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THE IMPACT OF FOREIGN EXCHANGE RATE ON BUILDING MATERIALS AND RESIDENTIAL BUILDING CONSTRUCTION COST IN NIGERIA (1999-2021)

RESEARCH ARTICLE¹

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ABSTRACT

Nigeria has a housing deficit of over 17.5 million. Over the years, the government has articulated several policies to encourage investment and development of the housing sector. However, the housing construction sector imports most of the building materials which is affected by the various government directives on foreign exchange policies, with significant impact on the cost of housing production. This study examined the impact of foreign exchange rates on the costs of residential building materials in Ibadan, with a view to proposing policy directives on the local production of building materials in Nigeria. A survey research design was adopted and the retrospective longitudinal approach was employed to obtain data for the study. It was revealed that two types of rates (the fixed exchange rate and the floating exchange rate) dominated the trend of foreign exchange in Nigeria. The prices of building materials indicate an upward price movement and correlations exist between changes in exchange rates and changes in the price of building materials. A unit increase in the foreign

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exchange rate affects the price of building materials as seen in this study, where the foreign exchange rate positively increased by 1 value, the interbank and the parallel market exchange rates rose by exchange rate values of 0,807 and 0,705, respectively. To reverse the current trend of dependence of prospective house owners on foreign materials for housing production, the use of quality-assured local building materials in housing development should be encouraged.

ABSTRAK

Nigerië het 'n behuisingstekort van meer as 17,5 miljoen. Oor die jare het die regering verskeie beleide geartikuleer om belegging en ontwikkeling van die behuisingsektor aan te moedig. Die behuisingkonstruksie-sektor voer egter die meeste van die boumateriaal in wat geraak word deur die verskillende regeringsvoorskrifte oor buitelandse valutabeleide met 'n beduidende impak op die koste van behuisingproduksie. Hierdie studie het die impak van buitelandse wisselkoerse op die koste van residensiële boumateriaal in Ibadan ondersoek, met die oog daarop om beleidsvoorskrifte oor die plaaslike produksie van boumateriaal in Nigerië voor te stel. 'n Opname navorsingsontwerp is aangeneem en die retrospektiewe longitudinale benadering is aangewend om data vir die studie te verkry. Twee tipes koerse (die vaste wisselkoerse en die swewende wisselkoerse) het die tendens van buitelandse valuta in Nigerië oorheers. Die pryse van boumateriaal dui op 'n opwaartse prysbeweging en korrelasies bestaan tussen veranderinge in wisselkoerse en veranderinge in die pryse van boumateriaal. 'n Eenheidsverhoging in die buitelandse wisselkoerse beïnvloed die pryse van boumateriaal soos vir hierdie studie wanneer die buitelandse wisselkoerse positief met 1 waarde toegeneem het, het die interbank- en die parallelmarkwisselkoerse gestyg met wisselkoerswaardes van onderskeidelik 0,807 en 0,705. Om die huidige tendens van afhanklikheid van voornemende huiseienaars van buitelandse materiaal vir behuisingproduksie om te keer, moet die gebruik van gehalteversekerde plaaslike boumateriaal in behuisingontwikkeling aangemoedig word.

1. INTRODUCTION

With a population of over 200 million, Nigeria has a housing deficit of approximately 20 million (Oyediran, 2019: 39). To address the deficit, successive governments have formulated various housing-related policies to stimulate investment and development in the housing sector (Alabi, Muraina & Kasim, 2018: 47; Kasim, 2018: 955). For example, the government policy directives on foreign exchange policies have affected the housing market (ITA, 2019). It is believed that the housing market is driven by institutional, foreign, local and private businesses, as well as the growth of locally established businesses (Alabi, 2015: 103). The development of the housing market is dependent on the price of building materials, which are mainly imported, and exchange rates determined in a largely dollarised economy in Nigeria.

The exchange rate is the price of one currency against another. In Nigeria, the exchange rate evolved from a fixed rate in 1960 to a pegged structure between the 1970s and the mid 1980s and finally to the Second Tier Foreign Exchange Market (SFEM) in 1986. Before adopting the Structural Adjustment Programme (SAP) in 1986, the foreign exchange rate was

administratively determined. The introduction of SFEM, in 1986, allowed the exchange rate to find a realistic or appropriate level, thus eliminating various distortions in resource allocations (Alabi, 2015: 104; IMF, 2016; ITA, 2019).

Since the adoption of SFEM, the Nigeria Naira has continued to depreciate against international currencies. Over the years, Nigeria was presumed to be facing the challenge of a dwindling Naira rate in the international market (Ugochukwu, Ogbuagu & Okechukwu, 2014: 872-873). This was manifested in the sharp rate of depreciation of the Naira to USD, as a result of the fall in the oil price in the global market in 2015 (Isibor, Ojo & Ikpefan, 2017: 2340; Umaru *et al.*, 2023: 186). As a result of the continued depreciation of the Naira, the prices of residential building materials, mostly imported, have been on the increase and these have, in turn, discouraged many individuals from starting or continuing the construction of new houses (Agbola, 2005; Uma *et al.*, 2019: 113). Ugochukwu *et al.* (2017: 886) noted that the reliance of housing developers on the use of imported building materials has led to an increase in the cost of housing supply.

With the increasing population coupled with the inability of the government to meet the widening gap of housing deficit in Nigeria, many of the citizens have been using self-help to meet their housing needs (Onibokun, 1998; Taiwo, Yusoff & Abdul Aziz, 2018: 3770-3771; Adegun & Olawale, 2019: 332). The self-help strategy has been constrained by the inadequacy of locally produced building materials and the high dependency on imported materials (Alabi *et al.*, 2018: 47; Uma *et al.*, 2019: 119). Studies have been done on factors influencing housing production and delivery in Nigeria (Agbola, 2005; Agbola & Kasim, 2017: 19; Makinde, 2014; Iheme, Ekung & Effiong, 2015; Ugochukwu *et al.*, 2017; Alabi, Omirin & Kasim, 2017; Kasim, 2018; Taiwo & Misnan, 2020). The investigation also revealed that, since the adoption of financial liberalisation policies in 1987, the foreign exchange market in Nigeria has witnessed changes that affect the cost of construction materials and the overall cost of housing projects (Dada & Oyeranti, 2012; Ugochukwu *et al.*, 2014; Alabi, 2015; Ajayi, 2017; Izobo-Martins, Ekhaese & Ayo-Vaughan, 2018). Guided by the listed studies, this research adopted a streamlined approach to examine the impact of changes in foreign exchange rate policies on the prices of residential building materials in Ibadan, Nigeria. Since Nigeria's housing sector depends heavily on foreign materials for housing construction, the study provides a policy direction for import substitution and the investment in, and development of local production of most of the imported building materials to cushion the effects of the variations in the foreign exchange rates.

2. LITERATURE REVIEW

2.1 Purchasing power parity

A series of concepts and theories could be used to explain the impact of foreign exchange rates on the cost of residential building materials. However, for this study, emphasis is placed on the theory of foreign exchange behaviour. The origins of the Purchasing Power Parity (PPP) concept can be traced back to the Salamanca School in 16th-century Spain. Its modern use as a theory of exchange rate determination begins with the work of Gustav Cassel (1918), who proposed PPP as a means of adjusting pre-World War I exchange rates or parities for countries intending to return to the gold standard system after hostilities ended (Dornbusch, 1987).

According to this theory, the purchasing power of countries is one of the key determinants of foreign exchange rates at a particular point in time. PPP deals with how inflation or deflation affects exchange rate determination (Ajayi, 2017: 49; World Bank, 1997). This implies that inflation or deflation determine the exchange rate under the theory of foreign exchange behaviour. The PPP is based on the notion that high domestic inflation rates will, ultimately, make exports, investments, and tourism more expensive to foreigners. There are two variants of PPP; the absolute PPP and the relative PPP (Vo & Vo, 2023: 447). The absolute PPP predicts that the exchange rate should adjust to equate the prices of national goods and services between two countries because of market forces driven by arbitrage (Schreyer & Koechlin, 2002: 1). Under absolute PPP, the exchange rate is simply equal to the ratio of the domestic to the foreign price of a given aggregate bundle of commodities (Schreyer & Koechlin, 2002: 1). The relative PPP implies that the exchange rate between two countries should eventually adjust to account for differences in their inflation rates when prices of similar products in different countries are measured in the common currency (Schmitt-Grohe, Uribe & Woodford, 2022: 193-210; Schreyer & Koechlin, 2002: 1).

With the PPP in operation, the exchange rates will continue to adjust according to global demands, driving the domestic currency's price downward/upward by as much as it takes to equal the difference in inflation rates (Manzur, 2018: 217). However, many factors affect short-term exchange rates in addition to differential inflation rates (Argyropoulos *et al.*, 2021: 253-254). Some of the factors include the existence of non-traded goods and services that preclude arbitrage and the presence of significant transactions costs for traded goods, including transport costs, tariffs, taxes, information costs, and other non-tariff trade barriers that make arbitrage costly (Manzur, 2018: 217; Vo & Vo, 2023: 447).

PPP has some inherent shortcomings as a particularly good predictor of short-term exchange rate movements. Nonetheless, it does a fairly good job of predicting general dynamics in exchange rates over the longer term (Barguelli, Ousama Ben-Salha & Zmami, 2018: 1302-1303). In the short term, exchange rates are affected by factors other than inflation differentials but income level, government control or the interest rate and movements of capital (Ke, Shabbir & Corona, 2018: 369). As a result, many studies have highlighted the non-reliability of this theory, and it should only be used in conjunction with other methods (Engel, 2019: 22; Nakamura, 2022). Hence, the relevance of the supply shock concept.

2.2 Supply-side shock

Supply-side shocks, which are events external to an economy, but which affect its production of goods and services, are sudden and unexpected changes in cost variables such as oil prices, commodity prices, and wages (Peersman & Van Robays, 2012: 1544; Umore *et al.*, 2023: 186). The macroeconomic effect of supply shock on the cost of building materials depends on whether the shock is positive or negative (Ugochukwu *et al.*, 2017; Umore *et al.*, 2023). When there is a positive shock, the supply curve for building materials shifts from its original place to the right. As a result of the positive oil shocks of 1973/1974 and 1978/1979, the Naira became greatly overvalued. At the height of the oil boom, in 2013-2014, Nigeria's economy grew rapidly and overtook South Africa as the continent's largest economy. But when the oil price plummeted, the country's weaknesses were exposed.

Due to the oil glut that crept into the Nigerian economy in 1981, as well as the collapse of the international oil market in 1986 (negative shocks), the revenue generated by the "black gold" has continued to decrease. According to Olowe (2009: 379), the introduction of the SAP in Nigeria in 1986 led to the deregulation of the foreign exchange market and the introduction of the market-determined exchange rate. This created uncertainty in the exchange rate, thus leading to volatility. Deregulation of foreign exchange rates has led to the scarcity of dollars. That in turn, led to the development of a parallel dollar market as an alternative to the formal sector market. When dollars are scarce, the dollar exchange rate market is illiquid, making it difficult to pay dollar commitments (Ajayi, 2017; Ugochukwu *et al.*, 2017: 97). The illiquidity and the difficulty to service foreign debt prompted the state to respond by floating the currency's exchange rate, with the aim to discourage importations induced by the parallel market by devaluing the Naira.

The devaluation of the currency in 2014, due to falling oil prices driven by a global supply glut and declining world demand for crude oil, created a steep difference in Naira/USD parity (Ajayi, 2017: 50; Ugochukwu *et al.*, 2017: 96-97). As the Nigerian dollar receipt dropped, due to lower oil prices, the Naira also weakened and the trend continues to date. Construction projects are a high-risk business activity influenced by both internal and external factors, for example, foreign exchange fluctuations (Kulemeka, Kululanga & Morton, 2015). When undertaking projects within a local context with international influence, the construction cost may be significantly affected and complicated by the risk of fluctuations in the foreign exchange rates (Izobo-Martins *et al.*, 2018: 194; Kanu & Nwadiubu, 2020: 59-60). As noted by Olawale & Sun (2010) and Kulemeka *et al.* (2015) the fluctuations affect progress and cause delays. This, in turn, creates problems for subcontractors, namely cost overruns, disputes, arbitration, total abandonment, and litigation. It has been reported that deficit foreign exchange fluctuations may cause the price of, especially imported raw materials to increase, leading the cost overruns (Musarat, Alaloul & Liew, 2021: 408; Oluyemi-Ayibiowu, Aiyewalehinmi & Omolayo, 2019).

2.3 Exchange rate policy and construction cost

Alabi (2015: 103) states that Nigeria, like many other low-income open economies of the world, has adopted the two main exchange rate regimes to gain internal and external balance. The regimes are direct administrative control exchange rate policy and market-oriented exchange rate policy. The arguments and conditions for and against each of the regimes are clear, given that the two regimes are aimed at maintaining stability in exchange rates (Alabi, 2015). Direct administrative control exchange rate policy was used to manage Nigeria's foreign exchange from independence in 1960 until 1986, when the SFEM was introduced as a fallout of the adoption of SAP (Alabi, 2015).

Since the adoption of financial liberalisation policies, most of the developing countries have been exposed to sharp exchange rate fluctuations (Barguelli *et al.*, 2018: 1302). Therefore, in an attempt to achieve an optimal level of foreign exchange efficiency, several policy guidelines and requirements were introduced to manage the nation's foreign exchange market. The prominent policies emerged in 1986 when Nigeria shifted to a market-oriented economy to promote the productive sector and enhance the facilitation of Foreign Direct Investment (FDI) influx into the country. The Nigeria foreign exchange market has witnessed tremendous changes since the introduction of SFEM in September 1986; the unified official market in 1987; the Autonomous Foreign Exchange Market (AFEM) in 1995; the Inter-bank Foreign Exchange Market (IFEM) in 1999 (Alabi, 2015), and the floating and flexible regime in 2015. A floating and flexible regime led to

the emergence of the Investors and Exporters (I&E) Market, which was introduced in the first quarter of 2017 to stabilise the forex market and provide liquidity in the market for Forex in Nigeria (Ajayi, 2017).

The various organised market arrangements for selling and buying foreign exchange under the floating regime are convoluted (Alabi, 2015). However, it is clear that the volatility, frequency, and instability of the exchange rate movement, since the beginning of the floating exchange rate, raises concern about the impact of such movements on construction materials and commercial real estate returns in Nigeria. As observed by Dada & Oyeranti (2012: 231), the flexible forex market becomes a factor that can affect the cost of real estate development and may give rise to uncertainty in attempting to estimate the cost of developing projects.

Nigerians rely on imported goods and services in all sectors of the economy, housing production inclusive. The fluctuation in the foreign exchange rate has been presumed to be one of the causes of an increase in housing production cost (Alabi, 2015: 105; Alabi *et al.*, 2018: 46-47; PWC, 2016; Uma *et al.*, 2019: 113). Since the deregulation of the Naira in 1986, the currency has continued to depreciate against the currencies of major trading partners. The implication of this is that the prices of imported building materials have been on the increase, as reflected in the cost of housing construction and prices of the finished good, a house. It has been documented that slight variations and/or fluctuations in prices of building construction materials could greatly affect the overall cost of building (Dada & Oyeranti, 2012).

Completing construction projects within the estimated time and cost is an indicator of efficiency, but the process of construction is subjected to many unpredictable and changing factors that come from different sources (Ismail *et al.*, 2012; Ugochukwu *et al.*, 2014). These sources include the performance of the parties involved, resource availability, and the prevailing economic situation, including foreign exchange volatility (Olawale & Sun, 2010: 511-513; Kulemeke *et al.*, 2015). The financial situation of construction organisations can be adversely affected when the currency of exchange rates fluctuates (Ling & Hoi, 2006). It has been documented that one of the predominant causes of delay for construction projects is financial difficulties experienced because of the fluctuations in foreign exchange rates (Ismail *et al.*, 2012: 4968-4970; Kanu & Nwadiubu, 2020: 59-60; Okoli, Mbah & Agu, 2016: 6-7; Olawale & Sun, 2010: 511-513). As noted by Ugochukwu *et al.* (2014: 872), the construction industry in Nigeria has experienced a challenging period owing to the exchange rate volatility. Therefore, projects that would have helped uplift the standard of living have either been abandoned or did not take off at all, due to inadequate funds and the rising cost of construction materials (Izobo-Martins *et al.*, 2018: 194).

3. METHODOLOGY

3.1 Research design

The study examined the relationship between foreign exchange rates and the price of building materials in Ibadan, Nigeria, to determine the effects of the nexus on the cost of housing construction. A correlational research design was adopted for this study to collect retrospective longitudinal data (Robins, 1988: 315-316; Creswell, 2014). The longitudinal approach, a method used in collecting continuous and trend data over an extended period (Caruana *et al.*, 2015: 537) was used to obtain data on foreign exchange rates, and the cost of building materials for the study. The method was deemed appropriate and versatile in the collection of repeatable data and allows for the documentation of quantitative trend data (Venkatesh & Vitalari, 1991: 124). The survey covered a period from 1999-2021.

3.2 Sampling method

Information on sources and prices of building materials was obtained from the records of building materials dealers in Iwo Road, Ibadan. The choice of building material dealers in the Iwo Road area, Ibadan, stems from the fact that large numbers of building material dealers are found in this location, which serves as the central market for building materials in Ibadan. Virtually all types of building materials required in housing production are sold along this corridor of the city. From the preliminary survey carried out, 108 building materials points of sales were identified and disaggregated into six distributor/wholesale outlets and 102 retail shops. Further investigation revealed that the majority of the retail outlets/shops were either owned or under the control and/or direct supervision of the six major wholesalers/distributors (Uchekinze Nigeria Ltd, Tony Anne Nig. Ltd, Jontana Nig. Ltd, Macfoster Builders Station, B Fams Nig. Ltd, and Demmy Super Build Mart). It is important to note that, in a typical Nigerian major market corridor, the major distributors and wholesalers also have their hands in the pie as market intermediaries and retail outlets to maximise their market share and sphere of influence (Ladipo, Alarape & Nwagwu, 2013: 135; Odia & Dakare, 2019: 139).

3.3 Data collection

The six major wholesalers and distributors serve as the one-stop shop for builders and buyers of building materials. Information on the average prices of building materials was retrospectively collated and documented from the sales receipts of the building materials distributors from 1999-2021. The data obtained were subjected to an aggregated transformation process involving the conversion of the raw data from the six major wholesalers

and distributors of building construction materials into a cleansed, validated, transformed through differencing and made stationary in ready-to-use format (Bond & Fox, 2001; Osborne, 2019). The data on the foreign exchange rate was obtained from the CBN statistical bulletin, the National Bureau of Statistics, and other existing literature.

3.4 Data analysis

Data were analysed using descriptive and inferential statistics. The descriptive analyses calculated the percentage variations in foreign exchange rates and prices of building materials and showed the results over two 10-year interval periods.

For inferential analysis Pearson Product Moment Correlation, t-test, as well as simple and multiple linear regression analyses at $p \leq 0.05$ was used to find correlations between exchange rates, prices of residential building materials and residential building construction costs. To analyse the difference in the cost of the two types of dominant cement in Nigeria (Lafarge and Dangote) and the price of locally made metal doors and imported doors, a paired samples t-test with $p=0.05$ was done to compare the mean of cases, and to find any correlations between the cases examined (Ross & Willson, 2017: 17). Pearson Product Moment Correlation is best used in determining a linear relationship between the two variables (Coffman, Maydeu-Olivares & Arnau, 2008). According to Gujarati and Porter (2009: 20), correlation coefficients (r) measure whether there is a linear relationship between two variables. It has values between -1 and 1, where:

- -1 indicates a perfectly negative linear correlation between the two variables.
- 0 indicates no linear correlation between the two variables.
- 1 indicates a perfectly positive linear correlation between the two variables.

For this study, a Pearson's correlation test with $p=0.05$ was done to find any significant relationship between exchange rates and prices of building materials. However, to measure the real relationship between different variables when time-series data is analysed, the collected data were transformed, using the first and second differences in making the data stationary. This implies that the change in one variable is tested against the change in another variable to accurately predict the causal relationships between the variables through a correlation test.

4. FINDINGS

4.1 Foreign exchange rate in Nigeria

Results in Figure 1 show that exchange rate fluctuation is a period in which the value of domestic currency appreciates or depreciates. The fluctuation has implications for the overall economy of a nation, especially the price of imported goods. Owing to changing government policies, the Nigerian foreign exchange market is known for its high level of fluctuation. A larger part of the housing construction materials is imported; therefore, fluctuation in the exchange rate will have an effect on the construction cost of a building. For example, in 1999, the Central Bank of Nigeria's official exchange rate was N85.6/dollar. In 2000, it depreciated to N92.5/dollar and the official rate increased in 2001 to N113.12/dollar. Naira depreciated further to N133/dollar in 2004. However, it increased from N131.65/dollar in 2005 to 127.38/dollar and N124.61/dollar in 2007. The exchange rate increased to N117/dollar in 2008 because of the foreign exchange rate stabilisation policy aimed at increasing the value of the Naira.

The foreign exchange rate increased to N147/dollar in 2009 and this fluctuated slightly from 2011 to 2014 to range between N152/dollar to N156/dollar and increased to N193/dollar in 2015. From 1999 until 2015, a pseudo-fixed exchange rate policy was adopted by the government to fix the Naira/dollar exchange rate to below the N200 threshold.

In late 2015, the fixed exchange rate policy was discarded to allow a floating exchange rate policy. The floating exchange rate policy led to the removal of government control to allow the forces of supply and demand to regulate the exchange rate. Whenever prices are regulated by market forces in Nigeria, it often leads to huge volatility. Hence, the exchange rate increased beyond the N200 Rubicon by increasing from 193/dollar to N253.2 in 2016 and N306/dollar in 2018. In 2020, the Naira was further devalued to N386/dollar. The interbank rates were slightly higher, as the exchange rates were 259.66/dollar, 336.89/dollar, 362.38/dollar, 362/dollar, and 386/dollar in 2016, 2017, 2018, 2019 and 2020, respectively. In the parallel market, the exchange rates were N443, N361, N361, and N430 in 2017, 2018, 2019 and 2020, respectively. In summary, between 2000 and 2010, the CBN, interbank, and parallel market rates increased by 72%, 59%, and 70%, respectively. The rates for CBN, interbank, and parallel market rates were 149%, 145%, and 172%, respectively, between 2011 and 2020. Figure 1 shows the yearly foreign exchange rates in Nigeria.

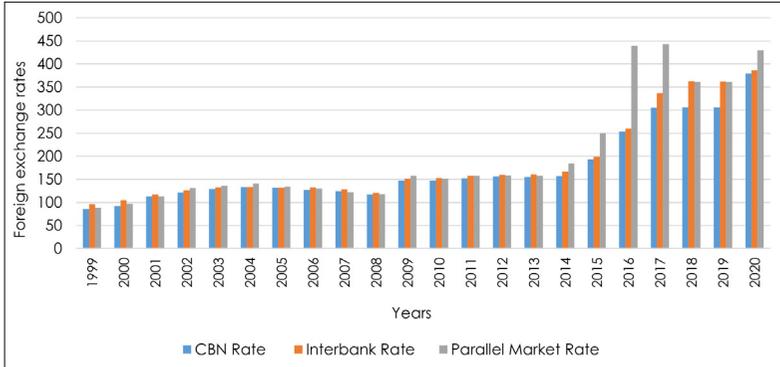


Figure 1: Yearly foreign exchange rates

Source: CBN, 2020

Based on the trend analysis of the foreign exchange rate during the period (1999-2021) under review, two rates dominated the trend. The first was when Nigeria was operating a fixed exchange rate (1999-early 2015), which was regulated by the government, and the second was the era when a floating exchange rate was introduced (2015-2020). During the former era, the Nigerian Government ensured that the rate was below 200/US\$1 but during the latter era, the rate increased from N253//US\$1 2016 to N306/US\$1 in 2018 and increasing to N380/US\$1 in September 2020.

4.2 Prices of residential building materials

The trends in the prices of roofing sheets in Nigeria, as shown in Table 1, indicate an upward price movement from 1999 to 2020. The price of corrugated iron sheets, which was N4,200 per bundle between 1999 to 2003/2004, increased to N7,600 in 2008 and was sold for N12,000 in 2020. The price (per sqm) of aluminium roofing sheet (long span) 0.45mm (Tower product) was N950 between 1999 to 2005, but it increased from N1,250 in 2006 to 2010 and increased further to N1,450 in 2011 and sustained price till 2012. The price decreased to N1,320 and N1,313 in 2013 and 2014, respectively; it increased to N1,454 in 2015 and maintained this trend at N2,475 per unit cost in 2018. Between 2019 and 2020, it increased from N2,500 to N2,800. In addition, there has been an increase in the price of other brands and sizes of roofing sheets such as aluminium roofing sheet (long span) 0.55mm (Tower product), step tiles roofing sheet 0.45mm (tower), step tiles roofing sheet 0.55mm (tower), waterproof membrane 4mm thick Italian membrane, aluminium roofing sheet (long span)

0.45mm (other product), and aluminium roofing sheet (long span) 0.55mm (other product). This implies that the cost of roofing materials increased consistently from 1999 until 2020.

Table 1: Prices of roofing materials

Year	Price (N/sq.m)						Price (N/bundle)
	Aluminum roofing sheet (long span) 0.45mm (Tower product)	Aluminum roofing sheet (long span) 0.45mm (other product)	Aluminum roofing sheet (long span) 0.55mm (Tower product)	Aluminum roofing sheet (long span) 0.55mm (other product)	Step Tile roofing sheet 0.45mm (Tower product)	Step Tile roofing sheet 0.55mm (other product)	Corrugated iron sheet
1999	950	850	1,050	1,050	1,300	1,625	
2000	950	850	1,050	1,050	1,310	1,630	4,200
2001	950	850	1,050	1,050	1,320	1,635	4,200
2002	950	850	1,050	1,050	1,330	1,645	4,200
2003	950	850	1,050	1,050	1,340	1,658	4,200
2004	950	850	1,050	1,050	1,350	1,665	7,200
2005	950	850	1,050	1,050	1,355	1,670	7,200
2006	1,250	1,150	1,450	1,350	1,382	1,685	7,200
2007	1,250	1,150	1,450	1,350	1,398	1,695	7,200
2008	1,250	1,150	1,450	1,350	1,420	1,700	7,600
2009	1,250	1,150	1,450	1,350	1,450	1,730	6,500
2010	1,250	1,150	1,450	1,350	1,485	1,770	6,900
2011	1,450	1,250	1,650	1,800	1,420	1,775	7,000
2012	1,450	1,250	1,650	1,800	1,435	1,780	7,000
2013	1,320	1,250	1,600	1,800	1,448	1,785	7,300
2014	1,313	1,250	1,605	1,800	1,470	1,798	7,300
2015	1,454	1,250	1,827	1,800	1,866	2,053	7,800
2016	1,761	1,400	2,202	2,550	1,867	2,334	8,500
2017	3,071	1,400	3,753	2,550	3,255	3,978	9,000
2018	2,475	1,400	2,778	2,550	2,635	3,258	10,200
2019	2,500	1,700	3,000	2,700	2,800	3,300	10,500
2020	2,800	2,000	3,200	3,000	2,900	3,500	12,000

The unit price of 8mm thick vitrified tiles (400mmx400m) increased by 26% between 2000 and 2010 and further increased by 102% from 2011 to 2020. The unit prices of 8mm vitrified glazed tiles (300mmx300mm) increased by 20% between 2000 and 2010 and by 138% between 2011 and 2020. For the unglazed (600mmx600mm), the percentage unit price increased by 21% from 2000 to 2010 and 112% from 2011 to 2020, respectively.

Table 2: Prices of floor, wall, and PVC tiles

Year	Price (N/sq.m)						
	8mm thick vitrified tiles (400mmx400mm)	8mm thick vitrified glazed tiles (600mmx600mm)	8mm thick glazed tiles (300mmx300mm)	8mm thick unglazed tiles (600mmx600mm)	8mm thick unglazed tiles (400mmx400mm)	Wall tiles (ceramics) kitchen and bathroom	PVC tiles (300mmx300mm) 1.8mm thick
1999	1,350	1,750	950	1,550	1,100	250	500
2000	1,350	1,750	950	1,550	1,100	250	500
2001	1,400	1,750	950	1,550	1,100	300	500
2002	1,400	1,650	1,000	1,580	1,150	400	750
2003	1,500	1,650	1,000	1,580	1,150	600	750
2004	1,600	1,700	1,100	1,600	1,180	750	800
2005	1,580	1,800	1,100	1,600	1,180	800	900
2006	1,580	1,800	1,100	1,700	1,200	900	900
2007	1,650	1,950	1,150	1,700	1,200	1,020	1,450
2008	1,650	1,950	1,150	1,850	1,350	1,080	1,500
2009	1,650	1,950	1,300	1,880	1,350	1,080	1,600
2010	1,700	2,100	1,300	1,880	1,440	1,050	2,000
2011	1,730	2,100	1,580	1,980	1,440	1,100	2,000
2012	1,730	2,200	1,580	1,980	1,550	11,000	2,000
2013	1,950	2,200	1,600	2,000	1,550	1,100	1,200
2014	1,950	2,450	1,600	2,250	1,700	1,150	1,500
2015	2,650	2,850	2,180	2,600	1,900	1,150	1,700
2016	2,650	3,100	2,180	2,600	2,100	1,200	1,750
2017	2,800	3,500	2,500	2,600	2,100	1,200	1,800
2018	2,800	3,300	2,450	2,550	2,050	1,200	1,300
2019	3,200	4,100	2,600	3,400	3,200	1,300	1,400
2020	3,500	5,000	2,800	4,200	2,700	1,600	1,600

The price of a wash-hand basin (450mmx350mm), bathtub enamelled cast and water closet (China vitreous) with fittings per unit increased by 143%, 88%, and 76%, respectively, from 2000 to 2010. The same items' unit prices increased by 100%, 127%, and 225% between 2011 and 2020, as shown in Figure 2.

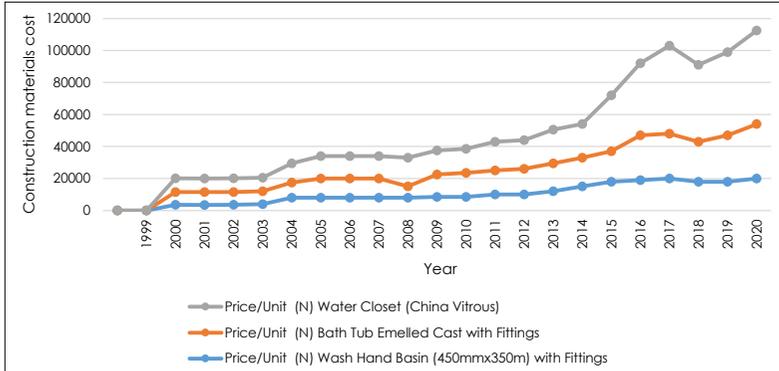


Figure 2: Price of sanitary fitting

Between 1999 and 2010, the unit price of a metal door with a glass double door (2.1mx1.2m) decreased by -7% from 2000 to 2010 and increased by 56% between 2011 and 2020, as shown in Table 3. The unit price of a locally made metal double door (2.1mx1.8m) remained unchanged from 2000 to 2010 and increased by 22% between 2011 and 2020. Turkish double door (2.1mx1.8m), Turkish single door (2.1mx1.2m), and Turkish single door (2.1mx0.9m) unit prices increased by 23%, 40%, and 56%, respectively. The cost of aluminium sliding door (1800mmx2100mm) per unit increased by 7% between 2000 and 2010 to 41% from 2011 to 2020. Table 3 also shows that a unit cost of aluminium sliding windows (1.2mx1.2m) increased from 2000 to 2010 by 15% and by 79% between 2010 and 2020. The same trend was observed for aluminium sliding windows of various dimensions: 600mmx600mm, 900mmx1200mm, and 1800mmx1200mm.

Table 3: Prices of doors and windows

Year	Price/Unit (N)										
	Metal double door with glass (2.1mx1.2m)	Metal single door with glass (2.1mx0.9m)	Metal double door (2.1mx1.8m)	Turkish double door (2.1mx1.8m)	Turkish single door (2.1mx1.2m)	Turkish single door (2.1mx0.9m)	Aluminum sliding door (1800mmx 2100mm)	Aluminum sliding windows (1.2mx1.2m)	Aluminum sliding windows (600mmx 600mm)	Aluminum sliding windows (900mmx 1200mm)	Aluminum sliding windows (1800mmx 1200mm)
1999											
2000	45,000	26,000	55,000				30,000	6,500	3,500	5,500	9,500
2001	45,000	26,000	55,000				30,000	6,500	3,500	5,500	9,500
2002	45,000	26,000	52,000				30,000	6,500	3,500	5,500	9,500
2003	40,000	24,000	52,000				25,000	6,500	3,500	5,500	9,500
2004	40,000	24,000	48,000				25,000	6,500	3,500	5,500	9,500
2005	35,000	25,000	48,000				28,000	6,500	3,500	5,500	9,500
2006	35,000	25,000	50,000				28,000	7,500	4,000	6,500	12,500
2007	40,000	26,000	50,000	148,000	115,000	25,000	28,000	7,500	4,000	6,500	12,500
2008	40,000	26,000	52,000	148,000	115,000	25,000	30,000	7,500	4,000	6,500	12,500
2009	42,000	28,000	52,000	152,000	110,000	22,000	30,000	7,500	4,000	6,500	12,500
2010	42,000	28,000	55,000	152,000	110,000	22,000	32,000	7,500	4,000	6,500	12,500
2011	45,000	28,000	55,000	155,000	100,000	22,500	32,000	9,500	4,500	8,500	14,800
2012	45,000	31,000	57,000	155,000	105,000	23,000	33,000	9,500	4,500	8,500	14,800
2013	48,000	31,000	57,000	158,000	105,000	25,000	33,000	9,500	4,500	8,500	14,800
2014	48,000	31,000	58,000	160,000	110,000	25,000	35,000	9,500	4,500	8,500	14,800
2015	50,000	32,000	58,000	160,000	110,000	27,000	35,000	9,500	4,500	8,500	14,800
2016	60,000	35,000	65,000	180,000	120,000	30,000	40,000	14,000	5,500	12,500	20,000
2017	60,000	35,000	65,000	180,000	120,000	30,000	40,000	14,000	5,500	12,500	20,000
2018	55,000	35,000	65,000	180,000	120,000	30,000	40,000	14,000	5,500	12,500	20,000
2019	63,000	36,000	65,000	180,000	125,000	32,000	42,000	15,000	6,500	14,000	21,000
2020	70,000	40,000	67,000	190,000	140,000	35,000	45,000	17,000	8,000	16,000	23,000

Electrical fittings and wires were divided into three categories, namely cables, sockets, and switches. The unit price of a coil of 16mm 4 core pure copper cable, as per Table 4, increased by 50% and 183% between 2000 and 2010, and between 2011 to 2020, respectively. The same trend is captured for 1.5mm cable, 16mm copper, 2.5mm cable and 18mm aluminium cable with 111%, 275%, 211%, 175%, and 112% increases in 2020, respectively.

The unit price of the 13amps double socket, 1-way gang switch and 4-way gang switch increased by 39%, 88%, and 100% from 2000 to 2010, respectively. A trend of 140%, 100%, and 133% was also recorded between 2011 and 2020 for the item listed. For the water-heater switch and distribution board, the unit prices increased from 50% to 233% and 56% to 221% between 2000 to 2010 and from 2011 to 2020 for the water-heater switch and distribution board, respectively.

Table 4: Prices of electrical cable, electrical socket, switch, and distribution board

Year	Price/Coil (N)							Price/Unit								
	Recline cable 16mm 4 Core	1.5mm cable	16mm pure copper	2.5mm cable	4mm cable	16mm aluminum cable	13 Amps double socket	13 Amps single socket	15 Amps socket	4-way gang switch	3-way gang switch	2-way gang switch	1-way gang switch	Water-heater switch	100A TP&N gear switch	60A TP&N distribution board
1999	200	2,100	11,500	2,400	6,500	2,500	180	150	300	300	150	100	80	300	8,500	4,500
2000	200	2,400	11,500	2,400	6,500	2,500	180	150	300	300	150	100	80	300	8,500	4,500
2001	250	2,500	11,600	2,400	6,500	2,500	180	150	350	300	180	100	80	300	9,000	4,500
2002	250	2,500	11,800	2,400	7,000	2,800	200	150	350	450	180	150	100	350	9,000	5,500
2003	250	2,500	11,800	3,000	7,000	2,800	200	180	350	450	220	150	100	350	9,500	5,500
2004	280	3,500	11,800	3,000	7,000	3,000	220	180	400	450	220	180	100	350	9,500	5,500
2005	270	3,500	11,800	3,000	7,500	3,000	220	200	400	550	250	200	120	400	10,000	6,500
2006	270	3,500	12,000	3,000	7,500	3,500	230	200	400	550	250	200	120	400	10,000	6,500
2007	280	3,000	12,000	3,500	7,500	3,800	230	200	500	550	250	200	120	400	15,000	6,500
2008	260	3,000	14,000	3,500	7,500	4,500	250	280	500	550	280	250	120	400	15,000	6,500
2009	300	4,500	14,000	3,600	8,000	4,500	250	280	500	550	280	250	150	450	18,000	7,000
2010	300	4,500	20,000	3,600	8,000	8,500	250	280	550	600	280	250	150	450	18,000	7,000
2011	300	4,500	20,000	4,500	8,000	8,500	500	400	550	600	300	250	200	450	18,000	7,800
2012	350	5,500	45,000	4,500	10,000	8,500	500	400	600	700	300	300	200	500	25,000	8,200
2013	350	5,500	45,000	5,500	10,000	9,000	500	400	800	700	350	300	250	500	25,000	10,500
2014	400	5,500	50,000	5,500	10,500	9,000	700	500	900	750	350	300	250	550	30,000	15,900
2015	450	7,000	60,000	8,500	17,000	11,000	700	550	950	750	400	300	250	550	30,000	18,000
2016	500	7,000	65,000	10,500	17,000	14,000	750	600	1,000	1,000	450	400	300	600	33,000	20,500
2017	500	7,000	70,000	11,500	18,000	15,000	800	600	1,200	1,200	500	400	300	600	33,000	21,000
2018	500	7,000	70,000	11,500	18,000	15,000	800	600	1,200	1,200	500	400	300	600	33,000	23,000
2019	700	8,000	70,000	12,000	19,000	15,000	900	700	1,500	1,400	600	500	400	1,500	35,000	25,000
2020	850	9,500	75,000	14,000	22,000	18,000	1,200	800	1,800	1,400	750	700	400	1,500	38,000	25,000

Using 1999 as the base year, the price of 1.5 HP surface and submersible pumping machines increased by 102.9% between 1999 and 2010 and 168.5% between 2011 and 2020. The price of 1HP surface and submersible water pumps increased on average by 140% between 1999 and 2010 and by 85.43% between 2011 and 2020.

Table 5: Prices of plumbing materials

Year	Price/Unit (N)			
	<i>Pumping machine (submersible) 1.5HP</i>	<i>Pumping machine (surface) 1.5HP</i>	<i>Pumping machine (submersible) 1HP</i>	<i>Pumping machine (surface) 1 HP</i>
1999	15,000	8,000	7,500	
2000	17,000	9,000	10,000	
2001	19,000	9,000	10,000	
2002	20,000	10,000	12,000	5,000
2003	22,000	12,500	15,000	5,000
2004	24,000	13,000	17,500	5,000
2005	25,000	13,000	18,000	6,000
2006	28,000	15,000	22,000	6,000
2007	28,000	16,000	23,000	6,500
2008	29,000	16,000	24,000	6,500
2009	29,000	16,500	24,000	7,000
2010	29,000	17,000	24,000	7,000
2011	30,000	17,500	25,000	7,000
2012	30,000	18,000	25,000	8,000
2013	30,000	18,000	25,000	8,000
2014	32,000	19,000	27,000	8,000
2015	34,000	21,000	31,000	10,000
2016	45,000	28,000	40,000	13,000
2017	64,000	42,000	55,000	15,000
2018	60,000	35,000	49,000	13,000
2019	65,000	35,000	30,000	15,000
2020	65,000	38,000	32,000	17,000

The unit price of a bag of Lafarge cement (50kg), as shown in Figure 3, increased by 262% from 2000 to 2010 and by 100% from 2011 to 2020. The unit price of a bag of Dangote cement (50kg) increased by 120% from 2011 to 2020.

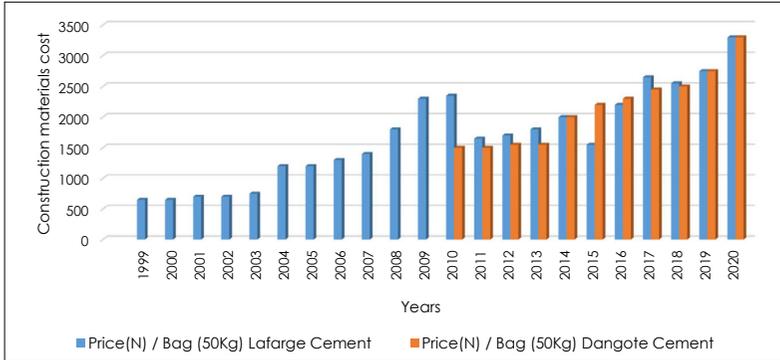


Figure 3: Prices of cement

4.3 Correlations between exchange rates, prices of residential building materials and residential building construction costs

Investigation revealed that the CBN exchange rate affected the interbank rate as well as the parallel exchange rate positively. The results of the zero-order correlation analysis, as per Table 6, revealed a positive correlation between the CBN exchange rate and the interbank exchange rate ($r=0.807$); the CBN exchange rate and the parallel exchange rate ($r=0.705$), and the interbank exchange rate and the parallel exchange rate ($r=0.496$). The simple linear regression results (see Table 7) show that the CBN exchange rate was a significant explanatory variable for the interbank rate ($r^2=0.650$) and the parallel exchange rate ($r^2=0.497$). For this study, this meant that when the CBN exchange rate positively increased by 1 value, the interbank and the parallel market exchange rates rose by exchange rate values of 0.807 and 0.705, respectively. The F-ratios (37.220 and 19.747) were significant, showing that the simple linear regression equations were reliable.

Table 6: Zero-order correlation coefficients between foreign exchange rates

	<i>CBN rate</i>	<i>Interbank rate</i>	<i>Parallel market rate</i>
CBN rate	1.000	0.807**	0.705**
Interbank rate	0.807**	1.000	0.496*
Parallel market rate	0.705**	0.496*	1.000
**. Correlation is significant at the 0.01 level (2-tailed)			
*. Correlation is significant at the 0.05 level (2-tailed)			

Table 7: Simple linear regression results: Interbank and parallel exchange rates and explanatory variable (CBN exchange rate)

<i>Dependent variable</i>	<i>CBN exchange rate</i>	<i>Beta coefficient</i>
Interbank rate	CBN exchange rate	0.807
	Constant	
	R	0.807
	R ²	0.650
	Adjusted R ²	0.633
	F-ratio	37.220
Parallel market exchange rate	CBN exchange rate	0.705
	Constant	
	R	0.705
	R ²	0.497
	Adjusted R ²	0.472
	F-ratio	19.747

No. of cases = 22; level of significance = 0.01 (2-tailed)

Results from the Pearson Product Moment Correlation analyses in Table 8 show a positive correlation between changes in exchange rates and changes in the prices of most of the building materials. The correlation between the CBN exchange rate and the prices of Tower's long-span aluminium roofing sheet (0.45mm) was $r=0.568$; the interbank exchange rate and the prices of Tower's long-span aluminium roofing sheet (0.55mm) was $r=0.631$, while the correlation with the parallel market exchange rate and the prices of Tower's step tile aluminium roofing sheet (0.45mm) was not significant. The significant correlation coefficients for other long-span products range between $r=0.450$ and $r=0.675$. The increase rate in the prices of residential building materials between 2010 and 2020, when Nigeria commenced a floating foreign exchange rate, became apparent in the trend analysis, as prices increased significantly. The increase in prices of sanitary fittings could not be unconnected with the fluctuations in the CBN exchange rate. The correlation between the CBN exchange rate and the price of bathtub enamelled cast with fittings was $r=0.592$ and the water closet (China vitreous) was $r=0.607$. The correlation between the interbank rate and pumping machines of various types are as follows: pumping machine (submersible), 1.5HP ($r=0.726$); pumping machine (surface), 1.5HP ($r=0.684$); pumping machine (submersible), 1HP ($r=0.552$), and pumping machine (surface), 1 HP ($r=0.511$).

Correlation coefficients between the CBN exchange rate, on the one hand, and various types of cables, on the other, are as follows: 1.5mm cable ($r= 0.423$); 2.5mm cable ($r= 0.712$); 4mm cable ($r=0.454$), and 16mm

aluminium cable ($r=0.556$). Positive correlations existed between the CBN exchange rate and the prices of 3-way gang switch ($r=0.611$) and 2-way gang switch ($r=0.545$).

Similarly, positive correlations exist between the CBN exchange rate and the prices of imported doors. The correlation between the CBN exchange rate and the metal door double door (2.1mx1.8m) was 0.479. The correlation coefficient ($r=0.696$) was slightly higher for imported Turkish double doors (2.1mx1.8m). The correlation coefficient between a single (2.1mx0.9m) Turkish-made metal door with glass and the CBN exchange rate was $r=0.519$. The analysis revealed a positive relationship between the CBN exchange rate and the different types of aluminium sliding windows: 1.2mx1.2m ($r=0.539$); 600mmx600mm ($r=0.543$); (900mmx1200 mm ($r=0.513$), and 180mmx1200mm ($r=0.429$).

Table 8: Correlations between exchange rates and prices of building materials

Building materials		CBN rate	Interbank rate	Parallel market rate
Sanitation	Wash-hand basin	0.292	0.091	0.406
	Bathtub	0.592**	0.397	0.737**
	Water closet	0.607**	0.497*	0.628**
Pumping machines	Pumping machine submersible 1.5HP	0.507*	0.726**	0.412
	Pumping machine surface 1.5HP	0.621**	0.684**	0.504*
	Pumping machine submersible 1HP	0.465*	0.552**	0.388
	Pumping machine surface 1HP	0.683**	0.511*	0.754**
Cable, socket, and switch	Recline 16mm	0.388	0.074	0.310
	1.5mm cable	0.423*	0.143	0.254
	16mm pure copper	0.189	0.144	0.181
	2.5mm cable	0.712**	0.531*	0.638**
	4mm cable	0.454*	0.268	0.281
	16mm aluminium cable	0.556**	0.360	0.529*
	13 Amps single socket	0.182	-0.064	0.287
	15 Amps socket	0.401	0.188	0.131
	4-way gang switch	0.312	0.489*	0.412
	3-way gang switch	0.611**	0.257	0.364
	2-way gang switch	0.545**	0.127	0.470*
	1-way gang switch	-0.011	-0.002	0.229
	Water-heater switch	-0.127	-0.134	-0.029
	100A gear switch	0.120	-0.022	0.249
60A distribution board	0.008	0.153	0.223	

<i>Building materials</i>		<i>CBN rate</i>	<i>Interbank rate</i>	<i>Parallel market rate</i>
Doors and windows	Metal double door with glass (2.1mx1.2m)	0.479*	0.234	0.661**
	Turkish double door (2.1x1.8mm)	0.679**	0.495*	0.850**
	Turkish single door (2.1x0.9mm)	0.519*	0.215	0.485*
	Aluminium sliding window (1.2x1.2m)	0.539**	0.382	0.746**
	Aluminium sliding window (600x600mm)	0.543**	0.197	0.513*
	Aluminium sliding window (900x1200mm)	0.513*	0.341	0.705**
	Aluminium sliding window 1800x1200mm)	0.429*	0.317	0.666**
Roofing	Long span 0.45mm (Tower product)	0.568**	0.631**	0.335
	Long span 0.45 mm (other product)	0.288	0.022	0.278
	Long span 0.55mm (Tower product)	0.487*	0.550**	0.356
	Long span 0.55mm (other product)	0.450*	0.325	0.675**
	Step tile roofing sheet 0.45mm (Tower product)	0.456*	0.573**	0.187
	Step tile roofing sheet 0.55mm (other product)	0.548**	0.656**	0.300

** . Correlation is significant at the 0.01 level (2-tailed)

* . Correlation is significant at the 0.05 level (2-tailed)

Table 10: Correlations between exchange rates and prices of Lafarge and Dangote cement

<i>Exchange rate</i>	<i>Type of cement</i>	
	<i>Lafarge cement</i>	<i>Dangote cement</i>
CBN rate	0.542	0.455
Interbank rate	0.438	0.057
Parallel market	0.428	0.267

Correlation is significant at the 0.05 level (2-tailed)

The correlation results in Table 10 show that, from 2011, there has not been any significant difference ($p > 0.05$) between exchange rates and the prices of Lafarge and Dangote types of cement. In Table 11, results from the paired-sample t-test ($p = 0.457$) show that there was no significant average difference between the prices of Lafarge and Dangote types of cement ($t = 0.733$, $p > 0.05$). On average, Lafarge cement prices were 81.18 Naira per unit higher than Dangote cement prices (95% CI [-163.9249, 307.5513]).

Table 11: The paired sample t-test result

Variables pairs	Paired difference			95% confidence interval of the difference		T	df	Sig. (2-tailed)
	Mean	Std. deviation	Std. error	Lower	Upper			
Prices of Lafarge and Dangote cements	81.81	350.907091	105.80272	-163.9249	307.55133	0.773	10	0.457

Significant at 0.05 Level

In Table 12, results from the paired-sample t-test show that, from 2011, there was a significant average difference between the prices of the locally made metal double door (2.1mx1.8m) and the Turkish double door (2.1mx1.8m) ($t=-43.976$, $p=0.000$). On average, locally made double metal door prices were 105,55 Naira per unit lower than Turkish double door prices (99% CI [-110682.86, -100317.143]).

Table 12: The paired sample t-test result

Variables pairs	Paired difference			95% confidence interval of the difference		T	df	Sig. (2-tailed)
	Mean	Std. deviation	Std. error	Lower	Upper			
Locally made double metal door (2.1mx 1.8m). Turkish double door (2.1mx 1.8m)	-1055500.0	8976.465	-2399.061	-110682.86	-100317.143	-43.976	13	0.000*

*Significant at 0.05 Level

5. DISCUSSION

Policies that will directly or indirectly affect housing production are relevant to, and important for the achievement of the sustainable development goals of a nation (UN-Habitat, 2020). For any policy to be relevant in transforming the society where it is enacted, it should be well-thought-out, inclusive, evidence-based, and responsive to societal real needs, as well as address social challenges associated with housing. One such policy change is the foreign exchange rates. This is the presence of a trade imbalance, negatively affecting the domestic prices of building materials (Olowe, 2009;

Ugochukwu *et al.*, 2017). The postulation of the theory of foreign exchange behaviour notes that a country experiencing inflation will have its currency devalued in terms of another country's currency, and the purchasing power of the country witnessing inflation drops (Manzur, 2018: 217; Njoku, 2015; Vo & Vo, 2023: 447).

The devaluation of the Naira in 2015, owing to a fall in the crude oil price (glut) in the world market, impacted on the economy of Nigeria and, in return, affected the purchasing power of the Naira. Thus, with the advent of the floating regime, prices of building materials and construction costs have continued to increase and the cost of construction within a period of two years can increase by about 30%. It has been documented that Nigerians depend on importing building materials (Agbola, 2005; Ugochukwu *et al.*, 2017: 97) and that foreign exchange rates affect the price of commodities such as building materials (Njoku, 2015; Ugochukwu, 2017). Owing to the increase in prices of construction material and a result of inflation, the construction sector of the economy is negatively impacted. With several components of the construction materials imported (the locally manufactured materials still rely on foreign components), building material prices are expected to continue to increase, unless proactive measures are put in place by the Government to address and/or cushion the effects of the changing foreign exchange.

Before the CBN's intervention in the I&E window in 2017, the Naira was traded as high as N480/US\$ (Popoola, 2020: 20). With the CBN's interventions through the I&E window, the average Naira exchange rate to the dollar at the parallel market lowered to N420/US\$ in the year 2020. However, owing to the commercial economy of Nigeria that is import-determined, this intervention cannot be sustained, as the demand for the dollar keeps increasing. As of 2022, a dollar was exchanged for 680 Naira at the parallel market (The Cable, 2023: online).

It is very complex to understand the operation of organised market arrangements for buying and selling foreign exchange in the floating regime in Nigeria. However, it is understood that the frequency of volatility and fluidity of the exchange rate from the beginning of the floating exchange rate raises concern about the effects of the volatility of the exchange rate on construction materials and commercial real estate returns in the country. As observed by Musarat *et al.* (2021: 411), a volatile forex market is one of the factors affecting the cost of real estate development and may lead to uncertainty in the estimation of the cost of developing projects. It is important to note that the trend analysis on the price of cement, a locally produced building construction material, showed that the price of cement did not change significantly with changes in exchange rates. The outcome of the price cement analysis is at variance with most of the imported

building materials. Therefore, the foreign exchange rate volatility and depreciation of the Naira will continue to lead to an increase in the price of imported building materials and such action would have an impact on the construction cost and cost of supplying housing.

The forex rate has been fluctuating over the years and with the drastic increase in the foreign exchange rate between 2015 and 2020, individuals and housing investors are significantly affected by the increase in the cost of building materials (Olowe, 2009). Housing construction costs increased consistently between 1999 and 2020, and this could be due to inflation and national laws relating to minimum wage which also affected the wages of artisans in the country. Since construction cost per square metre is a function of prices of building materials, labour, and other exigencies, there is no doubt that, with the increasing price of building materials as a result of foreign exchange, construction costs will increase. This analysis confirms the opinion of Nwachukwu (2004) and Musarat *et al.* (2021) that the housing industry and the cost of construction are vulnerable to changes in material prices, due to forex volatility and inflation.

The increasing construction cost has implications for housing production, most especially in the urban centres (Musarat *et al.*, 2021). For example, many Nigerians are working in paid (salaried) enterprises. The salary paid per month, especially in the public sector, has not increased significantly over the years in relationship with foreign exchange upward fluctuations. This has implications for purchasing power and funds set aside for housing construction in the face of inadequate access to mortgage financing. Ugochukwu *et al.* (2017) noted that there are elements of imported materials in any component of a building and many prospective homeowners in Nigeria will use imported materials for doors, tiles, and other fittings. This penchant may necessitate the need to seek foreign exchange to supply the materials in demand. Hence, where the forex market becomes volatile and deregulated, the prices of commodities, and building materials inclusive, will be on the increase, especially where citizens depend on imported goods (Caporale & Plastun, 2021; Chen, 2022; Ugochukwu *et al.*, 2017). As homeowners in Nigeria depend on the use of imported building materials, whenever there is an increase in the forex rate, the price of building materials would be affected and, by implication, affect the cost of housing supply (Umoru *et al.*, 2023). Therefore, there is a need to look inward through export substitution and investment in local production of most of the imported building materials.

The study hypothesised that the increasing price of building materials occasioned by the upward increase in foreign exchange rates may have implications on the ability to build. It is important to note that other constraints such as income, access to land, tenure security, interest rate,

value-added tax, and import tariff, among others, were not considered in the study. Therefore, future studies should be conducted to investigate the effects of the listed variables in addition to foreign exchange fluctuation on housing production in Nigeria.

6. CONCLUSION AND RECOMMENDATION

Foreign exchange rates affected the prices of residential building materials and the overall construction cost. Where individual disposable income is constant and there is a persistent increase in the forex rate, which translates into an increase in the price of building materials and cost of construction per square meter, low- and medium-income earners will find it difficult to build good quality and affordable housing units. Incremental housing has become rampant and many ongoing housing projects have been abandoned. Thus, the housing supply has continued to decrease. Therefore, when setting foreign exchange policy, the government and the Central Bank of Nigeria should consider the effects of the policy on the major sectors of the economy, including the building construction industry.

The building construction industry, as shown in the study, has been significantly affected by foreign exchange policy owing to the reliance on imported materials. To reverse the current trend of dependence by builders on foreign materials for housing production, the use of local building materials in housing development should be encouraged to ensure an adequate supply of housing and encourage low- and medium-income earners to build houses. Government policies and laws should encourage and support the use of local building materials by individual homeowners and government-sponsored projects. Consequently, the Nigerian housing policy should be reviewed periodically to make it functional and acceptable, with the incorporation of locally sourced raw materials that will facilitate the implementation of the blueprint of a building materials policy for Nigeria. In addition, access should be provided to locally produced building materials. Nigeria's 2012 National Housing Policy encourages research into, and the promotion of the use of locally produced building materials as a means of reducing housing costs. Therefore, the Nigerian Building and Road Research Institute (NBRRI) and the universities should engage actively in building materials research and the development of alternatives to the imported materials certified by the Standards Organisation of Nigeria (SON). The focus of the research and development should be on capacity building and the use of appropriate technology to facilitate local production. A larger percentage of materials to be used in the construction of government mass housing projects should be locally sourced, while the National Orientation Agency (NOA) should also intensify efforts to encourage the use of local building materials using mass and social media.

The NOA should also disseminate available research findings on locally made building materials and locally fabricated equipment that can be used for the provision of affordable housing. This will reduce builders' level of reliance on imported building materials for housing projects. Formulation of policy that will allow partnership with investors, experts, and foreign countries with the required competence and technical know-how, for the conversion of available raw materials into tasteful, durable, affordable and quality building materials for housing development should be encouraged and embraced by the government at all levels. The imposition of high tariffs and taxes on imported building materials should be adopted as part of measures by the Government to discourage building material importation. Building materials import substitute industries should be established with a form of tax relief for the producers of local building materials which will improve the economy in the long run, provide employment opportunities, lessen pressure on forex demand, reduce the cost of housing construction and supply and, by extension, lead to increase in housing supply.

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