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DEPRECIATION OF THE NAIRA AGAINST THE DOLLAR

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DEPRECIATION OF THE NAIRA AGAINST THE DOLLAR

by

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ABSTRACT

DEPRECIATION OF THE NAIRA AGAINST THE DOLLAR

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Over the years, the value of Nigerian currency, the naira, has declined against the United States dollar by over 50%, a move that has impacted the Nigerian people, sometimes negatively. There are several different possible reasons why the naira has depreciated against dollar. In an attempt to identify potential causes, historical data will be used to derive an empirical model. The empirical model is based on three important long-run equilibrium relationships in international economics, purchasing power parity (PPP), uncovered interest parity (UIP) and stable money demand. The evidence presented suggests an important role for the Nigerian income, United States money supply and interest rate. Of less importance are inflation rates.

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CHAPTER 1

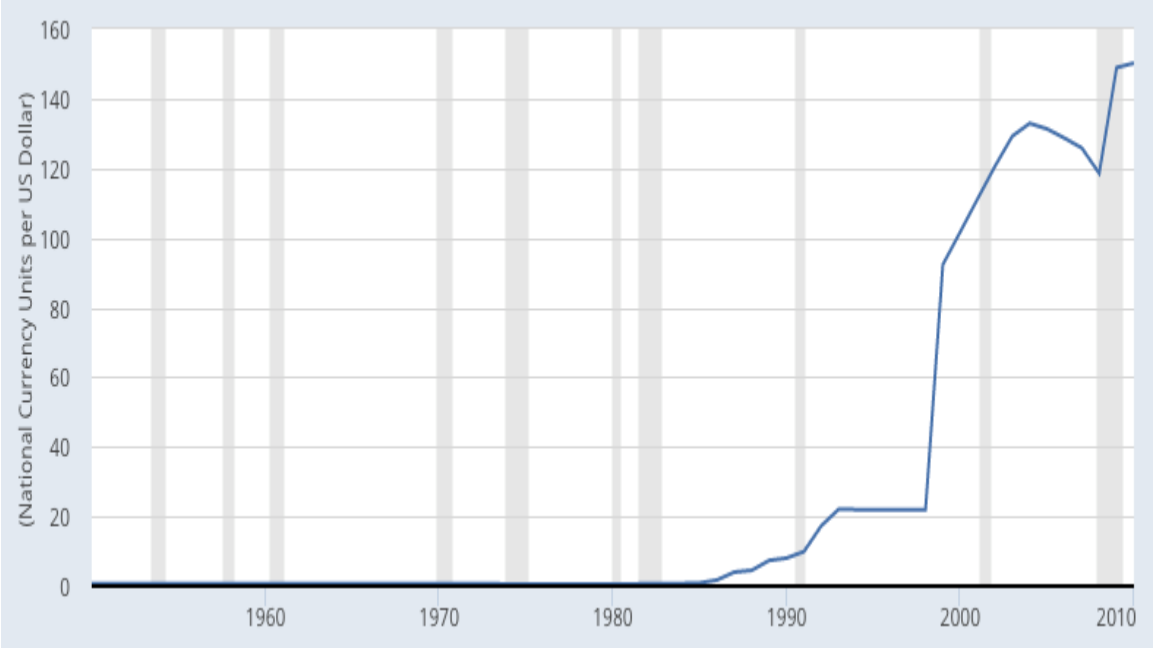
INTRODUCTION

The reduction in the value of a country's currency with respect to one or more foreign currencies is widely known as currency depreciation. Economic fundamentals, interest rate differentials and political instability are common reasons for currency depreciation. This paper investigates the causes of the depreciation of the Nigerian naira against the United States dollar.

In the 1970s and early 1980s, the naira exchange rate was about 77 kobo to 1 dollar. In 1986, the naira started to depreciate under the Banbangida's administration, a past military president of Nigeria. The introduction of the Structural Adjustment Program (SAP) was thought to be the major cause of the depreciation of the naira. The SAP consisted of loans, provided by the International Monetary Fund and the World Bank, to countries that experienced economic crises.

Although the United States is the largest economy in the world, it has also been faced with currency depreciation. In the years 2008-2009 the United States was faced with economic financial crises. The crises caused 33 percent depreciation on the United States dollar and had a negative effect on the economy. In addition, the Federal Reserve could implement monetary policies to either strengthen or weaken the US dollar. In order to encourage investors to borrow money, the Federal Reserve reduces interest rates. Reducing interest rates or purchasing of bonds could weaken the dollar and in turn lead to depreciation.

Figure 1.1: Exchange Rate to U.S. Dollar for Nigeria from 1960-2010
Source: Fred Economic Data, University of Pennsylvania



The devaluation of the naira currency has adversely impacted the spending power of Nigerians because the price of basic human needs like foods and clothes have drastically increased. In addition, the unemployment rate has increased from 9.90 to 10.40 percent. In 2011, Nigeria experienced a very high unemployment rate. The unemployment rate in Nigeria averaged 8.85 percent from 2006 until 2015, reaching an all time high of 19.70 percent in the fourth quarter of 2010 and a record low of 5.10 percent in the fourth quarter of 2010 (Trading Economics, 2016).

1.1 Nigeria's Oil: A Blessing or a Curse?

Nigeria, with the abundance of crude oil, is a blessed nation. The oil price shocks in the 1970s resulted in a large transfer of wealth to Nigeria (Pinto, 1987). Since the 1970s, Nigeria has earned more than $340 billion in oil and gas revenues. Before oil was discovered, Nigeria depended on other natural resources and agriculture for income. Agriculture has always been an important sector in the Nigerian economy and still is

despite the oil boom. Agriculture contributed to the growth of the Nigerian economy, reduced poverty, increased export revenue earnings and provided employment opportunities (Oji-Okoro, 2011). The rise in crude oil revenues in the early 1970s was the major cause of the decline in the agricultural sector. Nigeria neglected its strong agricultural and light manufacturing roots in favor of an unhealthy dependence on crude oil (Odularu, 2008). In the 1960s, agriculture accounted for about 65-70% of total exports. In the 1970s it fell to about 40% and crashed to less than 2% in the late 1990s (Olajide, Akinlabi, Tijani, 2009).

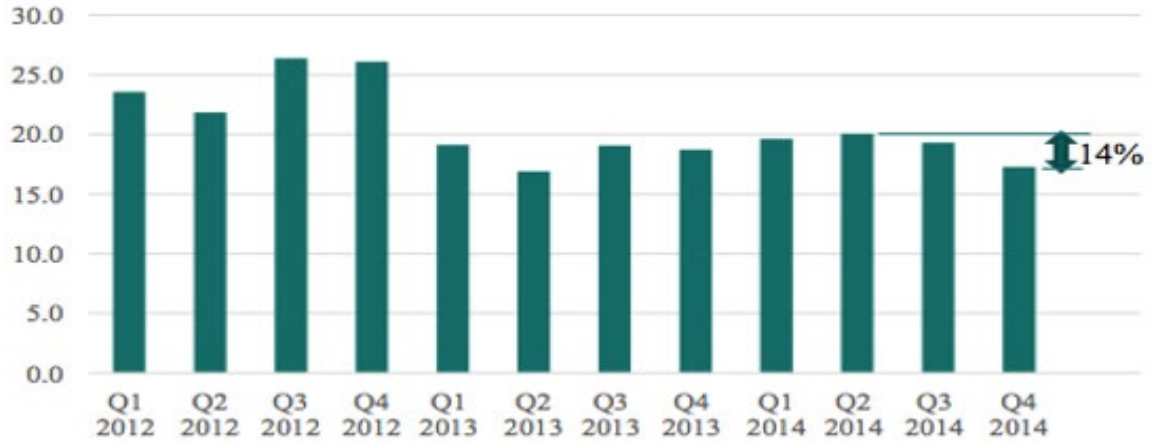
Despite disregarding other natural resources like agriculture, the oil boom was still favorable to the Nigerian economy in the 1970s. Nigeria's export earnings from crude oil rose steeply as a result of the oil price spike. By 1981, oil became the major contributing factor to Nigeria's real income, external terms of trade and creditworthiness. It is estimated that, in the year 2000, oil and gas exports accounted for more than 98 percent export earnings and about 83 percent of federal government revenue (Odularu, 2008).

Because oil is the largest and most commonly traded commodity, its price is important to the world's economy. The changes in the price of oil will have wide-ranging effects on both oil-producing and consuming countries. Long-term reductions in OPEC oil export revenues would force OPEC countries to make difficult economic and political tradeoffs if the price of oil continues to drop. A decline in oil prices benefits oil-importing countries and hurts oil-exporting countries. Nigeria, being a member of OPEC, has been greatly affected by the decline in the price of oil. Crude oil exports generate over 90% of Nigeria's foreign exchange earnings. Due to lower oil prices and production cuts, Nigeria's

crude oil export revenues were expected to fall by 36% in 1998, to $9.2 billion, compared to $14.5 billion in 1997 (Feld, MacIntyre, 1998).

After the United Kingdom, Nigeria's largest trading partner is the United States. Accounting for about 40% of Nigeria's oil export, the United States is the largest customer for Nigeria's crude oil. The introduction of a new drilling technique called fracking and lower national oil consumption has caused the United States to decrease their annual imports of crude oil in Nigeria from 41,767,000 to 3,405,000 barrels. The decrease in the demand of crude oil has reduced Nigeria's export, leading to lower export revenues, which have reduced Nigeria's foreign exchange reserves, worsened its fiscal position and exerted a downward pressure on the naira's exchange rate to the U.S. dollar (Hou, Keane, Kennan 2015). There are many concerns from financial markets around the world about Nigeria's ability to secure the naira. These concerns have led to a cycle of capital outflows, leading to more downward pressure on the exchange rate. Nigeria's exchange rate has depreciated by 22% over the half year of 2014 to 2015. So far this had only a modest impact on the real effective exchange rate, which appreciated by 35% over the previous five years (Hou, Keane, Kennan 2015).

Figure 1.2: Nigeria's Oil Exports (US$ billion) Decline Towards the End of 2014
Source: World Bank GEM and Foreign Trade Statistics, Fourth Quarter 2014, National Bureau of Statistics, Nigeria



1.2 Corruption: A Contributing Factor to the Naira's Downfall

The decline in the price of oil coupled with corruption has affected not just the Nigerian economy and fiscal growth but also the naira. The overdependence of oil revenues in Nigeria led to widespread corruption in the country. Instead of using the large transfer of wealth from crude oil to develop Nigeria, the leaders of the country started stealing and embezzling the nation's money for their selfish consumption. Nigeria has been unfortunate to have a history of poor leadership since their independence. Both the civilian and military leaders right from independence were pronounced to have been undisciplined and corrupt while their actions have been guided by ethnicity and nepotism (Makinde, 2013).

Since 1960 Nigeria's government has acquired about $600 billion in oil revenue, yet an estimate of about $400 billion dollars has been misspent, stolen or diverted to another country. A previous dictator, Sani Abacha, who ruled for about five years, is said to have stolen $4.3 billion, which was hidden in another country. In the year 2013, the previous Central Bank governor, Lamido Sanusi, stunned the country by identifying $20 billion missing from government oil accounts. The corruption in Nigeria has led to insufficient

money in the reserves, thereby forcing the country to take loans from the International Monetary Fund (IMF). In return for crisis assistance, the IMF has forced Nigeria to devalue its currency (York, 2015).

1.3 Are the Economic Policies Making Things Worse or Better for Naira?

In 1986, during General Ibrahim Babangida's regime, the Structural Adjustment Program (SAP) was introduced. A program originally meant to last for two years was still being used eighteen years after its launch. The SAP consisted loans by the IMF and World Bank to countries facing economic crises. The objectives of the Nigerian SAP was to achieve fiscal stability, set the basis for a sustained non-inflationary growth and diversify productive base of the economy. In order to make the SAP successful, it possesses some features which analyst regard as its fundamental elements. The SAP's elements included the establishment of foreign exchange markets to implement a realistic exchange rate policy, the implementation of pricing policies for public enterprises to encourage competition through liberalization and deregulation to reinforce the process of efficiency and the strengthening of demand management polices.

Table 1.1: Highlight of Structural Adjustment Program Implementation in Nigeria
Source: Moser, Rogers, and van Til 1997:13; Herbst and Soludo (2001)

Area of Reform	1986	1987	1988	1989	1990	1991	1992	1993	1994
Structural/Policy Reforms									
Foreign Exchange Market	*	*		*	*		*	X	X
Import Liberalization	*	*	X	X	X	X			
Export Promotion	*	X	X	X					
Debt Conversion	*						*		
Prices	*							*	*
Privatization/Commercialization			*						
Interest Rates	*	*		X		X	*		X
Credit Guidelines	*	*					*		
Financial Sector					*	*		*	
Budget (tax/expenditure)									
Policy Implementation									
Inflation	--	+	+	+	-	+	+	+	--
Fiscal Deficit/GDP	-	+	+	-	-	+	+	+	-
Petroleum Subsidy		>	>	>	>	>	>	>	>
Fertilizer Subsidy	>	>	>	>	>	>	>	>	>
Extrabudgetary Expenditures	--	+	+	+	-	+	+	+	-
Growth in Broad Money	-	+	+	-	+	-	+	-	-
Real Effective Exchange Rate (+ appreciate)	-	-	+	-	-	-	-	+	+
Official and Parallel Exchange Rate Spread	-	-	+	+	-	+	-	+	+
External Current Account	-	+	-	+	+	-	-	-	-

Note: *indicates reform; x indicates reversal of reform (change relative to previous year); - indicates a decline; + indicates an increase; > indicates variable was positive; and --indicates figure is zero, or that the item does not exist.

Since the implementation of the Nigerian SAP, none of its objectives has been achieved. The SAP was introduced when Nigeria was facing economic hardship and plagued by a tense economic political atmosphere. Despite the situation in hand, the government still went ahead to accept loans from the IMF, which in return came with some negative consequences. The introduction of the Nigerian SAP came with some unpleasant penalties such as high unemployment due to workers losing their jobs through retrenchment, inability to afford the necessities of life due to wage cuts and withdrawals of subsidies and the skyrocketing inflationary situation induced by currency devaluation (Nwabugo, 2011).

Today, all African countries that implemented SAP are not growing, are suffering mass unemployment and are experiencing increasing indebtedness and budget deficits. This trend has been experienced for about a decade by the currencies of all SAP nations that have implemented the policy. Since the introduction of the SAP, there has been an endless devaluation in the naira currency. Before the SAP began, one dollar exchanged for 77 kobo (1 naira = 100 kobo). Later in 1986, when SAP was introduced, the dollar exchanged for 1.756 naira. Corporate executives explained that the reason for this initial devaluation was that there were insufficient foreign currencies available to exchange for the naira. As the dollar exchanged for more naira, companies did not have enough naira to exchange for dollars and hence became short of cash for business. In 1987 a dollar exchanged for 4.106 naira; in 1988, 9.9 naira; in 2000, 101.6; naira and in 2016, 199 naira (Ogbimi).

CHAPTER 2

THE MONETARY MODEL

2.1 Long-Run Equilibrium Relationships Characterizing International Economies

There are two basic approaches to the theoretical modeling of exchange rates, the flow approach (Mundell, 1960) and the stock approach of (Frenkel, 1976). The theoretical model used in this study is the simple monetary model of exchange rate determination, the most basic of the stock or asset approach models. The simple monetary model is based on three long-run equilibrium relationships that characterize international economies: Purchasing Power Parity (PPP), Uncovered Interest Parity (UIP) and stable money demand relationship. Each is discussed in turn.

2.1.1 Purchasing Power Parity

PPP is a theory that suggests that the exchange rate adjusts so that an identical good in two different countries has the same price when expressed in a common currency. Purchasing power parity is also called the law of one price. The law of one price means that all homogenous goods should sell for one price, anywhere in the world, when prices are converted to a common currency. The idea of the purchasing power parity is that if one price holds for one individual good, then it should hold for aggregate goods. In theory, markets enforce the law of one price. With the pursuit of profit, identical goods are likely to have equal prices in different countries. Goods arbitrage should ensure the law of one price and by extension PPP. For example, an exporter in the United States can buy a certain

product in his country and sell at a higher price in another country to make a profit. Exploitation of these opportunities ensures that the price of the product equalizes in both countries. PPP implies the following relationship,

$$s_t = p_t / p_t^*$$

where s_t is the natural log of the exchange rate, defined as units of domestic currency per unit of foreign currency, and p_t and p_t^* are the log of the domestic and foreign price levels, respectively. This formula shows that the exchange rate is equal to the price of a domestic good divided by the price of a foreign good

Purchasing power parity is a useful tool because the PPP exchange rate provides a measure of a currency long run foreign exchange value. When the foreign exchange value of the dollar equals its PPP value, there should be no tendency for the dollar value to rise or fall. In contrast, when the dollar diverges from its PPP value, market forces push it back.

2.1.2 Uncovered Interest Parity

The Uncovered Interest Parity states that, adjusted for the currency denomination, expected returns on interest-bearing securities of similar risk and quality will be equal. Without the existence of the parity, there would be opportunities to make profit. For example, assume that the interest rate in America is 10% and the interest rate in another country is 20%. According to the Uncovered Interest Rate Parity, the currency of the other country is expected to depreciate against the American dollar by approximately 10%. The UIP relationship can be characterized by

$$E_t(\Delta s_{t+1}) = i_t - i_t^*$$

where E_t is the mathematical expectation conditional on the information available in time period t and i_t and i_t^* are the nominal return to domestic and foreign assets, respectively.

A decline in an exchange rate leads to an appreciation of a nation's currency. A good example to explain the Uncovered Interest Parity is that a U.S. investor who thinks returns would be higher in a foreign country must buy the foreign currency to purchase its assets. Buying the foreign currency would push the value of the foreign currency up, hence leading to a decline in the exchange rate and vice versa.

2.1.3 Equilibrium Money Demand

The stability of the money demand function is an obvious requirement for the monetary model of exchange rates. An increase in the stock of money may generate a predictable rise in the price level; for a given stock of money, an increase in the level of real output may generate a predictable rise in interest rates. The exact nature of these transmission processes is a more general macroeconomic question, but the hypothesis that they can be adequately described by a relatively simple money-demand function is a key element of the monetary approach. The formula for the money demand is:

$$m_t - p_t = \alpha y_t - \gamma i_t$$

where m_t is the log of the money supply, p_t is the log of the price level, y_t is the log of real income and i_t is the return on competing asset.

This equation shows that money demand is a function of interest rates and income in the economy. The money demand relationship shows the real purchasing power of money in terms of what it can purchase. For example, if a billion dollars is in circulation and every good cost $1, then there is enough money to purchase a billion goods. But if every good cost $100 dollars then there is only enough money to purchase 10 million goods. People consume based on income, so as income increases, demand for money increases, hence making α positive. On the other hand, interest measures the opportunity

cost of holding money. So holding more money will lead to a loss in the interest that could have been saved. Therefore, as interest rate goes up, the cost of holding money rises, making -γ negative.

2.1.4 The Flex-Price Monetary Model

If we assume that PPP holds continuously, essentially assuming that goods prices are perfectly flexible, then the three equilibrium relationships, PPP, UIP and money demand, imply the flex-price monetary model of exchange rate determination, in the equation below,

$$s_t = \alpha_0 + \alpha_1(m_t - m_t^*) + \alpha_2(y_t - y_t^*) + \alpha_3(\, i_t - i_t^*)$$

where $\alpha_1 > 0, \alpha_2 < 0, \alpha_3 > 0$ are predicted by the theoretical model. For simplicity we have assumed that foreign and domestic elasticities are equal. This restriction is relaxed in the empirical analysis.

The assumption of perfect price flexibility is clearly not valid in the real world, so we relax this assumption and instead assume that PPP only holds as a long-run equilibrium condition. Furthermore, we assume that the adjustment of the exchange rate to its PPP equilibrium is given by the following equation,

$$E_t \Delta s_{t+1} = -\theta(s_t - \bar{s}) + E_t(\pi_{t+1} - \pi_{t+1}^*)$$

where $\bar{s}$ is the long-run equilibrium value of the exchange rate given by PPP. The parameter θ governs the speed at which the equilibrium is restored. Combining this with the UIP and money demand conditions results in the sticky-price model of exchange rate determination given below:

$$s_t = \alpha_0 + \alpha_1(m_t - m_t^*) + \alpha_2(y_t - y_t^*) + \alpha_3(\, i_t - i_t^*) + \alpha_4(\pi_t - \pi_t^*)$$

where $\alpha_1 > 0, \alpha_2 < 0, \alpha_3 < 0, \alpha_4 > 0$ are predicted by the theoretical model. The key difference between the flex-price and sticky-price models is that, under the former, real interest rates are equal across countries while, under the latter, that is only true in the long-run equilibrium.

CHAPTER 3

METHODOLOGY

The sticky-price and flex-price model are the two forms of the monetary model presented. The specification for the flex price is:

$$\dot{S}_t = \alpha 0 + \alpha 1(m_t - m_t*) + \alpha 2\ (y_t - y_t*) + \alpha 3\ (\ i_t - i_t*)$$

The specification for the sticky price model is:

$$\dot{S}_t = \alpha 0 + \alpha 1(m_t - m_t*) + \alpha 2\ (y_t - y_t*) + \alpha 3\ (\ i_t - i_t*) + \alpha 3\ (\ \pi_t - \pi_t*)$$

Where:

m_t = Money supply of the domestic currency (naira)

m_t* = Money supply of the foreign currency (dollars)

y_t = Income of the domestic currency

$y_t* =$ Income of the foreign currency

i_t = Interest rate of the domestic currency

i_t* = Interest rate of the foreign currency

π_t = Inflation rate of the domestic currency

π_t* = Inflation rate of the foreign currency

3.1 The Flex-Price Model

Economic theory predicts that α1 should be positive, α2 should be negative and α3 should be positive.

In figure 3.1 the formula for the flex price model is:

$$St = \underset{(0.683)}{1.759} + \underset{(0.050)}{0.074} m_t + \underset{(0.104)}{0.357} m_t * - \underset{(0.096)}{0.220} y_t + \underset{(4.99E-05)}{7.78E-05} y_t * - \underset{(0.312)}{0.005} i_t - \underset{(0.008)}{0.031} i_t *$$

To find the t statistics, we divide the coefficient by the standard error:

$t_{\alpha_0} = \frac{1.759}{(0.683)} = 2.574$, $+ t_{\alpha_1} = \frac{0.0746}{0.050} m_t = 1.477$, $t_{\alpha_2} = + \frac{0.357}{0.104} m_t * = 3.406$, $t_{\alpha_3} = -\frac{0.220}{0.096} y_t = -2.287$, $t_{\alpha_4} = + \frac{7.78E-05}{4.99E-05} y_t * = 1.559$, $t_{\alpha_5} = -\frac{0.005}{0.003} i_t = -1.403$, $t_{\alpha_6} = -\frac{0.0312}{0.008} i_t * = -3.738$

Table 3.1: Regression Analysis of the Flex-Price Model

Dependent Variable: S
Method: Least Squares
Date: 03/07/16 Time: 14:41
Sample: 2000 2015
Included observations: 16

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.759573	0.683360	2.574885	0.0299
M	0.074682	0.050552	1.477335	0.1737
M_STAR	0.357478	0.104934	3.406710	0.0078
Y	-0.220071	0.096192	-2.287822	0.0479
Y_STAR	7.78E-05	4.99E-05	1.559770	0.1532
I	-0.005092	0.003627	-1.403911	0.1939
I_STAR	-0.031270	0.008364	-3.738529	0.0046

R-squared	0.955714	Mean dependent var	4.941029
Adjusted R-squared	0.926189	S.D. dependent var	0.157630
S.E. of regression	0.042825	Akaike info criterion	-3.163755
Sum squared resid	0.016506	Schwarz criterion	-2.825748
Log likelihood	32.31004	Hannan-Quinn criter.	-3.146446
F-statistic	32.37047	Durbin-Watson stat	2.335766
Prob(F-statistic)	0.000013		

3.2 The Sticky-Price Model

Economic theory predicts that $a(1)$ should be positive, $a(2)$ should be negative, $a(3)$ should be negative and $a(4)$ should be positive. Using figure 3.1 the formula for the sticky price model is:

$$S_t = = \underset{(1.72)}{-0.695} + \underset{(0.130)}{0.248} m_t + \underset{(0.174)}{0.577} m_t * - \underset{(0.098)}{0.163} y_t + \underset{(5.52E-05)}{0.000012} y_t *$$

$$- \underset{(0.0035)}{0.00054} i_t - \underset{(0.0095)}{0.023} i_t * + \underset{(0.0035)}{0.0017} \pi_t - \underset{(0.0090)}{0.014} \pi_t *.$$

To find the t statistics, we divide the coefficient by the standard error:

$t_{\alpha_0} = \frac{-0.695}{(1.72)} = -0.405$, $t_{\alpha_1} = + \frac{0.248}{0.130} m_t = 1.899$, $t_{\alpha_2} = + \frac{0.577}{0.174} m_t * = 3.301$, $t_{\alpha_3} = -\frac{0.163}{0.098} y_t = -1.646$, $t_{\alpha_4} = + \frac{0.000012}{5.52E-05} y_t * = 2.2308$, $t_{\alpha_5} = - \frac{0.00054}{0.0035} i_t = -1.502$, $t_{\alpha_6} = -\frac{0.023}{0.0095} i_t * = -2.392$, $t_{\alpha_7} = + \frac{0.0017}{0.0035} \pi_t = 0.465$, $t_{\alpha_8} = - \frac{0.014}{0.0090} \pi_t * = -1.504$

Table 3.2: Regression Analysis of the Sticky-Price Model

Dependent Variable: S
Method: Least Squares
Date: 02/08/16 Time: 18:39
Sample: 2000 2015
Included observations: 16

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.695916	1.718297	-0.405003	0.6976
M	0.247540	0.130301	1.899754	0.0992
M_STAR	0.576677	0.174652	3.301855	0.0131
Y	-0.162895	0.098947	-1.646278	0.1437
Y_STAR	0.000123	5.52E-05	2.230811	0.0609
I	-0.005362	0.003569	-1.502408	0.1767
I_STAR	-0.022801	0.009530	-2.392669	0.0480
INFL	0.001673	0.003596	0.465379	0.6558
INFL_STAR	-0.013673	0.009085	-1.504968	0.1760

R-squared	0.968222	Mean dependent var	4.941029
Adjusted R-squared	0.931904	S.D. dependent var	0.157630
S.E. of regression	0.041134	Akaike info criterion	-3.245649
Sum squared resid	0.011844	Schwarz criterion	-2.811068
Log likelihood	34.96519	Hannan-Quinn criter.	-3.223395
F-statistic	26.65954	Durbin-Watson stat	3.103668
Prob(F-statistic)	0.000142		

CHAPTER 4

CONCLUSION

4.1 The Flex-Price Model

Concerning the flex-price model, the t-statistics displayed in figure 3.1 are testing the null hypothesis $H(0): \alpha(i) = 0 \; for \; i = 0,6$. Using a standard 5% level of significance with a t stat of 1.477 degrees of freedom = 9 and t critical of 2.269, then we accept the null and conclude that the value of α(i) is significantly equal to zero. If money supply (m_t) in the domestic country, Nigeria, goes up by 1%, then according to the regression analysis, exchange rate goes up by 0.075%. The p value shows the probability that the null hypothesis is true. In order to reject the null, the p value has to be less than alpha. The p value, which is 17%, is greater than the significance level of 5%, meaning the coefficient is equal to zero. Although the sign is positive, it is not statistically different from zero. Therefore, domestic money supply does not play much of a role in determining the value of the exchange rate.

The t-statistics displayed in figure 3.1 are testing the null hypothesis $H(0): \alpha(i) = 0 \; for \; i = 0,6$. Using a standard 5% level of significance with a t stat of 3.406 degrees of freedom = 9 and t critical of 2.262, then we reject the null and conclude that the value of α(i) is not significantly equal to zero. If the money supply ($m_t *$) in the foreign country, United States, increases by 1%, then the exchange rate will go up by 0.357%. The p value, which is 0.7%, is less than the 5% significance level, so we reject the null hypothesis. The

estimate shows that an increase in the United States money supply will cause depreciation on the Nigerian naira. This estimate does not conform to the model. Not only is the estimate not the right sign, but statistically, $m_t *$ is playing an important role in the determination of the exchange rate.

The t-statistics displayed in figure 3.1 are testing the null hypothesis $H(0)$: $\alpha(i) = 0 \; for \; i = 0,6$. Using a standard 5% level of significance with a t stat of -2.287 degrees of freedom = 9 and t critical of - 2.262, then we reject the null and conclude that the value of α (i) is not significantly equal to zero. The estimate is statistically significant at a 5% level. The coefficient of y_t conforms to the theory, which says the domestic income should be negative. The underlying argument is that the higher the domestic income, the higher the domestic money demand. Therefore, if Nigerian residents hold more naira, the value of the naira will go up. The income in Nigeria plays a strong role in affecting the exchange rate. From this estimate, we conclude that the reason naira is depreciating is because the domestic income has not been growing rapidly in the last few years.

The t-statistics displayed in figure 3.1 are testing the null hypothesis $H(0)$: $\alpha(i) = 0 \; for \; i = 0,6$. Using a standard 5% level of significance with a t stat of 1.559 degrees of freedom = 9 and t critical of 2.262, then we accept the null and conclude the value of α(i) is significantly equal to zero. The p value, which is 15%, is greater than the significance level of 5%, meaning the coefficient is equal to zero. If income $(y_t *)$ in the foreign country goes up by 1%, then according to the regression analysis, exchange rate goes up by 7.78E-05%. The domestic income should be positive based on the theory. Based on the estimate it is positive, but with a coefficient of 7.78E-05 has a tiny estimate.

The t-statistics displayed in figure 3.1 are testing the null hypothesis $H(0)$: $\alpha(i) = 0\ for\ i = 0{,}6$. Using a standard 5% level of significance with a t stat of -1.403 degrees of freedom = 9 and t critical of -2.262, then we accept the null and conclude the value of α(i) is significantly equal to zero. According to the regression estimate, a 1% increase in Nigerian interest rates would decrease the exchange rate by 0.005%. The p value, which is 19%, is greater than the significance level of 5%, meaning the coefficient is equal to zero. The domestic interest rate should be positive based on the theory. Regarding the estimate, the coefficient is negative. We would conclude that the estimate is statistically insignificant.

The t-statistics displayed in figure 3.1 are testing the null hypothesis $H(0)$: $\alpha(i) = 0\ for\ i = 0{,}6$. Using a standard 5% level of significance with a t stat of -3.738 degrees of freedom = 9 and t critical of -2.262, then we reject the null and conclude that the value of α(i) is not significantly equal to zero. The p value, which is 0.4%, is less than the 5% significance level, meaning the coefficient is not equal to zero. If the interest rate ($i_t *$) in the foreign country increases by 1%, then the exchange rate will go down by 0.031%. Based on the theory, the sign of the foreign interest rate should be negative and regression analysis estimate displays a negative result. We conclude $i_t *$ is statistically significant and plays an important role in the determination of the exchange rate.

Based on the results of the flex price model, the Nigerian income (y_t), United States money supply ($m_t *$) and United States interest rate ($i_t *$) are the primary factors driving the values of the naira and dollar. From the regression analysis of the flex-price model, 95% of the variation of the exchange rate (s_t) is explained by $m_{t,}\ m_t *, y_t, y_t *, i_t$ and $i_t *$.

4.2 The Sticky-Price Model

Concerning the sticky-price model, the t-statistics displayed in figure 3.2 are testing the null hypothesis $H(0): \alpha(i) = 0 \; for \; i = 0,8$. Using a standard 5% level of significance with a t stat of 1.899 degrees of freedom = 7 and t critical of 2.365, then we accept the null and conclude that the value of α(i) is significantly equal to zero. If the money supply in the domestic country goes up by 1%, then according to regression analysis the exchange rate goes up by 0.247%. The p value shows the probability that the null hypothesis is true. The p value, which is 9.9%, is greater than the significance level of 5%, meaning the coefficient is equal to zero. Although the sign is positive, it is not statistically different from zero. Therefore, domestic money supply does not play much of a role in determining the value of the exchange rate

The t-statistics displayed in figure 3.2 are testing the null hypothesis $H(0): \alpha(i) = 0 \; for \; i = 0,8$. Using a standard 5% level of significance with a t stat of 3.302 degrees of freedom = 7 and t critical of 2.365, then we reject the null and conclude that the value of α(i) is not significantly equal to zero. If the money supply in the foreign country goes up by 1%, then according to regression analysis, the exchange rate goes up by 0.576%. The p value, which is 1.3%, is less than the significance level of 5% meaning the coefficient is not equal to zero. This estimate does not conform to the model. Not only is the estimate not the right sign, but statistically $m_t *$ is playing an important role in the determination of the exchange rate.

The t-statistics displayed in figure 3.2 are testing the null hypothesis $H(0): \alpha(i) = 0 \; for \; i = 0,8$. Using a standard 5% level of significance with a t stat of -1.646 degrees of freedom = 7 and t critical of -2.365, then we accept the null and conclude that the value of

α(i) is significantly equal to zero. From the regression analysis, the domestic income conforms to the theory, which says its coefficient should be negative. If the income in the domestic country goes up by 1%, then according to regression analysis, the exchange rate goes down by 0.162%. The p value, which is 14%, is greater than the significance level of 5% meaning the coefficient is equal to zero. The estimate of the income in the domestic country using the sticky-price model is different from the estimate of the income in the domestic country using the flex-price model.

The t-statistics displayed in figure 3.2 are testing the null hypothesis $H(0)$: $\alpha(i) = 0 \; for \; i = 0,8$. Using a standard 5% level of significance with a t stat of 2.23081 degrees of freedom = 7 and t critical of 2.365, then we accept the null and conclude that the value of α(i) is significantly equal to zero. A 1% increase in the income of the foreign country will lead to 0.000123% increase in the exchange rate. The p value, which is 6%, is greater than the significance level of 5%, meaning the coefficient is equal to zero. If income $(y_t *)$ in the foreign country goes up by 1%, then according to the regression analysis, exchange rate goes up by 7.78E-05%. The domestic income should be positive based on the theory. Based on the estimate, the coefficient of $y_t *$ is positive, but with a coefficient of 0.000123, $y_t *$ has a tiny estimate.

The t-statistics displayed in figure 3.2 are testing the null hypothesis $H(0)$: $\alpha(i) = 0 \; for \; i = 0,8$. Using a standard 5% level of significance with a t stat of -0.0053 degrees of freedom = 7 and t critical of -2.365, then we accept the null and conclude the value of α(i) is significantly equal to zero. According to the regression estimate, a 1% increase in Nigerian interest rate would decrease the exchange rate by 0.005%. The p value, which is 17%, is greater than the significance level of 5%, meaning the coefficient is equal to zero.

The domestic interest rate should be negative based on the theory. Regarding the estimate, the coefficient is negative. We would conclude that the estimate is statistically insignificant.

The t-statistics displayed in figure 3.2 are testing the null hypothesis $H(0)$: $\alpha(i) = 0 \; for \; i = 0,8$. Using a standard 5% level of significance with a t stat of -2.392 degrees of freedom = 7 and t critical of -2.365, then we reject the null and conclude that the value of α(i) is not significantly equal to zero. The p value, which is 0.48%, is less than the 5% significance level, meaning the coefficient is not equal to zero. If the interest rate ($i_t *$) in the foreign country increases by 1%, then the exchange rate will go down by 0.022%. Based on the theory, the sign of the foreign interest rate should be positive but the estimate of the regression analysis displays a negative result. We conclude $i_t *$ is statistically significant and plays an important role in the determination of the exchange rate.

The t-statistics displayed in figure 3.2 are testing the null hypothesis $H(0)$: $\alpha(i) = 0 \; for \; i = 0,8$. Using a standard 5% level of significance with a t stat of 0.4653 degrees of freedom = 7 and t critical of 2.365, then we accept the null and conclude the value of α(i) is significantly equal to zero. According to the regression estimate, a 1% increase in Nigerian inflation rate would increase the exchange rate by 0.0016%. The p value, which is 65%, is greater than the significance level of 5%, meaning the coefficient is equal to zero. The domestic inflation rate should be positive based on the theory. Regarding the estimate, the coefficient is positive. We would conclude that the estimate is statistically insignificant and does not play much of a role in determining the value of the exchange rate.

The t-statistics displayed in figure 3.2 are testing the null hypothesis $H(0)$: $\alpha(i) = 0 \; for \; i = 0,8$. Using a standard 5% level of significance with a t stat of -1.504 degrees of freedom = 7 and t critical of -2.365, then we accept the null and conclude the value of α(i) is significantly equal to zero. According to the regression estimate, a 1% increase in United States inflation rate would decrease the exchange rate by 0.0136%. The p value, which is 17%, is greater than the significance level of 5%, meaning the coefficient is equal to zero. The foreign inflation rate should be negative based on the theory. Regarding the estimate, the coefficient is negative. We would conclude that the estimate is statistically insignificant and does not play much of a role in determining the value of the exchange rate.

Based on the results on the sticky-price model, the United States money supply ($m_t *$) and United States interest rate ($i_t *$) are the primary factors driving the values of the naira and dollar. From the regression analysis of the sticky price model, 96.8% of the variation of the exchange rate (s_t) is explained by $m_{t,}$ $m_t *$, y_t, $y_t *$, i_t, $i_t *$, π_t and $\pi_t *$.

Although a decline in oil price, corruption and previous economic policies are contributing factors to the depreciation of the naira, the results from the flex-price and sticky-price model indicate that another substantial reason the naira is depreciating against the dollar is because, the rate at which the domestic naira is growing has drastically reduced in the last few years. The results from the flex-price model also shows that an increase in the United States money supply will cause a depreciation of the Nigerian naira. Nigeria's central bank recently stopped selling foreign exchange to money-changers because it struggles to stabilize the naira amid a plunge in oil prices that have hit government finances (Bala-Gbogbo, 2016). The results from the flex-price and sticky-price model provides a better understanding on why the Nigerian government is taking certain measures like,

reducing the flow of dollars to money-changers and restricting the amount of dollars Nigerians can use abroad. The main purpose for the restriction is to save the Nigerian naira from further depreciation and strengthen its value.

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BIOGRAPHICAL INFORMATION

Olufunke Ogunjobi was born and raised in Porthacourt, Nigeria. She began her undergraduate career in 2012 as an international undeclared Business major. She later joined the Honors College and declared a major in Economics in her sophomore year. She desires to be a successful entrepreneur, and God willing to become the finance minister of her home country, Nigeria. She hopes to use this research as a platform to understand the basic problems facing Nigeria.

Olufunke has always seen herself as a leader. She started her leadership journey as the head girl of her high school in Lagos, Nigeria, and continued by joining the Goolsby Leadership Academy in the UT Arlington College of Business, where she has learned to develop herself to be a better leader. She is particularly interested in giving back to society and wishes to start a scholarship foundation to sponsor students in Africa who cannot afford college abroad.