The oil shocks in Nigeria in the late 20th century: a case of the Dutch Disease?

A comparative bachelor thesis on determining the existence of the Dutch Disease in Nigeria.

Yannick Lamens

354012

July 2014

Bachelor thesis paper IBEB (International Bachelor Economics and Business Economics)

Supervisor: Dr. Vladimir Karamychev

ERASMUS UNIVERSITEIT ROTTERDAM

ERASMUS SCHOOL OF ECONOMICS

Abstract

This paper investigates whether the Dutch Disease occurred in Nigeria during the late 20th century following significant oil discoveries. This was done by investigating the spending and the resource movement effect using regression analysis in accordance with the Error Correction and Partial Adjustment models. The spending effect shows that under a fixed exchange rate regime the Dutch Disease can be nullified. Under a floating exchange rate, the exchange rate appreciates which is indicative of the Dutch Disease being present. Controlling for the change in exchange rate regime, which occurred in 1986 following an upward pressure on the Naira, results in the effect of the oil shock on the Real Effective Exchange Rate to become insignificant while the regime dummy remains significant. This means a spurious regression was run and no inferences can be taken from this result. When examining the resource movement effect, the manufacturing sector contracts in accordance with the Dutch Disease model but the Agricultural sector's size remains stable. The assumption in the core Dutch Disease model of perfect labor substitutability seems not to hold empirically. This paper concludes that when using the resource movement effect as an indicator, the Dutch Disease is present following the oil shock in 1998 to 2002. In accordance with Balassa (1964), Samuelson (1964), Dornbusch (1980) and Edwards (1988), this paper takes the view that when looking at economic phenomena one should focus on the change in economic fundamentals. The appreciation of the exchange rate is merely a means to an end. Therefore it's concluded that the Dutch Disease is present following the 1998 to 2002 oil shock under a floating exchange rate, Looney's finding of effective policy against the Dutch Disease holds empirically and the Dornbusch overshooting phenomenon is found under a fixed exchange rate regime.

Table of Contents

1. Introduction:

Over the last couple of decades Nigeria has been the stage of major oil discoveries. (The Economist, 2011) These discoveries have come paired with frequent political unrest, not only fueled by the sudden increase in wealth but also the ongoing conflict between the predominantly Muslim north and the Christian South. (The Economist, 2014). Many thought the discovery of oil in Nigeria in 1960 signaled a new beginning for the Nigerian people (The Economist, 2014). There was indeed a change, but not as economists expected. Instead of the oil discovery leading to an increase in wealth for the Nigerian nation it instead marked the start of a period riddled with unrest, oil spills and economic downturn (Fagbadebo, 2007). Economists have frequently pointed out that other African countries which discovered natural resources , such as Sierra Leone's diamond mines in 1983 (Hirsch, 2001), gave rise to the term the Resource curse. (Mehlum, Moene, & Torvik, 2006) Due to the inherent instability of African countries the discovery of a valuable resource will come paired with violence and will over time result in stagnation of the already fragile economies within Africa.

In 1982, W. Max Corden and J. Peter Neary set out to explain why the Dutch economy weakened following the discovery of the largest gas fields in Europe in Groningen, The Netherlands. (Corden, 1984) Their research led them to describe what was coined by the Economist as the Dutch Disease Model, which describes that through market (resource movement effect) and financial mechanisms (spending effect) an exogenous shock in wealth can lead to a country being worse off after finding a natural resource. (The Economist, 2010) Researchers went on to alter the model such that it could be applied to developing countries and has since then been used to analyze a wide array of economic phenomenon, from the Saudi Arabian housing market (Looney, 1992) to the Sri Lankan gas crisis (Bandara, 1995). This paper will apply the Dutch Disease model to Nigeria which experienced oil shocks in the late 20th century to determine whether the Nigerian Economy stagnated because of political implications or because the Dutch Disease was present over this period. The research question that will be answered in this writing is therefore:

''Was the Dutch Disease present following the oil shocks Nigeria experienced in the late 20th century?''

This question contains social relevance as the presence of the Dutch Disease raises the ethical question whether oil exploration should continue at the cost of the Nigerian economy and the Nigerian people. (Khan, 1994) Until now, the major outcries of protest have used the oil spills as a tool to perhaps limit or even stop extraction within the Nigerian Delta (Watts, 2010) without much success. The Nigerian economy has become too dependent on oil exports and the investments of large multinational oil companies such as Shell, British Petroleum and Total. (Watts, 2010) Understanding the mechanism of the Dutch Disease could yield policies which counteract the effects and let the Nigerian people share in the wealth extracted from their country. (Khan, 1994) Regarding scientific relevance, although the Dutch Disease has already frequently been applied to developing countries, it has not yet been analyzed using regression analysis in Nigeria. This method of analysis allows other control variables to also be analyzed and to see whether certain policies such as having a fixed exchange rate have had any effect. (Looney, 1992) Existing literature has only ever examined the financial sector or other markets. (Struthers, 1990) This paper aims to examine both in order to then give an overall conclusion and give a more complete overview of the determinants and effects of the Dutch Disease.

It is concluded that under a fixed exchange rate regime the effect of the spending effect is nullified, while under a floating exchange rate there is a marginal appreciation indicative of the Dutch Disease. When a dummy is added to account for the change in exchange rate regime this result becomes insignificant while remaining significant itself, meaning a spurious regression was run. This means that when looking at the spending effect the Dutch Disease is not present. Regarding the resource movement effect, it is concluded that the contraction of the manufacturing sector following an oil shock suggests that the Dutch Disease is present. The agricultural sector however stays the same during the same oil shock, contradicting existing literature. (Bandara, 1995) This paper concludes that the assumption of perfect labor substitutability does not hold empirically meaning that laborers cannot freely migrate to the booming (oil) sector. When combining both the spending and resource movement effect, this paper argues in accordance with Balassa(1964), Samuelson (1964), Dornbusch (1980) and Edwards (1988) that when looking at an economic phenomena one should focus on the change in real economic fundamentals and not on financial markets as they're susceptible to monetary policies. (Dornbusch, 1976) Therefore, this paper concludes that the Dutch Disease was present following the 1998 to 2002 oil shock.

The theoretical and literature overview of this paper examines existing literature on the general Dutch Disease model and outlines the core model. Then literature applying the core model to developing countries is analyzed and certain assumptions in the core model are relaxed and some are added. From this model two separate effects are deduced, the spending effect and the resource movement effects and hypotheses will be formulated accordingly. In the results section, multiple regression equations are run for each effect with an oil shock simulated under a fixed exchange rate regime and under a floating exchange rate regime. The spending effect is analyzed and run in accordance with the Error Correction Model and Partial Adjustment model in order to be able to make inferences from the Nigerian exchange rate. (Malpezzi, 1999) The resource movement effect is analyzed using Ordinary Least squares and the hypotheses are answered. In the conclusion a statement is made taking into account all factors discussed throughout this writing.

2. Theoretical and literature overview

This section will first cover the general model of the Dutch Disease and explain the different causes and effects of the Disease. As existing literature is predominantly focused on explaining the effects of the Dutch Disease on developed countries this paper will make new assumptions and modify the model to fit a similar scenario but now applied to less economically developed countries (LDC). Having changed certain prerequisites and assumptions of the general model this paper then moves on to discuss the empirical aspect of testing for the Dutch Disease and the application of the results.

The Dutch Disease:

The term Dutch disease was initially used by the Economist during the 1970s and was used to describe the effects on the Dutch economy following the discovery of the 1959 Slochteren gas field discoveries in Groningen, The Netherlands. (Neary, 1982) The discovery of the largest natural gas field in Europe at that time was followed by a sharp appreciation of the Dutch Gulden which negatively impacted both the Dutch export industry and the manufacturing industry. (Copeland, 2005) This appreciation in the Gulden, according to Corden (Corden, 1984), was not the result of a natural appreciation in the nominal exchange rate. He instead argued that it was the result of an increase in wages in the manufacturing industry as a direct result of the discovery of gas. There are multiple theories which support such a claim, one of them being the Dutch Disease (Copeland, 2005)

Apart from the appreciation in currency, the Dutch Disease can also be witnessed through markets. (Copeland, 2005) Van Wijnbergen proposed that the shift in industries is caused by a wealth effect. (Wijnbergen, 1984) When the gas field was discovered, the country experienced an increase in wealth through an exogenous finding of a scarce resource. (Peter, 1982) This wealth was re-distributed to individuals by an increase in wages. (Corden, 1984) An increase in wages raises the amount of disposable income per household resulting in an increase in consumption and consequently a rise in domestic aggregate demand. (Maes, 1992) For a small open economy such as the Netherlands during the 1970s, the price of tradable goods was treated as given. (Magud & Sosa, 2010). The price of the non-tradable goods market clears the domestic economy, and the relative price of non-tradable goods increased. This, as explained earlier, put upward pressure on the Gulden and resulted in an appreciation of the real exchange rate. Throughout this paper a decrease of the real effective exchange rate will be treated as an appreciation of the exchange rate. (Copeland, 2005) An appreciation in the Gulden relative to other surrounding economies meant that Dutch tradable goods are relatively more expensive with respect to their foreign counterparts. (Copeland, 2005) This decreased demand for Dutch exports and consequently increased domestic demand for foreign products, increasing imports, both adding to the worsening current account at the time and also an overall slowdown of the Dutch Economy. (Wijnbergen, 1984) Since then, this phenomenon has been labeled the Dutch disease, where an exogenous shock in wealth can result in an overall decrease in Economic growth.

In order to model the causes and the effects of the Dutch disease, preceding literature has usually presented the model within an economy containing three sectors. (Corden, 1984) The first is described as the booming sector. This is the sector which has most benefited as a result of the exogenous shock. In terms of the Netherlands, this booming sector will for example include Royal Dutch Shell and the provincial entity of Groningen. The second sector mentioned is described as the lagging sector. The term lag is used because both the booming and the lagging sector produce tradable goods in this model, but in contrast to the booming sector the lagging sector will be affected indirectly through the exchange rate and demand for tradable goods. (Wijnbergen, 1984) This sector is used to describe the manufacturing sector or agriculture. The final sector depicted in a traditional Dutch Disease model is that of the non-tradable sector. This sector primarily consists of firms offering a service.

When applied to a developed country, goods produced by both tradable sectors (booming and lagging) can be considered to be perfect substitutes with respect to the goods available on the world market. (Olusi & Olagunju, 2005) Other assumptions include that output in each sector is produced by a factor which is specific to that sector and hence cannot be used in another sector. (Corden, 1984) The third assumption is that there's perfect labor mobility between the three sectors. This means that any wage discrepancies are non-existent as a higher wage in one sector will result in an increased supply of labor in that sector. This excess supply will result in a decrease in the wage in this sector and equalize wages across the three sectors. (Frank & Bernanke, 2011) This assumption is important in order for the wealth effect to be translated from the booming sector to the rest of the economy. Furthermore, wages and rent (prices of the factors of production (Kevin, Pesaran, & Smith, 1997)) are assumed to be initially inflexible. The final assumptions that are made is that both capital and labor are internationally immobile and perfect substitutes. This assumption means that the amount of labor and capital will be constant throughout the analyses of the model following an exogenous shock in wealth and are interchangeable. (Corden, 1984) Taking all these assumptions and the two mechanisms outlined previously into account, the Dutch Disease occurs as follows. After a discovery of resources or another exogenous shock in wealth, the booming sector will experience an increase in the aggregate income of the factors employed in this sector. This initial effect will result in two effects, the spending effect and the resource movement effect. (Corden, 1984) (Wijnbergen, 1984)

The spending effect:

The spending effect describes the impact of the additional revenue in the booming sector on the non-tradable goods sector. Applied specifically to the Dutch scenario, this increase in spending consisted of infrastructure and tools in order to extract the gas. (Lartey, 2008) Increased government spending on non-tradable items was largely financed by the increased tax revenue received by the government as a result of an increase in income within the booming sector. (Lartey, 2008) Under the assumption that the income elasticity of demand is positive for non-tradable goods, which is supported by Frank and Bernanke (Frank & Bernanke, 2011), combined with constant aggregate prices [1] will lead to an excess demand for non-tradable products and result in a higher price for non-tradable products relative to tradable sector products. Within the context of the model, the real exchange rate in this case

[1] In the previous section the assumption was made that the prices for tradable goods in the short run are constant.

is defined as the price of non-tradable products relative to that of tradable products. (Corden, 1984) The equation will be:

$$S_{Real\ exchange\ rate} = \frac{P_{\ T}}{P_{N.T}} \quad Equation\ 1.0$$

If now the relative price of non-tradable products increases ($P_{N.T}$) the real exchange rate will appreciate.[2] As the price of non-tradable products increase, this sector will become more profitable with respect to the tradable sectors. Therefore, this real appreciation in currency will result in resources being re-allocated from the tradable sector, both booming and lagging, to the non-tradable sector. This is known as the spending effect.

The resource movement effect:

The resource movement effect occurs due to the increase in the marginal product of labor in the booming industry. (Corden, 1984) After the exogenous shock in wealth occurs, the booming sector will demand more labor (Gylfason*, 2001). Recall that labor is internationally immobile and therefore labor is constant throughout. This means that labor will flow out of the lagging and non-tradable sector towards the booming sector. This movement can be subdivided into two separate processes:

Direct De-industrialization: This process describes the movement of labor from the lagging sector to the booming sector, resulting in a decrease in output in the lagging sector. (Mohsen, 1991) It is known as ‘‘Direct de-industrialization’’ as the movement of factors of production does not involve the non-tradable goods market and therefore doesn’t constitute an appreciation or depreciation in the real exchange rate which was defined as such previously.

Indirect De-industrialization: Is the movement of labor from the non-tradable goods sector to the booming sector under a constant real exchange rate. (Corden, 1984) In combination with the spending effect, this movement results in excess demand for non-tradable goods as the demand is no longer met as output decreases due to the outflow of labor. This will lead to an appreciation of the currency and a subsequent flow from labor from the lagging sector to the non-tradable sector in order to meet the excess demand, this effect amplifies the spending effect. The combined effects lead to a movement of labor from the lagging sector to the non-tradable sector and supplement the direct-industrialization resulting from the movement

[2] Recall that this paper defines a decrease in the exchange rate as an appreciation of the currency in accordance with existing literature on the British exchange rate notation. (Copeland, 2005)

between the lagged sectors to the booming sector. In summary, the output of the non-tradable sector can be higher or lower depending on the relative strength of the spending effect and the resource movement effect. When examined separately, the spending effect will result in an increase in output in the non-tradable sector. The resource movement effect will cause a decrease in the output of the non-tradable sector. (Peter, 1982)

The general (core) model of the Dutch Disease was initially written to describe the effects of the Dutch Disease on a developed economy. In order to apply the model to a less economically developed country (LDC) existing literature will be discussed in more depth and the main findings will be used to alter the model as to better simulate the average LDC.

The Dutch disease, empirical literature:

Existing literature can be divided into two main subgroups, literature describing the effect of the Dutch Disease on a developed economy and literature applying the Dutch Disease to a less developed country (LDC). Ellman (1981) was one of the first to apply this theory to a developed country and observed that at the time of gas exploitation in the Netherlands the manufacturing sector declined while at the same the service (non-tradable) sector expanded. (Corden, 1984)[3] However, during his research it became apparent that other western economies experienced a similar decline at the time, without any discovery of resources. Barker (1981) and Kremers (1985) used this finding to question the viability of concluding that there was a decrease in the size of the manufacturing industries because of the Dutch Disease. (Olusi & Olagunju, 2005)

Another noteworthy discovery of the implications of the Dutch Disease on developed countries was done by Michael L. Ross, who's research led to the discovery that between 1977 and 1980 the Real Effective Exchange Rate (REER) of the pound sterling appreciated by 54%. (Ross, 1999) Prior to the appreciation in the exchange rate the crude oil exploitation of newly discovered oil reserves commenced in 1975. Following the appreciation in the pound sterling there was a fall in manufacturing output of 14% in 1979. Ross therefore concluded that on the basis of these phenomena occurring in the chronological order as the general model of the Dutch Disease stipulates, that the Dutch Disease must be present. (Ross, 1999). Forsyth (1985) agrees that there is evidence to suggest that the Dutch Disease might

[3] Ellman's writings are not widely available and hence Corden, whom most frequently sourced and shared Ellman's views, is sourced instead.

be present but that it remains very difficult to measure the precise impact of a resource boom on the structural changes in the economy. (Bouza & Turnovsky, 2011)

As can be deduced from the two previous examples, there is no conclusive evidence that the appreciation of the exchange rate and the consequent changes in the markets can be purely attributed to the Dutch Disease. Balassa (1964), Samuelson (1964), Dornbusch (1980) and Edwards (1988) suggests that if a country's real effective exchange rate will radically appreciate it will result in clearly visible changes in the existing markets, but that this appreciation is mainly caused by changes in the real fundamentals in an economy and not changes in the financial sector as these alterations are subject to changes in monetary policy or also experience a lag before they affect the real economy and indirectly the real effective exchange rates. (Wijnbergen, 1984) This is one of the major reasons why there was an apparent shift in focus of applying the Dutch Disease to developed economies to less developed economies. According to the IFAD Rural Poverty Report 2011:

"Many LDCs remain heavily rural, and the agricultural sector continues to play a critical role".- (IFAD, 2011)

This is in sharp contrast to developed countries where the service industry, also known as the sector producing non-tradable goods in the general Dutch Disease model, is increasing in size relative to the tradable goods sector. (Worldbank, 2012) If the service sector increases in size relative to the tradable sectors, in this case the booming and the lagging sector, the effects of the Dutch Disease will not be as distinctively present. (Corden, 1984) To see why, imagine an economy which has just discovered a large new oil field. The non-tradable or service sector constitute 90% of the economy while the booming and lagging sector each make up 5% of the economy respectively. Under the normal assumptions of the Dutch Disease general model, an oil discovery will lead to an increase in revenue in the booming sector and consequently a rise in average income for the people employed in this sector. These people will demand more non-tradable products (more expensive service) resulting in an excess demand in the non-tradable sector. Market forces will push the price of non-tradable up relative to the price of tradable goods. The Exchange rate is defined as seen in equation 1.0, and a consequent rise in the price of non-tradable products will result in a decrease in the exchange rate also known as an appreciation of the exchange rate. However, since the economy now is dominated by the non-tradable sector any increased demand as a result of an increase of income for non-tradable goods will not lead to excess demand as it can be met with ease due to the potential production differential. Without this excess demand there will be no increase in price and a result no appreciation. This nullifies the spending effect and therefore decreases the degree to which the economy is affected by the Dutch Disease. (Wijnbergen, 1984) According to Kiminori Matsuyama it can therefore be concluded that the effects of the Dutch disease can be amplified by having an economy with a larger manufacturing sector, which is why literature moved on to examine the possible existence of the Dutch Disease on developing economies. (Matsuyama, 1992)

Existing literature on less economically developed countries has particular emphasis on the role of exchange rates in the Dutch Disease crowding out process. There has been a far less coherent verdict on whether the Dutch Disease influences developing economies. According to Yu-Chin Chen and Kenneth Rogoff this can be attributed partly to whether an economy has a weighted, fixed or purely floating exchange rate. (Chen & Rogoff, 2003) Warr (1985) and Roemer (1994) both investigated the effect of the increase in oil, mining and forestry activities during the early 1980s. Warr found that although the energy boom did have a distinct effect on the domestic price level in Indonesia, it was not clear whether it had an effect on the structure of the economy. (Suhardi, 2013) Roemer attributed this to the Indonesian government managing the exchange rate as to counteract the appreciation and subsequently nullify the negative effects of the Dutch Disease. (Roemer, 1995)

Looney went on to apply the theoretical model of the Dutch Disease to the Middle East for countries which have invested heavily in the private sector and modeled it as an exogenous shock in wealth, specifically Saudi Arabia (1989) and Kuwait (1991). In both cases it was noted that following the appreciation of currency, it actually resulted in a contraction of the industrial (booming) sector, instead of the expansion predicted by the core model. Looney stated that this contradiction was the result of effective government policy which could counteract the effects of the Dutch Disease (Looney, 1992)

Jazayeri (1986) conducted a similar study to that of Looney of both Iran and Nigeria during the post-1973 period. He shares Looney's view that the government's macroeconomic and sectorial policies can have an empirical effect on the outcome of the Dutch Disease. This finding suggests that the Dutch Disease can be counteracted through government policy, which is a phenomenon incorporated in this paper.

When examining existing literature which applies the Dutch Disease model to developing economies a number of distinct assumptions are made in order to model the Dutch Disease more accurately to the developing countries. In classical literature on developed economies, the tradable sectors are seen as the manufacturing (lagging) sector and the energy (booming) sector. In LDCs, these sectors are the agricultural sector and the *new* energy sector. When applying this new setting to the existing model, a boom in the new energy sector should, ceteris paribus, leads to a contraction of the agricultural sector. In this paper, the effect of an oil shock on both the manufacturing and agricultural sector will be modeled in order to verify this finding. The second assumption is that the spending effect can be offset or changed by means of government policy as was advocated by Looney and Roemer. (Looney, 1992) (Roemer, 1995)

3. Data and methodology:

Methodology and Empirical analysis:

This paper will use the core model of the Dutch Disease while taking into account the two modified assumptions. This paper aims to investigate whether there is sufficient evidence to conclude that the Dutch Disease was present in Nigeria over the period of 1980 to 2011 following the two oil shocks in 1980-185 and 1995-1999 respectively. In order to verify whether the Dutch Disease is present, the effect of both the spending and resource movement on the Nigerian economy will be analyzed using regression analysis. For the spending effect an auto distributed lag model (ADL) will be used, a regression equation which predicts the current value of a dependent variable using the current value(s) of the explanatory variables and the lag of the explanatory variables, which is the value of this variable in a past period. (Zellner & Palm, 1974) A subset of this theory will be used to interpret the regression equations, namely the partial adjustment model (PAM) and the error correction model (ECM). These will be elaborated in the following section.

ADL, PAM and ECM:

ADL, or auto distributed lag model aims to explain the dependent variable using the current values of the explanatory variables as well as the lagged explanatory variables. (Hill, Griffiths, & Lim, 2012) This is done for a multitude of reasons, the main being in order to attempt to make a variable stationary. (Hill, Griffiths, & Lim, 2012) Stationarity of a variable is a requirement to be able to accurately interpret a regression analysis and is satisfied when the following assumptions are fulfilled:

(i) $E[X_t] = u$

This constitutes that the expectation of our process $E[X_t]$ is equal to a constant (u) which is not a function of time.

(ii) $Var[X_t] = \sigma^2$

The second assumption is that the variance is constant where σ is not a function of time.

(iii) $Cov(X_t, X_{t+h}) = f(h) \neq g(t)$

This simply states that the covariance structure is not changing over time.

These three conditions together state that X_t comes from a specific data generating process *for all points in time*. Without these requirement interpretation of X_t will most probably be flawed. The two main reasons stationarity is required are:

a. $Y_t = \alpha + \beta X_t + \varepsilon_t$

To have a linear relationship between Y and X all series have to be stationary.

b. If all processes are stationary then the law of large numbers holds, which states that under a large sample there is normal distribution, and central limit theorem holds. (Hill, Griffiths, & Lim, 2012) This theorem states that if a repeated sample is taken from a population, if for each sample a sample mean is calculated, $\bar{X}$, then independent of the original population distribution the frequency distribution $\bar{X}$ will be *normally* distributed about the true population mean, u. This implies that the distribution of the population in fact is irrelevant, hence making inference much easier when it comes to analyzing regression equations. (Hill, Griffiths, & Lim, 2012)

Building on this original econometric literature, a multitude of models has been derived in order to make variables stationary in certain regression equations. Two of which will be discussed during this paper.

The Error Correction Model (ECM), a type of dynamic model, originates from the proposition that non-stationarity can be eliminated by *regressing the first difference of the dependent variable on the first difference of the independent variable.* (Engle & Granger, 1987)

$$\Delta Y_t = \partial_0 + \partial_1 \Delta X_t + v_t \ (Short\ run\ relationship)$$

Assuming that Y_t and X_t in themselves are I(1), non-stationary, means that their first differences are stationary, denoted by I(0). (Hill, Griffiths, & Lim, 2012) If however Y and X are co-integrated, meaning that there is a long term equilibrium of a given linear combination of X, such as an exchange rate, then the ECM model can be applied. This can be denoted as following:

$$Y^{Eq.} = \alpha + \beta X^{Eq.} + v_t \ (Long\ run\ relationship)$$

In order to incorporate the notion that Y_t can differ from its equilibrium value $Y^{Eq.}$, there can be some dependence on both X_t *but also* X_{t-1} *because* Y_t *can take time to react to changes in* X_t. Another assumption is made that there is a certain degree of dependence on lagged value of the dependent variable, Y_{t-1}, representing the time it takes for Y to adjust and denotes the degree of inertia present. Finally an error term v_t is included to capture any unexplained variance. Formally this can be represented as follows:

$$Y_t = C + \partial_1 X_t + \partial_2 X_{t-1} + uY_{t-1} + v_t$$

The problem with estimating this particular equation on an empiric level is twofold. First of all it does not explain the dynamics of Y and X, so there is a lack of economics content. (Hill, Griffiths, & Lim, 2012) A second reason is that if Y and X are in themselves non stationary then there is a high probability of running a spurious regression. (Hill, Griffiths, & Lim, 2012) This means that there is an omitted variable present which explains Y but that does not act through variable X. (Babbie, 2013) This is reflected by the fact that even if X and Y are completely unrelated they might still yield a statistically significant result for ∂_1 .

In order to address these problems this paper will use ECM. This model formally looks as follows:

$$Y_t - Y_{t-1} = C + \partial_1 X_t + \partial_2 X_{t-1} + (1-u)Y_{t-1} + v_t$$

This regression equation uses $(1-u)Y_{t-1}$ instead of uY_{t-1} to incorporate the fact that Y_{t-1} was deducted from both sides. This equation can be rewritten as:

$$\Delta Y_t = C + \partial_1 X_t + \partial_2 X_{t-1} + (1-u)Y_{t-1} + v_t$$

The change in Y_t (ΔY_t), as seen previously, is stationary (I(0)). In order to also make X_t and Y_{t-1} stationary (I(0)) the following transformation is applied:

$$\Delta Y_t = C + \partial_1 X_t - \partial_1 X_{t-1} + \partial_1 X_{t-1} + \partial_2 X_{t-1} + (1-u)Y_{t-1} + v_t$$

This can be further simplified to give:

$$\Delta Y_t = C' + \partial_1 \Delta X_t - \curlywedge (Y_{t-1} - \alpha - \beta\, X_{t-1}) + v_t$$

In this new equation $\curlywedge$ is a newly chosen parameter and the constant C becomes C prime (C'). The other terms are simplified as follows, $\curlywedge = (1-u)$ and $\beta = \frac{\partial_1 + \partial_2}{1-u}$.

The relationship between these variables allows for a number of important conclusions. The ΔY_t will be stationary (I(0)) given that Y_t is non-stationary to a degree of (I(1)) meaning that one difference has to be taken in order to make it stationary. The same applies to ΔX_t as a difference is taken between X_t and X_{t-1}. The term $- \curlywedge (Y_{t-1} - \alpha - \beta\, X_{t-1})$ however refers back to the long run relationship seen deduced previously: $Y^{Eq.} = \alpha + \beta X^{Eq.}$. Combining the two equations yields:

$$Y^{Eq.} - Y_{t-1} = \alpha + \beta\, X_{t-1}$$

In this case this term also constitutes the difference in Y. If the long run relationship between X and Y exists, the term $\curlywedge (Y_{t-1} - \alpha - \beta\, X_{t-1})$ is co-integrated, meaning its stationary. (Hill, Griffiths, & Lim, 2012) This is turn means that if the long run relationship exists and α and β are known, there will be no spurious regression which resolves one of the initial issues with estimating a non-stationary regression.

From an economic aspect, which will be elaborated most on during this paper, the following situation can take place:

$$y_{t-1} > \alpha + \ \beta\, X_{t-1}$$

This would mean that Y at that point in time is above its equilibrium function $Y^{Eq.}$. If Y is above its equilibrium value then the change is Y will be slightly negative as indicated by the term $- \curlywedge (Y_{t-1} - \alpha - \beta\, X_{t-1})$. Hence the error in the last period is adjusted in order to further tend towards the long run equilibrium value of Y. This error correction mechanism is the reason why the model is known as the error correction model, or ECM. Generally speaking:

$$\underbrace{\Delta Y_t = C' + \partial_1 \Delta X_t}_{Short\ run\ dynamics} \underbrace{- \curlywedge (Y_{t-1} - \alpha - \beta\, X_{t-1})}_{Long\ run\ dynamics} + v_t$$

The parameter $\curlywedge$, in general terms, denotes the rate at which Y_t adjusts to any disequilibria taking into accounting changes in short run and long run fundamentals. This paper uses ECM in order to determine the effect of an oil discovery and its subsequent exploitation on the long run real effective exchange rate of the Naira to the US dollar and whether its adjustment schedule is in line with ECM and classical Dutch disease literature.

A Partial Adjustment Model (PAM) uses a similar approach to the ECM model but differs in a few key ways. The regression equation looks as follows:

$$Y_t^{Eq.} = \alpha + \beta X_t + \varepsilon_t \ Eq\colon 1.A$$

The value of Y might differ from its equilibrium value $Y^{Eq.}$ due to a certain degree of inertia (θ) which can be modeled as:

$$Y_t - Y_{t-1} = \theta\left(Y_t^{Eq.} - Y_{t-1}\right) \ Eq\colon 1.\mathrm{B}$$

The addition PAM provides with respect to ECM is that it assumes that:

$$0 < \theta < 1$$

This gives a clear view as to how the adjustment mechanism operates. If for example $Y_t^{Eq.} > Y_{t-1}$ then θ will be positive as can be deduced from equation 1.B and consequently there will be a positive adjustment towards the long run equilibrium. However, as $\theta < 1$,there will only be a partial adjustment. (McManus, Nankervis, & Savin, 1994) This partial adjustment, also known as inertia (θ), can be caused by a multitude of factors. The most prominent in existing literature being habit formation and cost, meaning it's costly to move towards the equilibrium value. (McManus, Nankervis, & Savin, 1994) In order to create a functional equation $Y_t^{Eq.}$ in Eq. 1.B. is substituted for Eq. 1.A. This produces:

$$Y_t = \theta\alpha + \theta\beta X_t + \theta\varepsilon_t + (1-\theta)Y_{t-1} \qquad Eq.1.C$$

In functional form, this regression equation can be changed to:

$$\Delta Y_t = \partial_0 + \partial_1 X_t + \partial_2 Y_{t-1} + v_t \qquad Eq.1.D$$

Comparing equation 1.C and 1.D yields that:

$$\hat{\theta} = 1 - \widehat{\partial_2}$$

This means that the *estimated* rate of adjustment or inertia is equal to the negative OLS estimate of ∂_2. (McManus, Nankervis, & Savin, 1994) Parameter β can be estimated using: $\hat{\beta} = \frac{\widehat{\partial_1}}{1-\widehat{\partial_2}}$ *or* $\hat{\beta} = \frac{\widehat{\partial_1}}{\hat{\theta}}$ but this estimate will not be used in the regression analysis of this paper. This paper will use the PAM to estimate and explain the effect of an oil discovery and its subsequent exploitation on the Nigerian real effective exchange rate (REER) to determine whether the *spending effect* is present.

The spending effect:

The first step is to perform linear regression analysis (using OLS, Ordinary Least Squares) to determine whether there was an appreciation of the exchange rate following the oil discovery and subsequent exploitation in accordance with PAM and ECM. As explained in the theoretical overview, following an oil discovery the spending effect will result in an increase in the relative price of non-tradable goods due to excess demand. This in turn will lead to an appreciation of the exchange rate. This paper will treat an appreciation of the Nigerian Naira relative to the US dollar ($) as an indication of the Dutch disease being present. In order to test for this, regression analysis will be performed. The regressions equation will have the REER (Real effective exchange rate) as the dependent variable and the variance of the REER will be explained by independent variables which are key factors in the Nigerian economy. These independent variables will include control variables to account for an appreciation or depreciation of the Nigerian Naira that is not related to the discovery or exploitation of new oil fields. The independent variables that are used in accordance with the PAM and ECM will be discussed in the following section. All data and definitions were collected from the OECD and World Bank databases using DataStream. (Worldbank, 2012)

Regressions variables used to determine the spending effect:

Although OLS regression is performed, the equation in which it is run has to adhere to the form of ECM as specified in the previous sections. The equation will therefore look as following:

$$\Delta Y_t = C' + \partial_1 \Delta X_t - \measuredangle\, (Y_{t-1} + Y_{t-2} - \alpha - \beta\, X_{t-1}) + v_t$$

D(REER): The *dependent* variable in this regression equation will be D(REER), the difference between the real effective exchange rate of the Nigerian Naira to the US dollar ($)

as measured on an annual basis. The Real effective exchange rate in this paper is defined as the nominal effective exchange rate, which is a measure of the value of a currency against a weighted average of several foreign currencies, divided by a price deflator or index of costs, the consumer price index as calculated per basket of standard goods. This indicator is based on a nominal rate adjusted for relative changes in consumer prices. This variable gives an indication of the long run equilibrium path of the Nigerian Naira ($Y_t^{Eq.}$).

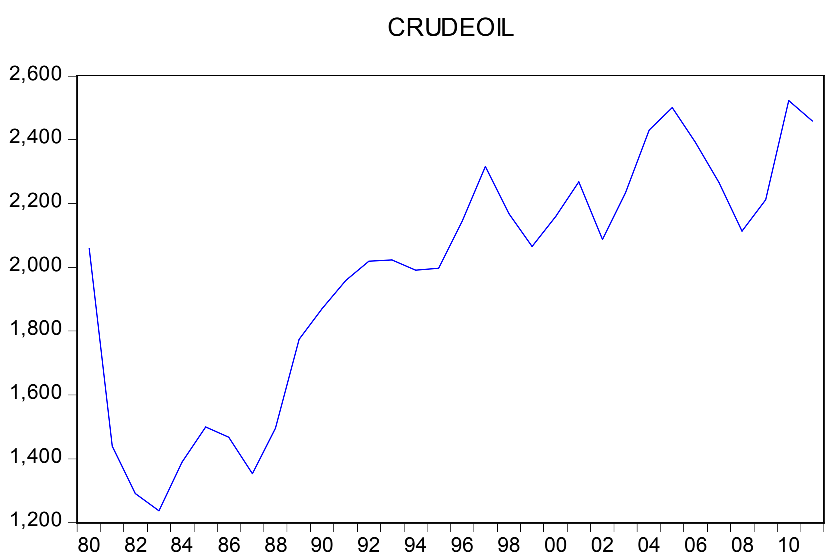
DREER(-1): The first difference of the real effective exchange rate as defined above. This variable in accordance with ECM literature denotes Y_{t-1}. The coefficient is expected to adhere to the following traits. If the Nigerian REER,$REER_t$, is above its equilibrium rate, $REER_t^{Eq.}$, then at first a positive shock is expected. However, as proposed by the PAM, because $\theta < 1$ there will only be a partial correction of the error, diverting the REER back to its long run equilibrium path, $REER_t^{Eq.}$. The opposite holds true when the REER is below its equilibrium rate.

REER(-2): The second lag of the absolute value of the real effective exchange rate as measured on an annual basis, denoted as Y_{t-2} in the ECM model. This is a modification from the original model but due to the limited amount of data points an additional lag is included in order to decrease any autocorrelation present. Autocorrelation, or serial correlation, in the context of this paper is defined as the correlation between the current REER and the lagged value of the REER(-1). (Hill, Griffiths, & Lim, 2012) If the correlation is statistically significant then OLS is no longer the best linear unbiased estimator (BLUE) and alternatives should be considered. (Hill, Griffiths, & Lim, 2012) This paper aims to use OLS and hence wishes to limit any autocorrelation present. The coefficient is expected to be negative as predicted by the PAM. For example, if the REER is above its long run equilibrium position, and as explained previously, the first lag will make the REER increase but only partially. However, after two periods the exchange rate is expected to fall towards its long run position and hence the coefficient of Y_{t-2} is anticipated to be negative and vice versa.

Dgdpgrowth: This variable is defined as the change in the annual percentage growth rate of GDP (or change in the logged gross domestic product) at market prices based on the constant local currency, the Nigerian Naira. GDP is the sum of gross value added by all resident producers in the economy. It is calculated without making deductions for depreciation. The sign of this coefficient is expected to be negative, as an economy grows, generally speaking, so do its exports. (Krugman, 2006) As the amount of exports increase the demand for domestic currency increases and hence the currency appreciates. (Copeland, 2005) This is reflected by the negative sign of this coefficient.

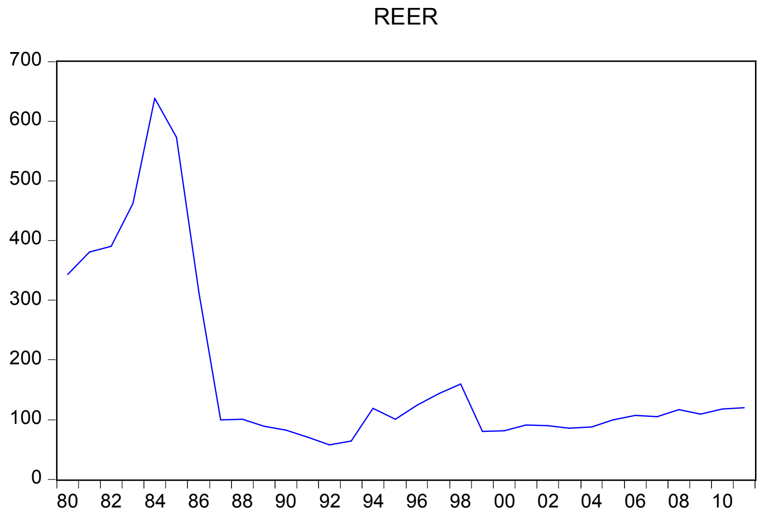
Gdpgrowth(-1): This variable constitutes the lagged change in Nigeria's percentage growth in gross domestic product (GDP) as measured on an annual basis. This data was calculated according to the methodology described in the outline of *Dgdpgrowth.* The sign of this coefficient is anticipated to again be negative. If the Nigerian economy grew last period there is a high probability of that resulting in a lagged effect of an increase in exports in the present period and an appreciation of the Nigerian Naira, signified by a negative coefficient sign.

Dummy for oil 1980-1985: This independent dummy variable is used to simulate the increase in production following an oil discovery within Nigeria. At the beginning of the 1980s, an increase in oil extraction occured following not only a range of oil discoveries in the delta near Port Harcourt but also the permits granted by the Nigerian government to start extraction at these sites. (U.S. Energy Information Administration , 2013)



Graph 1.1(y-axis denotes the number of barrels per day ,x-axis denotes the number of years).

However, as seen in graph 1.1, which reflects the total number of barrels extracted by British Petroleum (BP) on a daily basis, production dropped during 1980-1982. This is attributable to monetary policy as a change occurred from a fixed or pegged exchange rate against the pound to a semi floating exchange rate. This meant that in absolute terms the Nigerian Naira appreciated against the currency the barrels were sold for, meaning it was more expensive to export and led to a fall in the number of barrels extracted daily. (Copeland, 2005)

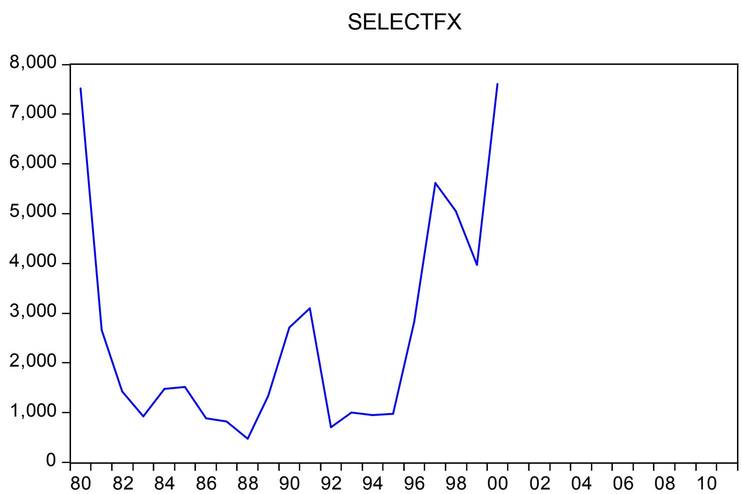


Graph 1.2 (Y-axis denotes the real effective exchange rate, x-axis denotes the number of years).

This effect combined with political instability and refocused efforts for exploration rather than exploitation resulted in a drop of the number of barrels extracted by BP, which will be used as a proximate as it characterizes the entire oil industry in Nigeria at that time. (U.S. Energy Information Administration , 2013) Following this decline the Nigerian government issued permits to start drilling at the new sites (U.S. Energy Information Administration , 2013) and this resulted in the characteristic peak observed in graph 1.1 during the period 1983-1985. This process typifies an oil finding which subsequently can be modeled as an exogenous shock in wealth as described in classical Dutch Disease literature. (Corden, 1984) The dummy will therefore range from 1980-1985 to incorporate the entire process and will be used in order to determine whether its variance contributes towards explaining a change in the real effective exchange rate. From 1980 to 1985 when the oil shock is modeled the Nigerian Naira is still pegged to the British pound and various other currencies. As explained in the theoretical framework, the spending effect is expected to be nullified under a fixed or pegged exchange rate. (Looney, 1992) This is why the expected coefficient sign is *positive or close to zero*. If positive it can be indicative of the Dornbusch overshooting phenomenon, but this will be touched upon in the result section whilst analyzing the regression output. (Dornbusch, 1976)

Dummy for oil 1995-1999: Having changed from a fixed to a floating exchange rate during 1985, the Nigerian naira has reached a new equilibrium level within it fluctuates following the increase in oil production. (Copeland, 2005) When comparing graph 1.1 with 1.2 this becomes apparent and can be explained using simple exchange rate economic theory.

Assuming that the majority of oil found is exported (U.S. Energy Information Administration , 2013), the increase in a given country's exports will increase the demand for its currency. (Copeland, 2005) Although most oil is purchased in dollars, it still has a significant influence on the domestic currency as the foreign currency trickles down through the economy and is exchanged for the Nigerian Naira and increasing aggregate demand indirectly. (Copeland, 2005) This is illustrated in graph 1.3.



Graph 1.3 (y-axis denotes the level of foreign reserves, the x-axis denotes the number of years).

Following both the increased production of oil barrels in 1980-1985 and 1990-1995 a lagged effect takes place in the economy, namely the trickling down of foreign currency through the markets. The peaks in 1990 and 1997 signify the increased amount of foreign currency reserves by the Nigerian government as a result of the exports of crude oil and getting foreign currency in return. When comparing graph 1.1 to graph 1.2 note that during 1995, a peak in the number of barrels a day using the BP oil proxy is observed, while at the same time the real effective exchange rate is experiencing an appreciation. This is characteristic of the Dutch Disease effect and supports the decision to model a dummy for the period of 1995 to 1999. The sign of the coefficient is predicted to be *negative* as now the Nigerian Naira is subject to a floating exchange rate regime. This makes it liable to change in market fundamentals as outlined in classical Dutch Disease literature leading to an appreciation of the currency as a result of the spending effect. The hypotheses for the spending effect are:

Hypothesis spending effect:

H_0: $There\ will\ be\ no\ change\ in\ the\ Real\ Effective\ Exchange\ Rate\ after\ an\ oil\ shock.$

H_1: $Following\ an\ oil\ shock\ there\ will\ be\ an\ appreciation\ in\ the\ Real\ Effective\ Exchange\ Rate.$

The resource movement effect:

Balassa(1964), Samuelson (1964), Dornbusch (1980) and Edwards (1988) propose that the exchange rate appreciates as a result of a change in economic fundamentals and not financial markets as they are also affected by monetary policies and have a lagged effect on the real economy. This is why, in addition to examining a change in the exchange rate of the Naira to the dollar, this paper will also investigate the market changes triggered by the resource movement effect. As explained earlier, the net outcome of this effect is that there will be an outflow of labor from the lagging and non-tradable sector towards the booming sector under the assumption that the amount of labor in the economy is fixed in the short run.

In the context of Nigeria, the lagging sector will be defined as the agricultural and manufacturing sector. Both sectors will be examined to determine whether existing Dutch Disease literature on developing economies has used a plausible assumption of agricultural being the lagged sector and whether labor is perfectly substitutable . The non-tradable sector will be treated as the service industry in Nigeria. However, due to the relatively small size of the service industry in Nigeria this paper assumes that the effect on this sector is negligible. (U.S. Energy Information Administration , 2013) The final assumption made is that the Nigerian economy only consists of these three sectors and that labor is fixed.

In order to investigate the effect of an oil shock on the Nigerian economy, the market mechanism as postulated by the Dutch Disease core model is examined. One such effect is that due to the resource movement effect labor flows from the agricultural and manufacturing sector towards the booming sector which in this case is the oil industry. Two OLS regression equations will be run. The first equation measures the effect of an oil shock on the agricultural sector while controlling for a number of variables. The second equation models the effect of an oil shock on the manufacturing sector. All data and definitions are taken from OECD and World Bank databases using DataStream. (Worldbank, 2012) The dependent and independent variables used for both equations are as follows:

Manufacturing (dependent): This variable is measured as the value added of the manufacturing sector by adding up all outputs and subtracting intermediate inputs, calculated without making deductions for depreciation. Data is measured in U.S. dollars ($) according to the current exchange rate. This data was obtained from the world bank and the OECD national account data files.

Agriculture (dependent): As a proximate for total agriculture within Nigeria this paper will use the aggregate amount of permanent arable land measured in hectares. The world bank and OECD defined this variable as following:

"Agricultural land refers to the share of land area that is arable, under permanent crops, and under permanent pastures. Arable land includes land defined by the FAO as land under temporary crops (double-cropped areas are counted once), temporary meadows for mowing or for pasture, land under market or kitchen gardens, and land temporarily fallow. Land abandoned as a result of shifting cultivation is excluded. Land under permanent crops is land cultivated with crops that occupy the land for long periods and need not be replanted after each harvest"- (Worldbank, 2012)

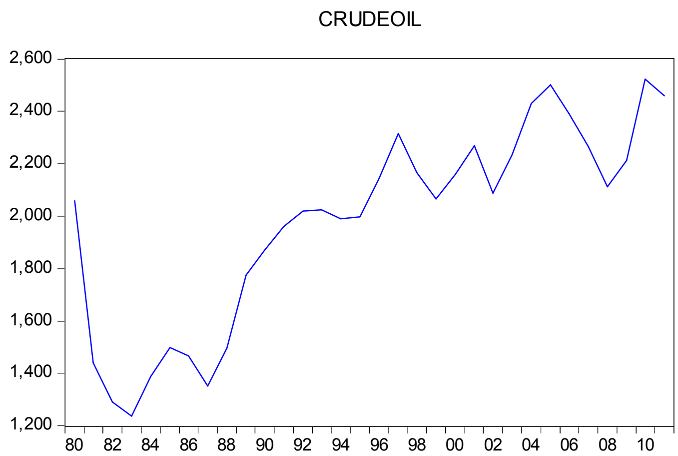
This specific definition shows that permanent land requires constant care and is therefore a good estimator for the amount of labor devoted towards the agricultural sector. Alternative measures such as the number of people employed in the agricultural sector is more liable to be both inaccurate and invalid. Inaccuracies occur due to measurement errors and the use of unregistered child labor. (Kuijs, 1998). Its lacking validity also originates from cross-contamination between sectors of the economy. (Kuijs, 1998) Nigerian farmers often engage in other sectors of the economy conducting activities such as fishing and producing intermediate cotton goods (Kuijs, 1998). This results in an inaccurate representation of the amount of labor present in the agricultural workforce. These measurement issues are limited as the amount of permanent agricultural land accurately approximates the share of labor devoted towards agriculture.

The actual lagged value of the gross domestic product: An independent variable used is Nigeria's GDP, gross domestic product, defined as the purchaser's prices of the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant 2000 U.S. dollars meaning that dollar figures for GDP are converted from domestic currencies using $2000 measured at the current exchange rates. As the GDP is an indicator of an economy, an increase in this measure usually means the sectors that compose it are also doing well. (Frank & Bernanke, 2011) Therefore the sign of this coefficient is expected to be positive.

Crude oil: This variable is used to reflect the activity level of oil production within Nigeria as measured in the number of Barrels of oil extracted per day. The data was collected from British Petroleum (BP) data records of activities within Nigeria. This variable is included in order to account for any deviations in oil extractions not attributable to the oil shock. The sign of this coefficient is expected to be negative due to the resource movement effect outlined at the beginning of this section.

Openness: McKinnon's openness criterion is most often applied during the analysis of optimum trading areas and the effectiveness of exchange rates as a policy measure. (Maes, 1992) This criterion uses the equation $\frac{(Import+export)}{(GDP)}$ in order to estimate the degree to which an economy is exposed to external influences, and it is also an effective indicator of the amount of trade a country conducts relative to its economies size. The variables import and export are, similarly to GDP, measured as a constant of 2000 U.S. dollars and taken from the world data bank and OECD national data files. Developing countries are generally very reliant on the exports to foreign countries. (Adenauer & Vagassky, 1998) The sign of this coefficient is expected to be positive.

Oil dummy 1998-2002: In order to estimate the effect of an oil shock on the amount of labor allocated towards the agriculture and manufacturing sector, assuming that the total amount of labor in the economy remains constant, an oil dummy is used to replicate such an oil shock. The years 1998 to 2002 require a value of one to signify that the oil was discovered and exploited at that time, while the remaining years get a value of zero. This five year period was chosen to investigate the sudden increase in oil production as can be observed from graph 1.4:



Graph 1.4 (y-axis denotes the number of barrels per day, the y-axis denotes the number of years).

The peak in 2001 at 2268 barrels per day is in sharp contrast to the level at 1999 at which only 2066 were extracted. This motivates the decision to model this time period as an exogenous shock in wealth and determine whether it had an effect on both the manufacturing as well as the agricultural sector. The sign of the coefficient is expected to be negative due to the resource movement effect. The hypotheses for the resource movement effect are formulated as:

Hypothesis resource movement effect:

Manufacturing:

$H_0: There\ will\ be\ no\ change\ in\ labor\ in\ the\ manufacturing\ sector\ following\ an\ oil\ shock$

$H_1: Following\ an\ oil\ shock\ there\ will\ be\ a\ decrease\ in\ labour\ in\ the\ manufacturing\ sector$

Agriculture:

$H_0: There\ will\ be\ no\ change\ in\ labor\ in\ the\ agricultural\ sector\ following\ an\ oil\ shock$

$H_1: Following\ an\ oil\ shock\ there\ will\ be\ a\ decrease\ in\ labour\ in\ the\ agricultural\ sector$

In the following section the results to the abovementioned hypotheses will be discussed. All analysis is conducted using a confidence level of 10% due to the low amount of data points. (Hill, Griffiths, & Lim, 2012).

4. Results

Spending effect results:

In order to determine whether the Dutch Disease was present in Nigeria following an exogenous shock in wealth the following regression equations were performed:

Model 1:

$$D(REER) = \alpha + \partial_1 DREER(-1) + \partial_2 REER(-2) + \measuredangle\, Dgdpgrowth + \beta Gdpgrowth(-1) + \Omega Oildummy1980s + v_t$$

Model 2:

$$D(REER) = \alpha + \partial_1 DREER(-1) + \partial_2 REER(-2) + \measuredangle\, Dgdpgrowth + \beta Gdpgrowth(-1) + \Omega Oildummy1990s + v_t$$

Where:

D(REER) : The annual difference between the Nigerian Naira's Real Effective Exchange Rate.

DREER(-1): The annual lagged difference between the Nigerian Naira's Real Effective Exchange Rate.

REER(-2): The Nigerian Naira's Real effective exchange rate with respect to the US dollar lagged by two periods.

Dgdpgrowth: The annual difference in the percentage GDP growth of the Nigerian economy.

Gdpgrowth(-1): The change in Nigeria's percentage growth in GDP lagged by one period.

Oildummy1980s: A dummy simulating an oil discovery and subsequent exploitation during the period 1980 to 1985.

Oildummy1990s: A dummy simulating an oil discovery and subsequent exploitation during the period 1995 to 1999.

Regime: A dummy variable portraying the change in exchange rate regime in 1986 by denoting all years between 1980 to 1985 with a value of one and the remaining years with a value of zero.

Running the regression equations yields the following results:

Table 1.	Model 1:	Model 2:	Model 3:
α	58.0 *0.00*	105 *0.00*	52.0 *0.03*
DREER(-1)	-0.39 *0.02*	0.20 *0.02*	-0.42 *0.02*
REER(-2)	-0.58 *0.00*	-0.35 *0.00*	-0.58 *0.00*
Dgdpgrowth	-1.69 *0.40*	-4.77 *0.10*	-1.35 *0.54*
Gdpgrowth(-1)	0.18 *0.95*	-10.8 *0.02*	1.01 *0.77*
Oildummy1980s	257 *0.00*	N/A	N/A
Regime	N/A	N/A	270 *0.00*
Oildummy1990s	N/A	-52.3 *0.07*	10.5 *0.67*
R^2	0.79	0.59	0.79

1. First number indicates the coefficient of the variable.
2. Second number indicates the p-value of the variable.
3. N/A: Not applicable to this regression equation.

Before evaluating the coefficients, first the fit of each model is examined. As seen in table 1, model 1 has an R-squared value of 0.79. Meaning that 79% of the variation of D(REER) can be attributed to the explanatory variables used in the regression equation. In order to verify that all the regression assumptions of OLS hold, various residual and stability tests are performed. After performing a Breusch Pagan Godfrey test, it may be inferred from table B.1[4] that the residuals are not heteroskedastic. As these regression equations both only consist of 31 observations before being lagged, there is a high chance of autocorrelation. To test for serial-correlation a Breusch Godfrey test is performed and as can be seen from table B.1 there is some serial correlation present but not statistically significant. A Jarque-Bera test

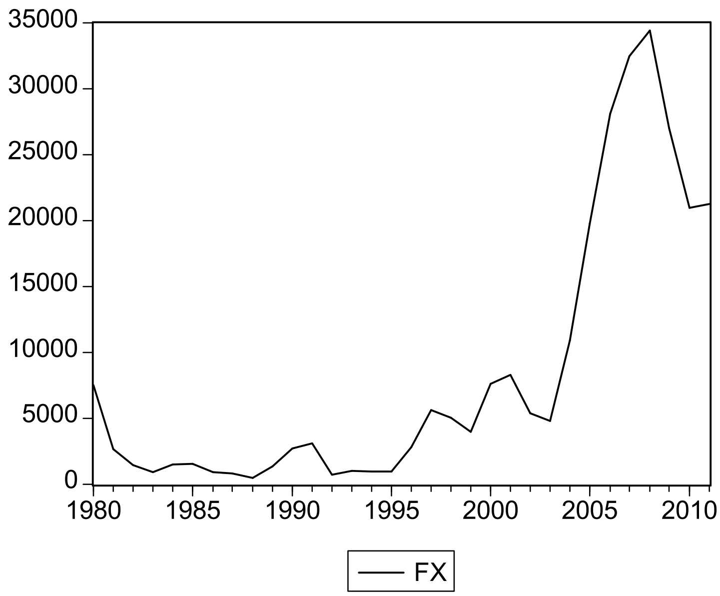
[4] See Appendix

for normality shows that the residuals are normally distributed. Finally a Ramsey RESET test for mis-specification is performed. As seen from table B.1 there is no mis-specification for model 1. The coefficients of both models will now be discussed and the hypotheses surrounding the Dutch Disease spending effect can be evaluated in accordance with the Partial adjustment model (PAM) and Error Correction Model (ECM).

This paper will elaborate on the model 1 first, modelling an oil shock from the period 1980 to 1985. In order to be able to compare both models the same variables and coefficients are examined, despite some being insignificant. As proposed by Econometrics literature, drawing valid inference from the constant is inaccurate (Babbie, 2013), which is a view shared by this paper. As proposed by the ECM, the Nigerian REER follows a long run equilibrium path: $Y^{Eq.} = \alpha + \beta X^{Eq.} + v_t$. the coefficient of *DREER(-1)* is statistically significant at a value of -0.39, suggesting the REER is below its long run equilibrium or has *appreciated* at a faster rate as predicted in accordance with its equilibrium path. The Partial Equilibrium model now predicts a positive deviation towards the equilibrium byθ, where $0 < \theta < 1$. However, as seen in table 1, *REER(-2)* takes a value of -0.58 and is highly significant. This suggests that the REER would continue diverging from its equilibrium value and is therefore not in accordance with the ECM or PAM model. An explanation for this phenomenon could be sought in the limited amount of data, a perhaps more plausible explanation could be the existence of a spurious variable, such as government policy, that influences the relationship between REER and its lagged values. (Babbie, 2013) Although both *Dgdpgrowth* and *Gdpgrowth(-1)* are statistically insignificant, their signs will be interpreted for the sake of homogeneity in the analysis. *Dgdpgrowth* takes a value of -1.69 suggesting that as there is a positive increase in the difference of the rate at which the Nigerian economy grows the REER will decrease, or appreciate. This view is supported by literature on exchange rates. As an economy performs better more of its currency will be demanded and hence an appreciation will follow. (Copeland, 2005) The variable *Gdpgrowth(-1)* takes a value of 0.18. Although highly insignificant, this figure suggests that the lagged effect has hardly any influence on the economy as its effect has dissipated over time.

To answer the *spending effect hypothesis* requires the inference of the oil dummy for 1980 to 1985 (*Oildummy1980s)*. As seen in table 1, this explanatory variable takes a value of 257 and is statistically highly significant. The core Dutch Disease model predicts that as a result of an increase in oil extraction, modelled as an exogenous shock in wealth, the price of non-tradable goods will increase due to excess demand leading to an appreciation of the currency.

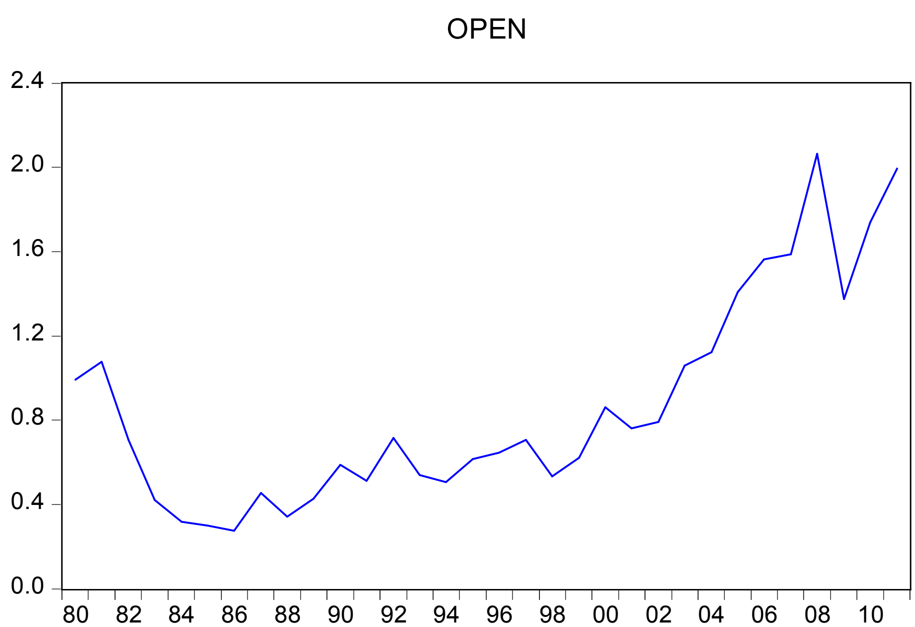
The positive value taken of the dummy is therefore not in accordance with the Dutch Disease model's predictions. A possible explanation for this phenomenon is that because of the fixed exchange rate regime the Naira was unable to appreciate or depreciate in order for the financial sector to have an effect on the real sector of the economy. This is a similar to Looney's conclusion when applying the Dutch Disease to the Middle East. (Looney, 1992) The Nigerian government's active policy measures are reflected in the level of foreign reserves which they hold.



Graph 1.5 (y-axis denotes the level of foreign reserves; the x-axis denotes the number of years).

As reflected by graph 1.5, the amount of foreign currency held in the period of 1980 to 1985 is relatively low. This could suggest the active use of monetary policy in order to keep the Nigerian Naira stable with respect to the US Dollar by selling domestic currency to counteract an appreciation and to purchase domestic currency to counteract a deprecation of the Nigerian Naira. (Copeland, 2005) The magnitude with which the currency depreciates following an oil shock, evident by the size of the coefficient, suggests that the Dornbusch overshooting phenomenon could be present. (Dornbusch, 1976) According to this model, monetary policy to counteract may overshoot the desired equilibrium because prices are inert in the short run while the prices of currencies (exchange rates) are flexible. The resulting adjustment lags in sections of the economy can induce compensating volatility in other sectors. This especially occurs when an exogenous variable changes, such as a change in the amount of oil reserves an economy possesses. (Dornbusch, 1976) This results in the short run effects being greater than the long run effects, leading to the overshooting phenomenon. In the context of this paper, this means that as the Nigerian government sells Nigerian Naira in exchange for US dollars to counteract an appreciation in the domestic currency, the effect can be amplified in such a way that the Naira depreciates too much. This result is captured in the fact that the coefficient of the dummy has a large positive value.

This paper will now move on to examine the effect of an oil shock on the REER using the 2nd model. To verify whether the regression run is a BLUE (Best Linear Unbiased) estimator, (Hill, Griffiths, & Lim, 2012), again the various stability and residual tests are performed. As can be seen in table B.2 the data is not heteroskedastic, has normally distributed residuals, auto correlated but not statistically significant, but more importantly not mis-specified which was the case when examining the oil shock during the 1980s. A probable explanation for this occurrence is the switch to a floating exchange rate policy in 1986 by the Nigerian government, this can however only be concluded after examining the coefficient of the oil dummy covering the oil shock in 1995 to 1999. The decreased R-squared value cannot be attributed to a change in the number of variables used as some literature suggests as this is kept constant. (Babbie, 2013) A possible explanation for the drop to about 59% could be that because of the floating exchange rate the Nigerian economy is more liable to external influences (Copeland, 2005), for example oil prices set by OPEC (Organization of the Petroleum Exporting Countries).



Graph 1.6 (y-axis denotes the McKinnon's openness criterion).

Furthermore, graph 1.5 highlights that with respect to 1985 the McKinnon's openness criterion has increased considerably. This suggests that the Nigerian economy has become increasingly interdependent on other economies, which means that the variation in the Real Effective Exchange rate is also progressively becoming more dependent on external factors, hence the decreased R-squared value. The independent variables will now be analyzed.

As can be seen in table 1, the coefficient of the lagged difference of the real effective exchange rate has a value of 0.2 and is significant at a 10% level. The fact that the coefficient is positive suggests that the exchange rate is currently above its long run equilibrium, this is a finding that contrasts to the period of 1980-1985. Under a floating exchange rate regime more volatility is expected compared to the period under a fixed exchange rate regime and hence also more likely to deviate from its equilibrium path. (Copeland, 2005) The ECM model now predicts a partial adjustment as $\theta < 1$. This prediction is supported by the data as θ is equal to 0.2 meaning that the after one period the REER continues to depreciate (increase in absolute terms) but at a diminishing rate. (Engle & Granger, 1987) The Error Correction Model now predicts a decrease (appreciation) of the REER to revert back to its long run equilibrium. Table 1 shows that the second lag of the REER has a value of -0.5 and is in line with the predictions of both the ECM and PAM. In the second period following the disequilibrium in the exchange rate of the Nigerian Naira the currency reverts back to its long run equilibrium. A plausible explanation why ECM holds in model 2 but not in model 1 can again be traced back to the fact that now the exchange rate is floating. As advocated by Looney, a way of counteracting the Dutch Disease is by managing the exchange rate through the purchasing and selling of reserves. If this is not the case and the exchange rate is purely managed through market fundamentals then theories built to predict the path of freely moving long run equilibria are then also more likely to hold empirically. (Copeland, 2005)

The difference in GDP growth further supports the idea that under the floating regime a change in the exchange rate has a direct effect on the real economy, whether through market fundamentals or monetary markets. (Adenauer & Vagassky, 1998) If the percentage change at which the GDP rises increases, then the REER is expected to appreciate. This prediction coincides with this paper's finding as the coefficient takes a value of -4.77 and is marginally significant at a 10% level. It's interesting to note that the lagged value of GDP growth has both a larger coefficient size at -10.78 and is highly significant. This finding suggests that a change in the financial markets have a lagged effect on the real economy, which is a recurring conclusion drawn in present literature. (Copeland, 2005)

The oil dummy simulating the oil shock from 1995 to 1999 will now be analyzed. This explanatory variable is statistically significant at a 10% level and has a coefficient of -52.3 signifying that when this oil shock occurred the Nigerian Naira appreciated with respect to the US Dollar. This is in line with the predictions of the spending effect, as the price of non-tradable goods increased relative to tradable goods due to excess demand the currency will appreciate or decrease in absolute terms. *This finding would suggest that the Dutch Disease was present in Nigeria following the 1995-1999 oil shock.* However, it is important to note that the probability of running a spurious regression in this case is high due to two reasons. First of all, the decrease in R-squared signals that there might be other variables which explain the variation in the Nigerian Real effective Exchange rate. The second reason was outlined during the description of the Error Correction model. When performing a regression equation which includes the first lagged difference and second lag of the dependent variable whilst only including a single control variable (GDP growth) the chance of running a spurious regression is high. A recurring trend throughout this paper has been that many changes in the REER can be attributed to the change in exchange rate regime. Therefore, the following regression equation is performed:

$$D(REER) = \alpha + \partial_1 DREER(-1) + \partial_2 REER(-2) + \measuredangle\, Dgdpgrowth + \beta Gdpgrowth(-1) + \Omega Oildummy1990s + Regime + v_t$$

The regime dummy models the change in regime during 1986, where the years 1980 to 1985 get assigned a value of one to account for this while the remaining years are given a value of zero. The results of this regression are depicted in table 1 under model 3, which adheres to all the assumptions of OLS as seen in table B.3. The first noteworthy observation is the increased R-squared value of 0.79, depicting that this model explains more of the variance in the REER then model 2. Furthermore, the predictions of the ECM and PAM no longer hold as both the lagged first difference as well as the second lag of the REER are negative, limiting any inference from these coefficients. The independent variables using GDP growth both become statistically insignificant at a 10% confidence level despite the R-squared value of the model increasing. This suggests that the regime dummy has a high degree of explanatory power. The main finding of interest to this paper is that the regime dummy renders the oil dummy for the period of 1995 to 1999 statistically insignificant while being highly significant itself. These findings suggest that the regime dummy can most likely be viewed as a spurious or omitted variable. (Hill, Griffiths, & Lim, 2012) (Babbie, 2013)

This paper makes the following inference from these observations. The regression equation examining the oil shock over the 1980s yields inconclusive evidence due to policies by the Nigerian government to keep the Naira fixed. It was however established that the effects of the spending effect can be reduced through policy, which is in accordance with Looneys previous findings. This paper then moved on to examine the effect of an oil shock under a floating exchange rate regime from 1995-1999. Under this model both the Error Correction Model and the Partial Adjustment model hold and are reflected by the sign of the coefficients which are statistically significant at 10%. Due to the low R-squared value and assumptions made in the ECM and PAM a regime dummy was introduced in order to account for a potential omitted variable. The regime dummy rendered the oil dummy to become insignificant while increased the R-squared value of the model which suggests the possibility of it indeed being an omitted variable. *This paper therefore concludes that there is insufficient evidence to reject the null hypothesis in favor of the alternative hypothesis of the spending effect being present despite the findings following the oil shock in 1995 to 1999.*

The resource movement effect:

In order to determine whether the resource movement effect is present the following regression equations are run:

Model 4:

$$Manufacturing = C + \partial_1 Crudeoil + \partial_2 Open(-1) + \measuredangle\, GDP(-1) + \beta Oildummy9802 + \varepsilon_t$$

Model 5:

$$Agriculture = C + \partial_1 Crudeoil + \partial_2 Open(-1) + \measuredangle\, GDP(-1) + \beta Oildummy9802 + \varepsilon_t$$

Where:

Manufacturing: The value added of this sector using the current US dollar exchange rate.

Agriculture: The total amount of permanent arable land within Nigeria measured in hectares.

Crudeoil: The amount of barrels extracted on a daily basis.

Open(-1): The lagged value of McKinnon's Openness criterion.

GDP(-1): The lagged value of Nigeria's gross domestic product measured as a constant of 2000 US dollars.

Oildummy9802: A dummy simulating an oil shock and subsequent discovery from 1998 to 2002.

Running both regression equations yields the following results:

Table 2.	Model 4:	Model 5:
C	392073154 *0.00*	2604 *0.84*
Crudeoil	-284487 *0.00*	-25 *0.03*
Open(-1)	271361772 *0.00*	-12577 *0.28*
GDP(-1)	0.01 *0.00*	1506822 *0.00*
Oildummy9802	-157821506 *0.00*	10054 *0.11*
R^2	0.92	0.62

1. First number indicates the coefficient of the variable.
2. Second number indicates the p-value of the variable.

As before, the fit of each model is examined. Table 2 indicates that Model 4 has a fit of 0.92, meaning that 92% of the variation in manufacturing is explained by the independent variables included in the regression analysis. For model 5 the value for R-square is 62%, even though it's lower the model still yields significant results and both models will be analysed consequently. In order to verify that this OLS regression is a BLUE estimator, various residual and stability tests are performed. Table B.4 shows that model 4 is heteroskedastic, autocorrelation is present and the model is mis-specified. Although not adhering to the OLS assumptions, the sole purpose of this analysis is to investigate the sign of the oil dummies. These are not likely to change when more data points are available and hence this paper will infer as such. (Hill, Griffiths, & Lim, 2012) The coefficients of the 4th model will now be discussed in order to be able to evaluate the *resource movement hypothesis*.

Homogenous with preceding analysis, there will be no inference drawn from the constant in model 4 despite its high level of statistical significance. (Babbie, 2013) The variable crude oil has a coefficient of -284487 and is statistically highly significant at a 10% confidence level.

From this finding it can be deduced that as there is an increase in the number of oil barrels extracted on a daily basis then there will be a decrease in the absolute value added of the manufacturing sector. This is in line with the Dutch Disease model which predicts that because of the resource movement effect, through direct-industrialization, labour will shift from the manufacturing sector towards the booming oil sector. This is reflected in this result as the decreased amount of labour results in a fall of the value added of the sector with respect to the previous year.

The lagged openness of Nigeria has a coefficient size of 271361772 and is highly statistically significant. Its large magnitude suggests that there's a large interdependence between the manufacturing industry and the degree to which Nigeria exports and imports goods relative which makes it a very sensitive independent variable. As the degree of openness increases the manufacturing sector thrives, seeming to suggest that a large portion of the finished goods are exported or that a large share of the raw materials need to be imported. (Maes, 1992) Although Dutch Disease literature makes no mention of this relationship, it's important to control for this variable to omit the possibility of running a spurious regression.

The explanatory variable describing the lagged gross domestic product of Nigeria has a small coefficient at 0.01 but is again highly significant. Its positive sign proposes that as GDP increases in the preceding period, the manufacturing sector increases marginally. Intuitively this seems plausible. The effect of GDP growth is often only observed in the following period. The small size of the coefficient may be explained by the fact that GDP is a measure of an entire economy while the manufacturing sector only constitutes a small part. This is especially true in developing countries such as Nigeria as outlined before. (U.S. Energy Information Administration , 2013)

Having controlled for the previous variables, the oil dummy simulating an oil shock from 1998 to 2002 is analysed. Its coefficient takes a value of -157821506 and is highly significant as seen in table 2. As the coefficient has a negative value it is in line with the predictions made by the Dutch Disease model, which states that the manufacturing sector should contract following an oil shock due to the outflow of labour towards the booming sector. The magnitude of the coefficient reflects that as an oil shock occurs there is a substantial contraction of the value added of the Nigerian manufacturing sector. Existing literature on the Dutch Disease in developing countries predicts that the main sector that will contract will be the agricultural sector. (Pardmanesh, 1991) There are authors that claim that in certain situations the degree of expertise varies too much in order for labourers to switch to such a different field work. (Borjas, 2012) This, in terms of the core Dutch Disease model, means that the direct industrialization effect seems to dominate the indirect industrialization effect as labour is moving directly from the lagging sector to the booming sector. Instead, as is evident from this result and the analyses covering the agricultural sector in the next section, the majority of the labour that moves to the booming sector stems from the manufacturing sector. This movement is in accordance with classical Dutch Disease literature but contradicts the existing literature on developing countries. Instead, this paper concludes that the manufacturing industry supplies most of the labour to the booming sector due to the similar expertise needed from workers in both sectors as opposed to those active in agricultural sector who possibly lack the required knowledge to operate within the oil industry. This conclusion is shared by Mohsen. (Mohsen, 1991) Based on the preceding analysis this paper therefore concludes that the null hypothesis is rejected in favour of the alternative hypothesis. *It can be concluded that the Dutch Disease is present when examining the manufacturing sector to account for the predictions made under the resource movement effect.*

This paper will now move onto analysing model 5. The constant will not be interpreted as before. The variable crude oil is statistically significant and has a coefficient of -25. This result proposes that as the number of barrels extracted daily rises then the agricultural sector will marginally decrease. This is in line with the predictions made by the Dutch Disease model. As productivity increases in the booming sector, which could be indicated by an increase in the number of barrels extracted in the oil industry, the total amount of permanent arable land is set to decrease. This decrease could be due to the outflow of labour from the agricultural sector towards the oil (booming) sector assuming total labour remains constant. As arable land becomes neglected due to its owners now operating in a different sector it will no longer yield crops and hence not be identified as permanent arable land. This potential explanation will be reviewed and applied to the oil dummy for 1998 to 2002. First the lagged value of the McKinnon’s openness criterion will be examined.

The variable describing Nigeria’s openness has a coefficient of -12577 but is not statistically significant at a confidence level of 10%. Therefore this paper will choose not deduce any economical explanation from this variable. If this variable was significant the negative sign of the coefficient seems not to yield a plausible economic explanation.

The coefficient for the lagged gross domestic product is 1506822 and is statistically significant at a 10% confidence level. From an economic perspective this holds. The gross domestic product is an indicator of the performance of a country over a given period. Nigeria can be classified as a developing country, and like most developing countries has a very large agricultural sector. (U.S. Energy Information Administration , 2013) This fact can potentially explain the magnitude and sign of the coefficient. If the GDP of Nigeria increased in the previous year, it is likely to have a positive effect on the Agricultural sector in the present year. This could be due to extra subsidies or improved infrastructure or miscellaneous investments targeting the agricultural sector with the surplus gained as a result of an increase in the gross domestic product. As the agricultural sector constitutes such a sizeable portion of the Nigerian economy and is largely used for domestic means it has been a frequent target of investment. (The World factbook, 2014) Although not outlined in the Dutch Disease model it is included within this paper in order to avoid omitted variables.

The final variable that will be analyzed is the dummy simulating an oil shock from 1998 to 2002. It takes a coefficient of 10054 and is marginally significant at a 10% confidence level. Its positive sign suggests that as oil shocks occur that the amount of permanent arable land will increase. This finding contradicts the predictions made by the Dutch Disease model which instead forecasts a contraction in the Agricultural sector. This is a prediction which is shared by existing literature and has been proven to exist in Kazakhstan and Zambia. (Calì & Velde, 2007) A number of reasons could have led to this opposing result. A possible explanation could be that labourers in the agricultural sector simply do not possess the means to operate in the oil industry, and that perfect labour substitutability and mobility does not hold. This is also a possibility which was derived when analysing the effect of an oil shock on the manufacturing sector. A second reason could be the geographical inertia that labourers experience. (Adenauer & Vagassky, 1998) Although not accounted for in the theoretical explanation of the Dutch Disease, this could be a determining factor. The majority of agriculture within Nigeria occurs north of Abuja, while most oil and gas is located within the Niger Delta and the Gulf of Guinea. (The World factbook, 2014) As the water in the delta is a mix of salt and fresh water combined with frequent oil spills many farmers chose to relocate in the North during the 1960s. (U.S. Energy Information Administration , 2013) This distance pooled with the oil industry being the very reason of their relocation makes it improbable that farmers would want to move back let alone work for the oil companies themselves such as Shell, BP and Total. It is worthy to note that this result has to be analysed with a degree of caution as the p-value of this variable is 0.11 which strictly speaking means no inferences should be drawn from the result. However, based on the analysis conducted this paper concludes that the null hypothesis cannot be rejected in favour of the alternative hypothesis. *Based on the findings of this regression equation, it cannot be concluded that the Dutch Disease is present when examining the Agricultural sector to account for the predictions made under the Dutch Disease model.*

5. Conclusion:

This paper set out to determine whether the Dutch Disease was present during the oil shock of 1980-1985 and 1995-1999. First the classical or core Dutch Disease model was outlined as it was originally written for developed economies. Two effects were identified and defined in order to be analyzed. The spending effect which states that as an oil boom occurs there's a shift in consumption preferences to more expensive products and a shift in labor from the non-tradable sector to the booming sector. This results in an excess demand for non-tradable goods. The exchange rate in the Dutch Disease model is defined as the ratio of the price of tradable goods to non-tradable goods, meaning that the exchange rate will decrease because of the spending effect, which is also known as an appreciation of the currency. In order to establish whether this appreciation occurred this paper ran three regression equations in order to verify whether this mechanism took place, one under a fixed exchange rate regime, one under a floating exchange rate and the third equation accounts for any explanatory power due to the switch in the exchange rate regimes. All three equations are in the form of the Error Correction Model (ECM) and the Partial Adjustment Model (PAM). This is done in order to account for the long run path of the Difference in the Real effective exchange rate (DREER) which is regressed on the first difference of the Real Effective Exchange Rate, the second lag of the Real effective exchange rate, the lagged difference in the growth of the gross domestic product and the lagged value of the growth in the gross domestic product. Then for the 1st, 2nd and 3rd model the oil dummies for the periods 1980 to 1985, 1995 to 1999 and 1995 to 1999 including the regime dummy are used respectively. This analysis yielded that in the 1980s the Dutch Disease was not present because of active monetary policy by the Nigerian government to maintain the fixed exchange rate. This nullified any effect on the exchange rate and hence there was no sign of the Dutch Disease. The 2nd model showed that under a floating exchange rate there was a significant appreciation of the Nigerian Naira to the US dollar which could suggest the presence of the Dutch Disease. However the 2nd model's lower R-squared value raised suspicion as to how valid this inference was. In order to determine whether any omitted variables were present a 3rd model was run in which the dummy for the years 1995 to 1999 was included as well as a dummy for the change in exchange rate regime in 1986 from a fixed to a floating regime. This inclusion of the regime dummy caused the oil dummy to become insignificant while remaining significant itself, which indicated that the 2nd model was a spurious regression. This paper therefore concluded that although the characteristics of the Dutch Disease were present under a floating exchange rate, there is insufficient evidence to suggest that the Dutch Disease was present following the oil shocks in 1980 to 1985 and 1995 to 1999. A notable finding was that the results of this paper support the findings of Looney who suggested that governments can counteract the Dutch Disease through monetary policy. This proposition was supported by the findings under model 1 as the Dornbusch overshooting phenomenon suggested that the policy caused the currency to depreciate instead of appreciate, which arguably is a more favorable outcome for the Nigerian economy.

This paper then went on the examining the resource movement effect. Dutch Disease literature predicts that because of direct-industrialization and indirect-industrialization there will be an outflow of labor from the lagging and non-tradable sectors towards the booming sector. In terms of the Nigerian economy and in accordance with existing Dutch Disease literature on developing economies the sectors were defined as the manufacturing and agricultural, service and oil sectors respectively. As the Nigerian service industry was relatively small compared to the other sectors it was assumed that the service sector could be neglected throughout the analysis. Instead, the effect of an oil shock on the change in output and labor between the manufacturing, agricultural and oil sector was investigated. Additional assumptions made were that the amount of labor within the Nigerian economy stays constant over the duration of the analysis and that if a sector contracts its labor can only go to the booming sector. In order to investigate the effect of an oil shock on the Nigerian markets the amount of barrels extracted daily (crude oil), the lagged value of McKinnon's degree of Openness , the lagged value of Nigeria's gross domestic product and a dummy variable simulating the effect of an oil shock during the period of 1998 to 2002 were regressed on the value added of the manufacturing sector and the total amount of permanent arable land in model 4 and 5 respectively. This yielded that when examining the manufacturing sector an oil shock did cause a decrease in the value added by the manufacturing sector which can be indicative of a contraction of the manufacturing sector. This result supports the predictions of the Dutch Disease model, but goes against predictions made that not the manufacturing sector but the agricultural sector contract in order for the booming sector to expand. When examining the effect of an oil shock on the agricultural sector, it became apparent that the discovery of oil did not contract the agricultural sector, which is something that was the case on preceding literature investigating the effect of the Dutch Disease on Kazakhstan and Zambia. This difference to earlier literature can be attributed to the geographical discrepancies and that empirically there is no perfect labor substitutability and mobility. This means that laborers active in the agricultural sector are inert to switching to the oil industry because they do not possess the knowledge or skills in order to operate within the sector. This is an assumption made in the core Dutch Disease model which does not hold in reality and can possibly explain why this prediction made by the model does not hold.

On aggregate, based on the analysis performed throughout this paper it was concluded that the Dutch Disease was present when examining the Manufacturing sector but not when examining the agricultural sector due to empirical difficulties not accounted for in the theoretical model. When examining the spending effect, the Dutch Disease seemed to be present under a floating exchange rate but when accounting for fluctuations caused by the change in regime the oil shock was no longer statistically significant. This result suggests that, like under the fixed exchange rate, there was no spending effect following an oil shock. Therefore, when using the spending effect as indicative of the Dutch Disease being present then this paper concludes that the *Dutch Disease was not present in Nigeria following both Oil Shocks.* When using the resource movement effect as an indicator of the Dutch Disease being present, this paper concludes that *the Dutch Disease was present when examining the contraction of the manufacturing industry despite the agricultural sector remaining the same size following an oil shock.* The fact that it contradicts existing literature on developing economies is evident of the assumptions of the model not accommodating for real world phenomena but does not affect the validity of this outcome.

Throughout this paper the spending and resource movement effect have been analyzed separately. Determining whether the Dutch Disease is present requires combining the outcome of both to give an overall conclusion. The spending effect suggests that the Dutch Disease is not present, while the resource movement effect proposes that it does. This differing outcome depends on whether the real economy is examined or the financial markets. As advocated by Balassa(1964), Samuelson (1964), Dornbusch (1980) and Edwards (1988), it is the change in real economic fundamentals and not changes in financial markets which are indicative of a structural change in the economy. This structural change is the actual outcome of the Dutch Disease being present and not an appreciation in the domestic currency, which is a means to an end. This is why this paper concludes and answers the research question as such, the Dutch Disease was present but only over the period of 1998 to 2002 as the resource movement effect occurred and there was an appreciation in the real effective exchange rate. While determining the existence of the Dutch Disease, it became apparent that the spending effect can be nullified through active monetary policy, as proposed by Looney. This means that even if the Dutch Disease was present, it is not reflected in the real economy. This paper concludes that under the fixed exchange rate the Dutch Disease does not occur.

6. Limitations and suggestions for future research:

Throughout this paper several limitations have been encountered that could have a potential impact on the quality of the findings presented and the answers to the hypotheses and consequently the research question. The first limitation originates from existing literature. Previously, researchers have attempted to determine whether the Dutch Disease was present using a multitude of methods such as partial impact functions and forecast models but not yet through the use of regression analysis. Although this means that this paper adds a degree of scientific relevance it also means the shortcomings of regression analysis are perhaps too significant to bring forth a significant conclusion. An example of such a shortcoming is to isolate the effect of the Dutch Disease effect by controlling for all the other factors. However, literature using other methods of analysis has frequently led to inconclusive results. This suggests that the Dutch Disease in itself is quite hard to isolate. A suggestion for future research is to use a variety of different methods and compare the results. This is past the extent of this paper.

Besides the shortcomings of existing literature, the data used could also potentially distort the findings presented in this paper. All the data used is secondary and attained from databases by the IMF, the OECD and the World Bank. Despite the established position of these databases, they rely on the data from sources such as the central bank of Nigeria and the Nigerian Statistics Bureau. The data collection method used are largely unknown and hence are very susceptible to inaccuracies, this is especially true for data collected in African countries which is apparent by the many gaps found within the databases. The use of this data could lead to wrong inferences. Relatively however, Nigeria has a larger amount of data available compared to other African countries. This was one of the criterions why this paper chose to examine Nigeria along with the high level of activity within the oil industry.

Another aspect of data shortcomings is the amount of observations included within the regression analysis. This paper used 31 observations which is below the desired amount of observations when analyzing over time. (Hill, Griffiths, & Lim, 2012) Most of the data however was only available and complete from 1980 onwards which suggests that at this point the Nigerian government started to monitor determinants of its economy more accurately. Despite this shortcoming, analyzing a developing economy will frequently lead to data restrictions. This is not the case when examining developed countries but the aim of this paper was to identify the Dutch Disease within an emerging economy. Nigeria had the most relevant data available relative to other emerging economies. For future research, it could be an option to look at multiple similar countries and use panel data to identify economic phenomena. If this is not feasible, then an emerging country which yields data points exceeding 50 should be chosen in order to limit statistical issues.

The final point of improvement concerns the underlying political instability. Nigeria has seen a long period of political conflict as is evident by the frequent changes in power in its history. Although a political stability index could of been included in the regression, it was not significant and added no explanatory power. This shows that the political shifts cannot be captured within a regression framework and that therefore certain fluctuations of the Real Effective Exchange Rate cannot be explained. An example of this could be oil spills, only very few are documented and smaller oil spills are frequently not even reported. However, they do have an effect on the domestic economy especially agriculture.

Article I. Bibliography

Adenauer, I., & Vagassky, L. (1998). Aid and the Real Exchange Rate: Dutch Disease Effects in African Countries. *Intereconomics*, 20-43.

Babbie, E. (2013). *The Practice of Social Research, 13th edition.* London: Wadsworth-Thomson.

Bandara, J. S. (1995). Dutch Disease in a developing country: The case of Foreign capital inflows to Sri Lanka. *Seoul Journal of Economics*, 35-45.

Borjas, G. J. (2012). *Labor Economics.* New York: McGraw-Hill Companies.

Bouza, S., & Turnovsky, S. J. (2011). The distributional consequences of foreign transfers: do they reduce or exacerbate inequality? *Oxford Economic Papers*, 702–735.

Calì, M., & Velde, D. W. (2007). *Is Zambia contracting Dutch Disease? .* London: Overseas Development Institute.

Chen, Y.-c., & Rogoff, K. (2003). Commodity currencies. *Journal of International Economics*, 133-160.

Copeland, L. (2005). *Exchange Rates and International Finance.* Harlow: Pearson Education Limited.

Corden, W. M. (1984). Booming Sector and Dutch Disease Economics: Survey and Consolidation. *Oxford Economic Papers*, 359-380.

Dornbusch, R. (1976). Expectations and Exchange rate Dynamics. *Journal of Political Economy*, 1161-1176.

Engle, R. F., & Granger, C. W. (1987). Co-Integration and Error Correction: Representation, Estimation, and Testing. *Econometrica*, 251-276.

Fagbadebo, O. (2007). Corruption, Governance and Political Instability in Nigeria. *African Journal of political science and International relations*, 028-037.

Frank, R., & Bernanke, B. S. (2011). *Principles of Economics, fifth edition.* Boston: McGraw-Hill.

Gylfason*, T. (2001). Lessons from the Dutch Disease: Causes, Treatments and Cures. *STATOIL-ECON conference volume: The Paradox of plenty* (pp. 354-397). reykjavik: University of Iceland.

Hill, R., Griffiths, W., & Lim, G. (2012). *Principles of Econometrics, fourth edition.* London: Wiley.

Hirsch, J. L. (2001). *Sierra Leone, Diamonds and the struggle for democracy.* Boulder: Lynne Rienner Publishers.

IFAD. (2011). IFAD Rural Poverty Report 2011. *Fourth United Nations Conference on the Least Developed Countries (LDC IV)*, (pp. 7-19). Paris.

Kevin, L., Pesaran, M. H., & Smith, R. (1997). Growth and convergence in a multi-country emperical stochastic Solow Model. *JOURNAL OF APPLIED ECONOMETRICS*, 357-392.

Khan, S. (1994). *Nigeira: The political economy of oil.* Oxford: Oxford University Press.

Krugman, P. R. (2006). *International Economics:Theory and Policy.* London: Addison Wesley.

Kuijs, L. (1998). *Determinants of Inflation, Exchange Rate, and Ouput in Nigeria.* Frankfurt : International Monetary Fund.

Lartey, E. K. (2008). Capital Inflows, Dutch Disease Effects, and Monetary Policy in a Small Open Economy. *Review of International Economics*, 971–989.

Looney, R. E. (1992). Real or illusionary growth in an oil based economy: Government expenditures and private sector investment in Saudi Arabia. *World Development*, 1367-1375.

Maes, I. (1992). Optimum Currency Area Theory and European Monetary Integration. *Tijdschrift voor Economie en Management*, 78-103.

Magud, N., & Sosa, S. (2010, December 10). When and why worry about real exchange rate appreciation? The missing link between Dutch Disease and Growth. *International Monetary Fund*, pp. 66-104.

Malpezzi, S. (1999). A Simple Error Correction Model of House Prices. *Journal of House Economics*, 27-62.

Matsuyama, K. (1992). Agricultural Productivity, Comparative Advantage and Economic Growth. *Journal of Economic Throery*, 317-334.

McManus, D. A., Nankervis, J. C., & Savin, N. (1994). Multiple optima and asymptotic approximations in the partial adjustment model. *Journal of econometrics*, 81-128.

Mehlum, H., Moene, K., & Torvik, R. (2006). Institutions and the resource curse. *The Economic Journal* , 1-20.

Mohsen, P. (1991). Dutch Disease Economics and the Oil Syndrome: An Emperical Study. *World Development*, 711-717.

Neary, W. M. (1982). Booming Sector and De-Industrialisation in a Small Open Economy. *The Economic Journal*, 825-848.

Olusi, J. O., & Olagunju, M. A. (2005). The Primary Sectors of the Economy and the Dutch Disease in Nigeria. *The Pakistan Development Review*, 159-175.

Pardmanesh, M. (1991). Dutch Disease Economics and the Oil Syndrome: An Emperical Study. *World Development*, 711-717.

Peter, N. J. (1982, October 23). Real and Monetary aspects of the 'Dutch Disease'. *UCD Centre of Economic Research working papers series*, pp. 23-76.

Roemer, M. (1995). Dutch Disease and Economic Growth: The Legacy of Indonesia. *Harvard - Institute for International Development*, 83-107.

Ross, M. L. (1999). The Political Economy of the Resource Curse. *World Politics*, 297 - 322.

Struthers, J. J. (1990). Nigerian Oil and Exchange rates: Indicators of 'Dutch Disease'. *Development and change*, 309-341.

Suhardi, E. (2013, November 22). *Finding ways to cure the Indonesia natural resource curse* . Retrieved July 1, 2014, from The malaysian insider: http://www.themalaysianinsider.com/sideviews/article/finding-ways-to-cure-the-indonesia-natural-resource-curse-edi-suhardi

The Economist. (2010, September 9). *It's only natural*. Retrieved July 4, 2014, from The Economist: http://www.economist.com/node/16964094

The Economist. (2011, August 13). *Nigeria's oil; oil spoils*. Retrieved July 2014, 3, from The Economist: http://www.economist.com/node/21525963

The Economist. (2014, July 4). *The Economist*. Retrieved July 5, 2014, from Nigeria's fight against spreading instability; spreading instability: http://www.economist.com/blogs/baobab/2014/07/nigerias-fight-against-boko-haram?zid=304&ah=e5690753dc78ce91909083042ad12e30

The Economist. (2014, April 12). *The Economist*. Retrieved June 30, 2014, from Nigeria; Africa's new number one: http://www.economist.com/news/leaders/21600685-nigerias-suddenly-supersized-economy-indeed-wonder-so-are-its-still-huge

The World factbook. (2014, May 13). *Central Intelligence Agency* . Retrieved June 14, 2014, from Central Intelligence Agency : https://www.cia.gov/library/publications/the-world-factbook/geos/ni.html

U.S. Energy Information Administration . (2013). *Nigeria report.* Washington : U.S. Energy Information Administration.

Watts, M. (2010, June 4). Resource Curse? Governmentability, Oil and and Power in the Niger Delta, Nigeria. *Geopolitics*, pp. 50-80.

Wijnbergen, S. v. (1984). The 'Dutch Disease', a disease after all? *The Economic Journal*, 41-55.

Worldbank. (2012). *Growth of the service sector.* Chicago : Worldbank.

Zellner, A., & Palm, F. (1974). Time series analysis and simultaneous equation econometrics models. *Journal of Econometrics*, 17-54.

8. Appendix:

Table A1: Augmented Dickey-Fuller Unit Root Test Outcomes

Variable	**t-statistic**	**p-value**	**Stationarity**
D(REER):	-3.37	0.02	**Stationary**
Dgdpgrowth:	-11.7	0.00	**Stationary**
Manufacturing:	-18.2	0.00	**Stationary**
Crudeoil:	-4.73	0.00	**Stationary**
Open:	-8.54	0.00	**Stationary**
GDP:	-7.43	0.00	**Stationary**
Agriculture:	-4.04	0.00	**Stationary**

It is assumed that because the variables are stationary their lagged values are as well.

Table B1: Tests performed on ordinary least squares assumptions and mis-specification of model 1

Test	**Test name**	**Test statistic**	**p-value**
Heteroskedasticity	Breusch-Pagan-Godfrey	4.03	0.01
Serial Correlation	Breusch-Godfrey	3.13	0.06
Normal Distribution	Jarque-Bera	15.5	0.00
Mis-specification	Ramsey RESET	0.57	0.57

Table B2: Tests performed on ordinary least squares assumptions and mis-specification of model 2

Test	**Test name**	**Test statistic**	**p-value**
Heteroskedasticity	Breusch-Pagan-Godfrey	3.49	0.02
Serial Correlation	Breusch-Godfrey	2.70	0.09
Normal Distribution	Jarque-Bera	4.03	0.13
Mis-specification	Ramsey RESET	3.81	0.00

Table B3: Tests performed on ordinary least squares assumptions and mis-specification of model 3

Test	**Test name**	**Test statistic**	**p-value**
Heteroskedasticity	Breusch-Pagan-Godfrey	3.17	0.06
Serial Correlation	Breusch-Godfrey	7.43	0.00
Normal Distribution	Jarque-Bera	17.2	0.00
Mis-specification	Ramsey RESET	0.45	0.66

Table B4: Tests performed on ordinary least squares assumptions and mis-specification of model 4

Test	Test name	Test statistic	p-value
Heteroskedasticity	Breusch-Pagan-Godfrey	0.23	0.92
Serial Correlation	Breusch-Godfrey	0.17	0.84
Normal Distribution	Jarque-Bera	1.18	0.41
Mis-specification	Ramsey RESET	0.56	0.58

Table B5: Tests performed on ordinary least squares assumptions and mis-specification of model 5

Test	Test name	Test statistic	p-value
Heteroskedasticity	Breusch-Pagan-Godfrey	2.51	0.07
Serial Correlation	Breusch-Godfrey	0.72	0.50
Normal Distribution	Jarque-Bera	1.80	0.41
Mis-specification	Ramsey RESET	0.68	0.50

Tables:

Stationarity tests:

Null Hypothesis: D(REER) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.367160	0.0205
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(REER,2)
Method: Least Squares
Date: 07/11/14 Time: 18:19
Sample (adjusted): 1982 2011
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(REER(-1))	-0.570337	0.169382	-3.367160	0.0022
C	-5.480000	12.63450	-0.433733	0.6678

R-squared	0.288216	Mean dependent var	-1.193121
Adjusted R-squared	0.262795	S.D. dependent var	80.18783
S.E. of regression	68.84979	Akaike info criterion	11.36607
Sum squared resid	132728.2	Schwarz criterion	11.45948
Log likelihood	-168.4911	Hannan-Quinn criter.	11.39596
F-statistic	11.33777	Durbin-Watson stat	1.583356
Prob(F-statistic)	0.002223		

Null Hypothesis: D(GDPGROWTH,2) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-11.74080	0.0000
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDPGROWTH,3)
Method: Least Squares
Date: 07/11/14 Time: 18:23
Sample (adjusted): 1984 2011
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDPGROWTH(-1),2)	-2.454256	0.209037	-11.74080	0.0000
D(GDPGROWTH(-1),3)	0.612517	0.105538	5.803737	0.0000
C	0.202016	0.847862	0.238266	0.8136

R-squared	0.893933	Mean dependent var	0.582719
Adjusted R-squared	0.885448	S.D. dependent var	13.22422
S.E. of regression	4.475818	Akaike info criterion	5.936212
Sum squared resid	500.8236	Schwarz criterion	6.078948
Log likelihood	-80.10697	Hannan-Quinn criter.	5.979848
F-statistic	105.3499	Durbin-Watson stat	1.693414
Prob(F-statistic)	0.000000		

Null Hypothesis: D(MANUFACTURING,2) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-18.19564	0.0001
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MANUFACTURING,3)
Method: Least Squares
Date: 07/11/14 Time: 18:26
Sample (adjusted): 1983 2011
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(MANUFACTURING(-1),2)	-1.862334	0.102351	-18.19564	0.0000
C	6064594.	18286855	0.331637	0.7427

R-squared	0.924598	Mean dependent var	5865517.
Adjusted R-squared	0.921805	S.D. dependent var	3.52E+08
S.E. of regression	98477710	Akaike info criterion	39.71503
Sum squared resid	2.62E+17	Schwarz criterion	39.80933
Log likelihood	-573.8679	Hannan-Quinn criter.	39.74456
F-statistic	331.0813	Durbin-Watson stat	2.153921
Prob(F-statistic)	0.000000		

Null Hypothesis: D(CRUDEOIL,2) has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.730873	0.0009
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(CRUDEOIL,3)
Method: Least Squares
Date: 07/11/14 Time: 18:27
Sample (adjusted): 1987 2011
Included observations: 25 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(CRUDEOIL(-1),2)	-3.593227	0.759527	-4.730873	0.0001
D(CRUDEOIL(-1),3)	2.148453	0.636052	3.377794	0.0032
D(CRUDEOIL(-2),3)	1.201586	0.475102	2.529111	0.0204
D(CRUDEOIL(-3),3)	0.608858	0.310691	1.959688	0.0649
D(CRUDEOIL(-4),3)	0.292641	0.169364	1.727884	0.1002
C	4.213749	28.07270	0.150101	0.8823

R-squared	0.775433	Mean dependent var	-9.267000
Adjusted R-squared	0.716336	S.D. dependent var	261.4880
S.E. of regression	139.2688	Akaike info criterion	12.91625
Sum squared resid	368520.3	Schwarz criterion	13.20878
Log likelihood	-155.4532	Hannan-Quinn criter.	12.99739
F-statistic	13.12143	Durbin-Watson stat	1.882197
Prob(F-statistic)	0.000013		

Null Hypothesis: D(OPEN,2) has a unit root

Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.542925	0.0000
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(OPEN,3)
Method: Least Squares
Date: 07/11/14 Time: 18:29
Sample (adjusted): 1984 2011
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(OPEN(-1),2)	-2.966535	0.347251	-8.542925	0.0000
D(OPEN(-1),3)	0.790654	0.199329	3.966568	0.0005
C	0.028309	0.042474	0.666516	0.5112

R-squared	0.898022	Mean dependent var	-0.006863
Adjusted R-squared	0.889864	S.D. dependent var	0.674568
S.E. of regression	0.223868	Akaike info criterion	-0.054568
Sum squared resid	1.252917	Schwarz criterion	0.088169
Log likelihood	3.763946	Hannan-Quinn criter.	-0.010932
F-statistic	110.0754	Durbin-Watson stat	2.060299
Prob(F-statistic)	0.000000		

Null Hypothesis: D(GDP,2) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.428583	0.0000
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDP,3)
Method: Least Squares
Date: 07/11/14 Time: 18:29
Sample (adjusted): 1984 2011
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP(-1),2)	-1.883985	0.253613	-7.428583	0.0000
D(GDP(-1),3)	0.501054	0.150128	3.337508	0.0026
C	5.30E+08	2.47E+08	2.146207	0.0418

R-squared	0.738668	Mean dependent var	48293081
Adjusted R-squared	0.717762	S.D. dependent var	2.36E+09
S.E. of regression	1.25E+09	Akaike info criterion	44.83585
Sum squared resid	3.92E+19	Schwarz criterion	44.97858
Log likelihood	-624.7019	Hannan-Quinn criter.	44.87948
F-statistic	35.33191	Durbin-Watson stat	1.593338
Prob(F-statistic)	0.000000		

Null Hypothesis: D(AGRICULTURE,2) has a unit root
Exogenous: Constant
Lag Length: 7 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.039223	0.0055
Test critical values:	1% level	-3.769597	
	5% level	-3.004861	
	10% level	-2.642242	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(AGRICULTURE,3)
Method: Least Squares
Date: 07/11/14 Time: 18:30
Sample (adjusted): 1990 2011
Included observations: 22 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(AGRICULTURE(-1),2)	-12.15434	3.009079	-4.039223	0.0014
D(AGRICULTURE(-1),3)	9.727931	2.903100	3.350877	0.0052
D(AGRICULTURE(-2),3)	8.065381	2.649502	3.044112	0.0094
D(AGRICULTURE(-3),3)	6.358734	2.244000	2.833660	0.0141
D(AGRICULTURE(-4),3)	4.704520	1.739787	2.704078	0.0181
D(AGRICULTURE(-5),3)	3.182299	1.195711	2.661429	0.0196
D(AGRICULTURE(-6),3)	1.883979	0.675913	2.787310	0.0154
D(AGRICULTURE(-7),3)	0.785194	0.259360	3.027427	0.0097
C	1864.904	4118.787	0.452780	0.6582

R-squared	0.946148	Mean dependent var	324.4199
Adjusted R-squared	0.913008	S.D. dependent var	64078.68
S.E. of regression	18899.65	Akaike info criterion	22.82376
Sum squared resid	4.64E+09	Schwarz criterion	23.27010
Log likelihood	-242.0614	Hannan-Quinn criter.	22.92891
F-statistic	28.55012	Durbin-Watson stat	2.466382
Prob(F-statistic)	0.000000		

OLS Assumptions and Ramsey-reset test for models:

Model 1:

Breusch-Pagan-Godfrey

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	4.033834	Prob. F(5,24)	0.0085
Obs*R-squared	13.69904	Prob. Chi-Square(5)	0.0176
Scaled explained SS	21.07550	Prob. Chi-Square(5)	0.0008

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 07/11/14 Time: 18:37
Sample: 1982 2011
Included observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1910.073	939.9563	2.032087	0.0534
D(REER(-1))	-6.923579	8.111922	-0.853507	0.4018
REER(-2)	-1.005620	3.985335	-0.252330	0.8029
D(GDPGROWTH)	-159.6642	109.1902	-1.462257	0.1566
GDPGROWTH(-1)	-266.3762	151.0349	-1.763673	0.0905
OILDUMMY1980S	3208.629	2629.560	1.220215	0.2342

R-squared	0.456635	Mean dependent var	1162.579
Adjusted R-squared	0.343433	S.D. dependent var	2592.704
S.E. of regression	2100.836	Akaike info criterion	18.31492
Sum squared resid	1.06E+08	Schwarz criterion	18.59515
Log likelihood	-268.7237	Hannan-Quinn criter.	18.40457
F-statistic	4.033834	Durbin-Watson stat	2.841011
Prob(F-statistic)	0.008472		

Breusch-Godfrey

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	3.133055	Prob. F(2,22)	0.0635
Obs*R-squared	6.650484	Prob. Chi-Square(2)	0.0360

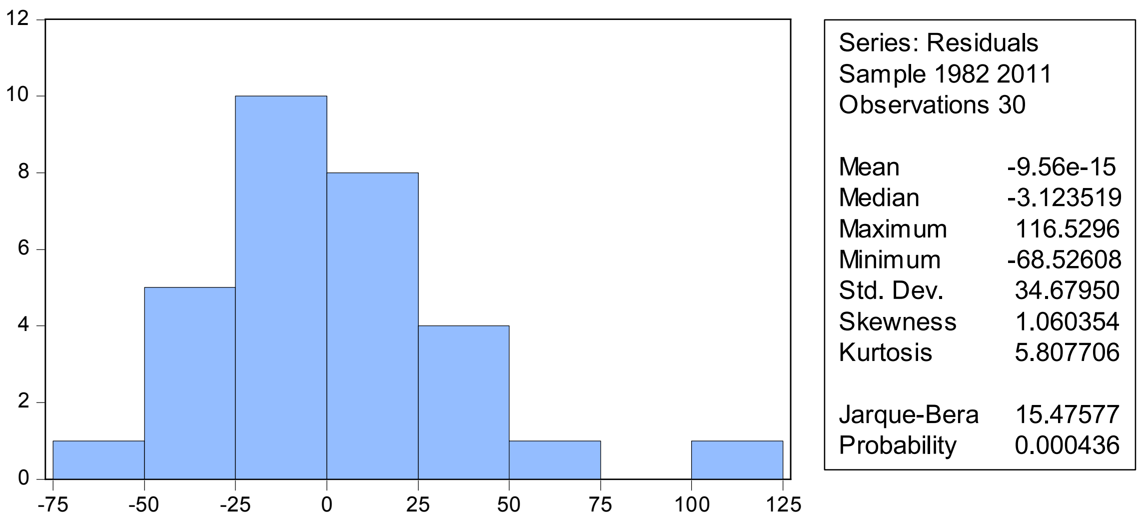
Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 07/11/14 Time: 18:38
Sample: 1982 2011
Included observations: 30
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.

C	-23.65926	18.54385	-1.275855	0.2153
D(REER(-1))	0.394149	0.207825	1.896540	0.0711
REER(-2)	0.192120	0.104194	1.843871	0.0787
D(GDPGROWTH)	2.503742	2.081941	1.202600	0.2419
GDPGROWTH(-1)	0.877413	2.549584	0.344140	0.7340
OILDUMMY1980S	-98.38893	60.01963	-1.639279	0.1154
RESID(-1)	-0.786470	0.319370	-2.462568	0.0221
RESID(-2)	-0.503229	0.279793	-1.798579	0.0858

R-squared	0.221683	Mean dependent var	-9.56E-15
Adjusted R-squared	-0.025964	S.D. dependent var	34.67950
S.E. of regression	35.12681	Akaike info criterion	10.17899
Sum squared resid	27145.65	Schwarz criterion	10.55264
Log likelihood	-144.6848	Hannan-Quinn criter.	10.29852
F-statistic	0.895159	Durbin-Watson stat	1.702364
Prob(F-statistic)	0.527208		

Jarque-Bera



Ramsey RESET

Ramsey RESET Test
Equation: TMP1980
Specification: D(REER) C D(REER(-1)) REER(-2) D(GDPGROWTH) GDPGROWTH(-1) OILDUMMY1980S
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	0.573603	23	0.5718
F-statistic	0.329021	(1, 23)	0.5718
Likelihood ratio	0.426117	1	0.5139

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	491.8924	1	491.8924
Restricted SSR	34877.36	24	1453.223
Unrestricted SSR	34385.46	23	1495.020

Unrestricted SSR	34385.46	23	1495.020

LR test summary:

	Value	df
Restricted LogL	-148.4441	24
Unrestricted LogL	-148.2310	23

Unrestricted Test Equation:
Dependent Variable: D(REER)
Method: Least Squares
Date: 07/11/14 Time: 18:39
Sample: 1982 2011
Included observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	50.20951	21.76361	2.307040	0.0304
D(REER(-1))	-0.335184	0.173306	-1.934065	0.0655
REER(-2)	-0.488900	0.170002	-2.875839	0.0085
D(GDPGROWTH)	-2.292300	2.265382	-1.011882	0.3221
GDPGROWTH(-1)	-0.004603	2.798420	-0.001645	0.9987
OILDUMMY1980S	232.4994	64.16200	3.623630	0.0014
FITTED^2	-0.000800	0.001395	-0.573603	0.5718

R-squared	0.789343	Mean dependent var	-8.709517
Adjusted R-squared	0.734390	S.D. dependent var	75.02413
S.E. of regression	38.66549	Akaike info criterion	10.34874
Sum squared resid	34385.46	Schwarz criterion	10.67568
Log likelihood	-148.2310	Hannan-Quinn criter.	10.45333
F-statistic	14.36375	Durbin-Watson stat	2.561037
Prob(F-statistic)	0.000001		

Model 2:

Breusch-Pagan-Godfrey

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	3.491558	Prob. F(5,24)	0.0164
Obs*R-squared	12.63294	Prob. Chi-Square(5)	0.0271
Scaled explained SS	10.87525	Prob. Chi-Square(5)	0.0539

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 07/11/14 Time: 18:44
Sample: 1982 2011
Included observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3237.651	1508.331	2.146513	0.0421
D(REER(-1))	-1.273374	8.419879	-0.151234	0.8811
REER(-2)	5.697689	4.459299	1.277710	0.2136
D(GDPGROWTH)	-308.7871	163.5459	-1.888077	0.0712
GDPGROWTH(-1)	-501.7431	180.7950	-2.775204	0.0105

OILDUMMY1990S	-321.9002	1633.620	-0.197047	0.8454

R-squared	0.421098	Mean dependent var	2233.017
Adjusted R-squared	0.300493	S.D. dependent var	3725.170
S.E. of regression	3115.602	Akaike info criterion	19.10309
Sum squared resid	2.33E+08	Schwarz criterion	19.38333
Log likelihood	-280.5463	Hannan-Quinn criter.	19.19274
F-statistic	3.491558	Durbin-Watson stat	2.435372
Prob(F-statistic)	0.016371		

Breusch-Godfrey

Breusch-Godfrey Serial Correlation LM Test:

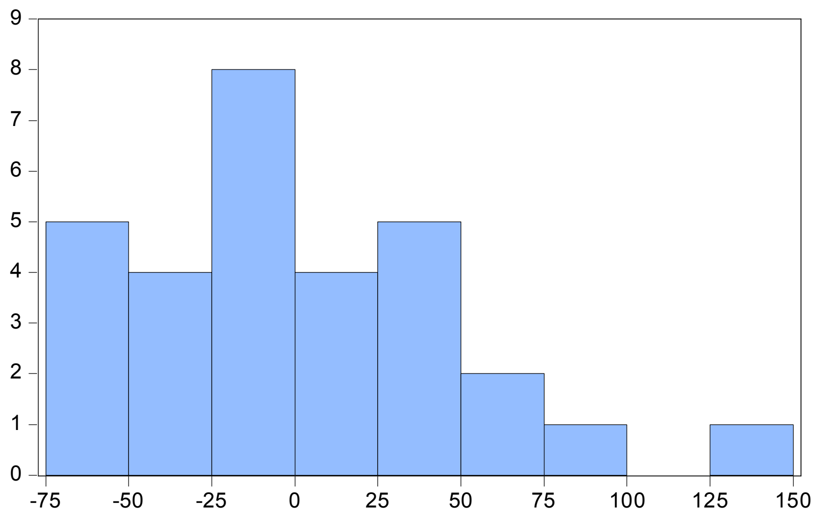
F-statistic	2.702600	Prob. F(2,22)	0.0892
Obs*R-squared	5.916980	Prob. Chi-Square(2)	0.0519

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 07/11/14 Time: 18:44
Sample: 1982 2011
Included observations: 30
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-25.02079	30.40881	-0.822814	0.4194
D(REER(-1))	0.070517	0.208163	0.338759	0.7380
REER(-2)	0.084269	0.093231	0.903871	0.3759
D(GDPGROWTH)	0.938326	2.782627	0.337209	0.7392
GDPGROWTH(-1)	2.329452	3.487462	0.667951	0.5111
OILDUMMY1990S	5.865131	26.60775	0.220429	0.8276
RESID(-1)	0.083142	0.287383	0.289306	0.7751
RESID(-2)	-0.508661	0.235929	-2.155996	0.0423

R-squared	0.197233	Mean dependent var	9.00E-15
Adjusted R-squared	-0.058193	S.D. dependent var	48.06264
S.E. of regression	49.44133	Akaike info criterion	10.86263
Sum squared resid	53777.79	Schwarz criterion	11.23628
Log likelihood	-154.9394	Hannan-Quinn criter.	10.98216
F-statistic	0.772172	Durbin-Watson stat	2.222590
Prob(F-statistic)	0.616666		

Jarque-Bera



Series: Residuals	
Sample 1982 2011	
Observations 30	
Mean	9.00e-15
Median	-6.757261
Maximum	138.5837
Minimum	-68.43986
Std. Dev.	48.06264
Skewness	0.829064
Kurtosis	3.690201
Jarque-Bera	4.032212
Probability	0.133173

Ramsey RESET

Ramsey RESET Test
Equation: TMP1990
Specification: D(REER) C D(REER(-1)) REER(-2) D(GDPGROWTH) GDPGROWTH(-1) OILDUMMY1990S
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	3.807974	23	0.0009
F-statistic	14.50066	(1, 23)	0.0009
Likelihood ratio	14.66593	1	0.0001

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	25903.72	1	25903.72
Restricted SSR	66990.51	24	2791.271
Unrestricted SSR	41086.78	23	1786.382
Unrestricted SSR	41086.78	23	1786.382

LR test summary:

	Value	df
Restricted LogL	-158.2348	24
Unrestricted LogL	-150.9018	23

Unrestricted Test Equation:
Dependent Variable: D(REER)
Method: Least Squares
Date: 07/11/14 Time: 18:45
Sample: 1982 2011
Included observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	59.03182	23.72541	2.488127	0.0205
D(REER(-1))	0.007848	0.124349	0.063112	0.9502

REER(-2)	-0.037913	0.101387	-0.373949	0.7119
D(GDPGROWTH)	-5.857479	2.236837	-2.618644	0.0154
GDPGROWTH(-1)	-7.425742	2.603644	-2.852057	0.0090
OILDUMMY1990S	-41.35983	22.34551	-1.850923	0.0771
FITTED^2	-0.007262	0.001907	-3.807974	0.0009

R-squared	0.748289	Mean dependent var	-8.709517
Adjusted R-squared	0.682625	S.D. dependent var	75.02413
S.E. of regression	42.26561	Akaike info criterion	10.52679
Sum squared resid	41086.78	Schwarz criterion	10.85373
Log likelihood	-150.9018	Hannan-Quinn criter.	10.63138
F-statistic	11.39577	Durbin-Watson stat	2.541989
Prob(F-statistic)	0.000006		

Model 3:

Breusch-Pagan-Godfrey

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	3.166509	Prob. F(6,23)	0.0206
Obs*R-squared	13.57106	Prob. Chi-Square(6)	0.0348
Scaled explained SS	20.07411	Prob. Chi-Square(6)	0.0027

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 07/11/14 Time: 18:40
Sample: 1982 2011
Included observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1906.611	1237.560	1.540621	0.1371
D(REER(-1))	-6.268186	9.518873	-0.658501	0.5168
REER(-2)	-0.846100	4.244852	-0.199324	0.8438
D(GDPGROWTH)	-174.4637	122.0825	-1.429064	0.1664
GDPGROWTH(-1)	-270.1785	191.1105	-1.413729	0.1708
REGIME	3213.406	3286.861	0.977652	0.3384
OILDUMMY1990S	-38.78008	1376.891	-0.028165	0.9778

R-squared	0.452369	Mean dependent var	1153.370
Adjusted R-squared	0.309508	S.D. dependent var	2631.782
S.E. of regression	2186.901	Akaike info criterion	18.41932
Sum squared resid	1.10E+08	Schwarz criterion	18.74627
Log likelihood	-269.2898	Hannan-Quinn criter.	18.52392
F-statistic	3.166509	Durbin-Watson stat	2.806816
Prob(F-statistic)	0.020558		

Breusch-Godfrey

Breusch-Godfrey Serial Correlation LM Test:

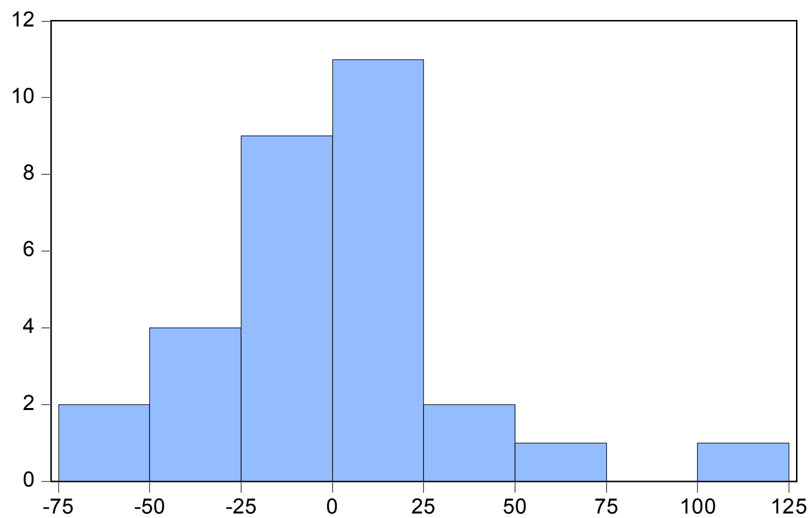
F-statistic	7.428444	Prob. F(2,21)	0.0036
Obs*R-squared	12.43015	Prob. Chi-Square(2)	0.0020

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 07/11/14 Time: 18:41
Sample: 1982 2011
Included observations: 30
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-62.50262	24.24139	-2.578343	0.0175
D(REER(-1))	0.511524	0.189481	2.699601	0.0134
REER(-2)	0.293557	0.099268	2.957229	0.0075
D(GDPGROWTH)	5.646201	2.271513	2.485657	0.0214
GDPGROWTH(-1)	4.869236	3.002055	1.621968	0.1197
REGIME	-109.5737	55.19061	-1.985368	0.0603
OILDUMMY1990S	38.44803	22.05173	1.743538	0.0959
RESID(-1)	-1.286679	0.336422	-3.824599	0.0010
RESID(-2)	-0.883037	0.290080	-3.044115	0.0062

R-squared	0.414338	Mean dependent var	-5.51E-15
Adjusted R-squared	0.191229	S.D. dependent var	34.54188
S.E. of regression	31.06409	Akaike info criterion	9.953307
Sum squared resid	20264.53	Schwarz criterion	10.37367
Log likelihood	-140.2996	Hannan-Quinn criter.	10.08778
F-statistic	1.857111	Durbin-Watson stat	2.088374
Prob(F-statistic)	0.122111		

Jarque-Bera



Series: Residuals
Sample 1982 2011
Observations 30

Mean	-5.51e-15
Median	-1.472486
Maximum	117.7401
Minimum	-66.51917
Std. Dev.	34.54188
Skewness	1.070663
Kurtosis	6.033144
Jarque-Bera	17.23155
Probability	0.000181

Ramsey RESET

Ramsey RESET Test
Equation: TMP1990
Specification: D(REER) C D(REER(-1)) REER(-2) D(GDPGROWTH) GDPGROWTH(-1) REGIME OILDUMMY1990S
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	0.445830	22	0.6601
F-statistic	0.198764	(1, 22)	0.6601
Likelihood ratio	0.269825	1	0.6034

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	309.8127	1	309.8127
Restricted SSR	34601.10	23	1504.396
Unrestricted SSR	34291.28	22	1558.695
Unrestricted SSR	34291.28	22	1558.695

LR test summary:

	Value	df
Restricted LogL	-148.3248	23
Unrestricted LogL	-148.1899	22

Unrestricted Test Equation:
Dependent Variable: D(REER)
Method: Least Squares
Date: 07/11/14 Time: 18:41
Sample: 1982 2011
Included observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	47.65836	24.39435	1.953663	0.0636
D(REER(-1))	-0.365078	0.210214	-1.736692	0.0964
REER(-2)	-0.508312	0.185653	-2.737974	0.0120
D(GDPGROWTH)	-1.971953	2.603682	-0.757371	0.4569
GDPGROWTH(-1)	0.579719	3.580276	0.161920	0.8728
REGIME	245.7547	81.23774	3.025130	0.0062
OILDUMMY1990S	6.727793	26.23234	0.256469	0.8000
FITTED^2	-0.000654	0.001468	-0.445830	0.6601

R-squared	0.789920	Mean dependent var	-8.709517
Adjusted R-squared	0.723077	S.D. dependent var	75.02413
S.E. of regression	39.48031	Akaike info criterion	10.41266
Sum squared resid	34291.28	Schwarz criterion	10.78631
Log likelihood	-148.1899	Hannan-Quinn criter.	10.53219
F-statistic	11.81746	Durbin-Watson stat	2.577981
Prob(F-statistic)	0.000004		

Model 4:

Breusch-Pagan-Godfrey

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.228605	Prob. F(4,26)	0.9198
Obs*R-squared	1.053227	Prob. Chi-Square(4)	0.9016
Scaled explained SS	0.753891	Prob. Chi-Square(4)	0.9445

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 07/11/14 Time: 18:46
Sample: 1981 2011
Included observations: 31

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.13E+15	8.29E+15	0.618178	0.5418
CRUDEOIL	1.43E+12	7.08E+12	0.201795	0.8416
OPEN(-1)	-6.94E+14	7.35E+15	-0.094362	0.9255
GDP(-1)	-44736.90	280019.1	-0.159764	0.8743
OILDUMMY9802	-3.27E+15	3.87E+15	-0.844646	0.4060

R-squared	0.033975	Mean dependent var	4.87E+15
Adjusted R-squared	-0.114644	S.D. dependent var	7.06E+15
S.E. of regression	7.46E+15	Akaike info criterion	76.07992
Sum squared resid	1.45E+33	Schwarz criterion	76.31120
Log likelihood	-1174.239	Hannan-Quinn criter.	76.15531
F-statistic	0.228605	Durbin-Watson stat	2.568927
Prob(F-statistic)	0.919848		

Breusch-Godfrey

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.172530	Prob. F(2,24)	0.8426
Obs*R-squared	0.439384	Prob. Chi-Square(2)	0.8028

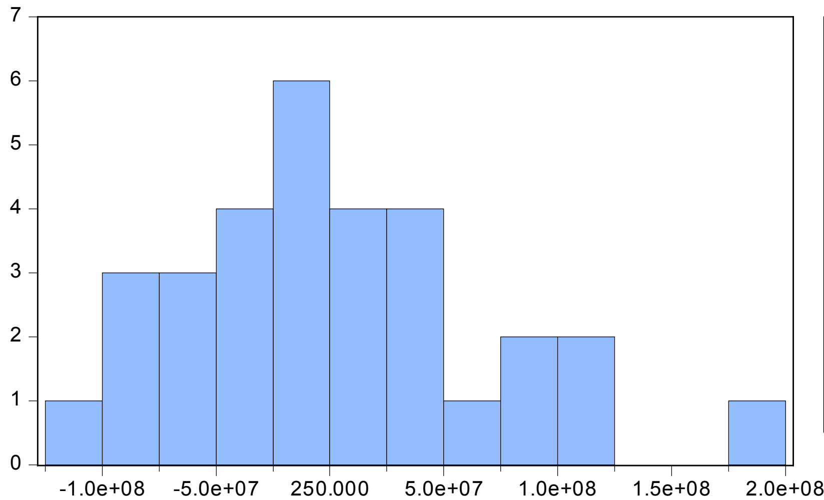
Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 07/11/14 Time: 18:47
Sample: 1981 2011
Included observations: 31
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-4263841.	88233230	-0.048325	0.9619
CRUDEOIL	1839.248	75353.09	0.024408	0.9807
OPEN(-1)	-8033196.	78875839	-0.101846	0.9197
GDP(-1)	0.000179	0.002980	0.060108	0.9526
OILDUMMY9802	-3008223.	41453138	-0.072569	0.9428
RESID(-1)	0.025258	0.208147	0.121346	0.9044
RESID(-2)	0.122319	0.213964	0.571678	0.5729

R-squared	0.014174	Mean dependent var	-6.85E-08

Adjusted R-squared	-0.232283	S.D. dependent var	70933997
S.E. of regression	78742581	Akaike info criterion	39.39695
Sum squared resid	1.49E+17	Schwarz criterion	39.72075
Log likelihood	-603.6527	Hannan-Quinn criter.	39.50250
F-statistic	0.057510	Durbin-Watson stat	1.850918
Prob(F-statistic)	0.999078		

Jarque-Bera



Series: Residuals	
Sample 1981 2011	
Observations 31	
Mean	-6.85e-08
Median	-14447058
Maximum	1.85e+08
Minimum	-1.25e+08
Std. Dev.	70933997
Skewness	0.590660
Kurtosis	3.035136
Jarque-Bera	1.804138
Probability	0.405729

Ramsey RESET

Ramsey RESET Test
Equation: MARKETS
Specification: MANUFACTURING C CRUDEOIL OPEN(-1) GDP(-1)
OILDUMMY9802
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	0.559920	25	0.5805
F-statistic	0.313510	(1, 25)	0.5805
Likelihood ratio	0.386335	1	0.5342

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	1.87E+15	1	1.87E+15
Restricted SSR	1.51E+17	26	5.81E+15
Unrestricted SSR	1.49E+17	25	5.96E+15
Unrestricted SSR	1.49E+17	25	5.96E+15

LR test summary:

	Value	df
Restricted LogL	-603.8739	26
Unrestricted LogL	-603.6808	25

Unrestricted Test Equation:

Dependent Variable: MANUFACTURING
Method: Least Squares
Date: 07/11/14 Time: 18:48
Sample: 1981 2011
Included observations: 31

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.57E+08	1.07E+08	3.338157	0.0026
CRUDEOIL	-207854.3	155263.0	-1.338724	0.1927
OPEN(-1)	2.22E+08	1.17E+08	1.894008	0.0699
GDP(-1)	0.007138	0.006040	1.181895	0.2484
OILDUMMY9802	-1.33E+08	59365383	-2.245655	0.0338
FITTED^2	1.86E-10	3.32E-10	0.559920	0.5805

R-squared	0.921066	Mean dependent var	4.76E+08
Adjusted R-squared	0.905279	S.D. dependent var	2.51E+08
S.E. of regression	77221614	Akaike info criterion	39.33424
Sum squared resid	1.49E+17	Schwarz criterion	39.61179
Log likelihood	-603.6808	Hannan-Quinn criter.	39.42472
F-statistic	58.34399	Durbin-Watson stat	1.978561
Prob(F-statistic)	0.000000		

Model 5:

Breusch-Pagan-Godfrey

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	2.512791	Prob. F(4,26)	0.0660
Obs*R-squared	8.642885	Prob. Chi-Square(4)	0.0707
Scaled explained SS	24.60331	Prob. Chi-Square(4)	0.0001

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 07/11/14 Time: 18:50
Sample: 1981 2011
Included observations: 31

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.26E+08	3.28E+08	0.994313	0.3292
CRUDEOIL	-449499.2	279814.2	-1.606420	0.1203
OPEN(-1)	-3.22E+08	2.91E+08	-1.107827	0.2781
GDP(-1)	0.019872	0.011070	1.795101	0.0843
OILDUMMY9802	3.85E+08	1.53E+08	2.512244	0.0185

R-squared	0.278803	Mean dependent var	1.12E+08
Adjusted R-squared	0.167849	S.D. dependent var	3.23E+08
S.E. of regression	2.95E+08	Akaike info criterion	41.98765
Sum squared resid	2.26E+18	Schwarz criterion	42.21894
Log likelihood	-645.8086	Hannan-Quinn criter.	42.06305
F-statistic	2.512791	Durbin-Watson stat	2.349589
Prob(F-statistic)	0.066033		

Breusch-Godfrey

Breusch-Godfrey Serial Correlation LM Test:

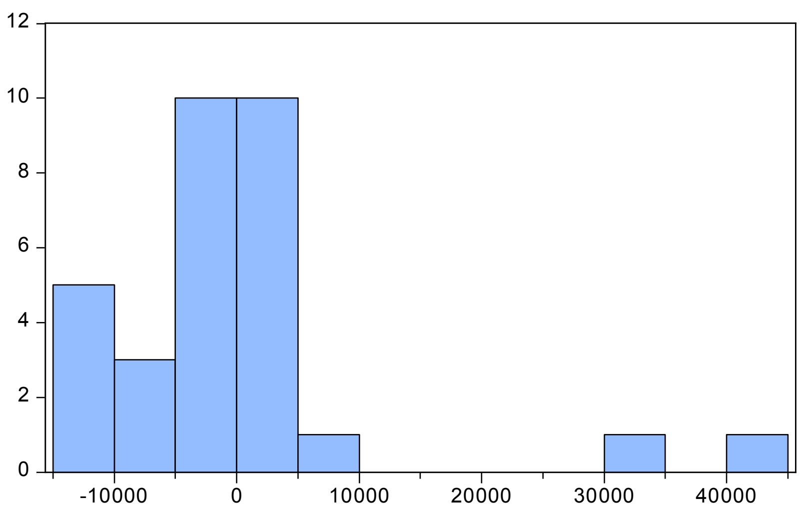
F-statistic	0.716413	Prob. F(2,24)	0.4987
Obs*R-squared	1.746467	Prob. Chi-Square(2)	0.4176

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 07/11/14 Time: 18:50
Sample: 1981 2011
Included observations: 31
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1505.180	13042.27	-0.115408	0.9091
CRUDEOIL	0.866404	11.13928	0.077779	0.9386
OPEN(-1)	4261.846	12182.42	0.349836	0.7295
GDP(-1)	-8.86E-08	4.51E-07	-0.196756	0.8457
OILDUMMY9802	2233.457	6345.545	0.351973	0.7279
RESID(-1)	-0.225567	0.220138	-1.024662	0.3157
RESID(-2)	-0.190500	0.220789	-0.862812	0.3968

R-squared	0.056338	Mean dependent var	4.31E-12
Adjusted R-squared	-0.179578	S.D. dependent var	10744.36
S.E. of regression	11669.27	Akaike info criterion	21.76299
Sum squared resid	3.27E+09	Schwarz criterion	22.08679
Log likelihood	-330.3263	Hannan-Quinn criter.	21.86854
F-statistic	0.238804	Durbin-Watson stat	2.082426
Prob(F-statistic)	0.959221		

Jarque-Bera



Series: Residuals
Sample 1981 2011
Observations 31

Mean	4.31e-12
Median	-676.0821
Maximum	40085.48
Minimum	-13453.97
Std. Dev.	10744.36
Skewness	2.286537
Kurtosis	9.093594
Jarque-Bera	74.97465
Probability	0.000000

Ramsey RESET

Ramsey RESET Test
Equation: MARKETS2
Specification: AGRICULTURE C CRUDEOIL OPEN(-1) GDP(-1) OILDUMMY9802
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	0.679410	25	0.5031
F-statistic	0.461598	(1, 25)	0.5031
Likelihood ratio	0.567161	1	0.4514

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	62785646	1	62785646
Restricted SSR	3.46E+09	26	1.33E+08
Unrestricted SSR	3.40E+09	25	1.36E+08
Unrestricted SSR	3.40E+09	25	1.36E+08

LR test summary:

	Value	df
Restricted LogL	-331.2251	26
Unrestricted LogL	-330.9415	25

Unrestricted Test Equation:
Dependent Variable: AGRICULTURE
Method: Least Squares
Date: 07/11/14 Time: 18:51
Sample: 1981 2011
Included observations: 31

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4940.458	13422.07	0.368085	0.7159
CRUDEOIL	-36.26768	19.88571	-1.823806	0.0802
OPEN(-1)	-19224.02	15102.79	-1.272878	0.2148
GDP(-1)	2.14E-06	1.03E-06	2.077878	0.0481
OILDUMMY9802	11115.85	6255.552	1.776957	0.0877
FITTED^2	-9.32E-06	1.37E-05	-0.679410	0.5031

R-squared	0.628279	Mean dependent var	10896.67
Adjusted R-squared	0.553934	S.D. dependent var	17462.20
S.E. of regression	11662.68	Akaike info criterion	21.73816
Sum squared resid	3.40E+09	Schwarz criterion	22.01571
Log likelihood	-330.9415	Hannan-Quinn criter.	21.82863
F-statistic	8.450932	Durbin-Watson stat	2.387909
Prob(F-statistic)	0.000086		

Output tables for models:

Model 1:

Dependent Variable: D(REER)
Method: Least Squares
Date: 06/30/14 Time: 14:40
Sample (adjusted): 1982 2011
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	57.78399	17.05617	3.387864	0.0024
D(REER(-1))	-0.385664	0.147197	-2.620063	0.0150
REER(-2)	-0.576870	0.072317	-7.976992	0.0000
D(GDPGROWTH)	-1.692518	1.981334	-0.854231	0.4014
GDPGROWTH(-1)	0.180414	2.740635	0.065829	0.9481
OILDUMMY1980S	256.6625	47.71522	5.379049	0.0000

R-squared	0.786330	Mean dependent var	-8.709517
Adjusted R-squared	0.741815	S.D. dependent var	75.02413
S.E. of regression	38.12116	Akaike info criterion	10.29627
Sum squared resid	34877.36	Schwarz criterion	10.57651
Log likelihood	-148.4441	F-statistic	17.66455
Durbin-Watson stat	2.337926	Prob(F-statistic)	0.000000

Model 2:

Dependent Variable: D(REER)
Method: Least Squares
Date: 07/14/14 Time: 12:12
Sample (adjusted): 1982 2011
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	104.7614	25.57735	4.095865	0.0004
D(REER(-1))	0.195019	0.142779	1.365876	0.1846
REER(-2)	-0.347737	0.075618	-4.598594	0.0001
D(GDPGROWTH)	-4.772885	2.773311	-1.721006	0.0981
GDPGROWTH(-1)	-10.75327	3.065812	-3.507479	0.0018
OILDUMMY1990S	-52.26193	27.70193	-1.886581	0.0714

R-squared	0.589594	Mean dependent var	-8.709517
Adjusted R-squared	0.504093	S.D. dependent var	75.02413
S.E. of regression	52.83248	Akaike info criterion	10.94899
Sum squared resid	66990.51	Schwarz criterion	11.22923
Log likelihood	-158.2348	F-statistic	6.895747
Durbin-Watson stat	1.708023	Prob(F-statistic)	0.000406

Model 3:

Dependent Variable: D(REER)
Method: Least Squares
Date: 07/14/14 Time: 12:12
Sample (adjusted): 1982 2011
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	52.02497	21.94918	2.370247	0.0265
D(REER(-1))	-0.419057	0.168825	-2.482193	0.0208
REER(-2)	-0.583701	0.075286	-7.753113	0.0000
D(GDPGROWTH)	-1.353920	2.165236	-0.625299	0.5379
GDPGROWTH(-1)	1.006169	3.389506	0.296848	0.7692
REGIME	270.4916	58.29526	4.640027	0.0001
OILDUMMY1990S	10.46477	24.42032	0.428527	0.6723

R-squared	0.788022	Mean dependent var	-8.709517
Adjusted R-squared	0.732724	S.D. dependent var	75.02413
S.E. of regression	38.78654	Akaike info criterion	10.35499
Sum squared resid	34601.10	Schwarz criterion	10.68193
Log likelihood	-148.3248	F-statistic	14.25034
Durbin-Watson stat	2.424764	Prob(F-statistic)	0.000001

Model 4:

Dependent Variable: MANUFACTURING
Method: Least Squares
Date: 07/07/14 Time: 16:25
Sample (adjusted): 1981 2011
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.92E+08	84762385	4.625556	0.0001
CRUDEOIL	-284486.5	72341.19	-3.932566	0.0006
OPEN(-1)	2.71E+08	75166268	3.610154	0.0013
GDP(-1)	0.010104	0.002862	3.530619	0.0016
OILDUMMY9802	-1.58E+08	39572978	-3.988113	0.0005

R-squared	0.920076	Mean dependent var	4.76E+08
Adjusted R-squared	0.907780	S.D. dependent var	2.51E+08
S.E. of regression	76195336	Akaike info criterion	39.28219
Sum squared resid	1.51E+17	Schwarz criterion	39.51348
Log likelihood	-603.8739	F-statistic	74.82731
Durbin-Watson stat	1.860183	Prob(F-statistic)	0.000000

Model 5:

Dependent Variable: AGRICULTURE
Method: Least Squares
Date: 07/07/14 Time: 16:25
Sample (adjusted): 1981 2011
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2603.858	12838.94	0.202809	0.8409
CRUDEOIL	-25.04537	10.95751	-2.285681	0.0307
OPEN(-1)	-12576.71	11385.42	-1.104633	0.2794
GDP(-1)	1.51E-06	4.33E-07	3.475949	0.0018
OILDUMMY9802	10053.97	5994.111	1.677307	0.1055

R-squared	0.621415	Mean dependent var	10896.67
Adjusted R-squared	0.563171	S.D. dependent var	17462.20
S.E. of regression	11541.29	Akaike info criterion	21.69194
Sum squared resid	3.46E+09	Schwarz criterion	21.92323
Log likelihood	-331.2251	F-statistic	10.66920
Durbin-Watson stat	2.291883	Prob(F-statistic)	0.000030