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Introduction- Economic policies in favour of openness and liberalisation have open up new markets, promoted financial market globalization and bridge the gap between domestic and foreign markets (Kim, 2003) but with attendant consequences for shocks contagion among countries. Some of these external shocks come in the form of exchange rate fluctuations (see Suriani, et al. 2015) occasioned by erratic portfolio investment flows, put differently, inconsistent international capital flow (Basak, et al. 2017), and instability in the price of essential commodity traded internationally such as crude oil in the case of Nigeria. These external risks and shocks have implications on domestic macroeconomic fundamentals and as such impact on financing and investment decisions. These fluxes can feed into the domestic financial market to amplify volatility in the stock market and create uncertainties for investors and speculators in the financial markets (see Khan and Abbas, 2015)..

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The Nexus between Stock Market Prices and External Shocks: Evidence from Nonlinear ARDL on Selected Firms in the Nigerian Stock Market

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I. Introduction

Economic policies in favour of openness and liberalisation have open up new markets, promoted financial market globalization and bridge the gap between domestic and foreign markets (Kim, 2003) but with attendant consequences for shocks contagion among countries. Some of these external shocks come in the form of exchange rate fluctuations (see Suriani, *et al*. 2015) occasioned by erratic portfolio investment flows, put differently, inconsistent international capital flow (Basak, *et al*. 2017), and instability in the price of essential commodity traded internationally such as crude oil in the case of Nigeria. These external risks and shocks have implications on domestic macroeconomic fundamentals and as such impact on financing and investment decisions. These fluxes can feed into the domestic financial market to amplify volatility in the stock market and create uncertainties for investors and speculators in the financial markets (see Khan and Abbas, 2015).

The foregoing has brought to fore the need to understand the role of risks associated with stock market from economic shocks as it impacts investment decisions; international investors hedging and portfolio diversification process (Aydemir and Demirhan, 2009; Kutty, 2010). This is a clear motivation to evoke research interests on the interconnection between international markets; goods, financial and foreign exchange markets. Theories suggest that stock market fundamentals respond to changes in exchange rate and pass-through shocks from the international oil market. This is particularly true for an oil dependent small open economy who takes essentials in the international market as given. There are also arguments that exchange rate respond to shocks from oil market from where it passes through to the stock market. There is therefore the need to undertake a research effort on the stock market, oil price and exchange dynamics. The role of oil shocks is evident in the nexus between stock and foreign exchange markets especially for an oil dependent economy like Nigeria that build up its foreign reserve with oil proceeds.

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This study is anchored on a three-legged theoretical footing; the asset pricing theories, the flow theory, and the portfolio balance theory. The asset pricing theories (Arbitrage Pricing theory and Capital Asset Pricing theory) connects stock market with risks from international transactions such as oil price shocks and exchange rate fluctuations. The flow model explains the dynamism of oil price shocks and exchange rate movements while the portfolio balance theory links exchange rate with stock market. A host of studies have worked in this regard with mixed conclusions (see for example Smith, 1992; El-Sharif, 2005; Aydemir and Demirham, 2009; Kutty, 2010; Tsai 2012;Zubair, 2013; Litsios, 2013; Dellas and Tavlas, 2013; Al-Shboul and Anwar, 2014; Narayan and Gupta, 2014; Narayan and Sharma, 2014; Khan and Abbas 2015; Raza, *et al*. 2016; Zivkov, et al. 2016;Salisu and Isah, 2017; Swaray and Salisu, 2017).

While the preceding empirical evidences on the impact of economic risks and shocks from international markets on the stock market adopt macro structure, the present study departs from this conventional way of inquiry to adopt a micro view to focus more on individual firms in the stock market. This is in tune with reality given that firms in the stock exchange markets are not homogenous and therefore, the shocks pass-through from international transactions may not be uniform across firms. Firms from different industries differ in terms of cost structure, competition, and regulation (see Fama and French, 1993); and as such, shocks from international oil price can have different impacts on each firm. Thus, we select firms across the banking, oil and gas, construction subsectors to examine the impact of these international risks on their stock prices. This study will assist in targeting policies appropriately to protect domestic firms against global market risk contagion.

II. Theoretical and Empirical Literature

Theoretically, stock market price orreturn has been visualised to respond to economic and financial risks such as oil price and exchange rate (see Fama and French, 2004; Salisu, *et al*. 2017). The theoretical modelling of stock return relies on the Ross (1976) Arbitrage Pricing Theory and the different variants of

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Capital Asset Pricing theories of Sharpe(1964), Lintner, 1965; Merton, 1973, 1990; Breeden, 1979; Jagannathan and Wang, 1996; Fama and French, 1993, 1995. Empirically, studies such as El-Sharif, 2005; Park and Ratti, 2008; Driesprong, *et al*. 2008; Raza, *et al.* 2016; Jiang and Gu, 2016; Salisu and Isah, 2017; Swaray and Salisu, 2017 assess the influence of oil price shocks on stock prices and report mixed findings. A number of other studies examine the influence of exchange rate risks in stock markets models (for example Aydemir and Demirham, 2009; Kutty, 2010; Zubair, 2013; Litsios, 2013; Lin, 2012; Dellas and Tavlas, 2013; Al-Shboul and Anwar, 2014; Suriani,*et al*. 2015; Raza, *et al*. 2016; Zivkov, *et al*. 2016). These studies are also polarised as regards their controversial results.

The theoretical motive for examining the risks from international commodity market is rooted in the flow model, which considers trade flows as the main determinants of exchange rate (see Dornbusch and Fischer, 1980). The trade approach suggests that the demand and supply for foreign exchange are determined by the flows of currency created by international transactions in goods and services and portfolio investment. Consequently, for an oil dependent economy, this has evoked interest to consider the risk exposure from oil price in international market; exchange rate response and pass-through to stock price via the international flow of portfolio investment. Empirical exercise in this line have shown that exchange rate responds to oil price shocks from where it transmits to the domestic economic variables (see for example Kilian, 2009; Kilian and Vigfusson, 2011; Atems, *et al*. 2015).

With the upsurge in investment flows due to financial globalisation and integration, there has been greater role for financial assets in exchange rate determination (Kim, 2003; Khan and Abbas, 2015). To conceptualise this theoretically, the financial asset theory also known as stock model comes in handy. The financial asset theory link exchange rates to the foreign and domestic demand and supply of money, bonds, stocks and other financial assets (see Fama and French, 2004). There are two variants of the asset theory in the literature; the monetary theory (see Mussa, 1976; Dornbusch, 1976; Bilson, 1978; Frenkel, 1976 among others) and the portfolio balance theory (see Branson, *et al*. 1977; Branson, 1983; Friedman, 1988; Boyle, 1990 among others). The monetary theory is a restricted version of the asset theory which single out the influence of monetary factors excluding other financial assets in exchange rate determination (see Khan and Abbas 2015; Salisu and Oloko, 2015). The theory opines that exchange rate for any two currencies is determined by relative money demand and money supply between the two countries (see Fama and French, 2004; Huy, 2016). The other variant, the portfolio balance theory underscores the influence of all classes of financial assets in international transactions for exchange rate adjustments. In the portfolio balance model, investors compose their portfolios with money and other financial assets (see Fama and French, 2004; Huy, 2016). These investors who, by rule seeks to hedge against risk, diversify their investment portfolio from countries with lower stock returns to countries with higher stock returns, leading to high demand (currency appreciation) for the currencies of the countries with higher stock return at the expense of the countries with lower stock returns (see for more details Kutty, 2010; Ulku and Demirci, 2012; Salisu and Oloko, 2015). Using this theory, a good number of empirical studies have examined the nexus between stock returns and exchange rate fluctuations (see for example Smith, 1992; Tsai 2012; Kutty, 2010; Khan and Abbas 2015; Zivkov, et al 2016).

These previous empirical evidences apply the underlying theories for aggregate study of the stock market. However, we argue that the stock market comprises of heterogenous set of firms with unique characteristics and as such deserve to be studied distinctly. Innovatively therefore, we adopt a micro framework to investigate the impact of economic shocks and risks from exchange rate and international oil price on individual firms of the stock market. The nexus between stock market and exchange rate is emphasised given that the two markets are entwined in any open economy. The focus of the study on Nigeria further accentuate the need to examine the role of oil price fluctuations given the status of the oil sector in the economy. We further make improved contribution on Nigerian specific studies by considering the asymmetric response of stock market fundamental to exchange rate and oil price changes. This allows us to see clearly the impact of positive and negative external shocks.

III. Data and Methodology

This study is centred on the Nigerian stock market. To circumvent aggregation bias, we conduct a micro analysis on specific firms cutting across various sectors (consumables, oil & gas, construction, pharmaceuticals, insurance and banking) of the Nigerian economy. We therefore obtain data on share prices of each of the firms namely, Nestle, Oando, Julius Berger, Glaxo Smith Kline, AIICO Insurance, and Access Bank to highlight the role of external shocks pass-through from international oil market and foreign exchange market on the stock market performance. We adopt 83-period daily data on the variables from 01/06/2017 to 29/09/2017. The ensuing results provide insight as to the risks exposure of the investors in the Nigerian financial market.

On the basis of the theoretical footing and empirical literature espoused in the previous section and case for nonlinearity in the stock, foreign exchange and oil markets nexus, we adopt the nonlinear ARDL

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(NARDL) framework of Shin, et al. (2014) to model asymmetric response of firm-level stock prices from oil price and exchange rate. The model specification evolves from a simple nonlinear specification to an on linear ARDL model as follows:

$$stp_{i,t} = \alpha + \alpha_0 stp_{i,t-1} + \alpha_1 exch_t^+ + \alpha_2 exch_t^- + \alpha_3 oilp_t^+ + \alpha_4 oilp_t^- + e_t \quad (1)$$

Where 'stp', 'exch', 'oilp' and 'i' are stock price, exchange rate, oil price and the ith firm (one of the six firms in the Nigerian stock market) respectively. The positive and negative superscripts are the partial sums of the positive and negative changes in oil price and exchange rate.

$$\Delta stp_{i,t} = \alpha + \beta_0 stp_{i,t-1} + \beta_1 exch_{t-1}^+ + \beta_2 exch_{t-1}^- + \beta_3 oilp_{t-1}^+ + \beta_4 oilp_{t-1}^-$$
$$+ \sum_{t=1}^{p} \varphi_j \Delta stp_{i,t-j} + \sum_{t=0}^{q} (\theta_j^+ exch_{t-1}^+ + \theta_j^- exch_{t-1}^-) + \sum_{t=0}^{s} (\vartheta_j^+ oilp_{t-1}^+ + \vartheta_j^- oilp_{t-1}^-) + \zeta_t \quad (2)$$

The equation (2) is the study specific NARDL specification of Shin, et al. (2014) on the pattern of Pesaran, et al. (2001). The estimation of the model is the fulcrum of this study.

IV. Results and Discussion

a) Preliminary Analyses

Prior to estimation of the asymmetric model, we conduct preliminary analyses on the data. These involve the descriptive statistics to reveal the salient characteristics of the series (i.e. mean, standard deviation, skewness and kurtosis) (see Table 1) and the stationarity tests (Augmented Dickey-Fuller, Pillips-Perron, and Kwiatkowski-Phillips-Schmidt-Shin) to show time series properties of the variables (see Table 2). Deducible from the analyses, oil price in the international market sells for an average of US$ 47.45 while the dollar exchanges for N338.59 for the second half of the year 2017. Among the six firms, Nestle is the most performing company while AIICO insurance is the least performing in terms of prices of their stocks. Based on this benchmark, GSK, Julius Berger, Oando, and Access Bank appear to perform below average given their relatively low share prices compared with Nestle.

Five of the eight variables are negatively skewed including those of the external shocks while AIICO, Julius Berger and Oando stock prices are positively skewed. The kurtosis statistics also turn up a mixture of leptokurtic (those with kurtosis values greater than 3) and mesokurtic distributions (those with values less than 3). Consequently, the external shocks, AIICO and Julius Berger are mesokurtic while the other four variables are leptokurtic. The variables are a mixture of stationary and non stationary series; integrated of orders one and zero. An interesting observation here is that the same variables that are mesokurtic are also integrated of order 1 while the leptokurtic series (Access, GSK, Nestle and Oando) are stationary at level. These information are contained in Tables 1 and 2 and they form the basis for adopting an ARDL framework.

Table 1: Descriptive Statistics

Variables	Mean	Standard Deviation	Skewness	Kurtosis
External shocks				
Exchange rate (N/$)	338.599	20.3841	-0.3084	1.8877
Oil price (US$)	47.4507	2.23175	-0.0483	2.4974
Stock prices				
Access bank	9.7915	0.4224	-0.4129	3.6624
AIICO	0.5707	0.0256	0.4426	2.8837
GSK	20.474	0.9766	-1.1878	5.2445
Julius Berger	35.051	3.6351	0.2840	2.3339
Nestle	1044.505	184.894	-2.0005	12.671
Oando	18.1378	99.0917	8.9440	81.001

Source: Author's Computation

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Table 2: Stationarity Tests

Variables	ADF	Status	PP	Status	KPSS	Decision
External shocks						
Exchange rate (N/$)	-11.69*** (-4.0753)	I (1)	-12.14*** (-4.0753)	I (1)	0.0842 (0.2160)	Stationary at first diff.
Oil price (US$)	-9.630*** (-4.0753)	I (1)	-9.630*** (-4.0753)	I (1)	0.0784 (0.2160)	Stationary at first diff.
Stock prices						
Access bank	-3.6303** (-3.4655)	I(0)	-3.8651** (-3.4655)	I (0)	0.1285 (0.1460)	Stationary at level
AIICO	-3.9037** (-3.4655)	I (0)	-3.6112** (-3.4655)	I (0)	0.1463 (0.1460)	Stationary at first diff.
GSK	-3.5034** (-3.4655)	I (0)	-3.5840** (-3.4655)	I (0)	0.0880 (0.1460)	Stationary at level
Julius Berger	-7.755*** (-4.0753)	I (1)	-7.815*** (-4.0753)	I (1)	0.0584 (0.2160)	Stationary at first diff.
Nestle	-6.362*** (-4.0738)	I (0)	-6.609*** (-4.0738)	I (0)	0.1518 (0.2160)	Stationary at level
Oando	-9.125*** (-4.0738)	I (0)	-9.126*** (-4.0738)	I (0)	0.0481 (0.2160)	Stationary at level

Source: Author's Computation

***, **, * represent significance at 1, 5 and 10% respectively
The null hypotheses of ADF and PP tests are that the underlying series are non stationary while the KPSS null is that the series is stationary.
Values in parenthesis are the tabulated values of the relevant test statistics at 5% significance level.

b) Asymmetric models of stock prices: positive and negative changes in oil price and exchange rate

Having shown that the variables of the study are a mixture of stationary and integrated series, we proceed to estimate the NARDL model specified in (2). Given that our study is a micro-analytical study of the specific stock prices, we estimate the NARDL model for each of the six selected firms in the Nigerian stock market to decompose the positive and negative responses of the stock prices to external risks posed by fluctuations in the international oil market and foreign exchange market (see Table 3). The results are partitioned to reveal the short run and long run effects of oil price and exchange rate on the firm-level stock prices. The results obtained from the estimations appear to be reliable given that all the error correction parameters are correctly signed (i.e. negative) and significant. For consistency, only coefficients that are statistically significant are considered in the discussion.

In the short run, positive shocks to exchange rate (dollar appreciation) seems to increase the share prices of Access Bank, AIICO insurance, GSK & Nestle while exchange rate (dollar) depreciation have limited impact on stock prices; affecting only two of the six firms' stock prices – a negative impact on Access bank and positive impact on Nestle. This implies that asymmetry does not matter in the nexus between exchange rate and Nestle stock price in the short run. Asymmetry however does matter in the Access bank stock price – exchange rate nexus.

On the short run impact of oil price shocks, increases in the international oil price appear to raise the share prices of Access bank and GSK while the negative changes to oil price exert negative impacts on the share prices. This shows that asymmetry matters in the nexus in the short run. In a different parlance, either positive or negative changes to oil price reduces the share prices of AIICO, Julius Berger, Nestle, and GSK. Thus, asymmetry does not matter in these relationships. Result also clearly indicates that asymmetry does not matter in the Nestle stock price – oil price nexus in the short run since the asymmetric changes result to the same (negative) impact.

There is no case for asymmetry in the long run relationship between exchange rate and the stock prices. The asymmetric changes in exchange rate increase the stock prices in the long run. Also, asymmetry turn out to be negligible when we consider shocks from oil price. The reason for this is not far fetched. Both positive and negative components of oil price produce positive impact on Access bank shares and negative impact on AIICO shares. Further, oil price increase appears to increase GSK and Nestle.

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Table 3: The estimated asymmetric models of firm-level stock prices

Variables	Exchange rate				Oil price				ECM
	Long run		Short run		Long run		Short run		
	Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative	
Access bank	0.01446** (0.0199)	0.01459* (0.0992)	0.00636** (0.0201)	-0.0075* (0.0942)	0.13382*** (0.0013)	0.19028*** (0.0001)	0.17723*** (0.0011)	-0.1309*** (0.0064)	-0.44015*** (0.0000)
AIICO	0.00020 (0.5538)	0.00013 (0.7795)	0.00115*** (0.0022)	0.000062 (0.7791)	-0.0086*** (0.0033)	-0.0087** (0.0133)	-0.00404** (0.0168)	0.01154*** (0.0048)	-0.46916*** (0.0000)
GSK	0.00489 (0.6588)	0.04644** (0.0183)	0.01310* (0.0613)	-0.00940 (0.1952)	0.30754** (0.0130)	0.04486 (0.7050)	0.09263*** (0.0005)	-0.1545** (0.0125)	-0.30120*** (0.0000)
Julius Berger	0.06011 (0.4972)	-0.00279 (0.9817)	0.00625 (0.5092)	-0.00029 (0.9817)	-0.35656 (0.5791)	0.59532 (0.4838)	-0.03711 (0.5998)	0.06197 (0.4520)	-0.10409** (0.0300)
Nestle	2.89443** (0.0338)	3.31514* (0.0747)	2.27206** (0.0409)	2.60231* (0.0840)	19.9197* (0.0576)	6.48575 (0.6075)	-124.13*** (0.0000)	-54.039** (0.0448)	-0.78497*** (0.0000)
Oando	0.56113 (0.4919)	1.08955 (0.3307)	0.66148 (0.4933)	1.28440 (0.3351)	-8.6875 (0.1677)	-10.5223 (0.1673)	113.133*** (0.0000)	36.5229 (0.1374)	-1.17883*** (0.0000)

Source: Author's Computation

***, **, * represent significance at 1, 5 and 10% respectively
Values in parenthesis are the probability values of the coefficients.

V. Conclusion

This study is motivated by the asset pricing, the flow, and portfolio balance theories and the controversies around studies that adopt same for to examine the nexus among stock price, exchange rate and oil price. This study is distinct in that it adopts a micro analysis to assess the asymmetric responses of firms' stock prices to positive and negative changes in oil price and exchange rate. The results are mixed across the firms but evidence reveal that the role of asymmetry is negligible in the nexus. Based on the short run dynamics, Access Bank, AIICO insurance, GSK and Nestle could expect to benefit in terms of higher share prices from dollar appreciation against the naira. In the same vein, Access bank and GSK could gain from positive shocks to oil in the international market.

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