Inflation, Dividend Policy and Investment Decisions of Quoted Firms: A Panel Data Estimates from Nigeria

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Abstract

In this study, we investigated the effect of inflation on dividend decision and investment decision of quoted firms in Nigeria using both time series and panel data frameworks. The study aimed to examine how the three inflation variants; core, food and headline affect the performance in these decision areas of 21 quoted firms selected from different sectors of the Nigerian economy. For time series analysis, the autoregressive distributive lag (ARDL) model was employed and the data were collected yearly from 1981 to 2016. The panel data analysis was based on the three conventional panel data methods; pooled least square, fixed effects and random effects methods. The panel data comprises 210 observations on 21 firms over 10 time series from 2007 to 2016. Both Likelihood Ratio and Hausman specification tests were employed for model selection and validation. The results showed that inflation has a negative relationship with dividend decision, measured by average dividend yield. There is evidence that the three variants of inflation all have positive relationships with firm investment decision measured by net investment cash flows. The study conclude that inflation have significant effect on dividend decision and investment decision of the quoted firms. We recommend that that payment of dividend is necessary, especially in the presence of asymmetric information between managers and shareholders. Firms should invest in only assets that promise higher future cash flows and should use appropriate inflation-adjusted discounted capital budgeting methods to appraise new projects.

Keywords: Inflation, Dividend Policy, dividend per share, Investment Decision, Quoted Firms, Panel Data Estimates.

Introduction

Every corporate organization operate in two broadly categorized environments, these are the internal and the external environments. External environment such as macroeconomic factors play significant roles in corporate financial management practices and performance. Ross (1976) argues that corporate shareholder returns are significantly influenced by some systemic factors arising from the firm's external environment including macroeconomic factors such as inflation, exchange rate, interest rate. This position is well-captured in his famous Arbitrage Pricing Theory (APT). he role of inflation in influencing corporate financial management practices is well documented in financial literatures. Corporate managers make corporate decisions in the areas of investment, financing and dividend policy to influence corporate earnings and maximize shareholders' wealth in the face of macroeconomic uncertainty. In addition, financial economists agree that inflation is a social ill that imposes welfare costs. Even at its anticipated level, inflation can cause distortions in the distribution of income and wealth. Furthermore, unanticipated inflation leads to higher cost of capital, lower investments Chen & Boness (1975) and increases business risk (Hatzinikolaou *et al*, 2002). Highly concentrated inflation prone market is believed to have a significant negative effect on corporate profit, while low inflation driven markets are closely associated with high levels of profits at the expense of other performance indicators due to decreased inflation. That inflation can affect profitability position of an enterprise in four ways. Firstly, it changes the cost of funds used to finance the business. Secondly, it raises cost of raw materials; labour and the price of product. Thirdly, it affects the tax liability to be paid. Finally, it causes shift in demand levels (Maduson, 2006). The link between inflation and corporate financial management practices has continued to be a major concern for both corporate managers and researchers. According to Oxman (2011), although, there is a long history of research about the effect of inflation on corporate financial management, there is however, no general agreement in the literature. For example, prior to World

War II, researchers relying on the Fisher's (1930) model claimed that inflation and stock prices are positively correlated. However, researchers have also documented that the correlation between inflation and stock returns in the post-war is negative, hence, disproving the Fisher's model.

Previous studies in both Nigeria and other countries focused mainly on the impact of headline inflation on selected areas of corporate financial management. It is therefore, our view that studying the three variants of inflation on the entire aspects of corporate financial management practices would enrich the literature and would provide both theoretical and empirical insights on the relationship between inflation and corporate financial management practices. Secondly, the study is also comprehensive in that it focused on all the sectors of the Nigerian economy. To the best of our knowledge, no previous Nigerian study in this line of inquiry considered all the sectors of the Nigerian economy. Thirdly, by using panel data framework, the current study controlled for firm-specific heterogeneity factors such as management styles, organization's culture that are not directly observable but play significant roles in corporate financial management practices. Previous Nigerian studies conspicuously ignored this aspect of the relationship between inflation and corporate financial management practices. From the above, this study examined the effect of inflation on dividend policy and investment decision of quoted firms in Nigeria.

Inflation and Corporate Investment and Financing

Several authors have argued that potential investments should be selected on the basis of Net Present Value (NPV). The interesting fact is how inflation affects the net present value calculation in the process of investment appraisal and evaluation. These two methods will give the same result if applied consistently. But the fact that the two methods will produce the same result if applied consistently does not mean that the two methods are the same. Although, the real cash flow; real interest rate (real-real) approach is deemed to be the preferable one does not exclude the fact that in some cases, the nominal approach may prove more effective. This position could be explained in two aspects: The Case of Pure Equity and Debt Financing. Where a firm is entirely financed by equity in the absence of inflation and assuming further that the firm has no significant true growth opportunity, the required rate of return, p, can be inferred from the Price-Earning (P/E) ratio. Assuming the same proposition holds under inflation except that Price-Earnings Ratio must now be recognized as the required real rate of return. This rate must be distinguished from the nominal rate of return from holding the security, p_n, which includes, in addition to the earnings, also any capital appreciation. Since earnings may be expected to rise at the rate of inflation (at least when inflation is neutral) as long as P/ E is constant, the price must also rise at the rate of inflation, producing a capital gain per naira equal to the rate of inflation, p.

Thus, the nominal equity rate is $p_n = p + p$ (1)

Also, when a firm is financed by the combination of equity and debt capital because the real cost of debt capital to a firm depends not only on the market nominal rate but also directly on the rate of inflation. The real cost per naira of debt, r_c, can be expressed as.

$$r_c - (1-\tau)R - p = (1-\tau)r - \tau p \quad (2)$$

Where, τ is the corporate income tax rate.

The relevance for capital budgeting is not the cost of debt funds but the overall real cost of capital, defined as the required tax-adjusted Earnings Before Interest and Tax (EBIT) per Naira of capital. The relationship between r_c and the overall real cost, p is usually expressed in terms of the "weighted average cost of capital (WACC)":

$$\rho = i\frac{s}{v} + r_C\ \frac{D}{V} \qquad (3)$$

where, i represents the required rate of return on equity capital;

$$i = \frac{(EBIT - RD)(1-\tau) + \rho D}{S} = \frac{(EBIT)(1-\tau) + r_C D}{S} \qquad (4)$$

While the weight S/V and DN represents the shares of equity and debt, respectively, in the overall capital structure.

The Fisher Effect

This study tends to base its theoretical framework on some of the renowned theories including the well-known theory of Fisher (1930). According to Fisher's hypothesis, inflation is the main determinant of interest rates, and as the inflation rate increases by one per cent, the rate of interest increases by the same proportion.

The fisher hypothesis postulates a one-for-one relationship between expected inflation and nominal interest rates and the ex-ante real rate of interest that is approximately constant over the long-run. He hypothesized that the nominal interest rate is made up of two components:

The expected rate of inflation (JC_f^e) and the real interest rate, (r_t)

Thus:

$$C\ i_t = r_t + \pi_t^e \qquad (5)$$

Where: i_t is the nominal interest rate

r_t is the real interest rate and

π_t^e is the expected rate of inflation

However, the fisher effect equation can be rewritten as shown in some studies, as

$$C = r_t + B\,\pi_t^e \qquad (6)$$

Where:

B = 1 but if B<1, then there will be weak fisher effect;

This equation is based on the background that rational economic agents like savers, investors and so on, need compensation for any purchasing power lost on the nominal income due to inflation.

It makes high inflation rate to avoid this phenomenon, the policy marker attempts to reduce the effect of the inflation rate by tightening monetary policies so that a high real interest rate position can be achieved due to higher real components in the interest rate.

To demonstrate this relationship, the fisher equation can be re-written as:

$$it = rt + B\pi_r^e \quad (7)$$

Where:

i_t = nominal interest rate

r_t = real interest rate

π_r^e is the expected inflation rate.

If Fama (1975) position is assumed to be that expected actual inflation to differ by a white noise stationary term and ex-ante real interest rate stationary, the fisher equation can be tested empirically as:

$$\pi_r^e = \pi + \in_t \quad (8)$$

Notably in the long run, the quantity of expected inflation equals to actual inflation rate. What this means is that the average of the error terms

$$E\left(\in_t\right) = 0 \quad (9)$$

Substituting equation (25) in (26), we obtained equation (39) as stated below:

$$i_t = r_t\, \beta\pi_t + \beta \in_t \quad (10)$$

N_t Can be defined to be equal to $\beta \in_t$, so that above stated equation can be re-written to be:

$$i_t = r_t + \beta\pi_t + \beta \in_t + N_t \quad (11)$$

However, in the long run, $N_t = 0$ therefore the fisher equation in the long run can be stated as:

$$i_t = r_t\, \beta\pi_t + \beta\pi_t \quad (12)$$

The relevance of this theory to the course of study is predicated upon the fact that Fisher (1930) asserted that inflation leads to high nominal interest rates since investors demand compensation for a loss in future values of money. Since stock prices of firms are based primarily on the present value of future streams of cash flow, inflation will reduce the future value of cash flows which mean that the value of future cash flows are worthless today. The

subsequent high interest rate leads to high cost of borrowing and thus reflects a negative impact on the performance of firms in terms of profitability and consequently the value of the firm. Since then, several responses have been made to the fisher effect and its impact on the value of firms.

Inflation Illusion Theory

The inflation illusion hypothesis was advocated by Modigliani and Cohn (1979) as the possible explanation of the observed negative correlation between equity market yield and rate of inflation. However, according to Basak and Yan (2010), inflation illusion theory dates back to Fisher (1928). The theory states that people tend to think in monetary terms rather than in real terms. Modigliani and Cohn, (1979) argues that inflation illusion makes investors to erroneously use nominal rates to discount real cash flows and this tends to increase nominal yields leading to under-pricing of assets. Because equity investors have the tendency of using nominal rates to discount real cash flows, stocks are underprized when inflation rises, and are overpriced when inflation falls. According to Cohen, Polk and Vuolteenaho (2005), this pricing error implies that inflation variability makes investors to subjectively expect future equity premium to deviate systematically from rational expectation. During rising inflation, investors in the bond market increase the nominal interest rates which are used by stock investors to discount future dividends that are unchanged. This leads to undervaluation of equity, thus generating an inverse relationship between inflation and stock returns. The inflation illusion hypothesis and its implication for investor behaviour and security prices have been considered in many studies. Schmeling and Schrimpf (2011) empirically tested the money illusion theory using survey-based data from several industrial countries. They find that future aggregate stock returns can be significantly and strongly predicted by measures of expected inflation and that money illusion is the reason behind this result. Similarly, Cohen, Polk and Vuolteenaho (2005) find cross-sectional evidence that the future equity returns provided by the stock market during high inflations irrespective of the riskiness of stocks is higher than can be justified. They, therefore, concluded that equity investors are influenced by inflation illusions.

Empirical Review

Marimba (2018) conducted a research on the effect of inflation on profitability of commercial banks in Kenya. Data was collected from Thirty-Seven commercial banks from 2013 to 2017 on an annual basis. Using a Using a descriptive correlation design and regression analysis as the analytical tool, the results show that there is a negative and significant relationship between inflation and profitability of commercial banks in Kenya. Fallah and Hashem (2017) examined the effect of inflation and operating cycle on cash holding of companies listed in the Tehran Stock Exchange. The test utilized data from 77 countries and used Multivariate regression to analyse the data. The results of the test conducted showed an inverse relationship between inflation and cash holding in companies selected for the test. Reza (2017) examined the effect of inflation uncertainty on the capital structure of non-financial firms in Tehran. Utilizing sample of 186 manufacturing firms for the period from 2007 to 2014 and applying the GARCH model to proxy uncertainty, the results revealed that inflation under uncertainty had a negative effect on the leverage of more than 50% of the firms in the sample, while others were positively affected by the type of uncertainty. William et al (2016) conducted a research to determine the influence of inflation rate on stock price growth among diversified companies in the Philippines. Sample for the study was collected from the seventy-three diversified companies in that country. The study used monthly data of stock price growth of the diversified companies to obtain an understanding of the underlying forces and structure that produced the observed data. Using a descriptive correlation design and regression model to analyse the panel data collected, the results showed that though the inflation rate has a positive influence on the stock price growth among diversified companies in the Philippines, the influence was not

significant. Jubaedah and AbdulRazak (2016) conducted a study on the impact of financial performance, capital structure and macroeconomic factors which includes inflation rate on the value of the firm. Using panel regression analysis on cross-sectional time series data collected from the audited accounts of twenty textile firms listed on Indonesian stock exchange, the results showed that the independent variables exerted a significant influence on the dependent variable. Zufigar and Nizam (2015) examined the effects of inflation, interest rate and firm's performance in Pakistan. Panel data of fifty different firms at Karachi stock exchange were collected. Using Ordinary Least Square as the statistical tool to analyse the data, the results revealed that inflation and interest rate have significant and positive impact on return on asset (ROA). However, inflation rate showed a positively insignificant effect on return on asset (ROA). The study concluded that inflation rate should be kept in single digit for the further betterment of firms and the overall economy. Pervan et al (2015) used the dynamic panel GMM model to examine the determinants of bank profitability for 46 Croatian banks from 2002 to 2010. They also use the Markov Chains stochastic process to examine the persistence of bank profitability over the same period. The study measures bank profitability in terms of return on assets or ROA. Among the significant determinants of bank profitability with positive coefficients are lagged profitability, bank size, intermediation, solvency risk, industry concentration, market growth and GDP growth. On the other hand, inflation, credit risk and operating expenses management all exert negative and statistically significant influence on bank profitability.

Köksal and Orman (2015) examined the capital structure determinants in Turkey using an unbalanced panel of 11726 non-financial firms over the period from 1996 to 2009. The study includes firm-specific factors, tax related factors, industry-specific factors and macroeconomic factors in a firm leverage model and compares two capital structure theories; trade-off and pecking order theories. According to the authors, while the trade-off theory argues that positive relationship exists between inflation and capital structure, pecking order theory argues that inflation plays no role in a model of capital structure. Supporting the trade-off theory, the panel data regression results show that inflation is among the factors that exert a strong positive influence on capital structure such that a 5% decrease in the average firm's debt are due solely to a decrease in inflation. Chadwick et al (2015) investigated inflation as a determinant of firm level liquid asset holdings. They constructed a theoretical framework to formalize the explanation between inflation and firm level liquid asset holdings. The empirical analysis showed that inflation is responsible for almost the entire reduction and one-third of the increase in the average firm-level cash ratio. In addition, the study depicts that these liquid asset holdings are not perfectly hedged against inflation, therefore, changes in inflation affects the real value of a firm's liquid asset portfolio making them to readjust their liquid asset balances. Umashankar and Himahindu (2015) examined the impact of inflation on stock price performance of two Indian Behemoth Fast Moving Consumer Goods (FMCG) companies. 10 years inflation rates and stock prices between 2005 and 2014 were collected. The results showed mixed responses when they used SPSS 20 statistical package and Excel to carry out the regression and descriptive analysis. They found a negative and significant relationship between inflation and stock price movements for four years and a positive significant relationship for three years. Oleka et al (2015) investigated the relationship between inflation and firm's performance in Nigeria. Time series data were collated from the annual financial statements of some sampled banks operating in Nigeria between the periods of 2000 to 2014 and the central bank of Nigeria statistical bulletin. The population of the study consists of all the 18 deposit money banks quoted on the Nigerian Stock Exchange that were in operation after 2005 banks consolidation. Using Ordinary Least Square to analyse the data, the result of the study revealed that there was no significant positive relationship between inflation and reported profit as well as return on equity.

First, they investigate the long run inflation-financial sector relationship using aggregated cross-sectional data averaged over the study period. The results show evidence of a negative inflation effect on the financial sector which is consistent with the argument that predictable inflation can worsen market frictions and hinder financial sector performance, with negative consequences on economic performance. Second, the authors employ the dynamic panel GMM method to examine the dynamic relationship between inflation and financial sector variables. The results are also consistent with the previous cross-sectional results. For countries with low to moderate inflation, there is strong evidence that inflation and financial intermediary are negatively related. Thus, the results validate the theoretical argument that predictable increase in inflation encumbers resource mobilization and economic growth.

Methodology

This study used ex-facto research design to examine the effect of inflation on dividend policy and investment decision of quoted firms in Nigeria. This study focused on quoted firms in Nigeria. Accordingly, our population is all the 170 firms listed in the Nigerian stock exchange as at 2016 financial year. These firms are categorized into 12 industries (1) Agriculture, (2) Construction/Real Estate, (3) Consumer Goods, (4) Financial Services, (5) Health Care, (6) Industrial Goods, (7) Information and Communication Technology, (8) Natural Resources, (9) Oil and Gas, (10) Services, (11) Utilities, and (12) Conglomerates. Our panel data sample consists of 21 firms. The sample selection is based on a non-probability sampling technique. Specifically, the 21 firms were purposively selected from the 12 industries that constitute the study population. The time series dimension covers from 2007 to 2016, thus, there are a total of 210 (21×10) panel data observations in our sample. Thus, we have a short panel or simply panel data. On the other hand, our time series sample consists of yearly observations from 1981 to 2016. This gives a sample size of 36 which is sufficient for any empirical analysis.

Method of Data Analysis

Time series data Analysis

To analyse the time series data, the Autoregressive Distributive Lag (ARDL) method was employed. As it is well known, the ARDL method is the dynamic version of the classical Ordinary Least Square (OLS) regression method which incorporates the lagged values of both the dependent and independent variables as additional regressors so that both long run and short run relationships can be examined.

The simple ARDL specification is given by:

$$Y_t = \alpha + \beta_1 Y_{t-1} + \beta_2 X_t + \beta_3 X_{t-1} + \varepsilon_t \qquad (13)$$

Where;

Y_t= The current value of the dependent variable

Y_{t-1}= The lagged value of the dependent variable

X_t= The current value of the explanatory variable

X_{t-1}= The lagged value of the explanatory variable

ε_t= The classical error term

α = the intercept term

β_1, β_2, and β_3 = The slope coefficients that captured the relationships of interest. While the short run of impact of X on Y is captured by β_2, the long run impact is captured by $(\beta_2 + \beta_3)$. β_2 Captured the effect of the previous value of the dependent variable on its current value.

Panel Data Analysis

For the analysis of panel data, the three panel data regression methods; namely, pooled OLS, fixed effects and random effects methods, were employed. The employment of the three methods is to allow for a comparative analysis for better empirical results. The three methods are discussed in the following subsections.

The Pooled Regression Method

The pooled OLS model, which is usually the starting point of empirical analysis under a panel data framework, could be specified as:

$$Y_{it} = \alpha + \beta X_{it} + \varepsilon_{it} \quad (14)$$

Where; it= subscripts representing cross-sectional and time dimensions of the panel data. Y_{it} is the dependent variable, α is the intercept term or average value of the dependent variable when all explanatory variables are jointly zero, X_{it}= $1 \times k$ vector of explanatory variables, β=$k \times 1$ vector of coefficients which are the main parameters of interest, ε_{it} = classical error term. The pooled model disregards the cross-sectional heterogeneity in the panel data so there is no subscript attached to the intercept term, α. Thus, there may be heterogeneity bias in the model. Similarly, the betas,β's also entered the model without subscripts, implying that the slope coefficients were constant across firms. Therefore, if these assumptions (i.e. ϵ_{it} is a white noise and both α and β are constants) are met, then the pooled model is a classical linear regression model (CLRM) which can be estimated using the OLS. However, the assumption that cross-sectional heterogeneity is irrelevant is too restrictive as studies have shown that they always account for a significant proportion of the variation in the dependent variable. Although, very simple and straightforward, the pooled regression model may give bias and inconsistent results due to omitted variable.

The Fixed Effects Method

One alternative to the pooled regression approach that incorporates the cross-sectional heterogeneity in the panel data model is the fixed effects method. The fixed effects model could be written as:

$$Y_{it} = (\alpha + \kappa_i) + \beta X_{it} + \varepsilon_{it} \quad (15)$$

Where κ_i= time invariant parameter that accounts for the cross-sectional differences or heterogeneity. Examples of cross-sectional heterogeneity are differences in managerial styles, management culture, industries where firms operate and compete etc. (Brooks, 2008). Although, these cross-sectional specific factors are not directly observable, ignoring them may induce heterogeneity bias which is a serious specification problem under the panel data methodology. Further, it may be the case that κ_i correlates with the observed regressors X_{it} in influencing Y_{it} which is consistent with the fixed effects theory. To ease estimation, we can rewrite (15) so that the intercept term can absorb κ_i as follows:

$$Y_{it} = \theta_i + \beta X_{it} + \varepsilon_{it} \quad (16)$$

Whereθ_i $(= \alpha + \kappa_i)$ vary cross-sectionally but are time-invariant so that each θ_i will represent each cross-sectional. Thus, differences in $\theta_1, \theta_2, \ldots, \theta_N$ reflect differences in cross-sectional units. However, the $\beta's$ remains constant, implying that the relationship between Y_{it} and X_{it} is constant cross-sectionally.

One straight forward method of estimating (16) is the Least Square Dummy Variable (LSDV) method. The LSDV model is given by:

$$Y_{it} = \theta_1 V_1 + \theta_2 V_2 + \theta_3 V_3 + \cdots + \theta_N V_N + \beta X_{it} + \varepsilon_{it} \quad (17)$$

Where $V_1, V_2, V_3, \ldots, V_N$ are individual dummies for cross-sectional units while their effects are captured by $\theta_1, \theta_2, \theta_3, \ldots, \theta_N$. Although, (17) is simply an OLS model, its estimation is usually associated with the problem of dummy variable trap which occurs when all the dummies are included in the regression model together with an intercept term. Therefore, our LSDV model at (17) does not include the intercept. One estimation problem with this method is that it consumes many degrees of freedom when *N* is large as each cross-sectional unit would require one dummy variable. Thus, the LSDV approach may lack parsimony.

Random Effects Model

Another alternative to the pooled OLS approach which also accommodates the cross-sectional heterogeneity but does not consume many degrees of freedom is the random effects method. The random effects model is given by:

$$Y_{it} = \alpha + \beta X_{it} + (\kappa_i + \varepsilon_{it}) \quad (18)$$

In this case, α is the common intercept or the mean of all the cross-sectional intercepts while κ_i is the random deviation of each cross-sectional intercept from α. Like the fixed effects model, κ_i enters (38) so that cross-sectional differences can be accommodated. The random effects model also assumes that the betas are constant cross-sectionally. However, unlike the fixed effects assumption, the random effects theory assumes that κ_i is uncorrelated with X_{it}. The random effects model can be rewritten as:

$$Y_{it} = \theta + X_{it}\beta + \mu_{it}, \quad (19)$$

Where $\mu_{it} (= \kappa_i + \varepsilon_{it})$ is the composite error term which absorbs κ_i and the residualsε_{it}. The random effects model also assumes that the distribution of κ_i is independent of both ε_{it} and X_{it}. The random effects model is usually estimated using the generalized least square (GLS) method. This is because the OLS estimators, though, consistent, but inefficient due to cross-correlations between the errors at different time periods (Brooks, 2008, Greene, 2002

Model Specification

To achieve the objectives of this study, the econometric form of the models are stated as

$$ADY_t = \lambda_0 + \lambda_1 INFL_t + \lambda_2 ANEER_t + \lambda_3 INTR_t + \nu_t \quad (20)$$

$$DPS_{it} = \theta_0 + \theta_1 HINF_t + \theta_2 CINF_t + \theta_3 FINF_t + \kappa_i + w_{it} \quad (21)$$

$$NCF_{it} = \alpha_0 + \alpha_1 HINF_t + \alpha_2 CINF_t + \alpha_s FINF_t + \kappa_i + \varepsilon_{it} \quad (22)$$

Where;

ADY = Average dividend yield of quoted Nigerian companies

DPS = Dividend value per share of the selected companies

INFL = Headline Inflation (year on year change in consumer price index)

ANEER = Average nominal effective exchange rate

PLR = Interest rate (Prime lending rate)

HINF = Headline Inflation

CINF = Core Inflation

FINF = Food Inflation

α_i = beta coefficients capturing the relationships in model 20

β_i = beta coefficients capturing the relationships in model 21

λ_i = beta coefficients capturing the relationships in model 22

ε_t, ϵ_t and ν_t are classical white noise disturbance terms

The parameters α_i, β_i $\lambda_i, \gamma_i, \theta_i, \gamma_i \delta_i$, $\vartheta_i, \varrho_i, \xi_i, \psi_i, \varphi_i, \phi_i$, are the slope coefficients that captured the main relationships of interest, $\kappa_i =$ latent parameters that captured cross-sectional heterogeneity, $\varepsilon_{it}, \epsilon_{it}, \nu_{it}, u_{it}$, w_{it} , ω_{it}, e_{it}, μ_{it}, are the error terms. If κ_i in each model is zero and errors are classical white noises, all the panel data are simply pooled OLS specifications. Otherwise, they are either fixed effects or random effects specifications depending on whether κ_i are correlated with the macroeconomic factors or not. If changes in inflation, exchange rate and interest rate affect (or correlate with) firm-specific factors, κ_i, then models (20) – (23) except (18) are fixed effects specifications as in (17) or (16) above. On the other hand, if κ_i are uncorrelated with the macroeconomic factors, the models are random effects specifications. Thus, two hypotheses are worth considering; (1) the firm-specific intercepts κ_i are jointly zero (H_0: $\kappa_i = 0$ vs H_1: $\kappa_i \neq 0$), and (2) the firm specific factors κ_i are uncorrelated with the macroeconomic factors.

A-priori Expectation

1. We expect *a-priori* that $\kappa_i > 0$ for all firms, so that firm-specific latent factors such as management styles and management culture influence corporate performance positively and significantly.
2. We expect *a-priori* that $\mathrm{Cov}(X_{it}, \kappa_i) = 0$ so that firm-specific latent factors are simply random deviations from the overall mean and are uncorrelated with macroeconomic factors. Thus, the random effects model is expected to be the best model for our panel data.

Method of Testing Appropriate Model

For the main relationships of interest, hypothesis testing was based on the usual t-test and F-test. While the t-test was used to test the significance of the individual betas, the F-test was used to test the joint significance of the betas between the dependent and independent variables.

For methodological hypothesis, we employed two tests associated with panel data methodology; namely, the Likelihood ratio (LR) test, and the Hausman Specification test. These tests were also used to formally select the best performing model for our panel data.

The Redundant Fixed Effects Likelihood Ratio test

The Redundant Likelihood ratio (LR) test formally compares the pooled OLS estimates with those of the fixed effects under the hypothesis that firm-specific latent factors are jointly insignificant. The null hypothesis for this test is given by: H_0: $\kappa_i = 0$vsH_1: $\kappa_i \neq 0$

The test LR test statistic is given by:

$$LR = -2(L_{pooled} - L_{fixed}) \sim \chi^2(m) \quad (23)$$

where L_{pooled} = the log-likelihood function of the pooled OLS model which is also the restricted model, L_{fixed} = the log-likelihood function of the fixed effects model which is also the unrestricted model. The LR test statistic is distributed as Chi-square (χ^2) with degree of freedom (m) equals2. There is evidence in favour of the fixed effects model if the test is significant. On the contrary, there is evidence in favour of the pooled OLS model if the test is insignificant.

The Correlated Random Effects Hausman test

The correlated random effect test proposed by Hausman (1978) compares the estimates of the random effects model with those of the fixed effects model under the null hypothesis that firm-specific latent factors are uncorrelated with the independent variables (i.e. macroeconomic factors). The Hausman test statistic is given by:

$$H = (\hat{\beta}_{FEM} - \hat{\beta}_{REM})'[var(\hat{\beta}_{FEM}) - var(\hat{\beta}_{REM})]^{-1}(\hat{\beta}_{FEM} - \hat{\beta}_{REM}) \quad (24)$$

where $\widehat{\beta}_{FEM}$= the beta estimates for fixed effect model, $\hat{\beta}_{REM}$= beta estimates for random effect model, var= variance. The test statistic H is distributed as Chi-square with degree of freedom equal to the number explanatory variables. If the test is significant, then there is evidence in favour of the fixed effects model which would also imply that the firm-specific latent factors are correlated with the explanatory variable.

Results and Discussion of Findings

The tables below give details of the effect of inflation on dividend policy of quoted firms in Nigeria.

Table 1: Estimation results (DV = Average Dividend Yield)

Variable	Beta	p-value
LADY(-1)	0.717097	0.0000
LINFL	-0.030356	0.6012
LANEER	-0.025824	0.6326
LINTR	0.021155	0.9311
Constant	0.671385	0.4786

Source: Output from EViews based on research data; DV = Dependent Variable

Table 2: Goodness of Fit and Diagnostic test

Statistic	Value	Probability
R-squared	0.541452	–
Adjusted R-squared	0.480313	–
F-statistic	8.855987	0.0000
Durbin-Watson stat	1.833917	–
LM-statistic	4.071868	0.1306
White (LM)	15.71027	0.3314

Source: Output from E-Views

From table 1 both LADY (-1) (beta = 0.7170) and LINTR (beta = 0.0211) had positive coefficients, indicating that both variables are positively related to the dependent variable. In contrast, both LINFL (beta = -0.0303) and LANEER (beta = -0.0258) had negative coefficients, indicating that both variables have negative relationship with the dependent variable. Again, like the previous results, none of the included regressors (p-value > 0.05, 0.1) is statistically significant, except the lagged dependent variable (p-value = 0.0000) which is highly significant. Thus, while the lagged dependent variable is a significant explanatory factor for its current value, none of the macroeconomic variables can help explain the observed variation in average dividend yield of companies in Nigeria.

From table 2, the Adjusted R-square of 0.4803 shows that the model has a moderate fit; approximately 48% of the changes in the dependent variable are explained by the model. The probability of the F-statistic is 0.0000, showing also that the overall regression is highly significant. As expected, the Durbin Watson statistic (= 1.833) is close to 2 and is much higher than R-square (= 0.541), showing that the regression results are not spurious. Again, both the serial correlation LM statistic (p-value = 0.1306) and the White LM statistic (p-value = 0.3314) are associated with high probabilities, suggesting that both tests are insignificant. Thus, we also fail to reject the null hypotheses of no serial correlation and no heteroskedasticity at conventional levels. This implies that the fitted ARDL model passed all diagnostic tests and is therefore, well behaved.

Table 3: Panel Results (DV = Dividend per Share)

1	2	3	4
Variable	**PLSM estimate**	**FEM estimate**	**REM estimate**
Panel A: Model parameter estimates			
Constant	-6.5302 (0.1812)	-1.4801 (0.1657)	-2.0470 (0.1380)
LCINFL	-2.2097	0.9163	0.9206
	(0.5439)	(0.2551)	(0.2518)
LFINFL	1.3587	-0.5791 (0.6595)	-0.5424 (0.6756)
	(0.8237)		
LHINFL	2.4486 (0.7606)	-0.7762 (0.6530)	-0.7925 (0.6458)

Panel B: Goodness of fit statistics and diagnostic tests			
R-squared	0.0153	0.9654	0.0409
Adjusted R-squared	-0.0178	0.9564	0.0085
F-statistic	0.4621	107.398	1.2656
Prob(F-statistic)	0.7094	0.0000	0.2910
Durbin-Watson	0.0790	1.6884	1.3963

Source: Output from E-Views; DV = Dependent variable; ( ) contains p-values
PLSM = Pooled Least Square Method; FEM = Fixed Effects Method; REM = Random Effects Method

From panel A of table 3, the estimated betas for the three inflation variants; LCINFL, LFINFL and LHINFL, all are consistently associated with high probabilities (p-value > 0.1), indicating that none of them is significantly related to dividend per share. The pooled least square beta estimate is negative for LCINFL (beta = -2.2097) but positive for both LFINFL (beta = 1.3587) and LHINFL (beta = 2.4486), indicating that dividend share is a negative function of core inflation but a positive function of both food and headline inflation rates. On the contrary, both fixed effects and random effects methods estimated positive coefficient for core inflation (beta > 0) beta a negative coefficient for both food and headline inflation rates (beta < 0). Thus, compared with the pooled least square method, the fixed effects and random effects methods estimated a reverse relationship between dividend per share and each of the three inflation variants.

From panel B of table 3 the explained variance in the dividend per share model which is estimated at 97% for the fixed effects method ($R^2 = 0.9654$) is quite substantial and much higher than approximately 4% and 1.5% estimated by the random effects ($R^2 = 0.0409$) and pooled least square ($R^2 = 0.0153$) methods respectively. This also implies that the fixed effects regression provides a much better fit for the relationship between dividend per share and the three inflation variants than both random effects and pooled least square regressions. Further, the overall fixed effects regression (F-statistic, 107.398, p-value = 0.0000) is highly significance while the overall random effects (F-statistic, 1.2656, p-value = 0.2910) and pooled least square (F-statistic, 0.4621, p-value = 0.7094) regressions both are insignificant at all conventional levels. The Durbin Watson statistic is also higher for fixed effects method (DW = 1.6884) than both random effects (DW = 1.3963) and pooled least square (DW = 0.0790) methods. Thus, the above results suggest that the fixed effects method outperformed its competitors. Again, formal tests are required to confirm which method is most appropriate for the relationships in model 3.

Table 3 shows the likelihood ratio and Hausman tests which formally compared the performance of the fixed effects methods with both the pooled least square and random effects method. Consistent with the pooled least square assumption, the Likelihood ratio test tests the null hypothesis that the unobserved firm specific fixed effects are insignificantly related with dividend per share. A rejection of this null hypothesis would imply evidence in favour

of the fixed effects method. On the other hand, the Hausman test tests the null hypothesis that these unobserved effects are uncorrelated with the three inflation variants in model 3.

Table 4: Model Selection Tests for Model 3

Test	$\chi^2 -$ statistic	*p*-value
Likelihood Ratio test	311.570	0.0000
Hausman Test	1.5961	0.6603

Source: E-Views results output

From table 4 the Likelihood ratio test (χ^2-statistic = 311.57) is associated with zero probability (p-value = 0.0000), indicating that the test is highly significant. Thus, the null hypothesis that the unobserved firm-specific effects in model 3 are insignificant is rejected at less than 1% significance level. This implies that the fixed effects method outperforms the pooled regression method. On the other hand, the Hausman test (χ^2-statistic = 1.5961) has a probability of 0.6603, indicating that the test is insignificant. The null hypothesis that the unobserved firm-specific effects are uncorrelated with the three inflation variants is therefore, not rejected at all conventional levels. This implies that the random effects method outperforms the fixed effects method. In conclusion, there is clear evidence that the random effects beta estimates in column 3 of table 4 are more reliable than those of pooled least square and fixed effects in columns 2 and 3 respectively.

Table 5: Panel Results (DV = Investment cash flows)

1	2	3		4	
Variable	**PLSM estimate**	**FEM estimate**		**REM estimate**	
Panel A: Model parameter estimates					
Constant	9.2151 (0.1122)	12.5472	(0.0002)	11.7633	(0.0002)
LFINFL	2.3725 (0.7958)	0.0551	(0.9903)	0.1346	(0.9757)
LCINFL	2.1283 (0.6483)	0.3595	(0.8786)	0.3070	(0.8940)
LHINFL	-2.3086 0.8403	0.3908	(0.9465)	0.4652	(0.9340)
Panel B: Goodness of fit statistics and diagnostic tests					
R-squared	0.0691	0.9063		0.0632	
Adjusted R-squared	-0.0271	0.8237		-0.0337	
F-statistic	0.7183	10.9678		0.6521	
Prob(F-statistic)	0.5491	0.0000		0.5880	
Durbin-Watson	0.2688	3.0056		1.655735	

Source: Output from E-Views' DV = Dependent Variable; ( ) contains p-values

PLSM = Pooled Least Square Method; FEM = Fixed Effects Method; REM = Random Effects Method

From table 5 we can see that the three inflation variants; LFINFL, LCINFL and LHINFL, all are associated with very high probabilities (p-values > 0.1), indicating that each has an insignificant relationship with corporate investment cash flows. Looking at the signs and the magnitude of the individual betas, although both LFINFL and LCINFL consistently have positive coefficients, the fixed effects and random effects estimates are more comparable than those of the pooled least squared method. For example, the estimated LFINFL coefficient for pooled least square method (beta = 2.3725) is much higher in size than that of the fixed effects method (beta = 0.0551) and random effects method (beta = 0.1346). Similarly, the estimated LCINFL coefficient for pooled least square method (beta = 2.1283) is much higher in size than that of fixed effects method (beta = 0.3595) and random effects method (beta = 0.3070). For headline inflation (LHINFL), the pooled least square method (beta = -2.3086) estimated a negative coefficient while the fixed effects (beta = 0.390) and random effects methods (beta = 0.4652) both estimated a positive coefficient.

In terms of the overall performance of the estimated model 4, we can see that the R-squared produced by the fixed effects method $(R^2{}_{Fixed} = 0.9063)$ is very substantial while that produced by the pooled least square $\left(R^2{}_{pooled} = 0.0691\right)$ and random effects methods $(R^2{}_{random} = 0.0632)$ both are very low. Similarly, while the F-statistic is associated with almost zero probability for the fixed effects method (p-value = 0.0000), it is associated with very high probability for both pooled least square (p-value = 0.5491) and random effects (p-value = 0.5880) methods. This may suggest that the fixed effects method produces a much better goodness fit to the panel data for model 4 than both pooled least square and random effects methods. However, given that the Durbin-Watson statistic for the fixed effects method (DW = 3.0056) is much higher than the theoretical 2 and the fact that none of the individual betas is statistically significant; we can say that the very high R-squared produced by the fixed effect method is misleading and doubtful. On the other hand, since the Durbin-Watson statistic for random effects method (DW = 1.6557) is close to 2 compared to that produced by the pooled least square method (DW = 0.2688), our initial conclusion is that the random effects estimates are more reliable than its competitors. However, formal specification tests are required to confirm this position.

Table 6 shows the Likelihood ratio and the Hausman specification tests results for model 4. As stated previously in chapter 3, these tests are formally used to compare the performance of the estimated three panel data methods While the Likelihood ratio tests compares the fixed effects estimates with those of the pooled regression under the assumption that the unobserved firm specific effects are irrelevant, the Hausman test compares the random effects estimates with those of the fixed effects under the assumption that the unobserved effects are uncorrelated with the explanatory variables.

Table 6: Model selection tests

Test	$\chi^2 -$ **statistic**	***p*-value**
Likelihood Ratio test	75.7832	0.0000
Hausman Test	0.7211	0.8682

Source: E-Views Results Output

From table 6the Likelihood ratio test (χ^2-statistic = 75.78, p-value = 0.0000) has a zero probability, indicating that the test is highly significant. Therefore, the assumption that the unobserved firm-specific effects are irrelevant in model 4 is invalid and rejected. This implies that the fixed effect estimates are more reliable than those of the pooled least square method. On the other hand, the Hausman test (χ^2-statistic = 0.7211, p-value = 0.8682) is associated

with a probability that is quite high, indicating that the test is insignificant. This validates the random effects assumption that the unobserved firm-specific effects are uncorrelated with the three inflation variants. Thus, the random effects method has outperformed the fixed effects method. This is consistent with our earlier position that the random effects estimates are better than its competitors in terms of the relationships in model 4. Therefore, based on the random effects results in column 4 of table 6, we can confidently announce that the three inflation variants; core, food and headline all are positively but insignificantly related with the firm investment cash-flows. Further empirical analysis and discussion for model 4 would be based on the random effects results.

Discussion of Findings

Our results show that holding constant the influence of exchange rate, interest rate and lagged average dividend yield, a 1% increase in inflation rate would on average, lead to approximately 0.03% reduction in average dividend yield. This evidence is provided by the coefficient on LINFL (-0.0303) in table 6 which is negatively signed, although, the high associated p-value (= 0.6012) indicates that this coefficient is not statistically significant. Thus, inflation and dividend yield are negatively related. Although, this result seems to be consistent with what appear to be academic consensus and most of the earlier studies including Linter (1975) and Bodie (1976), it should be interpreted with caution, given that size of the inflation beta suggests that the effect of inflation is only marginal.

First, we found that the random effects estimates are much better than both the pooled and the random effect methods. This evidence is provided by the Hausman specification test ($\chi^2 = 0.7211, p$-value = 0.8682) in table 6 which formally rejected the fixed effects method in favour of the random effects, although, the Likelihood ratio tests preferred the former over the pooled regression method. The implication is that the random effects model provides the best description of the relationship between inflation and investment decisions, and the heterogeneity parameter in our panel data specification does not correlate with the three inflation variants.

For the main relationship of interest, the random effects results suggest that the three variants of inflation; core, food and headline inflation rates, jointly do not have any significant influence on cash flow from investments. This evidence is provided by the fixed effects F-statistic (F= 0.6521, p-value = 0.5880) in Column 4 of table 6, which is associated with a very high probability, hence, failing to reject the null hypothesis of no joint effect of core, food and headline inflation rates on cash flow from investment. The Adjusted R-squared in the same column is negative, suggesting that the three inflation rates lack explanatory power for investment cash flows. In other words, variance of investment cash flows is not due to unexpected changes in core inflation, food inflation and headline inflation. Therefore, hypothesis 3 is not rejected.

On the individual effects, the random effect results also indicate that although, the three inflation variants all have positive coefficients, their effects on investment cash flows are, however, statistically insignificant as indicated by the p-values in Panel of 4. However, we argue that these coefficients are economically significant given that they are relatively large. The coefficients of 0.1346, 0.3070 and 0.4652 imply that cash flow from investment activities would increase by approximately 0.13%, 0.30% and 0.46% following a 1% increase in food, core and headline inflation rates respectively. Thus, firms' investment cash flows move in the same direction with the three inflation rates. However, while the headline inflation has the highest economic impact on firms' investment decisions, followed by the core inflation, the food inflation has the least impact. Thus, although, we rejected the null hypothesis of

no significant impact on statistical grounds, the theoretical argument that specific revenue and cost items react differently to an unexpected change in the rate of inflation has been validated.

Conclusion

There is evidence that the relationship between inflation and dividend decision is best described by an autoregressive process under a time series framework. The results show that inflation has a negative relationship with dividend decisions in Nigeria. However, the effect of inflation is insignificant as a 1% increase in inflation rate would, on average, reduce dividend yield by approximately 0.03%, holding the influence of exchange rate, interest rate and lagged average dividend yield. Thus, we conclude that inflation marginally distorts dividend decisions in Nigeria.

There is evidence that the relationship between inflation and investment decisions is best described by a random effects process under the panel data framework. Thus, the unobserved firm-specific effects such as management style, management culture and policy play an insignificant role in the relationship between inflation and investment decisions as they do not correlate with the three inflation variants in the investment decision model. Further, the three variants of inflation all move in the same direction with investment cash flows, but their effects are statistically insignificant both individually and collectively. However, we argue that the economic impact of inflation on investment decisions is significant given that investment cash flows increase by approximately 0.13%, 0.30% and 0.46% following a 1% increase in food, core and headline inflation rates respectively. Also, the headline inflation has the highest economic impact on firms' investment cash flows, followed by food inflation, and then by core inflation.

Recommendations

1. The evidence of a marginal effect of inflation on dividend decisions implies that rising inflation does not distort firms' stock investment decisions. Therefore, regular payment of dividends to shareholders should continue to be the main priority of firms even during rising inflation. This would serve as a signal to investors that the firm is operationally efficient and profitable, which would in turn boost investors' confidence about the future direction of the firm. This recommendation is consistent with the Signalling theory of Bhattacharya (1979, 1980) and Miller and Rock (1985) that payment of dividend is necessary, especially in the presence of asymmetric information between managers and shareholders.
2. The evidence that rising inflation increases the cash flows from investment activities implies that rising inflation is not deleterious to firm investment decisions. Therefore, we recommend that firms should invest in only assets that promise higher future cash flows and should use appropriate inflation-adjusted discounted capital budgeting methods to appraise new projects.

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