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All-Share Index in the Nigerian Capital Market Responses to External Financial Flows Shocks

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Capital market remains an effective channel of financial intermediation. However, it has been underperforming in developing economies and thus resulting in the attendant illiquidity and other inefficiencies. This study examined the response of All-Share Index (ASI) to external financial flows shock since accessing capital from the capital market to augment the saving-investment gap has necessitated the high demand for external financial flows in Nigeria. The study employed data from 1981 to 2021 and the framework of impulse-response function and short-run pairwise Granger-causality approach were used. The finding showed that the impulse-responses of ASI for one-unit shocks to remittance from personal transfers, remittance from compensation of employees (RECE), trade openness and official development assistance (ODA) had noticeable positive impacts on ASI from the short to long-run. While shocks to FDI and FPI had negative impacts on ASI in the long-run. Also, the causal relationships were mixed-revealing across the time periods. The implication is that policymakers must develop policy directions to suit the time horizon of capital flows because the policy measures aimed at directing long-run capital inflows should not be the same as those aimed at changing the short-run patterns of flow in enhancing capital market performance.

Keywords: All-share index, capital market, external financial flows, impulse response function, Nigeria

JEL: C59, E44, F30

The slow spate of development in the developing countries is usually traceable to inadequate resources to speed up economic growth and development, as saving in this part of the world is usually less than the investment needs (Akhtaruzzaman, 2019; Emiola and Fagbohun, 2021; Olowe *et al*., 2022; World Bank's Nigeria Economic Outlook, 2018). Thus, most economies have resorted to foreign borrowings while others geared efforts toward attracting foreign contributions in the form of external finance inflow through the capital market to stimulate development. Hence, the importance of external financial flows either by private or public agencies in promoting growth and development in developing countries cannot be overemphasized.

However, most developing economies are challenged with inadequate domestic investment that could ensure the achievement of desired economic growth. This is because there is an imbalance between the

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required capital and the available saving capability. Thus, accessing capital from the capital market to augment the saving-investment gap has necessitated the high demand for external financial flows in Nigeria (Abayomi and Yakubu, 2022; Ayeni and Fanibuyan, 2022; Imoughele, 2020; Iortyer and Maji, 2022; Musa *et al*., 2022). Also, capital markets in developing economies are underdeveloped or underperforming, thus the attendant illiquidity, high cost of transactions, and other inefficiencies and lack of finance for development (Abayomi and Yakubu, 2022; Omimakinde and Otite, 2022). External financial flows include Foreign Direct Investment (FDI), Foreign Portfolio Investment (FPI), Remittance from Personal Transfers (REPT), Remittance from Compensation of Employees (RECE), Trade Openness and Official Development Assistance (ODA).

Therefore, this study sought to determine the extent to which external financial flows will influence capital market performance in Nigeria proxied by all share index. Because an increase in external financial flows is expected to increase capital market performance, it leads to an increase in the volume of transactions by listed firms on the stock exchange (Akinmulegun, 2018; Azimi, 2022; Babatunde and Ajibola, 2017; Ezeibekwe, 2021; Gbalam *et al*., 2020; Nkemgha *et al*., 2023). The fundamental objective of this research work is to empirically examine the response of All-Share Index in the Nigerian capital market to external financial flows shock, and analyse the short-run causal linkage between the external financial flows and the Nigerian All-Share Index. In other words, the study is interested in the extent to which All-Share Index response to external financial flows shocks, and it is imperative to raise the research question to guide this enquiry. Do external financial flows have any significant shock on All-Share Index in Nigerian capital market? Answering this question will provide critical understandings to the various economic agents such as policymakers, public and private investors, and the nexus between external financial flows and capital market performance in Nigeria. Therefore, this study filled this gap by investigating the effect of external financial flows (FDI, FPI, REPT, RECE, TOP and ODA) on capital market performance in Nigeria and the eventual spillover effects of improvement on the capital market performance affecting external financial flows.

The rest of this study is structured as follows: Section two comprises the literature review; section three

focuses on the methodology; section four presents the results, while section five concludes the paper by outlining the summary of findings, policy implications, and limitations and future directions.

LITERATURE REVIEW

Theoretical Underpinnings

-The Capital Market Theory (CMT)

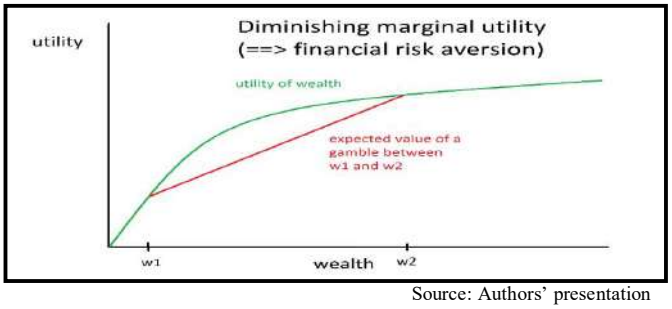
The three major theories of capital market efficiency and investors' prospect, incorporate the Efficient Market Hypothesis (EMH), Modern Portfolio Theory (MPT), and the Capital Asset Pricing Model (CAPM). Capital market theories offer the muse for the event of monetary asset pricing models.

Beneath the norms of MPT, risk-averse venture capitalists have similar outlooks concerning the mean, variance, and covariance of asset earnings, and wish at make the most of their expected utility when making investment choices. The CMT explains and forecast how capital and intermittently financial markets will develop over time (Qi *et al*., 2023). Furthermore, in studying the CMT, managers deal with issues like the role of the capital markets (this emphasizes its relevance to this study), the major capital markets, the initial public offerings, and the role of the venture capital in capital markets.

The primary role of the capital market is allocation of ownership of the economy's capital stock" (Fama, 1970). Based on the assumption of market efficiency and the principle of diversification, Markowitz (1952) developed the first theory that incorporates the concept of risk in the portfolio management process. The attitude of investors towards risk in the portfolio theory of Markowitz (1952) is based on the concept of risk aversion described by the expected utility theory, which is expressed by the conventional utility curve illustrated in Figure 1.

Under the expected utility theory, investors make decisions between alternative investments based on the expected utility that can be achieved from the respective investments as shown in Equation (1) (Kahneman and Tversky, 1979):

$$E(U) = (p_1 u(x_1) + p_2 u(x_2) + \cdots + p_n u(x_n) \qquad (1)$$



Source: Authors' presentation

Figure 1. Risk Aversion and Marginal Utility

Where: $x_1, x_2 \cdots x_n$ are the possible asset positions of the investment; and $p_1, p_2 \cdots p_n$ are the probabilities assigned to the possible asset positions of the investment.

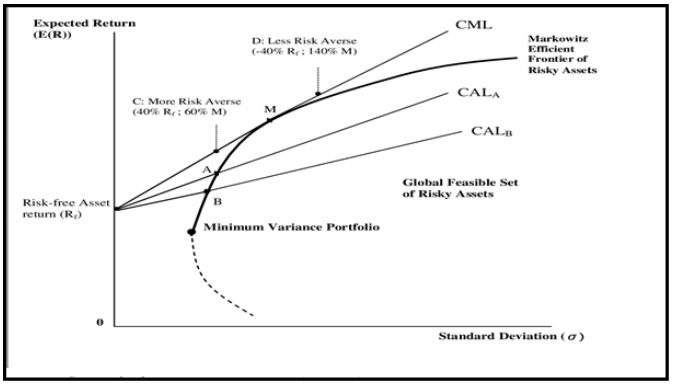
Equation (1) is rational and not subject to psychological biases since the decision relies purely on the probabilities of the various possible asset positions of an investment. However, equations (2) and (3) mathematically demonstrate the expected return and the variance of a portfolio that consists of two assets i and j. The weights carried by constituents i and j are proportional to their relative market values:

$$E(R_\rho) = (w_i \times E(R_i)) + (w_j \times E(R_j)) \quad (2)$$

$$\sigma_p{}^2 = (w_i^2 \sigma_i^2) + (w_j^2 \sigma_j^2) + (2 w_i w_j \sigma_i \sigma_j p_{ij}) \quad (3)$$

Where: w_i and w_j are the weights of constituents i and j in portfolio p; σ_i and σ_j are the standard deviations of constituents i and j in portfolio p; and p_{ij} is the correlation coefficient between the returns of constituents i and j in portfolio p.

Incorporating the concept of diversification, the Markowitz efficient frontier of risky assets is derived from efficient mean-variance optimization with the objective of maximizing the expected return of the portfolio at each level of portfolio standard deviation from the feasible set of risky assets. Figure 2 illustrates the umbrella-shaped Markowitz efficient frontier of risky assets. While, Equation (4) depicts the mathematical representation of the capital market line (CML), which states that the expected return on an efficient portfolio is equal to the



Source: Authors' presentation

Figure 2. Markowitz Efficient Frontier of Risky Assets

return on the risk-free asset (R_f) plus a market risk premium $(E(R_M) - R_f)$ proportional to the total risk of the portfolio ($\sigma_p{}^2$) relative to the total risk of the market portfolio ($\sigma_M{}^2$):

$$E(R_\rho) = R_f + \sigma_p{}^2 \times \left(\frac{E(R_M) - R_f}{\sigma_M{}^2} \right) \qquad (4)$$

Where: $E(R_\rho)$ is the expected return of portfolio P; $E(R_M)$ is the expected return of the market portfolio M; R_f is the return on the risk-free asset; $\sigma_p{}^2$ is the variance of portfolio P; and $\sigma_M{}^2$ is the variance of the market portfolio *M*.

Equation (4) can be restated as:

$$E(R_i) = R_f + \beta_i (E(R_M) - R_f) \qquad (5)$$

Equation (5) known as the security market line (SML) supports financiers in shaping the conditions for equilibrium of exchange of the assets.

Empirical Review

Broad empirical studies are piloted on the connection between securities market enlargement – economic evolution and also the macroeconomic and formal factors of assets marketplace growth. However, most of

those studies have fixated on the influence of external resources inflows on securities market development. These studies usually affirmed that foreign direct investment inflows, foreign portfolio investments, and remittances had an affirmative influence on the event of the capital marketplace. The intermediation role of the capital market in mobilizing long-term debt and equity finance for investments in long-term assets positions, render it a critical institution in driving investment, economic activity, and by extension, economic growth, and development (Gbalam *et al*., 2020).

Anthony and Ogbuabor (2018) examined how the development of the Nigeria's capital market stimulates the inflow of capital from overseas and how this foreign capital support economic growth in Nigeria. To achieve this, real gross domestic product was used as the dependent variable, while market capitalization, all share index, aggregate savings, foreign capital inflow, degrees of trade openness, and real exchange rate were used as independent variables. Historical data from 1985 to 2016 were called and analyzed using the ordinary least square technique and Johansen co-integration technique to ascertain if a long-run equilibrium relationship exists or not in the model. The co-integration results indicated the existence of long-run equilibrium relationship in the model. The error corrections result further indicate that foreign exchange rate exert negative and statistically insignificant impact on economic growth at the 5 percent tolerance level. The results further averred that market capitalization stimulates economic growth positively and significantly.

According to Subair and Salihu (2013), stock market can be measured by market capitalization (MCAP). Lawal and Ijirshar (2013) further explained that market capitalization is also another major measurement of stock market performance. Market capitalization (also known as market value) is the share price times the number of shares outstanding. However, Zubair (2013) asserted that All Share Index (ASI) can also be used to measure stock market performance. The stock market is one of utmost important place through which companies raise needed money. This allows businesses to be publicly traded or raise additional capital for expansion by selling shares of ownership of the company in a public market (Mishkin, 2001).

Akinmulegun (2018) applied the vector error correction mechanism on the data from 1985 to 2016 to study

the nexus between foreign portfolio investment inflow and capital market development in Nigeria. The study showed a positively significant relationship between foreign portfolio investment and the Nigerian All-Share Index as well as a negative significant relationship between foreign portfolio investment and market capitalization in Nigeria. In another study, Iriobe *et al*. (2018) investigated the impact of foreign portfolio investment inflows on the performance of the Nigerian capital market, using data from 2007 to 2017. The study thus relied on the ex post facto research design to examine the impact of the dependent variable of stock market development and the independent variable, foreign portfolio investment inflows in Nigeria using the autoregressive distributive lag model. The study showed that foreign portfolio direct investment inflows is a catalyst in the performance of the Nigerian capital market.

Cliff *et al*. (2020) investigated the effects of diaspora Remittances and Stock Market Development at Nairobi Securities Exchange, Kenya. Diaspora remittances, unlike other external sources of financing, tend to be more stable making remittances a reliable source of financing for emerging economies. Despite the consistent upward trend in diaspora remittances, emerging capital markets are typically characterized by a small number of listing and very high volatility. This study therefore sought to establish the effect of diaspora remittances on stock market development at the Nairobi Securities Exchange, Kenya. The study covered the period 2008 to 2018 and quarterly time series data were analyzed using correlation analysis and the Autoregressive Distributed Lag Model. The study findings documented a significant positive effect of diaspora remittances on stock market development in the short-run as evidenced by the negative and significant coefficient of the Error Correction Term (ECT). Equally, diaspora remittances had a significant positive effect on stock market development in the long-run. In view of the foregoing findings, the study recommends that the Kenya government should create a department of economic relations located at all Kenyan foreign embassies abroad to educate Kenyans abroad on the available investment opportunities at the Nairobi Securities Exchange and the importance of investing back at home.

Njoroge (2014) sought to determine the effect of Diaspora remittances on stock market performance using evidence from the Nairobi Securities Exchange. Stock market performance was measured by The Nairobi

Securities Exchange All-Share Price Index (NASI). Inflation, interest rates and exchange rates were used as control variables. Time series monthly data for seven years from February 2008 to May 2015 were obtained from the Nairobi Securities Exchange and the Kenya Central Bank for the purpose of meeting the study objectives. The study applied both descriptive analysis and multiple regression analysis. The study findings indicated that Diaspora remittance had strong and significant positive effect on stock market performance. The current study however analyses the relationship between diaspora remittances and stock market development using autoregressive distributed lag model.

Raza and Jawaid (2014) studied the effect of remittances on stock market development in 18 Asian countries. The study covered the period 2000 to 2010 and time series data were analyzed using ARDL cointergration, and Toda Yamamota causality test. The findings indicated that remittances had significant effect on stock market development. Toda Yamamoto causality test indicated a bi-directional causal relationship. Notably, this study is conducted beyond the context of the emerging African stock markets.

Nikmanesh (2016) investigated the relation between trade openness and stock market volatility in the ASEAN-5 countries, using data of the composite price indices and trade openness in these countries from 1990 to 2013. A two-step methodology was employed. Firstly, the volatilities of stock indices were estimated using GARCH modeling. Then panel and the seemingly unrelated regression (SUR) methods were utilized to find the linkage between trade openness and stock market volatility. The results proved that the SUR method can efficiently handle certain limitations of the panel regression method in the present study. The results concerning the whole sample period demonstrate that trade openness affects the stock market volatility in Indonesia and Malaysia positively, and in Thailand negatively. Although the effect of trade openness on the Philippine and Singaporean stock market volatilities was not significant during the whole sample period, trade openness was found to influence stock market volatility in the Philippines and Singapore in the subsamples.

Nikhil (2016) examined the effects of all three sources of external development finance and foreign exchange earnings (FDI, ODA and remittance) on economic growth in South Asia. By using Gross Domestic

Product (GDP) as the dependent variable and FDI, ODA, and remittances as the independent variables, while controlling for population, life expectancy, capital formation, and economic openness calculated by trade shares. The study identified an econometric model that properly portrays this relationship and analyzed the effect of external development finance and foreign exchange earnings on economic growth in South Asia. A Fixed Effect panel model was developed using data of Bangladesh, Bhutan, India, Nepal, Pakistan, and Sri Lanka ranging from 1960 to 2014. These findings suggest that only remittance have a consistent positive effect on growth, whereas Foreign Direct Investment and foreign aid have varying effect dependent upon model specification.

Although there were varied studies on the effect of foreign portfolio investment either on stock and capital market growth or on the economic process, and also, different attempts made within the literature to look at the link between foreign investment (with regards to foreign direct investment and foreign portfolio investment only) on capital market performance (empirical literature review). Aside FDI and FPI, trade openness, remittances and ODA other variables instrumental to capital market performance and which has not been wholly explored by researchers in recent time (Gbalam *et al*., 2020). As such, this study proposes to test the null hypothesis based on the discussion above:

H_1: External financial flows has no significant effect on NGX All-share Index in the Nigerian capital market.

METHODOLOGY

Sample and Procedure

This study adopted a comprehensive multi-stage estimation procedure by employing an annual time series data spanning 35 years between 1985 and 2021 for the empirical analysis. The independent variables for this study include the external financial flows proxied by foreign direct investment, foreign portfolio investment, remittance, trade openness, and ODA. The dependent variable, capital market performance, was proxied by

NGX All-share Index. Data for total annual market capitalization on the Nigerian Exchange (NGX) Group, NGX All-share Index, foreign direct investment, foreign portfolio investment, remittance, trade openness, and ODA were sourced from the Central Bank of Nigeria Statistical Bulletin (CBN, 2021), National Bureau of Statistics (NBS, 2021), World Bank Reports (World Bank, 2021) and publications of Nigerian Exchange Limited (NGX, 2021).

Data Analysis Techniques

A comprehensive multi-stage estimation procedure was adopted. This study examined the response of All-Share Index in the Nigerian capital market to external financial flows shock as well as to construct a model using multivariate and achieved in three stages (preliminary, estimation and post-estimation).

The preliminary analysis involves descriptive analysis and pre-estimation tests to avert the matter of spurious regression results and erroneous inference. A unit root test to work out the stationarity or otherwise of the statistic data, using Augmented Dickey-Fuller (ADF) unit root test, the foremost widely used (Dickey and Fuller, 1979) and Kwiatkowski Phillips-Schmidt Shin (KPSS) test by Kwiatkowski, Phillips, Schmidt and Shin (1992) as a complement to tests of unit root.

Based on the result of the pre-estimation tests, the study employed a Vector Error Correction Model (VECM) and Error Correction Model (ECM) to examine long and short-run dynamics of the cointegrated series. It restricts the long-run behavior of endogenous variables to converge to their cointegrating relationships, while Johansen Cointegration was conducted to examine cointegrating relationships between several non-stationary time series data. The study used the regressors' and ECT *t*-statistics approach to check for the short run, long run and strong causal effects among the variables. The regressors' and ECT *t*-statistics were statistically significant, and thus, the short-run, long-run and strong causal effects inferred.

For the post-estimations tests, the following diagnostic or post estimation tests (Normality, Autocorrelation, and Heteroskedasticoty) were conducted to ensure Classical Linear Regression Model (CLRM) assumptions have not been violated and the recommendations of the study are reliable. This also ascertains the validity

and robustness of regression model.

Model Specification

The model for this study is anchored on the modern portfolio theory developed by Fama (1965, 1970 and 1991) and Markowitz (1952). The the functional form of Markowitz's model in equation (5) was expressed as:

$$Y = f(X_1, X_2, X_3 \ldots\ldots\ldots\ldots X_n) \qquad (6)$$

Adapting and modifying Onyesi *et al*., (2016) through inclusion of foreign direct investment, personal remittances and remittance from compensation of employees', the model for this study was specified as:

$$ASI = f(FDI, FPI, REPT, RECE, TOP, ODA) \qquad (7)$$

Where: ASI_t is the NGX All-Share Index, FDI_t is foreign direct investment at the time t, FPI_t is foreign portfolio investment at the time t, $REPT_t$ and $RECE_t$ are the values of personal remittances at time t ($REPT_t$ is the sum remittance from personal transfers or personal transfers in form of remittance at time t While $RECE_t$ is the remittance from compensation of employees' compensation from the rest of the world at time t), TOP_t is trade openness at time t, $TOP_t = (IMP_t + EXP_t / GDP_t$), where: IMP is defined as the value of imports and EXP is defined as the value of exports, ODA_t is defined as official development assistance.

The econometric specification of this general model expressed in full-log. Thus, the equation in its empirical form is specified below:

$$\begin{aligned}\log \boldsymbol{ASI}_t = {} & \beta_0 + \beta_1 \log \boldsymbol{FDI}_t + \beta_2 \log \boldsymbol{FPI}_t + \beta_3 \log \boldsymbol{REPT}_t + \beta_4 \log \boldsymbol{RECE}_t \\ & + \beta_5 \boldsymbol{TOP}_t + \beta_6 \log \boldsymbol{ODA}_t + \mu_t\end{aligned} \qquad (8)$$

Where: β_0 is constant, $\beta_1 - \beta_6$ slopes parameters and $_t$ ~NIID (0, 1) thus, a white noise stochastic disturbance term and t time.

Following equation (8), the corresponding VEC models of ASI written as:

$$\begin{aligned}\Delta \log ASI_t = {} & \beta_{0ASI} + \sum_{i=1}^{k-1} \beta_{1i} \Delta \log ASI_{t-i} + \sum_{i=1}^{k-1} \beta_{2i} \Delta \log FDI_{t-i} + \sum_{i=1}^{k-1} \beta_{3i} \Delta \log FPI_{t-i} + \sum_{i=1}^{k-1} \beta_{4i} \Delta \log REPT_{t-i} \\ & + \sum_{i=1}^{k-1} \beta_{5i} \Delta \log RECE_{t-i} + \sum_{i=1}^{k-1} \beta_{6i} \Delta TOP_{t-i} + \sum_{i=1}^{k-1} \beta_{7i} \Delta \log \mathrm{ODA}_{t-i} + \lambda_{ASI} \varepsilon_{t-i} + u_{1ASIt}\end{aligned} \qquad (9)$$

Where: adjustment parameter is θ determines speed of adjustments of the models, while $\beta_1 - \beta_6$ are the short run dynamic coefficients of the ASI model. However, the difference Δ represents only the short-run change in the time series but totally misses out the long-run information.

From equation (9), the long-run cointegrating equstion for ASI model is given as:

$$\varepsilon_{\text{t-1}} = \boldsymbol{ECT}_{t-1} = \log \boldsymbol{ASI}_{\text{t-1}} - \varphi_0 - \varphi_1 \log \boldsymbol{FDI}_{\text{t-i}} - \varphi_2 \log \boldsymbol{FPI}_{\text{t-i}} - \varphi_3 \log \boldsymbol{REPT}_{\text{t-i}} - \varphi_4 \log \boldsymbol{RECE}_{\text{t-i}} - \varphi_5 \boldsymbol{TOP}_{\text{t-i}} - \varphi_6 \log \boldsymbol{ODA}_{\text{t-i}} \quad (8)$$

Where: ECT represents the long run operator or the long relationship in the model (the cointegrating equation and long run model in VECM). Note: ECT_{t-1} can be rewrite as ε_{t-1}. $\varphi_1 - \varphi_5$ are the long-run coefficients of the ASI model.

RESULTS

Descriptive Statistics

This sub-section provides the summary statistics of the variables being examined, such as All-Share Index (ASI), foreign direct investment (FDI), foreign portfolio investment (FPI), Remittances (REPT, RECE), official development assistance (ODA), and trade openness (TOP). Table 1 (See Appendix-I) presents the summary statistics of the variables being examined. All the variables are positively skewed meaning that they exhibit long right tail. The kurtosis values for the variables range from 2.0610 to 14.0832. ASI and TOP with kurtosis values of 2.0610 and 2.4661 are platykurtic whereas FDI, FPI, ODA, RECE, REPT and TMC having kurtosis values of 4.7705, 5.5736, 4.7098, 14.0832, 3.3704 and 5.1556 are leptokurtic since their values are higher than 3.0

The probability of the Jarque-Bera are less than 0.05 for FDI, FPI, ODA, RECE, REPT and TMC indicating that they do not exhibit normal distribution while ASI and TOP have probabilities greater than 0.05 indicating normal distribution. The absence of normal distribution observed in the data set is not unexpected considering the issues associated with data collection and data quality prevalent in Nigeria. Therefore, stationarity test was

to be conducted in order to know the order of integration and the most appropriate estimation method.

Unit Root Test

The results of the stationarity test using augmented Dickey-Fuller (ADF) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) presented in Table 2 (see Appendix-I1) revealed that the variables were integrated of order one, that is, I(1). Therefore, the null hypothesis (ρ = 1) is accepted at levels and the null hypothesis (ρ = 1) that the series are non-stationary after the first difference is rejected for all the series. Therefore, concluded that the series are of order one I(1). These are MacKinnon critical values for the rejection of hypothesis of a unit root. All the series were integrated at first difference, they are integrated of the same order, I(1). The implication of this is to test for cointegration. Consequently, Johansen cointegration test and vector error correction mechanism (VECM) were considered appropriate estimation technique for the study.

Optimal Lags Length for the Series in the Model

Table 3 (see Appendix-III) shows that the optimal lags length for all the series in the model is 1 and the selected criteria is Akaike Information Criterion (AIC). It is the criterion that gives the lowest values.

Estimation Results

-Johansen Cointegration Test

Table 4 (see Appendix-IV) shows 7 hypothesized number of cointegrating equation (CE). The 7 variables are LOGASI, LOGFDI, LOGFPI, LOGREPT, LOGRECE, TOP, and LOGODA formed the null hypothesis equations. The result shows that FPI, REPT, RECE, TOP, and ODA will have positive effects on ASI in the long-run. 1% change in the FPI, REPT, RECE, TOP, and ODA will associate with 0.261%, 0.156%, and 0.317%, 0.045% and 0.203% increase in ASI, respectively, on average ceteris paribus in the long-run. The results also show that FDI will have negative effects on ASI in the long-run. 1% change in FDI will associate with 0.291% decrease in the ASI in the long-run. These results are partially in line with our *a priori* expectations of the long-run effects of extent external financial flows on the Nigerian All-Share Index.

-The Vector Error Correction Model (VECM) Analysis

ECM-VECM was estimated with ASI as Target Variable. The cointegration test indicates only 3 cointegrating equations at the 0.05 level. Thus, specifying an ECM for the target variable LOGASI. Table 5 (see Appendix-V) showed the summary of the result output of the VECM model.

The result shows that 1% change in the lag of ASI is associated with 0.246% increase in the current ASI, on average ceteris paribus in the short-run, while 1% change in the lags of FDI, FPI and ODA are associated with a 0.171%, 0.061% and 0.036% increase, respectively, in ASI on average ceteris paribus in the short-run. Also, 1% change in the lags of REPT, RECE and TOP are associated with 0.117%, 0.024% and 0.013% decrease, respectively, in ASI on average ceteris paribus in the short-run.

The ECT result shows that the previous period's deviation from long-run equilibrium is corrected into current period at an adjustment speed of 29.84%. Or the coefficient of -0.2984, suggests 29.84% movement back towards equilibrium following a shock to the model, one period later. The error correction term has a *t*-statistic of -3.17649, which is highly significant supporting the cointegration result. The coefficient on the error correction term is negative, so the model is stable.

-Probability Values and DW statistic of the ASI-VECM Output

Table 6 (see Appendix-VI), shows the adjustment coefficient (λ) for the target variable (LOGASI) equation is C (1) = -0.2984 with a probability value of 0.0018. The target variable equation is significant at 0.0018 (1%) level. The short-run results show that the explanatory variables exerts little or no impact on ASI in the short-run. VECM pays more attention to the long-run effects than the short-run effects.

The *t*-statistic is statistically significant (-3.176487) with a probability value of 0.0018 at less than 5%. This shows there is convergence and long-run causal relationship in the ASI model. Also, in the LOGASI equation only D (TOP (-1)) probability value is (0.0238) less than 5% level of significance. Thus, only this variable TOP has causal effects on ASI in the short-run and also in the long-run (see the VECM analysis Table 5).

The fact that results the *t*-statistics of the D (TOP) in the short-run is statistically significant and the *t*-statistics of the ECT is also statistically significant in the long-run, these joint statistically significance between

the variables in the short and long-run implies a strong causal relationship in between the variables. The ECM estimated result shows that the previous period's deviation from long-run equilibrium is corrected into current period at an adjustment speed of 49.94% for the annual market capitalization model and 29.84% for the all-share index model.

Post Estimation Results

The post estimation tests include VEC Residual Serial Correlation LM and Normality tests. Tables 8 (see Appendix-VII) and 9 (see Appendix- IX) present the results of the residual correlation and normality tests, respectively. For the residual serial correlation test result, the probability of the 1 lag is 0.1747 and the null hypothesis of no autocorrelation can be accepted since the *p*-value are greater than 0.05 (5% level). There is no evidence of positive autocorrelation. This shows that the model is not serially correlated. While, the residual serial normality test i.e., Jarque-Bera result show that four variables were normally distributed with their probability values given as: 0.1778, 0.6259, 0.5256 and 0.9456 for ASI, REPT, RECE and TOP, respectively, while the variables FDI and ODA were not normally distributed with the probability values given as 0.0001. The Jarque-Bera joint statistic shows that the variables were not normally distributed with joint probabilities value of 0.001. All these results suggest that the residual series do not obey normal distribution and nor obey heavier-tailed distribution.

DISCUSSION

This study sought to determine the extent to which external financial flows will influence capital market performance in Nigeria proxied as all share indices. In evaluating the time series properties of the variables, the stationary test results revealed that all the included variables were integrated of order one or they were stationary at first difference and statistically significant at 5% critical values and the optimal lags length for all the series in the models was one and our selected criteria was Akaike Information Criterion (AIC). Given the results generated from the cointegration tests, tested with constant and without trends, the null hypothesis of no cointegrating equation were rejected at the 5% level. This implies that there exists long-run relationship

among the variables.

The findings from this study tend to conform to the *a priori* expectations on the effects of external financial flows on capital market performance. Based on the empirical results obtained, the following results arose:

The VECM result reveals that in the short-run only these explanatory variables, the past level of all-share index, FDI, FPI and official development assistance have positive effects on all-share index model. The highest contributions seem to be from the past values of the dependent variables.

The long-run VECM result for the all-share index model shows that all the independents' variables except for the FDI have positive effects on all-share index. The result shows that foreign portfolio investment, remittance from personal transfers, remittance from compensation of employees, trade openness and official development assistance have positive effects on ASI in the long-run. The estimated effects show that 1% change in these variables will associate with 0.261%, 0.156%, 0.317%, 0.045%, and 0.203% increase in ASI, respectively, on average ceteris paribus in the long-run.

The error correction model (ECM) results in the model shows that there is convergence and long-run causal relationship. The adjustment coefficients of ECT in the model was negative and statistically significant. The ECM estimated result shows that the previous period's deviation from long-run equilibrium is corrected into current period at an adjustment speed of 29.84% for the all-share index model.

The impulse responses of all-share index of the Nigerian Exchange (NGX) Group for one-unit shock shows that shocks to remittance from personal transfers, remittance from compensation of employees, trade openness and official development assistance have noticeable positive effects on all-share index from the short and long-run. All-share index response to structural one innovation appears to be greater in remittance from compensation of employees, trade openness than others. This shows that both variables' innovations play important roles in variation of all-share index in the long-run than they do in the short-run. Also, the variance decomposition result shows that all-share index exhibits strong exogenous effects in the short-run because in the short-run the percent all-share index variance due to explanatory variables is very weak.

Based on regressors' and ECT *t*-statistics causality test approach, for the short-run, long-run and strong causal relationships, the results that shows there are convergence and short-run, long-run and strong causal relationships among the variables in the model. In all-share index model, only trade openness has causal effects on all-share index in the short-run and also in long-run. These joint statistically significance between the variables in the short and long-run implies a strong causal relationship between the variables.

In the short-run direction of causality of the ASI model, the test results showed that short-run unidirectional causation runs from ASI to FDI, and ASI to RECE. The results also show that there is an independent causation between ASI and FPI, ASI and ODA, and ASI and TOP, while there is a bidirectional causal relationship between both variables ASI and REPT in Nigeria.

Looking at this empirical study, it is clear that knowledge related to capital market performance sensitivity to the behavior of essential variables such as remittance from personal transfers, remittance from compensation of employees, and official development assistance are very important in the context of major areas of finance and investments. This study contributes to the literature on diaspora remittances and official development assistance by considering the importance of input-output sectoral linkages, and highlights the potential for future research work in this area. Diaspora remittance have become a major source of external development finance. Diaspora remittance provide the catalyst for financial market and monetary policy development in developing countries.

CONCLUSION

In this study, the arguments were pursued to achieve the objectives using empirical methods. Methodologically, the study employed the vector error correction model (VECM), the error correction model (ECM), the impulse response function, variance decomposition, and the long and short-run causality approaches to establish the long-run and short-run relationship between the dependent and the independent variables.

The outcome of this study showed that external financial flows play important role in capital market

performance. The study found that official development assistance, foreign direct investment, remittance from compensation of employees, foreign portfolio investment and remittance from personal transfers have strong and significant positive effects on capital market performance in the long-run and partially in the short-run, while trade openness has little impact on total annual capital market performance in the long-run. Increase in these variables will significantly improve the performance of capital market.

However, despite having a long-run relationship, the study found independent causal relationships between ASI and FPI, ASI and ODA, and ASI and TOP in Nigeria. Therefore, there is a need for more optimal external financial flows management through strong policy efforts to attract foreign financial flows.

The results show a one-way causality between ASI and FDI, ASI and RECE. This evidence also means that these variables are significant predictors of capital market performance in Nigeria. Furthermore, the unidirectional causality relationship between them shows that external financial flows in the form of these variable lead to capital market growth.

For example, the study found strong evidence of a positive and significant link between capital market performance and diaspora remittances, irrespective of the different control variables and estimation techniques used. Since diaspora remittances had a significant positive effect on the NGX All-Share index, the study concludes that an increase in diaspora remittances will result in enhanced market value, liquidity and price stability. In other words, increase in diaspora remittance (RECE & REPT) will significantly improve the performance of stock market, because remittances influence certain aspects of financial development such as money supply. Also, official development assistance (ODA) has played an essential role in development financing, especially for those countries with less access to private capital flows for development like Nigeria.

Thus, the study has shown that the behavior of the external financial flows are strong variables influencing the all-share index in the capital market in Nigeria, especially in the long-run. The stock indices movement is respective to the change in external financial flows basic. Specifically in the model, though no short-run causation runs from foreign portfolio investment to All-Share index in Nigeria, but movements in foreign

portfolio investment inflows stimulate changes in capital market development in Nigeria, but the development of the market only generates weak response in the direction of FPI inflows to the country. The development of the external capital can serve as a launch pad for growing the much-needed capital market in the Nigeria, with the attendant economic growth implications.

IMPLICATIONS

The indication from the study points to the fact that foreign direct investment, foreign portfolio investment, remittance from personal transfers, remittance from compensation of employees, trade openness and official development assistance are significant components of external financial flows that will cause an improvement in the level of the all-share index in the capital market of Nigeria in the long-run and partially in the short-run. As a consequence, therefore, it is imperative to consider a package of recommendations directed at improving their effects in short and long-run welfares in Nigeria.

There is therefore strong indication that a veritable difference exists between short-run and long-run effects of foreign capital inflows to Nigeria on the capital market. The study suggested that the policy measures aimed at directing long-run capital inflows should not be the same as those aimed at changing the short-run patterns of flow. Furthermore, in order to boost the value of transactions in the Nigerian capital market, there is a need for the availability of more investment instruments such as derivatives, convertibles, futures, swaps, and options as obtainable in the developed countries.

In addition, enforcing a uniform exchange rate platform and lowering the transaction costs of remittances to Nigeria may help increase the flow of remittances through official channels and this may increase their contribution to financial development. It is also important to bring remittance recipients into the formal financial sector and channel their savings into productive uses that can generate long-term benefits. This could be achieved by adopting credit facility programs by financial institutions.

LIMITATIONS AND FUTURE DIRECTIONS

The study has a few limitations. First, learning about capital markets is a complex undertaking, as there are many different functions and products within capital markets. However, the study could have intended to extend this analysis by using pooling time-series or panel data pooled and cross-section effects from at 10 developing countries in Africa for a certain period. Second, the study only focused on empirical economic variables.

The limitations found in this study could serve as a direction for future research. Therefore, future research may consider deploying a Pooled Mean Group (PMG) and the Panel Autoregressive Distributed Lag (Panel ARDL) estimators across 10 developing countries in Africa to analyze short-run and long-run cross-section effects.

In addition, future research in this space can be designed to accommodate demographic variables bureaucratic management, and environmental aspects, it is likely to produce more comprehensive findings by analyzing factors and variables associated with a country's economic growth.

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Appendix-I

	ASI	FDI	FPI	ODA	RECE	REPT	TOP
Mean	189517.0	6440.327	15708.91	3.00E+08	17101327	1.80E+09	29.7720
Median	122220.9	162.3400	3330.970	18745494	602083.9	1.40E+08	30.8400
Maximum	605096.4	38678.98	93778.91	1.74E+09	2.00E+08	8.35E+09	58.9200
Minimum	0.0000	3.7600	689.5700	23416.50	11980.40	8059.170	7.3600
Std. Dev.	187049.3	10237.18	23773.57	4.72E+08	43757341	2.51E+09	12.2580
Skewness	0.5611	1.6568	1.8219	1.6729	3.4499	1.2461	0.0571
Kurtosis	2.0610	4.7705	5.5736	4.7098	14.0832	3.3704	2.4661
Jarque-Bera	3.6573	24.1126	33.9973	24.1186	291.1786	10.8444	0.5092
Probability	0.1606	0.0000	0.0000	0.0000	0.0000	0.0044	0.7752
Observations	41	41	41	41	41	41	41

Source: Authors' presentation using data from WDI and CBN 2021 Bulletin

Table 1. Descriptive Statistics

Appendix-II

Augmented Dickey Fuller (ADF)				Kwiatkowski-Phillips-Schmidt-Shin (KPSS) @ 5% - 0.1460		
Variables	**Level**	**1st Difference**	**Status**	**Level**	**1st Difference**	**Status**
LOGASI	-1.1234	-5.4033***	I(1)	0.1887	0.0961***	I(1)
LOGFDI	-2.2685	-5.6662***	I(1)	0.1328	0.0636***	I(1)
LOGFPI	-1.8978	-6.01923***	I(1)	0.1506	0.0965***	I(1)
LOGODA	-2.7996	-5.7056***	I(1)	0.1566	0.0560***	I(1)
LOGRECE	-2.5944	-6.8788***	I(1)	0.1645	0.1420***	I(1)
LOGREPT	-0.4595	-3.9613**	I(1)	0.1765	0.0871**	I(1)
LOGTMC	-1.1882	-4.3535***	I(1)	0.2161	0.1324**	I(1)
LOGTOP	-1.9907	-3.9820**	I(1)	0.1802	0.0976***	I(1)

Source: Authors' computation

Table 2. Summary of Results of ADF and KPSS Unit Root Tests at First Difference

Appendix-III

Endogenous variables: LOGASI						
Lag	LogL	LR	FPE	AIC	SC	HQ
1	-2.102395	115.6892	0.074540	0.162157*	0.331103*	0.271937
Endogenous variables: LOGFDI						
Lag	LogL	LR	FPE	AIC	SC	HQ
1	-23.36518	136.6843*	0.222513*	1.335010*	1.421198*	1.365675*
Endogenous variables: LOGFPI						
Lag	LogL	LR	FPE	AIC	SC	HQ
1	-44.98599	43.40048*	0.694313*	2.472947*	2.559135*	2.503612*
Endogenous variables: LOGREPT						
Lag	LogL	LR	FPE	AIC	SC	HQ
1	-43.81302	130.2708*	0.652745*	2.411212*	2.497400*	2.441877*
Endogenous variables: LOGRECE						
1	-60.15201	60.24775*	1.542460*	3.271159*	3.357347*	3.301824*
Endogenous variables: TOP						
Lag	LogL	LR	FPE	AIC	SC	HQ
1	-133.1449	26.06235*	71.88801*	7.112889*	7.199078*	7.143554*
Endogenous variables: LOGODA						
Lag	LogL	LR	FPE	AIC	SC	HQ
1	-36.01379	115.5897	0.432984	1.945035*	2.086914*	2.031391
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

Source: Authors' computation

Table 3. Summary of the Results of the Optimal Lag Length

Appendix-IV

Sample (adjusted): 1987 2021					
Included observations: 35 after adjustments					
Trend assumption: Linear deterministic trend					
Series: LOGASI LOGFDI LOGFPI LOGREPT LOGRECE TOP LOGODA					
Lags interval (in first differences): 1 to 1					
Unrestricted Cointegration Rank Test (Trace)					
Hypothesized		Trace	0.05		
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**	Remark
None *	0.847489	193.9375	125.6154	0.0000	We reject H_0 at 5%
At most 1 *	0.710898	128.1194	95.75366	0.0001	We reject H_0 at 5%
At most 2 *	0.666194	84.68521	69.81889	0.0021	We reject H_0 at 5%
At most 3	0.539994	46.28341	47.85613	0.0697	We fail to reject H_0 at 5%
At most 4	0.277656	19.10534	29.79707	0.4854	We fail to reject H_0 at 5%
At most 5	0.197429	7.721473	15.49471	0.4957	We fail to reject H_0 at 5%
At most 6	0.000679	0.023760	3.841466	0.8774	We fail to reject H_0 at 5%
Trace test indicates 3 cointegrating eqn(s) at the 0.05 level					
* denotes rejection of the hypothesis at the 0.05 level					
**MacKinnon-Haug-Michelis (1999) *p*-values					

Source: Authors' computation

Table 4. Summary of Cointegration Test Level Result for Model

Appendix-V

Vector Error Correction Estimates							
Sample (adjusted): 1987-2021							
Included observations: 35 after adjustments							
Standard errors in ( ) & *t*-statistics in [ ]							
First Part: Cointegrating Equation (Long-Run Model)							
Cointegrating Eq:	CointEq1						
LOGASI(-1)	1.000000						
LOGFDI(-1)	0.229495						
	(0.06987)						
	[3.28459]						
LOGFPI(-1)	-0.261534						
	(0.04667)						
	[-5.60330]						
LOGREPT(-1)	-0.156193						
	(0.05397)						
	[-2.89397]						
LOGRECE(-1)	-0.316657 (0.05459)						
	[-5.80028]						
TOP(-1)	-0.044580						
	(0.00697)						
	[-6.39315]						
LOGODA(-1)	-0.203467						
	(0.07741)						
	[-2.62860]						
C	1.778821						
Second Part: Short-Run Model							
Error Correction:	D(LOGASI)	D(LOGFDI)	D(LOGFPI)	D(LOGREPT)	D(LOGRECE)	D(TOP)	D(LOGODA)
CointEq1	-0.298051	-0.255206	-0.150431	-0.968953	0.467492	-2.760176	-0.270234
	(0.09383)	(0.18260)	(0.37511)	(0.29520)	(0.47321)	(3.54198)	(0.26631)
	[-3.17649]	[-1.39761]	[-0.40103]	[-3.28241]	[0.98792]	[-0.77928]	[-1.01472]
D(LOGASI(-1))	0.246296	0.513585	-0.721462	-0.006615	0.294059	6.666055	0.033521
	(0.17489)	(0.34036)	(0.69918)	(0.55023)	(0.88203)	(6.60205)	(0.49640)
	[1.40825]	[1.50895]	[-1.03186]	[-0.01202]	[0.33339]	[1.00969]	[0.06753]
D(LOGFDI(-1))	0.170578	0.271180	0.179186	0.308299	-0.743491	-3.823425	0.009283
	(0.16871)	(0.32832)	(0.67446)	(0.53077)	(0.85084)	(6.36856)	(0.47884)
	[1.01108]	[0.82596]	[0.26567]	[0.58085]	[-0.87383]	[-0.60036]	[0.01939]

D(LOGFPI(-1))	0.060922	0.006164	-0.021019	-0.114487	-0.626682	0.140035	-0.124410
	(0.09168)	(0.17843)	(0.36653)	(0.28845)	(0.46239)	(3.46098)	(0.26022)
	[0.66448]	[0.03454]	[-0.05735]	[-0.39691]	[-1.35532]	[0.04046]	[-0.47809]
D(LOGREPT(-1))	-0.116763	-0.116409	-0.127903	-0.584110	-0.011254	-2.793201	-0.259071
	(0.07023)	(0.13668)	(0.28078)	(0.22096)	(0.35421)	(2.65127)	(0.19934)
	[-1.66248]	[-0.85168]	[-0.45553]	[-2.64349]	[-0.03177]	[-1.05354]	[-1.29962]
D(LOGRECE(-1))	-0.024482	0.093486	-0.032998	0.018651	-0.130284	0.771542	0.074358
	(0.03840)	(0.07472)	(0.15350)	(0.12080)	(0.19364)	(1.44940)	(0.10898)
	[-0.63762]	[1.25112]	[-0.21497]	[0.15440]	[-0.67282]	[0.53232]	[0.68232]
D(TOP(-1))	-0.012831	-0.014577	0.004437	-0.035337	-0.020385	-0.472115	-0.010045
	(0.00563)	(0.01096)	(0.02251)	(0.01771)	(0.02839)	(0.21252)	(0.01598)
	[-2.27918]	[-1.33051]	[0.19713]	[-1.99512]	[-0.71798]	[-2.22153]	[-0.62864]
D(LOGODA(-1))	0.036393	-0.142835	-0.260906	-0.256017	-0.182369	2.231410	0.081631
	(0.09090)	(0.17690)	(0.36340)	(0.28598)	(0.45844)	(3.43143)	(0.25800)
	[0.40036]	[-0.80743]	[-0.71795]	[-0.89522]	[-0.39781]	[0.65029]	[0.31640]
C	0.117433	0.172908	0.275908	0.643803	0.408727	0.793405	0.342911
	(0.07769)	(0.15119)	(0.31058)	(0.24441)	(0.39180)	(2.93261)	(0.22050)
	[1.51161]	[1.14368]	[0.88837]	[2.63411]	[1.04321]	[0.27055]	[1.55517]
Number of coefficients		70					

Source: Authors' computation

Table 5. VEC Estimation Output for LOGASI Model

Appendix-VI

Estimation Method: Least Squares				
Date: 24/09/22 Time: 07:38				
Sample: 1987-2021				
Included observations: 35				
	Coefficient	**Std. Error**	***t*-Statistic**	**Prob.**
C(1)	-0.298051	0.093830	-3.176487	0.0018
C(2)	0.246296	0.174895	1.408254	0.1608
C(3)	0.170578	0.168709	1.011077	0.3133
C(4)	0.060922	0.091685	0.664477	0.5072
C(5)	-0.116763	0.070235	-1.662479	0.0981
C(6)	-0.024482	0.038396	-0.637625	0.5245
C(7)	-0.012831	0.005630	-2.279176	0.0238
C(8)	0.036393	0.090902	0.400356	0.6894
C(9)	0.117433	0.077688	1.511609	0.1324
Determinant residual covariance		0.001161		
Equation: D(LOGASI) = C(1)*(LOGASI(-1) + 0.229494650494*LOGFDI(-1) - 0.261533763703*LOGFPI(-1) - 0.156192983765*LOGREPT(-1) - 0.31665691623*LOGRECE(-1) - 0.0445802729696*TOP(-1) - 0.203467135341*LOGODA(-1) + 1.77882081135) + C(2)*D(LOGASI(-1)) + C(3)*D(LOGFDI(-1)) + C(4)*D(LOGFPI(-1)) + C(5)*D(LOGREPT(-1)) + C(6)*D(LOGRECE(-1)) + C(7)*D(TOP(-1)) + C(8)*D(LOGODA(-1)) + C(9)				
R-squared	0.664332	Mean dependent var		0.159704
Adjusted R-squared	0.599511	S.D. dependent var		0.291745
S.E. of regression	0.244176	Sum squared resid		1.550172
Durbin-Watson stat	2.105653			

Source: Authors' computation

Table 6. VECM Ordinary Least Squares Method for LOGASI Model

Appendix-VII

Pairwise Granger Causality Tests			
Date: 24/09/22 Time: 13:25			
Sample: 1981-2021 Lags: 1			
Null Hypothesis:	Obs	*f*-Statistic	Prob.
LOGFDI does not Granger Cause LOGASI	36	0.19372	0.6627
LOGASI does not Granger Cause LOGFDI		4.86631	0.0345
LOGFPI does not Granger Cause LOGASI	36	1.00285	0.3239
LOGASI does not Granger Cause LOGFPI		0.32309	0.5736
LOGREPT does not Granger Cause LOGASI	36	4.18858	0.0487
LOGASI does not Granger Cause LOGREPT		4.75175	0.0365
LOGRECE does not Granger Cause LOGASI	36	0.16301	0.6890
LOGASI does not Granger Cause LOGRECE		4.51247	0.0412
TOP does not Granger Cause LOGASI	36	0.30173	0.5865
LOGASI does not Granger Cause TOP		0.05395	0.8178
LOGODA does not Granger Cause LOGASI	36	3.65749	0.0645
LOGASI does not Granger Cause LOGODA		1.42196	0.2416

Source: Authors' computation

Table 7. Pairwise Granger Causality Tests Results of the ASI Model

Appendix-VIII

VEC Residual Serial Correlation LM Tests						
Date: 24/09/22 Time: 11:56						
Sample: 1981-2021						
Included observations: 35						
Null hypothesis: No serial correlation at lag h						
Lag	LRE* stat	*df*	Prob.	Rao *f* -stat	*df*	Prob.
1	59.59	49	0.14	1.27	(49, 70.4)	0.18
Null hypothesis: No serial correlation at lags 1 to h						
Lag	LRE* stat	*df*	Prob.	Rao *f*-stat	*df*	Prob.
1	59.59	49	0.14	1.27	(49, 70.4)	0.18
*Edgeworth expansion corrected likelihood ratio statistic.						

Source: Authors' computation

Table 8. VEC Autocorrelation LM Tests for ASI Model

Appendix-IX

VEC Residual Normality Tests				
Orthogonalization: Cholesky (Lutkepohl)				
Null Hypothesis: Residuals are multivariate normal				
Date: 24/09/22 Time: 12:10				
Sample: 1981-2021				
Included observations: 35				
Component	**Skewness**	**Chi-sq**	***df***	**Prob.***
1	-0.74	3.19	1	0.07
2	2.81	46.03	1	0.00
3	1.09	6.97	1	0.01
4	0.40	0.93	1	0.33
5	0.47	1.28	1	0.26
6	0.05	0.01	1	0.91
7	-1.40	11.35	1	0.00
Joint		69.75	7	0.00
Component	**Kurtosis**	**Chi-sq**	***df***	**Prob.**
1	3.43	0.26	1	0.61
2	14.60	196.17	1	0.00
3	4.33	2.58	1	0.11
4	2.95	0.00	1	0.95
5	3.09	0.01	1	0.92
6	2.74	0.10	1	0.75
7	8.72	47.78	1	0.00
Joint		246.90	7	0.00
Component	**Jarque-Bera**	***df***	**Prob.**	
1	3.46	2	0.18	
2	242.19	2	0.00	
3	9.54	2	0.01	
4	0.94	2	0.63	
5	1.29	2	0.53	
6	0.11	2	0.95	
7	59.13	2	0.00	
Joint	316.65	14	0.00	
*Approximate *p*-values do not account for coefficient estimation				

Source: Authors' computation

Table 9. VEC Residual Normality Tests for ASI Model