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OIL PRICE SHOCKS, REAL EXCHANGE RATES AND REAL STOCK

RETURNS IN AFRICA

By

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DECLARATION

I hereby declare that this submission is my own work towards the degree of Master of Philosophy (Economics) and that, to the best of my understanding; it contains no information previously published by another person, or information which has been accepted for the award of any other degree of the University, except where acknowledgment has been made in the text.

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DEDICATION

I dedicate this thesis to GOD ALMIGHTY, to my lovely mother and big sister. I also dedicate this thesis to Dr. E. F. Oteng-Abayie, Dr. John Bosco Dramani, Dr. Prince Frimpong and all other lecturers for their immense support. I appreciate you all for your sacrifice for me.

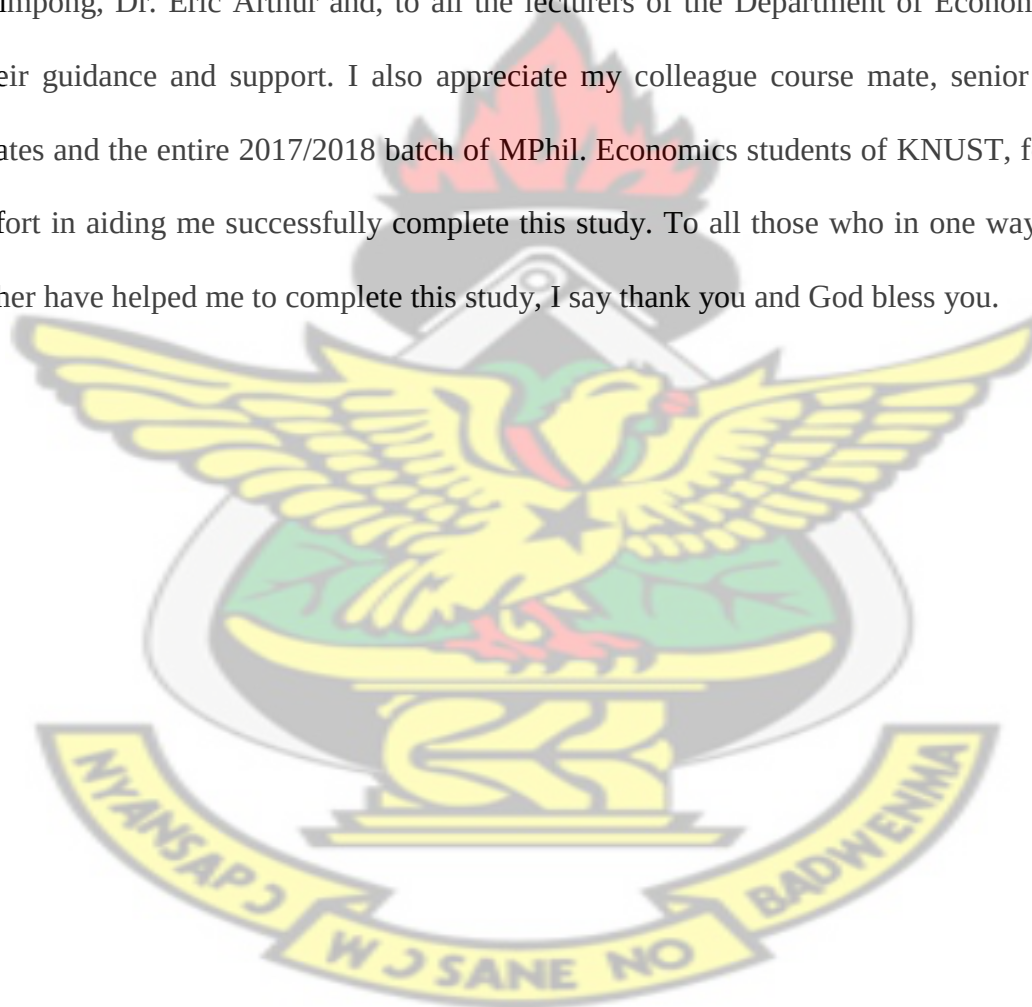
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ABSTRACT

The study examined the impact of oil price shocks on real exchange rates and stock returns. Using a decomposition analytical framework, oil price shocks was disaggregated into three components – aggregate demand shocks, oil-specific demand shocks and oil supply shocks. The study then proceeded to investigate the short-run transmission of these components of an oil price shock to real exchange rate and real stock market returns as well as the degree of pass-through effect for oil importing countries. Monthly data covering January 2000 to May 2017 of selected African countries was used for this work. Using several econometric models specified in basic and panel vector autoregressive forms plus the impulse response functions and variance decomposition techniques, the sensitivity of real exchange rate and stock market returns to disaggregated oil price shocks were examined. At the end of the study, it was detected that oil price movements have been mainly associated with shocks to oil demand rather than oil supply. The short-run results revealed a partial (incomplete) pass-through of oil price shocks to stock market returns and real exchange rate through the real exchange rate channel and real stock returns channel respectively. Furthermore a positive oil price shock leads to depreciation in real exchange rate and an appreciation in real stock market returns in the short-run for oil importing African countries. The robustness tests were consistent with the main findings (i.e. for countries which were affected by oil price shocks). Giving the findings, it was recommended that policymakers should vote for policies that will cushion the economies against oil price shocks by hedging the purchase of oil against high oil prices.

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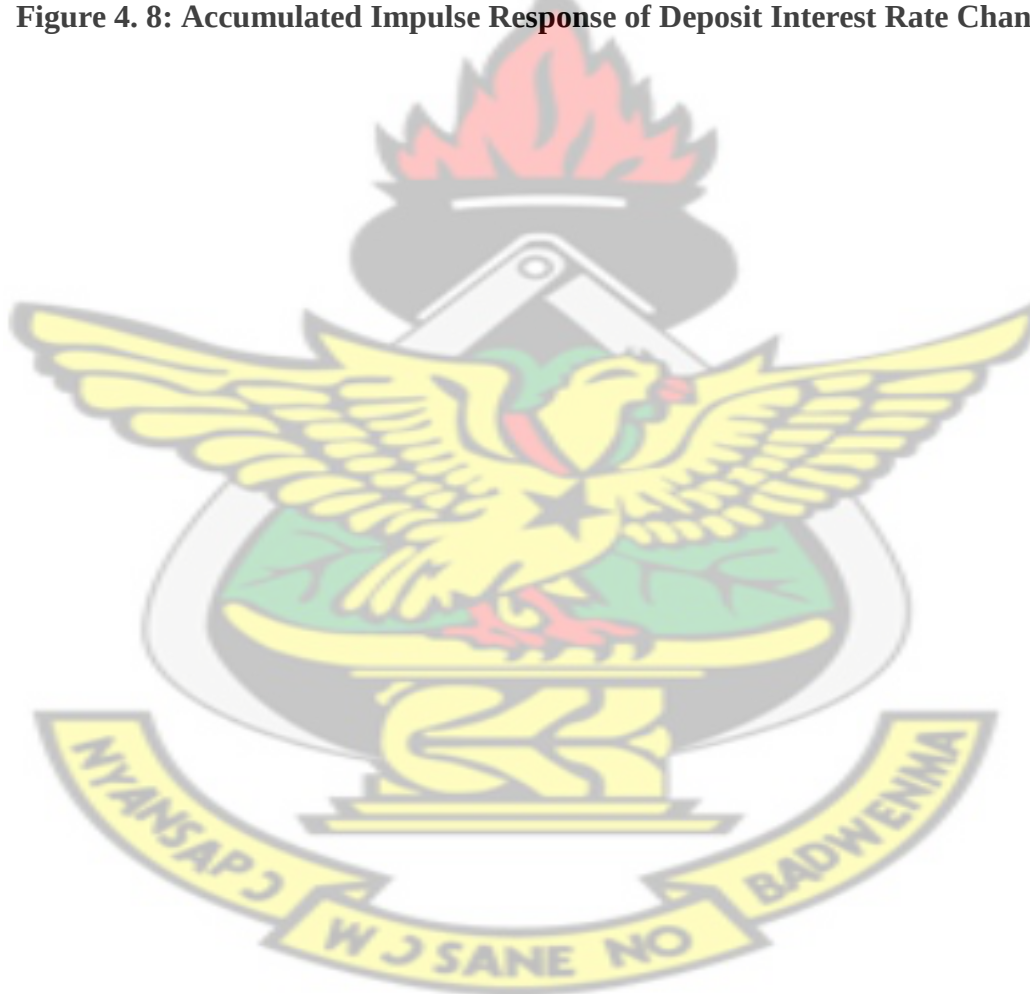
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CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Oil, without doubts, is the most prominent physical commodity which forms a significant part of any economy (Kuncoro, 2011). According to the African Development Bank and African Union (2009), world energy supplies are satisfied by two out of three of oil and gas provisions. The discoveries of crude oil especially in oil-producing states have led to some social and economic transformations. Oil has, and constantly supports most sectors because of its multi useful energy source, which is greatly expended in many nations (Stambuli, 2014). Crude oil has been used to fuel machines for production in industries such as the manufacturing, and the transportation industries (Hosseini, 2012).

Because of the importance of oil, it's a standout amongst the most generally traded commodities which have influenced international and trade economies worldwide (Milonas and Henker, 2001). Africa being rich in crude oil has the attracted attention from corporate and political decision-makers because of the growing global demand for oil (Frynas and Paulo, 2006). Since the 1970s, the African continent has been internationally recognized as a non-negligible partner in oil production (Gourene and Mendy, 2018).

Major players to the global production of oil in Africa include Algeria, Nigeria, Angola, and Libya. These countries are also members of OPEC who have contributed

enormously to the supply of oil to many nations. It was estimated that African oil accounted for 25% of all US crude oil imports (Sahu, 2008).

In spite of the share of oil producing African countries in global oil supply, revenues acquired have not translated massively to economic growth and development (Sahu, 2008). This may be attributed to the high and costly reliance on oil imports from outside Africa. It is also amazing to note that Africa consumes fewer than thirty percent of its oil and gas products while it exports the remaining to Asia and the US. This might be because of the way that oil refined products in the area are primarily produced in small, inefficient, poorly maintained and outdated refineries; while the quality of these refined oil products do not meet the international standards (Sahu, 2008).

Because of the job unrefined petroleum plays in an economy, it's without any doubt that changes in its prices have attracted a substantial amount of attention over decades. Various efforts have been made to clarify the behavior of oil prices in addition to its shocks to the macroeconomy since the 1970s. Hamilton (1983) in his pioneering work found that oil price shocks depressed the US economy. His findings aroused the need to research into this area and for years the influence of oil price tremors on numerous economic and financial variables have been of great interest.

Earlier studies observed that major disruptions in the supply of oil made individuals uncertain about the future; advancing a shortfall in the demand for cars, appliances, housing, and investment goods in the US in the short run (Hamilton, 2003). Bresnahan and Ramey (1993) in their empirical work found out that the oil shocks led to significant changes in the demand for automobile over ten years.

A plethora of studies also revealed that an oil price shock had the capability of influencing certain macroeconomic variables. Such variables include; exchange rate, inflation, output interest rate and, economic activity, etc. Jbir et al., (2009) studied the oil prices–macroeconomy relationship by analyzing the role of subsidy policy. They found an indirect effect whereby oil price shocks affected Tunisia through the government’s spending, which was the key variable affecting economic activity. The exchange rate and stock market returns have exclusively been regarded as an important team player in the subject area. Huang and Tseng (2010) in their research found out that variations in exchange rates, as well as depressing values of stocks and bonds, especially those quoted in the US Dollar, are explained by movements in crude oil prices.

Hypothetically, variations in the cost of oil influences exchange rate mostly via the terms of trade and wealth channels. An unexpected increment in the cost of oil is anticipated to prompt a surge in the money value of oil exporting states and devaluation in the currency of importing states. It is also postulated that wealth is transferred of from these oil importing nations to oil exporting nations. Looking toward the association among oil value shocks and the stock market, following theory, the worth of stock which is the total discounted anticipated future currency flows may be impacted by oil value shocks. An upsurge in the cost of oil prompts an expansion in production costs which prompts companies to cut down productivity. A fall in yield consequently implies a fall in the profit of these firms which prompts a dip in stock market prices (Tang et al., 2010). Wang et al., (2013) in their results disclosed that the oil market had substantial control over the stock market. Their discoveries stimulated market participants in oil-exporting nations to utilize future contracts or other

financial instruments to restrict uncertainties in demand, while those in oil importing nations did not have to devote their aid to uncertainties in demand.

There also exist theories on the exchange rate-stock market relationship. Adjasi et al., (2009) writes that stock prices are probably going to be influenced by trends in exchange rate; they report currency devaluations are likely to favor external markets and hence instigate investors to shift their assets to the external market. Stock prices/returns affect exchange rates through the portfolio balance models where the intent of capital account dealings is emphasized. For example, a lively stock market will draw in foreign capital inflows from its stockholders, thereby raising the desire for its cash. This prompts an appreciation in the domestic currency. On the contrary, when stock prices are falling, investors will attempt to sell their stocks to avoid additional losses. This consequently leads to the devaluation of the native currency (Adeyibi et al., 2009).

Considering the high oil dependency rate of most African countries, it is assumed that an oil price shock is capable of having an enormous impact on real exchange rate and stock market returns be it a producer or a consumer of oil. The study argues that it is vital to acknowledge the influences of oil prices on real exchange rates and real stock returns in Africa so as to recognize impacts that might be deliberate crosswise over nations instead of being nation specific.

1.2 Problem Statement

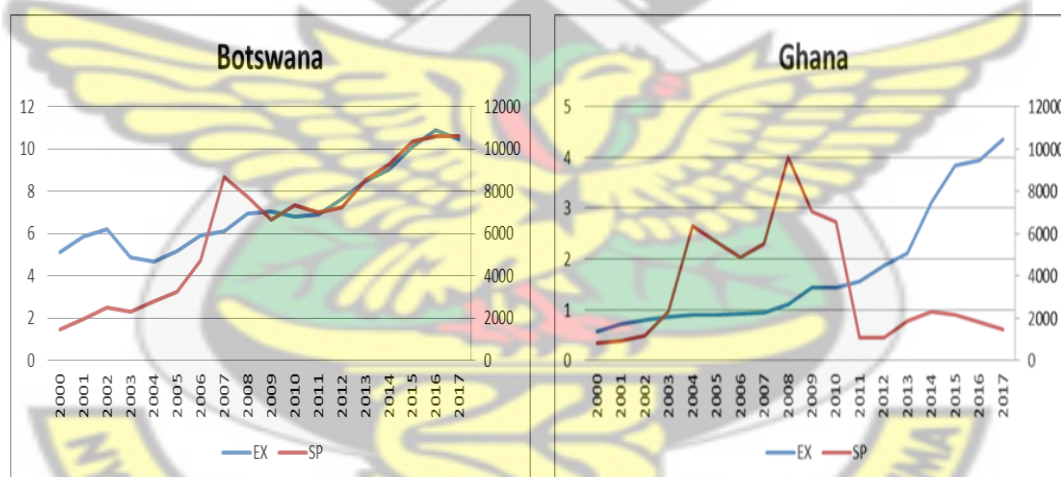
Over a decade oil price shocks have attracted the attention of researchers and policymakers. This has been, as a result of oil being a strategic natural resource and variations in its prices and market trades have been discovered to have diverse repercussions on an economy and its financial markets. The global variations in oil prices have been accountable for most economic recessions, rising inflationary pressures, huge trade and budget deficit, and instability in other macroeconomic variables (see for example Hamilton, 1983; Hooker, 1996).

Since volatilities experienced in the exchange rate market have been recognized to form part of the major causes of the macroeconomic instabilities, the over-reliance on crude oil for foreign exchange earnings and for consumption purposes by African developing economies have been found to influence the economic performance of these nations. Moreover, since stock markets are more or less also been defined as a mirror of a country's economic activity (Gourene and Mendy, 2018), abnormalities in the cost of oil are very likely to affect stock markets because of the significant impact oil has on a country's economic activity. Though there have been conflicting views ideas concerning the relationship between oil prices and the stock market, following Nayaran and Nayaran (2010), Cong et al., (2008), and many others, the study seeks to identify the impact of oil price shocks on the stock market returns of oil importing African countries.

Crude oil spot prices, measured using Brent crude oil, closed out the year 2001 at \$24.41 per barrel. By July of 2008 oil prices had risen to \$133.9 per barrel. Over this same time period, the Ghanaian cedi and Botswana pula depreciated against the US

dollar approximately by 55% and 19% respectively. Thus, the USD/GHS increased from 0.71 to 1.11 while the USD/BOT\$ increased from 5.84 to 6.97. Figure 1.1 portrays an upward trend in both countries exchange rate over the study period. Thus, their currencies experience an ever increasing pressure. Though we cannot ascribe the depreciating pressures of Ghana and the Botswana to oil price shocks, the study seeks to identify the linkage between oil prices and the exchange rates of the selected oil importing countries. Within this same period, stock prices of Ghana rose from \$930.24 to \$9600.77 while stock prices in Botswana also saw an increase from \$1981.86 to \$7727.08. For Botswana, we realize how exchange rate and stock prices move hand in hand. Stock prices in Ghana immediately drop after 2008.

Figure 1. 1: Trend Analysis of Botswana and Ghana



Though works on the association within oil and stock prices exists, and distinct works on the association within oil prices and exchange rates :(Hamilton, 1996, Chen and Chen, 2007, Zhang et al., 2008, Kilian and Park, 2009, Basher et al., 2012, Jammazi et al., 2014, Raza et al., 2016, etc.), the transmission channel as well as the extent of pass through has, however, not been extensively studied. This study therefore seeks to add to literature by examining the transmission channels through which oil price

shocks alters real exchange rate and real stock returns of selected oil importing countries by utilizing the Panel Vector Autoregression (PVAR) model . For robustness test, the study includes two net-oil exporting nations to the panel of oil-importing nations. In addition, it seeks to discover how different the results may be when the outlook is shifted towards oil producing and non-oil producing nations rather than on oil importing and exporting nations. Finally, a country specific analysis is executed by utilizing the standard vector autoregression model.

1.3 Objectives of the Study

The primary goal of this analysis is to examine the dynamic relationship between oil price shocks, real exchange rate, and real stock market prices. Specifically, the study aims at achieving the following objectives:

1. To examine the sources of oil price shocks in the selected oil importing African nations.
2. To examine the transmission channels through which oil price shocks affect real exchange rates and stock market returns in selected oil importing African nations.
3. To examine the degree of the pass-through effect of oil price shocks on exchange rates and on stock market returns in selected oil importing African nations.

1.4 Research Questions

1. What are the causes of oil price shocks in the selected oil importing African nations?
2. What are the transmissions channels through which oil price shocks affect real exchange rates and stock market returns in selected oil importing African nations?
3. To what extent do (degree of pass-through) oil price shocks affect exchange rate and on stock market returns in selected oil importing African nations?

1.5 Significance of the Study

The study seeks to be significant in three ways; this study is anticipated to influence the direction of policy, bridge knowledge gaps and to contribute to literature for further researches. Understanding the link amongst oil prices shocks, real exchange rates, and real stock market returns is essential. This is because developing economies are relied upon to exercise a dominant control over the worldwide economy as they develop and thrive (Basher, 2012).

Firstly, the results from the objective of examining the causes of oil price shocks, the transmission channel and the degree of pass-through effect of an oil price shock on real exchange rate and real stock returns of oil importing countries informs policymakers about the sources and direction of oil price shocks in the selected oil importing countries. It identifies the extent to which oil price shocks affect these oil importing African countries. Also, how best these countries will handle shocks originating from instabilities in world crude oil prices.

Looking at the relationship between these variables keeps both local and foreign investors abreast with periods that may be profitable for the investment in assets. Since the goal of the government is to achieve sustainable growth and development, measures can be put in place to guarantee the resourceful use of crude oil and the establishments of a well-diversified fuel mix in the various selected developing countries.

Secondly, the study seeks to add-up to literature by analyzing the transmission pathways through which oil price shocks affect real exchange rate and on real stock returns. This procedure isolates the individual roles in terms of how oil price shocks impact the transmitting channel from how the transmitting canal influences real exchange rates and real stock returns. By investigating the degree of pass-through impact of an oil price disruption on real exchange rates and real stock returns in the listed African countries, the study also commits to current literature since it appears to represent a fundamental omission to the literature.

For academic purposes, this empirical work seeks to arouse interest for further studies in this area. It is likewise noteworthy in terms of timing and purpose. This is on the grounds that realizing the dynamical link amidst oil prices, exchange rates, and stock prices have meaningful implications at the hypothetical, practical and the macro level. Recent studies on the subject matter are biased in terms of location. Related studies are centered on developed countries and a few African countries that are considered major players in the oil market. (Hamilton, 1996; Chen and Chen, 2007; Zhang et al., 2008; Kilian and Park, 2009; Basher et al., 2012; Jammazi et al., 2014; Raza et al.,

2016, etc.). The study, therefore, is expected to bridge knowledge gaps and contribute to literature on the subject matter in some selected African countries.

1.6 Scope of the Study

To determine the influence of oil price disruptions on real exchange rates and real stock returns for a chosen quantity of oil importing African countries, the study employs real exchange rates, stock market returns, world oil production, world real economic activity, and interest rates to engage in the research work. All data set are secondary in nature. They also take the form of monthly data from January in 2000 to the May in 2017 for eleven African countries. Out of which nine are oil importing states and the remaining two are net-oil exporting countries. This time period was chosen due to the accessibility of relevant data and has also been considered as reasonably long enough to provide sufficient information on the influence of oil price shocks on real exchange rates and stock returns.

1.7 Organization of the Study

Chapter two provides the literature review and the hypothetical substructures of the study. Chapter three defines the methodology, encompassing the sources of data, the specification of the model, and strategies of investigation. Empirical outcomes are discussed in chapter four, while the outline and conclusion are confined in chapter five. The last chapter again contains possible restrictions and areas for further examination

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This division places emphases on the literature review. It discusses both theoretical and empirical literature and it is divided into seven sections. Section one defines key concepts. Section two looks at measurement of oil price shocks. The next, establishes the hypothetical link amongst oil price, exchange rate, and the stock market. Section four gives an overview of oil prices shocks, exchange rate and the stock market in Africa. Section five looks at the empirical review. Section six also looks at the degree of oil price shocks pass through to exchange rate and stock market prices. Lastly, section gives a summary of empirical studies.

2.2 Definition of Concepts

2.2.1 Oil price Shocks

An oil price shocks are abrupt adjustments in oil prices huge enough to motivate a worldwide recession or decrease in global economic activity. According to Kilian (2009), oil supply disturbances, oil demand disturbances, and oil specific-demand disturbances are the causes of an oil price shock.

2.2.2 Real Exchange Rate

In actual fact, exchange rate describes the rate at which a nation's currency is traded for that of another nation's money during international trade. Real exchange rate, then again, takes into account the inflationary effect. The International monetary fund (2018) defines real exchange rate between two currencies as the product of the ratio of prices between nations and the nominal exchange rate.

2.2.3 Stock Market Returns

Like OECD (2019), stock market returns are defined as the yields that investors make out of the stock market. Thus how much money they will make as a result of investing in a basket of shares. These revenues can be structured as profits made over trading or structured as dividends given to shareholders by its business over time.

2.2.4 Deposit Interest Rates

Deposit interest rate denotes to the sum of cash paid out as interest by banks or financial institutions on money deposited. Certificates of deposit, self-directed deposit retirement accounts, savings accounts and investment accounts are all examples of a deposit account. This is in accordance with the Index Mundi definition.

2.3 Oil Price Shocks and Measurement

2.3.1 Sources of Oil Price Shocks

Agreeing to Baumeister and Peersman (2010), oil price shocks are caused by three major factors. And they include; oil supply shocks, oil demand shocks, and oil-specific demand shocks.

Table 2. 1: Elements of Oil Price Shocks

	Quantity of Oil	Price of Oil	Economic Activity
Oil Supply Shocks	≤ 0	≥ 0	≤ 0
Oil-specific demand Shocks	≥ 0	≥ 0	≤ 0
Global demand Shocks	≥ 0	≥ 0	> 0

Source: Baumeister and Peersman (2010)

With the supply side, movements of the supply curve are caused instabilities generated by oil supply shocks (disturbances). This curve is not driven by macroeconomic fundamentals, but by over or under production which may be as a result of poor forecasting, conflicts, and quotas imposed by the oil producing-economies. Therefore, unfavorable oil supply will lead to a plummet in world oil production and an upsurge in price the cost of oil while world economic activity also experiences a downturn.

On the demand side, changes in macroeconomic activities are responsible for global (aggregate) demand shocks which influence the present demand for crude oil. Therefore, oil demand shocks are therefore expected to shift output and oil prices on an equal path. Oil market-specific demand shocks on the other hand, are those disturbances compelled by adjustments in the precautionary demand for oil which is also concerned with the uncertainties in the availability of future supply of crude oil with respect to projected demand. This analysis is similar to Kilians' (2009) types of oil price shocks.

2.3.2 Measurement of Oil Price Shocks

There has been several distinct ways of measuring disturbances from oil prices. One popular measure was to define oil price shocks based on present movements in the price of oil. Such shocks (innovations) were further disintegrated into oil demand and supply shocks. Like Kilian (2009), oil prices are determined in the worldwide market by recognizing oil supply, aggregate demand, and precautionary demand shocks.

Unusually high (or occasionally low) oil prices occurrences have also been termed as oil price shocks. These occurrences have a long life span (ie. extending over several years). It argues that the huge adjustments in the price oil on a month to month premise may not be enough to describe oil price shocks but rather the extended periods in which oil prices experiences modest, but persistent advancements. For example, the 2003-08 oil price floods. This is in accordance with the findings of Mork (1989). He argues that, the main oil shocks since 1948 were price surges until the breakdown in oil price in late 1985.

Hamilton (1996, 2003) also proposed another measure. He defined an oil price shock as “An increment in the net oil price, which is the log change in the nominal price of oil relative to its preceding three year high if positive, or zero otherwise”. The impression is that, when the cost of oil surpasses the highest price of oil that consumers and businesses experienced in recent periods, an oil price shock is identified. Just like Hamilton, Filis et al., measured the oil price disturbances by taking the log and finding the returns on oil prices. However, this measure was despised by Kilian (2008a) as it failed to filter out changes in the price of oil due to political wars or other demand driven factors.

2.4 Theoretical Review

2.4.1 Relationship between Oil Price and Exchange Rate

According to the theory of demand and supply, variations in the world crude oil price (designated in the US dollar), affects an economy depending on whether the country is an importing or exporting country. An oil price shock caused by either an oil demand or an oil supply shock causes oil importing countries to increase their demand for U.S. dollars in order to pay for the oil imported. This raises the rates of exchange and hence causing depreciation of the local currency of importing countries while exporting countries experiences an appreciation in their currency. This study is consistent with the findings of Dawson (2000).

2.5 Transmission Mechanism of Oil Price Shocks and Exchange Rate

2.5.1 Terms of Trade Channel

In understanding the terms of trade channel, following Buetzer et al. (2012), the study assumes a basic two-country open economy static model, where the cost of the transacted goods are fixed on the world market. The world market decides the national wages for both the transacted and non-transacted good divisions. A positive term of trade shock as a result of an increase in the price of the traded good (oil price) prompts an increment in the wages of the commodity sector (oil) of the producing country. This well-being is translated into the other sectors of the economy. As a result, there is an increase in the price of the non-transacted products as well as an appreciation in the real exchange rate in the economy. The reverse is true (Buetzer et al., 2012; Cashin et al., 2004).

2.5.2 Wealth and Trade Balance Channel

There is also a transfer of wealth from oil importing to exporting nations (consequently, an appreciation in the exchange rate) when the value of oil increases. This is seen as an enhancement in the export earnings and current account balances of these oil exporting nations (Beckmann and Czudaj, 2013). That is, the disposable incomes, the corporate productivity, national demand and stock prices of these exporting countries increases. If an oil exporting state reinvests its incomes in US dollar assets, there is a probability that the US dollar will appreciate in the short-period due to the wealth effect.

The process again works generally in the reverse: oil importing nations experiences trade deficit. This portrays the beginning of weak economic growth and, over time, devaluation in real exchange rate and stock prices (Adebiyi et al., 2009). The cost of doing business rises while profit of non-oil related organizations falls (Basher, 2012).

2.5.3 Portfolio Reallocation Channel

According to the portfolio effect, the oil exporter's relative taste for example, US dollar assets determines the impact on the US dollar relative to the currency of oil exporting nation. If it is assumed that oil exporting nations have a solid taste for dollar-designated assets however not for their residential commodities, an oil price hike will prompt a surge in the value of the dollar in the short run (Bénassy-Quéré et al., 2007).

2.5.4 Monetary Channel

The monetary channel explains the process by which oil price changes affects exchange rates through inflation and interest. Inflation caused by increased oil prices makes domestically produced goods more expensive than foreign products. This prompts an expansion in demand for less expensive foreign commodities relative to locally produced goods. An increase in the demand for foreign products and hence the foreign currency causes the devaluation of the local currency. To curb inflationary pressures, the government increases interest rates to attract foreign investment and help improve a nation's exchange rate.

The link amongst these variables can only be settled through empirical investigations. Figure 2.2 gives a brief conceptual description of the direct and indirect relationship between oil prices and exchange rates.

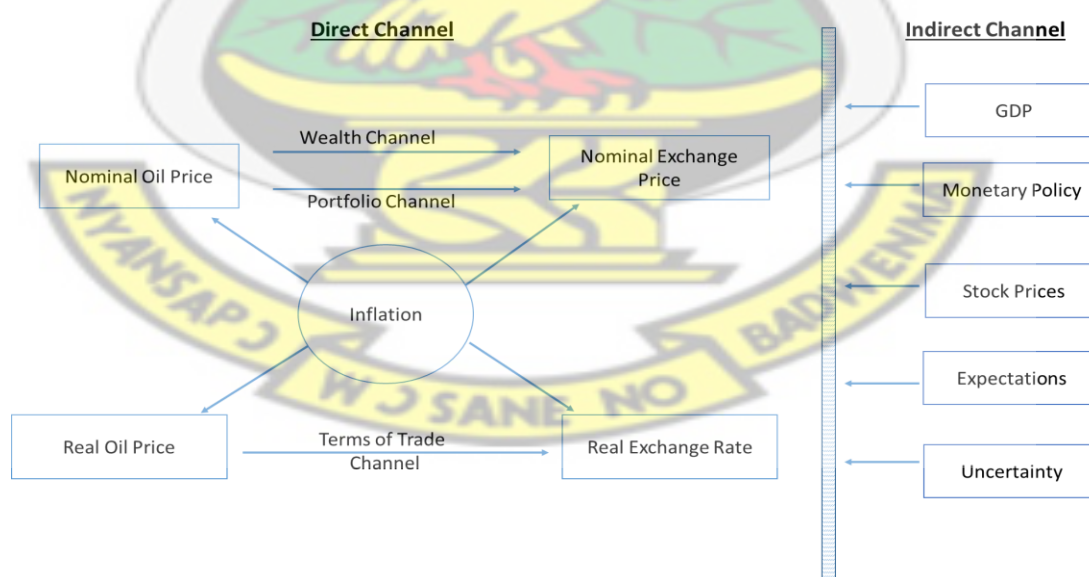


Figure 2. 1:Transmission channels of Exchange rate
Adapted from Beckmann et al., (2017)

2.6 Relationship between Oil Price and Stock Market

Theoretically, without a total substitution effect between the factors of production, there is an increase in the expense of doing business and a decrease in the profits of non-oil producing states when the price of oil increases. These high costs of oil can be imparted unto buyers as increments in the costs of final goods and services which consequently reduces the demand for final goods and services and once again a reduction in profits. Oil prices can influence stock prices straightforwardly by compelling future money flows or indirectly via other channels. These direct and indirect channels are carefully explained in the section below.

2.7 Transmission Mechanism of Oil Price Shocks and Stock Market

2.7.1 Stock Valuation Channel

This channel as proposed by Degiannakis et al., (2017) describes the immediate path by which oil prices influences stock prices. Theory advocates that present stock prices mirrors the discounted future currency flows of a particular stock (Huang et al., 1996). This is seen as:

$$P_{j,t} = \sum_{m=t+1}^M \left(\frac{E[Cf_m]}{(1+E[i])^m} \right) \dots\dots\dots 2.1$$

From the equation 2.1, Cf_m is the cash flow at time m and i is the discount rate. $E(\cdot)$ represents the expectation operator. From the above, stock market returns can be calculated as:

$$R_{i,t} = \log \left(\frac{P_{i,t}}{P_{i,t-1}} \right) \dots\dots\dots 2.2$$

$P_{i,t}$ denotes the stock price of firm i at time t . The equations 2.1 and 2.2 indicates that stock prices and returns are affected by elements that influence the expected flow of money/or the discount rate. Oil prices do have the tendency of influencing stock market prices and returns either positively or negatively with regards to whether the nation is importing or exporting oil. Therefore, oil exporting nations are expected to experience an increase in its cash flows which is as a result of an expanded profit margin after an upturn in the price of oil. Intuitively, oil producers are expected to exhibit a bullish behavior amid times of oil price increases. The reverse is true for oil using nations.

2.7.2 Monetary Channel

The second transmission mechanism is the monetary channel which explains the process by which the value of oil influences stock value/returns through inflation and interest rates which also partially forms part of the expected discount rates of future cash flow. An expansion in the expense of production which is as a result of acceleration in the price of oil, transfers this expense to consumers in the form of higher retail bills and high expected inflation.

By way of curbing such inflationary pressures, we anticipate monetary policy makers to raise the short-run interest rates (Basher and Sardosky, 2006). It's important to note, that increments in short-run interest rates leads to an upturn in discount rates (increased rate of borrowing) for any future investment. Furthermore, the net present value is decreased due to an increase in the cost of borrowing. This prompts devaluation in the stock prices (Beckmann et al, 2017).

2.7.3 Output Channel

Countless number of literatures maintains the notion that fluctuations in the value oil influences total output (Hamilton, 1983; Hamilton, 2003; Kilian, 2008 etc.). With regards to this channel, positive adjustments in the price of oil are relied upon to affect wages and the production price, which prompts an alteration in total output. Since the production effect has been clarified in the above-mentioned, more attention will be given to the income effect.

According to the income effect, the discretionary salaries of households are decreased after an increase in the price of oil primarily. This primarily due to the adjustments made to retail prices caused by an increase in the cost of production (Edelstein and Kilian, 2009). All things being equal lower incomes prompt a decline in quantity demanded. This leads a decrease in the demand for labor. The response of the stock market also tends to be negative.

2.7.4 Fiscal Channel

This channel pays particular attention to how oil exporting nations spend their oil revenues in financing physical and social infrastructure (see, Ayadi 2005; Farzanegan 2011). After the transfer of wealth from oil importing nations to oil exporting nations, there is a high tendency of an increase in government expenditures. If consumption and government expenditures are assumed to be complementary, then government purchases will prompt higher household utilization. Whiles private firms are encouraged to expand their money streams and profitability. Such advancements are expected to drive stock prices to elevated points and hence, causing the stock market to experience a bullish term.

However, the opposite is very likely to occur if consumption and government expenditures are viewed as substitutes. The reverse is made possible due to the crowding out effect firms experiences. The most productive private capitals are ushered out of the nation due to the substitution effect. This consequently lowers stock market returns (Beckmann et al., 2017).

2.7.5 Uncertainty Channel

Ultimately, this channel as suggested by Brown and Yücel (2002) demonstrates that an expansion in oil prices causes greater uncertainties in the real economy, because of the impact of the former on expenditure, yield, inflation, etc. as discussed in the channels above. Thus, a high price of oil lessens an organizations' desire for unalterable investments, which in turn, reduces the anticipated flow of cash. Rising uncertainty as a result of an increased oil prices, builds the motivation of families to save instead of consuming (Edelstein and Kilian, 2009). It's significant that an expansion in uncertainty decreases the motivation to invest or exhaust funds, which subsequently reduce economic growth predictions (Chuku et al., 2010) and thus a fall in stock market returns.

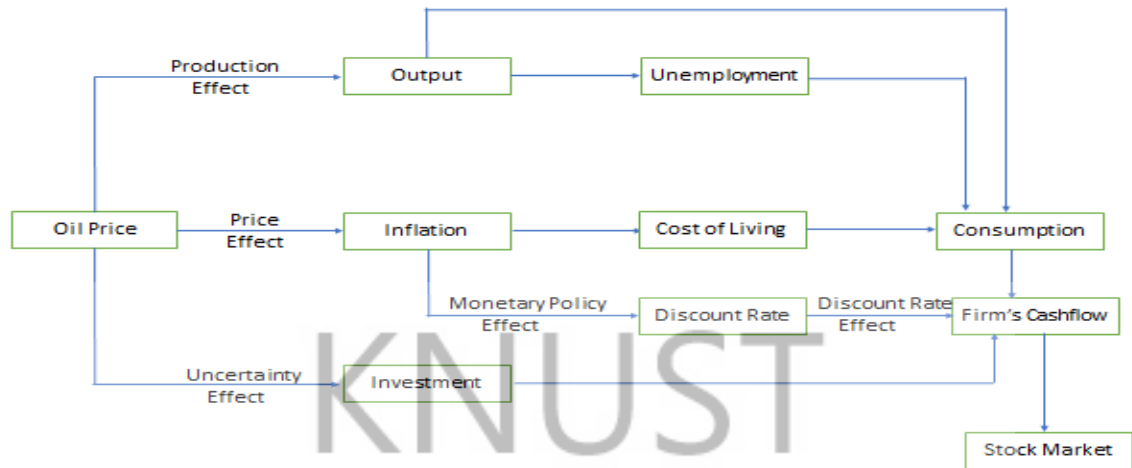


Figure 2. 2: Transmission Channels Of The Stock Market
Adapted from Tang et al. (2010)

2.8 Empirical Reviews

2.8.1 Oil Price and the Macroeconomy

As far back as the dramatic oil price hikes in the 1970s, and its resulting worldwide subsidence, economic analysts have analyzed these variations so as to comprehend their economic impact. The first of such studies to establish the causal link between shocks from oil prices and the macroeconomy was by Hamilton (1983). He contended out that higher oil prices were responsible for practically for the shakeout that took place in the United States after World War III. He explained further that an adverse connection existed amongst oil price shocks and economic activity. The great importance attached to the study stimulated great interest among early researchers. They sought to give insights into the impacts of crude oil price shocks on overall demand, inflation, employment and real economic growth which yielded mixed results. (Burbridge and Harrison, 1984; Jiménez-Rodríguez and Sánchez, 2005; Rafiq et al., (2009); Du, 2010 among others).

A work by Burbridge and Harrison (1984) sort to decide the influence of oil price changes on a number of OECD countries by employing the vector autoregressive model (VAR) where oil prices were regarded as exogenous to the system. The findings which were similar to that of Hamilton's suggested that adjustments in the price of oil granger-caused modifications in GNP and unemployment rate. Like Burbridge and Harrison (1984), Jiménez-Rodríguez and Sánchez (2005) tried to study the association between oil price shocks and real economic growth in seven OECD countries (a mix of oil importing and exporting) both in the short and long periods. Their findings reported that for an oil-importing nation, its real economic growth was inversely affected by an expansion in oil price. For oil exporting states the relationship was ambiguous.

Rafiq et al., (2008) also empirically examined the weight oil price volatility had on strategic macroeconomic variables in Thailand. By employing the vector autoregression technique, the outcomes from the impulse reaction functions and variance decomposition confirmed that a reasonable part of instabilities in unemployment rate and investment were clarified by volatilities in oil prices. Also, by the employing the VAR analyses Du et al., (2010) sought to discover the influence of the oil price's on the economy of China. The outcomes showed that world oil prices significantly and positively affected economic growth and inflation of China and the impact was non-linear. With an oil importing state like China, an expansion in the world oil price should increase its production expenses, in this manner hindering its GDP growth, yet this does not appear to occur. The possible reason they suggested was that China's GDP growth was very reliant on exports.

Though most of these studies were country specific, few studies focused on several different country analysis of the connection between oil prices (shocks) on the macroeconomy. Omojolaibi and Egwaikhide (2014) by employing the panel vector autoregressive tested the influence of volatilities in oil prices on the economic performance of five oil-exporting African nations. Reports from the impulse reaction function showed that gross investment was the only macroeconomic variable which reacted all the more to volatilities in the price of oil. The responses of fiscal deficit, money supply and real GDP were less viable. The conclusion was that gross investment was the principal course through which instability in the cost of oil influenced the real economies. By employing a similar methodology, Aziz and Dahalan (2015) reviewed the asymmetric influences of oil price disturbances on the economic activities in ASEAN-5 between 1991 and 2014. Their outcomes provided proof of an unbalanced association amongst oil prices and economic activities. In particular, an inverse association existed amongst oil price and the growth of output in the short and long periods.

Moshiri and Moghaddam (2018) in their study found out that price shocks caused positive influences on both oil exporting and oil importing provinces after investigating the heterogeneous influences of oil price disturbances on Canada by incorporating both autonomous oil exporting and oil importing provinces in a government framework under similar foundations. Their findings were not consistent with those frequently reported by other individual nations or regions.

Despite the studies which analyzed the link between oil prices and the macroeconomy, several other studies emerged across the continent analyzing the

association among oil prices and exchange rates and oil price-stock market association.

2.8.2 Oil price and Exchange Rate Studies

A plethora of empirical works have looked to comprehend the dynamic correlation concerning oil prices and (real) exchange rate. The first empirical researcher to ever study the oil price-exchange rate relationship was Trehan (1986) who argued that there was a likely exaggeration on the influence of oil price disruption on the US economy. This was because oil prices were designated in US dollars and ought not to be considered as exogenous as was assumed in before studies. Since then, numerous writers have directly considered the connection between oil prices and exchange rates in advanced and emerging nations. Some empirical researchers have discovered a positive connection amongst oil prices and the US dollar exchange rate.

Amano and Van Norden (1998), examined the link amid the real domestic cost of oil and real exchange rates for the US from 1972-1993. By utilizing the Johansen-Juselius cointegration test and the single-equation error correction model (ECM), their findings revealed a steady long-term connection amongst oil prices and the US real exchange rate and that, greater oil prices led to an appreciation of the US dollar. Bénassy-Quéré et al., (2007) confirms the results above by looking at a more recent date .i.e. from 1974 to 2004. It was only after 2002 that the US dollar deteriorated despite the fact that oil price still increased. They suggested that an operational break or regime change which might have happened in 2002 may be the cause, although the post break sample was excessively little to substantively test for breaks.

Few other papers arrived at the same conclusion but by using a different approach. Even though Coudert et al., (2008) just like the above, found that an expansion in the cost of oil was connected to an appreciation of the dollar in the long-period, oil prices affected exchange rates through the influence oil prices on US net foreign assets. Thus, they studied the indirect control of oil prices on exchange rates.

Looking in the direction of developing nations, Kin and Courage (2014) found the control oil prices on nominal exchange rates. An upsurge in the price of oil led to devaluation in the exchange rate after employing the generalized autoregressive conditional heteroskedasticity (GARCH) test in South Africa. They therefore concluded that the price of oil was an important variable in determining the strength and volatility of the South African Rand. In an effort to recognize the nexus amongst oil prices and exchange rate in Nigeria, Muhammad et al., (2012) by employing the GARCH and exponential GARCH (EGARCH) on monthly, discovered that an expansion in oil price return led to a devaluation in the naira within the study time frame regardless of the fact that Nigeria is a net-oil exporting country. This discloses to us that the economy of Nigeria is helpless against variations in the international price of unpolished oil.

Other studies identified the sources of an oil price shock and its effect on exchange rates. Following Kilian (2009), these studies identified oil supply, global oil demand and oil specific demand disruptions and their influences on exchange rate. Buetzer et al. (2012) for example, surveyed the effect of oil price shocks on both types of exchange rates and stock returns, for forty-four developed and developing nations by employing the VAR. Contrary to theory, there was no evidence of an appreciation in

the currencies of oil exporting nations after an oil specific demand disruption. However, an oil demand disruption exercises substantial appreciation weights on currencies by gathering foreign reserves. Basher et al., (2016) confirms the findings of Buetzer et al., (2012). Their study detects a significant appreciation of exchange rates pressures in oil exporting nations after an oil demand disruption while there was limited evidence of an oil supply disruption on exchange rates. This study was executed by applying the Structural VAR and the Markov switching models.

Huang and Guo (2007) explored the role oil price played in China's exchange rate market. By utilizing the structural vector autoregression model, they found out that real oil price disruption led to a slight valuation in the long period real exchange rate because of China's reduced reliance on imported oil as well as its rigorous government energy regulations.

Among others, the reactions of oil prices to exchange rate shocks have also been analyzed. Yousefi and Wirjanto (2004) in their empirical work documented OPEC member states price reactions to variations in the US dollar exchange rate and prices of other members. This test was undertaken by employing the generalized method of moments (GMM). There was confirmation that the export price of crude oil responded positively to US dollar devaluations which were in conformity with earlier studies that rejected the prevalent perception of the integrated price determined by OPEC cartel. By using the VAR and ARCH models and a recently proposed way to test Granger causality in risk, Zhang et al., (2008) discovered that the deterioration of the US dollar for the years under scrutiny was a vital factor in motivating the upsurge the international crude oil price.

It can be observed from the above that, not much has been done looking at the association amongst oil price disruption and real exchange rates in a panel model for selected African countries. Therefore, this study seeks to bridge this gap.

2.8.3 Oil price and Stock Market Studies

Whiles others looked at the oil price-exchange rate relationship, other researches have endeavored to examine the controls of oil price changes on asset prices, such as stock prices or stock returns and this led to varying results. Influential papers by Jones and Kaul (1996) and Huang et al. (1996) prompted an expanded enthusiasm for the connection amongst oil and stock market returns. The former reported a adverse and significant influence of oil on aggregate stock market returns.

Huang et al. (1996) conversely, was not in agreement to these discoveries. Their work claimed that the influence of oil price on stock markets were not factual. From that point onward, an abundance of writings has emerged with the aim exploring the possible consequence of oil price changes on the aggregate stock market. The first group sought to find evidence of a negative significant relationship. Sardosky (1999) deliberated on the connection concerning oil price shocks and stock market activity in United States by employing the GARCH and VAR models. His results suggested that both oil prices and oil price volatility assumed substantial characters in influencing economic activity. The estimated outcomes suggested that positive disruptions to oil prices depressed real stock returns.

Hammoudeh and Li (2005) then again, discovered a bidirectional negative connection amongst crude oil price growth and the world capital market after applying Vector

error correction model and APT model. This outcome implied that higher oil costs were awful for the world capital market as a whole. By also employing the vector error correction model, Miller and Ratti (2009) likewise broke down the long period connection amid the world price of unpolished oil and international stock markets and found that stock market indices responded inversely to an increase in the price of oil in the long period which is similar to the findings above. The negative relationship disintegrated and became less clear after 1999.

Deviating a little from the above findings, Kilian and Park (2009) first disintegrated oil price disruptions into global oil supply, global oil demand and oil specific demand shocks. They from that point broke down the consequence of these disruptions on the stock market of the United States. After employing the structural vector autoregressive (SVAR) model, their outcomes demonstrated that the reaction of real stock returns to an oil price shock differed incredibly relying upon whether the adjustment in the cost of oil was compelled by either oil demand or supply disruptions. The oil demand and supply disruptions driving the global crude oil market jointly accounted for twenty-two percent of the long period variation in the real stock returns of the US and this was consistent with accounts that oil price shocks caused a drop in domestic ultimate demand.

Other studies provided significant proof of a direct link amongst oil price shocks and the stock markets. Nayaran and Nayaran (2010) in their empirical study found that on a daily basis for the period 2000-2008, oil prices had a positive and statistically substantial influence on Vietnam's stock market values in the long-term after applying the dynamic vector error correction model. Their findings were not

consistent with theory. This was due to the increasing foreign portfolio investment inflows and the change in the preferences of the local participants from holding offshore currencies and local banks notes to stocks. Arriving at the same conclusion but with a different model, Bjornland (2009) employed the structural vector autoregressive (SVAR) procedure and found out that, a ten percent expansion in oil prices prompted an increment in Norwegian stock returns by two point five percent in the short period. Thereafter, the effect eventually died out. Not only does a stock return react to higher oil prices. All other variables points out that the economy of Norway reacts to larger oil prices by expanding overall wealth and demand.

Some literatures also discovered no critical effect of oil prices on stock prices. In other words, there was no clear cut link amongst oil prices and the stock market. Cong et al., (2008) investigated the intuitive connections amongst oil price disruptions and the Chinese stock market by utilizing the vector auto-regression model. Oil price disruption did not demonstrate any noteworthy consequence on the real stock returns of most stock market indices. This was because of the distinctions in the comparative significance of oil price disruption in the different Chinese markets.

The last group of researches concludes that was practically no connection amongst oil prices and the stock markets. Aktham (2004) investigated the consequence of oil price disruptions on the emerging stock markets of twenty-two evolving economies by taking on the vector autoregressive model method on a monthly basis. His findings established the fact that oil price disruptions had no substantial consequence on stock index returns in these evolving economies. Apergis and Miller (2009) modified the procedure of Kilian (2008) considered how oil price variations influenced stock

market returns in a model of eight nations. Following the same method they established that oil market disruptions did not have any extensive influence on international stock market returns. Thus, there is a significant but small in-magnitude outcome on stock market returns. Also, Alaali (2017) considered the influence of oil price disruptions on asset prices in UK by applying the GARCH and NARDL model. The results showed that a large portion of the stock returns of the transportation division's organizations had an insignificant contact to oil price risk.

Overall, the literature is mostly available for country-specific oil-importing and oil-exporting nations. This study complements literature by surveying the influence of oil price shocks on real stock returns for selected African countries in a panel analysis.

2.8.4 Oil price, Exchange Rate and Stock Market Studies

Few studies sought to look bring the two literatures together by looking at the link amongst oil price shocks, exchange rates and stock markets. Such scholarly works includes Basher et al., (2012), which in their work studied the connection amongst oil prices, exchange rates and the emerging stock markets in the US by employing the SVAR. Their results revealed that positive oil shocks generally discouraged developing market stock costs and US dollar exchange rates in the short period examines the association concerning oil prices, the US dollar and asset prices by using the hetroskedasticity for the recognizable proof of causality in the multifactor model. Though their findings exhibited a bi-directional relation amongst the US dollar and oil prices since the early 2000s, the US dollar as well as oil prices were affected significantly by changes in equity market returns and risk.

It was noted that oil prices did not retort to alterations in financial assets before 2001 and this was explained by the increased use of oil as an asset over the past period. The model reported a negative and rising association amongst oil prices and the US dollar since the early 2000s. They found that a ten percent expansion in the cost of oil prompted a deterioration of the US dollar effective exchange rate by about zero point three percent, while a one percent US dollar devaluation caused oil prices to rise by about zero point seven percent.

Following the writings above, we consolidate the three factors and distinguish the impacts of oil price disruption on real exchange rate and real stock returns. A summary of the above empirical analysis can be found in Appendix 1.

2.9 Degree of Oil Price Shocks Pass-through to Exchange Rate and Stock Market

The degree of pass through can be explained through the impulse response function of any vector autoregressive model. This is done by analyzing the either the magnitude of the system's standard error term response to oil price shocks or the magnitude of elasticity's of oil price shocks with respect to exchange rates and stock market prices.

2.9.1 Magnitude of Error Term

In relation to analyzing the magnitude of the systems standard error term to shocks, the actual figures derived from the impulse responses are used to identify either a full or partial pass-through. A full pass-through to real exchange rate and real stock market returns after an oil price shock is identified when the standard error term response of real exchange rate and real stock returns to an oil price shock is greater than or equal to one. Also, a partial pass-through is also identified when the standard

error term response of real exchange rate and real stock returns to an oil price shock is less than one.

2.9.2 Magnitude of the Elasticity

The study adopts the theory of elasticity to explain the degree of responsiveness of real exchange rates and stock market prices to a change in the price of crude oil. The magnitude of the impact of an oil price shock depends on whether the country is an oil importing or exporting country.

Exchange rate and stock market prices is said to be perfectly elastic when exchange rate and stock prices increases infinitely with a small fall in the price of oil or falls to zero with a small rise in the price of oil. Elasticity here assumes an infinite figure.

Exchange rate and stock market prices is said to be perfectly inelastic if they remain constant whatever the price of oil may be. Here, the elasticity is equal to zero.

Exchange rate and stock market prices are said to be relatively elastic if the percentage change in exchange rate and stock market prices is greater than the percentage change in the price of oil. Here, the elasticity is greater than one. But if the percentage changes in the price of oil leads to a less than proportionate change in exchange rates and stock prices, then the assumed value will be less than one. If the percentage change in exchange rate and stock prices is equal to the percentage change in oil prices. It is also called unitary elasticity and assumes a value equal to one.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This division lays out the procedures used in implementing the research objectives. The main source and type of data, the empirical specification of the model, the description of selected variables, the prior theoretical expectations and the variable estimation procedures are briefly discussed in the study below. To avoid spurious results, a model diagnosis check is provided to test the panel properties of the selected variables.

3.2 Theoretical Framework

Theoretically speaking, oil price can affect exchange rates in several ways. These channels are explained in the section above. Hence, an upsurge in the value of oil therefore prompts a transferal of wealth from an oil importing state to oil exporting state (in US dollar terms). This is reflected in the terms of trade channel as an enhancement in exports, balance of trade and the current account balance in local currency terms. Consequently, we expect cash of oil-exporting states to increase in value while that of oil-importing nations decreases in value (Golub 1983, Krugman 1983, Bénassy-Quéré et al., 2007, Beckmann and Czudaj, 2013).

According to Huang et al. (1996) and Nayaran and Nayaran, (2010), oil prices can influence stock returns/prices via two principal paths. First, considering oil as an input to production, an upsurge in the price of oil elevates the production cost, consequently depressing aggregate stock (returns) prices. Second, projected oil prices also affect stock returns via the rollback rate, comprising of projected inflation rate and the

projected real interest rate (Haung et al., 1996). For a net importer, higher oil prices will unfavorably influence balance of payment by exerting plunging weights on the country's foreign exchange rates and a growing weight on the domestic inflation rate. Consequently, a greater anticipated domestic inflation positively raises the discount rate which relates negatively to the stock prices (Narayan and Narayan, 2010).

3.3 Model Specification

Following the theoretical framework of modeling the association amongst oil price and exchange rates, the study seeks to demonstrate how oil price shocks affects exchange rates of the selected African oil importing countries by formulating a model which is consistent with literature expressing exchange rate as a function of an oil price shock.

$$\text{Thus; } RER_{i,t} = f(OPs_{i,t}) \dots \dots \dots 3.1$$

Where $RER_{i,t}$ is Real exchange rates and $OPs_{i,t}$ is oil price shock.

Again, in modeling the connection amongst oil price and stock market returns, the study seeks to demonstrate how oil price disruptions affects stock market returns by expressing stock market returns as a function of an oil price shock. Thus;

$$RSR_{i,t} = f(OPs_{i,t}) \dots \dots \dots 3.2$$

where $RSR_{i,t}$ is Real stock returns and $OPs_{i,t}$ is oil price shock.

Succeeding Kilian and Park (2009), an oil price shock (sudden change) is caused by exogenous disruptions in oil supply, aggregate oil demand and oil market-specific demand shocks. Therefore, a shift in world oil production, world real economic activity and world precautionary demand for oil prompts either a positive or a negative oil price shock. The study makes an extension of Equation 3.1 and 3.2 by including deposit interest rates since it has likely possibilities of influencing exchange

rates and stock market returns in the selected oil importing African countries. The sources of an oil price shock have been included to measure their impact on real exchange rate and real stock market returns. In addition the model expects a bi-directional connection between real exchange rates and real stock market returns. Therefore, these models are specified as;

$$RER_{i,t} = f(OPs_{i,t}, RSR_{i,t}, DR_{i,t}) \dots \dots \dots 3.2$$

$$RSR_{i,t} = f(OPs_{i,t}, RER_{i,t}, DR_{i,t}) \dots \dots \dots 3.3$$

All variables are as initially defined except for $DR_{i,t}$ which is defined as deposit interest rates. Equation 3.3 is expressed in a logarithmic form as:

$$\ln RER_{i,t} = \beta_0 + \beta_1 \ln OPs_{i,t} + \beta_2 \ln RSR_{i,t} + \beta_3 \ln DR_{i,t} + \varepsilon_{i,t} \dots \dots \dots 3.4$$

The error term is given as $\varepsilon_{i,t}$. The study expects than an unexpected increase in the price of oil caused by an oil supply or an oil demand shock devalues (appreciation) the local currency of an oil importing (oil exporting) nation. Thus, β_1 is anticipated to be negative (positive) for oil importing (exporting) African nations.

Stock market returns are anticipated to have a positive (negative) influence on exchange rate of an oil exporting (oil importing) nation. In a situation where stock market is booming, foreign capital inflows are attracted and this leads to a rise in the demand for the local currency and hence an increase in the value of the currency. Hence, β_2 is anticipated to portray a positive coefficient for oil exporting state and vice versa. Therefore, an upsurge in the price of oil puts inflationary weights on trade-in countries. Hence, the government responds by increasing interest rates. Since, higher interest rate builds the value of a country's currency the study anticipates a positive-indirect association amongst real exchange rate and oil prices. Hence, β_3 is expected to portray a negative coefficient oil importing nations.

Equation 3.4 is expressed as;

$$\ln RSR_{i,t} = \beta_0 + \beta_1 \ln OPS_{i,t} + \beta_2 \ln RER_{i,t} + \beta_3 \ln DR_{i,t} + \varepsilon_{i,t} \dots \dots \dots 3.5$$

All the variables are as formerly defined. An unexpected increase in the price of oil caused by either an oil supply or oil demand shock once again leads to a reduction (appreciation) in the profit margins of an oil importing (oil exporting) nation. Thus, β_1 is anticipated to be negative (positive) for oil importing (exporting) African nations.

Exchange rates are required to have a positive or negative impact on stock returns by counting on the condition of the stock market of the country. For instance, if there is devaluation in the local currency of the importing nation, there is a likely rise in the stock returns of foreign oil exporting nation. Therefore, β_2 is anticipated to portray a positive coefficient oil exporting nation and vice versa. Since the upsurge in the cost of oil causes government of an oil-importing nation to respond by increasing interest rates, the cost of borrowing increases while saving is rather encouraged. This goes further to curtail expansion of ventures, decrease stock returns and prices. Hence, β_3 is expected to portray a negative coefficient oil importing country.

The Panel vector autoregressive representation can be specified as;

$$y_t = (OILP_t, REAR_t, ROP_t, RER_t, RSR_t, DR_t)' \dots \dots \dots 3.6$$

3.4 Data Type and Source

The study makes use of secondary data. Monthly panel data from 2000:01 to 2017:05 is employed on eleven African countries, made up of; Botswana, Egypt, Ghana, Kenya, Mauritius, Malawi, Morocco, Nigeria, Sierra Leone, South Africa and Zambia. The variables employed in this study include; world oil production, world real economic activity, world crude oil prices, exchange rates, stock market prices, CPI for each country, CPI for the US and deposit interest rates.

Data on world oil production was obtained from the US Energy Information administration. World real economic activity and Exchange rates were obtained from the updated and corrected version of global real economic activity in industrial commodity markets which was proposed by Kilian and Zhou (2018) and the Pacific Exchange rate Forum respectively. World crude oil price and the US CPI were obtained from the Federal Reserve Bank of St. Louise.

Data on deposit interest rates and CPI for each country were obtained from and the International Financial Statistics database respectively whiles stock prices came from the Eurostat database. All variables selected as dependent (explained) and the independent (explanatory) variables are described in detail in this section below. For modeling purposes these variables are transformed into its natural logarithms.

3.5 Data Description

3.5.1 Global Oil production

Following a huge collection of researches, oil production is included to capture the significant effect oil supply disruptions have on economic activity. The study goes further to develop its percent change. Following Kilian, oil supply disruptions are referred to as impulsive innovations to oil production.

3.5.2 World Real economic activity

The world real economic activity is constructed from the percentage growth rates of equal-weighted index acquired from a panel of a dry cargo single voyage ocean shipping freight rates in dollars per ton. This measure is preferred to others because it captures current tremendous increments in worldwide request for industrial merchandises from developing nations such as Brazil and China. The index is collapsed by the US consumer price index.

3.5.3 World Real Oil price (cost)

The study employs the Brent crude oil because it is generally observed as a yardstick for world crude oil prices which are denominated in the US dollars. Real world crude oil prices are acquired by deflating world nominal unrefined oil prices by the US consumer price index (CPI).

$$\text{World real oil cost} = \text{oil cost} \times \left(1 - \log \frac{CPI_{t+1}}{CPI_t}\right) \dots \dots \dots 3.7$$

3.5.4 Real Exchange Rate

The exchange rate in this study is delineated in terms of the external currency price of the US dollar. This implies that the dollar increases in value as the exchange rate

risers. Exchange rate in nominal term is converted to real exchange rate by deflating nominal exchange rate by CPI of the US dollar and the CPI of the local currency.

$$\text{Real exchange rate} = \log(\text{CPI}_{\text{US}}) - \log(\text{nominal exchange rate}) - \log(\text{local CPI})$$

.....3.8

3.5.5 Real Stock Returns

Stock returns are measured by making use of the monthly share price of the US dollar. The series are collapsed by the US CPI inflation rate to gain its real values since stock prices are valued in the US dollar. Real stock returns are delineated as the logarithm of the first difference of the collapsed series. The description of real stock returns is in accordance with the definition used by Park and Ratti (2008).

$$\text{Real stock returns} = \ln\left(\frac{SP_{t+1}}{SP_t}\right) - \ln\left(\frac{CPI_{t+1}}{CPI_t}\right) \dots\dots\dots 3.9$$

3.5.6 Deposit Interest Rate

Interest rates are measured by the use of monthly deposit interest rates. These are rates paid by financial institution to deposit account holders. According to the International Monetary Fund, these rates are already expressed as percentages. Hence no need to find its natural log form before engaging in the analysis.

3.6 Empirical Strategy

The data analysis begins with a basic and panel VAR estimations by first performing a model diagnosis test to achieve model sustainability and the stationarity attributes of the variables. Checking the panel attributes of the variables will ensure that the estimation and interpretation of spurious results is avoided completely.

The Levin et al., (2002) (LLC) and the Im et al., (2003) (IPS) tests are used to check for stationarity attributes among the variables studied. To ensure correct specification of the model, the study takes into consideration the optimal lag to be selected. The Akaike Information Criterion (AIC), the Schwartz-Bayesian Information Criterion (SBCI) is utilized to select the optimal lags of the variables.

3.7 Unit root tests

Testing for unit root on data has become a usual practice among researchers and forms an integral part of the econometric courses (Baltagi, 2008). In recent times the test of stationarity for panel data has become very important. The current consideration given to the problem in the econometrics of panel data rises from numerous applications of time series measures to panels, for which issues such as non-stationarity, spurious regressions and cointegration are becoming key.

It is therefore necessary to test for the order of integration of the variables used in the econometric model specification to prevent the possibility of spurious regression in panel data analysis. If the panel is found to be integrated of order zero; $I(0)$, then the Ordinary Least Square (OLS) method can be employed. However, if the panel is integrated of an order greater than zero: $I(f)$, where $f > 0$. Then, the OLS estimator will be a biased estimator.

3.7.1 Levin-Lin-Chu Test

The Levin- Lin –Chu (2002), referred to as LLC is a unit root test which deal with panel data as being made out of homogeneous cross-sections, thus running a test on a pooled data series. LLC generalizes the model take into account fixed effects, individual deterministic trends and heterogeneously correlated errors. It assumes that both N and T turn to infinity. Nevertheless, T surges at a faster rate than N with N/T going to zero.

The LLC suggests a more dominant panel unit root test than individual unit root test for cross section. The null hypothesis says that each individual time series comprises of a unit root against the alternative hypothesis which says otherwise. The LLC the unit root test is executed by a three-step procedure. First the study runs an Augmented Dickey-Fulley (ADF) regression for every cross-section in the panel where error terms are worked out. Utilizing an ADF type regression as:

$$\Delta y_{it} = \nu_i y_{i,t-1} + \sum_{j=1}^{p_i} \theta_{ij} \Delta y_{it-j} + z'_{it} \eta + \varepsilon_{it} \dots \dots \dots 3.10$$

The null hypothesis is now described as $H_0: \nu_i = 0$, against $H_1: \nu_i < 0$ whiles the t-statistic is delineated as $t_{\nu}: \hat{\nu} / Se(\hat{\nu})$.

3.7.2 Im-Pesaran-Shin Test

The homogeneity hypothesis proposed by Levin, Lin and Chu can however be too restrictive in panel data in the sense that it requires to be homogenous across. This is because panel data can be made out of several cross-sections with different autoregressive coefficients and as proposed by Maddala (1999), every country cannot be restricted to converge at the same rate under the alternate hypothesis. Hence, the

Im-Pesaran-Shin (2003) (IPS) test which depends on the notable Dickey-Fuller strategy is utilized. It allows for heterogeneous coefficients which recommend a different testing strategy which depends on averaging individual unit root test statistics. Besides allowing heterogeneity of trends, the test also permits hetroskedasticity, serial correlation, and non-normality. Its model is ;

$$y_{it} = \gamma_i + \rho_i y_{i,t-1} + \psi_{it} \dots \dots \dots 3.11$$

The null hypothesis is that each variable holds a unit root process while the alternative hypothesis permits particular individual variables to have unit roots. This is inscribed as;

$$H_0: \rho_i = 1 \text{ for every } i$$

$$H_1: \rho_i < 1 \text{ for not less than } i$$

At the point when t_{vi} is the individual t-statistic for analyzing the null hypothesis, the test is said to be centered on the averaging individual unit root tests, i.e.

$$\bar{t} = \frac{1}{N} \sum_{i=1}^N t_{pi}, N(0,1).$$

3.8 Co-integration Test

Once the order of integration has been identified, we continue to test for co-integration of the panel. We test for co-integration among the variables to reason-out whether the factors have a long run equilibrium correlation. The rationale behind testing for cointegration among the variables is to help the researcher in adopting the appropriate model to estimate the variables that are studied. The VAR or the VECM models can only be applied after testing for the cointegration among the variables. The vector error correction Model is applied when there is evidence of cointegration

among the panel. To test for cointegration the study employs the Pedroni cointegration test.

3.8.1 Pedroni Cointegration Test

The technique tests the null hypothesis of no cointegration in dynamic panels using several regressors and computes the fairly accurate critical values for these investigations. A significant feature of this test is that it licenses not just the dynamics and fixed effects to vary across members of the panel, yet in addition they grant the cointegrating vector to contrast crosswise over individuals under the alternative hypothesis. The general estimated cointegration regression takes the form;

$$y_{i,t} = \phi_i + \alpha_i t + \beta_{1i,t} x_{1i,t} + \dots + \beta_{ni,t} x_{ni,t} + e_{i,t} \dots \dots \dots 3.12$$

For $t = 1 \dots T$; $i = 1 \dots M$; $n = 1 \dots N$. T is the quantity of observations over time, M denotes the quantity of single representatives in the panel, and N also denotes the quantity of regression factors. Where the betas are the slope coefficients. The Pedroni test involves two classes of statistics. The first type is constructed by merging the error terms of the regression along the within-dimension of the panel. The statistics involved are the panel v -statistic, the panel ρ -statistic, the panel PP-statistic, and the panel ADF-statistic. The second type likewise built by merging the error terms of the regression beside the between-dimension of the panel. It includes the group ρ -statistic, the group PP-statistic, and the group ADF-statistic.

3.9 Estimation of Variables

In addition to the above analysis, the short-run relationship among the factors is assessed using the standard and panel vector autoregressive model (VAR/PVAR). The VAR/PVAR is utilized on the grounds that it is progressively fitting to demonstrate the dynamic connection between the variables. The dynamic nature of the components of oil price disturbances and how they affect real exchange rate and real stock returns makes the VAR/PVAR the suitable technique of estimation. The technique has a unique ability to identify the sudden variation in a variable after taking their first differences.

3.9.1 The VAR Model

The vector autoregressive (VAR) model created by Sims (1980) is used to study the cooperation amongst oil price disturbances and real exchange rates and the connections amid oil price disturbances and real stock market returns. Benefits of the VAR are that, it needn't bother with any hypothetical assumptions on the course of the reaction of the variables within the framework. To understand this connection amongst the variables, it is required to recognize the principal forces driving oil price movements. To recognize the fundamental explanations behind oil price movements we follow a simple approach by Kilian (2009) but deviate a little by rather employing the vector autoregressive model which is atheoretical and not the structural autoregressive model which is based on theory because the study seeks to test the validity of Kilians findings.

Therefore, the study is based on standard VAR model on month to month data for the percent change in global crude oil production ($\Delta OILP$), global demand for industrial commodities as measured by an index of world real economic activity (REA_t), and the real price of oil (ROP_t). If we let x_t denote the vector of variables of interest,

$X_t = (\Delta OILP, REA, ROP)'$, then the proposed VAR representation is;

$$x_t = B_0 + \sum_{i=1}^p B_i x_{t-i} + \mu_t \dots \dots \dots 3.13$$

B_i is $k \times k$ matrix of unidentified coefficients; B_0 is a column vector of deterministic constant terms; μ_t is a column vector of white noises. Having acknowledged the abrupt changes and gotten the reactions of the world variables, the study proceeds to evaluate the consequence of these shocks on other variables in the selected oil-importing African countries. In particular, the study includes; real exchange rate (RER) and real stock return (RSR) and deposit interest rate (DR).

3.9.2 The Panel VAR model

Next, the study therefore employs the PVAR. The PVAR model joins the standard VAR approach that treats all factors in the framework as endogenous with the panel data style which licenses unnoticed individual heterogeneity. Since the equation cannot be evaluated directly due to the relationship existing amongst the variables and the error terms, they are transformed into a reduced form equation which can be estimated. Therefore, the reduced panel VAR model reads as;

$$y_{it} = c_i + \sum_{k=1}^K B_k y_{it-k} + \varepsilon_{it} \dots \dots \dots 3.14$$

The model has y_{it} as a vector of endogenous variables; c_{it} indicates a vector of constants which captures nation-fixed effects. In the estimation, the study additionally

controls for time-fixed effects: to avoid the problem of correlation between fixed effects and regressors, the takes the first difference of the variables. B_k is a matrix of autoregressive coefficients. ϵ_{it} is a vector of disturbances independent across i , with zero mean and constant covariance matrix whiles K captures the maximum lag length in the model. Y_{it} and ϵ_{it} are specified as;

$$y_{it} = [OILP_{it}, REAR_{it}, ROP_{it}, RER_{it}, RSR_{it}, DR_{it}]' \quad \text{And}$$

$$\epsilon_{it} = [e_{it}^{OILP}, e_{it}^{REAR}, e_{it}^{ROP}, e_{it}^{RER}, e_{it}^{RSR}, e_{it}^{DR}]'$$

3.9.3 Impulse Response Function

According to the VAR technique, the investigation of the predicted parameters on progressive lags contains no adequate data on the dynamic connections amid the variables in the framework. It is helpful to recognize the framework's reaction to random shocks signifies positive residuals of a unit standard deviation in every equation in the structure.

To perform impulse response, the study simulates a unit shock to an error term in an equation for one factor and then draws how different factors in the system reacts to the shock over a number of successive periods. This is illustrated in the formula below;

$$\begin{bmatrix} y_{1t} \\ y_{2t} \end{bmatrix} = \begin{bmatrix} \alpha_{11} & \alpha_{12} \\ \alpha_{21} & \alpha_{22} \end{bmatrix} \begin{bmatrix} y_{1t-1} \\ y_{2t-1} \end{bmatrix} + \begin{bmatrix} \epsilon_{1t} \\ \epsilon_{2t} \end{bmatrix}$$

A disruption in ϵ_{1t} has a rapid and unmediated influence on y_{1t} . The disruption in y_{1t} affects y_{1t-1} through the leading equation and also affects y_{2t-1} through the preceding equation all in period $t+1$. The impact works from period $t+2$ to the end.

Subsequently, an arbitrary shock in one innovation builds a progression of responses over time in all factors in the VAR and analyzes the series of feedbacks.

3.9.4 Variance Decomposition Function

The variance decomposition shows the rate change in the dependent variable due to own shocks and a rate change because of shocks from other variables. It is likewise described by the ability to conditionally forecast, particularly forecasting in short-run. Consequently, the forecast error variance decomposition demonstrates how much a random disturbance to a unit innovation is held accountable for forecasting successive disparities in the other innovation that is not at present responsible for its private fluctuation over time. The variance decomposition is computed as:

$$y_t = Ay_{t-1} + \xi_t \text{ Where } A \text{ is predetermined}$$

Then,

$$y_{t+1} = Ay_t + e_{t+1}$$

The provisional anticipation of y_{t+1} is optimum forecast at time t .

$$y_{t+1} = E(y_{t+1}/y_t, \dots, y_1) = Ay_t$$

Where $\hat{y}_{t+1}$ is the forecast vector

In general,

$$y_{t+s} = A^s y_t + A^{s-1} e_{t+1} + A^{s-2} e_{t+2} + \dots + A e_{t+s-1} + e_{t+s}$$

Thus, the optimum forecast becomes

$$\hat{y}_{t+s} = E(y_{t+s}/y_t, \dots, y_1) = A^s y_t$$

Hence, the vector of forecast errors is

$$vfe_s = y_{t+s} - \hat{y}_{t+s} = e_{t+s} + A e_{t+s-1} + \dots + A^{s-1} e_{t+1}$$

The variance-covariance matrix for the forecast errors is given as;

$$Var(e_s) = \theta + A\theta A' + A^2\theta(A')^2 + \dots + A^{q-1}\theta(A')^{q-1}$$

CHAPTER FOUR

ANALYSIS AND DISCUSSION OF EMPIRICAL RESULTS

4.1 Introduction

The models specified in chapter three are analyzed and has it empirical results presented in this chapter. The estimation of empirical results enables the researcher answer research the questions and also measure the study objectives appropriately. The study discusses the outcomes from unit root test, then, finally discusses the outcomes from the VAR/PVAR model.

4.2 Primary Results

4.2.1 Graphical Analysis

Appendix 2 shows the cyclical diagrams of global oil production (OILP), real global economic activity (REAR), real oil prices (ROP), real exchange rates (RER), real stock prices (RSP), real stock returns (RSR) and interest rates (INTR) for all the African countries studied. Notice how precisely real oil prices and market stock prices chase after each other between the periods of 2007 and 2010 for all the African countries studied. Both tend to rise sharply in the mid-2007 and peak off in 2008, it then hits the trough sharply in 2009, before it begins to rise again. This trend is observed for Botswana, Sierra Leone, Kenya, Zambia, Mauritius, South Africa, Morocco and Malawi.

This is followed by a subsequent decline in stock returns for these countries. The only to experience otherwise is Ghana. Ghana may not have experienced the direct impact of oil prices because of pricing policies executed by the government. Until 2015, the administration of Ghana subsidized petroleum product prices to an estimated yearly

average of 2.3 percent of GDP (Tweneboah and Anokye, 2008). Also when oil prices fell in 2014, it was only the Ghanaian stock prices which tracked real oil prices. It was also seen that stock returns increased in that same period. Also notice that, in 2008 when oil prices peaked, real exchange rates and oil prices for most of the African nations moved in the opposite direction. The response for Kenya, Sierra Leone, Mauritius and Morocco were more than experienced in other countries with a few of them hitting its trough. Therefore, for instance, a lower Ghanaian cedi corresponds with higher oil prices and vice versa. It is also noticed that deposit interest rates and real oil prices move in an opposed direction except for South Africa.

4.2.2 Descriptive Statistics

Table 4.1 provides a brief statement of the model's variables for oil importing countries African. Some observations are in proper arrangement. The mean of real oil price during the time frame is \$64.71, with a largest amount of virtually \$133.20 which can be observed in the mid-2008. The coefficient of variation, which is a standardized measure of dispersion, depicts the utmost variability for global oil production with a value of 4018.37. Real stock returns has the third least variability likened to other variables with a value of 16.95. Furthermore, the skewness and kurtosis statistic for world oil production, global real economic activity and real oil prices are near normality. Unfortunately, this analysis is not further sustained by the Jarque–Bera test statistic which suggests that the null hypothesis of normality is non-acceptable for oil production, real economic activity and real oil prices just like the remaining variables. This could be as a result of the panel nature of the data

Table 4. 1: Summary of Descriptive Statistics

	OILP	REA	ROP	RER	RSP	DR
Mean	74120.28	13.554	64.709	0.116	10.497	9.115
Median	73979.22	5.279	58.485	0.035	0.624	8.359
Maximum	82591.99	187.663	133.199	0.744	93.935	44.000
Minimum	66206.98	-163.743	18.674	7.56E-05	0.001	1.564
Std. Dev.	4018.366	75.499	31.823	0.177	16.955	5.854
Skewness	-0.004	0.322	0.358	2.212	2.229	2.230
Kurtosis	2.422	2.374	1.832	6.911	8.474	9.448
Jarque-Bera	26.105	62.843	146.467	2719.646	3888.122	4795.561
Probability	0.000	0.000	0.000	0.000	0.000	0.000
Sum	1.39E+08	25373.06	121135	216.782	19649.92	17063.00
Sum Sq. Dev.	3.02E+10	10664906	1894708	58.456	537850.5	64128.75
Observation	1872	1872	1872	1872	1872	1872

Note: OILP (global oil production); REA (global real economic activity); ROP (real oil prices); RER (real exchange rate); RSP (Real stock prices); DR (deposit interest rate).

4.2.3 Covariance/Correlation Analysis

According to Table 4.2, all variables are strongly correlated to itself. The study generally identifies (a positive or negative) association between the variables. An exception is identified when discount interest rate is not correlated to real economic activity and when stock price is not correlated to real economic activity.

Table 4. 2: Covariance/ Correlation Analysis

	Covariance					
	Correlation					
	Probability					
	OILP	REA	ROP	RER	RSP	DR
OILP	292025.3					
	1.000					

REA	-121010.9	292025.3				
	-0.414	1.000				
	0.000	-----				
ROP	175180.4	16651.34	292025.3			
	0.599881	0.057020	1.000			
	0.000	0.014	-----			
RER	50802.34	-	35364.23	292031.9		
		18214.59				
	0.174	-0.062	0.121	1.000		
	0.0000	0.0069	0.0000	-----		
RSP	44052.06	725.8894	40401.27	244414.4	292031.9	
	0.151	0.002	0.1384	0.837	1.000	
	0.000	0.914	0.000	0.000	-----	
DR	-83872.81	10938.89	-79476.24	-34959.05	-56540.44	292021.6
	-0.287	0.037	-0.272	-0.120	-0.194	1.000
	0.000	0.105	0.000	0.000	0.000	-----

4.3 Panel Unit-Root Test Results

The study went on to test for the existence of unit-roots among the variables using Levin-Lin-Chu (LLC) and Im-Pesaran (IPS) tests. Consequences of these two tests are specified in Table 4.3. The outcomes showed that at levels, the variables were all non-stable, as the null hypothesis of a unit-root can't be overruled at a 5% significance level. However, both the LLC and IPS tests essentially dismissed the null hypothesis of non-stability after the first-difference of each of the variables. It ought to be noticed that after the first difference, real stock prices are transformed to real stock returns.

Table 4. 3: LLC and IPS Unit Root Test Results

Oil-Importing countries				
Variables	LLC		IPS	
	Levels	First Difference	Levels	First Difference
OILP	-0.865	-16.368***	1.265	-38.617***
REA	7.045	-17.553***	2.068	-24.435***
ROP	-1.621	-2.889***	-1.015	-10.400***
RER	0.533	-34.919***	1.041	-31.266***
RSR	-0.056	-34.304***	1.479	-32.031***
DR	0.195	-26.347***	-0.192	-25.211***

*, **, *** represents 10%, 5% and 1% significance level

4.4 Cointegration Test Result

According to Table 4.4, in either case where real exchange rate or real stock returns are dependent variables, no long-run link is identified for the oil-importing African nations. Therefore, the study proceeds to employing the PVAR modeling instead of the PVECM modeling.

Table 4. 4: Cointegration Test Results

Oil-Importing African Nations		
	<i>t</i> -stats (<i>p</i> -value)	<i>t</i> -stats (<i>p</i> -value)
Pedroni Cointegration	Dependent Var: RER	Dependent Var: RSR
Panel <i>v</i> -statistic	-0.918 (0.82)	-1.789 (0.96)
Panel <i>rho</i> -statistic	0.853 (0.80)	1.454 (0.92)
Panel <i>PP</i> -statistic	-0.501(0.30)	1.428 (0.92)
Panel <i>ADF</i> -statistic	0.059 (0.52)	0.122 (0.54)
Group <i>rho</i> -statistic	1.261 (0.89)	1.979 (0.97)
Group <i>PP</i> -statistic	0.106 (0.54)	1.325 (0.90)
Group <i>ADF</i> -statistic	0.609 (0.72)	0.607 (0.72)

4.5 The Sources of Oil Price Shocks

Figure 4.2 displays the response of world oil supply, world aggregate demand, and the real oil price to oil supply shocks, aggregate demand shocks, and oil-specific demand shocks. The optimum lag length used in generating the impulse response function was chosen from the Akaike criterion at a lag length of two.

A unit standard deviation unanticipated disruption in the supply of oil indicates an immediate positive and significant effect in the first two months. Thereafter, a temporal reversal in production occurs in the third and fourth month. Oil production responds positively and insignificantly to an aggregate oil demand and oil specific demand in the first three months till the effect dies out. The conclusions drawn from this study is in harmony with the discoveries of Kilian (2009) which states that unrefined oil supply does not react instantly to any demand shock within the month, knowing the expenses in replacing oil production and the ambiguity about the condition of the unpolished oil market.

Aggregate demand shocks are highly persistent with a positive noteworthy impact on real economic activity with their effect diminishing over the one year study period. Uniform with the findings of Kilian (2009), an oil specific demand disturbance does not bring down global real economic activity in the first month, given the slowness of global real activity to respond to an oil-specific shock. This positive effect extends over a five months period. A unit standard deviation unexpected surge in oil specific demand to the oil market prompts a positive and noteworthy long-lasting control over the real oil price, although the effect achieves its crest in the fourth month while an aggregate demand disturbance causes a positive and significant effect on real oil

prices just in the first two months. Contrary to the findings of Kilian (2009), an unanticipated oil production disruption did not have any huge impact on real oil prices.

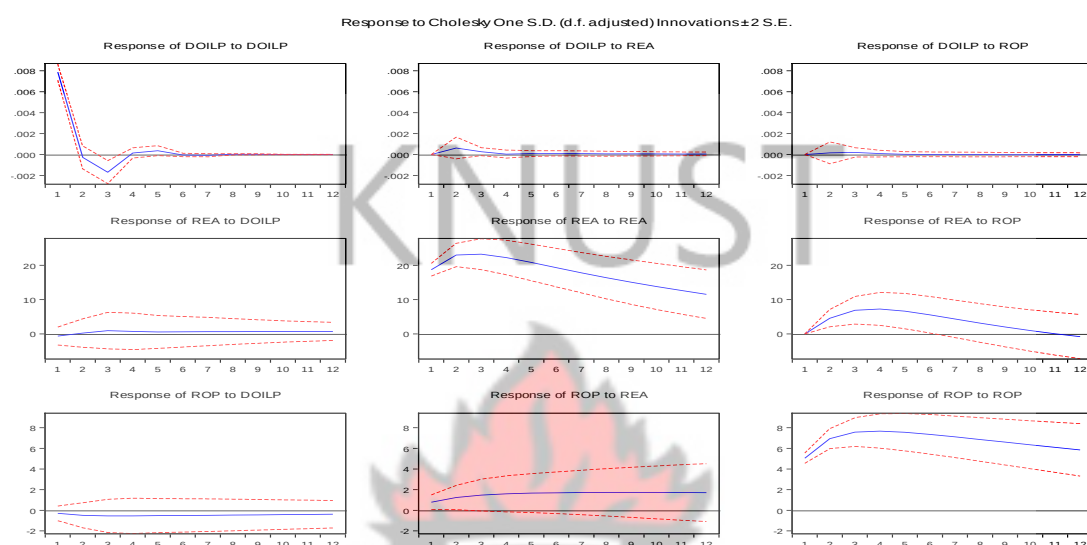


Figure 4. 1: Sources of Oil Price Shocks

In order to understand the shocks' contribution to the evolution of the real oil price, Figure 4.3 shows the historical decomposition starting in January 2000 to May 2017. In accordance to Kilian (2009), Figure 4.3 indicates that oil price shocks have been driven by a mix of aggregate demand and oil specific demand disturbances, instead of oil supply shocks. For instance, from figure 4.3, an oil supply shock has had very little control over real oil prices throughout the study period. The decline in the cost of oil from mid-2000 to mid-2005 was initiated by a decrease in precautionary demand for oil whiles, during the 2006-2008 periods, aggregate demand increased uninterruptedly, causing the upsurge in the cost of oil. The harsh drop in prices at the end of 2014, however, is mostly because of the negative influence of oil specific demand disturbances on the oil market. This is uniform with evidence that shifts in anticipations about future excess supply of oil can have significant price implications (see e.g. Kilian and Murphy (2014), and Beidas-Strom and Pescatori (2014)).

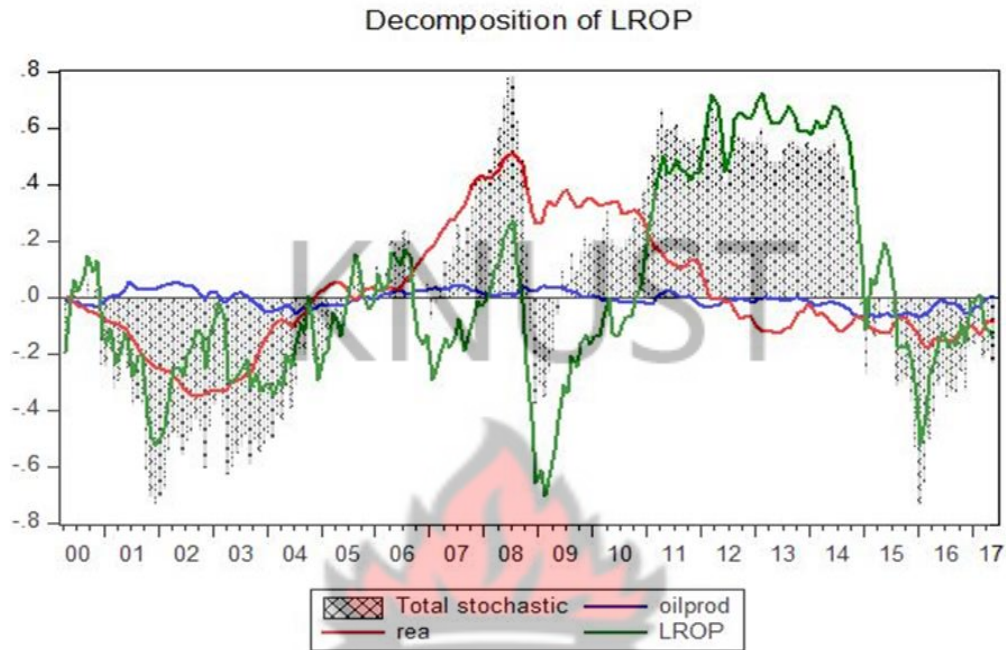


Figure 4. 2: Historical decomposition of the logarithm of real oil price into the three structural shocks

4.6 The Real Exchange Rate Model

Theory suggests that an oil price shock must result into devaluation in the currency of oil importing nations and an appreciation in the cash of oil-exporting nations. The basic model pays attention to the influence of oil price disturbance on real exchange rate for oil importing nations by employing the panel VAR approach without distinguishing between channels.

4.6.1 Impulse Reaction of Real Exchange Rate Model

Figure 4.4 displays the impulse reactions of real exchange rate to components of an oil price shock. The impulse response of real exchange rate shows a short-period negative significant response to an unanticipated disturbance in the supply, aggregate

demand and oil-specific demand of oil. This signifies devaluation in the currency of oil-importing nations. This effect is persistent within the first four months. Though real exchange rate exhibits a volatile nature after an oil price shock in the short-run, the reaction of real exchange rate to an oil supply shock is statistically insignificant and deviates negatively from its long-run path. This illustrated in the diagrams below;

4.6.2 Variance Decomposition of Real Exchange Rate Model

According to Table 4.4, it appears that real exchange rate controls the structure to some magnitude as its forecast errors are chiefly attributed to its own shocks accounting for 55.54% of the variations experienced in the last month. However, forecast errors of the real exchange rate are partially determined by a change in global oil production, global real economic activity and real oil prices accounting for 4.40%, 2.84% and 2.43% of the fluctuations in real exchange rate in the sixth month and 10.76%, 19.05% and 6.00% in the eighteenth month respectively. It is detected that with time the influence of oil price disturbances on real exchange rate increases with aggregate oil demand contributing the most.

Table 4. 5: Variance Decomposition Results of Real Exchange Rate Model

RER				
PERIODS	DOILP	DREA	DROP	RER
1	1.93	1.17	1.13	95.77
6	4.40	2.84	2.43	90.33
12	8.61	11.69	5.17	74.54
18	10.76	19.05	6.00	64.20
24	13.01	23.02	8.42	55.54

4.7 Real Stock Return Channel

So as to investigate the impact of a stock returns channel, the study includes real stock returns to the basic model. This allows us to consider how oil production, real economic activity and real oil prices affects real stock returns and how real stock returns affects real exchange rates. Also, examining the extent of the pass-through.

4.7.1 Impulse Response to Real Stock Return Channel

The study observes a real stock return channel. The degree (magnitude) of oil price shocks pass through to real exchange rate can be analyzed through the accumulated impulse response function.

4.7.1.1 Degree of Pass-Through Effect

In the study, a unit standard deviation tremor in oil supply points to a significant immediate upsurge in real stock returns by 0.003 in the first month. The maximum effect is reached in the third month where real stock returns increases by 0.019. Afterwards, real stock returns experiences of about 0.029 significant declines after the ninth month. Also, a unit standard deviation unanticipated surge in aggregate oil demand leads to an immediate significant rise in real stock returns just in the first month by 0.008. On account of an unanticipated oil specific demand disturbance, though the impact is positive, it's found to be insignificant in the first three months. After the sixth month, stock returns records a significant drop which nethermost part of 0.037 in the ninth month. A negative significant effect is expected after the eighteenth month. It can be observed that in all three situations, real exchange rates move away positively from its long-run path at the end of the period. Moreover, a unit standard deviation unexpected increase in a real stock returns leads to a persistent

substantial decline in real exchange rate. It declines by 0.017 in the first month. It further decreases by 0.008 in the fourteenth month.

The temporal surge in real stock returns in the short period can be as a result of high oil prices being passed to buyers in the form of high costs of final goods and services. This consequently prompts an increase in profit, hence, an increase in stock returns. This transfer is not long-lived as consumers retaliate by reducing their demand for final goods and services due to the decline in their purchasing power. A stock return on the other hand, takes a nosedive. Though real stock returns is a significant transmission channel through which any of the oil price components can affect real exchange rate, the degree of pass-through is small and can be generally described as a partial pass-through effect. Further confirmation is drawn from Figure 4.5 and Table 4.6.

Table 4. 6: Accumulated Impulse Reaction of Real Stock Return Channel

Response :RSR			
	DOILP	DREA	DROP
1	0.003	0.008	0.002
3	0.019	0.010	0.000
6	0.004	0.000	-0.021
9	-0.027	-0.019	-0.037
12	-0.013	0.016	-0.011
15	-0.004	0.015	-0.015

Response :RER				
	DOILP	DREA	DROP	RSR
1	-0.004	-0.003	-0.003	-0.012
3	-0.009	-0.004	0.000	-0.016
6	-0.004	-0.000	0.003	-0.015
9	0.006	-0.010	0.007	-0.001
12	-0.002	-0.001	-0.000	-0.012
15	-0.006	-0.003	0.000	-0.017

4.7.2 Variance Decomposition of Stock Return Channel

Further confirmation can be derived from the variance decomposition analysis which shows that in adding stock returns to the basic model, 4.89%, 3.04% and 2.60% of the shocks in real exchange rate in the sixth month were explained by shocks in oil production, real economic activity and real oil price which sees a slight increase in its variability as compared to the basic model. Aside real exchange rate being influenced greatly by its own shock, real stock return shocks accounts for the second highest variability experienced in real exchange rate by end of the twelve month. With its highest being 18.02% in the sixth month, we observe that the impact declines over time. Moreover, the combined effects of oil price shocks accounts for approximately 2.67% and 35.76% of the variation in real stock returns in the first and twelve month. It therefore established that oil price shocks have a combined appreciating effect on real stock returns.

Table 4. 7: Variance Decomposition of Stock Return Channel

RER					
PERIODS	OILP	REA	ROP	RSR	RER
1	2.022	0.956	1.091	18.524	77.407
6	4.893	3.044	2.596	18.902	70.565
12	9.144	12.186	5.013	15.857	57.799
18	11.189	19.142	5.742	13.917	50.009
24	13.845	22.057	8.054	12.792	43.251
RSR					
1	0.310	2.194	0.168	97.327	0.000
6	5.405	4.166	4.320	83.301	2.808
12	12.384	14.419	8.957	60.951	3.289
18	15.940	21.478	12.082	47.804	2.695
24	19.038	25.417	17.686	35.759	2.099

4.8 Deposit Interest Rate Channel

4.8.1 Impulse Response of Deposit Interest Rate Channel

According to Figure 4.6, none of the components of an oil price shock has any substantial influence on deposit interest rate. The discounted interest rate on the other hand, has no reciprocated significant impact on real exchange rate throughout the study period. Hence, no deposit rates channel.

4.8.2 Variance Decomposition of Discount Rate Channel

The Variance decomposition shows that the inclusion of deposit interest rate to the basic model proves the insignificant impact deposit interest rates has on real exchange rate throughout the study period. According to Table 4.6, the impact deposit rate on real exchange rate barely increases from 0.03% to 0.56% between the first to six months. This shows that the significant influence of the deposit rate channel is small.

Table 4. 8: Variance Decomposition of Deposit Rate Channel

RER					
PERIODS	DOILP	DREA	DROP	DR	DRER
1	1.842	1.194	1.029	0.029	95.925
6	4.335	2.669	2.164	0.562	90.270
12	8.379	11.184	4.973	0.793	74.671
18	10.537	18.415	5.672	0.973	64.401
24	12.675	22.690	7.863	0.903	55.869
DR					
1	0.573	0.699	0.702	98.026	0.000
6	1.884	1.559	1.544	94.256	0.757
12	4.254	8.598	3.874	81.576	1.698
18	7.489	16.935	7.282	66.596	1.699
24	10.233	25.270	10.884	52.250	1.364

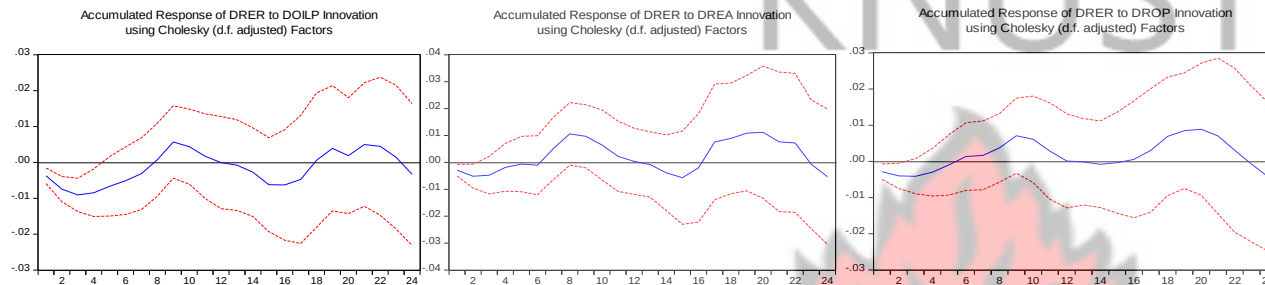


Figure 4. 3: Accumulated Impulse Reaction of Real Exchange Rate

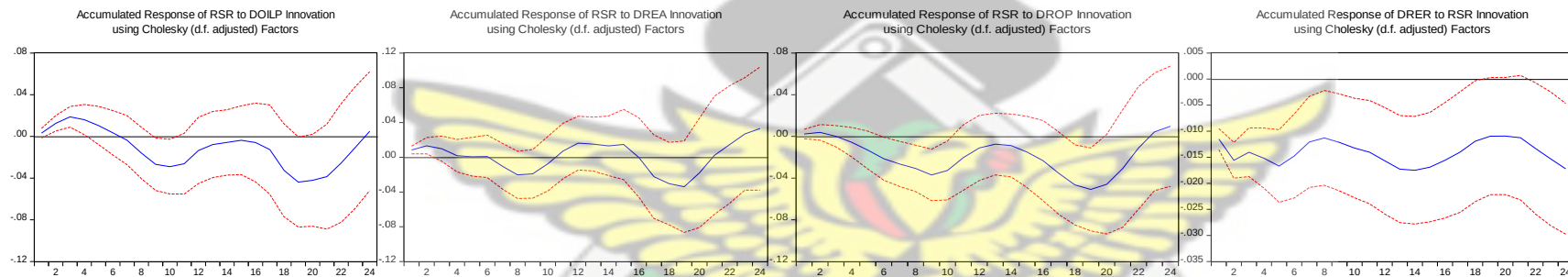


Figure 4. 4: Accumulated Impulse Response of Real Stock Return Channel

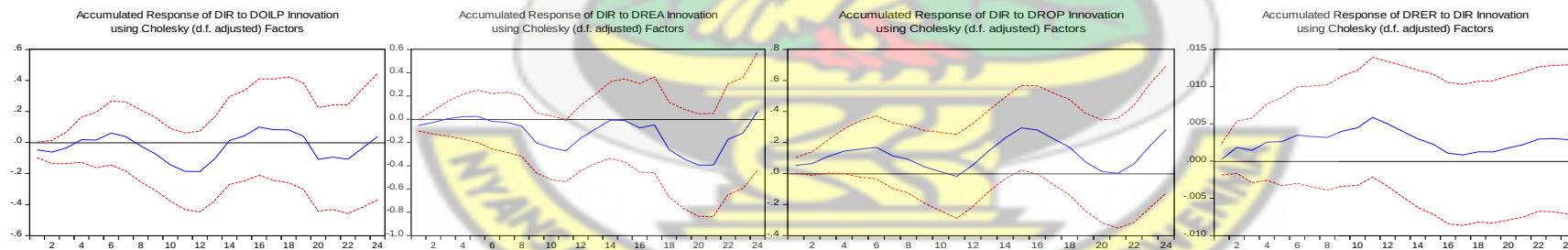


Figure 4. 5: Accumulated Impulse Response of Deposit Interest Rate Channel

4.9 Real Stock Return Model

Theory on the association amongst oil price shocks and real stock returns suggest that higher oil prices lowers stock market returns of oil-importing nations. Basher et al, 2012).

4.9.1 Impulse Response of Real Stock Return Model

In analyzing oil importing countries, an unanticipated distraction in oil supply and oil aggregate demand leads to a substantial positive influence on stock returns within the first four months. Thereafter, a negative insignificant effect is experienced between the ninth to eleventh months after an oil supply shock. Consistent with the findings above, an unforeseen surge in oil-specific demand causes real stock returns to experience a inverse significant effect between the sixth and eleventh months. It later recovers from its negative effect in the long-period.

4.9.2 Variance Decomposition of Stock Return Model

The variance decomposition shows that shocks from real stock returns explains majority of the variations in real stock returns. Though its impact is substantial, it diminishing over time from 97.42% to 37.86% in the first and last month. Oil supply, aggregate oil demand and oil-specific demand shock explains 5.51%, 3.96% and 4.42% of the inconsistency in real stock return in the sixth month respectively. It also evident that oil aggregate demand shock explained majority of the shocks from oil price shock to real stock returns. Again, the influence of oil price shocks on real stock returns is large as compared to its impact on real exchange rates.

Table 4. 9: Variance Decomposition of Real Stock Return Model

RSR				
PERIODS	DOILP	DREA	DROP	RSR
1	0.234	2.277	0.066	97.422
6	5.507	3.958	4.415	86.119
12	13.189	13.627	8.974	64.209
18	16.294	20.563	12.146	50.995
24	19.466	24.684	17.993	37.857

4.10 Real exchange rate channel

4.10.1 Impulse response of real exchange rate channel

For oil importing nations, the study observes an exchange rate channel. The degree (magnitude) of oil price shocks pass through to real stock returns can be analyzed through the accumulated impulse response function.

4.10.1.1 Degree of pass-through effect

Accordingly, a unit standard deviation disruption in oil supply causes real exchange rate to depreciate immediately by 0.004 in the beginning month. It however starts to recover subsequently in the fourth month until an insignificant increase in real exchange rate is experienced over a short period of time. The reaction of real exchange rate to an aggregate oil demand shock as well as a specific demand shock is adverse and statistically noteworthy just in the first two months. In the first month, real exchange rate devalued by about 0.003. It is observed that in all three cases, real exchange rate deviates negatively from its long-run path after almost two years. Consequently, real stock return responds adversely to a change in real exchange rate by 0.024 in the first month. Real stock returns begin to experience a recovery till a positive persistent insignificant impact is obtained after six months.

The analysis above shows that a depreciation in the domestic currency caused by oil price shocks can prompt turn-down in the stock returns of oil-importing African nations. This is because a weak domestic currency discourages investors from investing in domestic denominated assets. But rather a desire to transfer investment to foreign denominated assets (Basher et al., 2012). Though real exchange rate is a significant transmission passage by which any of the oil price components can influence real stock returns, the degree of pass-through is relatively small and hence, partial. This is supported with an accumulated impulse response table.

Table 4. 10: Accumulated Impulse Response of Real Exchange Rate Channel

Response :RER			
PERIODS	DOILP	DREA	DROP
1	-0.004	-0.003	-0.003
3	-0.009	-0.004	-0.004
6	-0.004	0.000	0.021
9	0.006	0.010	0.007
12	-0.002	0.001	-0.000
15	-0.006	-0.003	0.001

Response :RSR				
PEERIODS	DOILP	DREA	DROP	RER
1	0.003	0.008	0.002	-0.024
3	0.019	0.010	0.000	-0.020
6	0.003	0.000	- 0.021	-0.016
9	-0.027	-0.019	-0.037	0.000
12	-0.013	0.016	-0.011	0.003
15	-0.004	0.015	-0.015	0.006

4.10.2 Variance Decomposition Of Real Exchange Rate Channel

An oil supply, aggregate oil demand and oil-specific demand accounts for 0.31%, 2.19% and 0.168% while real exchange rate accounts for 18.79% of the disparity in real stock returns in the beginning month. The influence of oil price shocks on real exchange rates appreciates over time. For instance, an oil supply shock, oil aggregate demand and oil specific demand explains 4.89%, 3.04% and 2.60% of the variation in real exchange rates in the sixth month and 9.14%, 12.19% and 5.01% in the twelve month. It is also noticed that shocks from real exchange rate accounts for a diminishing impact on real stock returns. Thus, shocks from real exchange rate are responsible for 17.15% and 11.27% the variations in real stock returns in the sixth and eighteenth months.

Table 4. 11: Variance Decomposition of Real Exchange Rate Channel

RER					
PERIODS	DOILP	DREA	DROP	RER	RSR
1	2.022	0.956	1.091	95.931	0.000
6	4.893	3.044	2.595	88.678	0.789
12	9.144	12.186	5.013	72.584	1.072
18	11.190	19.142	5.742	62.385	1.542
24	13.845	22.057	8.054	54.033	2.011
RSR					
1	0.310	2.194	0.167	18.793	78.534
6	5.405	4.166	4.320	17.154	68.955
12	12.384	14.419	8.956	14.459	49.780
18	15.940	21.478	12.082	11.274	39.225
24	19.038	25.417	17.686	8.303	29.556

4.11 Deposit Interest Rate Channel

4.11.1 Impulse Response of Deposit Interest Rate Channel

Findings from the accumulated impulse response function portray the existence of no deposit interest rate channel. A sudden change in the components of oil price shock has no significant impact on deposit interest rate. While deposit interest rate also has no noteworthy influence on real stock returns.

4.11.2 Variance Decomposition of Deposit Interest Rate Channel

The analysis for all countries depict that an oil supply, oil demand, oil specific-demand and interest rate shock accounts for 5.61%, 3.92%, 4.52% and 0.91% variation in real stock return in the sixth month respectively, Its observed that discount rate has the least variation in real stock return. Real economic activity still contributes largely to shocks emanating from oil price shocks unto deposit interest rate.

Table 4. 12: Variance Decomposition of Deposit Rate Channel

DR					
PERIODS	DOILP	DREA	DROP	DR	RSR
1	0.769	0.737	0.713	97.781	0.000
6	1.899	1.274	1.259	95.219	0.348
12	4.510	7.087	3.622	83.712	1.038
	7.900	13.497	7.089	70.164	1.349
	10.567	20.982	10.879	55.842	1.730
RSR					
1	0.232	2.350	0.102	0.044	97.271
6	5.605	3.917	4.518	0.908	85.050
12	12.924	13.079	8.660	0.767	64.570
18	15.807	19.582	11.378	0.971	52.263
24	18.705	23.487	16.665	0.813	40.330

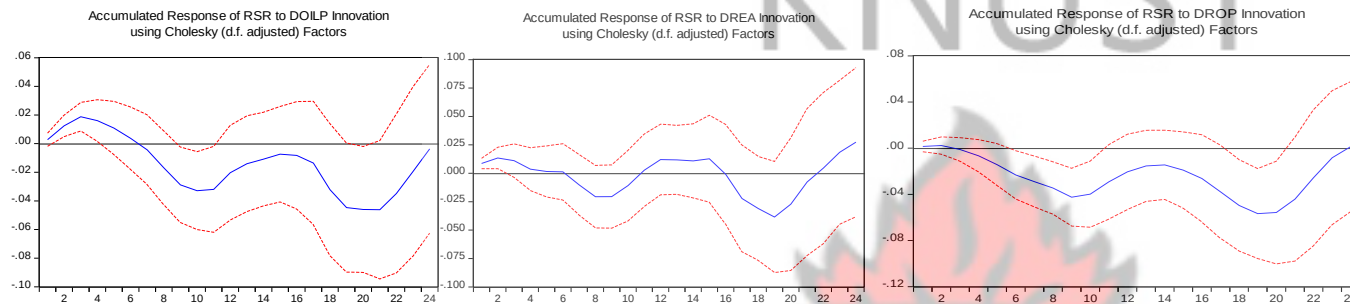


Figure 4. 6: Accumulated Impulse Response of Real Stock Return Model

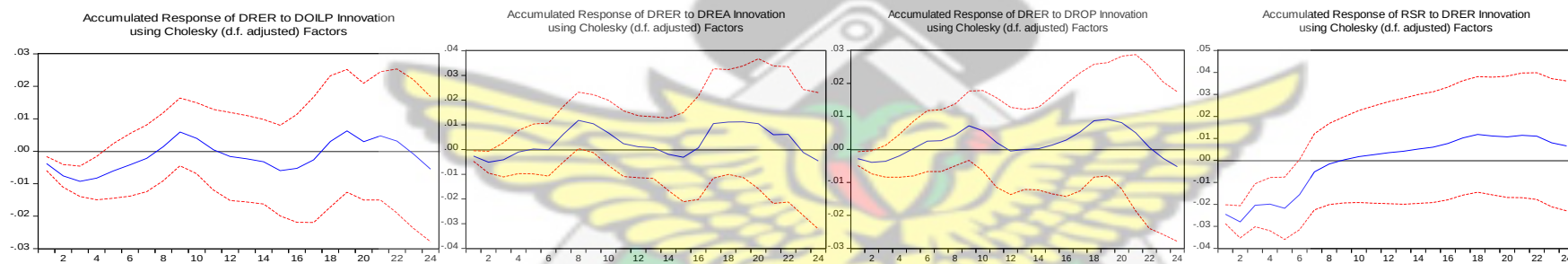


Figure 4. 7: Accumulated Impulse Response of Real Exchange Rate Channel

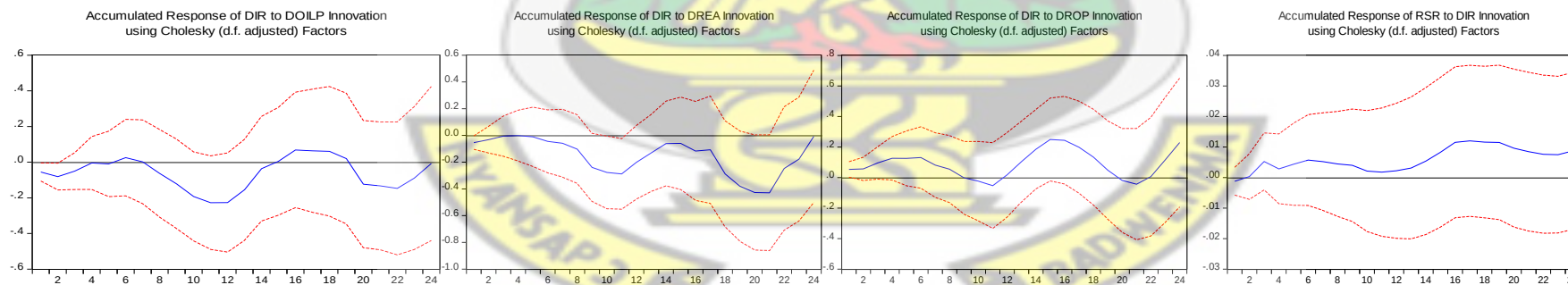


Figure 4. 8: Accumulated Impulse Response of Deposit Interest Rate Channel

4.12 Robustness of Real Exchange Rate and Real Stock Return Models

The above outcomes have been subjected to a series of robustness tests to see how real exchange rate and real stock returns reply to an oil cost tremor. The study looks at how different the response will be after including Nigeria and Egypt which are both oil net-exporting countries. These countries are further grouped into oil producing, non-oil producing African countries regardless of whether the states are net-importers or exporters of oil. It finally observes the individual country responses.

4.12.1 Real Exchange Rate Model

In analyzing the impact on the aggregated selected countries (i.e. after including Egypt and Nigeria), Figure 4.9 (in Appendix 3) shows that an unanticipated disruption of oil supply has an adverse statistically noteworthy influence on real exchange rate in the first six months. After the seventh month, real exchange rate begins to experience a contrary insignificant effect which is not long-lived. Same is experienced for oil producing countries. For non- oil producing countries impact was volatile and insignificant through. Though an oil aggregate demand shock in the aggregated countries also causes devaluation in the currencies, the impact was not substantial in the very short-term. However, oil producing countries had their real exchange rate depreciating significantly versus the dollar in about the first three months. For the aggregated countries and oil producing countries, an oil specific demand shock has no substantial impact on real exchange rate throughout the study. An oil price shock has no substantial impact on the real exchange rates of non-oil producing countries.

Taking a look at the countries individually, the test result for the net-oil exporting countries provides some interesting results. The impulse responses of Egypt and Nigeria show that real exchange rate is not significantly influenced by components of an oil price shock. However, the real exchange rate of Botswana and Ghana do not respond significantly to either an oil supply shock or oil demand shock. According to theory, net importing countries which are dependent on oil for its returns and consumption are to be influenced by changes in the prices of oil. Contrary to theory, Botswana and Ghana which are oil importing countries do not respond significantly to an oil price shock. These findings may be due to the influence of unknown country specific factors.

The economy of Mauritius has no recognized oil or natural gas reserves and therefore relies on imported petroleum products. With its fast growing economy, an unforeseen oil supply shock facilitates a persistent devaluation in the currency (or decline in the value of goods) of Mauritius throughout the study period. Depreciation in currency is also experienced in Kenya for the first seven months after an unforeseen surge in oil supply. Sierra Leone rather experiences an appreciation throughout after an oil supply shock. Although Zambia is not as developed as Mauritius, it is also highly dependent on the importation of oil. Oil demand shocks are responsible for the depreciation in the Zambian kwacha in the first two months. The components of an oil price shock prompt devaluation in the currency of the South African Rand in the first five months (short-run). Malawi provides conflicting results. An oil aggregate demand shock prompts a devaluation in the Malawian kwacha from the sixth and eleventh months. Figure 4.9 in the appendix 3 gives a clear description of the country specific analyses.

4.12.2 Real Stock Return Channel

The study reveals that after including real stock returns to the real exchange rate, no sign of a real stock return channel was discovered for Botswana, Egypt, Ghana, Morocco, and Malawi. Some countries were observed to have a real stock return channel. According to Figure 4.10 (in Appendix 3) a unit standard deviation unexpected oil price shock creates a significant abrupt surge in real stock returns by an average 0.008 in the first month for the aggregated African countries. For oil producing countries, an oil price shock led to a drop by an average of 0.004 in the first month. Moreover, a unit standard deviation unexpected increase in a real stock returns leads to an immediate significant decline in real exchange rate by approximately 0.009 in the first month for aggregated countries as well as oil producing countries. The effect recovers until a positive insignificant effect is experienced in the third month.

Figure 4.10 (in Appendix 3) specifies that for Kenya, Sierra Leone, Mauritius and Non-oil producing countries, a standard deviation increase in an aggregate oil demand prompts to an increase in real stock returns approximately by 0.02 in the first month. A unit standard deviation increase in real stock returns consequently causes real exchange rate to depreciate approximately by 0.013. It's discovered that the pass-through to real exchange rate is not large. Thus, a partial pass-through is identified. In South Africa and Zambia, a unit standard deviation increase in both oil demand prompts to an increase in real stock returns immediately by approximately 0.02 in the starting month. Real stock returns are also translated approximately into 0.027 declines in their currencies. In conclusion, real stock return is a significant transmission passage by which any of the oil price

components can affect real exchange rate. Its degree of pass-through can be described as relatively small (partial pass-through). The remaining countries not analyzed did not exhibit any pass-through mechanism.

4.12.3 Discount Interest Rate Channel

Figure 4.11 (in Appendix 3) reveals that after including discount interest rate separately to the real exchange rate, no sign of a discount rate channel existed for any of the countries either studied as a panel or at it country-levels.

4.13 Real Stock Returns Model

The study shows that some countries have their stock returns responding to an oil price shock while others do not. Countries like Botswana, Egypt and Morocco did not have their real stock returns responding to any component of an oil price shock. The aggregated country study disclosed in Figure 4.12 (in Appendix 4) indicates that, oil price shocks generally prompt a positive noteworthy influence on real stock returns within the first six months. Same is experienced for oil producing countries. Whiles a negative significant effect is next experienced in the long-run. .

The study also discloses that an unforeseen aggregate oil demand shock prompts a direct significant effect on the real stock returns for Kenya, Mauritius, Nigeria, Non-oil producing, Oil producing, Sierra Leone and Zambia countries. Malawi on the other hand has real stock returns responding negatively and significantly to an oil supply shock in the first three months. In Ghana, real stock returns responds negatively and significantly to an oil-specific demand shock in the second month. Whiles in South Africa and Zambia, an oil specific demand leads to a positive

significant impact on real stock returns in the short-run. The country definite analyses are also disclosed in Figure 4.12 (in Appendix 4)

4.13.1 Real Exchange Rate Channel

The study reveals that after including real exchange rate to the real stock returns model, no sign of a real exchange return channel was discovered for Aggregated countries, Botswana, Egypt, Ghana, Kenya, Nigeria, Non-oil producing countries, Malawi and Morocco. For Mauritius, South Africa and Oil producing countries, it was observed that a unit standard deviation disruption in oil supply leads to approximately 0.008 decline in real exchange rate. While a unit standard deviation shock in real exchange rate prompts an approximately 0.04 decline in real stock return throughout the study period. Zambia on the other hand experiences a decline in real stock returns as a result of an oil-specific demand shock. This also tells us that real stock returns exhibit a partial pass-through to an oil price shock. The above is demonstrated in Figures 4.13 (in Appendix 4)

4.13.2 Deposit Interest Rate Channel

The study reveals that after including deposit interest rate separately to the real stock return models, no sign of a deposit rate channel existed either in a panel or country specific basis. This is also demonstrated in Figures 4.14 (in Appendix 4)

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION, AND POLICY IMPLICATIONS

5.1 Introduction

This division summarizes the major findings that seek to measure the objectives of the study. It also provides detailed conclusions, outlines various policy implications as well as intuitive commendations based on the findings of the study.

5.2 Summary of Findings

The study began by reviewing the factors driving oil price shocks in the selected oil-importing African countries. It proceeded to identify the transmissions channels as well as the extent to which (pass-through) oil price shocks affect real exchange rates and stock market returns in the selected oil-importing African nations. It identified the causes of oil price shocks by disaggregating oil price shocks into three components – aggregate demand, oil-specific demand and oil supply shocks. Thereafter, the study continued by assessing the influence of the innovations from oil supply shocks, aggregate demand shocks and oil-specific demand shocks estimated on real exchange rates and real stock returns by adopting the panel vector autoregressive approach which gave an in-depth analysis.

The study began by examining a panel of oil importing nations. It later checked for robustness by including two net-exporting countries: Nigeria and Egypt (i.e. to form an aggregated set of selected oil-importing and exporting nations). The study went further to divide the countries into oil producing and non-oil producing states for a

robustness test. The oil producing countries include; Egypt, Ghana, Morocco, Nigeria, South Africa, and Zambia while the remaining five are known to be non-oil producing countries. It then finally looks at the individual country effects. Several important insights emerged from the analysis.

It was evident that, an oil supply shock had very little influence on real oil prices throughout the study period. The drop in the world price of oil in the period between 2000 and 2005 was as an outcome of a plummet in precautionary demand for oil whereas, during the 2006-2008 periods, aggregate demand rose uninterrupted, triggering a surge in the oil price. The study again reported the diverse reactions of real stock returns and real exchange rates to oil price shocks. The outcomes from this study supported the hypothesis that real exchange rates reacted to oil price shocks. Thus, an overall oil price shock led to an adverse and substantial impact on real exchange rate within the first four months. This signified depreciation in the currency of African oil importing countries.

A real stock return channel was discovered. The results showed that following a unit standard deviation disruption in oil supply and aggregate oil demand, real stock returns responded positively and significantly by approximately 0.014 in the first month. The positive effect was not sustained as real stock returns started to decline till a negative significant association was established after the sixth month. Real exchange rate subsequently responds negatively to a change in real stock return by 0.017 in the first month. The temporal positive control over real stock returns may be as a result of high oil prices being transferred to buyers in the form of high prices of goods and services (Basher et al., 2012). Hence, an increase in profit which

translates into an increase in stock returns which is not long lived because need for final goods and services eventually falls. Therefore, a decline in stock returns.

In assessing the consequence of the components of oil price shocks on real stock returns, it was found that an unpredicted disruption in oil supply and aggregate oil demand led to a slight upsurge in real stock returns within the first four months. In the other half of the year, a short-lived significant negative consequence was experienced. An oil specific demand shock had no substantial positive influence on real stock returns throughout the study period. But rather, a negative substantial effect was experienced after the fourth month. In the stock return model, a real exchange rate channel was discovered. The result shows that following a unit standard deviation oil price shock, real exchange rate depreciated approximately by 0.003 in the first month. Real exchange rate recovers to assume a positive insignificant influence after the fourth month. Real stock return on the other hand responds negatively by 0.024 in the first month. Since the pass-through is small, we conclude that oil price shocks partially influenced real stock returns.

In attempt to engage in robustness check, it was made clear that aggregated countries, oil producing, Mauritius, Kenya, Sierra Leone, South Africa and Zambia generally had their real exchange rate respond negatively and significantly within the first three months to one or more of the components of an oil price shock. Whiles Botswana, Egypt, Ghana, Malawi and Morocco did not possess a stock return channel, Aggregated countries, Oil producing, non-oil producing, Nigeria, Mauritius, Sierra Leone, South Africa, Kenya and Zambia had their real exchange

rates being partially influenced by components of an oil price shock through the real stock return channel just as in the basic model.

In relation to the stock return model, Botswana, Egypt, Ghana, Kenya, Nigeria, Non-oil producing countries, Malawi and Morocco did not have their real stock returns responding to any component of an oil price shock. The others on the other hand had real stock returns responding to at least one component of an oil price shock. No deposit interest channel was discovered for either real exchange rate or real stock returns. The empirical findings of the robustness test drove towards a conclusion that though general assumptions could be made; there existed substantial differences and heterogeneities in the responses of the selected oil exporting nations and oil importing nations to an oil price shock. Hence, the need to engage in a panel analysis to remove country specific effects.

5.3 Conclusions

Since the variations in oil prices have been responsible for most economic recessions, rising inflationary pressures, huge trade deficit and instability in other macroeconomic variables, the study sought to investigate whether oil price shocks contributed to the volatile nature of exchange rates and stock returns of nine oil importing nations. This was done by originally identifying shocks to the World oil price from oil supply, aggregate demand and oil market-specific demand. The study proceeded to also investigate the transmission of these components of an oil price shocks to real exchange rate and real stock market returns. It then finally examined the degree of pass-through effect. By employing basic and panel vector autoregressive forms plus the impulse reaction functions and variance

decomposition techniques, monthly data covering January 2000 to May 2017 of selected African countries was used for this work.

It was evident from the standard VAR analyses that oil price changes have largely been associated with oil demand shocks rather than shocks from oil supply. Since fluctuations in oil supply had a minor effect on oil price changes, in consistency with the findings of Kilian (2009) and Lorusso et al., (2018), our results also diverged from the opinion that key oil price changes were triggered by interferences in oil supply caused by external political events occurring in Venezuela and Iraq. By employing the panel VAR, the study surveyed the impacts of the components of oil price shocks on real exchange rate and real stock returns. It was manifested that an oil price shock generally led to depreciation in currencies of oil importing nations in the short period and it is uniform with theory as well as the findings of Dawson (2008).

According to the variance decomposition, an oil aggregate demand on the other hand, was responsible for majority of the variations in real exchange rate. The outcomes also showed that the impacts of real stock returns as a transmission channel for these oil importing countries were relatively low in the short period. This is constant with the findings of Gourene and Mendy (2018). The robustness tests were constant with the main findings (i.e. Countries which were affected by oil price shocks). Hence, irrespective of whether the country was an oil producing or non-oil producing state, their currencies depreciated against the dollar. In relation to the stock returns model, results from the short run estimates via panel VAR showed that real exchange rates played little role as a transmission channel through which

oil price shocks influenced real stock returns in short-run for the oil importing nations. This shows that real stock returns are relatively inelastic to an oil price shock.

5.4 Policy Implications

This section focuses on the recommendations made based on the major findings summarized in the previous section. The recommendations are made based on objectives of the study. It is anticipated that the recommendations of this study will inform policy makers on the dynamical association amongst real oil prices, real exchange rate and stock returns by looking at their transmission channels and degree of pass through effect.

Since variations in the world oil prices are mostly due to shocks emanating from the demand-side, to reduce the world oil dependency rate, there is therefore the need to shop for alternative energy sources. Oil producing countries are encouraged to build-up their oil producing sector (energy sector) to reduce the importation of crude oil products. Perhaps, to create more oil refineries in the various oil producing (most especially net-oil importing) nations. Also, since oil-importing nations are exposed to fluctuating oil prices, hedging the price of oil is another effective mechanism to eliminate the risk of spending so much on oil purchases.

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APPENDIX 1

Table 2.2: Oil and Macroeconomy

Author	Topic	Methodology	Variables	Results
Continent: Mixed continent				
Burbridge and Harrison (1984)	Testing for the effects of oil-price rises using Vector autoregressions	VAR	Oil price, industrial production, short term interest rate, wage, currency and demand deposit, CPI	Oil price granger-caused changes in GNP and unemployment rate
Hamilton (1983)	Oil and the macroeconomy since World War II	Granger causality	Oil price, real GNP, unemployment, Price deflator, hourly compensation per worker, import prices	A negative correlation existed between oil price shocks and economic activity
Jiménez-Rodríguez and Sánchez (2005)	The relationship between oil price shocks and real economic growth in Seven OECD countries	VAR	Real Effective Exchange Rate, Real GDP, Real oil prices, Real wage, Interest rate, Inflation	For an oil-importing country, oil price negatively affected real economic growth

Author	Topic	Methodology	Variables	Results
Continent: Mixed continent				
Aziz and Dahalan (2015)	Oil price shocks and macroeconomic activities in ASEAN-5 countries	PVAR	Real export, CPI Real GDP, real import, and oil price shocks	Positive oil price shocks negatively affected output growth
Moshiri and Moghaddam (2018)	The Effects of Oil Price Shocks in a Federation; The Case of Interregional Trade and Labour Migration	PVAR	Exchange rates, investment ratio, GDP per capita, nominal and real interest rates, and oil price shocks	Oil price shocks caused positive impacts in both oil-exporting and oil-importing state
Omojolaibi and Egwaikhide (2014)	Oil price volatility on economic performance of five oil-exporting African countries	PVAR	Fiscal deficit, Gross investment GDP Monetary Policy Oil price volatility	Gross investment responded more efficiently to oil price volatility

Table 2.3: Relationship between oil price shocks and exchange rates

Author	Topic	Methodology	Variables	Results
Continents :America and Asia				
Bénassy-Quéré et al. (2007)	China and the relationship between the oil price and the dollar	Johansen (1988) and Johansen and Juselius Cointegration(1990), VECM	Dollar real effective exchange rate, real EXR against Euro, oil price	A positive link between oil prices and the (appreciation)USD
Coudert et al., (2008)	Oil price and the dollar	Cointegration test, VAR	Real oil prices, US Effective exchange rates	The dollar appreciated in the long run
Huang and Guo (2007)	The role of oil price shocks on China's real exchange rate	SVAR	Real exchange rate, real GDP and Real oil price	Real oil price shocks led to a slight appreciation of the long-term real exchange rate

Author	Topic	Methodology	Variables	Results
Continent : Africa				
Kin and Courage (2014)	The Impact of oil prices on the exchange rate in South Africa.	GARCH	Nominal exchange rates and Oil prices	A negative association between the price of oil and exchange rate.
Muhammad et al., (2011)	Exploring oil price – exchange rate nexus for Nigeria.	GARCH and EGARCH.	Oil prices Nominal exchange rates	An oil price return led to devaluation of the naira currency vis-à-vis the dollar

Author	Topic	Methodology	Variables	Results
Continent : Mixed Continent				
Amano and Norden (1998)	Exchange rates and oil prices/ US, Japan, China	cointegration test, fully modified least-squares estimator (FMLS)	Real effective exchange rate, International crude oil prices	An increase in the price of oil appreciations the dollar
Basher et al., (2015)	The impact of oil shocks on exchange rates: A Markov-switching approach/ 9 importing and exporting economies	SVAR and Markov-switching approach	Oil prices Real exchange rates	An appreciation of exchange rates pressures in oil exporting countries after an oil demand shock

Table 2.4: Relationship between oil price shocks and stock market

Author	Topic	Methodology	Variable	Results
Continent: Asia				
Cong et al., (2008)	Relationships between oil price shocks and stock market: An empirical analysis from China	Multivariate vector auto-regression	Uk Brent crude oil, exchange rate, interest rates and stock market	An increase in the volatility of oil raises stock returns
Nayaran and Nayaran (2010)	Modeling the impact of oil prices on Vietnam's stock prices	Dynamic vector error correction model	Nominal exchange rates, oil price and Stock prices	There is a positive significant link between oil prices and stock prices

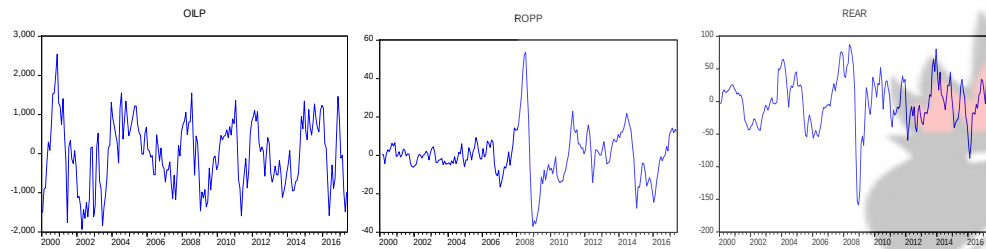
Author	Topic	Methodology	Variable	Results
Continent: America				
Kilian and Park (2009)	The impact of oil price shocks on the US stock market	Structural Vector Autoregressive (SVAR)	Oil prices Real stock market returns	An increase in the precautionary demand for crude oil reveals future oil supply short –run falls
Sardosky (1999)	Oil price shocks and stock market activity	GARCH and VAR	Industrial production, interest rates and oil prices.	A positive oil price shock dampens real stock returns
Author	Topic	Methodology	Variable	Results
Continent: Europe				
Alaali (2017)	Analyzing the effect of oil price shocks on asset prices: evidence from UK firms	GARCH NARDL	Oil prices and Stock prices	Most of the stock returns exhibit insignificant contact to oil price risk
Bjornland (2009)	Oil price shocks and stock market booms in an oil exporting country	Structural Vector Autoregressive (SVAR)	Oil prices and stock returns	An increase in oil price leads to higher stock market returns

Author	Topic/Country	Methodology	Variable	Results
Continent: Mixed continent				
Apergis and Miller (2009)	Do structural oil-market shocks affect stock prices/ 8 developed countries.	VAR or VECM	CPI, global real economic activity, oil prices, stock prices	Oil market shocks do not have any substantial effect on international stock market returns
Hammoudeh and Li (2005)	Oil sensitivity and systematic risk in oil-sensitive stock indices/ US, Norway and Mexico	APT and VECM	MSCI, Mexico IPC Index, NYMEX 3-month, NYSE transportation index, oil futures prices, oslo all-share Index and US Amex oil index	Higher oil prices are bad for the world capital market as a whole
Jones and Kaul (1996)	Oil and stock markets./ United States, Canada, Japan and United Kingdom.	OLS	Oil prices, real rate of stock returns, and inflation	Negative effect of oil on stock market returns

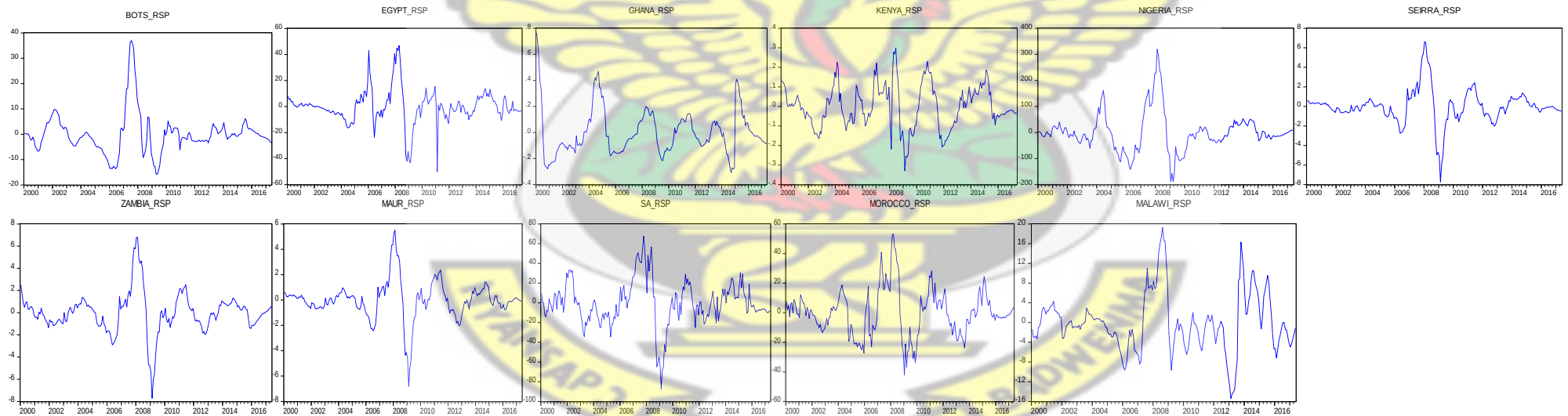
KNUST

APPENDIX 2

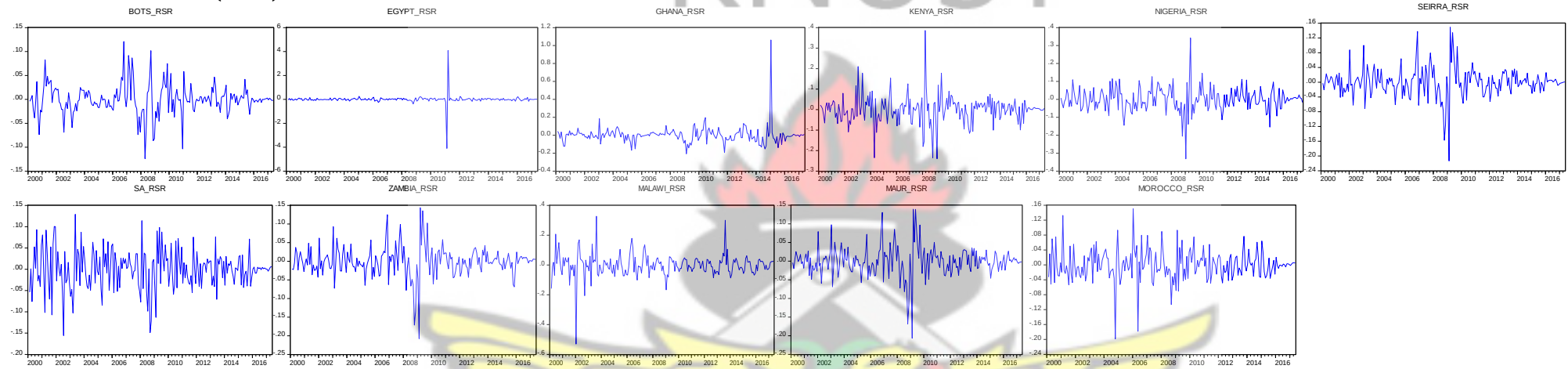
Oil production (OILP), Real oil prices (ROP) and Real Economic Activity (REAR)



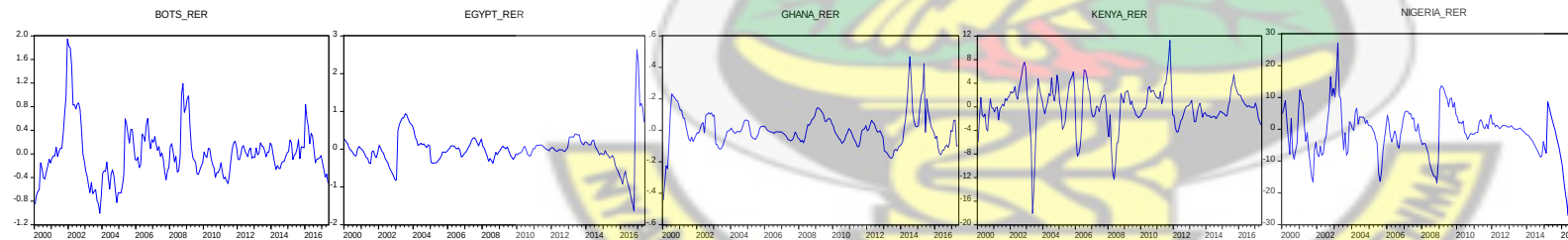
Real Stock Prices (RSP)

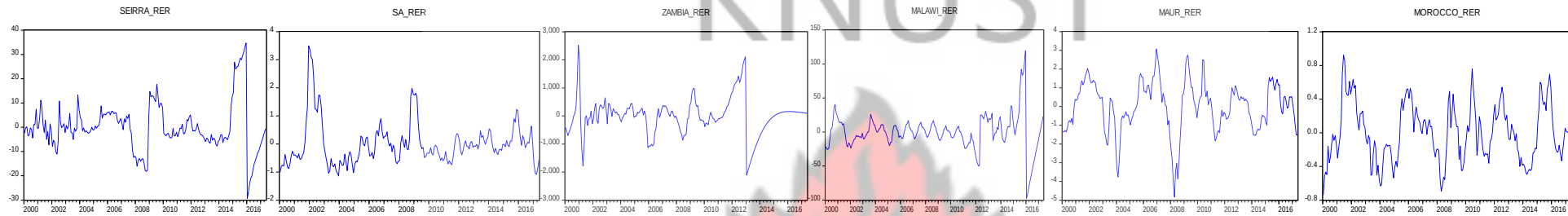


Real stock returns (RSR)



Real exchange rates (RER)





Discount Interest rates (INT)

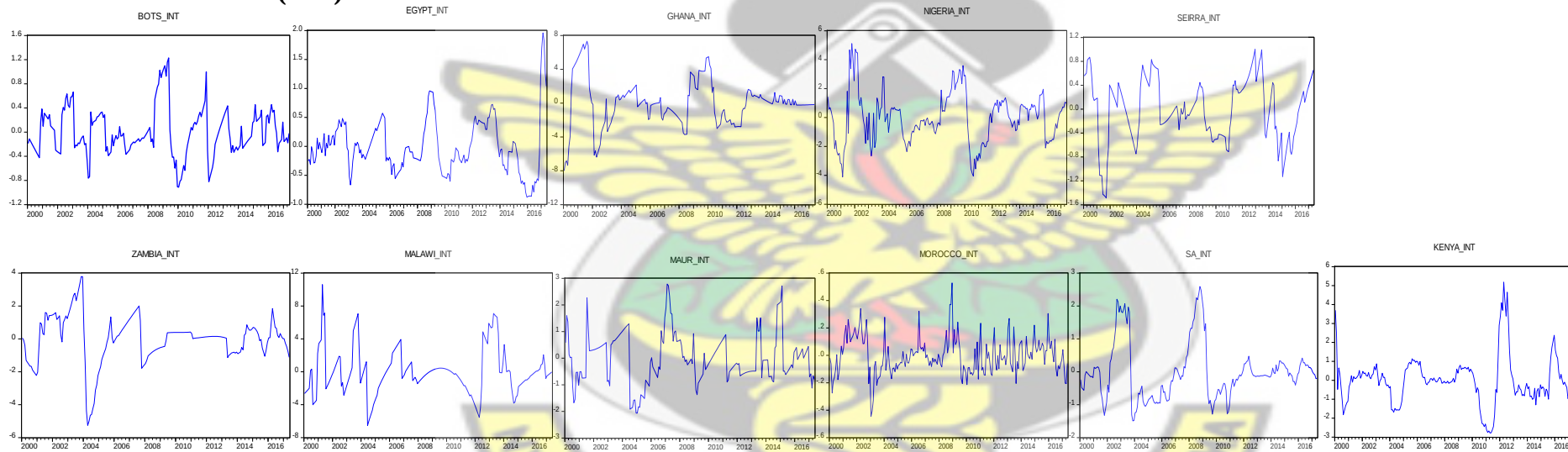
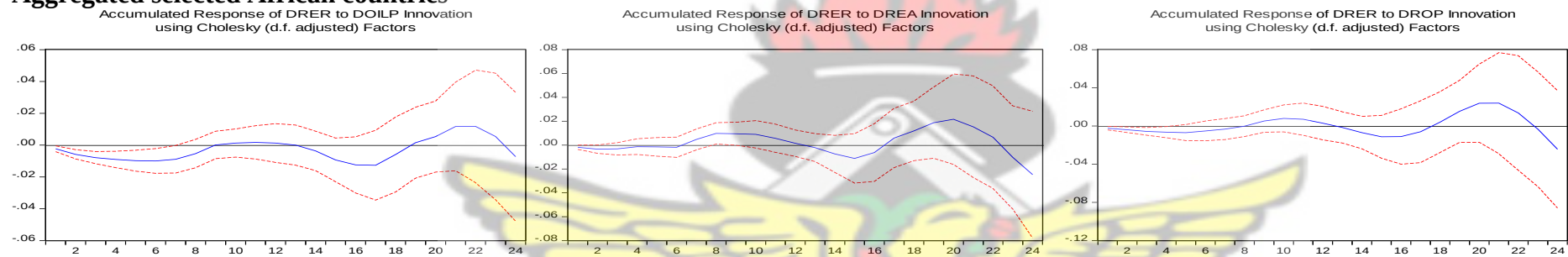


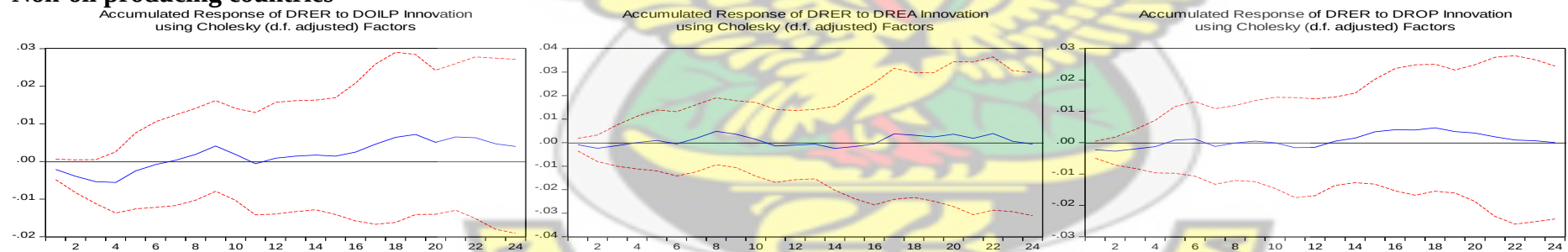
Figure 4.1 Business Cycle Analysis

APPENDIX 3

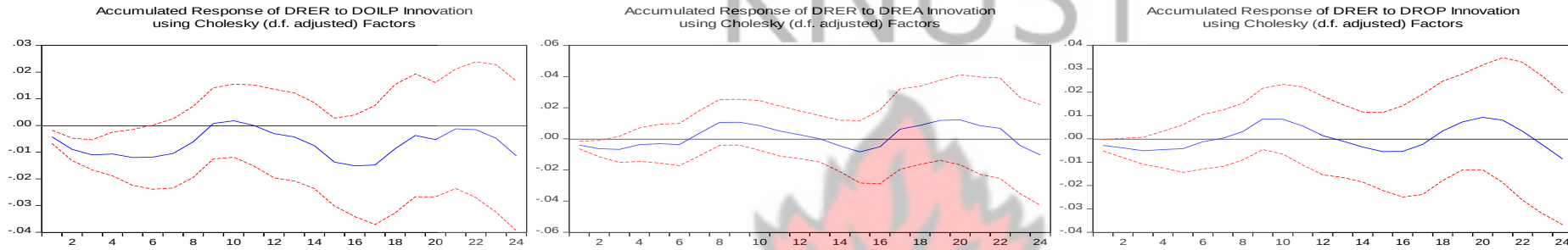
Aggregated selected African countries



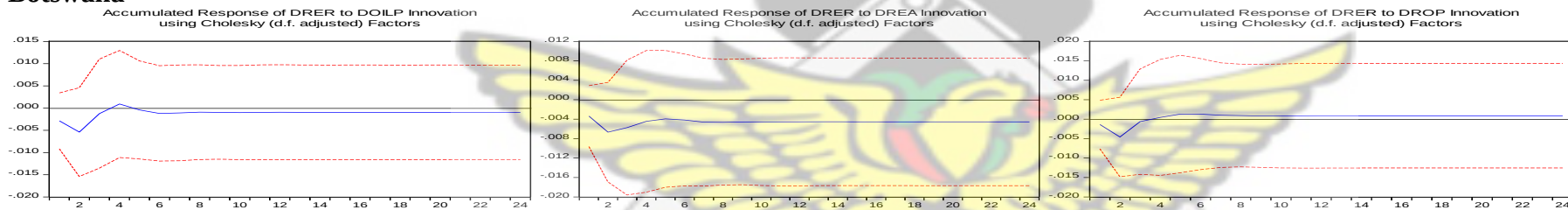
Non-oil producing countries



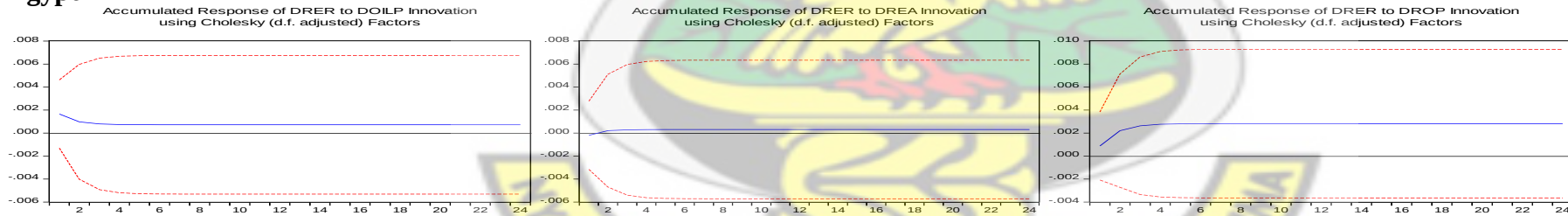
Oil producing countries



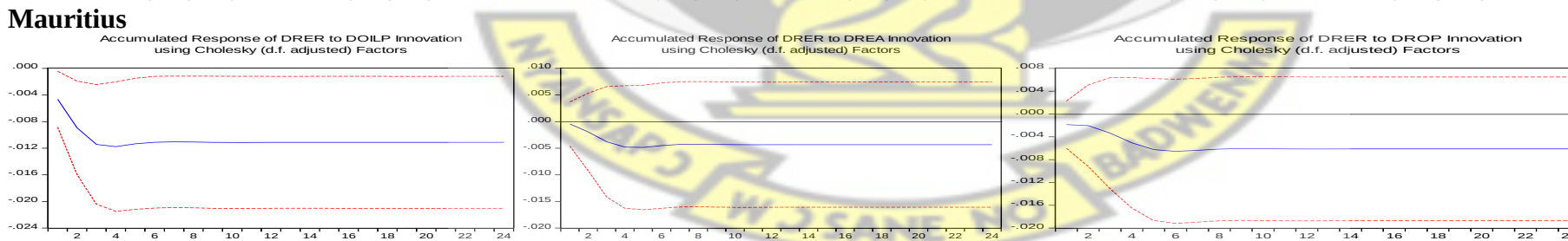
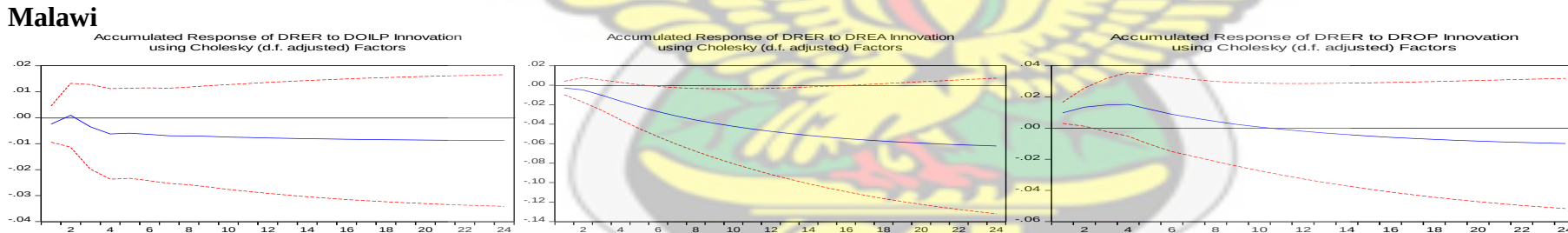
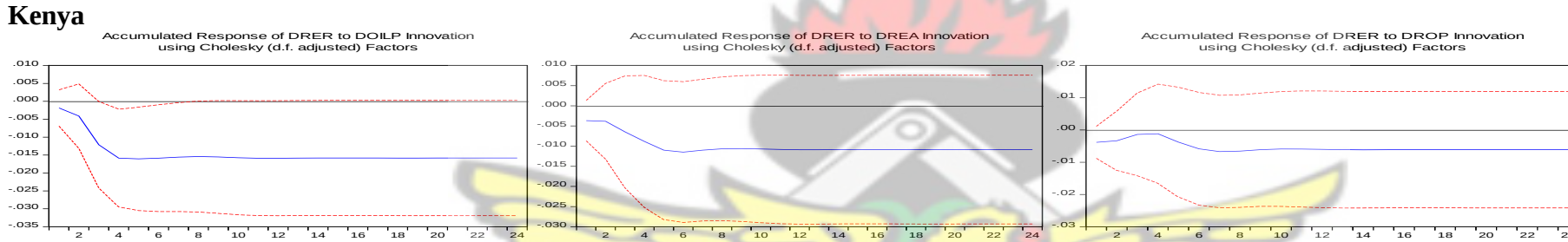
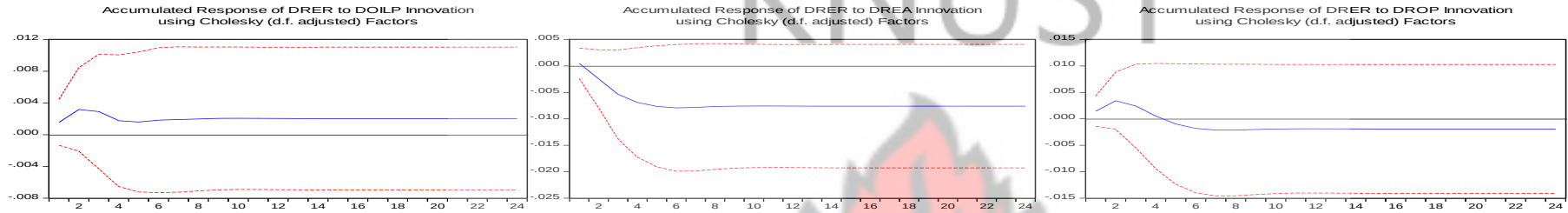
Botswana



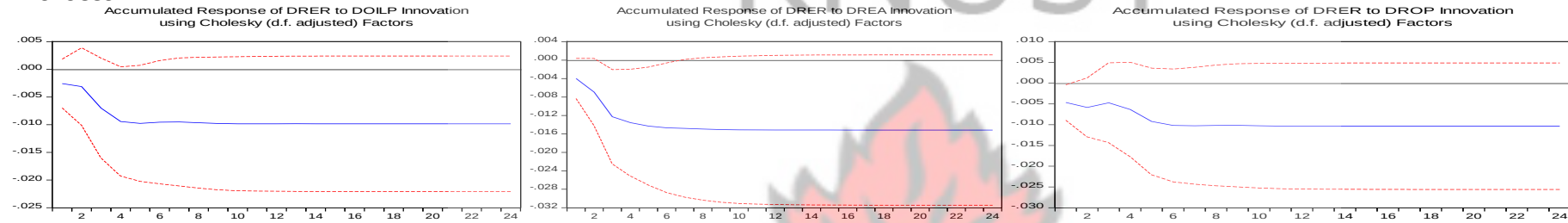
Egypt



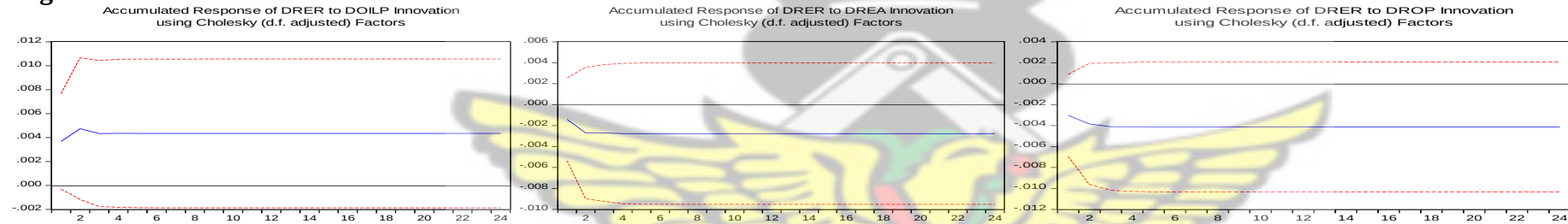
Ghana



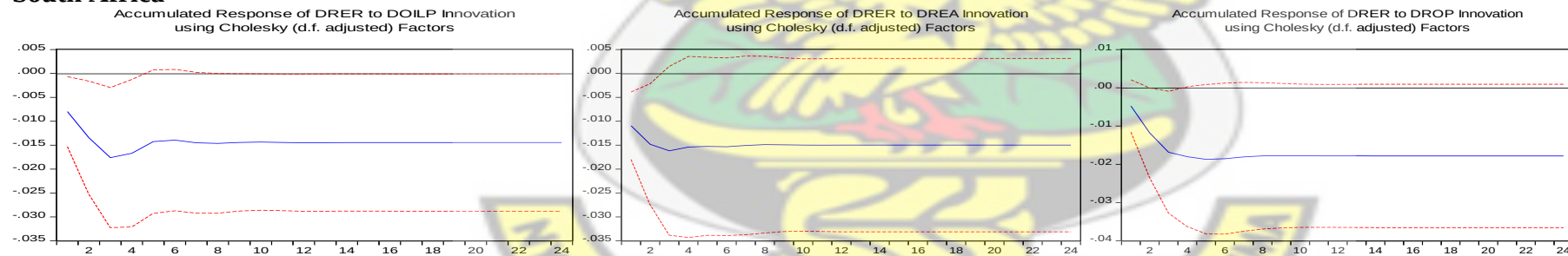
Morocco



Nigeria



South Africa



Sierra Leone

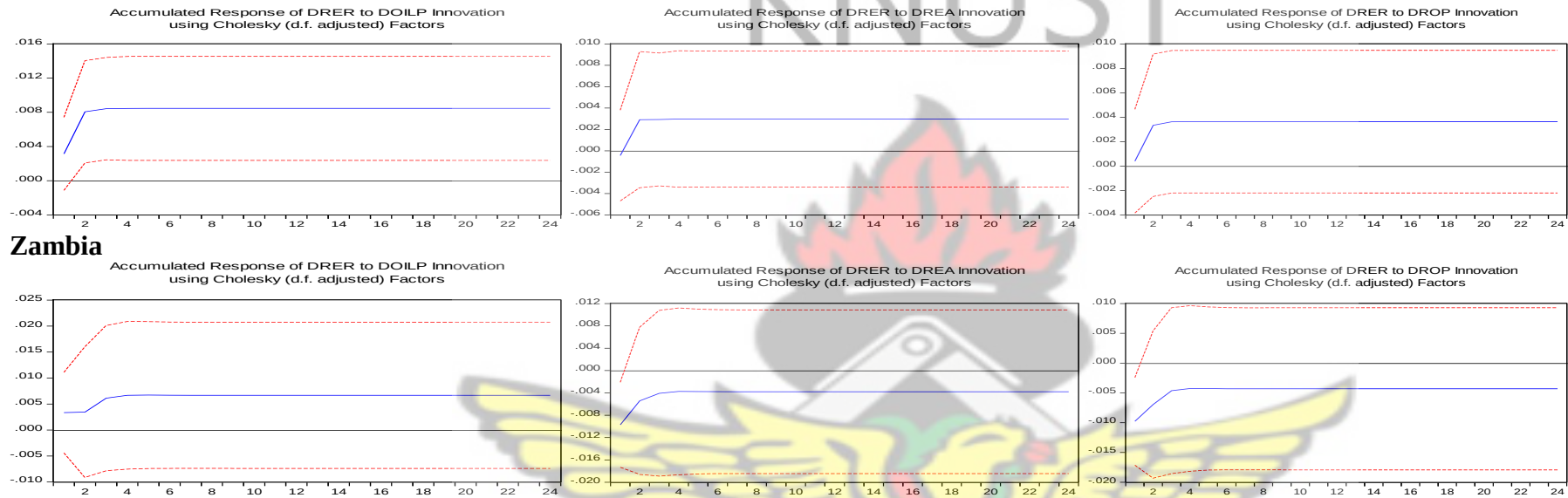
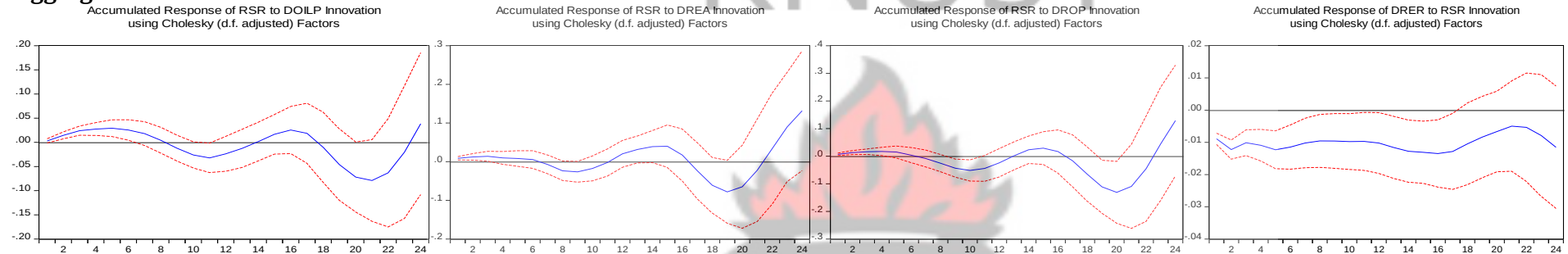
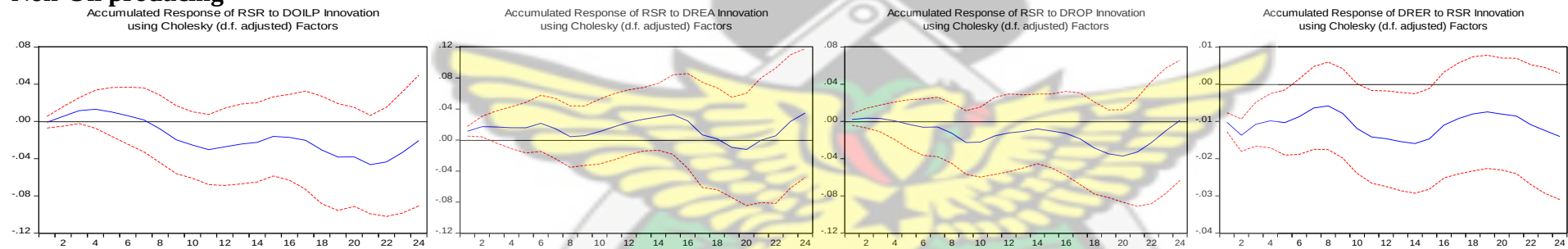


Figure 4.9: Accumulate Impulse Response of Real Exchange Rate model robustness check

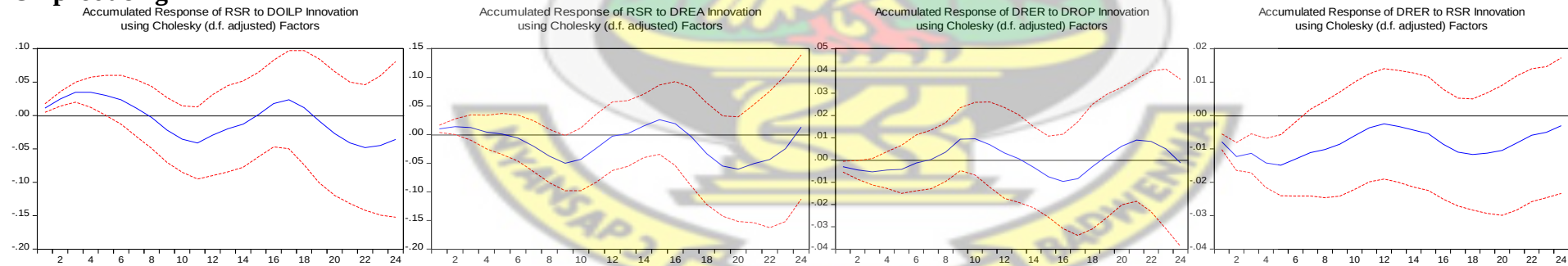
Aggregated African countries



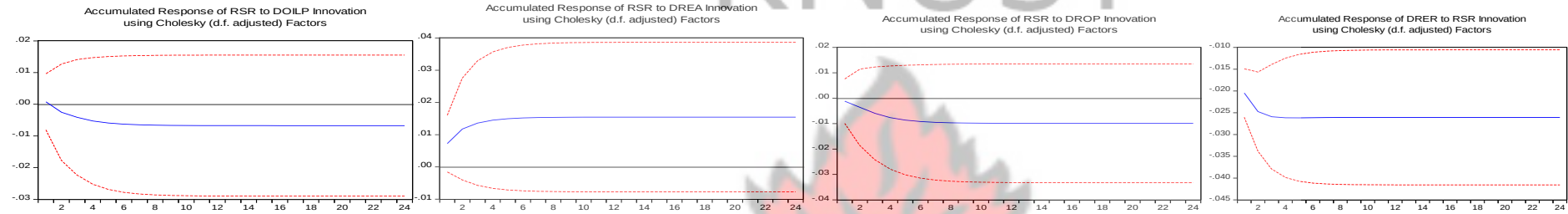
Non-Oil producing



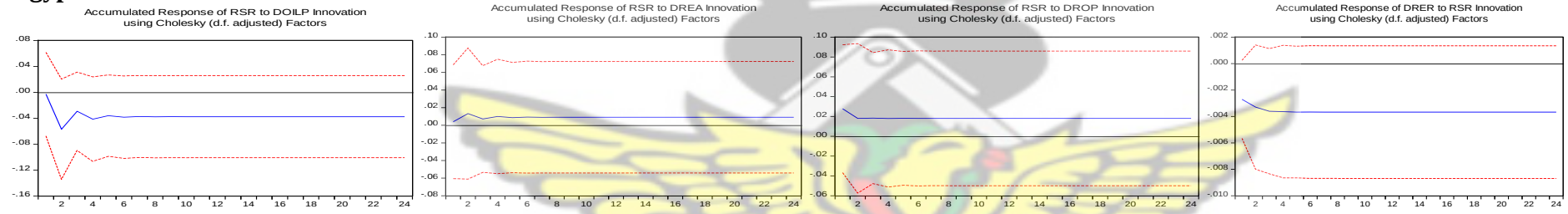
Oil producing



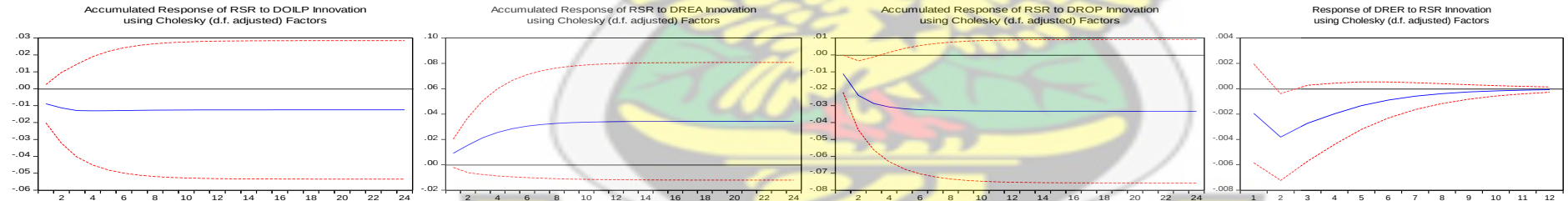
Botswana



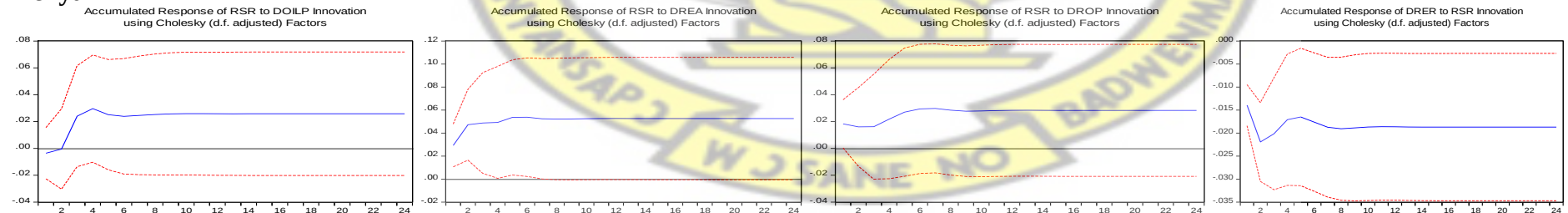
Egypt



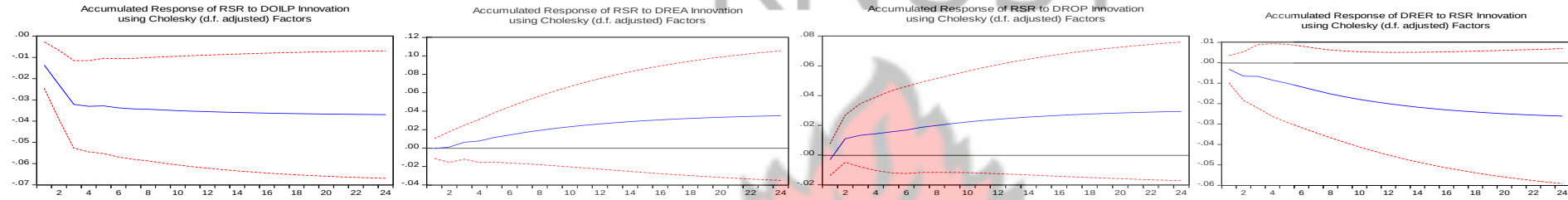
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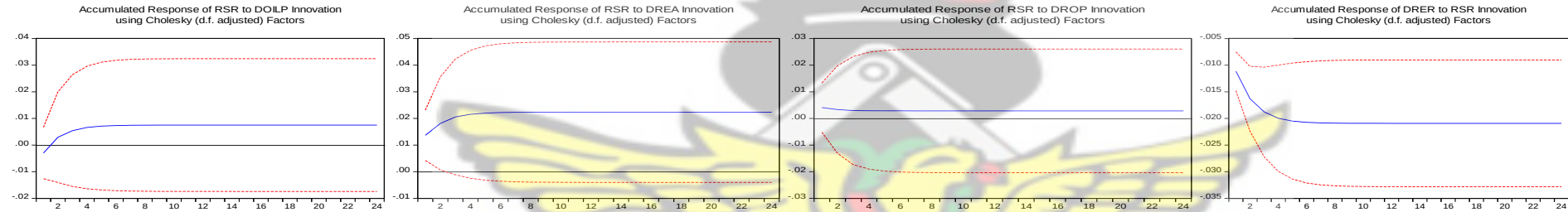
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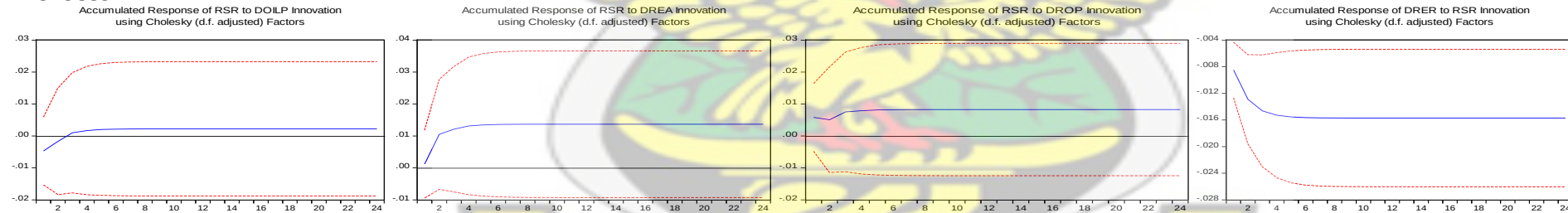
Malawi



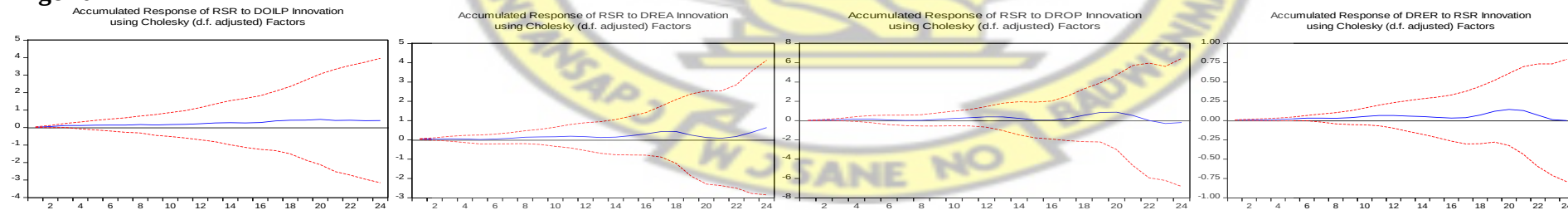
Mauritius



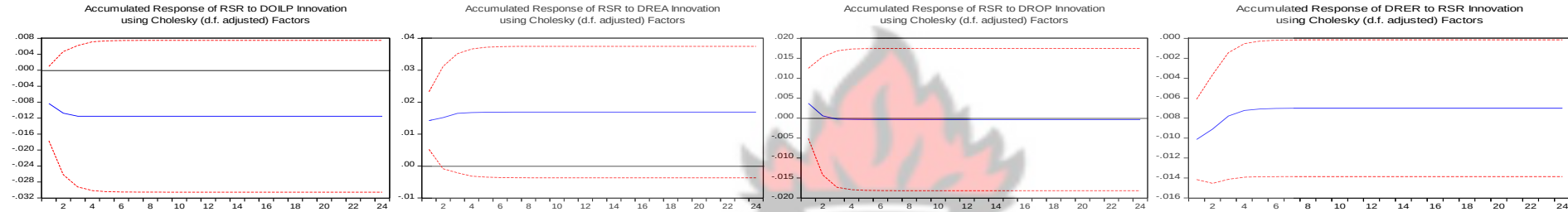
Morocco



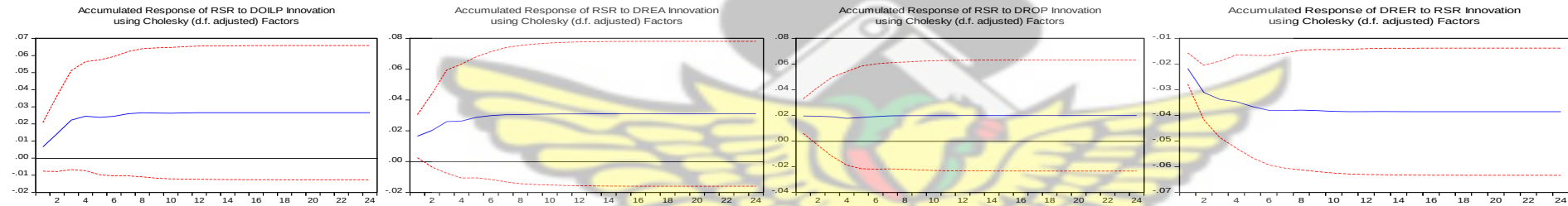
Nigeria



Sierra Leone



South Africa



Zambia

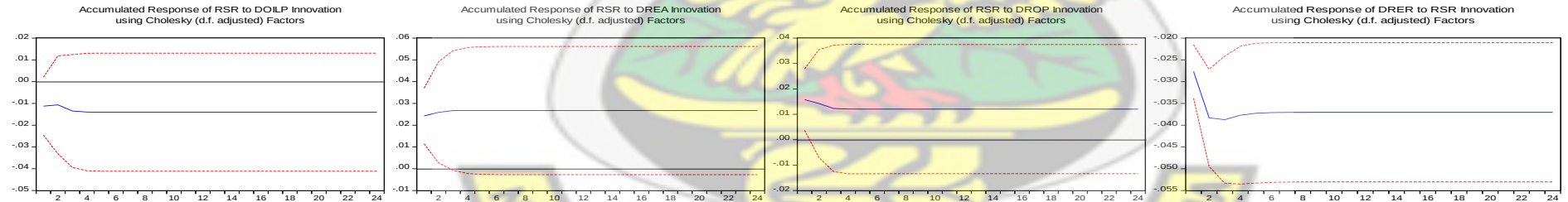
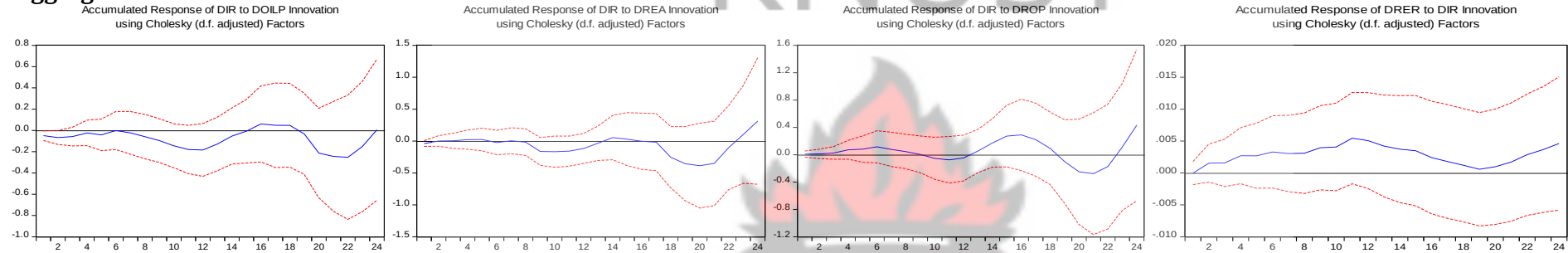
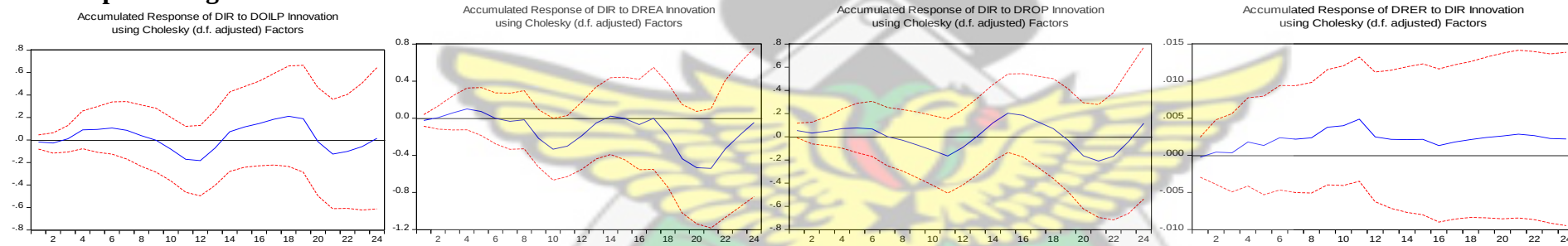


Figure 4.10: Accumulated Impulse Response of Real Stock Return Channel robustness check

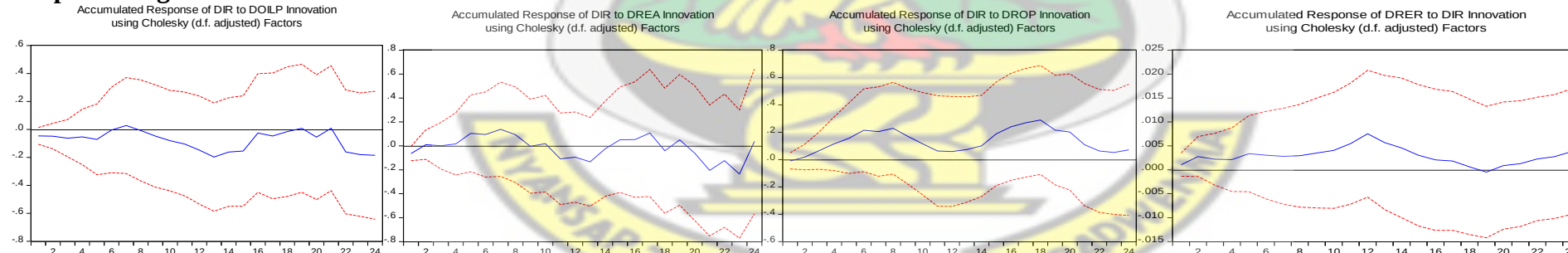
Aggregated countries



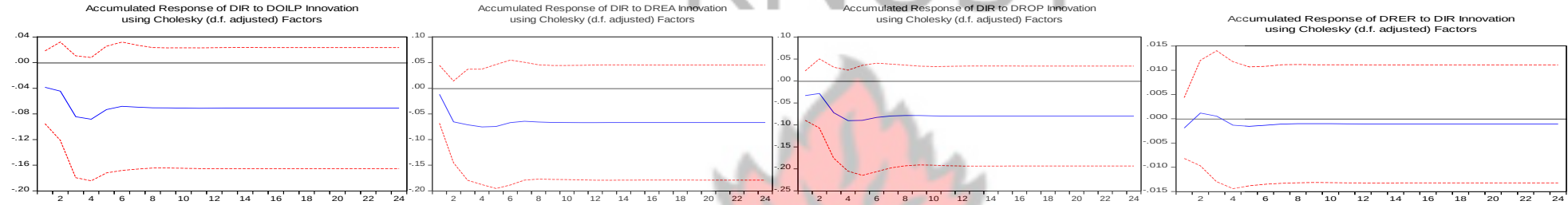
Non-oil producing



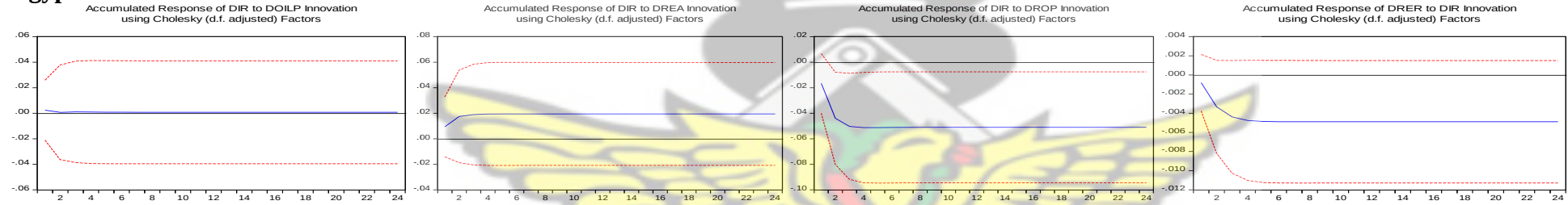
Oil producing



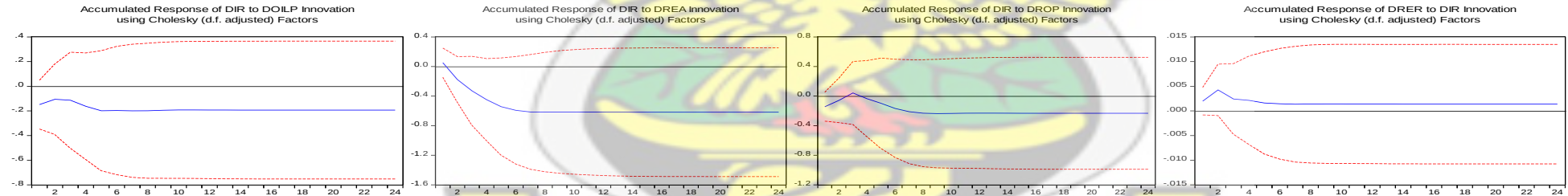
Botswana



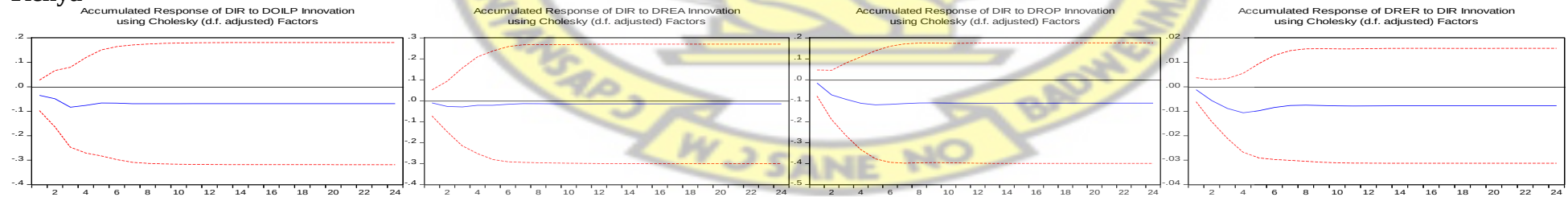
Egypt



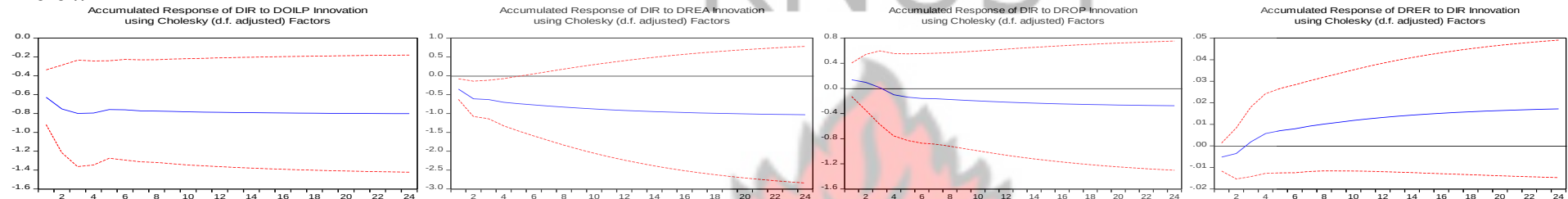
Ghana



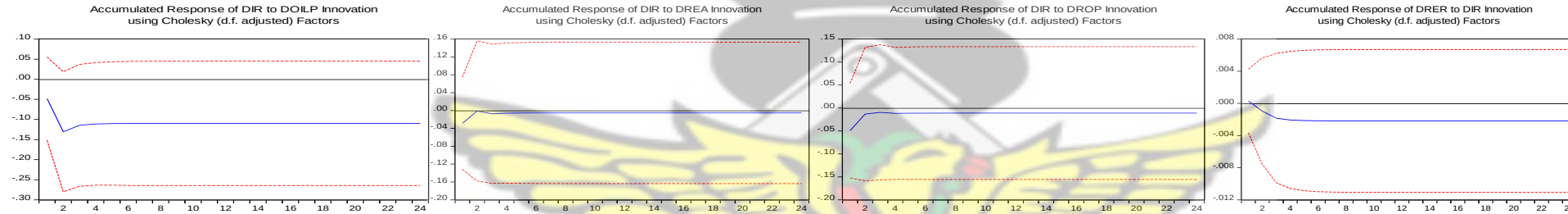
Kenya



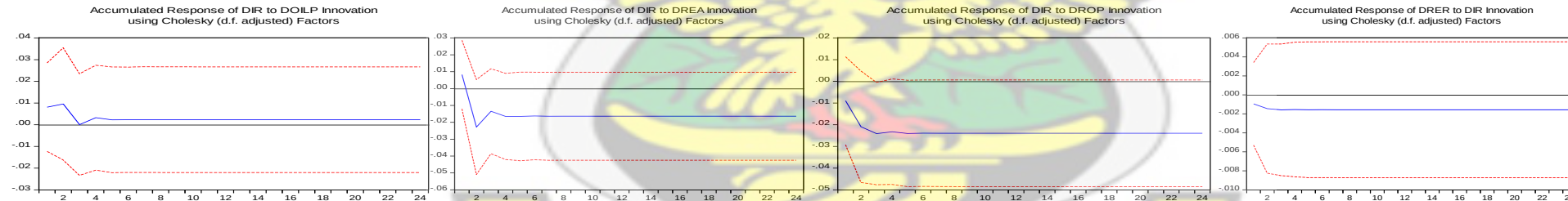
Malawi



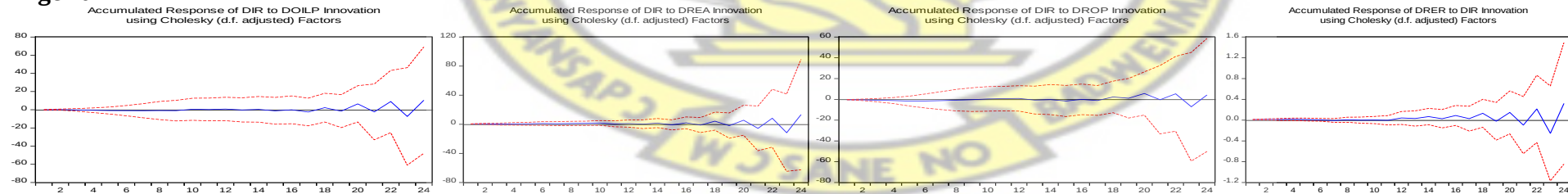
Mauritius



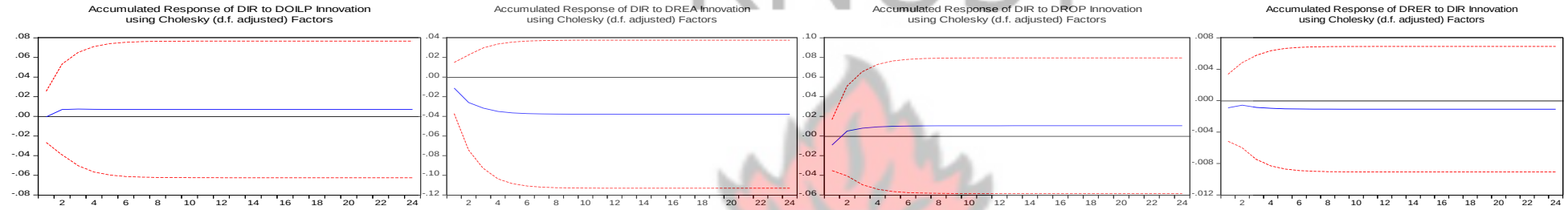
Morocco



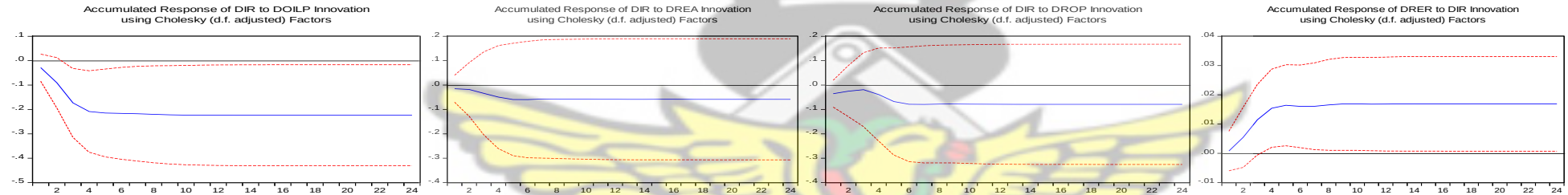
Nigeria



Sierra Leone



South Africa



Zambia

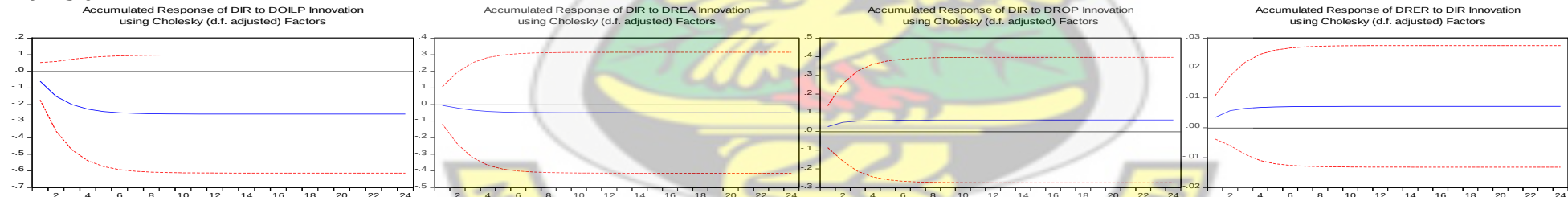
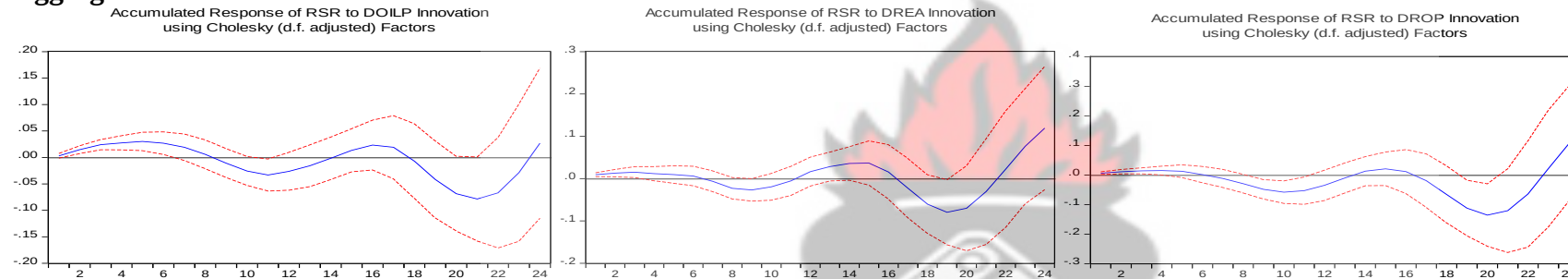


Figure 4.11: Accumulated Impulse Response of Deposit Interest Rate Channel robustness check

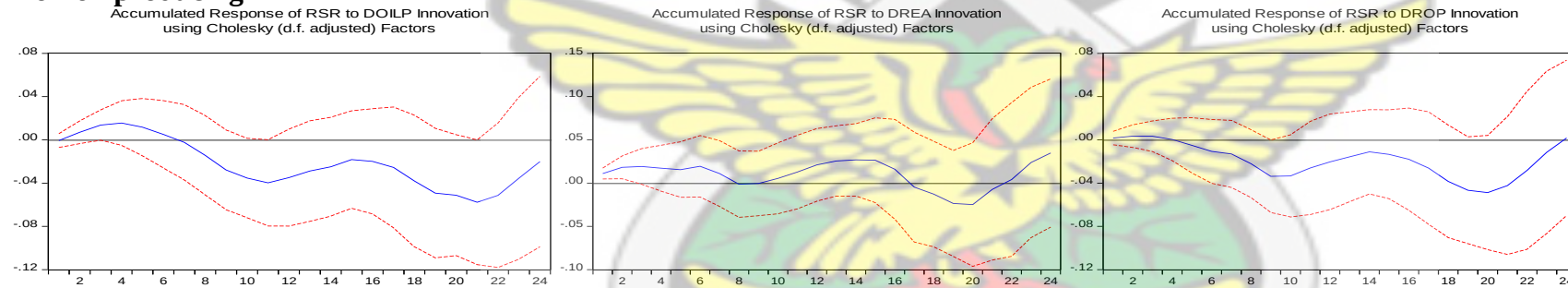
KNUST

APPENDIX 4

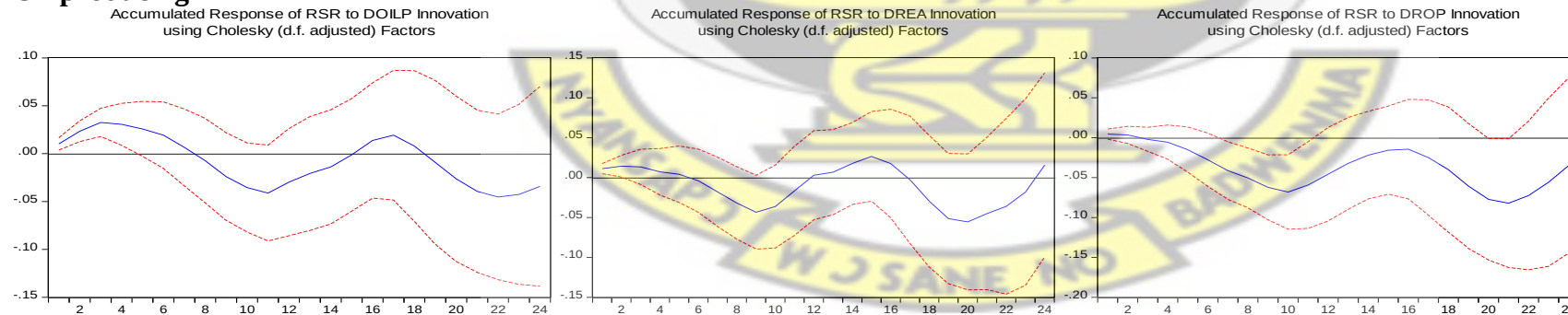
Aggregated countries



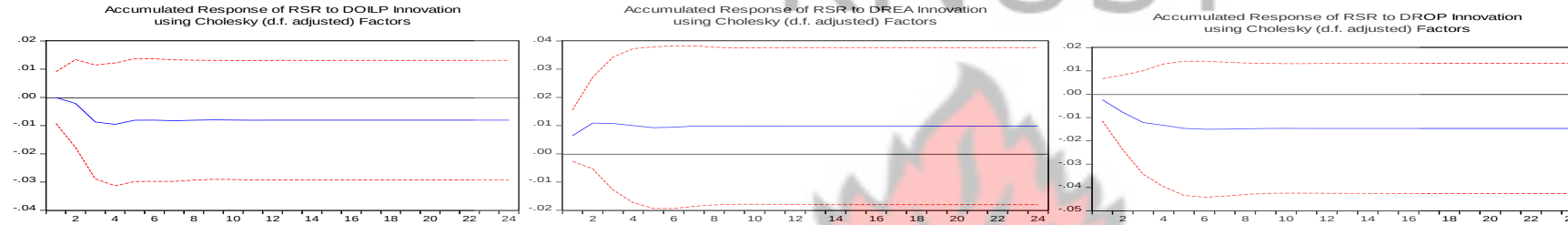
Non-oil producing



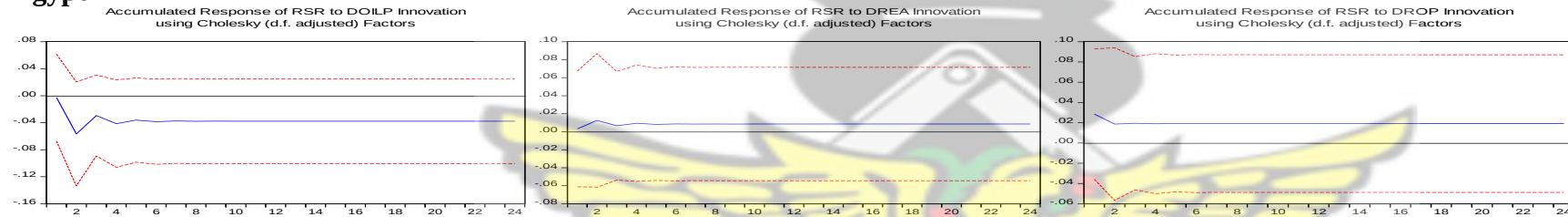
Oil producing



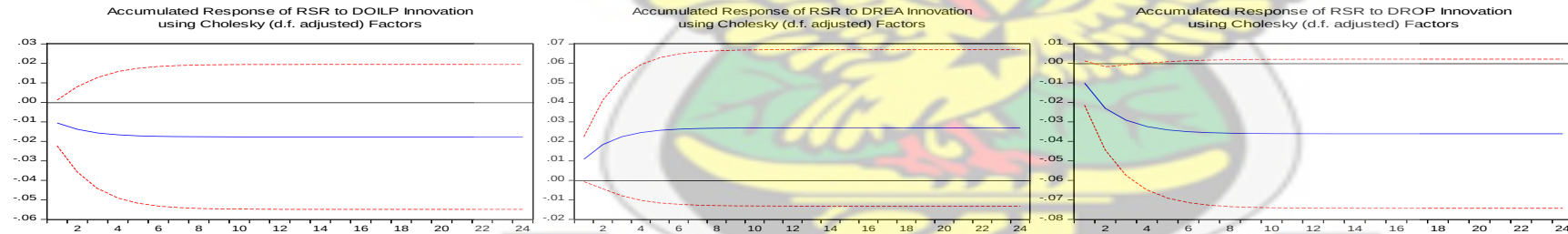
Botswana



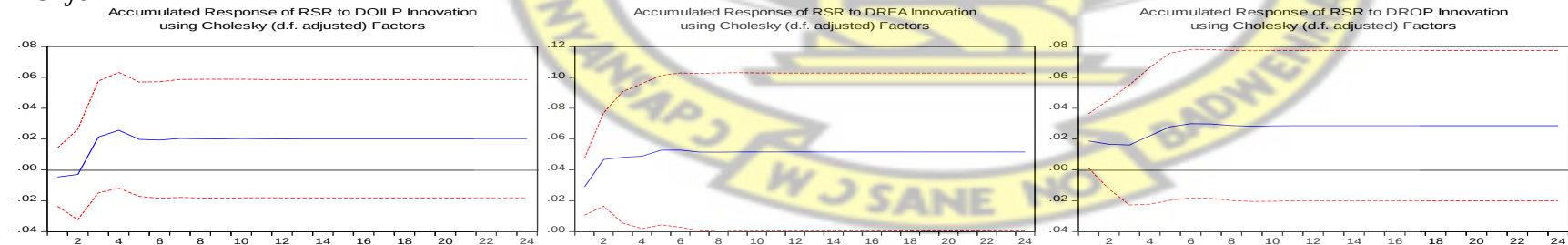
Egypt



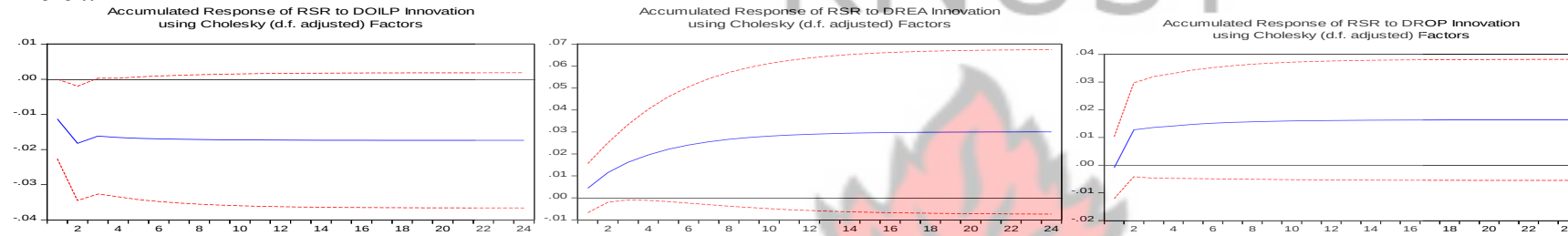
Ghana



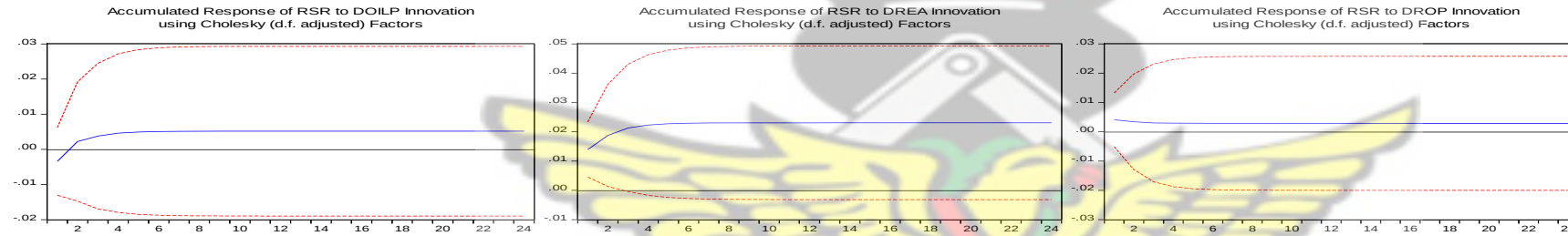
Kenya



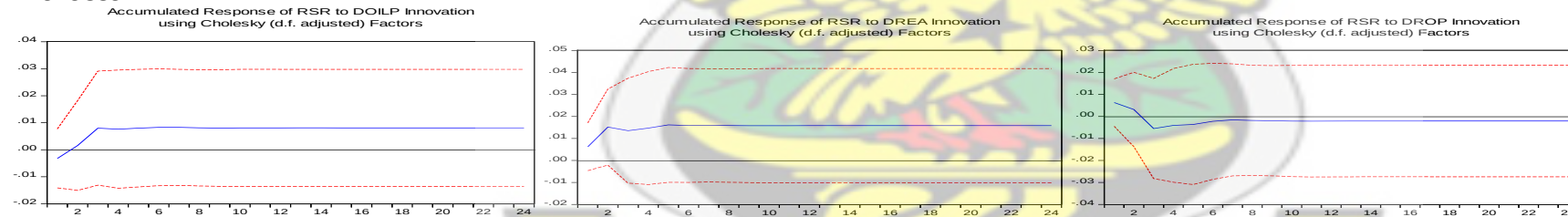
Malawi



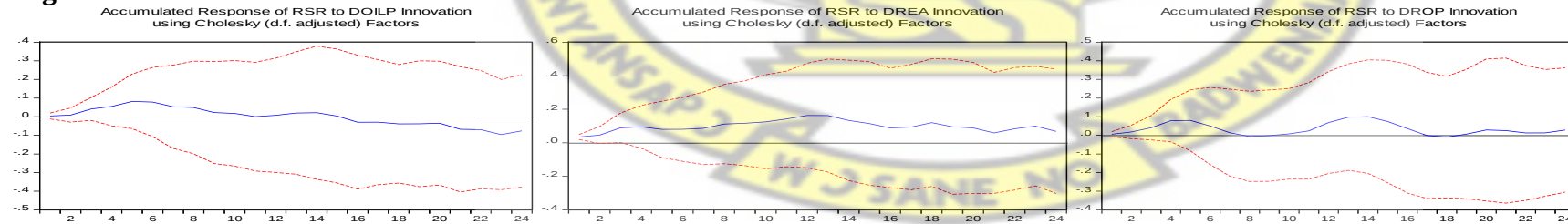
Mauritius



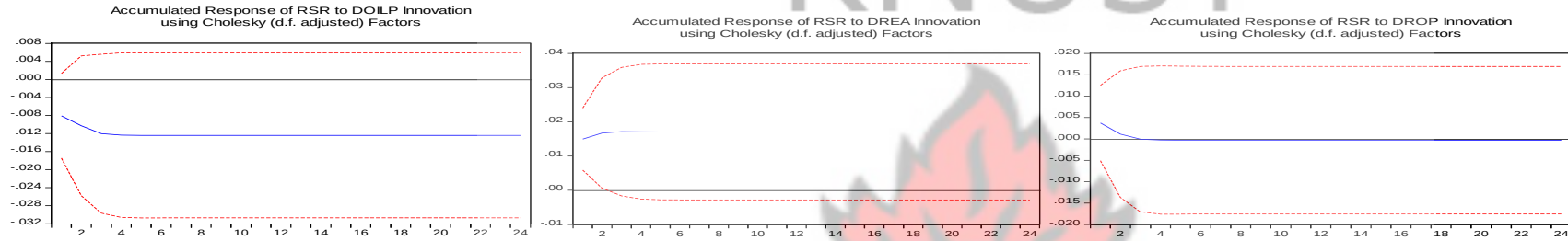
Morocco



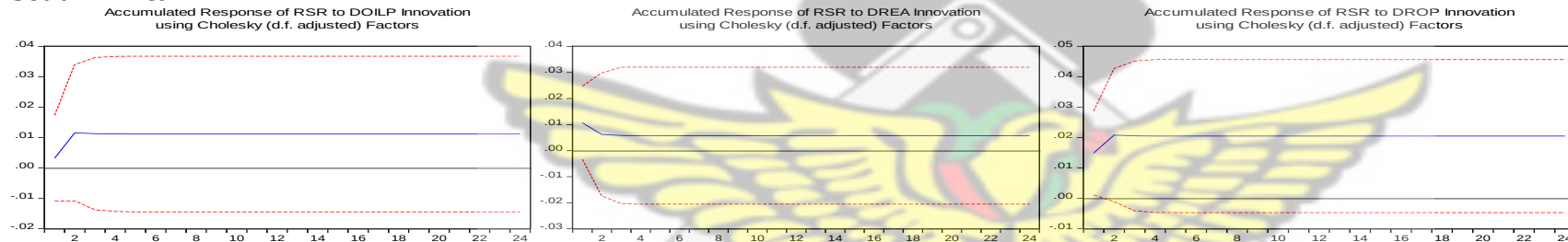
Nigeria



Sierra Leone



South Africa



Zambia

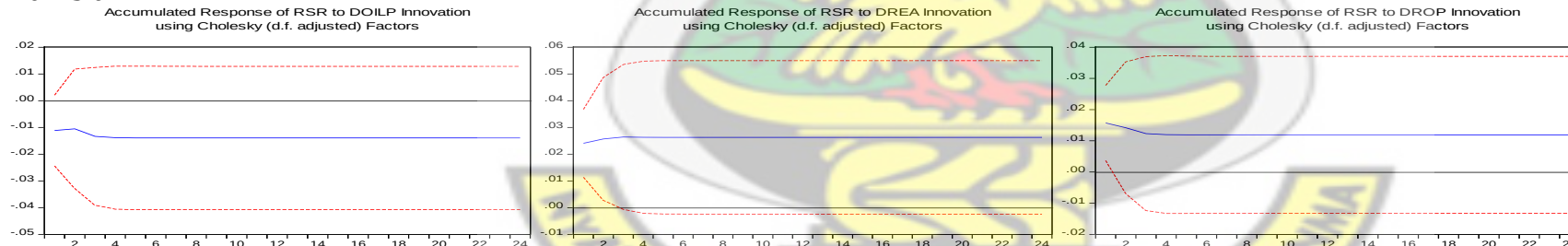
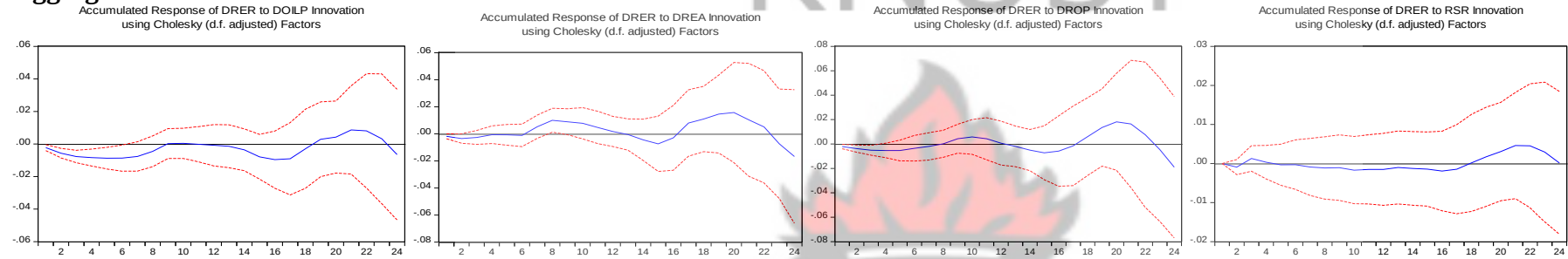
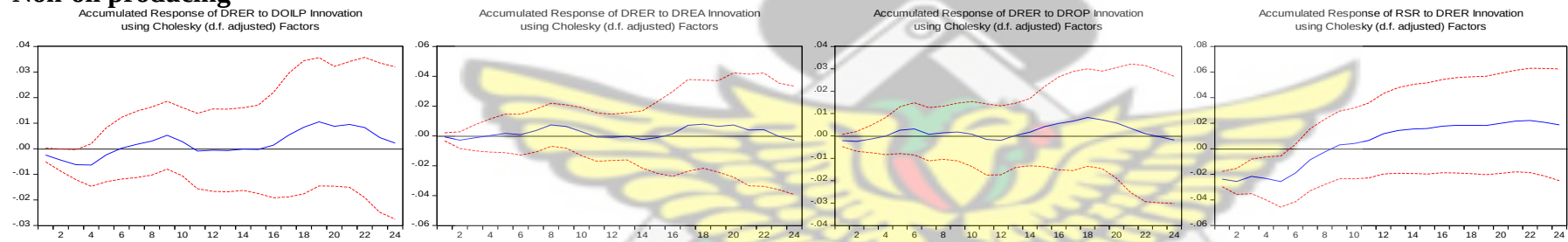


Figure 4.12: Accumulated Impulse Response of Stock Return Model robustness check

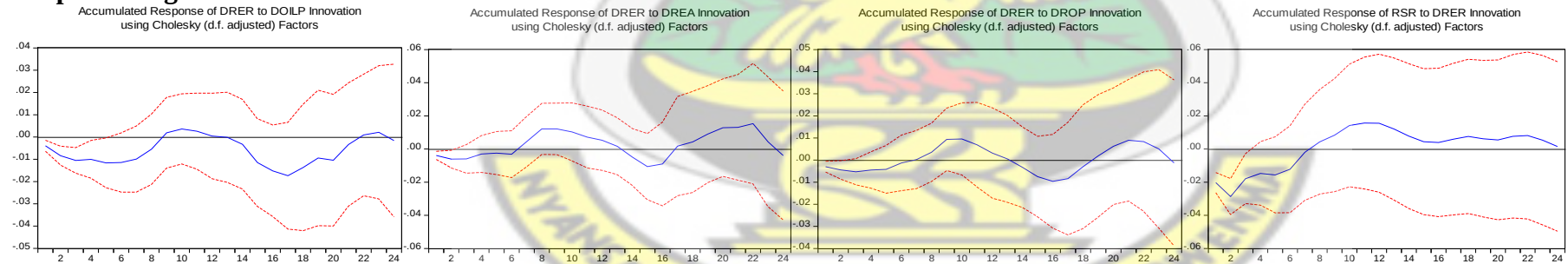
Aggregated countries



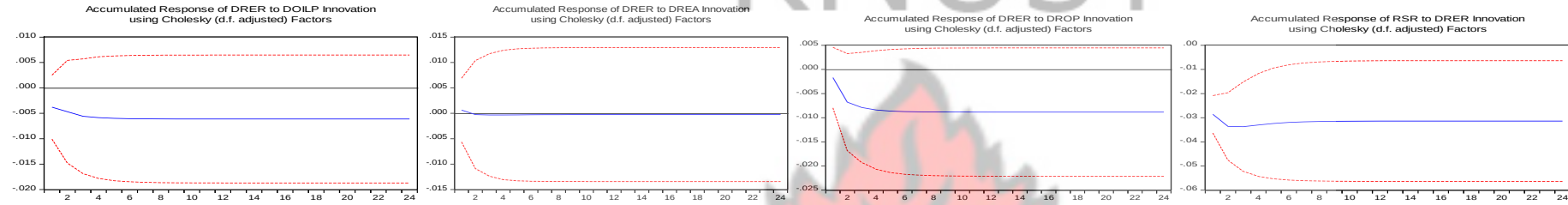
Non-oil producing



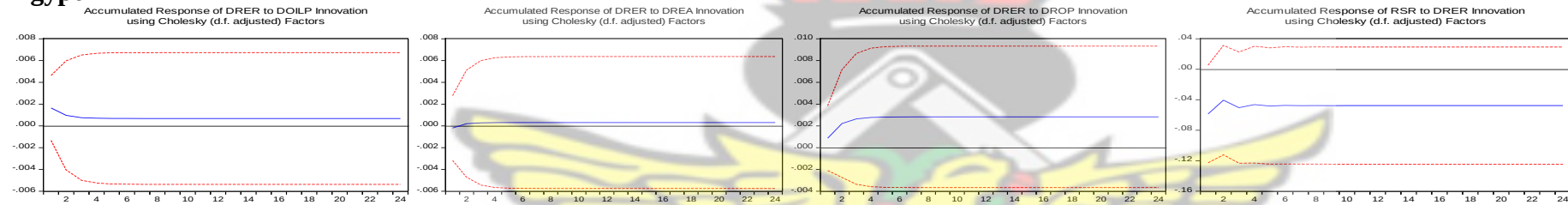
Oil producing



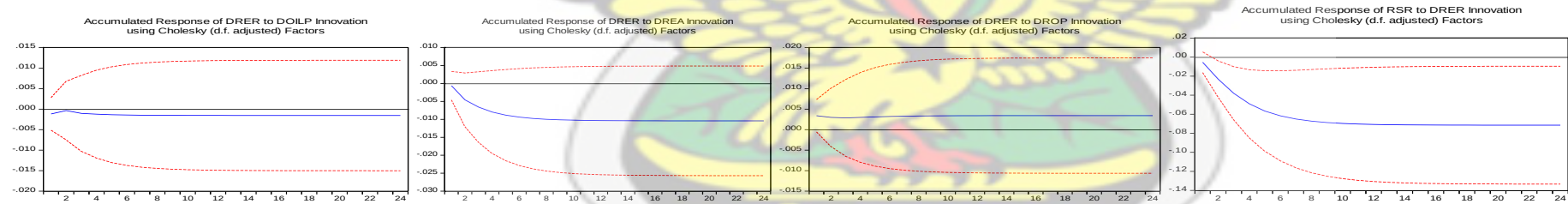
Botswana



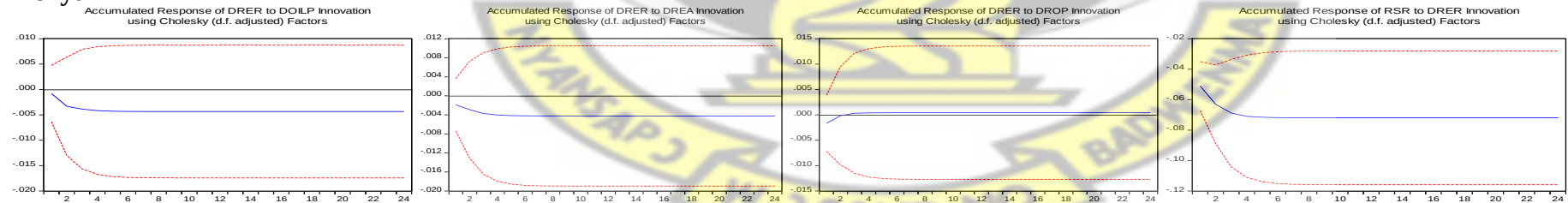
Egypt



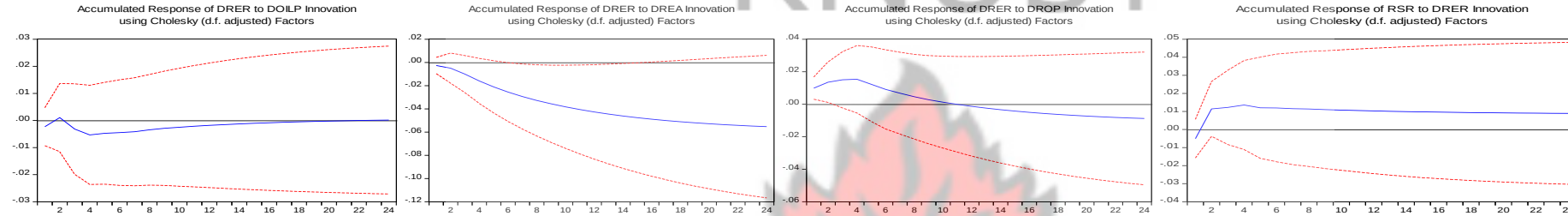
Ghana



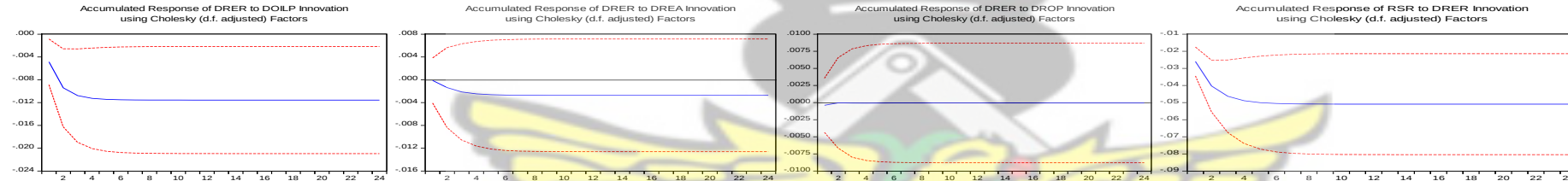
Kenya



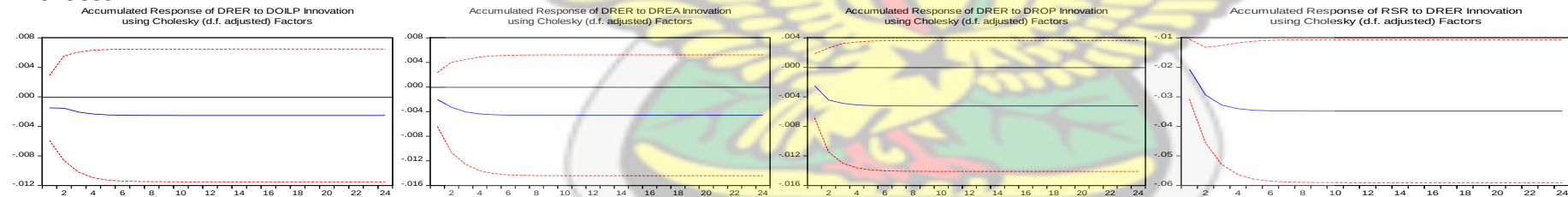
Malawi



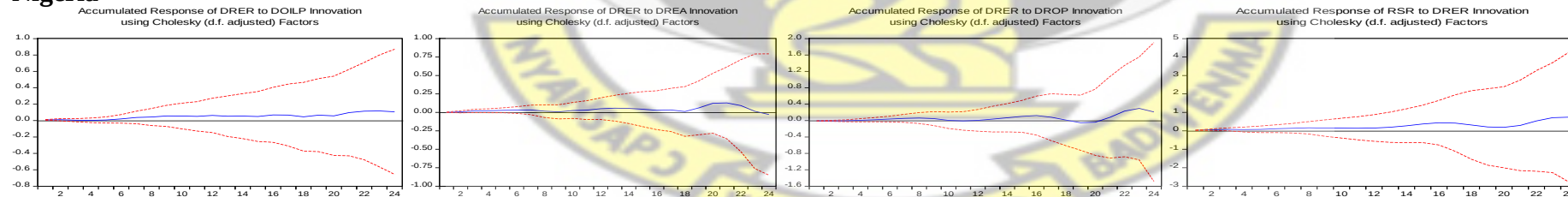
Mauritius



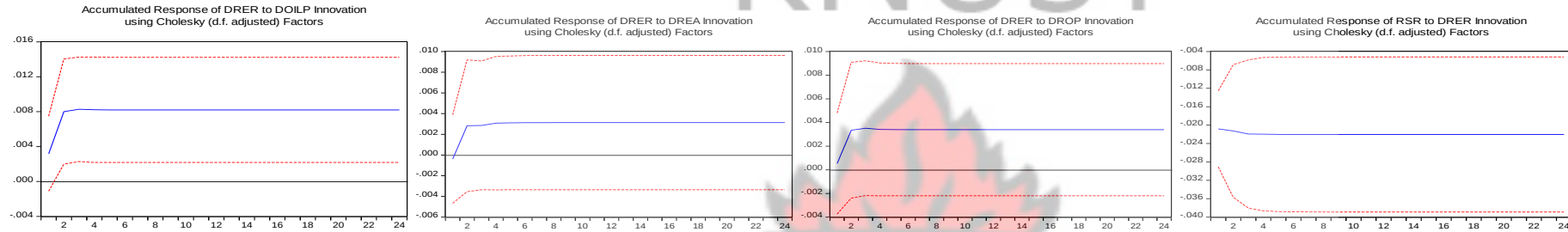
Morocco



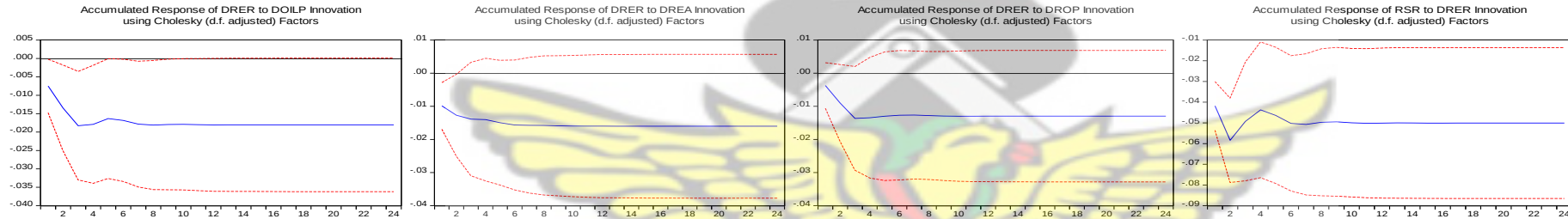
Nigeria



Sierra Leone



South Africa



Zambia

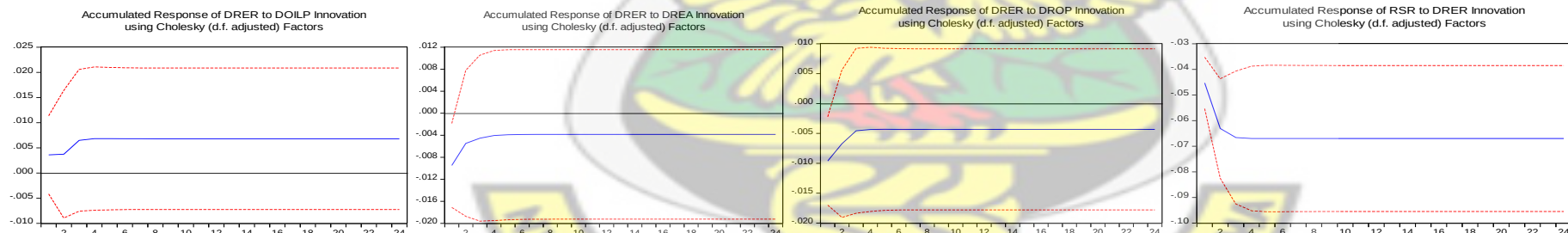
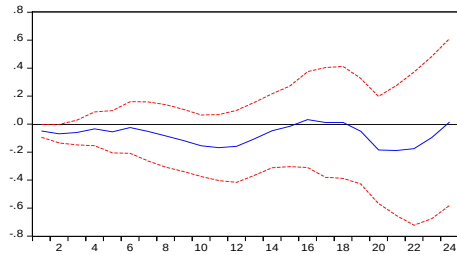


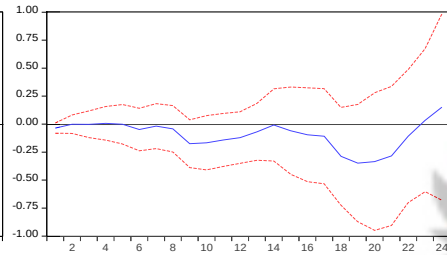
Figure 4.13: Accumulated Impulse Response of Real Exchange Rate Channel robustness check

Aggregated African countries

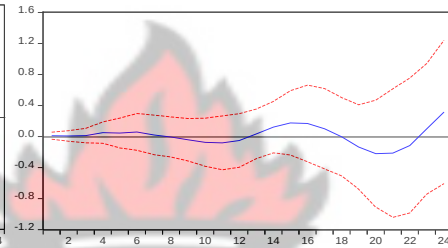
Accumulated Response of DIR to DOILP Innovation using Cholesky (d.f. adjusted) Factors



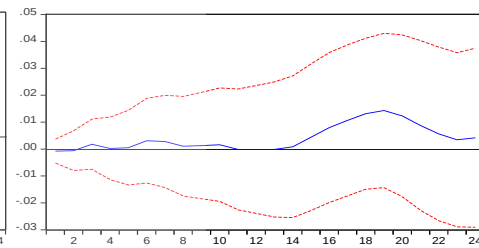
Accumulated Response of DIR to DREA Innovation using Cholesky (d.f. adjusted) Factors



Accumulated Response of DIR to DROP Innovation using Cholesky (d.f. adjusted) Factors

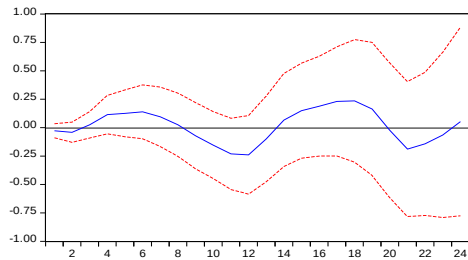


Accumulated Response of RSR to DIR Innovation using Cholesky (d.f. adjusted) Factors

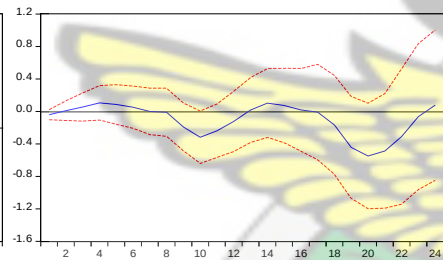


Non-oil producing countries

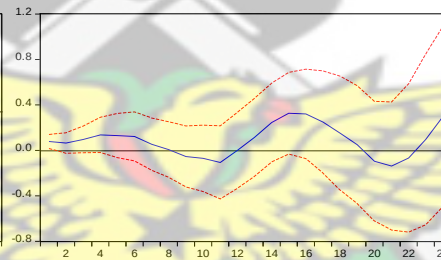
Accumulated Response of DIR to DOILP Innovation using Cholesky (d.f. adjusted) Factors



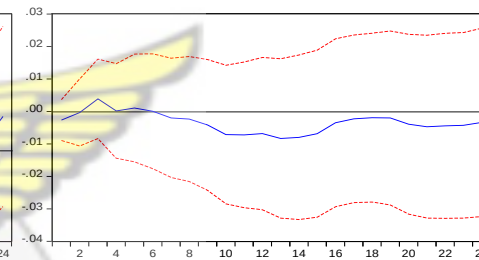
Accumulated Response of DIR to DREA Innovation using Cholesky (d.f. adjusted) Factors



Accumulated Response of DIR to DROP Innovation using Cholesky (d.f. adjusted) Factors

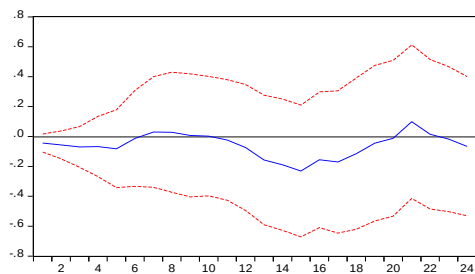


Accumulated Response of RSR to DIR Innovation using Cholesky (d.f. adjusted) Factors

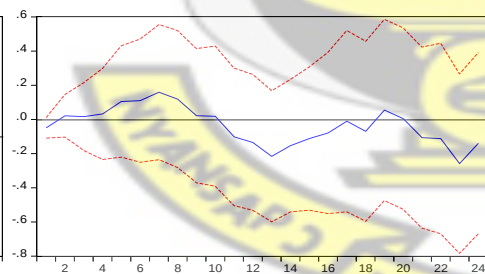


Oil producing countries

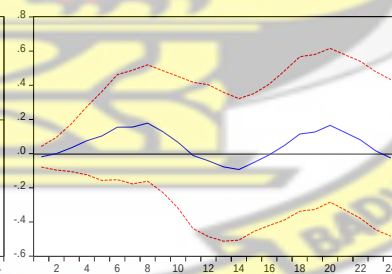
Accumulated Response of DIR to DOILP Innovation using Cholesky (d.f. adjusted) Factors



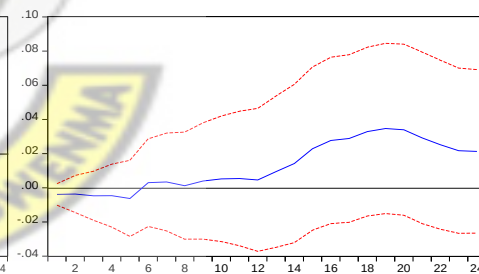
Accumulated Response of DIR to DREA Innovation using Cholesky (d.f. adjusted) Factors



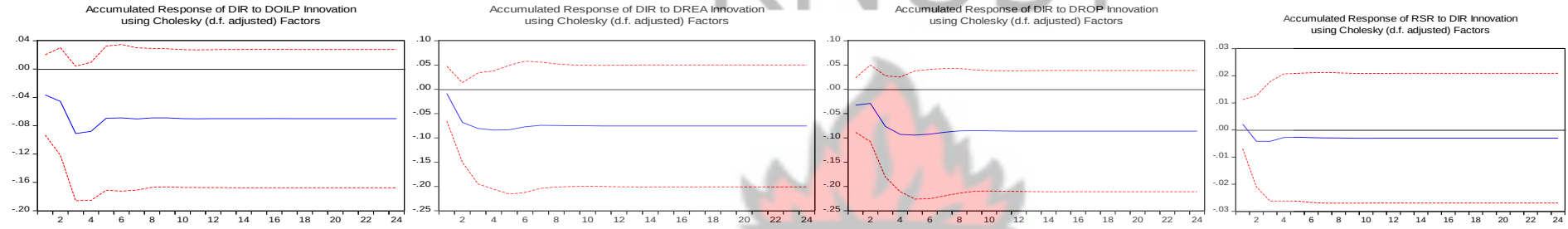
Accumulated Response of DIR to DROP Innovation using Cholesky (d.f. adjusted) Factors



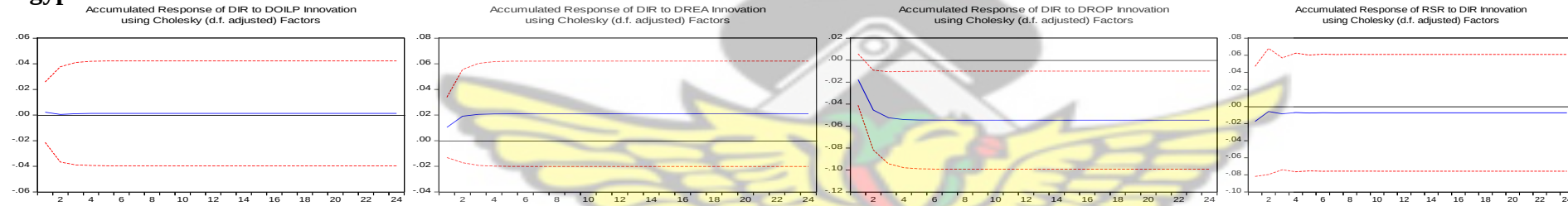
Accumulated Response of RSR to DIR Innovation using Cholesky (d.f. adjusted) Factors



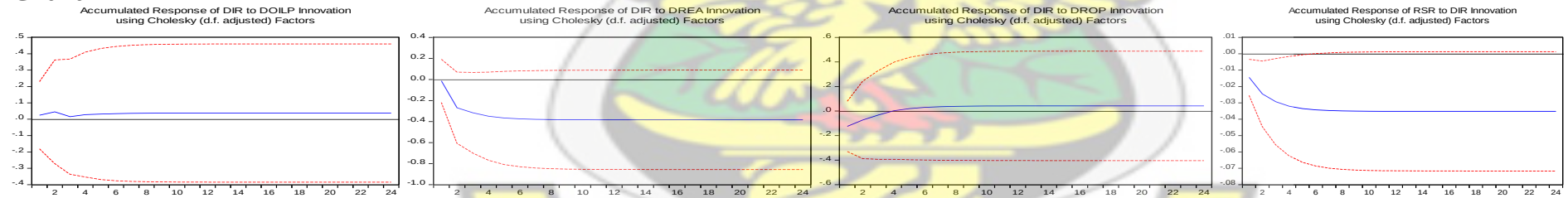
Botswana



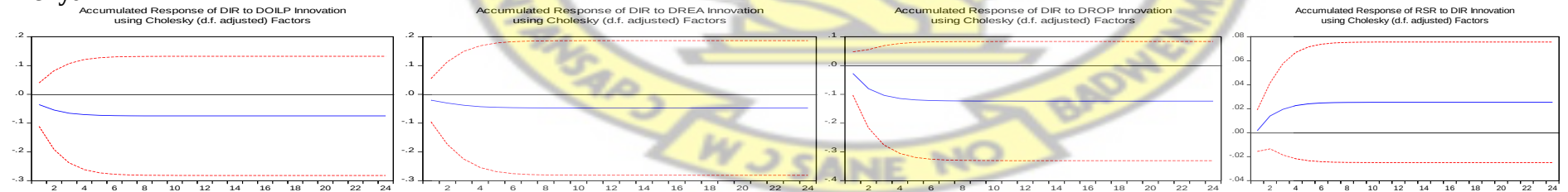
Egypt



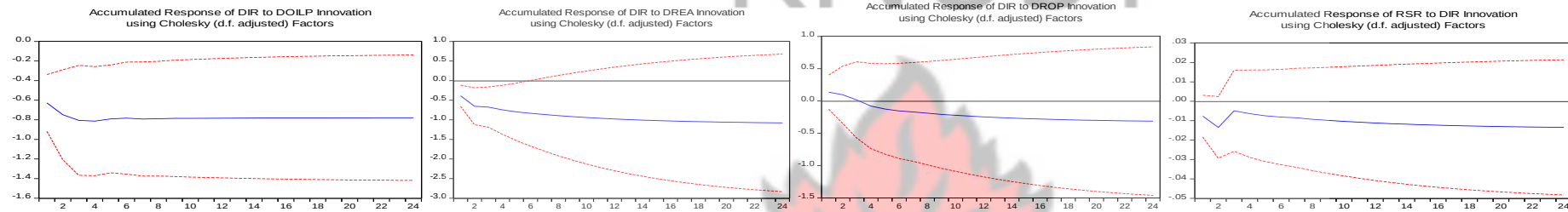
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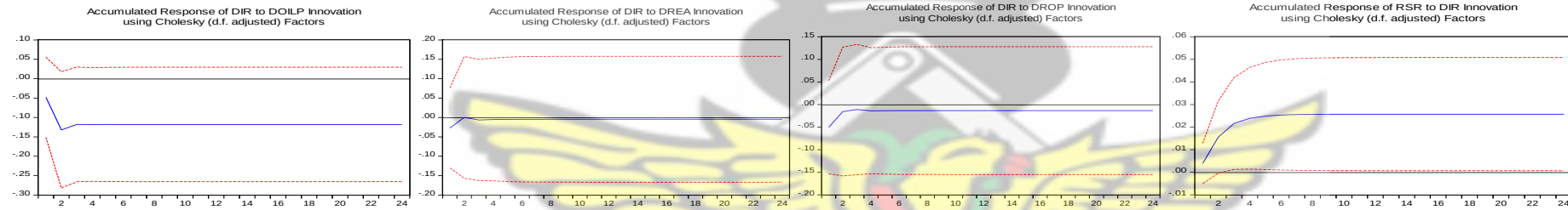
Kenya



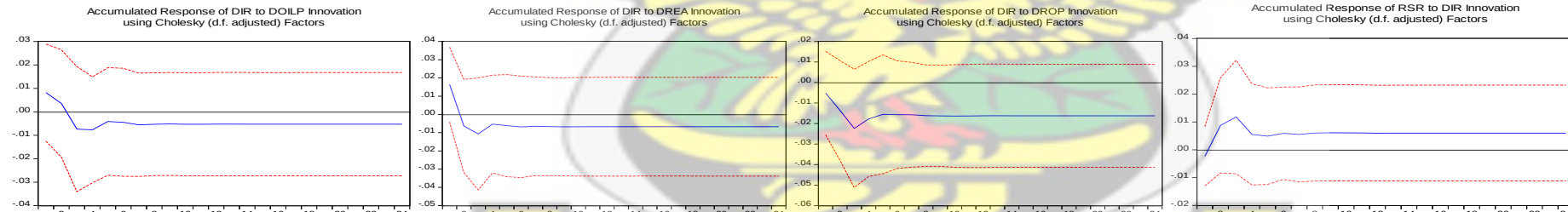
Malawi



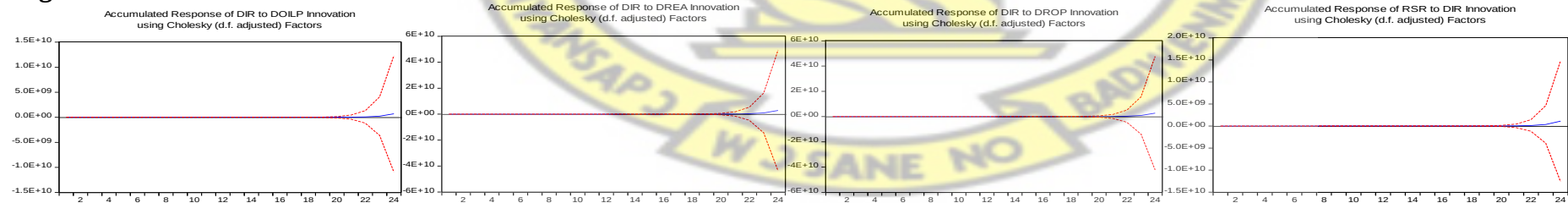
Mauritius



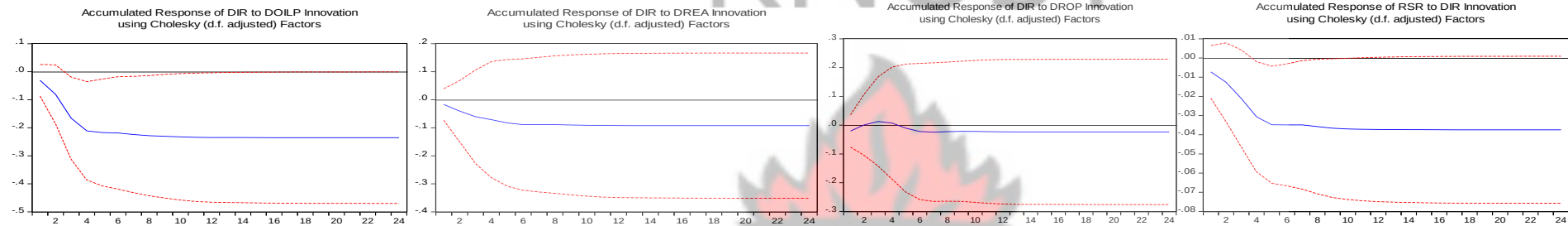
Morocco



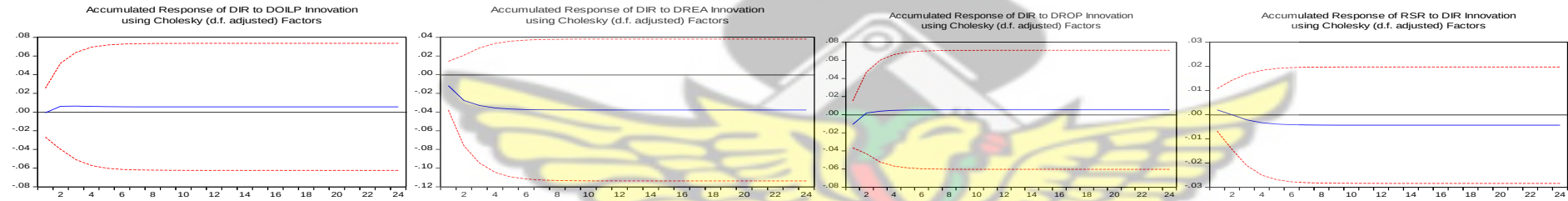
Nigeria



South Africa



Sierra Leone



Zambia

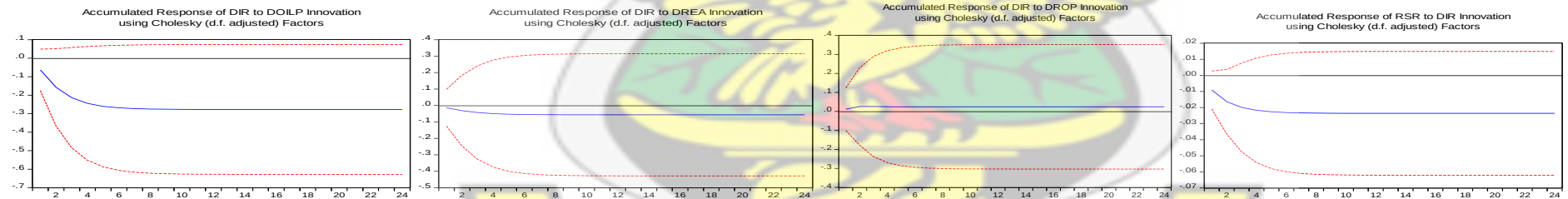


Figure 4.14: Accumulated impulse response of deposit interest rate channel robustness check

KNUST

