Market Risk Factors and Stock Returns in the Nigerian Bourse

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This study examines the link between market risk and equity return in Nigeria between 1980 to 2019. It employs the vector error correction model (VECM) to determine the short run dynamics and long run effect of market risk factors on stock return. The findings revealed that a dynamic relationship exists between market risk factors and stock returns in Nigeria. Also, exchange rate risk and oil price risks have significant influence on stock return, while inflation and interest rate risk, and political instability risks have a non-significant impact on stock return. Finally, a unidirectional relationship was detected between interest rate, oil price, political instability and stock return. The study concludes that market risk factors of exchange rate, oil price, interest rate and political instability risks are major determinants of stock return in Nigeria. It is recommended that rational investors seeking maximum returns should minimize market risk factors by diversifying their portfolios and study the risk behaviour and level in the market before taking investment decisions.

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1. Introduction

Investing in stock (equity) is essentially long-term investment. Investment in the capital market is associated with risk at different degrees and magnitudes. Risk is embedded in every investment, and it is more noticeable in the quest for wealth creation through stock market investments (Bello & Adedokun, 2015). The risk associated with stock return vary due to the impact of factors, such as difference in the sectors in which they operate, structure and managerial capacity differences across firms, the state of the macroeconomic environment, corporate, and government policies (Oludoyi, 2003).

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Theoretically, several works have discussed the risk-return relationship. The standard asset pricing theory like capital asset pricing model (CAPM) and arbitrage pricing theory (APT) assert a positive correlation between risks and expected stock returns. The risk-return nexus is a household scenario in investment analysis which is the bedrock of financial economics literature (Leon *et al.,* 2005). Direct relationship between risk and expected return has been described as the "first fundamental law of finance" because the perceived risk of undertaking an investment is weighted by the rate of return associated with that investment (Ghysels *et al.,* 2004). This shows a positive association between market risk and return because investors who are risk-averse need higher return for assuming greater risk as compensation. Thus, it is unarguable that risk-return association is paramount in investment decision making using the rational expectation asset pricing models (Raputsoane, 2009).

The APT suggests that systemic forces which act on stock returns are market risk variables of exchange, interest and inflation rates. These variables vary the discount factors and expected cash flow (Aliyu, 2015). Thus, macroeconomic variables could impact share prices and stock returns. The risks of exchange rate, oil price, inflation rate, interest rate and political instability, form the channel through which market risk affects stock returns in the Nigerian bourse. Usually, risks are uncontrollable in the stock market and constitute elements that affect the entire market and overall economy (Aruwa & Musa, 2014). On the nexus between market risk variables and stock returns during periods of political crisis, several experts like Labo (1999), Karolyi (2006), Brooks (1997), Leon (2000) and Chau *et al.* (2013) as cited in Hammami *et al.,* (2015) have shown that political instability influences both market risk factors and stock return. Therefore, it will not be out of place to consider political instability as a market risk factor.

A significant number of studies have documented robust evidence on risk-return relationship in Nigeria. Prominent among these studies are Osamwonyi and Asein (2012), Isemila and Erah (2012), Izedonmi and Abdullahi (2011), Bello and Adedokun (2015), Hammami *et al.* (2015), Nnenna (2012), Gupta and Panchal (2013), Nwude (2013), Adedokun and Olakojo (2012), Ajibola and Ogbulu (2015) and Raputsoane (2009). Using single index CAPM and multiple index model of APT, the outcomes of these studies vary as they show a weak negative or no relationship. These mixed findings could be as a result of differences in the research scope, methodology, and the variables considered. The empirical evidence incorporating volatility of risk factors in Nigeria is scanty, because prior studies (Osamwonyi & Asein, 2012; Isemila & Erah, 2012; Ajibola & Ogbulu, 2015) used macroeconomic variables rather than their volatilities as against the position of Ross (1976) who maintained that it is the changes in these macroeconomic variables that constitute market risk. However, there are different macroeconomic factors like fluctuation in inflation rate, exchange rate, interest rate, oil prices and political risk that could constitute major market risk factors in Nigeria because they are highly volatile in nature. Thus, there is the need to use APT multi-index model and volatility values of these variables to re-examine the stock returns in Nigeria. Hence, a gap exists in the literature because the actual effect of market risk factors on stock return using APT within a volatile macroeconomic environment as is the case of Nigeria is still debatable. As a result, more research is needed in this direction. It is therefore imperative to know the asset price co-movement that explains the effect and magnitude of market risks on stock returns within the APT framework in Nigeria. The influence of market risk factors on stock returns in the Nigeria bourse is the main objective of this study. The specific objectives are to examine the causality effect of market risk factors of exchange rate, oil price, interest rate, inflation rate, and political instability risks on stock returns in Nigeria.

This study is significant and timely, in view of the dearth of empirical works on market risk factors and stock returns in the Nigerian economy. It is one of the scanty studies available in the literature and the foremost in Nigeria to generate market risk (volatility) data from macroeconomic variables using the autoregressive conditional heteroschedasticity (ARCH) and the generalized autoregressive conditional heteroschedasticity (GARCH) models. Therefore, this study provides a new market risk data set analyzed with the vector error correction (VECM) model to establish the cause-effect relationship between market risk factors and stock return in the Nigerian bourse in the short and long run. The findings from this study have important implications for regulatory authorities, investors, and researchers as they highlight how market risk factors determine stock return in Nigeria. Hence, the study contributes to the literature and extends the frontier of knowledge in this regard.

2. Literature Review

2.1 Conceptual Review

The nexus between market size and market risks and returns is very important. Liquidity, often known as market depth or size, is one of the most crucial efficiency measures of the market; measured by value of trade in this study. Market depth denotes a large number of buyers and sellers in the marketplace. As a result, it is simple to locate possible buyers and sellers at any moment for the share transaction of any company. Because of this, market participants avoid making drastic price changes. It can be calculated by looking at the ratio of transaction values to total market capital. When this ratio is high, the market suggests that the depth is also high.

The volume traded is a significant element in determining share prices and returns. Different methods are used to measure volume. It is measured as the number of trades (total number of transactions) that occur for a particular security or for the overall market (Gul *et al.,* 2009). On the one hand, it is defined as a measure of the amount of shares that change owners for a given security. Others still define it as the sum of all traded shares' financial values. All three criteria are regularly used by researchers (Gul *et al.,* 2009). The daily volume on a security on any given day can be influenced by a number of different factors, including the amount of fresh information about the company that is available, whether options contracts are about to expire, whether the trading day is full or half day, and many other potential factors (Gul *et al,* 2009). A market is weak-form efficient, according to Fama, if all the information contained in previous stock prices fully reflects in present prices (Fama, 1970, 1991). It follows that technical analysis methods are useless because historical security prices cannot be utilized to forecast future price movements. Technical analysts, on the other hand, hold the opinion that knowledge from past security prices have not been fully incorporated into present security prices. As a result, they think that by looking at past security prices, information about future security prices can be discovered. Therefore, determining whether a market is week-form efficient is a fascinating topic in finance. Technical analysts fervently concur that "Volume moves the price" (Kapoff, 1987). Early research on the relationship between volume and price suggests that individual equities as well as market indexes have positive relationships between the absolute value of daily price changes and daily volume (Ying, 1966; Westerfield, 1977; Rutledge, 1984).

Early studies on the relationship between trading volume and price movements looked at the relationships that existed at the time. They therefore have little bearing on how accurately stock prices will move in the future. (Gervars *et al.,*2001) explore the function of trading activities in terms of the knowledge it carries about future prices, introducing a new paradigm to the trade volume-price correlations (Gervars *et al*, 2001). In other words, they are curious about how well trade volume may be used to forecast the course of future price fluctuations. They argued that equities with huge (small) trade volumes over the course of a day or a week tend to have significant (small) returns over the following month.

The values of shares around the globe have a big impact on stock indexes. Consequently, the fundamental query is "why link the trade volume and its relationship to prices and returns?" According to Karpoff (1987), there could be four causes. It first deepens our understanding of how financial markets are structured. Second, to fully comprehend this relationship, it is necessary to use a mix of price and volume data to draw conclusions. Third, in order to understand why the distribution rates of return resemble kurtosis, it is crucial to comprehend the price-volume relationship in futures and other speculative markets. Fourth, price volatility has an impact on the amount of trade in futures contracts. Depending on how they interact, speculation either stabilizes or destabilizes futures prices. Investor judgments are influenced by the aesthetics of financial reports in the absence of clear financial facts (Smith, 2003).

In order to estimate volatility by tracking the trends and evaluating how it interacts with market risk and stock return, the Value of Transactions (VOT) on the Nigeria Exchange Limited (NEL) is utilized as a stand-in for the size of the stock market. Figure 1 shows the trend of Transaction values from 1981 to 2019;

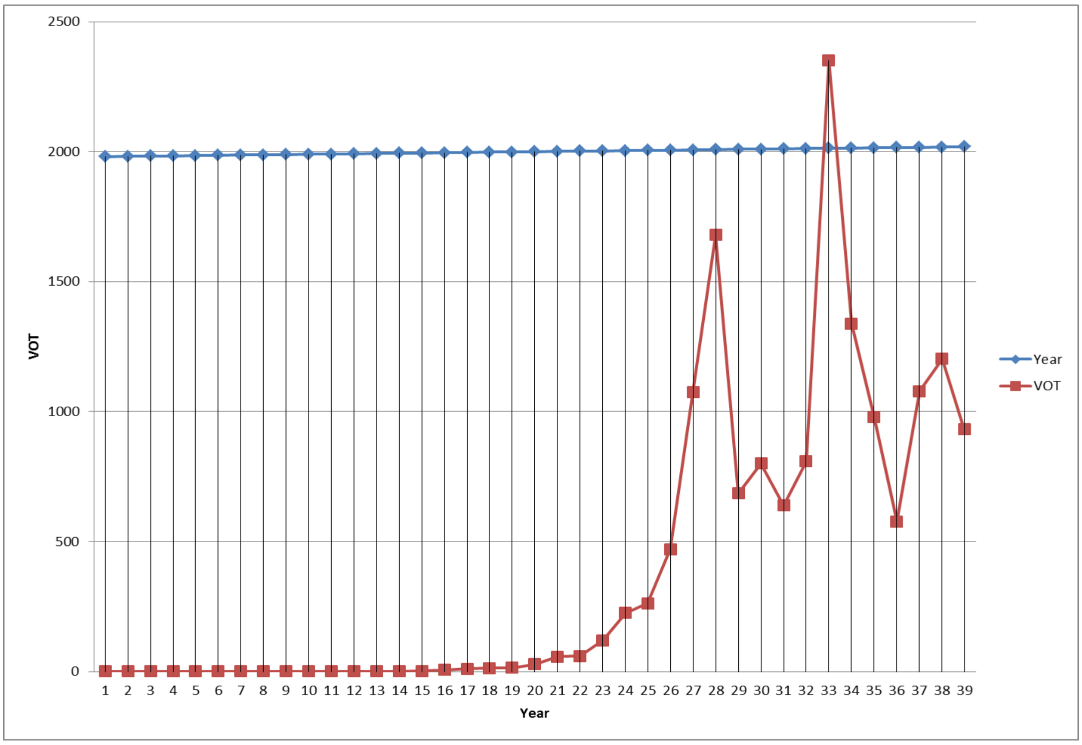

Figure 1: The trend of Value of Trade (VOT) on the Nigeria Exchange Limited (NEL): January 1981 to December 2019.

As seen in Figure 1, the market size volatility brought on by market risk factors has experienced instability over time. The trend in the NEL size (transaction value) series from 1981 to 2019 is clearly shown in Figure 1. From 1981 to 1995, the transaction values in the series were constant under 1.5 billion naira; from 1995 to 1999, the transaction values increased and stabilized at 1.8 and 14.07 billion naira. Once more, it exceeded 14.07 billion in 2000 and continued to grow steadily until 2007 and 2008, when it exploded upward to a peak of over 1,679.14 billion naira before rapidly declining to 685.72 in 2009. From 2009 until about 2012, it was stable when the size was between 799.91 and 808.99 billion. Then, it exploded upward to 2,350.88 in 2013 before plummeting to 577.82 billion in 2016. Around 2018, it increased gradually once more to 1,203.37 billion naira before sharply declining to 931.48 in 2019.

The problem with volatility of total amount of shares traded is the potential for long-term swings in the volume of shares traded on the stock market. Macroeconomic instability (risk) is the main cause of the ups and downs in the volume and value of stock traded in the market. Due to the fact that the stock market operates in a macroeconomic setting, an enabling setting is required in order for it to reach its full potential (Ibrahim, 2017).

2.2 Theoretical Literature

The most famous capital market model is CAPM, which was introduced by Markowitz (1952, and 1959) in his portfolio theory. Markowitz stresses the need for portfolio diversification with the use of correlation and the use of mean-variance approach to select an optimal portfolio. His work forms the bedrock of Shape (1964) and Lintner (1965) seminar work which was developed into wide economy implication to demonstrate efficient portfolio.

In practice, Lintner (1965) and Sharpe (1964) CAPM have been widely used and accepted (Young & Saadi 2011). CAPM and portfolio theory explains that in efficient portfolio, an investor can diversify non-systemic risk away. However, complete non-systemic risk elimination is impossible except returns on stock are perfectly negatively correlated (Markowitz 1952). Conversely, Sharpe (1964) argues that complete removal of systemic risk is impossible. According to CAPM, investors that assume systemic risk should be compensated, and this is measured by beta factor (Sharpe 1964). The major weakness and criticism of this model is that it is based on too many unrealistic assumptions. This makes its applicability almost impracticable in the real world. In light of the criticism of the CAPM, an alternative model called Arbitrage Pricing Theory (APT) was developed to overcome some CAPM's flaws. This theory was developed by Ross (1976), and it is a multifactor pricing model that does not require the identification of the market portfolio to determine asset prices. It neglects some assumptions made by CAPM and assumes a homogenous expectation, and replaces mean-variance framework with process generating security returns. APT suggests that returns on any stock tend to be in linear function of multiple indexes as a proxy for risk. This implies that the expected return is not a function of one factor (beta), but on different factors. Though, no external risk factors were identified by Ross from the lead off, later studies like Roll and Ross (1984) have mentioned and identified risk premium, interest rate term structure slope, industrial output and inflation. Also the theoretical derivation of APT was hinged on few unrealistic assumptions of CAPM. However, Camara (2009) and Brailsford (2007) strongly criticized the APT model of backward looking rather than being present and forward looking. In spite of these criticisms, the power point of this model cannot be overemphasized. First, the APT is flexible to absorb any and multiple macroeconomic risk or firm specific factors to predict stock returns. It follows return generating process. The model uses an asset expected return and the risk premium of multiple macroeconomic risk factors to predict accurate long term return (Ross, 1976). Thus, this model best fit a study of this nature.

The Arbitrage Pricing Theory (APT) as an unconditional multifactor model as developed by Ross (1976) and modified by Osamwonyi and Asein (2012) is the theoretical foundation for this study. This theory becomes imperative because it clearly explains the channels through which multiple risk factors of economic, social and environmental variables affect stock returns.

2.3 Empirical Review

Practically different methodological techniques such as CAMP non-linear regression, APT ordinary least square (OLS) multiple linear regression, causality test, vector error correction model (VECM) technique, autoregressive distributed lag (ARDL) error correction model (ECM) technique and general autoregressive conditional heteroschedasticity (GARCH) have been used to examine market risk factors effect on stock returns using CAPM or APT framework. Specifically, the CAPM, GARCH and OLS regression frameworks are adopted by Lintner (1965), Douglas (1969), Gupta and Sehgal (1993), Madhusoodanan (1997), Battilossi and Houpt (2006) to ascertain the influence of market risk on stock return in U.S, Indian, and Spain. Their studies revealed that CAPM was violated with positive and statistically significant residual risk, because intercept was larger than expected. The Indian study by Madhusoodanan (1997) recommended that high risk and high return strategy will not be rewarding in the Indian market, while low risk stocks are preferred. However, the findings of Black *et al.* (1972), Isakov (1999), Fletcher (2000), Hodoshima *et al.* (2000), Tang and Shum (2003), Akingunola (2007), Raputsoane (2009), Theriou *et al.* (2010), Sinaee and Moradi (2010) extensively explained excess return, thereby lending support to the structure of the linear equation as a good explanation of security returns. They also confirmed beta as a good measure of risk to be compensated by the market. Furthermore, Fletcher (2000) reported a positive and significant association between beta and returns in up market and the converse hold in the down market. This implies that the standard asset pricing theory held in the South African stock market.

Moreover, OLS VECM, GARCH-M, and ECM techniques have been used to estimate the APT multiple index model. Chen *et al.* (1986), Mukherjee and Naka (1995), Goriave (2004), Ramin *et al.* (2004), Menggen (2007), Abdul (2008), Al-Refai (2009), Soyode (2009), Mayewa and Oseyonmom (2010), Ajao and Oseyomon (2010) and Tunali (2010) adopted the APT model and a set of macroeconomic risk variables, in order to examine inflation, market return and oil prices, money supply, real economic activity, long term government bond rate, exchange rate, and call money rate and industrial production as proxy for systematic risk factors on US, Japan, Russian, Singapore, China, Pakistan, Jordan, Nigerian, Turkey stock returns. Their findings revealed a strong and significant long run relationship between the variables under consideration. Thus, stock returns are exposed to systematic economic news. A significant positive risk-return relationship is only found for daily returns in Shenghen Stock Exchange (Menggen, 2007; Al-Refai, 2009). On the contrary, using OLS multiple regression techniques, Gjerde and Saettem (1999) and Paavola (2006) examined macroeconomic risk variables in Norway and Russia respectively. They found a direct relationship between macroeconomic risk variables of oil price, economic activity, equity and stock returns. However, a significant relationship was not found between stock returns and inflation in Norway, as well as between the macroeconomic variables and equity returns in Russia.

Sulaiman *et al.* (2009) used the APT framework and OLS linear regression technique to study the nexus between macroeconomic (market) risk factors and share prices in Pakistan. The data for the study include several quarterly data for foreign exchange reserve, wholesale price index, M2 (Broad Money Supply), industrial production index (IPI), fixed capital formation (GFCF), exchange rate and whole sale price index (WPI). The study revealed that since 1991, only foreign exchange rate and reserve significantly affected stock prices. Other variables had no significant effect on stock prices. Izedonmi and Abdullahi (2011), and Melina and Chaido (2011) used the APT framework and multiple OLS regression techniques to examine the effect of market risk factors of inflation, exchange rate and market capitalization, interest rate, and industrial production in Nigeria and Greece. The study discovered no significant effect of market risk factors on stock returns in Nigeria, while co-integration vector association was detected between the variables considered which tend to converge together over time in Greece. Mohammed (2011) empirically confirmed a direct nexus between stock returns and industrial output, market earnings, and market capitalization. On the other hand, there exist a negative influence between stock returns, foreign remittance and inflation in Dhaka stock exchange using multivariate OLS regression model. Adopting a weekly data, Shah *et al.* (2021) used cross-sectional and time series OLS regression, CAPM, and Fama and French three factor models to examine stock return in Pakistan from 2006 to 2018. The study showed that beta cannot explain expected return as revealed in the cross-sectional regression, while the time-series regression suggested that both CAPM and three factor model are best in explaining expected returns. However, GRS-based test of regression intercepts and regressions R^2 indicate that Fama and French model better captures variations in observed stock returns than the CAPM.

Singh and Kushwaha (2011) examined the relationship between share prices of all listed companies from 2003 to 2008 and the macroeconomic risk variables in Taiwan stock market. Adopting a linear OLS regression method, the findings revealed that GDP and exchange rate directly affect the entire portfolio returns. Also, exchange rate, inflation rate, and M2 are inversely influenced by medium and big firm's portfolio returns. Okoro (2017) looked at the influence of selected macroeconomic risk factors on Nigeria stock performance through 1986 to 2015. The study adopted the OLS estimation technique, and revealed that the combination of GDP, M2, inflation, interest and exchange rates are not sufficient in predicting stock performance in Nigeria. Saeed *et al.* (2012) employed a GARCH model to study the influence of five market (macroeconomic) risk variables in Tehran (Iran) bourse under the arbitrage pricing theory framework. The findings of the study showed that inflation rate, gold price and exchange rate variables significantly determine stock returns. Emeka and Aham (2013) used the GARCH model to investigate the association between systemic risk and the Nigeria bourse returns spanning from 1985 to 2009. The findings showed that the index of manufacturing output expenditure of government, interest and inflation rate strongly and significantly affects stock returns, while exchange rate and M2 do not. Kalu and Okwuchukwu (2014) explored the effect of market risk factors on stock returns in Nigeria from 1996 to 2013. The regression results from GARCH-X model showed that M2 and inflation rate directly and significantly drive stock return volatility in Nigeria. The converse of this effect was shown by net foreign asset.

Haruna *et al.* (2013) employed VECM to look at the link between stock performance and systemic risk variables in Ghana from 1995 to 2010. The study revealed a significant long run association between stock returns and FDI, inflation and M2. A significant impact of interest rate, M2 and inflation on stock returns in the short run was also found. The findings revealed that Efficient Market Hypothesis (EMH) does not hold in Ghana stock exchange. Arodeye (2012) x-rayed the systematic risk variables impact of real GDP, inflation rate and interest rate on stock returns using quarterly data from the years 1985 to 2009 in Nigeria stock exchange. Findings from the VAR estimate showed that there is a long run correlation between stock prices, inflation rate and real GDP during the periods reviewed. Osamwonyi and Asein (2012) investigated the effect of market risk on stock returns in line with CAPM from the years 2001 to 2005. Direct linear association between market betas and security returns was confirmed by the result from the studied sample. Zubair (2013) used causality technique to ascertain the causality relationship between stock returns and market risk indicators of exchange rate and M2. The causality estimate showed no direct nexus between all-share index (ASI) and exchange rate, thus, confirming the findings of Khilji (1994) and Attuallah (2001).

Osamwonyi and Evbayiro-Osagie (2012) examined the effect of some macroeconomic variables on stock prices (proxy for All Share Index) from the years 1975 to 2005. VECM was employed and the study revealed that there is a long run relationship between six macroeconomic variables, namely fiscal deficit, interest rate, GDP, exchange rate, M2, inflation rate, and stock market index in Nigeria. Aliyu (2015) examined macroeconomic risk effect on stock returns in the Nigeria from 2000 to 2012. Adopting the unrestricted VAR model, the study revealed that there exists a marginal influence of the domestic variables of money supply, exchange rate, Nigeria treasury bills rate, inflation rate on stock returns. Changes in the US Stock prices have a significant direct impact on stock returns, while exchange rate has more impacts on change in stock return when compared with other domestic variables. This indicates that the Nigerian stock market is exposed to a contagious effect of global financial market.

Oyetayo and Adeyeye (2017) adopted APT model in Nigeria in order to examine the impact of market (macroeconomic) risk factors with ECM and the fully modified ordinary least squares (FMOLS) methodology. The findings of the study revealed that APT is valid in Nigeria in the short run, while RGDP and stock returns relationship are continuous in the long run. Bello and Fakunmoju (2019) ascertained the effect of market risk factors on stock return in the Nigeria bourse. The ECM ARDL bound test was adopted to analyze the twenty-one year observation. The study showed that exchange and inflation rates inversely and significantly affect stock return in the long run. Also, only the effect of market turnover was positive in the long run, while trading volume effect was negative and insignificant. The effects of these variables are significant and positive in the short run. Malika (2021) used ECM to examine the relationship between the stock market and macroeconomic factors (interest rate, consumer price index, exchange rate) in United Kingdom within the Pre and post Global Financial Crisis (GFC) of 2008; that is from January 1999 to December 2007. The findings of Johansen co-integration, and Granger and Toda Yamamoto (TY) Causality tests showed respectively that no co-integration existed between variables, no causal relation was depicted from macro factors to stock return, and a unidirectional causal relation was depicted from exchange rate to stock price. Also, VAR Granger non-causality/block exogeneity Wald tests results showed that both inflation (INF) and exchange rate growth (EXCG) Granger cause the UK stock market return. Moreover, the ARDL specification showed a stable long run effect of all considered macroeconomic factors on the UK stock price. Precisely, the results of the ECM showed that all considered macroeconomic factors drives UK stock price toward long-run equilibrium at a fast speed.

Kassi *et al.* (2019) investigated the effect of market risk on the financial performance of firms quoted on Casablanca bourse ranging from 2000 to 2016. The panel regression of fixed and random effect, differenced and system GMM methodology were adopted. The findings of the study revealed that different measures of market risk (financial leverage degree, gearing ratio and book-to-market ratio) have significant negative influences on the 31 companies' financial performance considered in the sample. Farlian, *et al.* (2019) studied market risk factors impact on Indonesian stock return from 2015 to 2007. Common effect and Chow test methodology were used. The study revealed that firm size impacts stocks return, and market risk does not impact stocks return of blue chip companies. Mwenda *et al.* (2021) examined systematic risk and performance of stock market in Kenya. The study was underpinned by the efficient market hypothesis, APT, and integration analysis which were used to establish the relationships between the variables of the study. The study found a significant long-run positive relationship between interest rate, inflation, and the performance of the stock market in Kenya. The study suggests that investment firms and financial analyst should use past data on 91 Treasury bills rate and inflation, in predicting the future performance of stock exchange for the benefit of investors.

From the reviewed literature, findings of the studies on market risk and stock returns in Nigeria were mainly mixed; with some finding significant effect of market risk on stock return while others found insignificant effect. In other words, study that uniquely used ARCH and GARCH model to generate the residual variance of inflation rate, exchange rate, interest rate, oil price and political instability volatilities as proxies for market risk factors; and the factors were further substituted into dynamic VECM framework is not common in the case of Nigeria. In this study, a new and recent dataset of market risk and stock return is generated. It is germane to use the multivariate VECM to determine the co-movements of asset prices that suggest the presence of underlying exogenous influence and the magnitude of the market risk variables of oil price risk, inflation rate risk, exchange rate risk, interest rate risk and risk of political instability on stock returns within the APT framework in Nigeria. The multivariate VECM is used because the technique emphasizes the causal dynamics and long-run relations among the model variables and it is a reliable and useful alternative method to structural modeling (Sim, 1982; Todd, 1990; Darrat & Al-Sowaidi, 2010).

3. Data and Methodology

3.1 Data

The variables considered in this study are time series. The study selects exchange, interest, and inflation rates, oil price, political instability and stock returns from 1980 to 2019. This period covers the pre and post GFC of 2008 and other significant developments that took place within the specified period. All variables were sourced from the CBN statistical bulletin, Nigeria Stock Exchange's (NSE) annual fact book publications 2019, World Bank Development Indicators database, and the Organization of Petroleum Exporting Countries' (OPEC) website (see Table 1).

Table 1: Data and Measurement

Variables	Definition	Measurement	Type / Sign	Source
STRTN	Stock Market Return	The yearly closing point of All-share index (ASI) of the Nigerian Stock Exchange is used to compute the stock market returns (STRTN). Following Saryal (2007) model, adapted in Ajao (2013), we compute the stock market returns as follows: $STRTN = Log\left(\frac{P_t}{P_{t-1}}\right) * 100$ This practice is common rather than using discrete compounding (Simons & Laryea, 2015).		NSE Annual Publication 2019
OILP	Oil Price Risk	The annual percent change in oil price.	Independent Variable (+)	OPEC Website

Variables	Definition	Measurement	Type / Sign	Source
INFR	Inflation Rate Risk	Inflation rate is derived from the consumer price index. Annual inflation rate is used due to the presence of INFR in the model.	Independent Variable (-)	CBN Statistical Bulletin 2019
INTR	Interest Rate Risk	It captures the rate of lending to credit worthy customers by deposit money bank. Nominal annual interest rate volatility is used.	Independent Variable (-)	CBN Statistical Bulletin 2019
EXCR	Exchange Rate Risk	It is the movement in the price of a nation's currency to a unit of other countries' currencies. It is very vital in constituting market risk. It was proxied by annual exchange rate volatilities	Independent Variable(+)	CBN Statistical Bulletin 2019
POLINSTBTY	Political Instability Risk	It is captured by the number and severity of political event that took place as collated by World bank development index. It is measured on a scale of 0 (Extreme stable) to 10 (Extreme high) based on the degree of severity of the political event (protest, riot and policy summersault).	Independent Variable (-)	World Bank Development index

3.2 Theoretical Framework

The relationship between portfolio return and its beta is best represented by a straight line called security market line (SML). The beta factor and the required return are directly related. The SML is given as:

$$E\left(R_i\right) = rf + E\left(r_m - r_f\right)\beta i \tag{1}$$

Where: E(R_i) is Return anticipated on stock i, rf is Risk-free rate, βi is Beta factor and E*(rm - rf)* is Anticipated market risk premium (market portfolio anticipated return less risk-free rate)

That is, equity expected returns is rf plus the market risk premium multiplied by the beta factor. Beta caters for stock's return responsiveness to change in total market return (Watson & Head, 2010). APT is indicated as:

$$\mathrm{E}\left(\mathrm{r_i}\right) = \mathrm{rf} + \sum_{\mathrm{k}=1}^{\mathrm{k}} \mathrm{E}\left(\mathrm{r_{mk}} - \mathrm{rf}\right) \beta_{\mathrm{ik}} \tag{2}$$

Where: β_{ik} is Stock i sensitivity to k risk factor

The macro level of this model as developed and propagated by Ross (1976) is given as;

$$\rho_{(rj)} = R_f + \delta_{j1}\gamma_1 + \delta_{j2}\gamma_2 + \delta_{j3}\gamma_3 + \delta_{j4}\gamma_4 + \cdots + \delta_{jn}\gamma_n \tag{3}$$

Where:$\rho_{(rj)}$ is Rate of return expected from j'i asset, R_f is Constant rate without risk (intercept term), δ_j is Asset j'i sensitivity return to a specific factor and γ_j is Particular factor risk premium

The notion propagated by APT affirms that the duo factor of macroeconomic, asset specific and security sensitivity influences are responsible for expected return. This correlation takes the pattern of the linear regression model in equation 3.

In line with this, Osamwonyi and Evbayiro-Osagie (2012) and Monogbe, *et al.* (2016) modified the APT model in the Nigeria capital market using the following model:

$$Ser = \alpha_0 + \alpha_1 Int + \alpha_2 Inf + \alpha_3 Exc + \alpha_4 X + e_i \tag{4}$$

Where; α_0 is Constant, *Ser* is Return on security, *Int* is Interest rate, Inf is Represent the inflation rate, *Exc* is Exchange rate, X is Array of other control variables included in the model by the authors and e_i is error term.

3.3 Model Specification

This study adapted the model of Osamwonyi and Asein (2012) and Monogbe, *et al.* (2016) to suit the objectives. Given a co-integrating relationship among variables in line with the existing literature, the VECM with standard assumptions indicating interrelationship between market risk and stock return is specified as:

$$\Delta STRTN_t = \alpha_{1t} + \sum_{j=i}^{n-1}\beta_{1j}\Delta STRTN_{t-j} + \sum_{j=i}^{n-1}\beta_{2j}\Delta INTR_{t-j} + \sum_{j=i}^{n-1}\beta_{3j}\Delta EXCR_{t-j} + \sum_{j=i}^{n-1}\beta_{4j}\Delta INFR_{t-j} + \sum_{j=i}^{n-1}\beta_{5j}\Delta OILP_{t-j} + \sum_{j=i}^{n-1}\beta_{6j}\Delta POLINTBTY_{t-j} + \delta_1\gamma_{t-1} + \varepsilon_{it} \quad (5)$$

$$\Delta INTR_t = \alpha_{2t} + \sum_{j=i}^{n-1}\psi_{1j}\Delta STRTN_{t-j} + \sum_{j=i}^{n-1}\psi_{2j}\Delta INTR_{t-j} + \sum_{j=i}^{n-1}\psi_{3j}\Delta EXCR_{t-j} + \sum_{j=i}^{n-1}\psi_{4j}\Delta INFR_{t-j} + \sum_{j=i}^{n-1}\psi_{5j}\Delta OILP_{t-j} + \sum_{j=i}^{n-1}\psi_{6j}\Delta POLINTY_{t-j} + \delta_2\gamma_{t-1} + \varepsilon_{it} \quad (5b)$$

$$\Delta EXCR_t = \alpha_{3t} + \sum_{j=i}^{n-1}\rho_{1j}\Delta STRTN_{t-j} + \sum_{j=i}^{n-1}\rho_{2j}\Delta INTR_{t-j} + \sum_{j=i}^{n-1}\rho_{3j}\Delta EXCR_{t-j} + \sum_{j=i}^{n-1}\rho_{4j}\Delta INFR_{t-j} + \sum_{j=i}^{n-1}\rho_{5j}\Delta OILP_{t-j} + \sum_{j=i}^{n-1}\rho_{6j}\Delta POLINTBTY_{t-j} + \delta_3\gamma_{t-1} + \varepsilon_{it} \quad (5c)$$

$$\Delta INFR_t = \alpha_{4t} + \sum_{j=i}^{n-1}\theta_{1j}\Delta STRTN_{t-j} + \sum_{j=i}^{n-1}\theta_{2j}\Delta INTR_{t-j} + \sum_{j=i}^{n-1}\theta_{3j}\Delta EXCR_{t-j} + \sum_{j=i}^{n-1}\theta_{4j}\Delta INFR_{t-j} + \sum_{j=i}^{n-1}\theta_{5j}\Delta OILP_{t-j} + \sum_{j=i}^{n-1}\theta_{6j}\Delta POLINTBTY_{t-j} + \delta_4\gamma_{t-1} + \varepsilon_{it} \quad (5d)$$

$$\Delta OILP_t = \alpha_{5t} + \sum_{j=i}^{n-1}\lambda_{1j}\Delta STRTN_{t-j} + \sum_{j=i}^{n-1}\lambda_{2j}\Delta INTR_{t-j} + \sum_{j=i}^{n-1}\lambda_{3j}\Delta EXCR_{t-j} + \sum_{j=i}^{n-1}\lambda_{4j}\Delta INFR_{t-j} + \sum_{j=i}^{n-1}\lambda_{5j}\Delta OILP_{t-j} + \sum_{j=i}^{n-1}\lambda_{6j}\Delta POLINTBTY_{t-j} + \delta_5\gamma_{t-1} + \varepsilon_{it} \quad (5e)$$

$$\Delta POLINTBTY_t = \alpha_{6t} + \sum_{j=i}^{n-1}\phi_{1j}\Delta STRTN_{t-j} + \sum_{j=i}^{n-1}\phi_{2j}\Delta INTR_{t-j} + \sum_{j=i}^{n-1}\phi_{3j}\Delta EXCR_{t-1} + \sum_{j=i}^{n-1}\phi_{4j}\Delta INFR_{t-j} + \sum_{j=i}^{n-1}\phi_{5j}\Delta OILP_{t-j} + \sum_{j=i}^{n-1}\phi_{6j}\Delta POLINTBTY_{t-j} + \delta_6\gamma_{t-1} + \varepsilon_{it} \quad (5f)$$

The a-priori expectation as derived from the empirical literature is given as:
$\alpha_0 > 0$; $\beta 1 > 0$, $\beta 3 > 0$ and $\beta 5 > 0$, $\beta 2 < 0$, $\beta 4 < 0$ and $\beta 6 < 0$

3.4 Estimation Procedure

To comply with econometric theory and procedure, the descriptive features of the variables are summarized and presented using descriptive statistics. To prevent spurious regression output, first, the test for the presence or absence of unit root is carried out using augmented Dickey Fuller (ADF) and Philips Perron (PP) techniques.

Next, the Johansen and Juselius (1990) trace and maximum eigen statistics is used to determine the existence of co-integrating relationship among the variables. ARCH and GARCH as developed by Engle (1982) and Bollerslev (1986) is adopted to generate the volatilities (risk) of all the endogenous variables under consideration. Bollerslev (1986) argues that ARCH and GARCH models are among the best models to characterize the changes of uncertainty in speculative prices over time. GARCH (1,1) conditional variance model is given as:

$$Y_t^2 = \alpha o + \alpha_1 X_{t-1}^2 + \beta Y_{t-1}^2 \tag{6}$$

where: Y_t^2 is the measure of macroeconomic variable volatility; αo = intercept; α_1 and β = coefficients of the ARCH and GARCH terms respectively; X_{t-1}^2 is the ARCH term, the lag of squared residual and captured news about volatility from the previous period Y_{t-1}^2 = The GARCH term, the lag of volatility measure itself. The mean equation of the GARCH model is specified as:

$$MRF_t = \emptyset_0 + \emptyset_1 MRF_{t-1} + \mu_t \tag{7}$$

where; ΔMRF is rate of change in macroeconomic variables employed in this study and μ_t is stochastic error that is stationary. We substitute the macroeconomic variables into Eq(7), and generate the corresponding volatilities, thereby transforming these variables into market risk variables. These market risk variables are then used as endogenous variables in the estimation of Eq(5). VECM is a restricted version of vector autoregressive (VAR) model with co-integrating restrictions built into the specification. It is constructed only if the variables are co-integrated and integrated of the same order (0 or 1). Also, all variables in VECM model are considered endogenous variables. It restricts the long run behaviour of the variables to converge to their co-integrating relationships. It is best for a study of this nature because it has the capability of revealing the short and long run causality dynamics of the co-integrated series. Besides, the resulting VAR from VECM representation has more efficient coefficient estimates. The Akaike Information Criterion (AIC) is employed to obtain the optimum lag length.

4.0 Results and Discussion

4.1 Pre-estimation results

The preliminary test results of market risks data generated from their corresponding macroeconomic variables using GARCH 1, 1 method are presented in table 1. The table shows the summary of the variables volatility (risk) properties.

Table 2: Descriptive Statistics

	STRTN	OILP	INFR	INTR	EXCR	POLINSTBTY
Mean	20.2397	1428.3670	20.0157	12.5468	74.8393	135.7299
Median	18.4600	94.1800	12.0000	12.8200	22.0500	46.3900
Std. Dev.	34.2818	2645.8090	18.6031	3.8129	72.5508	169.7806
Skewness	0.72628	1.8910	1.5896	0.6034	0.4689	1.4173
Kurtosis	4.2870	5.1322	4.5148	3.4679	1.9988	3.3634
Jarque-Bera	5.8065	29.1064	19.1197	2.5825	2.9009	12.5900
Probability	0.5048	0.1200	0.1801	0.2749	0.2345	0.1801

Only the ratio of mean to median is approximately one for STRTN and INTR risk. These two variables have a symmetric distribution that is relative to normal in table 4.1. The mean value for STRTN is greater than that of INFR and INTR. This implies that the average actual returns from stock exceed the level of INFR and INTR risk in the economy within the period studied as indicated by their corresponding Std. Dev values of 18.60 and 3.81 respectively. However, the reverse was the case for EXCR, OILP and POLINSTBTY volatilities, which constitute the highest market risk factors as shown by the high standard deviation values. On the other hand, INTR and INFR constitute the lowest market risk factors as indicated by the standard deviation values which are very low (Table 2).

The Jarque-Bera statistics show that all the variables are not significant as shown by their probability values. This shows that all the variables are normally distributed. All variables skewed to the right, thereby, having a long tail to the right from their mean values as indicated by their corresponding skewness value. STRTN, OILP, INFR and INTR show the peak distribution property as their Kurtosis values are approximately greater than 3.0. On the other hand, EXCR shows a flat distribution property as its Kurtosis value is less than 3.0. Only POLINSTBTY did not exhibit fat tailed distribution property as its Kurtosis is approximately 3.0.

Table 3: Stationarity Test (Unit Root Test)

Variables	ADF Stat	Order of integration	P-P Stat	Order of integration
STRTN	-5.0667**		-4.3272*	
	-7.860548***	I(1)	-6.5732*	I(1)
OILP	-3.3081		-2.2741	
	-6.8600***	I(1)	-4.0785**	I(1)
INFR	-4.2325		-3.3509***	
	-7.0210***	I(1)	-13.7725*	I(1)
INTR	-4.052		-3.2165***	
	-8.8743***	I(1)	-8.3408*	I(1)
EXCR	-2.8040		-1.4210	
	-5.4761***	I(1)	-4.2552*	1(1)
POLINSTBTY	-2.9650		-1.0311	
	-7.3112***	I(1)	-6.7575*	I(1)
Critical Values				
1%	-5.3476		-4.2310	
5%	-4.8598		-3.5403	
10%	-4.6073		-3.2024	

****, **, and * indicates stationary at 1%, 5% and 10% respectively*

All the variables are stationary at first difference I(1) at 5% critical level. This is consistent with theoretical criteria, thus, the co-integration test is conducted using Johansen approach and the results are presented in Table 4.

Table 4: Co-integration Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5% Critical Value	Prob.**
None *	0.8654	162.5295	95.7537	0.0000
@M 1 *	0.7728	96.3476	69.8189	0.0001
@M 2	0.6148	47.4422	47.8561	0.0546
@M 3	0.2426	15.9642	29.7971	0.7148
@M 4	0.1858	6.7945	15.4947	0.6017
@M 5	0.0004	0.0116	3.84147	0.9142

Trace test point out 2 co-integrating eqn(s) at the 0.05 level * shows hypothesis rejection at the 0.05 level @M = At Most

Hypothesized No. of CE(s)	Eigenvalue	Max- Eigen Statistic	5% Critical Value	Prob.**
None *	0.8654	66.1819	40.0776	0.0000
@M 1 *	0.7728	48.9054	33.8769	0.0004
@M 2*	0.6148	31.4780	27.5843	0.0150
@M 3	0.2426	9.16974	21.1316	0.8185
@M 4	0.1858	6.7829	14.2646	0.5151
@M 5	0.0004	0.0116	3.8415	0.9142

Max-eigenvalue test shows 3 co-integrating eqn(s) at 5% level* shows hypothesis rejection at the 0.05 level @M = At Most

Both the trace and maximum eigen statistics confirm co-integrating association among the variables. The trace results indicate two (2) co-integrating equations at 1% level of significance, while the Maximum Eigen statistics shows three (3) co-integrating equation at 1% level of significance. From the foregoing, the study rejects the null hypothesis that there is no co-integrating relationship among the variables. This implies that the variables adjust to equilibrium in the long run after short run shock that is, long run relationship exists.

Table 5 presents the lag selection criteria. Based on the AIC we select lag order two. However, we estimate a VECM of order 1 (VECM (2)) due to differencing.

Table 5: Lag Selection Criteria (Akaike Info Criterion)

Lag	LogL	LR	FPE	AIC	Lag	LogL
0	-1015.1430	NA	2.10e+20	63.8214	64.0962	63.9125
1	-888.6492	197.6460	7.67e+17	58.1656	60.0894*	58.8033
2	-836.5924	61.8175*	3.63e+17*	57.1620*	60.7348	58.3463*
3	-769.1822	54.7708	1.11e+17	55.1989	60.4206	56.9297

* indicates lag order selected by the criterion; AIC: Akaike information criterion

4.2 Empirical Results

The effect of market risk factors on stock return is shown by the VECM results in table 6.

Table 6: Vector Error Correction Estimates

VECM Long run Result

	EXCR(-1)	INFR(-1)	INTR(-1)	OILP(-1)	POLINSTBTY(-1)	C
Coefficients	-0.3800***	-1.2052***	-2.4919**	0.0429***	-0.6455***	54.91394
S.E	(0.0815)	(0.2249)	(1.0610)	(0.0042)	(0.0934)	
t-statistics	[-4.7524]	[-5.3597]	[-2.3281]	[10.1410]	[-0.65112]	

VECM Short Run Result

Error Correction:	STRTN	EXCR	INFR	INTR	OILP	POLINSTBTY
CointEq1	-0.7097	-0.1874	0.1194	0.0103	-17.8938	-0.1173
S.E	(0.16509)	(0.0759)	(0.1056)	(0.0187)	(4.4121)	(0.1802)
t-statistics	[-4.2985]	[2.4674]	[1.1312]	[0.5539]	[-4.0556]	[-3.6511]
DSTRTN(-1)	0.0872	-0.0891	-0.16009	0.0031	-0.2070	0.2203
	(0.1660)	(0.0764)	(0.1061)	(0.0188)	(4.4364)	(0.1812)
	[0.5251]	[-1.1667]	[-1.5084]	[0.1636]	[-0.0467]	[1.2161]
DEXCR(-1)	1.0597**	0.0316	0.2393	0.0310	-22.6695	0.9067
	(0.4255)	(0.1957)	(0.2720)	(0.0481)	(11.3706)	(0.4644)
	[2.4907]	[0.1612]	[0.8797]	[-0.7059]	[-1.9937]	[1.9526]
DINFR(-1)	-0.3011	0.1390	0.0463	0.0783	-9.2958	-0.2163
	(0.3369)	(0.1550)	(0.2154)	(0.0381)	(9.0042)	(0.3677)
	[-0.8937]	[0.8969]	[0.2147]	[2.0550]	[-1.0324]	[-0.5882]

Table 6: Continue

DINTR(-1)	-3.3054	0.9404	0.8294	-0.1272	37.0510	-2.4442
	(1.7459)	(0.8031)	(1.1162)	(0.1974)	(46.6580)	(1.9054)
	[-1.8933]	[1.1710]	[0.7431]	[-0.6445]	[0.7941]	[-1.2828]
DOILP(-1)	0.0213**	-0.0019	-0.0033	-0.0004	0.3990**	0.0206
	(0.0060)	(0.0028)	(0.0038)	(0.0007)	(0.1605)	(0.0066)
	[3.5433]	[-0.6832]	[0.8579]	[-0.5647]	[2.4865]	[3.1474]
DPOLINSTBTY (-1)	-0.3255	0.03967	0.0626	0.0199	11.9803**	0.1454
	(0.1715)	(0.0789)	(0.1097)	(0.0194)	(4.5833)	(0.1872)
	[-1.8981]	[0.5032]	[0.5710]	[1.0264]	[2.6139]	[0.7768]
C	-6.2220	4.8650	-1.4267	0.2932	71.4159	1.3832
	(6.5281)	(3.0029)	(4.1737)	(0.7380)	(174.4630)	(7.1247)
	[-0.9531]	[1.6201]	[-0.3418]	[0.3972]	[0.4094]	[0.1942]
R^2	0.8554	0.1010	0.1305	0.2844	0.6599	0.4226
Adjusted R^2	0.7693	-0.1393	-0.1129	0.0840	0.5646	0.2610
F-Statistic	5.0423	0.4412	0.5362	1.4193	6.9286	2.6141

Note: *** and ** =1% and 5% significant Level Respectively

The coefficient of determination R^2 and its adjusted version for stock return model in Table 6 has a good-fit of 86% and 77% respectively. This means that all the variables considered in the stock return model account for approximately 77% of total systematic change in stock return in Nigeria. The F-statistic value of 5.04 is significant at 1% level. This implies that there is a significant relationship between all the variables taken together in the model. Only 23% of total systematic change is not accounted for by the model.

Furthermore, the results reveal that two of the co-integrating variables DSTRTN and DEXCR are adjusting to long run equilibrium after short run shock and they are significant at 5%. This is embedded in the negative sign of their respective coefficients when compared to their corresponding t-values in CointEql. This shows that the error correction has the proper sign and speed of adjustment in the two variables which converge in the long run after the short run shock at the minimum speed of 19% and maximum speed of 71% approximately. Also, the short run disequilibrium in previous period converges into long run equilibrium relationship. The first difference of the endogenous variables was taken including STRTN (though STRTN was stationary at levels too) because the series were not stationary at levels. Stationary series at levels or first difference is a necessary and sufficient condition required for an efficient and accurate VECM output. The variables are the major drivers of convergence to equilibrium in the face of structural break thereby, preventing diverge from equilibrium.

The one period lag of all the variables considered showed the short run dynamic interactions between all the variables. From the VECM result, the stock return DSTRTN model (first column and a model of major concern) reveals that the one period lag value of stock return DSTRTN(-1) has a non-significant positive relationship on current year's stock return. This indicates that past values of stock return has not yielded the desired effect on current year stock's return in the short run. The one period lag value of exchange rate DEXCR(-1) and oil price volatility DOILP(-1) also has significant positive effect on stock return DSTRTN in the short run. This is not statistically significant at 1% and 5% level respectively. This means that the government's attention to exchange rate and oil price volatility in Nigeria economy has yielded the desire result in spurring stock return in the Nigeria stock market.

Finally, stock return, exchange rate, oil price volatility and political instability variables are signed correctly, while inflation rate and interest rate are not correctly signed in the model. This also means that government policies in inflation rate and interest rate have not really impacted stock return.

To further validate the veracity of the results, the portmanteau autocorrelation is conducted and the result reveals that the Q-Stat and the Adj Q-Stat values are not significant with high probability values that are greater than 0.05 up to order 12. This means the absence of autocorrelation in the VECM estimates. As such, the findings can be used for policy recommendation without re-specification.

A number of important findings and policy implications can be deduced from our empirical result. These findings and the policy implications are presented as follows: Exchange rate risk has a significant effect on stock return both in the short and long run within the periods under review in Nigeria. This implies that a unit rise in exchange rate risk will result to 1.059724 unit increase in stock return in the short run and -0.3800 significant decrease in stock return in the long run. This finding is in line with the *a priori* expectation and the findings of Hussein and Mgammal (2012), Lee and Wang (2012), and Sevuktekin and Nar gelecekenler (2007). However, this is contrary to the findings of Nath and Samanta (2003) and Franck and Young (1972). The findings further reveal that the inflation rate risk considered in the model has a non-significant effect on stock return in the short run but significant effect in the long run period. This shows that inflation rate has significant effect on stock return in Nigeria within the periods under consideration but only in the long run. This implies that a unit increase in inflation rate risk will cause stock return to decrease by -1.2052 units. This variable also behaves in line with the *a priori* expectation as indicated by its negative coefficient. These findings also concur with that of Fama (1990), Uwubanmwen and Igbinovia (2015), Flannery and Protopapadakis (2012).

The findings also show that interest rate risk has a non-significant effect on stock return in the short run and the effect became significant in the long run period. This indicates that interest rate has a significant catalytic effect on stock return in Nigeria within the periods under review but only in the long run. Also, a percentage change in interest rate risk will result to -2.4919 unit decrease in stock return. This result concurs with the findings of Uddin and Alam (2007), Inyiama and Nwoha (2014), Asaolu and Ogunmuyiwa (2010). However, the variable misbehaves by not conforming to the *a priori* expectation. This could be attributed to the high level of interest rate that is endemic in the Nigeria economy. In the same vein, oil price risk has a significant effect on stock return in Nigeria both in the short and long run period. The alternate hypothesis (Hi) is accepted and this implies that oil price volatility in Nigeria has significant effect on stock return within the periods under consideration. However, a unit change in this variable increases stock return with 0.0213 (2%) in the short run; and reduces stock return significantly with 0.0429 (4%) in the long run due to its negative coefficient. This finding affirms the submission of Akinlo (2014), Sadorsky (1999) and Hassan and Mahbobi (2013) that significant relationship exists between oil price risk and stock return. Also, political instability risk has a significant effect on stock return in Nigeria but only in the long run period. This implies that persistent political instability significantly impedes stock return in Nigeria within the periods under review. More so, a unit rise in political instability risk results in -

0.6455 (65%) significant decrease in stock return in Nigeria. This variable conforms to the *a priori* expectation, and the findings of Khalid and Rajaguru (2010), Laverde (2009), and Smales (2014).

In clear terms, it can be inferred from the findings of this study that exchange rate, interest rate, inflation rate, and political instability risks are the major market risk factors that inversely stimulate stock return in the long run in Nigeria within the periods under consideration. Also, oil price risk significantly spurs stock return in the long run as indicated by the VECM results where the relationship between market risk factors and stock return is linear in the long run.

5. Conclusion and Policy Recommendations

This study obtains its motivation from the dearth and mixed findings of empirical studies that adopt the major macroeconomic variables and volatilities of inflation rate, exchange rate, interest rate, oil price and political instability as proxy in exploring the significance of market risk factors (systemic risk) and in predicting stock returns in Nigeria. This is aimed at resolving the conflicting findings in the literature. The descriptive statistics, unit root test, co-integration and vector error correction model methodology are used to analyze the time series data. The study shows that the market risk factors of exchange rate risk, oil price risk, interest rate risk and political instability risk have a significant causal effect on stock return especially in the long run. Also, the effect of exchange rate risk and oil price risk are only significant in the short run. This study concludes that the market risk factors considered in this model are major significant determinants of stock return in Nigeria within the periods studied. The study therefore proffers the following as observed from the findings:

Rational investors seeking returns maximization may employ fundamental analysis to study the behaviour of these market risk factors before taking any investment decision in the stock market and perhaps other financial markets. The Nigerian government should stabilize the country's political arena by building strong institutions, that emphasis and promote low corruption and efficient rule of law rather than powerful individuals, in order to promote more investments that enable business climate. Active rational investors may study oil price behaviour as a tool for maximizing investment return in the short and long run since its effect is positive and significant in both periods. Government should harmonize all measures of import substitution strategy aimed at boosting local production for diversification of the economy in order to mitigate imported inflation.

Limitation and Recommendation for Future Studies

This study did not include Covid-19 among market risk factors that impacted stock return in Nigeria due to the time the pandemic was discovered in Nigeria, the nature of data and it unavailability. Future study should expand this model for event study to include Covid-19 pandemic period to compare whether the effect of market risk will be significantly different from the result of this study.

References

Abdul, R. (2008). Macroeconomic variables and stock exchange performance. *International institute of Islamic economics, MPRA paper, 26*(937), 20-32.

Adedokun, A. J. & Olakojo, S.A. (2012). Test of capital asset pricing model: Evidence from Nigerian stock exchange. *Journal of Economic Theory*, *6*, 121–127.

Ajao, M. G. & Oseyomon, E. P. (2010). The predictive content of some leading economic indicators on stock prices, *Journal of Research in National Development, 8*(1) 2-9.

Ajibola, A. & Ogbolu, O. M. (2015). Premium factors and the risk-return trade-off in asset pricing: evidence from the Nigerian capital market. *Journal of Business & Economic Policy*, 2(2), 31-38.

Akingunola, R. O. (2007), Capital asset pricing model (capm) and shares value in the Nigerian stock market. *Journal of Banking and Finance, 8*(2), 64-78.

Akinlo, O. O. (2014). Oil price and stock market: empirical evidence from Nigeria, European *Journal of Sustainable Development, 3*(2), 33-40.

Alam, M. M., Alam, K. A., & Uddin, M. G. S. (2007). Market depth and risk return analysis of dhaka stock exchange: An empirical test of market efficiency, *ASA University Review,* 1(1), 93-101.

Aliyu, M. Y. (2015). Impact of macroeconomic variables on stock returns in Nigeria, Unpublished M.sc Thesis, Submitted to the School of Postgraduate Studies, Ahmadu Bello University, Zaria, 1-77.

Al-Refai, H. (2009). Empirical test of the relationship between risk and returns in Jordan capital market, Working paper, 12-28.

Arodoye, N. L. (2012). An econometric analysis of the impact of macroeconomic variables on stock prices in Nigeria: A var model analysis. *International Review of Business and Social Sciences. 1*(8), 63-77.

Aruwa, S. A. S., & Musa, A. O. (2014). Risk components and the financial performance of deposit money banks in Nigeria. International Journal of Social Sciences and Entrepreneurship, 1(11), 514-522.

Attuallah, A. (2001). Macroeconomic variables as common pervasive risk factors and empirical content of the arbitrage pricing theory in Pakistan. Lahore Journal of Economics, 6(1), 55-77.

Asaolu, Y. O. & Ogunmuyiwa, M. S. (2010). An econometric analysis of the impact of macroeconomic variables on stock market movement in Nigeria. *Asian Journal of Business Management 3(1)*, 72-78.

Battilossi, S. & Houpt, S. (2006). Risk, return and volume in an emerging stock market, the bilbao stock exchange, international economic history congress, helsinki, *12*(XIV), 147-158.

Bello, A. I. & Adedokun, L. W. (2015). Analysis of the risk-return characteristics of the quoted firms in the Nigerian stock market, *International Journal of Business and Social Science*, 2(17), 158-165.

Bello, I. & Fakunmoju, S.K. (2019). Market liquidity and stock return in the Nigerian stock exchange market. *Binus Business Review*, 10(2), 87-105.

Black F., Jensen M. C. & Scholes M. (1972). The Capital Asset Pricing Model: Some Empirical Tests. *In studies in the theory of capital markets, Jensen M.C. Ed. New York: Praeger,* 79-121.

Bollerslev, T. Y. (1986). Generalized autoregressive conditional heteroscedasticity, *Journal of Econometrics*, *31*(3), 307-327.

Brooks, R. D., Davidson, S. & Faff, R.W. (1997). An examination of the effects of major political change on stock market volatility: The South African experience. *Journal of International Financial Markets Institutions and Money*, *7*, 255-275.

Camara, A, Chung, S. L & Wang, Y. H (2009). Option implied cost of equity and its properties, *Journal of Future Mark, 29*(7), 599–629.

Chau, F., Deesomsak, R. & Wang, J. (2013). Political uncertainty and stock market volatility in the Middle East and North African (MENA) countries. *Journal of International Financial Markets, Institutions and Money*, *28*, 1-19.

Chen, N. F., Roll, R., & Ross, A. S. (1986). Economic forces and the stock market. *Journal of Business,* 383-403.

Darrat, A. F. & Al-Sowaidi, S. S. (2010). Information technology, financial deepening and economic growth: Some evidence from a fast growing emerging economy. *Journal of Economics and International Finance*, *2*(2), 028-035.

Douglas G. W. (1969). Risk in the equity markets: An empirical appraisal of market efficiency, AnnArbor. Michigan, University Microfilms Inc. 2-34.

Emeka, N. & Aham, K. U. (2013). A generalized autoregressive conditional heteroskedasticity model of the impact of macroeconomic factors on stock returns: Empirical evidence from the Nigerian stock market, *International Journal of Financial Research, 4*(4), 4-14.

Engle, R. F. (1982). Autoregressive conditional heteroscedasticity with estimates of the variance of United Kingdom inflation, *Econometrica*, *50*(4), 987-1007.

Fama, E. F. (1970). Efficient capital markets: A review of theory and empirical work. *Journal of Finance*, 25, 383 – 417.

Fama E. F. (1981). Stock returns real activity, inflation, and money. *American Economic Review*, *71*, 545-565.

Fama, E. F. (1991). Efficient Capital Markets: II. *Journal of Finance*, 46, 1575 – 1617.

Farlian, T., Handayani, M., & Ardian. (2019). Firm size, market risk, and stock return: evidence from Indonesian blue chip companies. *Jurnal Dinamika Akuntansi dan Bisnis*, *6*(2), 171-182.

Flannery, M. J. & Protopapadakis A. A, (2012). Macroeconomic factors do influence aggregate stock returns, the review of financial studies, *15*, 751-782.

Fletcher, J. (2000). On the conditional relationship between beta and return in international stock returns. *International Review of Financial Analysis*, *9*, 235-245.

Franck, P., & Young, A. (1972). Stock p rice reaction of multinational firms to exchange realignments, *Financial Management, 1*, 66-73.

Ghysels, E., Santa-Clara, P. & Valkanov, R. (2004). There is a risk-return trade-off after all, NBER Working Paper, No. 10913, *National Bureau of Economic Research,* 4(9), 5-19.

Gjerde, O. & Saettem, F. (1999). Causal relations among stock returns and Macroecnomic variables in a small open economy, *Journal of International Finance, Markets money,* 9, 61-74.

Goriave, A. (2004). Risk factors in the Russian stock market. *Working Paper*, 21-38.

Gul, F., Javed, T. & Jinnah, M. A. (2009). Relationship between trading volume and stock exchange performance: *A Case From Karachi Stock Exchange. International Business & Economics Research Journa*l, *8*(8), 13-20.

Gupta, O. P., & Sehgal, S. (1993). An empirical testing of capital asset pricing model in India, *Finance India, 7*(4), 863–874.

Gupta, A. & Panchal, A. (2013). Analysis of risk-return relationship in Indian stock market, Project Report Submitted for Degree of B.A. (Hons.) Business Economics, University of Delhi, 3-53.

Hammami, A., Ghenimi, A & Bouri, A. (2015). Relation between risk and return in Tunisian's stock market after the revolution (during political instability), *Journal of Academic Finance (J.A.F.), 5*(15), 2-20.

Haruna, I., Yazidu, U. & Domanba, P. B (2013). Macroeconomic variables and stock returns in Ghana: any causal link?, *Asian Economic and Finncial Review, 3*(8), 1044-1062.

Hassan, S. & Mohbobi, M. (2013). The increasing influence of oil prices on the Canadian Stock market, *The Journal of Business and Finance Research*, *7*(3), 27-39.

Hodoshima, J., Garza-Gomez, X., & Kunimura, M. (2000). Cross-sectional regression analysisof return and beta in Japan. *Journal of Economics and Business, 52*, 515-533.

Hussein, M. & Mgammal, H. (2012). The effect of inflation, interest rates and exchange rates on stock prices comparative study among two gcc countries, *International Journal of Finance and Accounting*, *1*(6), 179-189.

Ibrahim, S. O. (2017). Forecasting the volatilities of the Nigeria stock market prices. *CBN Journal of Applied Statistics*, *8*(2), 23-45.

Gervais, S., Kaniel, R. & Mingelgrin, D.H. (2001). The high-volume return premium. *The Journal of Finance*, *51*, 877-919.

Inyiama, O. I. & Nwoha, C. (2014). Macroeconomic variables and share price movements in Nigeria brewery industry: Evidence from Nigerian Breweries PLC. *European Journal of Accounting Auditing and Finance Research, 2(5)*, 19-32.

Isakov, D. (1999). Is beta still alive? Conclusive evidence from the Swiss stock market, *2*(5), 4-11.

Isemila, P. A. & Erah, D. O. (2012). Share prices and macroeconomic factors: A Test of the Arbitrage Pricing Theory in the Nigerian Stock Market. *European Journal of Business and Management*, *4*(15), 66-76.

Izedonmi, P. F., & Abdullahi, I. B. (2011). The effects of macroeconomic factors on the Nigerian stock returns: A sectoral approach. *Global Journal of Management and Business Research*, *11*(7), 6-18.

Johansen, S. & Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration - with applications to the demand for money, *Oxford Bulletin of Economics and Statistics 52*, 169-210.

Kalu, E. O. & Okwuchukwu, O. (2014). Stock market return volatility and macroeconomic variables in Nigeria, *International Journal of Empirical Finance, Research Academy of Social Sciences, 2*(2), 75-82.

Karolyi, G. A. (2006). The consequences of terrorism for financial markets: what do we know?. Ohio State University, Working paper.

Karpoff, J. M., (1987). The Relationship between price changes and trading volume. *Journal of Financial and Quantitative Analysis*, *22*(1), 109-126.

Kassi, D. F., Rathnayaka, D. N., Louembe, P. A. & Ding, N. (2019). Market risk and financial performance of non-financial companies listed on the Moroccan stock exchange. *Risk*, *7*(1), 1-20.

Khilji, N. M. (1994). Non-linear dynamics and chaos: Application to financial market in Pakistan. Pakistan Development Review, 3(4), 1417-1429.

Lee, Y. M., & Wang, K. M. (2012). Cap ital Mobility and Current Account Imbalance: Non-linear Threshold Vector Autoregression Approach. International Interactions, 38(2),182-217.

Leon, H., Nicholls, S. & Sergeant, K. (2000). Testing volatility on the Trinidad and Tobago stock exchange. *Applied Financial Economics*, *10*, 207-220.

Leon A., Nave J. & Rubio, G. (2005). The relationship between risk and expected return in Europe, DFAEII Working Papers No. 200508, University of the Basque Country - Department of Foundations of Economic Analysis II, 12-27.

Lintner, J. (1965b). The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets, *Rev. Economics and Statistic, 47*, 13-37.

Lobo, B. J. (1999). Jump risk in the U.S. stock market: Evidence using political information. *Review of Financial Economic*, *8*, 149-163.

Madhusoodanan, T. P. (1997). Risk and return: A new look at the Indian stock market. *Finance India, 1*(2), 285–304.

Malika, N. (2021). The impact of macroeconomic variables on Stock market in United Kingdom. *Journal of Munich Personal RePec Archive. 3, 3-22.*

Markowitz, H. (1959). *Portfolio selection: Efficient diversification of investments*, New York , NY: John Wiley.

Markowitz, H. (1952). Portfolio selection, *Journal of Finance, 7*(1), 77-91.

Mayewa, G. O. & Osenyomon, E. H. (2010). The predictive contents of some leading Economic indicators on stock price, *Journal of Research in National development 8*(1), 5-21.

Melina, A. A., & Hasyaliniy, S. (2011). The preparation towards Asian exchange link between Malaysia Stock Market and Asian countries Macroeconomic variables interdependency, *International Journal of Business & Social Science*, 2(5), 8-19.

Menggen, C. (2007), The Ris-Return Trade Off in Emerging Stock Market: Evidence from China. A Seminar Paper Presented at ARRC Auditoriu, A/RC/014, Hosted by Department of Economic and Related Studies (DERS), Wed 20th June 2007, Peking University.

Mohammed, B. A. (2011). Impact of microeconomic and macroeconomic variables on emerging stock market return: a case on Dhaka Stock Exchange, *Interdisciplinary Journal of Research in Business*, *1*(5), 08-16.

Monogbe, T. G., Edori, I. S. & Akpoede, I. B. (2016). The application of arbitrage pricing theory (APT) in the Nigeria capital market, International Journal of Banking and Finance Research, 2(1), 32-45.

Mukherjee, T. K., & Naka, A. (1995). Dynamic relations between macroeconomic variables and the Japanese stock market: An application of a vector error correction model,

Markowitz, H. (1952). Portfolio selection, *Journal of Finance, 7*(1), 77-91.Journal of Financial Research, 18, 223–37.

Mwenda, K., Mutwiri, N., Omagwa, J., & Wamugo, L. (2021). Systematic risk and performance of stock market in Kenya. *International Journal of Research in Business and Social Science* (2147- 4478), 10(4), 204–214.

Nath, G .C & Samanta, G. P. (2003). Relationship between exchange rate and stock prices in India – An empirical analysis, Seminar Paper Presented at NSEIL, Bandra-Complex, Bandra (East), Mumbai, 1-11.

Nnenna, O. M (2012). X-raying the impact of domestic and global factors on stock return volatility in the Nigerian stock market, European Scientific Journal, 8(12), 235-250.

Nwude, E. C (2013). Is CAPM a good predictor of stock return in the Nigerian food and beverage stocks?, *Journal of Economics and Sustainable Development*, *4*(17), 176-188.

Okoro, C. O. (2017). Macroeconomic factors and stock market performance: evidence from Nigeria. International Journal of Social Sciences and Humanities Reviews, 7(1), 1-9.

Oludoyi, S. B. (2003). An empirical analysis of risk profile of quoted firms in the Nigerian stock market. Ilorin Journal of Business and Social Sciences, 8(1&2), 9-19.

Osamwonyi, I. O & Evbayiro-Osagie, E. I (2012). The relationship between macroeconomic variables and stock returns index in Nigeria, *Journal of Economics, 3*(1), 55-63.

Osamwonyi, I. O & Asein, E. I (2012). Market risk and returns: evidence from the Nigerian capital market. *Asian Journal of Business Management, 4*(4), 367-372.

Oyetayo, O.J & Adeyeye, P.O (2017). A robust application of the arbitrage pricing theory: evidence from Nigeria. Journal of Economics and Behavioral Studies, 9(1), 141-151.

Paavola, M. (2006). Tests of the arbitrage pricing theory using macroeconomic variables in the russian equity market, A Thesis Submitted to Department of Business Administration Section of Accounting and Finance, Laapeenranta University of Technology, Russia, 3-47.

Ramin, C. M., Lee, C. H., & Mohamad, A. H. (2004). Relationship between macroeconomic variables and stock market indices: Cointegration evidence from stock exchange of Singapores All- Sector indices, *Jurnal Penguran,* 24, 47-77.

Raputsoane, L. (2009). The risk-return relationship in the South Africa stock market, paper prepared for the 14th Annual Conference of the African Econometrics Society on Econometric Modelling in Africa, held in July 2009 at the Sheraton hotel, in Abuja, Nigeria, 3-22.

Roll, R. & Ross, S.A. (1984). An empirical investigation of the arbitrage pricing theory, *The Journal of Finance,* 1073-1104.

Ross, S. (1976). The arbitrage theory of capital asset pricing. *Journal of Economic Theory*, *13*, 341-360.

Rutledge. D. J. S. (1984) Trading volume and price variability: New evidence on the price effects of speculation. In Peck A. E. (ed.), Selected writings on futures markets: Research directions in commodity markets (237-251). Chicago: Chicago Board of Trade.

Saryal, F. S. (2007). Does inflation have an impact on conditional stock market volatility? Evidence from Turkey and Canada. *International Research Journal of Finance and Economics*, *11*, 123-1333.

Sevuktekin, M. & Nar gelecekenler, M. (2007). Turkiy e'de IMKB ve Doviz Kuru Aras ndaki Dinamik Turkiy e Ekonometri ve Istatistik Kongresi, Inonu Universitesi, Malaty a, 12-29.

Shah, S. H. A., Shah, A., Khan, M. K. & Hamidullah. U. (2021). The risk and return relations: New evidence from Pakistani stock market. *Journal of Accounting and Finance in Emerging Economies*, 7(1), 195-204.

Sharpe, W. F. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk. *Journal of Finance*, *19*(3), 425-442.

Sims, C.A. (1982). Policy analysis with econometric models. *Brookings papers on economic activity*, 107-152.

Simons, D. & Laryea, S. A. (2015). Testing the efficiency of selected African stock markets, *Journal of Finance and Management, 4*(2), 3-17.

Sinaee, H. & Moradi, H. (2010). Risk-Return Relationship in Iran Stock Market, *International Research Journal of Finance and Economics, 41*, 4-18.

Singh, S. & Kushwaha, B. P (2011). *In vitro methane emission from Indian dry roughages in relation to chemical composition, Current Science, 101*(1), 57-65.

Smith, M. K. (2003) Learning theory. Retrieved: from The Encyclopedia of Informal Education. http://infed.org/mobi/learning-theory-models-product-and-process/

Soyode, A. (2009). Nigerian capital market and macroeconomic variables: an empirical analysis, *Nigerian journal of monetary economics, 6(2),* 2-15.

Sulaiman, D. M., Adnan, H., & Adnan, A. (2009). The impact of macroeconomic variables on stock prices: Empirical evidence in case of KSE, *European journal of scientific research, 38*(1), 96-103.

Tang, G. Y. N., & Shum, W. C. (2003). The relationships between unsystematic risk, skewnessand stock returns during up and down markets. *International Business Review*, *12*, 523-541.

Theriou, G., Aggelidis, P., Maditinos, I., & Sevic, Z. (2010). Testing the relation between beta and returns in the Athens Stock Exchange. *Managerial Finance*, *36*(12), 1043-1056.

Todd, R.M. (1990). Vector autoregression evidence on monetarism: Another look at the robustness debate. Federal Reserve Bank of Minneapolis, *Q. Rev*, 19-37.

Tunali, H. (2010). The Analysis of Relationships between Macroeconomic Factors and Stock Returns: Evidence from Turkey Using VAR Model. *International Research Journal of Finance and Economics, 57*(3), 8-21.

Uddin, G. S. & Alam, M. (2007). The impacts of interest rate on stock market: empirical evidence from Dhaka stock exchange. *South Asian Journal of Management Sciences, 1*(2), 123-132.

Uwubanmwen, A. & Igbinovia, L. E. (2015). Inflation rate and stock returns: evidence from the Nigerian stock market, *International Journal of Business and Social Science*, 6(11), 155-167.

Watson, D. & Head, A (2010). *Corporate Finance*: Principles and Practice. 5^{th} ed. Harlow: Prentice Hall.

Westcrfietd. R. (1977). The distribution of common stock price changes: An application of transactions time and subordinated stochastic models. *Journal of Financial and Quantitative Analysis*, *12*, 743-765.

Ying. C. C. (1966). Stock market prices and volumes of sales. *Ecommetrica*, *34*, 676-686.

Young, S. D. & Saadi, S (2011). Using the capital asset pricing model and arbitrage pricing theory in capital budgeting, *Wiley, Hoboken, NJ,* 363–380.

Zubair, A. (2013). Causal Relationship between Stock Market Index and Exchange Rate: Evidence from Nigeria. *CBN Journal of Applied Statistics,* 4(2), 87-110.

Appendix

Appendix 1: Lag Selection Criteria (Akaike Info Criterion)

Lag	LogL	LR	FPE	AIC	Lag	LogL
0	-1015.1430	NA	2.10e+20	63.8214	64.0962	63.9125
1	-888.6492	197.6460	7.67e+17	58.1656	60.0894*	58.8033
2	-836.5924	61.8175*	3.63e+17*	57.1620*	60.7348	58.3463*
3	-769.1822	54.7708	1.11e+17	55.1989	60.4206	56.9297

* indicates lag order selected by the criterion; AIC: Akaike information criterion

Appendix 2: VECM Portmanteau Test

Lags	Q-Stat	Prob.	Adj Q-Stat	Prob.	df
1	18.15321	NA*	18.72049	NA*	NA*
2	48.05100	0.9528	50.54717	0.9204	66
3	80.45430	0.9432	86.19081	0.8692	102
4	114.7598	0.9258	125.2281	0.7744	138
5	152.3775	0.8800	169.5632	0.5808	174
6	177.6021	0.9492	200.3934	0.6713	210
7	196.9323	0.9906	224.9278	0.8285	246
8	222.8218	0.9961	259.1020	0.8323	282
9	258.7856	0.9935	308.5522	0.6375	318
10	277.5134	0.9990	335.4225	0.7535	354
11	314.5175	0.9980	390.9286	0.4772	390
12	335.2346	0.9996	423.4840	0.5253	426

*The test is valid only for lags larger than the VAR lag order. df is degrees of freedom for (approximate) chi-square distribution.