Price Setting Behaviour in Nigeria: Some Stylized Facts

Abstract

This study analyzed the microeconomics of price setting behaviour in Nigeria. It used a range of highly disaggregated narrowly defined micro-level retail price data underlying the computation of national indices of consumer prices in Nigeria. This data is directly obtainable from National Bureau of Statistics in Nigeria for monthly prices changes from January, 2011 to December, 2015. Descriptive statistics were used to align theories of price rigidities with data and in doing so addressed questions relating to the price setting behavior in Nigeria. The results revealed that prices were highly flexible, frequency of price changed is rigid downwards, degree of synchronization is low and the average size of individual price changes is quite small. Generally, the findings are consistent with literature in that state dependent pricing model explains the price setting behaviour in the goods sector while time dependent pricing model explain that of service sector. The results also showed, when compared with previous studies from other African countries, that prices changes are far more frequent in Nigeria than other African countries. The study showed that stable macroeconomic environment is necessary to reduce the consequences of state dependent price setting in an economy that is prone to exogenous macroeconomic shocks.

Keywords: price setting, state dependent model, time dependent model. price rigidities, macroeconomic shocks, Nigeria

I. INTRODUCTION

Price signals manifest itself in the pricing behaviour of firms. From the microeconomic perspective, it provides a deeper understanding of the indication of the competitive behaviour at the sectoral level, and firms’ reaction to the economic environment within which they operate as it affects firms’ profitability and competitive behaviour (Maharaj, 2012). From the macroeconomic perspective, the nature of the price setting behaviour has implication on a range of issues including welfare consequences of business cycles, the behaviour of real exchange rates and optional monetary policy
It is widely accepted that the way monetary policy is conducted can influence the level of economic activities as prices are not fully flexible, remaining fixed for at least very short periods. As such the misalignment between policy and adjustment affect the real economy at least in the short term as certain price adjustments are lagged when monetary policy is being implemented. A deeper understanding of the extent of nominal rigidities, their causes, the rules guiding them and to what extent they react asymmetrically to demand and supply shocks are therefore critical to the correct design and implementation of monetary policy.

The literature on the subject of price setting behaviour is almost entirely dominated by studies conducted for developed countries such as United Kingdom (UK) (Parker & Greenslade, 2012) the euro area (Fabiani, Gattulli, Sabbatini & Veronese, 2006). In spite of the importance of price setting behaviour of firms, there are very limited studies of price setting behaviour in the developing countries in general, and particularly in Africa. This is largely because the requisite disaggregated price data are unavailable in developing countries where economic shocks are frequent, and inflation rate are often high and variable, and infrastructure is weak, distribution networks are poor and markets are inefficient thus creating frictions to price adjustment.

Price setting behaviour in Africa may therefore challenge economic theories of price setting as well as empirical models used to stimulate the effects of policy and other shocks on the macroeconomic and microeconomic environment in the developed economies. According to Nakumura & Steinsson (2008), an important lesson from the theoretical literature is that different types of price setting rules predict different relationship between
inflation and the frequency of price change. It is important, therefore, to obtain direct and independent evidence on the price rigidity in order to find out which price setting rules can best explain actual price setting behavior.

The study focuses on Nigeria because the country has a GDP of US$522 billion in 2013, and it is the biggest economy and the economic hub of West Africa. It has a population of 182 million people (AfDB, 2016).

By identifying the features that characterize price setting behaviour of retail outlets in Nigeria, the study throws more light on the theoretical models of price setting behaviour, and hence aligns predictions of the theoretical models with the data, within the context of developing countries, and Nigeria in particular.

The broad objective of this study is to examine the microeconomics of price setting behaviour of firms in Nigeria. The specific objectives are to analyze the quantitative measures of degree of price stickiness in Nigeria and to identify which of the price setting rules is appropriate for Nigeria.

The rest of the paper is organized as follows: Section two contains the review of both the theoretical and the empirical literature. Section three discusses the methods and model specification; Section four presents the results, whiles section five concludes and makes recommendations.

**II. Review of Literature**

Views on the role of price setting in economics have varied. Early rational expectations and real business cycle models that emerged in the 1980s and 1990s did not acknowledge the role of price rigidity in stimulating economic growth during periods of slack in demand. The recent models accept the role of price setting in stimulating growth and acknowledge its outstanding consequences on business cycles. These models also recognize how price
setting affects the behaviour of real exchange rates, the speed with which the monetary authorities attempt to bring inflation back to target after disturbance, the type of response to excess demand or supply and the process by which changes in monetary policy are transformed to real activity and to inflation, (Amirault et al 2005).

Broadly speaking, literature suggests two prominent types of theoretical models of price setting behavior: the time dependent model and the state dependent model. Both models imply the presence of certain degree of stickiness. However, their aggregate implications, positive and negative can have different economic outcomes for the nominal rigidity depending on which model of the price change is adopted (Nakamura & Steinson 2008; Caplin & Spulber, 1987).

According to the time dependent pricing model, price change, which is determined by the passage of calendar time, is the outcome of optimization process by the firm (Small & Yates, 1999). There is thus an exogenous staggering of price changes across firms in the economy (Nchake, 2013) in which a fixed fraction of the number of firms alter their prices in each period (Klenow & Kryvtsov, 2008). But which firms can or cannot adjust their prices are exogenously determined (Small & Yates, 1999).

The two prominent time dependent pricing models are the Taylor (1980) model and Calvo (1983) model. In the Taylor formulation, the duration of the time length may be fixed since for every N period, a constant fraction of firms (1/N) adjust their prices (Matins, 2005). In the Calvo (1983) framework, the time interval is stochastic as it is assumed that every firm reset its price with probability of 1-Θ irrespective of the time which may have elapsed since last adjustment. Consequently, price is expected to remain constant for 1/(1- Θ) periods (Matins, 2005). Overall, time dependent
models have little scope for generating bunching of price changes (Neiman, 2009), cannot generally match many patterns uncovered in new micro data sets, imply that firms are not allowed to respond even to extreme changes of circumstances between (exogenously specified) price adjustment (Caplin & Leahy, 1991), and generally implies that unanticipated permanent changes in money will temporarily affect the aggregate real activity but will ultimately alter only price level (Dotsey, King & Wolman, 1999).

The state dependent pricing model assumes that firm adjust their prices as a result of the outcome of an optimization problem with timing of price change being when the result of cost benefit analysis indicates that the benefits outweigh the fixed costs of adjustment. The assumption of endogenous timing of price changes in which the frequency of price change is dependent on macroeconomic conditions is considered to be more realistic although more difficult to incorporate into macroeconomic models. In this model, the optimal pricing policy is to keep prices within the two real price bounds, S and s. Inflation erodes the real price upper bound S until it reaches the lower threshold s at which point the firm increases price to upper bound (Sheshinski & Weiss, 1977). Price change depends on observable economic factors such as inflation (Fabian et al, 2006) and firm will decide when it is worth paying the adjustment costs (Neimen, 2009). In comparison to time dependent pricing models, the real effects of monetary shocks are less persistent for a comparable economic set-up, the impulse response are more transient than a standard time dependent pricing model, the frequency of price changes is relatively not affected and the intensive margin is relatively more important than extensive margin.

Early studies of pricing behaviour such as Hall and Hitch (1939), which developed the kinked demand curve from responses to their survey, used data which were neither random nor representative as their samples reflected
personal contact. Accordingly, their data could not support formal analysis. The use of surveys, invigorated by Blinder (1991) and Blinder et al. (1998), has recently been supported by European Central Bank under the Euro System Inflation Persistence Network and European nations central banks. However, survey responses may be highly sensitive to precise wording of the questions and interviewers may have no incentives to respond truthfully or thoughtfully.

There have been other methods of collecting price data for studying price setting behaviour in recent times: micro level datasets underlying official CPI and PPI compiled by national statistical agency offices (Nchake, 2014) or scanner data (Midrigan, 2011) or scrape (online) data.

Until recently empirical evidence on price setting at the microeconomic level was somewhat limited, consisting mostly of studies that focused on relatively narrow sets of products as Cecchetti (1986) and Kashyap (1995) or focus a single firm or a single market which tended to be too narrow to permit implications to be drawn for price stickiness on the broad economy.

A number of studies have used the micro data that examined individual retail price level data to offer insight into the characteristic of price setting behaviour. These includes Small & Yates (1999) for the United Kingdom, Bils & Klenow (2004), and Nahamura & Steinson (2008) for the United States, and Parker (2014) for New Zealand. Gouvea (2007) for Brazil, Nchake (2013) for Lesotho and Balchin (2015) for South African Development Community have also provided comprehensive empirical microeconomic evidence on price setting behaviour for developing countries.

A conventional approach to investigate price setting behaviour is the use of frequency-based approach as Bachin (2014). This method is criticized
because it underestimates price rigidity due to oversampling of short price
spells. The analysis of price setting behavior has also been approached with
the econometrics method such as de Munik & Xu (2007) which employed
negative binomial regression models and discrete choice models to evaluate
the role of, and the macro foundation for prevailing sticky price theories
based on Canadian price setting data of 170 firms during 2002 to 2003.
Small et al (1997) employed probit model to study adjustment in United
Kingdom.

The empirical findings of the studies suggest that pricing strategies differed
across industries and across countries. Almirault et al. (2005) suggest that
Canadian firms have asymmetrical response of prices to changes in
economic conditions. Small & Yates (1999) find that market structure affects
nominal rigidity. Martin (2005) finds that the degree of nominal rigidity is
higher in the service sector, most firms change price once in a year, a little
bit more than half follow the time dependence pricing rule, and the presence
of implicit contracts between firms and their customers account for
persistence in prices.

Another finding in the literature is that there is a great variability in the
degree of synchronization across product categories (Kovanen, 2006;
Auccramanne & Dhyne, 2004). In general, two categories of product have
high degree of synchronization distinguished by the flexibility in pricing
behaviour. The first category has highly flexible pricing behaviour and the
second consist of goods whose prices are regulated or administered and
thereby characterized by high degree of price inflexibility. Literature also
reveals that the hazard rates differ across countries and across industries
(Nchake, 2013; Creamer et al, 2012; Nakamura & Steinson, 2008; Klenow &
Kryrtsor, 2008).
Overall, these studies reveal that the degree of price rigidity in terms of frequency, duration and size of price changes vary across industries, across countries and across time in the same country. Furthermore, no theoretical pricing model exactly match the empirical features found in the data and while certain industries would employ time dependent pricing rule in one country, the same industries can employ state dependent rule in another country. It is hereby concluded that there is no particular pattern of price setting behaviour for particular group of countries and industries.

III. Methodology

In order to gain insight into the quantitative nature of the price setting process, the duration of a price spell needs to be estimated. This can be done via the direct approach or the frequency approach. The direct approach compute the duration directly as the average length of a price spell. However, calculating the duration directly from the raw data can be biased due to the presence of censored spells (Harchaoui, Michaud & Moreau (2008), and is thus restricted for use with uncensored spells only. But the exclusion of censored spells leads to downward bias and long lasting spells are more likely to be discarded (Nchake, 2013). On the other hand, the frequency approach allows the use of the full data and avoids the potential bias from censored data. This study adopts the frequency approach following the work of Nchake,( 2013).

3.1. Empirical Specifications

Frequency of price changes

The average frequency of price changes for product i in retail market j, over the period T is

\[ F_{rij} = \left( \frac{1}{T_{ij} - 1} \right) \sum_{t=2}^{T_{ij}} X_{ijt} \] (3.1)
Fr$_{ij}$ is the frequency of price changes of product $i$ in market $j$,

T$_{ij}$ is the number of observations of the price of product $i$ sold by market $j$

p$_{ijt}$ is the price of product $i$ charged by market $j$ in period $t$,

x$_{ijt}$ is an indicator variable defined as

$$
1 \text{ if } P_{ij} \neq P_{ijt-1} \\
0 \text{ if } P_{ij} = P_{ijt-1}
$$

$i$ refers to product, $j$ = market, $t$ = time, $P_{ijt} = \log$ price of product $i$ in market $j$ and in month $t$.

**Duration of price spells**

$$\frac{1}{F_{rij}}, \text{ for all } i= 1 \ldots I, j = 1, \ldots \ldots J \ldots \ldots (3.2)$$

**Direction of price changes**

$$F_{rij}^+ = X_{ijt}^+ \text{ ------------------------(3.3)}$$

$$F_{rij}^- = X_{ijt}^- \text{ ------------------------(3.4)}$$

Where $F_{rij}^+$ = the frequency of price increases in market $j$ for product $i$

$F_{rij}^-$ = the frequency of price decreases for product $i$ in market $j$.

$T_{ij}$ = Numbers of observation of the price product $i$ sold in market $j$

$P_{ijt}$ = price of product $i$ charged by market $j$ in period $t$.

$$
X_{ijt}^+ = \begin{cases} 
1 & \text{if } P_{ijt} > P_{ijt-1} \\
0 & \text{otherwise}
\end{cases}, \quad X_{ijt}^- = \begin{cases} 
1 & \text{if } P_{ijt} < P_{ijt-1} \\
0 & \text{otherwise}
\end{cases}
$$

are indicators.

**Average size of price changes**
The mean absolute size of price change for product \( i \) in market \( j \) over a defined period as:

\[
S_{ijt} = \frac{1}{N} \sum_{t}^{N} I_{ijt} \times |dp_{ijt}| \text{……………….(3.5)}
\]

Where:

\( S_{ijt} = \) mean absolute size of price change for product \( i \) in market \( j \)

\( N = \) number of observations of non-zero price changes.

\( I = \) indicator variable which is equal to 1 if \( dp \neq 0 \) (0 otherwise).

\( dp_{ijt} = \) change in the log price of product.

**Hazard rates for individual products**

The hazard function can be expressed as

\[
h_{\tau} = \lim_{\tau \to 0} P_r \left( \frac{P_{t+r}}{P_{t+r-1}} \neq P_{t+r-2} = \ldots = P_t \right) \text{……..(3.6)}
\]

where price is assumed to reset at date \( t \).

**Synchronization of price setting**

Synchronization is computed as:

\[
F_{k_i} = \sqrt{\frac{1}{\tau} \sum_{\tau=2}^{\tau} \frac{(F_{it} - F_i)^2}{F_i(1-F_i)}} \text{……………….(3.7)}
\]

where \( F_{k_i} \) is the measure of the degree of synchronization for products category \( i \),

\( \tau = \) number of observation for which the ratio is computed

\( F_{it} = \) frequency of price changes for the product category \( i \) for all periods \( t \);
\[ F_i = \frac{1}{t-1} \sum_{t=2}^{T} F_{it}, \text{ and } 1 \geq Fk_i \geq 0 \]

3.2. Analytical Techniques

The techniques used to describe the price setting behavior in this study are the descriptive statistics.

3.3. Data and Sources of Data

The price database consists of unique highly disaggregated micro-level retail price data underlying the computation of the National Index of Consumer Prices (CPI) Nigeria. The data which is not published is obtainable directly from the National Bureau of Statistics, Lagos, Nigeria provides observations for prices of a range of narrowly defined product.

The monthly data covered a period of five years from January 2011 to December 2015. Month-to-month prices are used because it allows for investigation of the dynamics of price setting behavior to be influenced by seasonal factors or temporary promotions as these can cause price fluctuations in particular locations. Retail price level data used for this study has a number of advantages as it enables the direct measurement of the direction and magnitude frequency of price changes in each month.

The narrowly defined products for the objectives are: Food (Banana, Beans, Melon seed, Okro, Onion, Pawpaw, Plantain, Rice (Local), Sweet Potatoes, Orange); Clothing and Footwear (Bath Towel, Blanket, Brassier, Girl dress, Men shoe, Shirt (boys), Women dress; Household Equipment (Electric Iron, Electric Kettle); Beverages (Coca cola) and Services (Education).

IV. Empirical findings

Figure 1 presents a histogram showing the distribution of price changes across products and states over the period January 2011 and December 2015 in Nigeria. The distribution appears to be unimodal with symmetrical shape and centered at zero unit. Overall, the figure shows that the price changes are close to zero with less than 10 percent below zero (negative) and about 20 percent above zero (positive) indicating that there are many price changes, though small in sizes during the period. According to Loupias & Ricart (2004), it is state dependent pricing model that leads to frequent small price changes while time dependent pricing leads to periodic infrequent large price changes. Therefore, the data exhibits state dependence pricing model.

Generally food has a high frequency of price change (Table 1). This is partly explained in terms of perishability. Food perishes much more quickly than others, and has to be disposed much more quickly. Food items are typically
unprocessed goods and therefore have little value added beyond their primary input costs to absorb cost shocks since primary inputs are not diversified, their prices are likely to change more frequently in response to cost changes because firms and individual sellers would want to ensure that retail prices don’t fall below their marginal costs. Clothing and leather products also have a high frequency because they are affected by fashion and can be damaged by weather. Consequently they are disposed off more quickly so as not to result in loss of returns.

**Frequency of Price Changes by Products Category**

Table 1: Frequency of Price Changes across CPI Product Category

<table>
<thead>
<tr>
<th>Category</th>
<th>Mean Price Frequency</th>
<th>Median Price Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food and NAB</td>
<td>0.948</td>
<td>0.986</td>
</tr>
<tr>
<td>Clothing FW</td>
<td>0.952</td>
<td>0.964</td>
</tr>
<tr>
<td>Furnishing, HhE</td>
<td>0.847</td>
<td>0.847</td>
</tr>
<tr>
<td>Education</td>
<td>0.317</td>
<td>0.317</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>0.912</strong></td>
<td><strong>0.971</strong></td>
</tr>
</tbody>
</table>

*Source: Author’s Computation, underlying data from National Bureau of Statistics (NBS), Lagos, Nigeria, 2018.*

*Note: Food and NAB = Food and non-alcoholic beverages, Clothing FW = Clothing and footwear, Furnishing, HhE = Furnishings, household equipment and Education = Education are CPI Product Category based on COICOP (Classification of Individual Consumption by Purpose)*

**Frequencies of Price Increases and Decreases across Sub-Product Categories**

In Table 2, average price increase and decrease is shown across category. The frequency at which prices increase is more than the frequency at which they decrease. This simply shows that when goods and services increase in price either as a result of inflation or for other reasons, they hardly have their prices reduced afterwards, that is, prices tend to be rigid downward.

Table 2: Frequencies of Price Increases and Decreases across Sub-Product Categories
<table>
<thead>
<tr>
<th>Category</th>
<th>Mean Price Increase</th>
<th>Mean Price Decrease</th>
<th>Median Price Increase</th>
<th>Median Price Decrease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggregate</td>
<td>0.331</td>
<td>0.298</td>
<td>0.334</td>
<td>0.3105</td>
</tr>
<tr>
<td>Goods</td>
<td>0.496</td>
<td>0.444</td>
<td>0.502</td>
<td>0.470</td>
</tr>
<tr>
<td>Services</td>
<td>0.165</td>
<td>0.151</td>
<td>0.165</td>
<td>0.151</td>
</tr>
<tr>
<td>Food</td>
<td>0.487</td>
<td>0.442</td>
<td>0.502</td>
<td>0.472</td>
</tr>
<tr>
<td>Perishable</td>
<td>0.523</td>
<td>0.443</td>
<td>0.509</td>
<td>0.473</td>
</tr>
<tr>
<td>Non-Perishable</td>
<td>0.450</td>
<td>0.441</td>
<td>0.494</td>
<td>0.471</td>
</tr>
<tr>
<td><strong>Non-Food</strong></td>
<td><strong>0.465</strong></td>
<td><strong>0.427</strong></td>
<td><strong>0.463</strong></td>
<td><strong>0.443</strong></td>
</tr>
<tr>
<td>Durable</td>
<td>0.428</td>
<td>0.451</td>
<td>0.428</td>
<td>0.419</td>
</tr>
<tr>
<td>Non-Durable</td>
<td>0.501</td>
<td>0.402</td>
<td>0.497</td>
<td>0.466</td>
</tr>
</tbody>
</table>


In Figure 2, it can be seen that the relative proportions of changes due to price increases are generally more than price decreases in across month. In every month, between 30 and 60 percent of products show higher prices increase while 28 to 60 percent show decreases in price. In addition, the Figure 3 generally show that price increases are more pronounced in the last three (3) quarters of the calendar year (between the months of April and December), while price decreases are more noticeable in the first quarter of the calendar year (between the month of January and March). Particular price increases are far more than decreases in April and December while decreases are far more than increases in January and February. These indicate that the price changing have seasonal behaviour.
Figure 2: Frequency of Price Change by Month

Figure 3 plots the frequency of price increases or decreases by CPI product group and month. The chart shows that for most product groups the frequency of price increases are relatively higher than that for price decreases. However, the product that have more price increase in the last three (3) quarters of the calendar year (between the months of April and December) are Food and non-alcoholic beverages while they have more price decreases in the first quarter of the calendar year (between the month of January and March). In addition, the only product that reported very low price decrease during the period other than January is Education.

The seasonal frequency of price increases and price decreases can be explained by fact that consumers demand is higher in these periods with high frequency of price increases. The consumer demand is low in January and February every year resulting in low frequency of price increases probably due to excessive spending in festive of November and December. The fact that frequency price increases dominate the frequency of price decreases
suggest in general, that retailers are less likely to reduce prices than to increase them because of increasing inflation, suggesting evidence of price rigidly.
Figure 3: Direction of Frequency Price Change by CPI Products Category and Month. It shows the monthly frequency of price changes of different products. Education has the lowest frequency of price decreases and increases whereas food and clothing have high frequency of price decreases and increases on monthly basis.
Average frequency of price increases and price decreases with inflation

In order to better compare the relationship between price expansion and contraction, the study plotted the series in Figure 4 with inflation rate. Overall, the figure shows that the price increases and decreases relatively moved in opposite direction. The figure also shows that the prices of commodities tend to increase more in December whereas price reduction appeared more frequent in January and February. Further, the figure shows that price increase and inflation largely followed similar pattern. That is, prices increases co-move with inflation. This implies that for the period of high inflation, prices of the selected products change more frequently during the period.

Figure 4: Average Frequency of Price Increases and Price Decreases with Inflation
Average Size of Price Changes across Product Categories

Table 3 shows that the size of price changes are small reflecting a wide range of small menu cost across products and or time (Dotsey et al. 1999). Small idiosyncratic shocks therefore result in many firms changing prices. The sizes of prices changes are concentrated between range of (3.2%) and (13..3%) as shown in Table 3. Overall, these results reveal heterogeneity in the magnitude of price change across products in Nigeria. The combination of some large prices changes and many small price changes suggest that idiosyncratic shocks are important in price setting in Nigeria.

Table 3: Average Size of Price Changes across Product Categories

<table>
<thead>
<tr>
<th>Category</th>
<th>Mean Price Size</th>
<th>Median Price Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggregate</td>
<td>0.102</td>
<td>0.098</td>
</tr>
<tr>
<td>Goods</td>
<td>0.105</td>
<td>0.101</td>
</tr>
<tr>
<td>Services</td>
<td>0.033</td>
<td>0.032</td>
</tr>
<tr>
<td>Food</td>
<td>0.116</td>
<td>0.122</td>
</tr>
<tr>
<td>Perishable</td>
<td>0.129</td>
<td>0.133</td>
</tr>
<tr>
<td>Non-Perishable</td>
<td>0.077</td>
<td>0.073</td>
</tr>
<tr>
<td>Non-Food</td>
<td>0.092</td>
<td>0.091</td>
</tr>
<tr>
<td>Durable</td>
<td>0.091</td>
<td>0.090</td>
</tr>
<tr>
<td>Non-Durable</td>
<td>0.092</td>
<td>0.092</td>
</tr>
</tbody>
</table>

Duration of Price Spells for each Product

In Table 4, the estimated mean duration of price changes for each product are reported. The results typically indicate that the average duration of price changes for the full sample is 1.194 months and the average duration of the products is between 1.001 and 3.723 months. More specifically, the products with the longest duration is Education (School fee; 3.723 months) and this is followed by Can Coke ((1.463 months), Electric Kettle (1.253 months), Frozen Chicken (1.219 months), Electric Iron (1.156 months).
Table 4: Duration of Price Spells for each Product

<table>
<thead>
<tr>
<th>Product Category</th>
<th>Mean DURATION (MONTHS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banana</td>
<td>1.018</td>
</tr>
<tr>
<td>Bath Towel</td>
<td>1.028</td>
</tr>
<tr>
<td>Beans Brown</td>
<td>1.024</td>
</tr>
<tr>
<td>Blanket</td>
<td>1.037</td>
</tr>
<tr>
<td>Brassiere</td>
<td>1.031</td>
</tr>
<tr>
<td>Can Coke</td>
<td>1.463</td>
</tr>
<tr>
<td>Electric Iron</td>
<td>1.156</td>
</tr>
<tr>
<td>Electric Kettle</td>
<td>1.253</td>
</tr>
<tr>
<td>Frozen Chicken</td>
<td>1.219</td>
</tr>
<tr>
<td>Girl Dresses</td>
<td>1.043</td>
</tr>
<tr>
<td>Mellon Seed</td>
<td>1.029</td>
</tr>
<tr>
<td>Men Shoe</td>
<td>1.104</td>
</tr>
<tr>
<td>Okro</td>
<td>1.002</td>
</tr>
<tr>
<td>Onion Bulb</td>
<td>1.001</td>
</tr>
<tr>
<td>Orange</td>
<td>1.001</td>
</tr>
<tr>
<td>Pawpaw</td>
<td>1.010</td>
</tr>
<tr>
<td>Plantain</td>
<td>1.092</td>
</tr>
<tr>
<td>Local Rice</td>
<td>1.008</td>
</tr>
<tr>
<td>Shirt Boys</td>
<td>1.010</td>
</tr>
<tr>
<td>Shoe Polish</td>
<td>1.113</td>
</tr>
<tr>
<td>Sweet Potato</td>
<td>1.012</td>
</tr>
<tr>
<td>School Fee</td>
<td>3.723</td>
</tr>
<tr>
<td>Women Shoe</td>
<td>1.086</td>
</tr>
<tr>
<td>Total</td>
<td>1.194</td>
</tr>
</tbody>
</table>

Source: Author’s Computation, underlying data from National Bureau of Statistics (NBS), Lagos, Nigeria, 2018. Importantly, these figures imply that the average duration of price changes in Nigeria is about one month.

The Size and duration of Price spells across product

The plots of the average size of price changes with the duration of price spell for Nigeria data is presented in Figure 5. Overall, the figure depicts a positive relationship between the size of price changes and the duration of price spells.
Figure 5: The Size and Duration of Price Changes

Figure 5 explains the relationship between duration of price spills and the size of price changes. According to state dependent pricing theory, there is a little association between the size of price changes and duration as the length of price spell is endogenous to accumulated shocks. This is contrary to the prediction of time-dependent pricing rule which predicts a positive relationship between the size and duration of price spells. A positive relationship is observed between the size of price changes and the duration of price. This is a very important observation that can also be used to identify the appropriate pricing rule and is consistent with time-dependent pricing behavior. We should be very cautious about the interpretation of this graph because of the low $R^2$.

**Aggregate Hazard Function for the Nigeria Price Data**

Figure 6 plots the pooled hazard functions for goods and services products across States in Nigeria. The pooled hazard function for services is flat. This flat pattern in longer period reflect lack of competition for prices of the services. This pattern could also be an evidence of time dependent price setting behavior in the service sector as predicted by Calvo (1983). The flat pattern could also be
a reflection of regulated prices or combining heterogeneous price setters. The hazard function for services is generally flat indicating time dependent behavior.

![Smoothed hazard estimates](image)

**Figure 6: Aggregate Hazard Function for the Nigeria Price Data**

**Synchronization in Average Size of Price Change, Increase and Decrease across Product Categories**

In Table 5, comparison is made across the product categories. The results clearly show that the prices of the products are not highly synchronized since food and non-food products are synchronized only to the average values of 0.178 and 0.236 respectively.

**Table 5: Average Size of Price Increase and Decrease across Product Categories**

<table>
<thead>
<tr>
<th>Category</th>
<th>Mean Price Change</th>
<th>Mean Price Increase</th>
<th>Mean Price Decrease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggregate</td>
<td>0.200</td>
<td>0.192</td>
<td>0.197</td>
</tr>
<tr>
<td>Goods</td>
<td>0.198</td>
<td>0.198</td>
<td>0.188</td>
</tr>
<tr>
<td>Category</td>
<td>2018</td>
<td>2017</td>
<td>2016</td>
</tr>
<tr>
<td>-------------------</td>
<td>------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>Services</td>
<td>0.201</td>
<td>0.185</td>
<td>0.205</td>
</tr>
<tr>
<td>Food</td>
<td>0.178</td>
<td>0.177</td>
<td>0.168</td>
</tr>
<tr>
<td>Perishable</td>
<td>0.192</td>
<td>0.192</td>
<td>0.177</td>
</tr>
<tr>
<td>Non-Perishable</td>
<td>0.164</td>
<td>0.162</td>
<td>0.159</td>
</tr>
<tr>
<td>Non-Food</td>
<td>0.236</td>
<td>0.235</td>
<td>0.236</td>
</tr>
<tr>
<td>Durable</td>
<td>0.274</td>
<td>0.285</td>
<td>0.281</td>
</tr>
<tr>
<td>Non-Durable</td>
<td>0.197</td>
<td>0.185</td>
<td>0.190</td>
</tr>
</tbody>
</table>

*Source: Author’s Computation, underlying data from National Bureau of Statistics (NBS), Lagos, Nigeria, 2018.*

**Conclusion.**

This study shows that for Nigerian data, prices are flexible, and the size of the price changes is very small. The frequency of price changes are known to be high with the majority being close to 100%. The duration of price spell in Nigeria is about one month whereas it is 2.6, 2.7 and 10.2 months in Sierra Leone (Kovanen, 2006), Lesotho (Nchake, 2013), and Belgium (Aucremanne & Druant, 2005) respectively. In accordance with theory, state dependent pricing model fit the data for Nigeria. Theoretically, firms operating under the time dependent pricing model change their prices infrequently, but on periodic basis, as they are not able to change their prices in response to shocks. If information gathering and price changes are costless, state dependent pricing assumes that firms continuously review their prices in order to modify them continuously in response to shocks. In a real world with some information gathering costs, continuous price reviews become frequent price reviews. And if price changes are costly, price changes are not instantaneous anymore, but happens only when prices get out of line (Loupias & Ricart, 2004). Nevertheless, in the state dependent pricing world, firms would want to be aware of shocks in order to respond as fast as possible, price reviews must be a lot frequent than price changes. As a consequence, this pricing model leads to frequent small price changes, while time dependent pricing leads to periodic infrequent large price changes.
changes. The Nigerian data therefore fits into the state dependent pricing model because it changes very frequently but the size of the changes is small.

Generally, that the frequency of price increase dominate the frequency of price decrease suggest that retailers are less likely to reduce prices than to increase them especially in the inflationary environment of Nigeria implying that price are rigid downward. Average frequency of price increase and decrease move in opposite direction. That is, when frequency of price increase is high, the frequency of price decrease will be low for the same period. Generally, as expected, the frequency of price increase increases with inflation, that is, co-move with inflation.

References


Maharaj, R. (2012), Price Setting Behavior In South Africa Retail Sector, MBA


