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Abstract

Purpose: The research investigated variation of cattle prices in Nigeria. Specifically, the research: determined the presence of volatility in cattle prices, determined the degree of volatility of the cattle prices and estimated the level of persistence of the volatility of the cattle prices.

Methodology: Multi-stage and simple random (balotting) sampling techniques were used to select two states each from five out of the six geo-political zones in Nigeria, except South-East zone which was not represented due to unavailability of data. A total of ten states were selected. Data were analysed using the Generalised Auto Regressive Conditional Heteroscedasticity (GARCH)).

Findings: Results of the GARCH model revealed that prices were highly volatile in all the selected states except Yobe, since all coefficients were close to one and ranged from 0.71 to 0.88. The sum of the $\alpha + \beta$ coefficients were all close to or greater than one and ranged from 0.98 to 1.30, which indicated volatility was persistent. It was discovered that the prices in Nigerian cattle markets were highly volatile and persistent in volatility.

Recommendations: There is need to improve on the market information system and transportation and infrastructural facilities in order to ensure a good and efficient market and pricing system in the country. Hedging via Futures through contract agreement and/or Futures trading could be solutions to price volatility.

Keywords: *Price Volatility, GARCH, Nigerian Cattle Market.*

INTRODUCTION

Nigeria is one of the major producers of livestock in Africa, with a livestock population of 19.5 million cattle, 72.5 million goats, 41.3 million sheep and 7.7 million pigs (National Bureau of Statistics, NBS, 2016). It is second to Ethiopia, which has the largest population of livestock in Africa, with 59.5 million cattle, 30.7 million sheep, 30.2 million goats, 2.16 million horses, 1.2 million camels and 56.53 million poultry birds (Central Statistical Agency, Addis Ababa, CSA, 2017). According to the NBS, cattle population has risen to 22.1 million at the end of last quarter of 2017. Generally, ruminant animals, especially cattle, sheep and goats, constitute the major source of animal protein in the country. Cattle, however, dominates the industry because it supplies the bulk of meat, milk and hides (Wageningen UR Livestock Research, W-UR-LR 2013). Cattle is a livestock that is highly regarded by people in Nigeria because it contributes a lot to the social and economic well-being of the people and of the agricultural sector as a whole.

Cattle marketing in Nigeria involves the movement of cattle from the pastoralists in Northern Nigeria to the major final consumers through many intermediaries in southern Nigeria. The activities of intermediaries and stakeholders has led to increased transaction costs and increased retail prices. Transporting cattle from north to south is also a costly and risky business, as the seasonal roads are usually bad and cattle are kept standing in the two to three days journey. At times transporters and traders are robbed on the bad roads and even accidents may occur with the loss of lives and cattle. The non-functionality of rail transportation might have contributed to the heavy transport fares charged by road transporters since they know there is no alternative for moving cattle to the southern markets (Mafimisebi *et al*., 2013). The movement of cattle, thus may lead to increase in price of cattle and subsequently its variability. Also, prices of agricultural goods are not static but change due to reasons such as variability in output, seasonal changes, discontinuity in supply and change in income. Price is therefore an important factor in determining market efficiency. This is because the issue of interest in market efficiency studies is the co-movement of prices (integration), how often the prices change (volatility) and how the change in prices are transferred in the marketing system (transmission).

Market studies revolve around characteristic price changes, linkages and analysis of agricultural commodity prices. Prices of agricultural products are not static; they may increase or decrease depending on seasonal or climatic conditions. Price changes or fluctuations (volatility) are therefore inherent features of agricultural markets, and it will remain a normal risk to be managed by stakeholders in agricultural marketing as part of their business strategies. Lack of change in agricultural prices reflects a non-functioning market. Price changes within a certain bound are acceptable. On the other hand excessive price volatility is not desirable as it results in uncertain income for the marketer and poor degree of choice for the consumer (Natcher & Weaver, 1999).

Price variability which is generally defined as the excessive variations in agricultural commodity prices over time occurs when new unanticipated information enters the market (European Union Committee, EUC, House of Lords, 2016). Information transfer, which is a key function in volatility of market prices, is of paramount importance in determining the efficiency of markets. This is because it is through the flow of information that prices volatile (or otherwise) are transmitted across and between markets. The issue of price changes (volatility), price signals and information across markets that are separated by time and space is fundamental in markets of agricultural commodities, such as cattle. Market prices that are highly unstable will convey inaccurate price signals that might distort marketing decisions

and contribute to inefficient product movement. Furthermore, some marketing agents may exploit and benefit at the cost of other marketers' gain and consumers' welfare. Frequent change and poor co-movement of prices such as that of cattle questions the sustainability of current economic growth as well as efficiency of the cattle markets. Supporting livestock development, (particularly cattle) by reducing excessive volatility and encouraging price integration, offers a way to reduce poverty and food insecurity, and ensures efficiency in spatially separated cattle markets.

Spatial price analyses with respect to volatility of agricultural markets/products in Nigeria have been widely studied in literature. However, most of the literature reviewed focused on food and cash crops, while some others were limited to the oil and stock markets. Listortis and Esposti (2012) observed that several studies have focused on few agricultural commodities, mostly, cereals, meat and vegetable oil markets, due to lack of appropriate data for most agricultural commodities. The findings of Listortis and Esposti (2012) were further supported by Assefa *et al.* (2013). This research was therefore designed to fill some of the gap left in the agricultural sector, ie the status volatility of cattle market prices in Nigeria. Specifically, the study sought to determine the presence of volatility or otherwise of cattle prices in Nigeria and estimate the degree and persistence of volatility of the cattle prices;

MATERIALS AND METHODS

The study made use of the quarterly prices of cattle from the National Bureau of Statistics to determine volatility and integration of cattle markets in Nigeria. Data of cattle prices from ten selected states (selected trough balotting), two each from five geopolitical zones of Nigeria, using a time frame of 16 years (2002-2017), were used for the analysis. One geo-political zone (south-east) was not included due to unavailable data because the NBS does not capture non- major rearing or non-major producing states. However, this did not affect the data since the 36 states were first divided into major producing and major consuming zones; the major producing zone was represented by the Northern states while the major consuming zone was represented by the Southern states, therefore, the South East zone was covered for by the other states selected from the Southern major consuming zone.

The study made use of the quarterly prices of cattle from the National Bureau of Statistics to determine volatility in cattle prices in Nigeria. Data of cattle prices from ten selected states, two each from five geopolitical zones of Nigeria, using a time frame of 16 years (2002-2017), were used for the analysis. One geo-political zone (south-east) was not included due to unavailable data because the NBS does not capture non- major rearing or non-major producing states. However, this did not affect the data since the 36 states were first divided into major producing and major consuming zones; the major producing zone was represented by the Northern states while the major consuming zone was represented by the Southern states, therefore, the South East zone was covered for by the other states selected from the Southern major consuming zone.The cattle price series data were subjected to the stationarity test to clean it and make it stable for further analysis. When stationarity was achieved, the data was tested for volatility through: The method of Generalised Auto Regressive Conditional Heteroscedasticity (GARCH)

Unit Root or Stationarity Test

Most economic time series are non-stationary in nature and must undergo appropriate transformation to achieve stationarity. The unit roots test is done to check order of stationary of the data (in order to avoid spurious relationship). Non-stationary time series data tend to cause estimation, inference and forecasting problems in empirical modeling. In order to free

the data of these empirical problems, the non-stationary data is transformed into stationary one through the unit root test. The objective is to convert an unpredictable process to one that has a mean return to a long term average and a variance that does not depend on time. A variable is said to be stationary if it has time invariant mean and variance, and the covariance between the two time periods does not depend on the length of the estimation period but on the lag between the periods. The most frequent transformation process used in practice is called integration or differencing (Rufino, 2011). The two well-known stationarity tests in literature are the Augmented Dickey-Fuller (ADF) test (Dickey and Fuller, 1979), and the Phillips-Perron (PP) test (Phillips & Perron, 1988). The Phillips-Perron (PP) test is a non-parametric alternative to the Augmented Dickey-Fuller unit root test. This is because the PP test employs non-parametric methods without the necessity of having a more over-parameterized test regression. For the purpose of this work, the ADF (Augmented Dickey-Fuller) test was used due to its simplicity and ease of interpretation of results. The test was conducted on the level and first differences of price series to obtain results at I (0) and I (1) orders respectively. The following ADF regression equation was used to test for stationarity:

$\Delta Y_{it} = \beta_1 + \beta_2 t + \delta Y_{it-1} + \alpha_i \sum_{i=1}^{m} \Delta Y_{it-1} + \varepsilon_t$ ---------- 1

Where; β_1 is a constant, β_2 is the coefficient on a time trend;

δ is parameter that signifies the presence or absence of unit root;

Y_{it} is a vector to be tested for co-integration, that is the price of cattle in the ith market;

t is the time or trend variable; i=1, 2, 3, …,n (ith market)

$\Delta Y_t = Y_t - Y_{t-1;}$ ---------- 2

Y_t is the price time series; Δ is the first difference operator;

Y_{t-1} is the lagged value of the price series; α_i is the coefficients of the lagged values of Y_{t-1} ; and ε_t is a pure white noise error term; and m is the lag order.

The null hypothesis that δ=0 is tested against the alternative that δ< 0. The null hypothesis that $\delta = 0$; signifying unit root, states that the time series is non-stationary, while the alternative hypothesis, δ<0, signifies that the time series is stationary, thereby rejecting the null. The tabulated critical values called ADF statistics are always negative. If the ADF value obtained is less than the critical values, it can be concluded that Y_{it} is stationary i.e $Y_{it} \sim I(0)$. But when a series is found to be non-stationary, it is first differenced (i.e the series ΔY_{it} 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 $Y_{it} \sim I(1)$, that is Y_{it} is stationary at first differences. The price series for all the selected states were tested for their order of integration. The optimal lag length for each of the price series was selected using the Akaike Information Criterion (AIC). The AIC is a measure of the goodness of fit of an estimated statistical model.

A proiri Expectation

It is expected *a priori* that the null hypothesis signifying the presence of unit root would be rejected while the alternative signifying stationarity would be accepted.

Generalised Autoregressive Conditional Heteroscedasticity (GARCH) Model

The GARCH models introduced by Bollerslev (1986) which are also the most commonly employed class of time series models used to determine volatility and persistence of volatility in recent times, was employed to the analyse the data of this work. This is because it is

capable of capturing various dynamic structures of conditional variance, incorporates heteroscedasticity into the estimation procedure and allows for simultaneous estimation of both mean and the variance of the time series. The variance which is of primary concern in time series analysis is influenced by the exogenous variables in the GARCH model. The estimation of GARCH model involves the joint estimation of a mean and conditional variance equation. In general, the GARCH (p,q) can be presented as:

$Y_t = \lambda_0 + \lambda i \sum_{i=1}^{k} \quad Y_{t-1} + \varepsilon_t$ (autoregressive process) ---------- 3

The conditional mean equation is an autoregressive process of order k (AR (k))

Where; parameter λ_0 is the constant,

k = number of lags in the autoregressive process;

λ_1 = parameter to be determined by Maximum Likelihood Estimation;

Y_t is the price at time t;

Y_{t-1} = lagged values of Y_t;

$\varepsilon_t \sim N(0, \sigma_t^2)$, that is the heteroscedastic error term which is assumed to be normally distributed with mean zero and conditional variance (σ_t^2).

The conditional variance equation is given as:

$\sigma_{i_t}^2 = \propto_0 + \sum_{i=1}^{q} \alpha_i \, \varepsilon^2{}_{t-1} + \sum_{j=1}^{p} \beta_j \, \sigma_{t-1}^2$--------- ---------- 4

Where p is the number of Autoregressive (ARCH) terms (lagged orders of vectors);

and q is the number of GARCH terms (lagged orders of vectors).

In equation 3.4, $p > 0$ and $q \geq 0$, when q=0, the above specification reduces to an ARCH process. The model parameters, $\propto_0$, $\propto_i$ and β_j are relative weights of the lagged terms and usually assumed to be non-negative. Estimation of parameters with the GARCH approach requires the use of Maximum Likelihood Estimation (MLE) method.

Volatility is said to exist in the series if the coefficient of the parameters are significant. The sum of $\propto_i + \beta_j$ gives the degree of persistence of volatility in the series. The closer the sum is to 1, the greater is the tendency of volatility to persist for a longer time (meaning current volatility of quarterly prices can be explained by past volatility which tends to persist over time). If the sum exceeds 1, it is indicative of an explosive series with a tendency to slight away from the mean value.

RESULTS AND DISCUSSION

Test of Stationarity

Quarterly cattle prices from first quarter 2002 to fourth quarter 2017 (a total of 68 observations) were used for the analysis. The result for test of stationarity in the cattle price series for Borno (BO), Cross-River (CR), Edo (ED), Kano (KN), Nassarawa (NS), Osun (OS), Oyo (OY), Plateau (PL), Yobe (YB) and Zamfara (ZM) is presented on Table 1.

Table 1: ADF unit root test results for cattle prices

Markets	0 level			1st level		
	ADF	Critical value	Remark	ADF	Critical value	Remark
Borno	-2.381129	-2.90766	Non-stationary	-7.619265***	-2.90842	Stationary
Cross-River	-2.223833	-2.90766	Non-stationary	-3.708674***	-2.915522	Stationary
Edo	-2.221536	-2.90766	Non-stationary	-7.412621***	-2.90842	Stationary
Kano	-2.347207	-2.90766	Non-stationary	-8.034363***	-2.90842	Stationary
Nassarawa	-2.303043	-2.90766	Non-stationary	-7.714622***	-2.90842	Stationary
Osun	-2.145211	-2.90766	Non-stationary	-7.11486***	-2.90842	Stationary
Oyo	-2.664023	-2.90766	Non-stationary	-7.741753***	-2.90842	Stationary
Plateau	-2.32984	-2.90766	Non-stationary	-4.373243***	-2.912631	Stationary
Yobe	-2.215243	-2.90766	Non-stationary	-8.305384***	-2.90842	Stationary
Zamfara	-2.328488	-2.90766	Non-stationary	-4.370702***	-2.912631	Stationary

Note: * indicates that unit root in the first differences were rejected at 1% significance levels.**

Source: Computed from cattle price data series, 2002-2017 (NBS, 2018).

This implies that the price series have achieved stationarity (absence of unit root) and are integrated of order one (I,1), and therefore, the series could be tested for volatility. Moreover, according to Mesike *et al.* (2010) any endeavour to determine the dynamic function of the variable in the level (I,0) of the series based on results of the variables, will be inappropriate and may lead to problems of spurious regression.

Testing for Volatility in Cattle Prices

The cattle price series was tested for presence of volatility. The result is presented in Table 2. The auto regressive analysis (ARCH term) of the GARCH model result for volatility test revealed that all the prices for the ten markets studied except for those of Edo and Plateau

were statistically significant at 1%. Those of Edo and Plateau which were significant at 5%. The result showing statistical significance of all the variables implies rejection of the null hypothesis, thus indicating the presence of volatility in cattle prices in Nigeria. The significance of the ARCH term also indicates that volatility in the current quarter prices depends on volatility in the preceding quarter prices. The presence of price volatility signals risks for marketers and they may be compelled to strategise against this risk by reducing supply of cattle or investing less. This is similar to the findings of Sarker and Oyewumi (2015) who observed that the prices of sheep in Namibia and South Africa were volatile.

Table 2: Estimates of Volatility Coefficients of Cattle Prices

Market	Variable		Coefficient	Std. Error	z-Statistic	Prob.
Borno	C		2.595066	0.000257	10092.61	0.00000***
		β_1	0.108753	0.021266	5.113941	0.00000***
		β_2	0.22994	0.043223	5.319821	0.00000***
Cross-River	C		0.210406	0.011888	17.69872	0.00000***
		β_1	0.204455	0.025651	7.970507	0.00000***
		β_2	0.184966	0.042584	4.343591	0.00000***
Edo	C		5.046116	1.622899	3.109322	0.00190**
		β_1	0.775457	0.123722	6.267715	0.00000**
		β_2	0.218756	0.111741	1.95771	0.05030**
Kano	C		3.337085	0.165099	20.21264	0.00000***
		β_1	0.258069	0.041776	6.177511	0.00000***
		β_2	0.161709	0.053512	3.021914	0.00250***
Nasarawa	C		2.429755	0.308981	7.863758	0.00000***
		β_1	0.253511	0.020571	12.32344	0.00000***
		β_2	0.174074	0.061371	2.836406	0.00460***
Osun	C		0.1317	0.016648	7.911048	0.00000***
		β_1	0.212783	0.013927	15.27845	0.00000***
		β_2	0.499594	0.038253	13.06031	0.00000***
Oyo	C		0.418089	0.002437	171.5588	0.00000***
		β_1	0.32205	0.0065	49.54615	0.00000***
		β_2	0.224165	0.01597	14.03663	0.00000***
Plateau	C		1.923105	0.070588	27.24407	0.00000**
		β_1	1.249638	0.196997	6.343435	0.00000**
		β_2	0.349006	0.174489	2.000155	0.04550**
Yobe	C		2.307354	0.612112	3.769496	0.00080***
		β_1	0.325675	0.029546	11.02264	0.00000***
		β_2	0.155918	0.026736	5.831762	0.00000***
Zamafara	C		2.817317	0.707857	3.980065	0.00000***
		β_1	0.24822	0.017042	14.56519	0.00000***
		β_2	0.351435	0.073981	4.750341	0.00000***

Source: Computed from cattle price series, 2002-2017 (NBS, 2018).

Reasons for variations in prices of cattle include absence of market information, inadequacy of infrastructure, occasions, seasonality, drought, flooding, change in supply (quantity or pattern), unpredicted shocks, conflicts and banditry (Addis & Cinda, 2015). Others include lack of market-oriented production, lack of permanent animal route, lack or non-provision of

transport, ineffective and inadequate infrastructural and institutional set-ups (Solomon et al., 2003)

Level of Volatility in Cattle Prices

The GARCH result showing level of volatility in cattle prices is presented on Table 3.

Table 3: Estimates of Volatility Level (α) Coefficients

Market	Coefficient(α)	Std. Error	z-Statistic	Prob.
Borno	0.856227	0.000122	7028.305	0.00000
Cross-River	0.829185	0.000156	5315.288	0.00000
Edo	0.724306	0.094468	7.667188	0.00000
Kano	0.819475	0.010049	81.54834	0.00000
Nassarawa	0.879467	0.016306	53.93406	0.00000
Osun	0.811164	0.000929	873.6706	0.00000
Oyo	0.745297	0.001568	475.3169	0.00000
Plateau	0.706737	0.145854	4.845509	0.00000
Yobe	0.541722	0.030993	17.47885	0.00000
Zamafara	0.705975	0.046647	15.13441	0.00000

Source: Computed from cattle price data series, 2002-2017 (NBS, 2018).

Table 3 shows that the α coefficients for nine cattle markets (Borno, Cross River, Edo, Kano, Nassarawa, Osun, Oyo, Plateau and Zamfara) were close to 'one', and ranged from 0.88 (for Nassarawa) to 0.71 (for Plateau and Zamfara). This indicates the presence of strong volatility in the cattle prices and rejection of the null hypothesis, which stated that the prices of cattle in Nigeria are not volatile. Yobe price was also volatile with coefficient of 0.54, but it was not as volatile as the others. This shows the speed of price variability of prices in Yobe was slower than the others. Cattle are brought into Nigeria through the borders of Nigeria with Chad and Cameroun in Borno state, before they are moved to other parts of Nigeria including Yobe state. Yobe is bounded to the North by Niger Republic but most cattle trading activities in the Semi-arid region of the North-East are done in Borno, this probably because the border between Niger Republic and Yobe state is a desert which does not favour movement of livestock. The cattle brought to Borno are taken to the main cattle market in the state capital. The famous cattle market (*Kasuwan Shanu*) in the capital city of Borno, Maiduguri, is always full of activities with traders patronizing the market daily. This market serves as transit as well as selling point for livestock, prices are bound to change always depending on trade activities at the borders and also due to daily bargain between traders and buyers in this market. This leads to lack of stability in the prices of livestock. However, the patronage is less in Yobe, therefore prices may change less over time. Also most traders prefer to purchase their cattle in *Kasuwan Shanu* in Borno state rather than buying in Yobe, because of the large stock available in the Borno market.

This high level of volatility in the cattle prices is an indication of inefficiency and poor operation of the cattle markets, which may result in unstable income of marketers. This instability in income may adversely affect marketing planning with negative effects on cattle marketers. Uncertainties about future price changes hinder the marketers attempt to expand their market size and invest more in cattle marketing. Also marketers are constrained by their limited capacity for timing their sales due to price uncertainty, since prices are not stable and forecasting about the future may become difficult. According to Apergis and Rezitis (2003) price increases make the future uncertain to the marketers as well as the consumers thereby reducing accuracy of future forecasts (made by marketers and consumers) and causing welfare losses to both marketers and consumers of cattle/beef.

Persistence of Volatility in Cattle Prices

The result for persistence of volatility in the cattle prices is presented in the Table 4. The result shows strong persistence of volatility in the cattle prices. This is probably because of less popularity of the Yobe cattle market (as compared to that of Borno, which is a sister state) and the resulting less patronage witnessed in the market.

Table 4: Sum of α and β_2 coefficients

Market	Coefficient$(\alpha + \beta_2)$
Borno	1 .09
Cross-River	1.01
Edo	0.94
Kano	0.98
Nassarawa	1.05
Osun	1.31
Oyo	0.97
Plateau	1.06
Yobe	0.70
Zamafara	1.06

Source: Computed from cattle price data series, 2002-2017 (NBS, 2018).

The sum of the α and β_2 coefficients for eight cattle markets (Borno, Cross-River, Nassarawa, Plateau and Zamfara) stood at 'one'. The sum for Kano was 0.98 and Oyo was 0.97. In general, this shows strong persistence of volatility in these markets and thus the null hypothesis of no persistence in the prices of cattle in Nigeria was rejected. The sum for Yobe was the lowest (0.70), although still showing persistence but not as strong as those for the other nine markets. The reason for lower volatility may be due to less demand by marketers that buy and transport cattle to the south. This low demand suggests that prices would be low and less volatile. Only Osun market showed an 'explosive behaviour' (extreme persistence)

as the sum of α *and* β_2 exceeded 'one'. The persistence of volatility could be due to high level of volatility in the cattle prices which may have resulted from poor price transmission and inefficiency in the cattle market system. Marketers are mostly concerned with increased price volatility, which greatly exposes them to the risks and uncertainties associated with price changes which could discourage investment in the market. Persistent volatility also entails risk to marketers who may react by reducing supply of cattle and thus investing less. Price variation influences decision making with regards to production, marketing, investment and risk management in agriculture. This because high price variation affects producer's and marketer's profitability, since it plays a significant role in the decision-making process. High price variation also affects policy makers, since price and volatility levels impact food security, inflation rate, tax revenue, employment, GDP and the business cycle.

The explosive behaviour of prices in Osun suggests price variation is very large and creates a level of uncertainty which increases risks of investment for marketers. This may eventually lead to a more persistent sub-optimal or poor decision resulting from inadequate market knowledge. Marketers are faced with a high level of risks of investment since consumers may not be willing to buy at high prices, thus the market in Osun may not be able to absorb supply and demand shocks in the short-run.

CONCLUSION

The auto regressive analysis (ARCH term) of the GARCH model result for volatility test revealed that all the prices for the ten markets studied were statistically significant at one percent, while those of Edo and Plateau which were significant at five percent. This indicates the presence of volatility in cattle prices in Nigeria. The α coefficients for nine cattle markets (Borno, Cross River, Edo, Kano, Nassarawa, Osun, Oyo, Plateau and Zamfara) were close to 'one', and ranged from 0.88 to 0.71. This indicates the presence of strong volatility in the cattle prices. Yobe price was also volatile with coefficient of 0.54, but it was not as volatile as the others. The sum of the $\alpha + \beta$ coefficients were all close to or greater than one, and ranged from 0.98 to one, which indicated volatility was persistent. The coefficient for Osun was greater than one, indicating extreme persistence.

In conclusion, the study analysed the variability of cattle prices in Nigeria over a period of 16 years. It was discovered that the prices of cattle in the Nigerian markets were highly volatile and the volatility was persistent.

RECOMMENDATIONS

1. Hedging (risks management strategy) via Futures through contract agreement and/or Futures trading could be solutions to price volatility. This is when marketers would be educated, advised and encouraged to make use of profitable opportunities that may arise (when cattle prices are relatively profitable) against anticipated price changes in the future.
2. Since lack of proper information dissemination is one of the reasons for frequent change in the prices of cattle, there is need to improve on the market information system in the country so that information will flow to all the markets. This can be achieved in one way by the farmers forming an association whose major objective would be processing and dissemination of information. The other way to improve cattle price formation flow is by the intervention of the government by providing price information control centres/offices in all major cattle markets in the country.
3. Poor infrastructure and poor transport system are among the key issues in the under development of the market system, as it hinders easy flow of information, therefore

the government of Nigeria need to incorporate policy measures that will improve transportation and infrastructural facilities in order to ensure a good and efficient market system. Efficient roads and transport system could also reduce much of the asymmetry.

Suggestion for further research

Agricultural price volatility spillover effects, especially for those in developing countries like Nigeria, need to be estimated so that such information could be used by the government to control volatility and its spillover effects on the prices of agricultural goods especially livestock and cattle in particular

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