crops producer price variability (VC)	Inflation rate (%)
1971	0.0171	0.0015	16
1972	0.4249	0.0008	3.2
1973	0.3513	0.0162	5.4
1974	1.0273	0.0512	13.4
1975	1.0585	0.0318	33.9
1976	0.194	0	21.2
1977	0.2281	0.025	15.4
1978	0.146	0.0676	16.6
1979	0.8632	0.0204	11.8
1980	0.3871	0.0028	9.9
1981	0.2703	0.002	20.9
1982	0.034	0.0769	7.7
1983	0.0396	0.0001	23.2
1984	0.3187	0.0363	39.6
1985	0.8647	0.0323	5.5
1986	0.3868	0.0044	5.4
1987	0.5603	0.0588	10.2
1988	1.2476	0.1504	38.3
1989	0.2144	0.1414	40.9
1990	0.2048	0.0113	7.5
1991	0.3227	0.3977	13
1992	0.1191	0.1673	44.5
1993	0.1713	1.1875	57.2
1994	0.3853	0.3427	57
1995	0.224	0.7143	72.8
1996	0.1926	0.0407	29.3
1997	0.0824	0.0229	8.5
1998	0.084	0.0189	10
1999	0.4285	0.0528	6.6
2000	0.2716	0.0329	6.9
2001	0.4082	0.0277	18.93
2002	0.2606	0.0119	12.88
2003	0.0978	0.0424	13.99
Mean	0.3602	0.1149	21.14
Standard deviation	0.3083	0.2375	17.28
Coefficient of variation(%)	86	207	82

Source: Computed by the researcher from data in CBN, statistical Bulletin (2002, 2003, 2004) and various issues of Annual Report and Statement of Accounts from 1970 to 2004. VF and VC were computed using equation 9

CONCLUSION

Our results show that the effect of inflation on relative price variability is non-neutral for both food crops and cash crops and that there is a significant positive impact of inflation on price variability both in the short-run and long-run. The impact of inflation on relative price variability is higher for cash crops in the long-run than for food crops. However, the reverse is the case in the short-run. The effect of inflation on relative price variability is higher for food crops than cash crops in the short-run and the short-run elasticities are much lower than the long-run elasticities. These findings suggest the implementation of policies which will buffer the agricultural sector from the effects of inflation in the short-run and in addition food crops sub-sector from the long-run effect of inflation. Similarly, macroeconomic policies which reduce the rate of inflation will minimize relative price variability among agricultural commodities and consequently reduce inefficiency and misallocation of resources in agriculture, which might arise from the effect of inflation.

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