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The Influence of Inflation on Profitability of Publicly Quoted Firms in Nigeria: A Panel Data Approach

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Abstract:

The aim of this study is to examine empirically the relationship between inflation and firm profitability in Nigeria using firm-level panel data comprising 21 quoted companies over a period of 10 years from 2007 to 2016. Three variants of inflation; core inflation, food inflation and headline inflation, are considered while firm profitability is proxied by earnings per share. When the three conventional panel data models; pooled least square, fixed effects and random effects models are estimated and compared, the results show that the fixed effects model is the most plausible description of the relationship between inflation and firm profitability. The fixed effects results show that firm's financial profitability has a negative relationship with both core and food inflation rates but has a positive relationship with headline inflation rate. However, while none of the estimated coefficients is significant statistically, we argue that given the relatively large size of these coefficients, they are economically significant. Therefore, we conclude that inflation is an important factor for firm profitability in Nigeria

Keywords: Inflation, profitability, earnings per shares

1. Introduction

Firm profitability indicates the ability of firms to use its resources efficiently and generate profit from its operations. If the firm is unable to make profits, it will not be able to meet its financial obligations and reward its shareholders. If this inability to make profits persists, the firm will face serious operational problems, and this will adversely affect its value in the stock market. Modigliani and Miller (1958; 1961) explain profitability as the hallmark of a firm's corporate existence. A firm should make enough profit from its investments so that its value in the stock market can be maximized. They argue that the decision on how the firm capital is structured or how its profits are distributed does not matter as what matters is the ability of the firm to invest in projects with positive net present value.

However, apart from the firm-specific factors, firm profitability can be influenced by many macroeconomic factors. Among these factors is the rate of inflation. The role of inflation in firm's profitability is well researched. Inflation is known to be a social ill because it creates uncertainty in the firm's competitive environment. However, in the face of uncertainty created by inflation and other macroeconomic factors, corporate financial managers make investment decisions that are expected to lead to higher profitability so as to maximize their shareholders' wealth function. Every firm must, therefore, have a well-defined investment policy and develop a strategy on how to minimize the uncertainty created by inflation.

Theoretically, inflation has a negative influence on firm profitability. However, empirical evidence on the impact of inflation is mixed. While some studies reported evidence that is consistent with theory, others reported evidence of a positive relationship between inflation and firm profitability. This is the crux of the current study.

This study contributes to the literature by considering the effects of the three variants of inflation rates; core, food and headline inflation rates, on firm profitability using a sample of 21 quoted firms in Nigeria over a period of 10 years from 2007 to 2016. The study also examines the relative performance of the three static panel data methods; pooled regression, fixed effects and random effects methods, in the context of the relationship between inflation and firm profitability.

The remainder of this study has the following structure: The next section focuses on literature. Both the theoretical and empirical studies are reviewed. Section 3 describes the data, methods and model for empirical analysis. The empirical analysis and discussion of findings are provided in section 4 while the study is concluded in section 5.

2. Literature Review

Theoretically, high inflation threatens firms' budget, increase their operations costs and reduce their ability to meet their financial obligations (Pervan, Pelivan & Arneric, 2015). However, there are conflicting empirical results on the relationship between inflation and firm profitability. While some studies provide evidence supporting the theoretical negative relationship, others find that inflation and firm profitability are positively related.

Boyd, Levine and Smith (2001) examine effect of sustained inflation on financial sector performance for up to 100 countries using two data sets; banking data set spanning from 1960 to 1995 and stock market data set spanning from 1970 to 1995. 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.

Warr (2005) investigates the effect of inflation on economic value added (EVA) for a large sample of publicly traded US companies from 1974 to 2002 using the fixed effects regression approach. He argues that since inflation has a distorting effect on EVA through cost of capital and capital base and operating profit, these distortions would lead to inefficient investment and compensation outcomes. The results confirm that inflation has a distorting effect on EVA.

Using both cross-sectional and pooled regression, Konchitchki (2011) examines the economic consequences of not recognizing the effects of inflation from nominal financial statements and tests whether future cash flows can be predicted based on the gains and losses from inflation. The study is based on a sample of US firms U.S. with fiscal year-ends over the period 1984 to 2008 and the findings show that cash flow from operating activities is affected by unrealized inflation gains. The study further tests whether future stock returns depend on market expectations of inflation gains and the results show that inflation gains are not fully incorporated in stock prices as there is a negative relationship between gains from inflation and future abnormal returns.

Tan and Floros (2012) examine the factors that influence bank profitability in China using the two-step GMM system estimator. The sample includes 101 Chinese commercial banks (84 city banks, 12 joint stock banks and 5 state-owned banks) and covers the period from 2003 to 2009. However, the panel data is unbalanced as there are many missing observations. The results indicate amongst others that inflation and bank profitability are positively related.

Bhutta and Hasan (2013) examine the influence of food inflation and firm-specific factors on profitability of publicly quoted firms in the food sector in Pakistan using multiple regression analysis. The sample includes 12 firms and covers the period of 5 years from 2002 to 2006. Among the findings of the study is the positive but insignificant relationship between food inflation and food sector profitability.

Using a sample of 37 commercial banks (24 foreign and 13 local), Ongore and Kusa (2013) consider the effects of both firm-specific factors and macroeconomic factors on bank performance in Kenya from 2001 to 2010. The included firm-specific factors are capital adequacy, assets quality, management efficiency and liquidity while GDP and inflation are included as macroeconomic factors. ROA, ROE and net interest margin are used as bank performance variables. The study also considers the moderating effect of ownership structure on the above relationships. Ownership structure is captured by a dummy variable which has a value of 1 if the bank is locally owned or zero if it is owned by foreigners. The study finds amongst others that inflation exerts a significant negative effect on all performance measures.

In China, Wang, Chen and Song (2014) use a sample of 9165 quoted firms to investigate how corporate cash holdings respond to changes in inflation rates and operating cycles from both the macro- and the micro-perspective for the period 1998 – 2009. The fixed effects method is used, and the empirical results show that inflation, measured by consumer price index, and corporate cash holdings are negatively related. Higher level of inflation reduces the tendency of firms to hold cash. However, when inflation increases to a certain level, firms tend to increase their cash holding in order to reduce bankruptcy risk. The empirical findings also show that the relationship between cash holding and operating cycle is quadratic or U-shaped, but this relationship is affected as inflation changes.

Pervan, Pelivan and Arneric (2015) use 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.

Islam and Khan (2019) examine the effects of firm-specific and macroeconomic factors on the profitability of firms in the pharmaceutical industry in Bangladesh using the random effects regression approach. The data consists of 200 panel data observations for 20 firms over 10 years from 2007 to 2016. The results show among other things that both growth rate in GDP and inflation rate are significant determinants of firm profitability, measured by return on assets. However, while the effect of inflation is negative, the effect of GDP growth is positive.

3. Methodology

3.1. Data and Sample

To examine the impact of inflation on firm profitability in Nigeria, we use firm-level panel data at yearly frequency for 21 quoted companies over the period from 2007 to 2016. The companies, which were selected from different sectors, include Nigerian Breweries, Nestle, First Bank, United Bank for Africa, Oando, Julius Berger, UPDC, Dangote Cement, Lafarge, Livestock Feeds, Okomu Oil, Academy Press, University Press, May & Baker, Morrison, NCR, Tripple Gee, A. G. Leventis, John Holt, Alumin. Extru Ind and BOC Gases. Three inflation variants; core inflation, food inflation and headline inflation, are considered while firm profitability is proxied by earnings per share. The inflation data are obtained from the CBN statistical bulletin while earnings per share is calculated from the data obtained from the firm annual reports. The empirical analysis is done in EViews 9.

3.2. Model Specification

We specify our empirical model as follows:

$$EPS_{it} = \beta_0 + \beta_1 CINFL_{it} + \beta_2 FINFL_{it} + \beta_3 HINFL_{it} + k_i + u_{it}$$

Where EPS = earnings per share, $CINFL$ = core inflation, $FINFL$ = food inflation and $HINFL$ = headline inflation. Further, β_0 = the intercept term, k_i = the company-specific latent parameter which controls for cross-sectional heterogeneity, β_1, β_2 and β_3 are regression betas and u_{it} = the error terms. The cross-sectional dimension of our panel data is represented by i , its time series dimension is represented by t . We assume that the specified relationships are constant both cross-sectionally and over time, hence, there is no subscript attached to the β 's.

As it is well known, there are three conventional methods of solving a panel data model; pooled regression, fixed effects and random effects methods. While these methods have their specific advantages and assumptions about the heterogeneity term, it is usual to compare their relative performance using some formal tests. Two of these tests; Likelihood ratio and Hausman tests would be used to determine the best performing model for our panel data.

4. Empirical Analysis

4.1. Panel Data Regression Results

Table 1 shows the estimated pooled least square, fixed effects and random effects models for the relationship between the three inflation variants; core, food and headline inflation rates, and earnings per share. Panel A shows the model parameter estimates while panel B shows the model fit and model diagnostic tests. Table 2 shows the model specification tests.

1	2	3	4
Variable	PLSM estimate	FEM estimate	REM estimate
Panel A: Model parameter estimates			
Constant	-0.7549 (0.6693)	0.8142 (0.3864)	0.3669 (0.7197)
LCINFL	-0.8916(0.5211)	-1.0580 (0.1498)	-1.0183 (0.1650)
LFINFL	0.5294 (0.8488)	-1.3038 (0.3789)	-1.0074 (0.4945)
LHINFL	0.5878 (0.8740)	1.9794 (0.3138)	1.7021 (0.3848)
Panel B: Goodness of fit statistics and diagnostic tests			
R-squared	0.0089	0.7615	0.0194
Adjusted R-squared	-0.0097	0.7241	0.0009
F-statistic	0.4781	20.327	1.0524
Prob(F-statistic)	0.6979	0.0000	0.3711
Durbin-Watson	0.4202	1.7591	1.4909

Table 1: Panel Data Regression Results

Source: Output from EViews

DV = Dependent variable

PLSM = Pooled Least Square Method

FEM = Fixed Effects Method

REM = Random Effects Method

() contains p-value of t-statistic

From panel A of Table 1, we can see that all the estimated betas are associated with probabilities (p-value > 0.1) that are higher than the conventional significant levels, indicating that none of the three variants of inflation rates is significantly related to earnings per share. Further, the coefficient on CINFL (beta < 0) is consistently negative for different methods, indicating that earnings per share and core inflation rate are negatively related. By contrast, however, the coefficients on both LFINFL and LHINFL have mixed signs. For pooled least square method, the two variables are associated positive sign (beta > 0), showing that they are positively related with earnings per share. For both fixed effects methods, both variables are associated with negative signs (beta < 0), showing that they are negatively related to earnings per share. Thus, there is motivation to formally confirm which of these methods can be trusted.

From panel B of Table 1, we can see that the fixed effects method seems to provide a much better goodness of fit than its competitors, with about 76% ($R^2_{Fixed} = 0.7615$) of the error variance in earnings per share accounted for by the joint influence of the three variants of inflation rates. The proportion of the variance in earnings per share that is jointly explained by the explanatory variables is as low as approximately 0.8% and 1.9% for pooled least square ($R^2_{Pooled} = 0.0089$) and random effects ($R^2_{Random} = 0.0194$) methods respectively. The F-statistic is associated zero probability for fixed effects method, and a probability of 0.6979 and 0.3711 for pooled least square and random effects methods respectively. This shows that the fixed effects regression is highly significant while both pooled least square and random effects regressions are insignificant at all conventional levels. The Durbin-Watson statistic is also higher for fixed effects method (DW = 1.7591) compared with the pooled least square (DW = 0.4202) and random effects (DW = 1.4909) methods. Although, these results suggest that the fixed effects method performs much better than its competitors, formal tests are, however, required to confirm which method is most appropriate for the relationship between inflation and earnings per share.

Table 2 shows the likelihood ratio and Hausman tests which formally compare 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 earnings 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 unrelated to the three inflation variants. Rejecting this null hypothesis also implies evidence in favour of the fixed effects method.

Test	χ^2 – statistic	p-value
Likelihood Ratio test	232.236	0.0000
Hausman Test	8.0990	0.0440

Table 2: Model Selection Tests
Source: Eviews Results Output

From Table 2, the Likelihood ratio test (χ^2 -statistic = 232.23) 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 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 = 8.0990) has a probability of 0.0440, indicating that the test is significant at 5% level. The null hypothesis that the unobserved firm-specific effects are uncorrelated with the three inflation variants is therefore, rejected. This implies that the fixed effects method outperforms the random effects method. In conclusion, there is clear evidence that the fixed effects beta estimates in column 3 of Table 1 are more reliable than those of pooled least square and random effects in columns 2 and 4 respectively.

4.2. Discussion of Findings

First, the fixed effects results in Panel B of Table 1 indicate that the joint influence (F-statistic = 20.327, p-value = 0.0000) on earnings per share of core, food and headline inflation rates is highly significant effect. Therefore, consistent with the theoretical view, the three inflation variants jointly determine firm profitability in Nigeria.

Further, the fixed effects results in Column 3 of Table 2 indicate that none of the three inflation variants has a statistically significant impact on firm profitability. However, the size of the individual betas implies that the effect of each inflation rate is economically significant, although, there is mixed evidence in terms of their signs. The negative betas for both core (beta = -1.0580, p-value = 0.1498) and food (beta = -1.3038, p-value = 0.3789) inflation rates support the theoretical view that inflation has a negative impact on firm profitability. A 1% increase in both core and food inflation rates would lead to more than 1% decrease in earnings per share. This also agrees with the findings of Pervan, Pelivan and Arnerić (2015) that inflation and operating expenses management impacts the profitability of Croatian banks negatively and significantly. On the contrary, however, the positive sign of headline inflation (beta = 1.9794, p-value = 0.3138) indicates that high inflation increases firms' accounting profitability. A 1% increase in headline inflation rate leads to almost 2% increase in earnings per share. This tends to contradict the theoretical prediction and most of the previous empirical studies.

5. Conclusions

In this study, we examine the effects of the three inflation variants on firm profitability using Nigerian firm-level panel data. The study also considers the effects of unobserved firm-specific factors on the relationship between inflation and capital structure. The three inflation variants are core, food and headline inflation rates while earnings per share is used as a proxy for firm profitability. The study covers the period from 2007 to 2016.

When the three conventional panel data models; pooled least square, fixed effects and random effects models are estimated and compared, the results show that the fixed effects model is the most plausible description of the relationships between inflation and firm profitability. Both the Likelihood ratio tests and the Hausman specification test indicate that the fixed effects model, which assumes that firm-specific effects are correlate with inflation in the earnings per share model, performs better than both the pooled regression and random effects methods.

The fixed effects results show that firm profitability has a negative relationship with both core inflation and food inflation rates but has a positive relationship with headline inflation rate. However, while none of the estimated coefficients is statistically significant, we argue that given the relatively large size of these coefficients, they are significant economically. Therefore, inflation rate is an important factor for firm profitability in Nigeria.

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