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# *CONTAGIOUS EFFECTS AND PASS-THROUGH MARVEL AMONG FINANCIAL ASSETS IN NIGERIAN FINANCIAL MARKETS*

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## Abstract

*This paper sets out to empirically ascertain the evidence of cascading effects and pass through marvel among financial assets in Nigerian financial market for the period of 2019 to 2025 by using quarterly data. We employ the maximum log-likelihood method with the BEKK approach, a widely used Multivariate Generalized Autoregressive Conditional Heteroskedasticity-in Mean (MGARCH-M) model designed to estimate conditional volatility and covolatility (covariance) in financial time series. The major findings of this study, which focuses on asset performance indicators, cascading and most importantly, contagious effects in Nigerian financial markets are that it clearly confirms the evidence of dual pass through of volatility in both bond market and stock market. No such evidence in Treasury bill and bond markets, since there is one-way transmission of volatility from the Treasury bill market to bond market. In view of the conclusion set above, the following recommendations are made for choosing appropriate investment mix. Investors should diversify efficiently by holding a portfolio of either stocks and treasury bills or bond and treasury bills. They should discount inefficient diversification that arise when the same factors could influence the assets in a portfolio. Investors should invest in Treasury bill, and choose either bond or stock. Bond if the investors are risk averter, otherwise stock. The stock and Treasury bill markets are highly contagious; therefore, investors operating in these markets should hedge their investments by trading forward.*

***Keywords:*** *Stock, Bond, Treasury Bill, Financial Markets, GARCH-M, BEKK approach, Nigeria.*

## Introduction

Financial markets are deeply interconnected globally, meaning that asset classes such as stocks, bonds, and currencies, as well as regional markets in Asia, Europe, and America, often move together, especially during crises. This interdependence, driven by globalization and high capital mobility, implies that volatility in one region or asset class can quickly spread to others, accelerating market contagion. Financial crises have been associated with turbulence in asset markets across advanced and emerging economies. This has generated interest among investors, policymakers, and academics regarding asset market linkages across countries during crisis periods and whether these linkages differ from those in non-crisis periods (John Beirne & Jens Gieck, 2014). Episodes of volatility in international capital markets occurred prior to the Asian financial crisis; an example is the "tequila effect" that followed Mexico's December 1994 devaluation, which primarily affected Latin American countries. At that time, financial contagion had not yet attracted significant attention from policymakers in either industrial or emerging-market economies (Charles Kindleberger, 1989; Giancarlo Corsetti et al., 2005).

However, since the Asian Financial Crisis, policymakers and economists have

undertaken extensive research to identify and analyze the causes and transmission mechanisms of financial contagion. Contagion is commonly defined as a significant increase in cross-market linkages following a shock to a country or group of countries, measured by the degree to which asset prices or financial flows move together across markets relative to their co-movement during tranquil periods (Matthias Raddant & Dror Kenett, 2021; Roberto Rigobon, 2003; Kevin Bracker et al., 1999). Importantly, an increase in co-movement does not necessarily reflect irrational investor behavior. When one country experiences a shock, liquidity constraints may force investors to withdraw funds from other markets.

Furthermore, since many financial transactions are conducted by agents rather than principals, incentive-related issues can contribute to volatility. Decisions to withdraw funds across multiple markets may also arise from coordination problems among investors and the lack of effective international mechanisms for addressing liquidity challenges in affected countries or markets (Pushan Dutt & Ilan Mihov, 2013; Geert Bekaert et al., 2009, 2011). For the purpose of this study, the focus is to empirically ascertain the evidence of cascading effects and pass-through mechanisms among financial assets in the Nigerian financial market.

**Literature Review**

A number of studies have been carried out to confirm the transmission of shocks among economic and financial variables. Macroeconomic variables such as inflation, exchange rates, interest rates, stocks, bonds, derivatives, and other financial securities are known to exhibit this trend. Scholars have observed that economic theory can predict either a positive, negative, or zero effect of inflation on output growth, depending on the specific assumptions of the model (James Tobin, 1965; Alan C. Stockman, 1981; Miguel Sidrauski, 1967). Ji X., Wang S., Xiao H., Bu N., and Lin X. (2022) examined the contagion effect of financial markets in crisis. The study adopted the dynamic conditional correlation multiple generalized autoregressive conditional heteroskedasticity (DCC–MGARCH) model to explore contagion effects across financial markets during crises. The findings revealed that: (1) the financial crisis and the COVID-19 pandemic intensified the connection between the Chinese and U.S. stock markets in the short term; (2) dynamic conditional correlations during the COVID-19 pandemic were higher than during the 2008 financial crisis; (3) a stepwise increase occurred in the correlation between returns on the S&P 500 Index and the Shanghai Stock Exchange Composite Index (SSEC) during and after crises; and (4) a unidirectional contagion effect exists between the Chinese and U.S. markets, with the Hong Kong market contributing to risk spillovers.

John Beirne and Jens Gieck (2014) observed that many studies on equity market contagion trace their origins to the Black Monday. Using an ARCH framework, Yasushi Hamao, Ronald Masulis, and Victor Ng (1990) assessed price volatility transmission among the New York, Tokyo, and London stock markets. Similarly, Mervyn King and Sushil Wadhwani (1990) measured changes in cross-market correlations among U.S., U.K., and Japanese stock markets. Further, Wen-Ling Lin, Robert Engle, and Takatoshi Ito (1994) used a GARCH methodology to estimate correlations between returns and volatilities of stock indices in New York and Tokyo. These early studies generally found evidence of contagion across equity markets.

However, Kristin Forbes and Roberto Rigobon (2002) challenged these findings, arguing that correlation coefficients are biased upward during crises due to increased market volatility. Stock markets are interdependent and exhibit

volatility spillover effects. Lucia Morales and Bernadette Andreosso-O'Callaghan (2012) found strong interdependence between U.S. and Asian stock markets, with U.S. shocks significantly influencing Asian markets through underlying economic vulnerabilities. Likewise, Manolis Syllignakis and Georgios Kouretas (2011) reported high interdependence between U.S., German, Russian, and Central and Eastern European (CEE) stock markets, especially after the latter joined the European Union.

He Q. et al. (2020) found bidirectional spillover effects between Asian, European, and American markets. Similarly, Jebran K. et al. (2017) observed bidirectional volatility spillovers among Asian emerging markets during the 2007 financial crisis, attributed to increased financial integration. Beyond financial securities, some studies (Paul Gomme, 1993; Rodolfo Manuelli & Larry Jones, 1995) using endogenous growth models found a negative relationship between inflation and growth. Another theoretical perspective is provided by Milton Friedman (1977), who argued that high inflation increases inflation uncertainty, thereby reducing economic efficiency and output. Laurence Ball (1992) formally supported this hypothesis using a game-theoretic framework. Alex Cukierman and Allan Meltzer (1986), building on the model of Robert Barro and David Gordon (1983), predicted that higher inflation uncertainty leads to higher inflation.

Conversely, A. Steven Holland (1995) argued that policymakers respond to inflation uncertainty with tighter monetary policy, resulting in lower inflation. Michael Dotsey and Pierre-Daniel Sarte (2000) showed that inflation variability can positively influence growth through increased savings and investment. Similarly, Fischer Black (1987) suggested that higher uncertainty can lead to higher growth via risk-taking in specialized technologies, while Michael Devereux (1989) found that output uncertainty may positively affect inflation.

While extensive research has been conducted in developed and emerging markets, relatively little attention has been given to African markets. This is partly due to the relatively recent surge in international portfolio investments in frontier markets, driven by the growth of mutual funds and exchange-traded funds focusing on such markets (De Groot C., Pang J., & Swinkels L., 2012). Much of this interest stems from the low correlation of African markets with global markets (Paul Alagidede, 2009). African markets are distinct due to institutional and regulatory differences, and except for South Africa, they remain largely segmented from global markets, offering potential diversification benefits. This study therefore focuses on contagion effects and pass-through mechanisms among financial assets in Nigerian financial markets, including stock, bond, and treasury bill markets.

**Methodology**

The BEKK model (named after Baba, Engle, Kraft, and Kroner) is a widely used multivariate GARCH model designed to estimate conditional volatility and covolatility (covariance) in financial time series. It ensures the positive definiteness of the covariance matrix, making it ideal for modeling volatility spillovers and interactions between multiple assets.

**Results And Discussions**

**Descriptive Statistics, Normality and Stationary Tests**

The mean values and as well as skewness and kurtosis scores of the return series on stock, bond and treasury bill prices are calculated. So also, I conducted normality and stationary tests on these variables. These test results are summarized in table 4.1.

Table 4.1-Summarized Descriptive Statistics, Normality and Stationary Tests

| Descriptor | BR | SR | TBR |
|---|---|---|---|

| | | | |
|---|---|---|---|
| Mean | 0.139132 | 0.24731 | 0.004209 |
| Std. Dev. | 0.017136 | 0.603452 | 0.108954 |
| Skewness | 0.064029 | 2.744375 | 1.085687 |
| Kurtosis | 2.131059 | 10.70336 | 10.30316 |
| Jarque-Bera | 2.09(0.35) | 242.30(0.00) | 157.22(0.00) |
| ADF | 3.29(0.00) | 8.69(0.00) | 4.8(0.00) |

***Source: Author's Result Computation***

The descriptive statistics in table 4.1 cover a sample size of January 2019 to December 2025, approximately 66 observations. As clearly indicated in the table, the mean value of bond, stock and Treasury bill assets are about 0.14, 0.25 and 0.004 respectively. While the corresponded total risk or standard deviations are 0.02, 0.60 and 0.11. It is very evident here that stock has the highest mean or average value and the highest risk too, confirming the convection-the higher the return the higher the risk. Bond has a better return than treasure bill. However, the three securities have the same "syndrome" of increasing tendency in return over the sampling period. We can also see that by approximating the standard deviation of bond and Treasury bill to one digit, they have zero standard deviation, which means the bond and treasure bill are approximately risk-free securities. Bond has zero skewness, which means it is not skewed but symmetric. The skewness values of stock and Treasury bill are 2.74 and 1.09 respectively. Meaning stocks and treasury bills are positively skewed with long tail rightward, but bond is bird shaped. Kurtosis values are 2.13, 10.70 and 10.30 respectively for bond, stock and Treasury bill.

Therefore, bond is plytokurtic, while stock and Treasure bill are leptokurtic. The result of the distribution pattern is given by the Jarque-Bera statistics. Bond, stock and Treasury bill have Jarque-Bera statistics of 2.09, 242.30 and 157.22 respectively. Moreover, the associated probabilities are 0.35, 0.00 and 0.00. This suggests that bond price return is normally distributed but the return of stock and treasury bill prices are not.

**Unit Root Test (Test for Stationarity)**

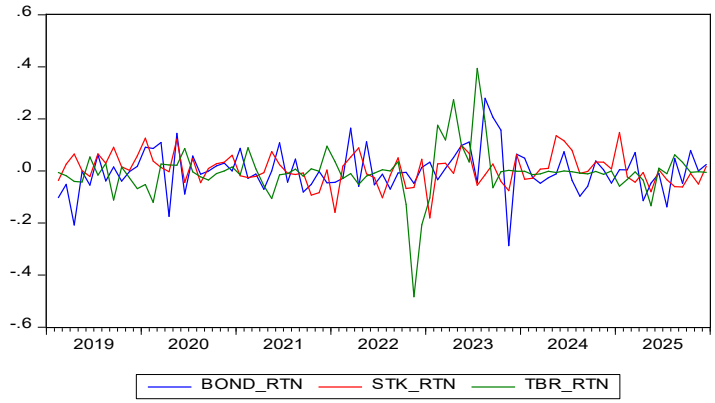
**Table 2: ADF unit root test results**

| Differenced Variables | ADF-statistic | Test Critical Values | | | Order of Integration | Prob. |
|---|---|---|---|---|---|---|
| | | 1% | 5% | 10% | | |
| STK_RTN | -7.865257 | -3.512290 | -2.897223 | -2.585861 | I(1) | 0.0000 |
| BOND_RTN | -9.725329 | -3.512290 | -2.897223 | -2.585861 | I(1) | 0.0000 |
| TBR_RTN | -5.460857 | -3.512290 | -2.897223 | -2.585861 | I(1) | 0.0000 |

***Source: Author's Computation using E-VIEWS***

Given the conditions for acceptance, the ADF statistic values are higher than the Test Critical values at all levels, therefore, acceptable. The corresponding probabilities are less than 0.05, thereby rejecting the hypothesis of unit root is valid in the context of this test. Hence, bond, stock and treasure bill price returns are mean reversible. This reversibility evidence can be examined in the line graph below.

**Bond, Stock, and TB Return in a Combined Line Graph**




In the figure above, there are three-line graphs- bond return, stock return and Treasury bill return line graphs. Stock returns were apparently stable from January 2010 to December 2021, and decline consistently throughout 2012. Since January 2023 until May 2025, stock return has appeared highly fluctuated. Bond return fell in January 2020, and then clustered in-between 1 and 17 percent, but got to the peak in December 2024, while Treasury bill and stock got to the peak in the middle of 2024. Treasury bill performed very poorly in 2023, when negative returns were recorded; but bond has never given negative return during the sampling period. Throughout 2025, Treasury bill return appeared stable, likewise bond showed element of stability in the last part of 2025. In addition, there is evidence that stock return is moving toward zero percent in the nearest future. This calls for the urgent attention of the capital market regulatory authority. We can now see the three variables in a combined line graph presented below.

In the combined graph above the blue colored line is the bond return, the red colored line and the grain line is the stock and Treasury bill return respectively. We can see that the bond return is somewhat stable. So also, Treasury bill return is stable except in the months of 2024, when there are features of swigging. On the contrary, stock return clustered exceedingly especially in the half part of the sample. This shows that bond and Treasury bill are fixed income security, while stock is a variable income security.

**Contagious Effects and Pass through Marvel**

We crown our investigation by confirming whether there is transmission of shocks/volatility from one market to the other. In view of this, the traditional diagonal BEKK specification was estimated, and table 4.6 presents the results.

Table3-BEKK Specification Estimation Results

| PANEL A-Transmission between Bond and Stock Market | | | | |
|---|---|---|---|---|
| Regressor | Coefficient | Sdt-error | T-value | P-value |
| A1(1,1) | 261.9686 | 148.5672 | 1.7633 | 0.0778 |
| A1(2,2) | 12.36893 | 4.481869 | 2.759771 | 0.0058 |
| B1(1,1) | 0.750542 | 0.269943 | 2.780372 | 0.0054 |
| B1(2,2) | 1.046839 | 0.01567 | 66.80537 | 0 |

| PANEL B-Transmission between Bond and TB Market | | | | |
|---|---|---|---|---|
| Regressor | Coefficient | Sdt-error | T-value | P-value |

| | | | | |
|---|---|---|---|---|
| C1(1,1) | 79.76443 | 54.81257 | 1.455221 | 0.1456 |
| C1(2,2) | 29.71274 | 13.47776 | 2.204576 | 0.0275 |
| D1(1,1) | 0.416651 | 0.783689 | 0.531653 | 0.595 |
| D1(2,2) | 0.416697 | 0.080609 | 5.169338 | 0 |

PANEL C-Transmission between Stock and TB Market

| Regressor | Coefficient | Sdt-error | T-value | P-value |
|---|---|---|---|---|
| E1(1,1) | 13.87003 | 3.75767 | 3.691124 | 0.0002 |
| E1(2,2) | 83.02821 | 25.24939 | 3.288325 | 0.001 |
| F1(1,1) | 1.01751 | 0.01915 | 53.13467 | 0 |
| F1(2,2) | 0.423581 | 0.074172 | 5.710787 | 0 |

***Source: Author's Computation***

According to the output in panel A, the coefficients of family shocks of bond return [A 1 (1, 1)] is 261.97, while that of stock return is 12.37, and they are both significant at 1 percent. This means that the previous family shocks of bond affect its current return more than the historical own shock of stock return. Nevertheless, the current stock return is affected by the historical family shocks of bond more than its historical own shocks. The coefficient of B 1(1,1) which relates to the own volatility of bond is 0.75 and that B 1(2, 2) relating to own volatility of stock return is approximately 1.04. This implies that the own volatility of stock return influences its current volatility more the historical own volatility of bond return. However, since the parameters are significant, there is evidence that shocks and volatility transmit from the stock market to the bond. The C 1 (1, 1) and C 2 (2, 2) coefficients are 79.76 and 29.71 respectively; p value is only significant in the case of C 2 (2, 2). The results infer that there is unidirectional transmission of shocks from Treasure bill market to bond market (no revision). I also discover that the shocks of bond return affect its current return more than the shocks of Treasury bill return.

Surprisingly, the coefficients of D 1 (1, 1) and D 2 (2, 2) are approximately the same (0.42), but only D 2 (2, 2) is significant. This means there is a pass through of volatility from Treasury bill market to bond market, but no pass through from bond market to Treasury bill market. Coefficient E 1 (1, 1) is13.87 and E 2 (2, 2) is 83.03 indicating that the own shocks of treasury bill affect its current return more than the historical shocks of stock, while the current return of stock is much more affected by the historical shocks of Treasury bill than its own historical shocks. The own volatility of stock return affects the current return more the previous own volatility of Treasury bill. All the parameters are significant implying that there is presence of bi-direction transmission of shocks and volatility in the two markets.

**Correlation between Markets**

In order to examine the absorptive capacity of these markets, we estimated the correlation coefficient between each pear of the three variables. The correlation matrix is presented in table 4.6 below.

Table4.6-Correlation Coefficient between BR/SR, BR/TBR and SR/TBR

| Variables | BR | SR | TBR |
|---|---|---|---|
| BR | 1 | 0.058 | -0.104 |
| SR | 0.058 | | |

| | | | |
|---|---|---|---|
| | | 1 | -0.172 |
| TBR | -0.104 | -0.172 | 1 |

***Source: Author's Computation***

The correlation coefficient between stock market and bond market is 0.06 or 6 percent. This means that an increase in bond price/return led to a rise in stock return. Therefore, diversifying between the two markets is imprudent. The correlation coefficient between bond market and Treasury bill market is -0.10 or -10 percent. Thus, an increase in bond price may lead to a decrease in interest rate on Treasury bill.

In addition, an increase in stock price induces a decline in Treasury bill interest rate; diversification is prudent in the two markets. Nonetheless, the weak correlation coefficients suggest that the financial market in Nigeria has large absorptive capacity.

**Findings, Conclusions and Recommendations**

The major findings of this study, which focuses on asset performance indicators, cascading and most importantly, contagious effects in Nigerian financial markets are that it clearly confirms the evidence of dual pass through of volatility in both bond market and stock market. No such evidence in Treasury bill and bond markets, since there is one-way transmission of volatility from the Treasury bill market to bond market. The analysis carried out has a number of implications of interest to policymakers. Our findings provide an insight into country-specific financial vulnerabilities in times of global financial turbulence. In order to derive appropriate policy responses, it is crucial that policymakers understand the source and nature of financial exposures. The results from this study also have implications for investors in relation to portfolio rebalancing and the construction of optimal portfolio diversification strategies at the country. The following recommendations are made for choosing appropriate investment mix. Investors should diversify efficiently by holding a portfolio of either stocks and treasury bills or bond and treasury bills.

They should discount inefficient diversification that arise when the same factors could influence the assets in a portfolio. Investors should invest in Treasury bill, and choose either bond or stock. Bond if the investors are risk averter, otherwise stock. The stock and Treasury bill markets are highly contagious; therefore, investors operating in these markets should hedge their investments by trading forward.

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