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Impact of poultry Feed Price on Poultry Egg Prices in Nigeria

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Abstract

Egg and meat production are the two major divisions of poultry production, although other divisions exists such as chick production, point of lay production, feed production, poultry tools and equipment production in addition to poultry processing and marketing. Poultry is heavily dependent on grains and other feed ingredients frequently used by man. They therefore compete directly with man for feeds but grain production in Nigeria is far less than demand. The cost of feed per unit output is significantly higher for poultry, this calls for reduction of feed cost and improved credit access to enhance the purchase of feeds and increase the flock size.

Secondary data collected was used to explain the rising effect of feed cost on the prices of eggs. Data was collected on the prices of layer's mash and some major feed materials such as maize and soya bean meal for the past thirty years (1991 - 2020). The prices of egg was collected for the same period (1991 - 2020). The use of time series data for analysis demands the investigation of presence of unit root in the data. This is to ensure that the variables used in the regressions are not subject to spurious regression. For this reason, unit root test was carried on the variables.

Vector Error Correction Model (VECM) to separates the long-run equilibrium (or 'cointegrating') relationship between price of egg and price of feed.

A unit increase in feed price will lead to 0.359 unit increase in egg price. that in the long run as the price of feed increases, the price of egg will also increase. This could be due to the impact of high cost of inputs such as maize and soybean meal which are the two major feed materials which over been on the increase over the period under consideration.

price has negative and significant effect in cost of egg production, thereby increasing the price of egg and making it less available to the Nigeria populace.

Keywords: Price of Feed; Price of Egg; Time Series; and VECM

Introduction

The domestication of birds such as chicken, ducks, quails, turkey, and geese with the intent of rearing them for meat, egg production as well as using their incidental products such as faecal droppings and feathers in industries as natural unprocessed materials is known as poultry farming (Stiles, 2017). Egg and meat production are the two major divisions of poultry production (United States Department of Agriculture – USDA, 2018) although other divisions exists such as chick production, point of lay production, feed production, poultry tools and equipment production in addition to poultry processing and marketing (Compassion in World Farming - CIWF, 2019).

Poultry is heavily dependent on grains and other feed ingredients frequently used by man. They therefore compete directly with man for feeds but grain production in Nigeria is far less than demand. A change in output of maize and its price shows immediate change in poultry feed price and prices of poultry products and consequently its profitability (Sani, 2015). Poultry feed being the single input with the highest cost in poultry production, the increase in its price would affect the total profit of the farmers because the increase in poultry products price could not be commensurate with feed price increase especially due to the dwindling purchasing power of the populace (Hassan, 2014). Today, the decline in the growth of poultry production has proceeded unabatedly, this could be attributed to the high prices of feed.

The cost of feed per unit output is significantly higher for poultry, this calls for reduction of feed cost and improved credit access to enhance the purchase of feeds and increase the flock size (Kato, 2008; Ajetomobi, 2006). However a study on the evolution of feed – producer price system in vertically integrated markets showed that positive shocks to the price spread generate a quicker adjustment of feed prices while they remain more rigid after negative shocks to the price spread (Kaabia, 2005).

Despite the numerous benefits of the poultry industry to private individuals and to the economy at large, the industry is facing a huge problem if not addressed on time may lead to the collapse of the industry thereby rendering most of the players in the industry jobless and exposing them to food and nutrition insecurity problem. According to Sani (2015) about 60-75% of the cost of production in the poultry industry is attributed to feed. Cost of feed has been rising over time due to rise in the prices of the major (maize and soybean meal) ingredient used in the production. In-view of this high feed price, this study was conducted to evaluate the influence of feed price on egg price.

Materials and Methods

Secondary data collected was used to explain the rising effect of feed cost on the prices of eggs. Data was collected on the prices of layer's mash and some major feed materials such as maize and soya bean meal for the past thirty years (1991 - 2020). The prices of egg was collected for the same period (1991 - 2020).

The use of time series data for analysis demands the investigation of presence of unit root in the data. This is to ensure that the variables used in the regressions are not subject to spurious regression. For this reason, unit root test was carried on the variables. The Johansen cointegration test and vector error correction model (VECM) were also employed to determine the long-run relationship between variables and the response of egg price to feed price.

Also Granger causality test was conducted to measures the ability of past values of one variable to predict the current values of other variables. The estimation procedure takes the following forms:

i. **Unit Root Test:**

The initial step in carrying out a time series analysis is to test for stationarity of the variables, in this case, egg price and feed price series.

The Augmented Dickey-fuller (ADF) test was used to check for unit root for the variables used for this study. A series is said to be stationary if the means and variances stay constant over time. It is denoted as I(0), meaning integrated of order zero. Non stationary stochastic series have changing mean or time varying variance. All the variables used in this study were first tested for stationarity. The rationale was to overcome the problems of spurious regression. A stationary series tends to always return to its mean value and variations around this mean value. A variable that is non-stationary is said to be integrated of order *d*, written as *I(d)*, if it must be differenced *d* times to be made stationary. In the same way, a variable that has to be differenced once to become stationary is believed to be *I(1)* i.e., integrated of order 1. According to Gujarati (2003), the Augmented Dickey Fuller

(ADF) test entails running a regression of the form:

$$\Delta Z_t = \beta_1 + \beta_2 t + \delta Z_{t-1} + \sum_{i=1}^{m} \alpha_i \Delta Z_{t-i} + \varepsilon_t \quad (1)$$

Where Δ = the change operator; Zt = variable series Feed price (FP) and egg price (EP) being investigated for stationarity); Z_{t-1} = Past values of variables;

$\Delta Z_{t-1} = (Z_{t-1} - Z_{t-2})$, $\Delta Z_{t-2} = (Z_{t-2} - Z_{t-3})$, e.t.c; t = time variable and ε_t is the white noise error. The null hypothesis that δ = 0 means existence of a unit root in Z_t or that the time series is non-stationary. The decision rule is that if the computed ADF statistics is greater than the critical at the specified level of significance, then the hull hypothesis of unit root is accepted otherwise it is rejected. In other words, if the value of the ADF statistics is less than the critical values, it is concluded that Z_t is stationary i.e $Z_t \sim I(0)$. When a series is found to be non-stationary, it is first-differenced (i.e the series $\Delta = Z_t - Z_t -1$ is obtained and the ADF test is repeated on the first-differenced series. If the null hypothesis of the ADF test can be rejected for the first-differenced series, it is concluded that $Z_t \sim I(1)$

Cointegration Test :

The rationale for carrying out cointegration is to identify or find out whether there is long-run equilibrium relationship between variables. When two or more data series have a long-run equilibrium relationship, it means that they move together closely, they will not separate from each other in the long run and are co integrated. An impulse will only make them to be apart from each other in the short run. However, in the long run, they will automatically resume equilibrium. The most commonly used methods for co integration test are the Engle-Granger two step test (Engle, 1987) and the Johansen Maximum Likelihood procedure (Johansen, 1990). This study adopts Johansen Maximum Likelihood procedure because it allows for all feasible co integration relationship and the number of co integrating

vectors to be verified practically. The starting point for Johansen co integration test is the vector auto regression (VAR) of order *p* given by: $Zt + \phi A_1Z_{t-1} + \ldots + A_pZ_{t-p} + \varepsilon t$

This VAR can be re-written as:

$$\Delta Z_t = \phi + \sum_{t-1}^{n} \Gamma_t \Delta Z_{t-1} + \Pi Z_{t-1} + \varepsilon_t \qquad (2)$$

Where,

$$\Pi = \sum_{t-1}^{p} A_t - I, \Gamma_t = -\sum_{f-t+1}^{p} A_t \, and Z_t \quad ((FP)$$

and (EP)) is a (n x 1) vector of all the non-stationary *l(1)* variables in the study, ϕ is a (n x 1) vector of parameters (intercepts), ε_t is an kx1 vector of innovations or random shocks. Γi and Π are (n x n) matrices of parameters, were Γi is a (n x 1) vector of coefficients of lagged Z_t variables. The Π is a *(n x 1)* is a long-run impact matrix which is product of two *(n x 1)* matrices. If the coefficient matrix Π has reduced rank *r<n*, subsequently there exist (*n x r)* matrices α and β each one with rank *r* such that $\Pi = \alpha\beta' and \beta' Zt$ is stationary. The *r* is the number of co integrating relationships, the elements of α is known as the adjustment parameters in the vector error correction model and each column of β is a cointegrating vector. It can be revealed that for a known *r*, the maximum likelihood estimator of β defines the combination of $Zt-1$ that yields the *r* largest canonical correlations of ΔZt with $Zt-1$ after correcting for lagged differences and deterministic variables once present. Johansen (1995) suggested two different likelihood ratio tests, the trace test which tests the null hypothesis of *r* co integrating vectors against the alternative hypothesis of *k* co integrating vectors and maximum eigenvalue test, which tests the null hypothesis of *r* co integrating vectors against the alternative hypothesis of *r + 1* co integrating vectors.

3.13. The structure of the Vector Error Correction Model

The study of Price Change or Transformation (PC or PT) for homogeneous commodities in space, or for a product as it is transformed along the stages of the marketing chain (e.g. wheat – flour – bread), has attracted the interest of agricultural economists for many decades (Meyer 2004). Early empirical studies of PT were based on simple correlation and regression analyses that did not account for dynamics and lead-lag relationships in price data (Fackler, 2001). In the course of the 1980s, these methods were increasingly replaced by dynamic regression models that include lagged prices (Ravallion, 2011) and studies based on the concept of Granger causality (Gupta, 1982). The emerging cointegration literature highlighted several pitfalls associated with the regression analysis of price data. In particular, since price data are often non-stationary, regression can lead to spurious results (Hassouneh et al; 2010). The basic insight of the cointegration approach is that to avoid the pitfall of spurious regression one must test whether non-stationary prices series (also referred to as 'integrated' price series) are not only correlated with one another but are rather 'co-integrated'. Cointegrated means that there exists a linear combination of the non-stationary series that is itself stationary, in other words that the series share a common form of non-stationarity and cannot drift apart indefinitely.

Ardeni (1989) published the first study of PT on agricultural markets based on cointegration methods. It is fair to say that with the exception of a comparatively small literature based on socalled parity bounds models (Barrett, 2002) today essentially the entire empirical PT literature draws on cointegration methods and, in particular, the so-called vector error correction model (VECM). The VECM is a re-parametrization of the standard vector autoregressive (VAR) model which relates the current levels of a set of time series to lagged values of those series. If the series (FP) and (EP) are found to be *I(1)* and co integrated, then the ECM model is represented by the

following equations:

$$\Delta InEP_t = \varphi_1 + \sum_{i=1}^{n} \beta_{1i} \Delta InFP_{t-1} + \sum_{i=1}^{n} \sigma_{1i} \Delta InEP_{t-1} + \alpha ECT_{t-1} + \varepsilon_t \qquad (3)$$

$$\Delta InFP_t = \varphi_3 + \sum_{i=1}^{n} \beta_{3i}\Delta InEP_{t-1} + \sum_{i=1}^{n} \sigma_{3i}\Delta InFP_{t-1} + \alpha ECT_{t-1} + \varepsilon_t \qquad (4)$$

Where *lnFP* is logarithm of feed price (naira/kilogram) in year t, lnEP is the logarithm of egg price (naira/crate) *ECT* is the error correction term, is the difference operator and is the error term which takes care of other variables that could have influence on egg price but not specified in the model and while *n* is the optimal lag length orders of the variables.

In matrix notation, and allowing for more than one lag of the price difference terms, this VECM can be written compactly as:

$$\begin{bmatrix} \Delta p_t^f \\ \Delta p_t^e \end{bmatrix} = \begin{bmatrix} \phi_1 \\ \phi_2 \end{bmatrix} + \begin{bmatrix} \alpha_1 \\ \alpha_2 \end{bmatrix} \begin{bmatrix} 1 & \beta_1 \end{bmatrix} \begin{bmatrix} p_{t-1}^f \\ p_{t-1}^e \end{bmatrix} + \sum_{i=1}^{k} \begin{bmatrix} \delta_{1i} & \rho_{1i} \\ \delta_{2i} & \rho_{2i} \end{bmatrix} \begin{bmatrix} \Delta p_{t-i}^e \\ \Delta p_{t-i}^f \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix}.$$

From the perspective of empirical PT analysis, the main advantage of the VECM over the VAR is that it separates the long-run equilibrium (or 'cointegrating') relationship between p^e and p^f – which is captured by the error correction term $(p_{t-1}^f - \beta_1 p_{t-1}^e)$ – from the short-run dynamics that ensure that any deviations from this long-run equilibrium are 'corrected' and thus only temporary. The key parameters in the VECM are β_1, which describes how one price reacts to changes in the other in the long run, and the so-called 'adjustment' parameters α_1 and α_2. If *p*w and p^f are cointegrated, then α_1 and α_1 must have negative and positive signs, respectively. If this is the case, then if for example p^f becomes too large relative to p^e and the error correction term is correspondingly positive, a decrease in p^f in the first equation of the VECM, and an increase in p^e in the second equation, will drive the prices back towards their long-run equilibrium. One-to-one price transmission in the long run requires that $\beta_1 = 1$, while $0 < |\alpha_i| \leq 1$, with large (small) values of α_1 and α_2 indicating that errors are corrected rapidly (slowly).

Granger Causality Test

Granger causality measures the ability of past values of one variable to cause the current values of another variable.

According to Granger (1969) causality, if a series X1 "granger causes" a series X2, then the past values of X1 should contain information that helps predict X2 above and beyond the information contained in the past values of X2 alone. Granger causality test is an essential analysis given that it highlights the existence of causation and it can be unidirectional or bidirectional (Gogoi, 2014). To implement the granger causality test, the following regression model was specified:

$$InEP_t = \alpha_1 + \sum_{I=1}^{P} \emptyset_{11i} InEP_{t-1} + \sum_{i=1}^{p} \emptyset_{12i} FP_{t-1} + \mu_{1t} \qquad (5)$$

$$InFP_t = \alpha_2 + \sum_{i=1}^{P} \emptyset_{21i} InFP_{t-1} + \sum_{i=1}^{p} \emptyset_{22i} InEP_{t-1} + \mu_{2t} \qquad (6)$$

Where p is the lagged observations incorporated in the model which is determined using the lag length criteria such as Akaike Information Criteria (AIC) and the Schwartz Information Criteria (SIC) amongst others, the matrix ϕ contains the coefficients of the model, μ_1, μ_2 are residual errors for each time series.

Empirical Model for Elasticity of Demand

Following Theil (1980), the differential output supply equation for a single output producer with *n* inputs can be specified as follows:

$$(1) \qquad d(\log Q) = \frac{\Psi}{\gamma - \psi}\left[d(\log p) - \sum_{t-1}^{n} \theta_1 d(\log w_1) \right]$$

where Q represents farm output, p is the output price, and the w_1 s are input prices. ψ is a positive scalar and may be regarded as a measure of the curvature of the logarithmic cost function and γ is the elasticity of total cost with respect to output. θ_i is the marginal share of the *i*th input in total cost (Laitinen, 1980, and Theil 1980).

Assuming ψ, γ and θ_i are constant, the finite version of equation (1) for a egg producing farm is expressed as follows:

For any variable $x, \Delta x_t = \log(x_t) - \log(x_{t-4})$. Q is total egg production in Naira. Crates of egg prices in naira are represented by *p*, and *fp* is the feed-price ratio. ε_t is a random disturbance term.

Given a production period of approximately one year, the independent variables are lagged one period (1 year). Equation (1) states that the log change in egg production is a function of the log change in output prices, and feed-price ratio in the previous year.

The supply specification in Theil (1980) indicates that the output supply for a profit maximizing firm should be expressed as a function of output and input prices.

To account for the indirect impact of feed cost on production through the number of egg produced, the derived demand for egg produced will be estimated as well. The derived demand equation, also expressed in differential form is

(3) $$\Delta h_t = \beta_0 + \beta_1 \Delta fp_t + u_t$$

Equation (3) state $_t$hat the number of egg produced in period *t* is a function of the feed-price ratio. All variables in equation (3) are in four-period log changes as well. u_t is a random disturbance term. Given limited data on feed quantities and the quantities of other productive inputs, this analysis will be limited to the derived demand for maize and soybean meal only.

Substituting equation (3) into equation (2), the elasticity of egg output with respect to feed price is

(4) $$\eta_{Q.feed} = \frac{d\log(Q)}{d\log(fp)} = \pi_2 + \pi_4 \beta_1$$

Letting feed price be the sum of corn price and soybean meal price, it is easily shown that

$$d\log(feed) = d\log(corn)(corn/feed) + d\log(\text{soybean meal})(\text{soybean meal}/feed).$$

This implies that the output elasticity with respect to corn cost is

(5)

$$\eta_{Q.corn} = \frac{d\log(Q)}{d\log(corn)} = (\pi_2 + \pi_4\beta_1)\frac{corn}{feed}$$

From equation (5) the impact of changes in corn prices on price of egg can be simulated with the following equation,

(6)

$$Q_t = \left(\eta_{Q,corn}\left[\frac{corn_t - corn_{t-1}}{corn_{t-1}}\right]\right)Q_{t-1} + Q_{t-1}$$

Results and Discussion

The empirical analysis of this study was done with the use of Econometric Views (E-Views) analytical software, 9.0 which was used to estimate the model and the following results were reflected in the subsequent sections. The model tests the relationship between feed price and egg price in Nigeria. The models are evaluated using relevant statistics of the estimated regression output.

Preliminary Analysis

The preliminary data and summary of the statistics of the variables were presented in Table 1. Mean value for egg price in Nigeria within the period under study is 638.53. The maximum value for egg price was 1816.11 while the minimum was 39.18. The average price of feed is 1472.28, it varies from maximum of 4851 to a minimum of 280. The large difference between the minimum and maximum values of the series indicates significant variation in the variables over the period of consideration. Additionally, the descriptive analysis was also furnished with skewness and kurtosis of all the variables of interest. The skewness measures symmetrical property of the histogram while the kurtosis measures the height and the tail shape of the histogram. Also, the results based on the statistical distribution of the series showed that all the series are positively skewed. The yardstick for measuring the skewness is how closer the variable is to the zero and for the kurtosis is how closer the variable is to the three.

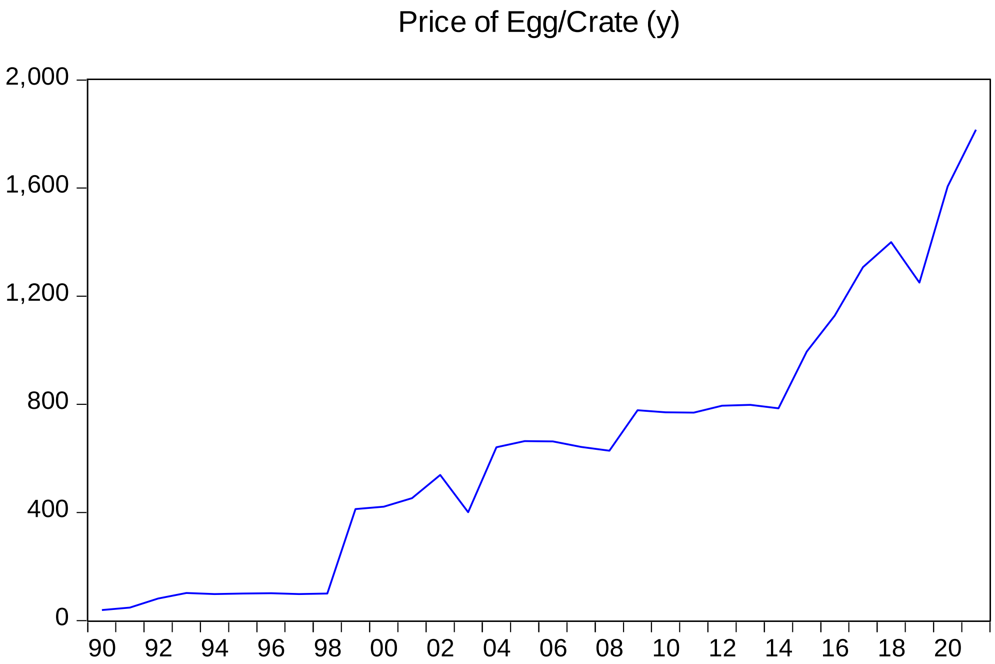
The kurtosis values show that feed price is mesokurtic because they mirror a normal distribution with a kurtosis value that is greater than 3 while egg price is platykurtic because they mirror a normal distribution with kurtosis values which are less than 3. The Jacque-Bera statistics is a goodness of fit to check whether the sample data have the skewness and kurtosis matching a normal distribution.

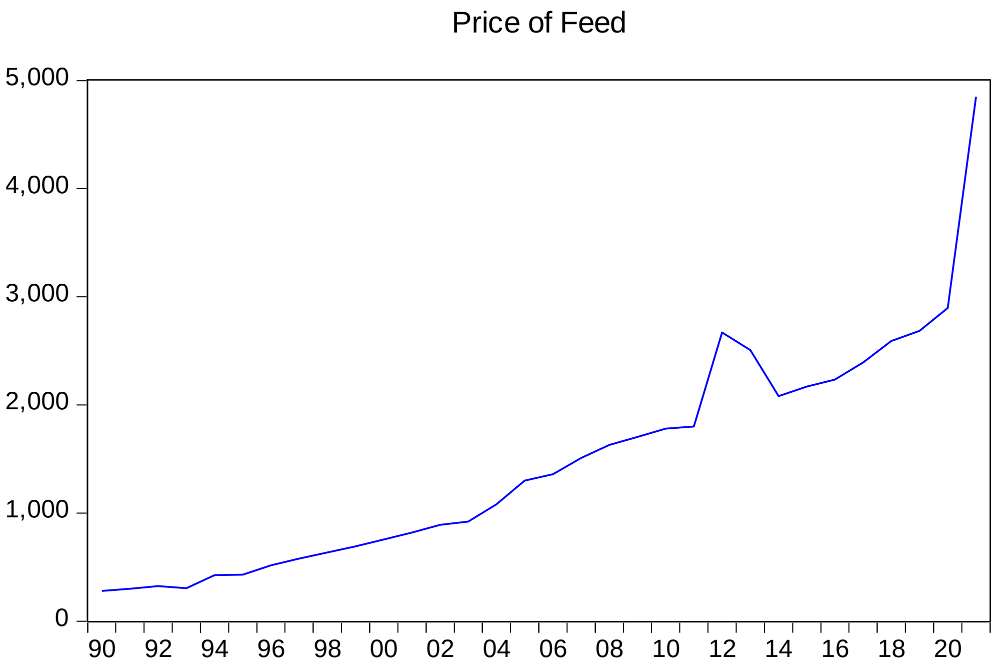
Table 1: Descriptive Statistics

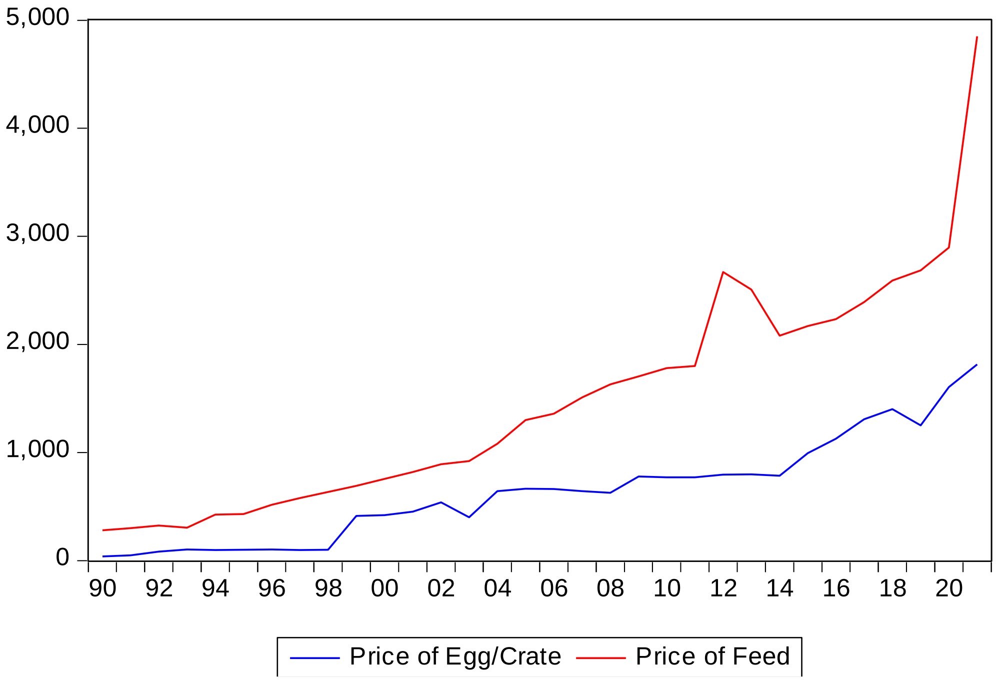
	PRICE_OF_FEED	PRICE_OF_EGG_CRATE
Mean	1472.281	638.5399
Median	1330.000	641.2754
Maximum	4851.000	1816.114
Minimum	280.0000	39.18428
Std. Dev.	1042.743	481.1612
Skewness	1.067170	0.623134
Kurtosis	4.386183	2.742996
Jarque-Bera	8.635886	2.158983
Probability	0.013327	0.339768
Sum	47113.00	20433.28
Sum Sq. Dev.	33706670	7176999.
Observations	32	32

Source: Author's computation using E-views 9.0 (2022)

Trend Analysis







Stationarity Test Result

This section explained the application of the unit root test which was carried out on the variables to determine their stationarity levels. Two tests were implemented here which were the Augmented Dickey Fuller (ADF) test to provide reliability and credibility on the data before further carrying out subsequent tests. This test is based on two statements of hypotheses which are the null and alternative hypothesis. The null hypothesis states that the variable is not stationary while the alternative hypothesis postulates that the variable is stationary.

The decision upon on which difference should be selected is based upon the decision criteria which states that if the absolute Aumented Dickey-Fuller test statistic is greater than the absolute critical value, then reject the null hypothesis and accept the alternative hypothesis while if the absolute test statistic is lesser than the absolute ADF, do not reject the null hypothesis.

Table 2 Tabular Representation of the Augmented Dickey Fuller Test Result

Series	5% Critical Value At levels	5% Critical Value At first differences	ADF at levels (Prob.)	ADF at first differences(Prob.)	ADF Test at levels	ADF Test at first difference	Equation Specification	Order of integration
EGGPRICE	-2.96	-2.96	0.9974	0.0000	1.193552	-5.943549	Intercept	I(1)
FEEDPRICE	-2.96	-2.96	0.9994	0.010	1.690651	-3.261966	Intercept	I(1)

Source: Authors computation using E-Views 9.0 (2022)

In the table above, all the variables, egg price and the price of feed are all stationary at first difference because their respective absolute test statistic is greater than their 5% critical values

Co-Integration Test Result

The co-integration test applied in this research study was the Johansen Co-integration test. One of the assumptions which must be satisfied before this test could be carried out was that the variables must be stationary at first difference I (1) and the lag interval must be determined which was at lag 2 with the selection of the Akaike information criterion. The result showed that since the just concluded unit root test was stationary at first difference, Johansen Co-integration test became necessary suggesting that long run relationship exist among the variables. Thus it is very appealing to investigate if the variables used in this study can actually converge in the long run or not. This is why the study employed Johansen cointegration test. The result showed that at most one cointegration equation exist in the model at 5% level of significance. There are two types of tests which will be considered under the Johansen test which are Eigen value and Trace statistic test. The two statement of hypothesis under this test are the null and alternative hypothesis. The null hypothesis states that there is no cointegration among the variables while the alternative hypothesis states that there is co-integration.

The decision criteria based upon this test is, if the trace statistic and maximum Eigen value is greater than the critical value then reject null and accept alternative hypothesis while if the trace statistic and maximum Eigen value is lower than the critical value then reject null hypothesis and accept alternative hypothesis.

Table 4 Results of the Johansen Co-integration test (Trace Statistic)

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.372626	17.31491	15.49471	0.0263
At most 1	0.122654	3.794763	3.841466	0.0514

Co-integration test based on (Eigen value)

Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None	0.372626	13.52015	14.26460	0.0653
At most 1	0.122654	3.794763	3.841466	0.0514

Source: Author's computation using E-views 9.0 (2022)

The tables above illustrate the results after carrying out the Johansen co-integration test based on trace and Eigen statistic. The result shows that there is long run relationship among the variables. This implies that the price of feeds has long run significant effect on the price of egg. Which means that an increased in the price of feed will lead to an increased in the price of egg on the long run. This is in-line with the a priori expectation.

Vector Error Correction Model

This test is carried out after the application of the VAR which is done to integrate the multi-variate time series

Table 6 Results of the Vector Error Correction Model (Short run result)

Error Correction	D(EGGPRICE)	D(FEEDPRICE)
CointEq1	0.230917	1.509235
	(0.16294)	(0.41224)
	[1.41723]	[3.66105]

Source: Authors computation using E-views 9.0 (2022)

The short run result shows that feed price has a short run positive effect on egg price

Long Run Mode

The regression was normalized after the co-integration test by multiplying the equation with the minus (-) sign and this is being shown below.

Table 7 Tabular Representation of Long Run Models

Variable	Co-Efficient	Standard Error	T-Statistic
D(FEEDPRICE)	0.3592	0.04905	7.3237
C	122.67		
R^2 = 0.74588 Regression Equation: EGGPRICE = 122.67 + 0.359FEEDPRICE			

Source: Authors computation using E-views 9(2022).

The result shows that feed price has positive effect on egg price. A unit increase in feed price will lead to 0.359 unit increase in egg price. This implies that an increase in the price of feed does not increase in the same rate with the price of egg

Explanatory Power of the Model: Coefficient of Determination (R^2)

In this study, R^2 was used to evaluate and determine the explanatory power of the model as the regression is simple regression analysis. It is considered to help find out how well the sample regression line fits the data. It measures the proportion or percentage of the total variation in 'Y' explained by the regression model. From the regression result, R^2 is= 0.745, this implies that the estimated model or regression line brings about a good fit to the observed data, being that 74.5% of total variation in egg price can be explained by the price of feed. This unexplained variation is attributed to the existence of the error term 'u̧' which are factors that influence egg price but were not included in the estimated model.

Model Evaluation

T-Statistics Test

This test was carried out to determine the statistical significance for each of the variables. The statement of hypothesis stated the null hypothesis as the variable which had no statistical significance while alternative hypothesis had the variable being statistical significant. The decision criteria is that if T-calculated is greater than T-tabulated then accept alternative hypothesis and reject the null hypothesis but if T-calculates is lesser than T-tabulated then reject alternative hypothesis and accept the null hypothesis.

Table 8 Tabular Representation of the T-Statistics Test Results

Variables	T-statistics		T-tabulated	Decision Rule	
	Short run	Long run		Short run	Long run
D(FEEDPRICE)	3.66	7.323	2.04	Significant	Significant

Source: Authors computation using E-views 9.0 (2022)

Note: The T-Cal values are absolute

The result shows that the price of feed has significant and positive effect on the price of egg price both in the short and long run.Which means that in the long run as the price of feed increases, the price of egg will also increase. This could be due to the impact of high cost of inputs such as maize and soybean meal which are the two major feed materials which over been on the increase over the period under consideration.

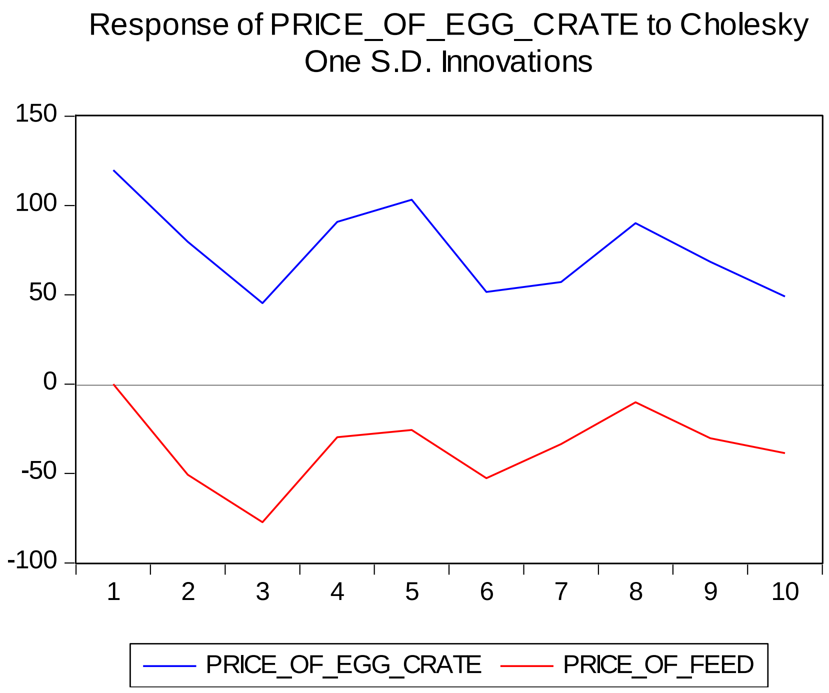
Table 9. Granger Causality Test

Null Hypothesis:	Obs	F-Statistic	Prob.
PRICE_OF_FEED does not Granger Cause PRICE_OF_EGG_CRATE	30	0.65331	0.5290
PRICE_OF_EGG_CRATE does not Granger Cause PRICE_OF_FEED		4.73030	0.0181

The result will be interpreted at 10% significant level. From the result, there is unidirectional relationship between the price of feed and the price of egg.

Impulse Response Function

The result from impulse response function shows that a standard deviation on the price of feed will lead to an increase in the price of egg from the 1st to the 10th year. This implies that there is short and long asymmetric effect of the price of feed on the price of egg



Conclusion

Poultry feed price has been found to have a direct impact on egg price this is because feed constitute about 70% of all the cost of poultry production.

This study was carried out to examined the response of egg price to feed price in Nigeria by employing time series data from 1990 to 2021. Augmented Dickey-fuller (ADF) test, Johansen cointegration test, vector error correction model and Granger causality test were employed for this study. The Johansen co integration test confirms the existence of a unique long run relationship among the variables. Consequently, co integration test results indicates that the dependent variable egg price is co integrated with feed price. From the findings of this study and other studies, price has negative and significant effect in cost of egg production, thereby increasing the price of egg and making it less available to the Nigeria populace. This implies that if the expected producer cost of egg increases, the quantity produced will decreased and the price of egg will increase. Policies on reduction of cost of poultry production should be implemented so as to reduce the price of egg in other to increase the protein source availability and affordability to the Nigeria masses.

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