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CURRENCY DENOMINATION AND MARKET PRICING OF COMMODITIES IN MAKURDI LOCAL GOVERNMENT AREA OF BENUE STATE, NIGERIA: A MONTE CARLO EXPERIMENT

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ABSTRACT

This study investigated the impact of currency denominations on market pricing of commodities in Makurdi Local Government Area of Benue State. To achieve this objective, the study compiled prices of 2,002 low-priced consumer goods ranging from food products and beverages; cosmetic, soap, detergent; water, drinks and dairy products among others from 116 distinct retail stores. Two datasets namely: the actual retail price (which represents the observed market price of a particular commodity) and the expected retail price (a surrogate price) were considered. Data gathered were analyzed using the Monte Carlo Simulation. The study found that the absence of coins denomination in circulation has made retailers to round up prices of items in the categories of food products and beverages; cosmetic, soap and detergent, water, drinks and dairy products. However, the impact of coins denomination on commodities such as razor blade, paper, and other stationery was negative as retailers strategically rounded down their prices. In general, the study found a significant relationship between price movement and the lowest denomination of ₦5 in Makurdi LGA. The study, therefore, recommended the need to redenominate the naira so as to facilitate easy adoption of the coins denominations as well as give them more value and hence, encourage their use.

INTRODUCTION

Money is important in all facets of an economy. It serves as the unit in terms of which the value of all goods and services are measured and expressed. It allows one to place specific values on economic goods and services are otherwise known as price. In narrow term, it comprises notes and coins in circulation held by non-monetary financial institutions. It is an integral component of the modern economy following the growth and development of Nations.

The demand for money relates primarily to transaction demand. Being the most liquid form of asset (Freidman, 1969), money is also held by the public for precautionary and speculative purposes. Its circulation is influenced by a host of factors. These factors according to Nachane, Chakraborty, Mitra, and Bordoloi (2013) include the per capita income levels of people, prices of goods and services, the opportunity cost of holding cash *vis-à-vis* other forms of money, the degree of monetization, the extent of financial inclusion and the size of the underground economy.

In Nigeria, the currency structure comprises three coin denominations (50K, ₦2 and ₦1) and eight note denominations; ₦5, ₦10, ₦20, ₦50, ₦100, ₦200, ₦500 and ₦1000. However, over the last five (5) years, there has been increasing unavailability of the lower denominations of 50K, ₦1 and ₦2 in circulation. This has been raising concerns among stakeholders. Prior to this period, the records of the ending-digits (last digits) observed on market prices of commodities spread between zeros (0) and nine (9). This was evidenced as prices of commodities were ₦2.5, ₦4, ₦6, ₦11, ₦12, ₦14, and ₦23 and so on. However, recent experiences of the market prices show that they are in multiples of fives (₦5, ₦10, ₦15, ₦20 and so on).

This portends danger for low-income consumers given that rounded prices would fall disproportionately on those least able to afford them. Although, price rounding might only have a minimal effect on the Consumer Price Index (CPI), in Naira terms even a seemingly small effect could mount over time to a considerable amount since virtually all government outlays (i.e social security and welfare benefits) and many private sector costs (i.e., wages) are indexed to the CPI (Lombra, 2001).

It was in realization of this that the Central Bank of Nigeria in addition to other efforts reissued the 50K, ₦1 and ₦2 coins in 2007. This, however, has proved to be ineffective as evidenced by the continued absence of the coin's denomination from circulation. In the light of this, investigating the extent to which the continuous absence of the coin's denomination affects macroeconomic parameter such as price becomes essential in the management of currency. Notwithstanding, there is the dearth of empirical work detailing the possible rounding effects that could arise from the absence of the coin's denomination on consumers in Nigeria. This study is, therefore, undertaken to fill

these gaps.

OBJECTIVES OF THE STUDY

The main aim of this paper is to investigate the extent to which the absence of lower denominations (50K, ₦2, and ₦1) has impacted on the market pricing of commodities in Makurdi LGA. Specifically, the study:

i. Investigated the cost of marketing a particular commodity and its market price;

ii. Examined the extent to which the absence of coins denominations affect the market price of the commodity; and

iii. Investigated the effect of rounding off the market price of commodities on consumers in Makurdi LGA.

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

Currency denomination refers to classification for the stated or face value of currency notes and coins. For example, in Nigeria, the currency denominations include 50K, ₦1, ₦2, ₦5, ₦10, ₦20, ₦50, ₦100, ₦200, ₦500 and ₦1000. Studies such as Abdulrasheed (2001), Central Bank of Nigeria (CBN, 2007) and Nachane, Chakraborty, Mitra, and Bordoloi (2013) have observed that when a country's money stock is increasingly composed of higher denominations, the lower ones will eventually disappear from circulation. This was implied in the famous Gresham's law, "bad money drives out good ones." This law according to Jevons (1896) as cited in Tamari (2011) indicates that "*bad money drives out good money*". The law was named after Sir Thomas Gresham, sixteenth-century financial agent. The author employed the law to explain to Queen Elizabeth I what was happening to the English shilling. Her father, Henry VIII, has replaced 40 percent of the silver in the coin with base metals, to increase the government's income without raising taxes.

Gresham's law states that any circulating currency consisting of both "good" and "bad" money quickly becomes dominated by the "bad" money. This is because people spending money will hand over the "bad" coins rather than the "good" ones, keeping the "good" ones for themselves. Legal tender laws act as a form of price control. In such a case, the artificially overvalued money is preferred in exchange, because people prefer to save rather than exchange the artificially demoted one (which they actually value higher). Hence, the undervalued money will vanish from the market, thus affecting prices quoted in it.

There are different versions of the law. Tracking the way the law was phrased reveals the differences. In his *History of Economic Analysis*, Schumpeter (1954) disagrees with the usual expression of the law, "bad money drives out good." He refers to this common definition as "not quite correct." The opposite is true! Standing by itself, the general statement, "good money drives out bad," is the more correct empirical proposition. He further observed that it has been good, strong currencies that have driven out bad, weak currencies. Over the span of several millennia, strong currencies have dominated and driven out weak ones both in domestic and in international competition. For instance, the pound sterling in the 19th century and the dollar in the 20th century did not become the dominant currencies of their time because they were weak. Consistency, stability, and high quality have been the attributes of great currencies that have won the competition for use in circulations.

It can be derived from the foregoing that the introduction of higher denominations of currency is likely to induce inflation. This, in turn, drives out weak ones from circulation and the current structure will be increasingly composed of the strong ones of higher denominations. This matters to the pricing structure.

A number of empirical works have laid credence to the link between currency and pricing structures in developed economies. This link can be traced to the work of Lombra (2001). The author in an attempt to investigate the impact of eliminating the Penny from the U.S. coinage system employed simulation-based approach on data gathered from the menu of a convenience store chain. The results from the simulation indicated that prices of 60-93% of purchases were rounded up, with 50-83% of them being paid for with cash. This implies an annual cost to consumers of roughly $318-$818 million each year. The study relied on price list obtained from a convenient store (which may not represent the general price structure) to arrive at its conclusion.

In a similar way, Chande and Fisher (2003) investigated the impact of eliminating the penny from the Canadian currency structure in 2003. The study employed simulation technique. Using data supplied by the Royal Canadian Mint, the study concluded that rounding of transactions to the nearest nickel will not increase the overall price level. This implies that the rounding effect may be negligible in a big picture sense. Like Lombra (2001), Chande and Fisher (2003) relied on data obtained from secondary sources to arrive at its conclusion.

Whaples (2007) investigated the effect of eliminating the Penny from the US coinage system considering actual transactions' data. This was obtained from a convenience store chain in 2007. The study rounded those prices in accordance with the proposed rounding policy. The study found that the "rounding tax" is, on average, slightly negative. Thus, the study concluded that the net rounding effect of such a policy will be effectively null.

Folkertsma (2001) estimated the effect of rounding on the Consumer Price Index (CPI) in the Netherland in 2001. The study simulated the same sample of prices as in the CPI for January 2001. The simulation involves determining whether or not each of the roughly 72,000 prices in the sample is at an attractive guilder price point. If the price is attractive, it is converted into euros and then rounded up to the next attractive euro price point. The remaining, 'ordinary' prices are converted into Euros and rounded up to the next cent. The overall effect

of the rounding on the CPI is computed by aggregating the price increases, weighted by the budget shares of the various products. The study found that CPI increased by a maximum of 0.7 %, although a few products could increase in price by 10% or more.

It is pertinent to state that all the empirical studies reviewed above were conducted in developed society and they yielded conflicting results suggesting that there may be location differences in the impact of currency denominations. On this basis, this paper hypothesized that

i. The absence of coins denominations has no significant effect on the market pricing of the commodity in Makurdi LGA

ii. The effect of rounding of the market price of the commodity in Makurdi LGA is symmetric (normally distributed) between consumer and marketer.

RESEARCH METHODS

The paper is centered on how the continuous absence of the lower denominations of currency in Nigeria has influenced market pricing commodities. The commodities studied were restricted to low-priced manufactured consumer items. These include among others food products and beverages; cosmetic, soap and detergent, water and dairy products. The choice of manufactured goods was necessitated by the possibility of obtaining data on their unit cost. Therefore, the study as a point analysis generated data relating to wholesale price desired retail margin (as a percentage of cost) and the market (actual) price of 2,002 low-priced consumer goods in Makurdi Local Government Area of Benue State, Nigeria. The goods sampled were broadly grouped into food products and beverages; cosmetic, soap, detergent; water, drinks and dairy products among others. Data on these goods were obtained from 116 distinct retail stores within the study area.

The study considered two types of prices namely, the Actual Market Price (AMP) which represents the retail price of a particular commodity and the Expected Market Price (EMP) which represents the constructed retail price using the wholesale price and the desired retail margin for a particular commodity. The rationale for the EMP is that the lower denominations of 50K, ₦1 and ₦2 are no longer in circulation and as a result, there is the tendency of approximation in the Actual Market Price. Thus, investigating the impact of these lower denominations requires one to have an alternative configuration (Expected Market Price) and compare if there is a statistical difference between the two set of prices. This means that after accounting for the direct cost of purchasing an item for resale, the overheads and retail margin for profit, any difference between the final-digit observed on EMP and AMP can be attributed to the currency effect.

The Expected Market Price was calculated using Sylos-Labini pricing equation given as

$$EMP = v + qv$$

Where EMP is the expected market price, v is the variable cost per unit and q is a margin to cover overheads and profit. The rounding effects were obtained by subtracting the Expected Market Price from the Actual Market price. The analyses that followed were based on the data gathered taking into account the differences in the two prices considered.

To evaluate the randomness of the final-digit observed on the expected market price over a given number of transactions, the Monte Carlo method was used. This evaluation helps in ascertaining the extent to which the absence of the coins denominations affects the market price of each commodity. The general principle of the Monte-Carlo method can be described as follow.

Suppose that we want to evaluate the integral

$$I = \int_a^b g(x)dx \quad \text{.....eq3.1}$$

Where g(x) is a real-valued function that is not analytically integral. To see how this *deterministic* problem can be approached by Monte Carlo simulation, let Y be the random variable (b – a)g(X), where X is a continuous random variable distributed uniformly on [a,b] [denoted by U(a,b)]. Then the expected value of Y is

$$\begin{aligned} E(Y) &= E[(b-a)g(X)] \\ &= (b-a)E[g(X)] \\ &= \text{ssssss} \\ &= \frac{(b-a)\int_a^b g(x)\,fx(x)dx}{(b-a} \end{aligned}$$

Therefore,

$$E(Y) = I \quad \text{.....3.2}$$

Where $f_x(x) = 1/(b-1)$ is the probability density function of a $U(a,b)$ random variable. Thus, the problem of evaluating the integral has been reduced to one of estimating the expected value $E(Y)$. In particular, we shall estimate $E(Y) = I$ [equation 3.2) by the sample mean

$$Y(n) = \frac{\sum_{i=1}^{n} Yi}{n} = (b-a)\frac{\sum_{i=1}^{n} g(Xi)}{n} \quad \text{.....(3.3)}$$

Where $X_1, X_2, ..., X_n$ are IID (Independent Identically Distributed) U(a,b) random variables with finite population mean μ and finite population variance σ^2, by the Strong Law of Large Numbers, an n independent replications of the simulation, will make the sample mean [Y(n)], an unbiased (point) estimator of μ: that is,

$$E[Y(n)] = \mu \quad \text{.....(3.4)}$$

Thus, with regards to the works of Keinsley (2013) and Lombra (2001), the study assumes that the distribution of ending-digit of prices was uniform, that the other *factors* affecting commodity prices were embedded in the determination of the margins. Consequently, any differences between the Expected Price and the Actual Price were due to rounding effect.

The Monte Carlo method is, thus, used to evaluate the expectation

$$v = E(P) \quad \ldots\ldots \quad (3.5)$$

where: P is the final digit observed on the Expected price of the ith item and E(P) is the expected probability that P will occur in the simulation run.

Data Presentation and Analysis

Expected and Actual Market Price of Commodities

In line with the first specific objective of the study, information relating to the expected and actual market price of commodities was sought. It is pertinent to reiterate that the key to the calculation of the expected market price constructed as an alternative to the actual retail price is the desired retail margin. To this end, data relating to the desired retail margin for a particular commodity was obtained from the selected retail outlets. Table 1 contains the descriptive statistics of the desired retail margins for the 2,002 low-priced consumer goods sampled from the 116 retails stores.

Table 1: Summary of Statistics for the Desired Retail Margin

	Food Products and Beverages (%)	Cosmetic, Soap and Detergent (%)	Water, Drinks and Dairy products (%)	Others (%)
Mean	17.43	21.80	38.61	26.39
Median	20.00	20.00	25.00	25.00
Maximum	30.00	50.00	100.00	50.00
Minimum	0.00	5.00	0.00	10.00
Std. Dev.	5.59	5.62	32.17	7.09

Source: Field Survey (2015)

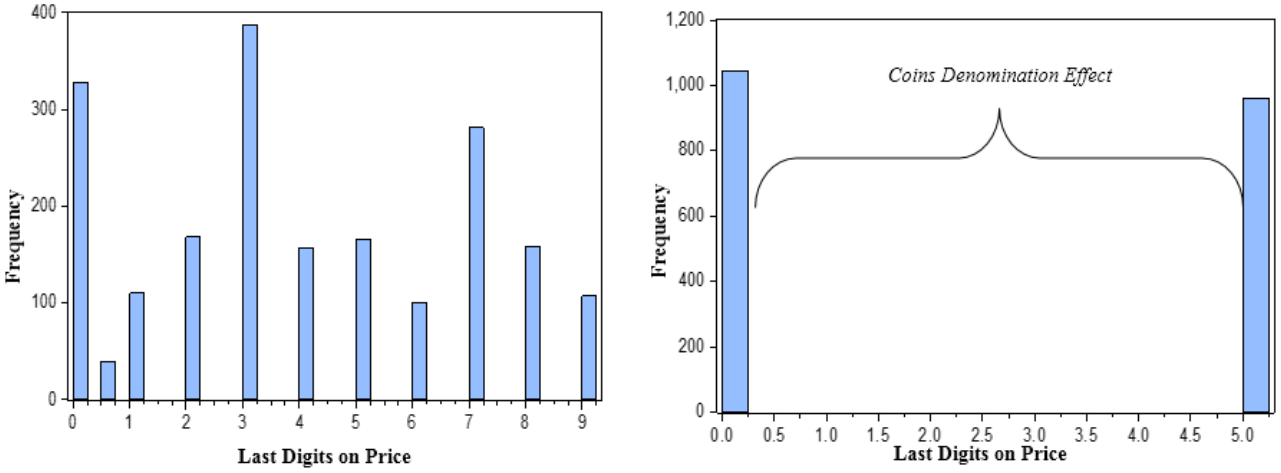
An examination of the results in Table 1 show that the desired retail margin for food products and beverages; cosmetic, soap and detergent; water, drinks and dairy products and other class of commodities averaged 17.43%, 21.80%, 38.61% and 26.39% respectively. The table further reveals that the lowest retail margins were zero (0) for commodities under the class of food products and beverages and water, drinks and dairy products and 5% and 10% for cosmetic, soap and detergent among others respectively. On the other hand, the table reveals that while retailers of commodities such as water, drinks and dairy products desired margins up to 100% of wholesale value of some of the items sold, those in food products and beverages, cosmetic, soap and detergents among others only desired a maximum of 30%, 50% and 50% respectively.

It is worthy to state that some of the commodities especially foodstuff were sold in divisions (muddles, milk cups of various sizes). For this type of commodities, zero retail margins were allocated to the smaller divisions so as to avoid doubling the margins since they have been added tothe higher divisions (for instance, the case of retailer selling in muddle and milk cups at the same place and time). On the hand, there were cases where producers of a particular commodity in an attempt to control the retail price, offer quantity rebates to the retailers so as to maintain the producer's price. In this case, the retail margin equals the monetary value of the extra units given. In general, other factors such as rent expenses and distance between the retail store and the suppliers, durability of the product, the level of demand are given for the varying markup/margins.

Computation of the Expected and Actual Market Prices of Commodities

After data on the desired retail margins were obtained, the study proceeded to compute the expected price so as to compare them with the observed retail price (the actual retail price). The calculations were carried out using the post-Keynesian Pricing model. In the calculation, we began with obtaining data on wholesale's values of the commodity and with the addition of an appropriate desired retail margins, we obtain estimates of the retail price (EMP). The data to this effect are presented in Figure 1 and summarized in Table 2.

Figure 1: Charts Showing the Last Digits on Market Prices



Panel A: Final Digit of the EMP **Panel B: Final Digit of the AMP**

Source: Column F and H of Appendices IV-VII

The illustrations in Panel A and Panel B of Figure 1 present the individual frequency of the last digits observed on the two prices (AMP and EMP). In Panel A of Figure 1, it can be seen that all the digits (from 0 to 9) were observed on the expected market price of the sampled commodities (though with some occurring far more frequently than others). A closer observation reveals that out of 2002 transactions involving low-priced commodities across the four categories, only 334 and 172 of them representing 16.68% and 8.59% respectively end with zero (0) digit (as in ₦ 10, ₦20, ₦ 30 and so on) and five (5) digits as in ₦ 5, ₦ 15, ₦ 25 and so on. The other categories observed as shown in the panel indicated that 43 commodities or 2.15% of the total commodities sampled end with 0.5 (that is 5kobo), 103 commodities or 5.14% end with one (1) digit (as in ₦ 1, ₦11, ₦21 and so on), 182 commodities or 9.09% end with two (2) digits (as in ₦2, ₦12, ₦22 and so on), 379 commodities or 18.93% end with three (3) digits (as in ₦3, ₦13, ₦23 and so on), 167 commodities or 8.34% end with four (4) digits (as in ₦4, ₦14, ₦24 and so on), 95 commodities or 4.75% end with six (6) digits (as in ₦6, ₦16, ₦26 and so on), 274 commodities or 13.69% end with 8 digits (as in ₦7, ₦17, ₦27 and so on), 156 commodities or 7.79% of them end with 8 digits (as in N8, N18, N28 and so on) and finally, 97 commodities representing 4.85% of the total commodities end with 9 digit (as in ₦ 9, ₦29, ₦39 and so on).

However, as shown in Panel B of Figure 1 which represents the Actual Market Price, none of the digit except 0 and 5 was observed on the last digit of the observed retail prices of the sampled commodities. This implies that even without any mathematical analysis, the impact of the coins denominations on market price of commodities is immediately apparent when the results in the two panels are compared. As shown in Panel A, only 25.27% of the sampled commodity prices were expected to end with 0 and 5 digits as in ₦5, ₦10, ₦15, and ₦20 while about 74.73% end with the remaining digits of 1, 2, 3, 4, 6, 7, 8 and 9. But due to the unavailability of the coin's denomination, it appears that these were rounded as none of them was observed in the Actual Market Price as indicated by the two bars. The two bars suggested 1034 of the observed prices end with 0 digits (as in ₦10, ₦20, ₦30 and so on) while the remaining 968 observed (actual) retail prices end with 5 digits (as in ₦5, ₦15, ₦25 and so on).

A salient feature of the distribution of final digits observed in the actual market prices (AMP) as depicted in Panel B suggested that they followed a patterned distribution with a common interval of 5. This implies that the price rounding due to the absence of the coins denominations was in fives as revealed by the gap between the two bars ("*coins denomination effect"*). This is a clear indication that there is a close association between price movement and the lowest denominated currency of a country (that is ₦5 in Nigeria). The finding confirms the assertion by Anietie (2012) who noted that the absence of the lower denominations has caused the price of goods and services to follow a discrete jump of ₦5 or ₦10. This was further supported by CBN (2007) who argued that prior to the reintroduction of the coins; no good could be bought for ₦1 because the denomination did not exist, as a result, low-priced commodities were priced in multiples of fives and this affected price level greatly.

The magnitude of the differences between the expected and the actual market prices are shown in Table 2.

Table 2: Expected and Actual Market Prices of Commodities

	Expected Market Price (Naira) A	Actual Market Price (Naira) B	Difference (B-A)
Food products and Beverages	34932.94	36090	1157.06
Cosmetic, Soap and Detergent	73285.9	74880	1594.1
Water, Drinks and Dairy products	17177.7	18040	862.3
Others	12150.7	12715	564.3
Total	**137547.2**	**141725**	4177.8

Source: Field Survey (2015)

The results in Table 2 show the individual summation of the two prices. From the table, it can be seen that the summation of the expected prices for the category of food products and beverages, cosmetic, soap and detergent, water, drinks and dairy products among others amounted to ₦34, 932.94, ₦73, 285.9, ₦17, 177.7 and ₦12, 150.7 respectively while the corresponding observed (actual) retail prices were ₦36, 090, ₦74, 880, ₦18, 040, and ₦12, 715. The differences with the observed and expected retail prices for the category of food products and beverages, cosmetic, soap and detergent, water, drinks and dairy products stood at ₦1,157.06, ₦1,594.1, ₦862.3 and ₦564.3 respectively. An interesting observation from the Table 2 is that the price (expected price) even with the addition of desired retail margins, continued to lag behind the actual market prices.

The Absence of Coins denomination and Commodity Prices: The Monte Carlo Experiment

The absence of the coins division of currency requires that cash purchases be rounded to the nearest Naira (that is ₦5). In view of this, this study aims at investigating the extent to which the absence of the coins denominations affects the market pricing of the commodity in Makurdi LGA. To achieve objective two, a compilation of the expected price for all the 2,002 low-priced consumer goods is done. The choice of using the expected price as a surrogate in the simulation is necessitated by the fact that the coin's denomination was no longer observed on prices so that the actual market prices observed are already rounded prices. Therefore, studying the impact of the coin's denomination on prices could be done through an analysis of the proportion of the expected prices that end in a particular digit from "0" to "9". Hence, the simulation aimed at determining the likelihood of a particular ending-digit (i.e. 0 to 9) on commodity prices occurs.

As a precondition for the Monte Carlo experiment, we performed some probability fitting tests to identify the most suitable input distribution. It is pertinent to note that each probability distribution can be uniquely identified by its parameter set, so, the distribution fitting is essentially the same as finding the parameters of a distribution that would generate the given data in question. Thus, given the random sample of 2,002 consumer goods, we fitted the dataset to a normal distribution.

After we had identified the underlying distribution for the input parameters of the simulation model specified in the preceding chapter, we carried out the Monte Carlo experiment to determine the randomness of the final digits in the multi-item transactions. The simulation draws 10,000 transactions each for the four categories of consumer goods studied. The simulation outcomes are summarized in Table 3

Table 3: Monte Carlo Experiment and the Mean Rounding

Ending Digit	Food products and Beverages		Cosmetic, Soap and Detergent		Water, Drinks and Dairy products		Others	
0	989	9.89%	1870	18.70%	1651	16.51%	1368	13.68%
0.5	181	1.81%	70	0.70%	166	1.66%	14	0.14%
1	975	9.75%	910	9.10%	930	9.30%	1071	10.71%
2	928	9.28%	740	7.40%	646	6.46%	897	8.97%
3	1848	18.48%	1340	13.40%	1899	18.99%	1503	15.03%
4	956	9.56%	850	8.50%	636	6.36%	956	9.56%
5	1002	10.02%	790	7.90%	631	6.31%	1131	11.31%
6	420	4.20%	630	6.30%	887	8.87%	806	8.06%
7	1226	12.26%	1130	11.30%	1351	13.51%	1023	10.23%
8	844	8.44%	710	7.10%	548	5.48%	795	7.95%
9	631	6.31%	960	9.60%	655	6.55%	436	4.36%
p-value		0.000		0.000		0.000		0.000
Mean Rounding		1.47		2.293		2.74		-2.82
Skewness		0.029		0.27		1.03		-0.17
sig-value		0.000		0.000		0.000		0.000

Source: Researcher's computation using Microsoft Excel Add-In

Table 3 contains the Monte Carlo simulation outcomes showing the likelihood of observing the coins denominations on prices, the net rounding due to their absence and the spread (symmetry) of the rounding effect around their means (that is, the skewness) for the four classes of consumer goods sampled. The results show that the distributions of the ending digits observed in the expected prices are not uniform for all the four classes of goods considered.

A glance at the results in Table 3 shows that, under the category of food products and beverages, about 9.89% of the simulated prices end in 0, 1.81% end in 0.5 (that is, 50kobo), 9.75% end in 1, 9.28% end in 2, 18.48% end in 3, 9.56% end in 4, 10.02% end in 5, 4.20% end in 6, 12.26% end in 7, 8.44% end in 8 and 6.31% end in 9. Similarly, the ending digit of prices for cosmetic, soap and detergent items indicated that 18.7%, 0.7%, 9.1%, 7.4%, 13.4%, 8.50%, 7.9%, 6.3%, 11.3%, 7.1% and 9.6% end in 0, 0.5, 1, 2, 3, 4, 5, 6, 7, 8 and 9 respectively. On the other hand, 16.51%, 1.66%, 9.30%, 6.46%, 18.99%, 6.36%, 6.31%, 8.87%, 13.51%, 5.48% and 6.55% ended in 0, 0.5, 1, 2, 3, 4, 5, 6, 7, 8 and 9 respectively for table water, drinks and dairy products. Finally, the results in the table indicate that 0, 0.5, 1, 2, 3, 4, 5, 6, 7, 8 and 9 were observed on the supposed prices of 13.68%, 0.14%, 10.71%, 8.97%, 15.03%, 9.56%, 11.31%, 8.06%, 10.23%, 7.95% and 4.36% of other categories of consumer goods sampled.

It should be noted that despite the spread of the ending digits observed on the expected prices, only two of the digits (that is 0 and 5) were observed in the actual market prices as shown in Panel B of Figure 1. The implication of this is that the absence of the three coins division of currency might have given retailers the incentive to strategically adjust prices in line with the note denominations of ₦5.

The results in the table also indicate that the mean rounding for food products and beverages; cosmetic, soap and detergent, water, drinks, and dairy products are positive and statistically different from zero as shown by their probability values (sig-value) which are substantially lower than the cut-off of 0.05. However, the mean rounding for other types of commodities is negative and statistically different from zero as shown by its probability value which stood at 0.000. The implication of this is that, while items in the categories of food products and beverages; cosmetic, soap and detergent, water, drinks, and dairy products were seen to be rounded up at the expense of consumers, the other category of commodities on the average were rounded down in favour of the consumer. This finding is supported by the skewness statistics which measures the spread (symmetry) of the rounding effect around their means. From the table, the skewness statistics is approximately symmetric for food products and beverages, cosmetic, soap, and detergent among others but highly skewed for water, drinks and dairy products.

Overall, given the signs of the mean rounding and the corresponding skewness statistics for the categories of food products and beverages, cosmetic, soap and detergent, water, drinks and dairy products which, constitute goods majorly purchased by an average consumer, the study concluded that there is evidence to justify the concern raised by consumers about possible abuses and cheating due to the unavailability of the coins denominations. Indeed, prices across these three categories of goods were rounded, but the rounding effect is more severe on the consumers for goods like water, drinks and dairy products as indicated by the skewness value. The finding is consistent with that of Lombra (2001).

In general, given the above proportion of transactions that ended between "0" and "9" and the direction of rounding, it seems safe to conclude that the absence of the coin's denomination adds ₦4.5kobo, ₦4, ₦3, ₦2, and ₦ 1 to 1.81%, 13.95% (that is, percentages of transactions that end in 1 and 6 digits), 21.54% (percentages of transactions that end in 2 and 7 digits), 26.92% (percentages of transactions that end in 3 and 8 digits) and 15.87% (percentages of transactions that end in 4 and 9 digits) respectively of total cash transactions on food products and beverages. Similarly, the absence of the coin's denomination add ₦4.5kobo, ₦4, ₦3, ₦2, and ₦1 to 0.70%, 15.40%, 18.90%, 20.50% and 18.80% of total household cash transactions on cosmetic, soap and detergents in the study area. Furthermore, it can be deduced from the experiment that 1.66%, 18.17%, 19.97%, 24.47% and 12.91% of consumers' cash transactions on water, drinks and dairy products were rounded up by ₦4.5kobo, ₦4, ₦3, ₦2, and ₦1. Finally, the magnitude of rounding on the other type of commodities considered was ₦4.5kobo, ₦4, ₦3, ₦2, and ₦1 for 0.14%, 18.77%, 19.20%, 22.98% and 13.92% of them respectively.

Other findings from the simulation indicated that the mean rounding for the four categories of commodities is statistically different from zero. This implies that the absence of currency denominations has a significant impact on the market pricing of the four categories of commodity considered. A closer observation as shown by the skewness statistics which reveal the direction of the rounding (that is whether the rounding is done to the disadvantage of the consumer or not) suggests that while the rounding of those items in the categories of food products and beverages; cosmetic, soap and detergent, water, drinks and dairy products were done to the disadvantage of the consumers, those of the other category of commodities on the average were rounded down in favour of consumers. The overall impact of the rounding is more severe on commodities like water, drinks and dairy products.

CONCLUSION AND RECOMMENDATIONS

This study has investigated the extent to which the absence of the lower denominations of 50K, ₦1 and ₦2 in Nigeria has impacted on the market pricing of commodities. Indeed, the analysis has demonstrated that the absence of the coin's denomination affect prices greatly as the market prices of

commodities were strategically rounded upward. Following the experiment, the study reveals that the unavailability of the coins denomination add ₦4.5kobo, ₦4, ₦3, ₦ 2, and N1: to 1.81%, 13.95%, 21.54%, 26.92% and 15.87% of total volume of cash transactions on food products and beverages; to 0.70%, 15.40%, 18.90%, 20.50% and 18.80% of total volume of cash transactions on cosmetic, soap and detergents; to 1.66%, 18.17%, 19.97%, 24.47% and 12.91% of total volume of cash transactions on water, drinks and dairy products to 0.14%, 18.77%, 19.20%, 22.98% and 13.92% of total volume of cash transactions for other type of commodities considered respectively.

Thus, the study concluded that there is a positive relationship *between price movement and the lowest denominated currency of a country. This has* compelled retailers in Nigeria to adopt ₦5 or ₦10 denominations as the minimum price of their products.

Based on the findings and conclusion drawn, the study argues that the simple act of promoting the circulation of coins division of currency in Nigeria may not on its own favourably affect their use and hence the pricing structure. On this basis, the study recommends effective management of inflation rate in order to give the coins denominations more value and encourage their use. As results, the Central Bank of Nigeria should consider the policy of redenominating the naira by knocking off zeros from the current country structure with a view to facilitating easy adoption of the coins. For instance, removing one zero will equate ₦100 to ₦10 in real terms and ₦10 to ₦1 in real terms.

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