DO REAL ESTATE ASSET AND OTHER LISTED INVESTMENT ASSETS RESPOND SIMILARLY TO MACROECONOMIC FLUCTUATIONS? AN INQUIRY FROM THE NIGERIAN INVESTMENT MARKET

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Abstract

Purpose: This study analysed the response of indirect real estate asset and other listed investment assets to macroeconomic fluctuations in the Nigerian property market. This is with a view to determining the existence of a short or long-run convergence between indirect real estate asset and other listed investment assets in an emerging property market like Nigeria.

Design/Methodology/Approach: The secondary data collected for the study comprised quarterly returns on the indirect real estate asset and the sectoral indices of listed investment assets on the Nigerian Stock Exchange (NSE), these are NSE Banking, NSE Oil and Gas, NSE Industrial, NSE Insurance and NSE Consumer. Others include quarterly data on five macroeconomic variables which are inflation rate, unemployment rate, exchange rate, GDP and interest rate over the study period, January 2009 to December 2020. The data were obtained from the daily price list of the Nigeria Stock Exchange (NSE) via the NSE website, the Central Bank of Nigeria Statistical Bulletin and the National Bureau of Statistics. While the holding period return was used to analyse the return of the investment assets, percentage changes were calculated for the macroeconomic variables over the study period. The study adopted the impulse response function obtained from the Variance Error Correction Model (VEC) in analysing the response of the investment assets to macroeconomic fluctuations.

Findings: The result showed that in the short run, the response of indirect real estate to the macroeconomic fluctuations varies from that of other listed investment assets. However, the indirect real estate and other listed investment assets readjusted and exhibited similar responses along the long run which connotes that indirect real estate asset and other listed investment assets have long-run equilibrium, in order words, they comove in the long run.

Practical Implications: The paper implied that indirect real estate asset and other listed investment assets have similar responses to macroeconomic fluctuations in the long run which implies that the asset classes have a long run convergence.

Originality/value: The paper represents one of the few attempts to examine the long-run response of real estate asset and other listed investment assets to macroeconomic variations from an emerging market perspective.

Keywords: Macroeconomic factors, macroeconomic fluctuations, real estate asset, investment asset, emerging market.

Introduction

The common goal of every rational investor is to earn profit in the form of return and ensure an optimal combination of assets. However, there has been increasing concern by investors in understanding the drivers that dictate investment return. This concern appears more compelling when faced with an array of investment alternatives. Bredin (2007) identified that the concern is premised on two major factors, one is the fact that investors are faced with an array of investment alternatives having different risk-return tendencies. Second is the effect of sudden economic fluctuations such as the global financial crisis of 2008 and its threat to investment performance. Hence, there is a need for investors to understand the effect of macroeconomic fluctuations on the risk-return performance of investment assets. An understanding of the interplay of macroeconomic

forces on the performance of listed investment assets will enhance the predictability of asset performance.

Extant studies such as Akinkunmi (2017) have noted that investment outlays cannot be exempted from the macroeconomic volatilities and investment assets respond at varying degrees to macroeconomic fluctuations. Consequently, it has become imperative for investors to understand macroeconomic factors impacting asset returns, the investment implications and incorporate these implications into the decision-making process (Olaleye *et al.,* 2015). However, while extant studies have submitted that real estate asset forms a major part of investors' portfolio, Hoesli (2002) noted that its reaction to macroeconomic fluctuations will be of concern to investors. This concern to investors becomes more compelling in an emerging economy like Nigeria for a couple of reasons. Emerging markets are bedevilled with a high rate of fluctuations and volatilities in macroeconomic indices as opposed to the developed markets which have somewhat stable and predictable macroeconomic indices (Hafner and Herwartz, 2006; Ayodele and Olaleye, 2021). Furthermore, given the cost implications of investment in direct real estate, and the need to avoid the implications of long-term mortgage bonds, several investors resort to investment in indirect real estate assets. These indirect real estate investments are often in the form of listed property stock or real estate investment trusts (REITs). Thus, an understanding of the response of indirect real estate assets to macroeconomic volatilities becomes of concern to investors.

Summarily, given that the level of the macroeconomic volatilities is peculiar across markets, and investment assets respond differently, it might be expected that the factors that drive the response of investment assets to macroeconomic fluctuations would vary across different economic climates. Binovska (2018) posited that the overall macroeconomic state of a country affects all investment assets including real estate investment. Thus, investors' decisions must involve a complete understanding of the factors that drive the performance of indirect real estate asset and other investment assets, especially in an emerging market like Nigeria. Investors' decisions must be based on the understanding of the reaction of the performance of investment outlays to macroeconomic volatilities, especially when considering asset combinations in a portfolio. This will help to determine the commonality between assets within a portfolio which according to Olaleye and Ekemode (2014) is an important consideration for investors before venturing into asset combination. Thus, an understanding of the relationship between the macroeconomic factors and the performance of investment assets would enhance investment decisions, especially towards asset combination and allocation of resources. Thus, the information would be useful for both domestic and international investors who are seeking to take advantage of geographical diversification and the inclusion of investment assets in emerging economies. The study will also provide indicators of future performance that may be expected in the response of indirect real estate to macroeconomic volatilities in an emerging Nigerian property market. This becomes important for portfolio managers when creating portfolios that may include indirect real estate assets. To this effect, this study intends to establish and compare the response of real estate assets and other investment assets to macroeconomic fluctuation in an emerging market like Nigeria. Specifically, the study seeks to know if real estate asset has an edge over other assets in terms of their responses to macroeconomic volatilities both in the short and long run.

The research objectives set for the study are:
  i. compare the returns of indirect real estate assets and other listed investment assets from 2009 to 2020
  ii. assess the percentage change in the macroeconomic indices over the study period
  iii. analyse the response of indirect real estate asset and other investment assets to macroeconomic fluctuations over the study period

Literature Review
The literature review is in two subsections. The first examines the response of indirect real estate asset to macroeconomic fluctuations while the second subsection is the response of other investment assets to macroeconomic fluctuations.

a. *Response of Indirect Real Estate Assets to Macroeconomic Fluctuations*

Real estate investments cannot be excluded from the idiosyncrasies of a country's economy. The state of the real estate asset is significantly influenced by the local economic conditions. Extant studies examining the response of indirect real estate assets to macroeconomic fluctuations include Liu *et al.* (1990) who provided mixed evidence about the relationship between the US securitized real estate market and the stock market. McCue and Kling (1994) showed that prices, nominal rates, output and investment all explicitly interact with indirect real estate prices. Ling and Naranjo (1997) concluded that interest rates, the unanticipated inflation component, and the real Treasury bill rate are the major factors whose fluctuation affects the indirect real estate returns negatively. Allen, Madura and Springer (2000) using a sample of publicly-traded REITs returns, found out that the REITs returns were sensitive to long- or short-term interest rate changes and stock market variability. The results of Ewing and Payne (2005) showed that equity real estate returns negatively responded to monetary policy, economic growth and inflation whereas default risk premium was positively related to future equity real estate returns.

Furthermore, West and Worthington (2006) submitted that macroeconomic factors such as unexpected inflation and construction index, and long-run interest rates are correlated with indirect real estate asset returns. Bredin (2007) using a GARCH framework established that REITs return strongly react to monetary policy shifts in the US market. Also, Ajmi *et al.* (2014) established a nexus between REITs equity assets and the macroeconomic environment; it concluded that REITs equity is very sensitive to macroeconomic variations. Chang, Cheng and Leung (2011) used a regime-switching VAR model which examined the response of REITs, housing and the stock market to monetary policy. The study established that there was a non-linear and strong response of equity REIT returns to federal funds rate and the interest rate spread. Hao *et al.* (2016) found a relationship that is unidirectional in which a shift in inflation-rate leads to a change in indirect real estate asset.

The foregoing review shows suggest varying response of real estate assets to macroeconomic fluctuations. While some studies established a negative interaction between the real estate asset returns and macroeconomic factors, some found a relationship between the real estate and macroeconomic factors to be positive. However, the majority of the studies were carried out in developed economies having varying macroeconomic indices compared to what obtains in most emerging markets. As such, the results from these studies cannot explain what obtains in an emerging economy like Nigeria.

Summarily, extant studies have focused on developed economies and REITs as a form of real estate asset. There has been a dearth of investigations on emerging markets such as Nigeria and indirect real estate assets, comprising listed property stock and REITs; these being the predominant form of real estate investment in most emerging markets. Studies from the Nigerian market could be grouped along two broad lines, those focusing on the effect of macroeconomic factors on direct real estate assets performance Ojetunde (2013), Dabara (2014) and Odu (2011). The others focus on the relationship between listed property stock and macroeconomic variables (Olaleye *et al.,* 2015). There has been a dearth of empirical analysis of the short and long-run response of real estate assets to macroeconomic volatilities and comparing same with other investment assets in the Nigeria market

b. Response of other Investment Assets to Macroeconomic Fluctuations

The argument as to the response of listed investment assets to volatilities in macroeconomic variables has also been a subject of investigation by extant studies. The studies observed varying patterns in the influence of macroeconomic variables on the returns of listed assets across different capital markets. For instance, Chen, Roll and Ross (1986) identified macroeconomic variables that affect stock returns to include interest rates, expected rates and expected inflation rates, and the spread between high and low-grade bonds. In addition, Chen, Roll and Ross (1986) showed that consumption, petroleum prices and market index do not impact the financial market whereas industrial production, risks premium shifts and yield patterns curve is found to be significant in explaining stock returns. Chen (1991) indicated that the potential return on stocks could be determined by the interplay of certain macroeconomic variables such as the default spread, t-bill rates, industrial outlet growth rate and prices ratio of dividends. From the perspective of the Japanese market, Mukherjee and Naka (1995) submitted that stock prices and six macroeconomic variables were cointegrated. The macroeconomic variables include exchange rate, inflation rate, supply of money, supply of money, genuine economic activity and long-term bond rating. Serkan (2008) showed that all portfolio returns were influenced by the exchange rate, interest rate, and return on the world market, while inflation is important for only three of the 12 portfolios.

Also, the effect of macro-economic variables on stock prices in Ghana was studied by Adam and Tweneboah (2008). The study found a long-term relationship between macroeconomic indicators and stock prices. The study further submitted that lagging interest rates and inflation prices have a major impact on the stock market. In the Nigerian market, attempts have been made to investigate the relationship between macroeconomic variables and stock prices. Akinnifesi (1987) found an inverse relationship between stock prices and exchange rates. Soyode (2005) tested the association between stock prices and macroeconomic variables such as exchange rate, inflation and interest rate. The study found a direct relationship between stock prices and macroeconomic variables. Nwokoma (2002) showed that industrial production and level of interest rates, as represented by the 3-month commercial bank deposit rate have a long-run relationship with the stock market. The study also found out that the Nigerian stock market does not respond to macroeconomic variables in the short run as much as it responds to its past price changes. Ologunde, Elumilade and Asaolu (2006) submitted that the prevailing interest rate had a positive influence on the stock market capitalization rate. The study also found that the government development stock rate exerts a negative influence on the stock market capitalization rate.

While the foregoing review shows a mixed outcome in the response of the listed assets to macroeconomic variables, it might be expected that indirect real estate would behave synonymously like the listed investment assets. This submission is premised on the findings of studies such as Olaleye and Ekemode (2014) who have noted that indirect real estate is integrated with the stock market. Thus, the returns of indirect real estate are significantly influenced by the vagaries of the stock market and not the underlying direct real estate assets. Thus, the study seeks to investigate the response of indirect real estate asset to macroeconomic volatilities across different markets and provide comparative evidence in addition to the existing body of knowledge. Towards this end, this study analysed the response of indirect real estate assets and other listed investment assets to macroeconomic fluctuation in an emerging market like Nigeria. The findings therefrom would be important for international investors and portfolio managers when forming portfolios that may include indirect real estate assets, especially from an emerging market.

Data and Methodology
The data set used to achieve the study objectives were secondary data on the returns on indirect real estate asset and other investment assets in the Nigerian investment market. For the indirect real estate asset, the average quarterly share prices and dividends of the UACN Property Development Company (UPDC), UPDC REIT, Skye Shelter and Union Home were used. For the

other investment assets, the average quarterly prices of the five sectorial indexes in the Nigeria Stock Exchange Market were used and this includes the NSE Banking Index, NSE Insurance index, Consumer Goods index, NSE Industrial index and NSE Oil/Gas index. For each of the assets, the data was collection period spanned from Q1 2009 to Q4 2020. The year 2009 was selected as the base year because the year proceeded the year indirect real estate investment was established in Nigeria. In addition, the study also obtained secondary data on five macroeconomic variables from 2009 to 2020. The five macroeconomic variables considered for the study were inflation rate, unemployment rate, exchange rate, GDP and interest rate. The choice of these assets owes to the fact that extant studies such as Kofoed-Phil (2000), Bello (2005), Odu (2011) and Dabara (2014) have noted that these macroeconomic variables significantly influence investment assets returns. The quarterly data of these macroeconomic variables were obtained and measured against the real estate asset and other listed investment assets to determine their response to macroeconomic fluctuations.

Data for the indirect real estate asset were obtained from the periodicals and the website of the Nigeria Stock Exchange (NSE) daily price list. The dividends of the indirect real estate asset were obtained from the website of the real estate companies. Data on the returns of other listed investment assets were obtained through the daily Nigeria Stock Exchange (NSE) price list via the NSE website. Also, data on the macroeconomic variables were obtained through the Central Bank of Nigeria Statistical Bulletin and the National Bureau of Statistics.

In analyzing the response of real estate asset and other investment assets to macroeconomic fluctuation, the risk-return characteristics of real estate assets and other listed investment assets were analysed using the holding period return. Thereafter, the study determined the quarterly mean return of each investment asset. Having obtained the quarterly returns of the assets, the study determined the trend in the selected macroeconomic factors by calculating the quarterly percentage changes of each of the five macroeconomic variables over the study period. Finally, the impulse response function was used to determine the response of real estate asset and other listed investment assets to macroeconomic fluctuations for the period under study. The impulse response functions of each investment asset were obtained from the Variance Error Correction Model (VEC). The impulse response functions were obtained from the VEC because the VEC is a restricted Variance Auto Regression (VAR) used for nonstationary series that are cointegrated. In interpreting the results from the VEC model, an aggressive response implies that the macroeconomic shock adversely affects the asset's performance negatively while the defensive response implies that the macroeconomic shocks induce little or no effect on the asset.

Analysis and Results
The results of the analysis are sub-divided into three sections, based on the objectives of the study. The first section presents the results of the average quarterly returns of the investment assets; the second section presents the average annual percentage changes in the selected macroeconomic factors while the third section presents the response of the investment assets to macroeconomic fluctuations.

Comparison of Average Quarterly Returns of Indirect Real Estate and Other Listed Assets
The average quarterly returns for the assets were calculated quarterly using holding period returns, the quarterly holding period returns for each year were subsequently averaged to arrive at the yearly returns. The results are presented in Table 1.

The results show that real estate asset outperformed other listed assets in the years 2010, 2011, 2015, 2016, 2018 to 2020, having average quarterly returns of 4.81%, 4.92%, 3.31%, 0.72%, 5.23%, 9.26% and 7.13% respectively. While most other assets had negative returns for the period under study, the least performance of indirect real estate was in 2016 with an average quarterly return of 0.72%. In the year 2017, most other assets, except NSE Consumer (-0.82%)

outperformed real estate, thereby ranking 5th with a quarterly mean return of 2.46%. Indirect real estate asset had its peak return of 9.26% in 2019.

Table 1: Quarterly Returns of Asset Classes from 2009(Q1) – 2020(Q4)

Period	IRE	NSE Banking	NSE Consumer	NSE Industrial	NSE Insurance	NSE Oil and Gas
2009	3.60	2.04	-1.40	-0.17	-17.49	6.08
2010	4.81	4.42	2.61	-0.78	-11.27	-1.83
2011	4.92	-8.79	-1.60	0.12	-3.08	-12.08
2012	4.61	7.94	-1.45	1.07	-3.35	-0.31
2013	5.87	4.31	3.41	0.34	6.15	14.22
2014	6.15	-5.10	-1.13	-0.54	-1.02	7.82
2015	3.31	-3.44	-0.69	-31.80	-1.44	-2.34
2016	0.72	-0.05	-1.52	-0.38	-1.77	-3.65
2017	2.46	19.94	-0.82	3.21	5.70	4.80
2018	5.23	-7.17	1.33	1.81	-4.90	-5.73
2019	9.26	-1.85	-1.69	0.43	6.77	-5.80
2020	7.13	2.46	2.80	0.39	-4.25	-0.09
Overall	*4.84*	*1.23*	*-0.01*	*-2.50*	*-2.91*	*0.09*

Source: Periodicals of indirect real estate companies and NSE price list
IRE – Indirect Real Estate Assets
NSE – Nigeria Stock Exchange

Overall, real estate asset had an average quarterly return of 4.84% thereby outperforming other listed investment assets over the period analysed. The returns of other listed investment assets ranged from 19.94% (NSE Banking) to -31.80% (NSE Industrial). NSE Banking and NSE Oil and Gas had a positive aggregate return of 1.23% and 0.09% respectively. However, NSE Consumer, NSE Industrial and NSE Insurance had a negative aggregate return of -0.01%, -2.50% and 2.91% respectively.

The results suggest that indirect real estate asset had positive returns throughout the study period, suggesting that indirect real estate outperformed other listed investment assets that did not maintain positive returns throughout the study period. This result corresponds to the findings of previous studies. For instance, Chen and Mills (2006) established that equity real estate asset yields a high rate of return than other listed investment assets. Similarly, Hoesli and Lekander (2008) and Ruhmann and Woolston (2011) found that indirect real estate return was higher than other listed stock returns. Likewise, Olaleye and Ekemode (2014) established that real estate equity outperformed non-real estate equity based on returns.

Percentage Change in Selected Macroeconomic Factors
Having obtained the quarterly data for the selected five macroeconomic factors from the NBS Quarterly report, these were subsequently computed into quarterly percentage changes. the quarterly percentage changes were subsequently averaged to determine the annual percentage change for each of the five macroeconomic variables. The results are presented in Table 2.

Table 2. Average Quarterly Percentage Change of Macroeconomic factors

Period	Unemployment Rate	Interest Rate	Inflation Rate	GDP	Exchange Rate
2009	2.23	-0.76	2.88	0.72	0.20
2010	2.80	-2.31	-6.90	3.39	0.63
2011	3.48	1.67	4.21	4.48	0.57
2012	-9.07	-0.40	-10.44	2.56	-0.12
2013	19.83	-0.20	0.01	4.12	0.31
2014	-9.18	0.53	2.88	3.84	5.66
2015	8.45	-0.03	14.84	3.10	7.21
2016	4.59	0.92	55.23	-0.07	5.78
2017	10.94	-0.39	-5.96	0.90	1.01
2018	1.44	-1.89	-3.51	0.98	-0.53
2019	6.93	-4.73	1.61	1.04	3.30
2020	5.29	3.47	5.02	0.62	2.74
Average	*3.98*	*-0.34*	*4.99*	*2.14*	*2.23*

The results showed that based on the annual average return for each year, the unemployment rate had the lowest percentage change of -9.18% in 2014 and the highest percentage change of 19.83% in 2013. However, the percentage change in interest rates showed that interest rates had the least percentage change of -4.73% in 2019 and the highest percentage change of 3.47% in 2020. The inflation rate had the lowest percentage change in 2012 (-10.44%) and the highest percentage change of 55.23% in 2016. For most of the period under analysis, the inflation rate had positive percentage changes. The result also shows that Gross Domestic Product (GDP) had positive percentage changes for most of the years under consideration except for 2016 (-0.07) and its highest percentage change of 4.48% in the year 2011. The exchange rate also had two negative changes. These are -0.12% in 2012 and -0.53% in 2018. The highest percentage change of 7.21% was recorded in the year 2015. On the whole, while the unemployment rate, inflation rate, GDP and exchange rate had positive annual aggregates of 3.98, 4.99 and 2.14% and 2.23%, the interest rate had a negative annual aggregate of -0.34%

Summarily, the macroeconomic factors exhibited significant fluctuations throughout the study period. These fluctuations could be attributed to some factors. First, the inconsistent and unfavourable economic policies and lack of succession plans by the various government. These fluctuations could also be attributed to the adverse effect of the global economic crisis whose effect became obvious in 2012 when the country dived into economic recession. Another major factor impacting the macroeconomic changes is the dependence on importation with very minimal exports.

The Response of Real Estate Assets and other Listed Assets to Macroeconomic Fluctuations
This section presents the results of the impulse response model carried out to examine the response of real estate asset and other listed investment assets to macroeconomic fluctuations in Nigeria. The responses of each asset to macroeconomic volatilities are presented in Tables 3 to 7. To further explain the response of each asset at each period, Appendix A presents the impulse response graphs of each asset to macroeconomic volatilities.

Response of Indirect Real Estate and other Listed Assets to Inflation Rate Volatilities
The responses of indirect real estate asset and other listed investment assets to inflation rate volatilities are presented in Table 3.

Table 3: Response of Indirect Real Estate Asset and other Listed Investment Assets to Inflation Rate

Period	IRE	NSE Consumer	NSE Banking	NSE Insurance	NSE Oil and Gas	NSE Industrial
1	-	-	-	-	-	-
2	-0.34	-0.51	0.05	-0.82	1.69	0.08
3	-0.14	0.07	-0.07	-0.43	-0.29	1.47
4	0.17	0.08	1.42	0.49	- 0.53	- 0.98
5	-0.05	0.01	1.33	0.61	0.38	0.83
6	0.17	0.17	0.19	0.54	1.03	0.70
7	0.05	0.29	0.04	0.19	0.72	0.16
8	0.05	0.12	0.38	0.42	0.77	1.04
9	-0.11	-0.01	-1.00	-0.65	-0.64	-0.88
10	-0.04	0.02	-0.99	-0.71	- 0.20	-0.49
Overall	*-0.03*	*0.03*	*0.15*	*-0.04*	*0.52*	*0.36*

The responses of indirect real estate asset range from -0.14 in period 3 to 0.17 in periods 4 and 6. Indirect real estate asset responded negatively in periods 2, 3, 5, 9 and 10. On average, the response of indirect real estate asset to inflation rate shock had a mean of – 0.03 and this indicates that the indirect real estate asset responds negatively to inflation rate volatilities. This result is similar to the result of Brook and Tsolacos (2001) who submitted that the unexpected inflation rate is one of the macroeconomic factors affecting listed property returns. Similarly, a study by Ewing and Payne (2005) and Olaleye *et al.* (2015) also revealed a negative response of indirect real estate asset returns to inflation rate shocks. Contrarily, West and Worthington (2006) included

unexpected inflation rate as one of the macroeconomic factors that had a positive relationship with indirect real estate asset.

An examination of other listed investment assets showed that the response of NSE Consumer to inflation rate ranged from -0.51 in period 2 to 0.29 in period 7. The responses of NSE Consumer suggest that the asset is more defensive to inflation rate shocks than being aggressive. To this end, volatility in the inflation rate might induce little or no effect on the asset. On average, the response of NSE Consumer to inflation rate shock has a mean of 0.02 for the period and this indicates that on average, the NSE Consumer responds positively to inflation rate shocks. Furthermore, for NSE Banking, the asset's response to the inflation rate ranged from -0.99 in period 10 to 1.42 in period 4. The result indicates that the asset is more of a defensive asset than aggressive when there is a shock in the inflation rate. On average, the response of NSE Banking to inflation rate shock has a mean of 0.15 and this is an indication that shocks in the inflation rate will most likely cause a positive reaction from NSE Banking. The response of NSE Insurance ranged from -0.82 in period 2 to 0.61 in period 5. The asset's response rates suggest that NSE Insurance was volatile to inflation rate shocks in some periods while the asset reacted positively in some other periods. On average, the response of NSE Insurance to inflation rate shock has a mean of -0.04 for the period, suggesting that the asset responded adversely to volatilities in inflation rates. The response of NSE Oil and Gas to the inflation rate ranged from -0.53 in period 4 to 1.69 in period 2. On average, the response of NSE Oil and Gas to inflation rate shock has a mean of 0.52. This result is an indication that shocks on the inflation rate induce positive reactions on NSE Oil and Gas and as such, inflation rate shocks have little or no effect on the asset's performance.

The response of NSE Industrial to inflation fluctuations ranged from – 0.98 in period 4 to 1.47 in period 3. The response of NSE Oil and Gas could be said to be relatively unstable, the asset exhibited positive responses in the first six periods and negative responses in other periods. On average, the response of NSE Industrial to inflation rate shock had a mean of 0.36 for the period, hence, the asset response to inflation rate shocks was defensive. The results reveal that indirect real estate asset had the same nature of negative response on an average basis with NSE Insurance; adverse/aggressive, while NSE Oil and Gas, NSE Industrial, NSE Insurance and NSE Consumer had average positive response rates (defensive).

The responses of indirect real estate asset to inflation rates vary from the other listed investment assets along the periods of short runs; that is, periods 1 to 5. However, the assets' responses readjusted in the long run, in the sixth period, the indirect real estate and other listed investment assets responded positively to inflation rate shocks which ranges from 0.17 to 1.03. Similarly, the assets have similar positive responses in periods 7 and 8 while they responded negatively in period 9 ranging from -1.0 to -0.01. Also in period 10, the assets all responded negatively to inflation rate shocks ranging from -0.99 to -0.02.

Response of Indirect Real Estate and other Listed Assets to Interest Rate Volatilities
The responses of indirect real estate asset and other listed assets to interest rate shocks are presented in Table 4.

The responses of indirect real estate asset range from -0.37 in period 2 to 0.07 in period 4, and the responses of indirect real estate to interest rate shocks were negative except in period 4 where the asset had a positive response of 0.07. The result is an indication that the response of indirect real estate asset to interest rate shocks is more aggressive than defensive. It means shocks in interest rate will induce a negative effect on the performance of indirect real estate asset. On average, the response of indirect real estate to interest rate has a mean of -0.10. This result corroborates the result of Lynge and Zumwalt (1980) which showed that indirect real estate responded negatively to unexpected shocks in interest rates. Similarly, a more recent result by Bjørnland and Jacobsen

(2010) and Olaleye *et al.* (2015) also established that unexpected shocks in interest rate induced negative effects on indirect real estate returns.

Table 4: Response of Indirect Real Estate Asset and other Listed Investment Assets to Interest Rate

Period	IRE	NSE Consumer	NSE Banking	NSE Insurance	NSE Oil and Gas	NSE Industrial
1	-	-	-	-	-	-
2	-0.37	-0.13	0.86	0.05	0.13	-0.04
3	-0.14	-0.13	-0.01	-0.52	0.61	0.19
4	0.07	0.04	0.03	-0.51	0.47	-0.21
5	-0.08	0.03	0.40	0.11	0.20	0.06
6	-0.12	0.02	-0.08	-0.15	0.27	0.71
7	-0.02	0.16	-0.21	-0.39	0.40	0.29
8	-0.04	- 0.16	-0.05	-0.18	-0.25	-0.52
9	-0.10	-0.05	-0.37	-0.37	-0.36	-0.70
10	-0.13	- 0.07	-0.75	-0.62	-0.38	-0.68
Overall	*-0.10*	*-0.01*	*-0.02*	*-0.29*	*0.12*	*-0.10*

The response of NSE Consumer to interest rate ranged from -0.16 in period 8 to 0.16 in period 7. The result shows that NSE Consumer has a negative response to interest rate shocks in about half of the time horizons except in periods 4, 5, 6 and 7. This is an indication that a shock in interest rate will induce a negative effect on the performance of NSE Consumer. On average, the response of NSE Consumer to interest rate shock has a negative mean of -0.01. To this end, the asset is more of an aggressive asset towards interest rate fluctuations. The response of NSE Banking to interest rates ranged from -0.75 in period 10 to 0.86 in period 2. On average, the response of NSE Banking to interest rate shock has a mean of -0.02 for the period. Hence, the asset reacted aggressively to interest rate shocks. The response of NSE Insurance to interest rate ranged from -0.62 in period 10 to 0.11 in period 5. The result reveals that NSE Insurance has more periods of negative responses than positive responses. The asset only responded positively to interest rate shocks in periods 2 and 5 at the rates of 0.05 and 0.11 respectively. The result suggests that NSE Insurance is volatile to interest rate shocks and as such, the shock in interest rate will induce a negative effect on the asset. On average, the response of NSE Insurance to interest rate volatility has a mean of -0.29 for the period analysed. The response of NSE Oil and Gas to interest rate ranged from -0.38 in period 10 to 0.61 in period 3. The result shows that NSE Oil and Gas has positive responses to interest rate shocks except in the last 3 periods; 8, 9 and 10, at -0.25, -0.36 and -0.38 respectively. On average, the response of NSE Oil and Gas to interest rate shock has a mean of 0.12. The result suggests that NSE Insurance is more defensive to the shocks in the interest rate and such, shocks in interest rate will most likely induce a positive reaction on the asset returns. Therefore, the interest rate shocks will have little or no effect on the performance of NSE Oil and Gas. The response of NSE Industrial to interest rate ranged from -0.70 in period 9 to 0.71 in period 6. The response of NSE Industrial to interest rate shocks has a mixture of both positive and negative responses. The asset has negative responses in periods 2, 4, 8, 9 and 10 while it responded positively for the remaining periods. On average, the response of NSE Industrial to interest rate shock has a mean of – 0.10 for the period, thereby indicating a negative reaction to interest rate shocks.

The results indicate that indirect real estate asset had the same nature of response with NSE Consumer, NSE Banking, NSE Insurance and NSE Industrial having exhibited average negative responses. Only NSE Oil and Gas had an average positive response to interest rate fluctuations for the period under study. The results further underscore the importance of interest rate volatilities to listed assets. It thus suffices to note that where there are significant volatilities in interest rates, the market returns are adversely impacted, leading to negative returns on most assets.

The listed assets had a long-run equilibrium at periods 8, 9 and 10 while responding to interest rate shocks. In period 8, the indirect real estate asset had a similar negative response as other listed investment assets which ranges from -0.52 to -0.04. In period 9, the indirect real estate asset and

other listed also comove by responding negatively to interest rate shocks with response rates which range from -0.70 to -0.05. Similarly, the indirect real estate asset and other listed investment assets responded negatively to interest shocks in period 10 ranging from -0.75 to -0.13. The results re-establish that indirect real estate and other listed investment assets have long-run co-integration.

Response of Indirect Real Estate and other Listed Assets to Unemployment Rate Volatilities

The responses of indirect real estate asset and other listed investment assets to unemployment shocks are presented in Table 5.

Table 5: Response of Indirect Real Estate Asset and other Listed Investment Assets to Unemployment Rate

Period	IRE	NSE Consumer	NSE Banking	NSE Insurance	NSE Oil and Gas	NSE Industrial
1	-	-	-	-	-	-
2	0.05	0.69	-1.43	-1.63	-3.04	2.48
3	0.17	-0.42	2.20	1.26	1.74	-0.46
4	0.22	0.08	0.92	0.67	-1.89	-1.2
5	-0.06	0.13	-1.91	-0.38	1.96	-1.51
6	-0.07	0.08	-0.53	0.18	-0.60	-0.69
7	-0.18	-0.18	-0.62	-0.77	-0.69	-0.56
8	-0.01	-0.16	-0.79	-0.90	-0.34	-0.22
9	0.05	0.11	0.63	0.67	0.79	0.37
10	0.13	0.09	0.74	0.41	0.78	0.69
Overall	*0.03*	*0.05*	*-0.09*	*-0.05*	*-0.14*	*-0.12*

The response of indirect real estate asset ranged from -0.18 in period 7 to 0.22 in period 4. On average, the response of indirect real estate asset to unemployment shock has a mean of 0.03. This means that indirect real estate responded positively to unemployment rate shocks. The result is in line with the findings of Demary (2010) whose results established that indirect real estate responded positively to unemployment rate shocks. However, the result negates the result of Schatz and Sebastian (2009) and Olaleye *et al.* (2015) which established that an unexpected change in the unemployment rate induced a negative reaction on indirect real estate asset.

The response of NSE Consumer to the unemployment rate ranged from – 0.42 in period 3 to 0.69 in period 2. NSE Consumer exhibits negative responses in three out of the ten periods which are periods 3, 7and 8, while the asset has a positive response in six periods. On average, the response of NSE Consumer to unemployment rate shock has a mean of 0.05, and this means the asset responded defensively to unemployment shocks. The response of NSE Banking to unemployment rate shocks ranged from -1.91 in period 5 to 2.20 in period 3. On average, the response of NSE Banking to unemployment rate shock has a mean of -0.09. This indicates that NSE Banking tends to respond negatively/adversely to unemployment shocks. The response of NSE Insurance to unemployment rate shocks ranged from -1.63 in period 2 to 1.26 in period 3. On average, the response of NSE Insurance to unemployment shocks has a mean of -0.05 for the period. The result shows that unemployment shocks will induce a negative reaction on NSE Insurance. NSE Oil and Gas response to unemployment rate shocks ranged from -3.04 in period 2 to 1.96 in period 5. The result showed that NSE Oil and Gas responded positively in periods 3, 5, 9 and 10 only. It means that shocks in the unemployment rate will most likely induce negative effects on the asset's performance. On average, the response of NSE Oil and Gas to unemployment rate shock has a mean of -0.14. The response of NSE Industrial to unemployment rate shocks ranged from –1.51 in period 5 to 2.48 in period 2. On average, the response of NSE Oil and Gas to unemployment shock has a mean of -0.12 for the period. The result is an indication that NSE Industrial is more of a volatile asset as far as unemployment shock is concerned. To this end, unemployment shocks will most likely induce a negative effect on NSE Industrial asset returns.

The results indicate that indirect real estate asset reacted similarly as NSE Consumer which had average positive response rates. Contrarily, NSE Banking, NSE Insurance, NSE Oil and Gas and

NSE Industrial had an average negative response. For the unemployment rate shocks, long-run equilibrium was achieved in the 7th period. In period 7, the indirect real estate asset had a similar negative response as other listed investment assets which range from -0.18 to -0.77. This indicates that in the 7th period, indirect real estate asset negatively comove with other listed investment assets. The result is similar to what was obtained in period 8 in which indirect real estate asset had similar negative response rates as other listed investment assets. However, in periods 9 and 10, the indirect real estate asset alongside other listed investment assets positively responded to unemployment shocks. This shows a positive long-run convergence between indirect real estate asset and other listed investment assets.

Response of Indirect Real Estate and other Listed Assets to GDP Volatilities
The responses of indirect real estate asset and other listed investment assets to GDP shocks are presented in Table 6.

Table 6: Response of Indirect Real Estate Asset and other Listed Investment Assets to GDP

Period	IRE	NSE Consumer	NSE Banking	NSE Insurance	NSE Oil and Gas	NSE Industrial
1	-	-	-	-	-	-
2	0.45	0.18	-0.12	-1.43	2.57	2.64
3	0.21	-0.16	4.09	2.88	2.88	0.04
4	0.17	0.09	- 0.57	1.61	0.30	-0.16
5	0.17	0.37	-2.62	-0.54	2.37	0.93
6	0.25	0.33	0.89	1.29	0.01	0.27
7	0.39	0.19	0.63	0.47	0.08	0.78
8	-0.13	-0.15	-1.57	-0.47	-1.20	-0.82
9	0.16	0.06	0.22	1.06	0.08	0.40
10	-0.38	-0.14	- 0.18	-0.46	-0.60	-0.06
Overall	*0.14*	*0.09*	*0.22*	*0.49*	*0.72*	*0.45*

The responses of indirect real estate asset and other listed investment assets to GDP shocks are presented in Table 6. The response of indirect real estate asset ranges from -0.38 in period 10 to 0.45 in period 2. The result reveals that the indirect real estate responded positively to GDP shocks for most of the time horizons. This is an indication that indirect real estate asset is a defensive asset to GDP shocks, that is a shock in GDP would have little or no effect on the performance of indirect real estate assets. On average, the response of indirect real estate to GDP shock has a mean of 0.14 for the period analysed. This result corroborates with the result of Cotter and Stevenson (2006) as well as Olaleye *et al.* (2015) whose results established that indirect real estate asset reacted positively to GDP volatility.

The response of NSE Consumer to GDP ranged from -0.16 in period 3 to 0.37 in period 5. The asset has a combination of both positive and negative responses. On the average, the response of NSE Consumer to the GDP shocks has a mean of 0.09 for the period. This indicates that NSE Consumer is defensive to GDP shocks. NSE Banking had responses ranging from – 2.62 in period 5 to 4.09 in period 3. On the average, for the period analysed, the response of NSE Banking to the variations in GDP has a mean of 0.22 and this suggests that the asset responds positively to GDP fluctuations. NSE Insurance response to GDP ranged from – 1.43 in period 2 to 2.88 in period 3. The asset responded negatively to GDP shocks in periods 2, 5, 8 and 10 at the rates of -1.43%, - 0.54%, -0.47% and -0.46 respectively. On the average, the response of NSE Insurance to GDP shocks has a mean of 0.49 for the period. The result indicates that shocks in the GDP rate will most likely induce a positive reaction on NSE Insurance; having little or no effect on the asset's performance. NSE Oil and Gas have only 2 negative responses in periods 8 and 10 with the rates of -1.20 and -0.60 respectively. The asset's response ranged from –0.60 in period 10 to 2.88 in period 3. The result indicates that the NSE Oil and Gas has the potential of reacting positively to GDP shocks, which means the asset is defensive to GDP shocks. A shock in the GDP rate might have little or no effect on the asset's existing performance. On the average, the response of NSE Oil and Gas to GDP shocks has a mean of 0.72 for the period. NSE Industrial responses to GDP

ranged from –0.82 in period 8 to 2.64 in period 2. On the average, the response of NSE Industrial to GDP shocks has a mean of 0.45. The result indicates that NSE Industrial is defensive to GDP volatility.

The results indicate that indirect real estate asset and other listed investment assets exhibited average positive responses, this implies that GDP shocks are insignificant in affecting the performance of indirect real estate and other listed investment assets in the Nigerian market. The response of indirect real estate and other listed investment assets to GDP shocks reached its long-run equilibrium in period 6 where the assets all exhibited positive responses which range from 0.01 to 0.29. Likewise in periods 7 and 9, the indirect real estate asset had similar nature of positive responses as with other listed investment assets which range from 0.08 to 0.78 in period 7 and 0.08 to 1.06 in period 9. However, in periods 8 and 10, the assets negatively responded to GDP shocks with responses ranging from -0.13 to -1.57 and -0.60 to -0.06 in periods 8 and 10 respectively.

Response of Indirect Real Estate and other Listed Assets to Exchange Rate Volatilities
The responses of indirect real estate asset and other listed investment assets to exchange rate volatilities are presented in Table 7.

Table 7: Response of Indirect Real Estate Asset and other Listed Investment Assets to Exchange Rate

Period	IRE	NSE Consumer	NSE Banking	NSE Insurance	NSE Oil and Gas	NSE Industrial
1	-	-	-	-	-	-
2	0.24	-0.09	0.94	1.00	1.18	-1.47
3	0.04	0.21	-0.27	0.16	-0.48	-1.13
4	-0.17	-0.11	-0.79	0.04	0.80	-0.41
5	0.07	-0.07	0.03	0.02	-1.09	0.28
6	0.15	-0.11	0.36	-0.04	-0.47	0.12
7	-0.03	-0.15	-0.78	- 0.63	-0.46	- 0.63
8	0.08	0.10	0.90	0.93	0.47	1.19
9	0.22	0.01	0.73	0.62	0.26	1.12
10	0.18	0.02	0.81	0.86	0.07	0.97
Overall	0.09	-0.02	0.21	0.45	0.03	0.08

The indirect real estate asset response ranged from -0.17 in period 4 to 0.24 in period 2. The result shows that indirect real estate responds positively in most of the ten time-horizon. The asset has negative response rates in periods 4 and 7 at the rates of -0.17 and -0.03 respectively. On the average, the response of indirect real estate to exchange rate shock has a mean of 0.09 for the period. This result is in line with the results of Addae-Dapaah and Loh (2005) and Olaleye *et al.* (2015) who concluded that indirect real estate asset reacted positively to shock in the exchange rate. Thus, volatilities in the exchange rate would have little or no effect on the performance of indirect real estate asset.

NSE Consumer response ranged from -0.15 in period 7 to 0.21 in period 3. The result indicates that NSE Consumer is more of an aggressive asset to exchange rate shocks and as such, a shock in the exchange rate will bring about a negative reaction by the asset. On the average, the response of NSE Consumer to exchange rate shock has a mean of -0.02 for the period. The response of NSE Banking to the exchange rate ranged from –0.79 in period 4 to 0.94 in period 2. It is noticed that NSE Banking has positive responses in almost the entire period except in periods 3,4 and 7 where the asset has -0.27, -0.79 and -0.78 respectively. This means that shocks in exchange rate might not affect the asset's performance because the asset has exhibited more of defensive nature than aggressive. On the average, the response of NSE Banking to exchange rate shock has a mean of 0.21 for the period. The response of NSE Insurance to the exchange rate ranged from – 0.63 in period 7 to 1.00 in period 2. NSE Insurance has a negative response only in the sixth and the seventh periods while it responds positively in other periods except in period 2 where the asset did not respond to the exchange rate shocks. This shows that NSE Insurance is more of a defensive

asset to exchange rate shocks than aggressive. On average, the response of NSE Insurance to exchange rate shock has a mean of 0.45. The response of NSE Oil and Gas to the exchange rate ranged from – 1.09 in period 5 to 1.18 in period 2. On the average, the response of NSE Oil and Gas to exchange rate shock has a mean of 0.03 for the period under analysis. It means that shocks in the exchange rate will most likely induce positive effects on NSE Oil and Gas as it appears from the result that the asset is more defensive to exchange rate volatility. The response of NSE Industrial to exchange rate shocks range from -1.47 in period 2 to 1.19 in period 8. The result suggests that NSE Industrial defensively responds to the shocks in the exchange rate and as such, a shock in the exchange rate will most likely induce a positive reaction on the asset. On average, the response of NSE Industrial to exchange rate shock had a mean of 0.08 for the period analysed.

The indirect real estate and other listed investment assets exhibited similar responses to exchange rate shocks from periods 7 to 10 and this is an indication that indirect real estate and other listed commoved in the long run. In period 7, the indirect real estate together with other listed investment assets exhibited a negative response to exchange rate shocks and this ranged from -0.78 to -0.03. Contrarily, indirect real estate and other listed investment assets in periods 8, 9 and 10 responded positively to exchange rate shocks. In period 8, the positive response ranged from 0.08 to 0.93 while it ranged from 0.02 to 0.97 in period 10.

Conclusion
The study assessed the response of indirect real estate asset and other listed investment assets to macroeconomic fluctuations. Given that indirect real estate has been noted to behave synonymously like the stock market and not the underlying property being traded, the *a-priori* expectation is that indirect real estate will behave synchronously like other listed investment assets both in the short and long run to the volatilities in the macroeconomic factors. However, analysis from the impulse response model showed that the indirect real estate asset and other listed assets exhibited different responses to macroeconomic volatilities in the short run while they exhibited similar responses to macroeconomic fluctuations in the long run. Thus, while the *a-priori* expectation was not satisfied in the short run, the long-run response showed that indirect real estate assets and other listed investment assets have similar reactions to the unexpected changes in the macroeconomic factors, which constitute part of the unavoidable risks.

On this note, the finding in this study has implications for the investors and other participants in the Nigerian investment market. The study, therefore, recommends that investors should not consider the combination of indirect real estate and other listed investment assets in the long run because the assets have exhibited similar reactions to macroeconomic shocks along the long run which will result in little or no long-run diversification benefit. This result implies that the combination of these investment assets in a portfolio will hinder the investor's motive of long-run profit maximization. The result of the study may be useful to risk-averted investors who intend to consider the combination of indirect real estate asset and other listed investments in an investment portfolio as such a decision will mar the investor's profit maximization motive. This study can therefore be extended by analyzing the effects of macroeconomic shocks on indirect real estate and other listed investment assets.
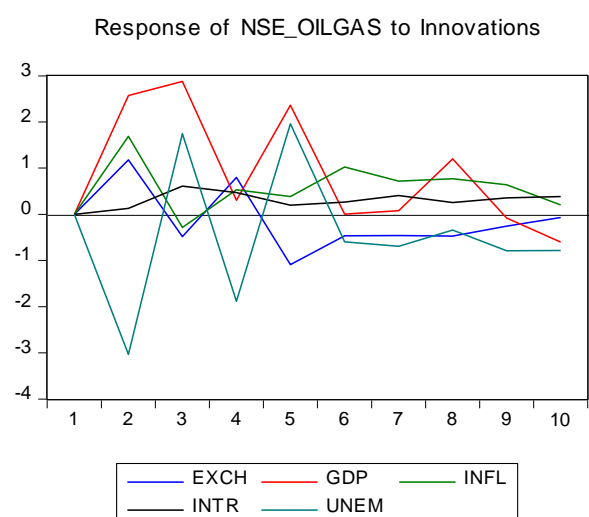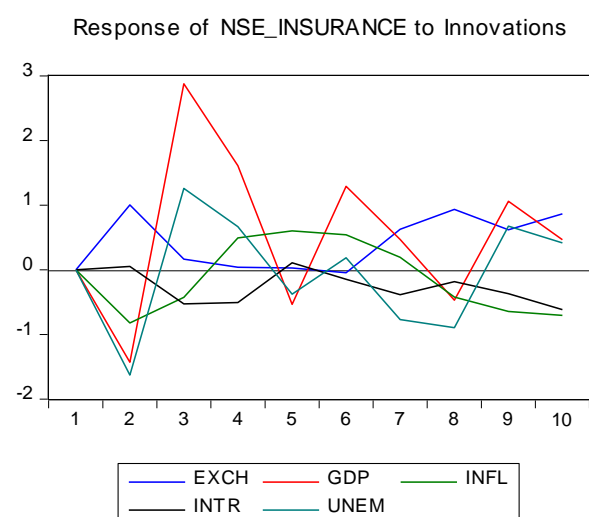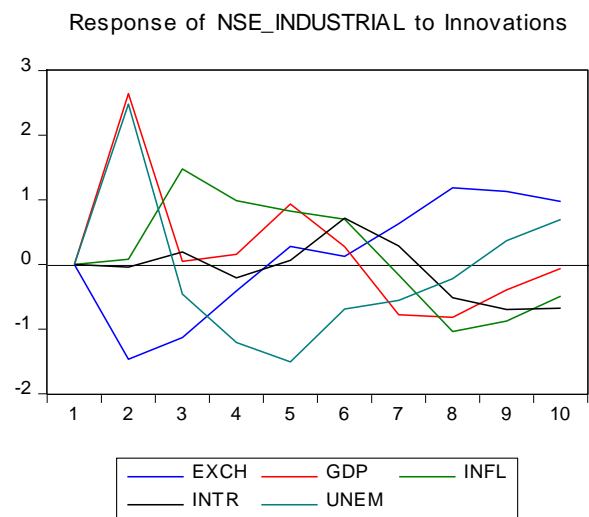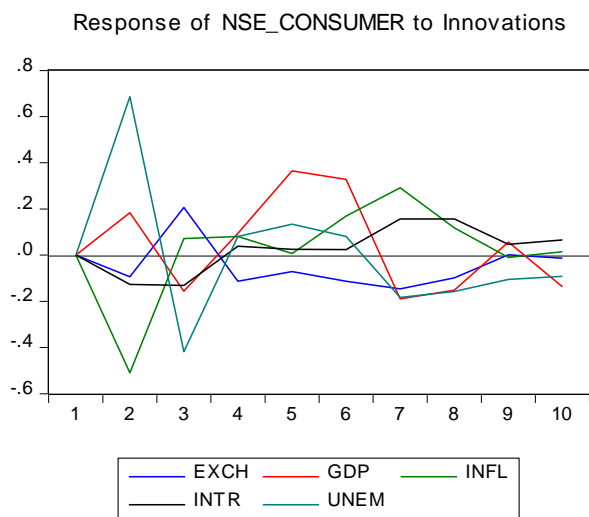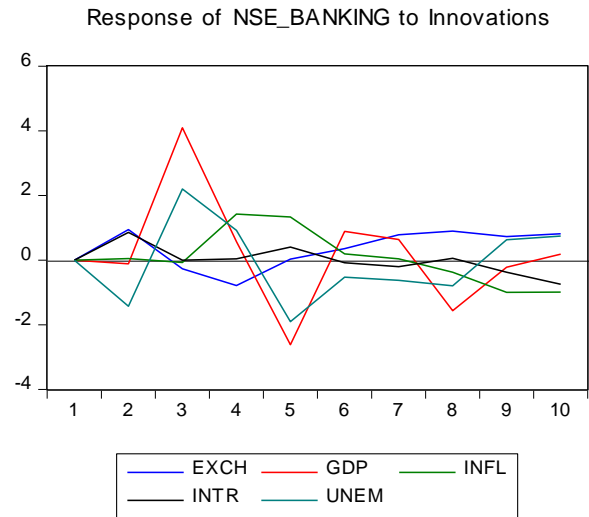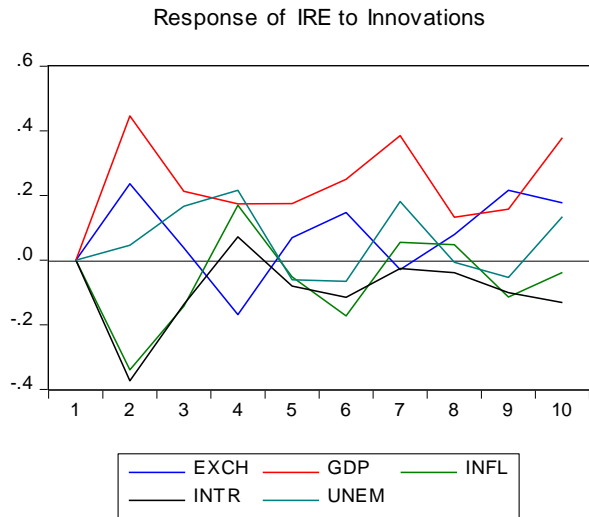
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Response to Cholesky One S.D. (d.f. adjusted) Innovations

Response of IRE to Innovations

Response of NSE_BANKING to Innovations

Response of NSE_CONSUMER to Innovations

Response of NSE_INDUSTRIAL to Innovations

Response of NSE_INSURANCE to Innovations

Response of NSE_OILGAS to Innovations

The graphs are drawn on a coordinate x-axis and y-axis with a scale of 1cm to 1 unit. Along the x-axis are the periods while along the y-axis are the negative and positive values of the macroeconomic data