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Price Setting Behaviour In Jamaica
A Micro and Macro Perspective

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Abstract

A number of microeconomic and macroeconomic factors are theoretically perceived to be influential in the price setting behaviour of agents on goods captured within the consumer price index (CPI). This paper seeks to unveil the distinctive behavioural patterns relating to frequency, duration, and symmetry in price changes to capture information on price rigidities across varying sectors, types of goods, and time within the Jamaican economy. We found evidence of heterogeneity across industries in the price setting process with signs of fair and attractive pricing strategiesbeing employed among some firms. Various industry classifications display similar resultsto seminal work conducted onselect internationalmarkets.Also, there exist asymmetric behavioural patterns among some Jamaican firms when implementing price increases relative to declines. A moderate level of price rigidity is found among industries which may be attributed to some domestic anti-competitive market microstructures and frequent instability in the economic environment.

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The views expressed in this paper are those of the author and do not necessarily represent those of the BOJ.

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TABLE OF CONTENT

INTRODUCTION

Inflation is a measurement of the change in the general level of prices in an economy. It is generally measured as the percentage rate of change between two prices or index of prices over a set period of time. Consumers monitor inflation when evaluating their income's spending power over time. Wage earners consider inflation when negotiating current and future contracts; bankers consider inflation when setting the cost of lending (interest rates); businesses consider inflation when setting prices or judging the viability of future investments; governments consider inflation when seeking to enhance the standard of living and reduce the level of poverty. It is therefore imperative to maintain low inflation for any territory. The Bank of Jamaica (BOJ) has been given the charge to "safeguard the value of the domestic currency". It is therefore essential for the BOJ to understand the underlying nuances that motivate price changes in order to forecast and best structure policies that will create an environment of low and stable price changes, consistent with its mandate.

The aim of this paper is to assess the general behaviour of price setters in Jamaica across industries, product types, and over time. Microeconomic factors based on the relationship amongst firms and between firms as well as consumers play an important role in explaining price setting behaviours. Macroeconomic relationships are crucial in explaining the role that policy action and other exogenous shocks at the aggregate level play in influencing the timing and decision of firms to adjust prices. The literature surrounding the topic of inflation highlights the important characteristic of stickiness of prices over time. In this light, the concerns of price rigidities become an important factor in price setting behaviour. Therefore, this study gives special consideration to the frequency, duration, magnitude, and symmetry of price changes.

The Jamaican basket of goods and services significantly reflects food and energy related components. When combined, both food and energy items accounts for approximately 57.4% of the current CPI basket. Prior to 2006 when the current basket was introduced, the share of food and energy components represented64.6% of the basket. The remaining components which span a wide range of durable goods, semi-durable goods and services, display orderly behavioural patterns in response to seasonal effects, pass-through of import costs, impact from fiscal policy and persistence ininflation expectations. The food and energy components of the basket are directly related to the cost of imported oil and grain commodities which serve as raw materials to

productive activity in Jamaica. Any variation in prices for imported materials invariably results in domestically adjusted prices. International commodities prices are significantly affected by global market conditions and tend to generate variousdegrees of volatility in domestic consumer prices. Eventhough imported commodities are generally considered to be essential products for the Jamaican productive sector, the nation cannot perpetual rely on these items if inflation pressures are to be minimized.

The rest of the study is organized as follows: Section 2 of this paper follows with a literature review outlining the key underlying theories and some empirical findings regarding price setting behaviour. Section 3 describes the data set and reveals some stylized facts pertaining to the data. Section 4 outlines the methodology employed in investigating price setting behaviour in Jamaica, while Section 5 discloses the results of various measures and econometric tests used in the analysis. Section 6 provides a summary and makes recommendations for inflation forecasting and general policies for maintaining low, but policy-responsive inflation environment.

LITERATURE REVIEW

Much of the theoretical foundations in the literature that pertains to price setting behaviour draws attention to whether inflexibility in price adjustment is attributed to state and/or time dependent factors. A distinction is therefore drawn between state and time dependent models and varying combinations. Time dependent models make definitive assumptions about the duration between two price changes. The models of (Taylor 1980) and (Calvo 1983) are two time-dependent models which analyse price setting behaviours. The Taylor model is regarded as the basis of most modern macroeconomic analyses on price rigidities (Dhyne, et al. 2009). More recent models have improved on the approach of Taylor while incorporating state-dependent components that explain various causes for price rigidities.

(Taylor 1979)specified an overlapping contracts model for wage determination in the context of staggered wage adjustments. He demonstrated that the commonly regarded inflation expectations term can be represented as the persistence of inflation emerge from the gradual adjustment of outstanding wage and price contracts that result from new economic information. (Taylor 1980)demonstrated that not all wages are contracted at the same time, and hence are staggered. When deciding on wages, firms and unions look not only on current wages, but also on

previously arranged contracts, and contracts that will soon be negotiated to determine the appropriate wage for the intended period of contract. Due to the characteristic of backward and forward looking wage and price setting behaviours, there are resulting delayed responses from inflation to unemployment. Hence, (Taylor 1980) shows that the persistence observed in unemployment shocks (business cycles) are attributed to the staggered nature of wage, prices and other rigid factors such as information. Nonetheless, Taylor type models have been criticized for a number of reasons. Key among these is the assumed exogeneity of price setting intervals or fixed durations, whereas in reality, price setting behaviour is more likely to depend on the state of the economy (Lunnemann and Matha 2005).

(Calvo 1983)also developed another time-dependent model that is often considered an alternative to the Taylor type model. His paper sought to capture stochastic price adjustments across firms as information pertaining to shocks became available. In such a model price setters (firms) change prices whenever an appropriate signal occurs but not necessarily at the time that the signal is first emitted. The model used included an assumption that the probability of a signal occurring in some future period follows a geometric distribution and would be independent of the past period in which the signal was emitted. Additionally, this behaviour, he assumes, would vary randomly across price setters. (Calvo 1983)suggested that firms take into consideration the average price and the expected future demand conditions whenever a price adjustment is made. The model captured some key characteristics of the contracts model presented by (Taylor 1979)&(Taylor 1980) without the complexity of literal contract models. The overarching premise is that prices remain sticky over time due to some embedded information asymmetry.

In contrast to the time-dependent models of (Taylor 1980) and (Calvo 1983), state dependent models have been developed with the key feature of endogenizing the price setting mechanism. (Caplin and Spulber 1987)demonstrated that firms exposed to a fixed cost when adjusting prices, will assess the economic environment before deciding on whether or not to make a price change. (Dotsey, King and Wolman 1999)enhanced the time-dependent model presented by (Calvo 1983) with state-dependent properties which was achieved by accommodating an increase in the proportion of firms that change prices as the inflation level rose. This was empirically supported by (Dhyne, et al. 2005). Whereas time dependent models seek to explain inflation persistence by making assumptions about the duration of price changes among firms, state dependent models sought to explain inflation persistence on the grounds of various features that is peculiar to the firm. Therefore, time-dependent factors may reflect intra-year frequency of price changes and

seasonality effects, while state-dependent models would capture firm specific features such as menu costs, attractive and fair pricing policies, and the degree of competition within the industry and even the level and cost of accessing information for decision making.

The range of theoretical premises on which staggered or sticky price models rely, includes: menu costs, attractive prices, fair pricing, and costly information (Dhyne, et al. 2009). Menu costs refer to the explicit cost imposed on firms when making nominal price adjustments. This may include instances where the industry or firm may be regulated, or the overhead cost of changing the menu of prices becomes a significant deterrent to price adjustment. Attractive prices refer to scenarios where firms set prices with particular characteristics aimed at generating certain behavioural pattern among consumers. Such pricing strategies may include charginga round price which ends with a zero or by signalling competitive type prices by ending prices with a nine. Additionally, firms may seek to set prices with fractional ending points that may aid recollection when consumers actively engage in comparing prices. Wherever attractive pricing behaviour prevails, an automatic price range is established such that prices are altered only when the price change warrants breaching the upper or lower bound. Fair pricing is based on the premise that firms are reluctant to change prices on fears that the action will anger customers. Fair pricing models anticipate that consumers are more accepting of price changes when input costs change rather than in conditions of high demand. Costly information reflects the limitations or high costs associated with obtaining timely and accurate information to guide pricing decisions. All premises are likely to lead to staggered pricing behaviour among firms.

A number of empirical studies have been conducted on micro-level consumer price data and other industry specific cases in an effort to unveil properties of rigidities in the price setting behaviour of firms. A summary of empirical investigations for Europe, US, and Other territories has been provided in the works of (Dhyne, et al. 2009)and (Craigwell, Moore and Morris 2010). This paper is intended to add to the existing body of work conducted within the Caribbean. For the purpose of this paper, a few noteworthy cases are highlighted.

(Craigwell, Moore and Worrell 2009)investigated whether consumer price rigidity exist within Barbados. Using retail price data between 1994 and 2008, it was found that price changes were featured on a monthly basis for 50 to 80 per cent of items in all categories of the basket. It was evidenced that price increases were more frequent and pronounced than price declines. An investigation on price rigidity was also conducted on non-fresh food products using CPI micro-

data for France (Baudry, et al. 2004). It was found that price changes were generally sticky with duration averaging 8 months. In general, price cuts were not significantly different from price increase providing no clear evidence of downward stickiness of prices. There was, however, evidence of heterogeneity among service related goods as price changes were relatively more rigid than manufacturing related goods.

(Polius and St. Catherine 2010)presented evidence on price setting behaviour in St Lucia using price quotes from household expenditure surveys used for the monthly CPI calculation. The data ranges from April 2002 to December 2007. Stylized facts using a combination of frequency and duration measures revealed that St. Lucia is characterized by reasonably flexible prices. This, however,waslargely attributed to the highly weighted sub-indices of food, fuel, light and transportation. The study provided evidence in support of sticky prices among services sectors relative to food, transport and energy segments. Items that are not frequently purchased such as clothing and footwear, and furniture & fixtures also reflected greater price rigidities. Some asymmetric price changes were also observed with price increases being more frequent and generally larger than price declines.

DATA CHARACTERISTICS

Two longitudinal datasets were used which consisted of monthly price data collected by the Statistical Institute of Jamaica (STATIN) for computing the Jamaica Consumer Price Index. As of December 2006, a new system of classification was introduced based on the COICOP (Classification of Individual Consumption According to Purpose) methodology. The new system includes 12 expenditure classifications that were determined from the 2004/05 Housing Expenditure Survey (HES) (see Table 1). Prior to the COICOP 12-division classification of goods, an 8 division classification was used. From here onwards, the two data sets will be referred to as 8-class and 12-class respectively. Separate analyses will be provided for both 8-class and 12-class systems of classification. The 8-class panel dataset collates data for the period January 1995 to December 2006 while the 12-class dataset spans the period January 2007 to December 2008.

The 8-class dataset consists of 1,643,052 unique price quotes across the range of CPI classifications for the period January1995 to December 2006, while the 12-class dataset

incorporates 646,140 unique price quotes for the period January 2007 to December 2008. Each price quoted in both dataset is distinctively identified by a numeric code for the specific product brand, regional area, outlet, town, and collection point. Alongside each product id value is a uniquely associated month, year and price, where all prices are quoted in Jamaican dollars. The 8-class panel dimension consists of 18,570 cross sections with the longest subset of observations being 132 months over the 12 year period. The 12-class panel dimension features 26,922 cross sections with the longest observation subset being 24 months over the 2 years.

The dataset had some missing data points. Missing data may occur in instances where prices are surveyed on a seasonal basis. The frequency of survey implementation may also result in missing information. Such instances may include cases where the data is surveyed only on a quarterly basis. Another case of missing data may occur if the product is absent from an outlet at the point of survey. All cases of missing information results in censored data.[2]To rectify instances of missing information, the "carry forward" methodology was employed to price quotes within each year. As a result, cases where a missing data point occurred after a price quote; the former quote was carried forward. In cases where there was no price quote before a missing data point, the earliest price record in the year for the specific product was left unchanged. This adjustment follows a right-hand censoring of the dataset, however, consistent with other similar studies, left-hand censoring was avoided due to the complexity, potential hazards, and minimal benefit of imposing such transformation of the data.

METHODOLOGY

MEASURES OF INTEREST

The measures used to indicate varying aspects of price rigidity includes the frequency (F) and duration (D) calculations. These measures depend on discrete price changes across products within the CPI basket. Prices are considered rigid when the frequency of price adjustments is relatively fewand/or, when the time duration before another price change is relatively long. Whereas the measure of duration can be approximated from the frequency measure, an initial

[2](Lunnemann and Matha 2005)identifies uncensored data as being characterized by a distinctive start and end of price spell. Left censored displays no definite start of a spell, while right censored has no definite end of spell. A double censored data has neither a start nor an end of price spell.

binary variable (I), capturing signals of price movements, is required for the calculation of frequency. The formulas are presented as follows:

$$I_{it} = \begin{Bmatrix} 1 & \forall & p_{it} \neq p_{it-1} \\ 0 & \forall & p_{it} = p_{it-1} \end{Bmatrix}$$ **Eq. 1: Price change indicator**

$$I_{it}^{u} = \begin{Bmatrix} 1 & \forall & p_{it} > p_{it-1} \\ 0 & \forall & p_{it} \leq p_{it-1} \end{Bmatrix}$$ **Eq. 2: Positive Price change indicator**

$$I_{it}^{d} = \begin{Bmatrix} 1 & \forall & p_{it} < p_{it-1} \\ 0 & \forall & p_{it} \geq p_{it-1} \end{Bmatrix}$$ **Eq. 3: Negative Price change indicator**

where I_{it} , I_{it}^{u} and I_{it}^{d} represents binary indicators of price change, price increase and price decrease respectively. Additionally, p_{it} represents the price of product i at time t.

The frequency measure captures the share of all price quotes that reflects a price change for the product within a month. The following measures capture the frequency of price changes, increases and decreases for the i^{th} product attime t.

$$F_i = \frac{\sum_{i=1}^{n} I_{it}}{N_i}$$ **Eq. 4: Frequency of prices changing**

$$F_i^{u} = \frac{\sum_{i=1}^{n} I_{it}^{u}}{N_i}$$ **Eq. 5: Frequency of prices going up.**

$$F_i^{d} = \frac{\sum_{i=1}^{n} I_{it}^{d}}{N_i}$$ **Eq. 6: Frequency of prices going down.**

The variable N_i is the number of the quoted price instances for the product*i*, F_i is the overall frequency of price changes for the i^{th} product and F_i^{u} and F_i^{d} captures the respective frequency of price increases and decreases respectively.

The measure of duration (D_i) represents the average number of months before a price change is expected for a particular product *i*. Duration is approximated as follows:

$$D_i = \frac{1}{F_i}$$ **Eq. 7: Duration for the i^{th} product**

Synchronization (S_i) is a measure of whether or not prices change at the same time. If products are synchronized then the measure of synchronization should be close to or equal to unity and indicates that firms are likely to move in unison when making price adjustments. A synchronization measure that is closer to zero would reflect non-uniformity in price setting behaviour among firms and varying lags in pass-through of price adjustments. A measure of synchronization is provided by (Fisher and Konieczny 2000)and is represented in (Eq. 8):

$$S_i = \frac{\sqrt{N^{-1}\sum_t \left(F_{it} - F_t\right)^2}}{\sqrt{F_t(1-F_i)}}$$ **Eq. 8: Synchronization of price changes**

Hazard functions capture the risk of a price change after a certain period of time has expired. (Lunnemann and Matha 2005)notes the hazard rate as the function *h(s),*which captures the conditional probability given that a price spell will end after [s] periods given that [s] periods have expired (see . Eq.9)

$$h(s) = \lim_{ds \to 0} \frac{P(S < s + ds \mid S \geq s)}{ds} = \frac{f(s)}{1 - F(s)}$$ **Eq. 9: Hazard rate**

ECONOMETRIC METHODS

The econometric method employed follows the approach taken by (Lunnemann and Matha 2005)and(Aucremanne and Dhyne 2005). The investigationutilizes a LOGIT model to evaluate the probability of price changes in response to a variety of time and state dependent variables. The dependent variable y_{ijt} is equivalent to the binary variables derived from Eq.1.

$$y_{ijt} = \begin{Bmatrix} 1 & \forall & p_{ijt} \neq p_{ijt-1} \\ 0 & \forall & p_{ijt} = p_{ijt-1} \end{Bmatrix}$$ **Eq. 10: Binary dependent variable**

$$P\left[y_{ijt}\right] = \frac{\exp\left(x_{ijt}\beta + u_i + \varepsilon_{ijt}\right)}{1 + \exp\left(x_{ijt}\beta + u_i + \varepsilon_{ijt}\right)}$$ **Eq. 11: Logit representation of a price increase**

where:

$$
\begin{aligned}
x_{ijt} &= \alpha_1 \sum_{t=T}^{t} \left| mcpi_{j,t-T} \right| + \alpha_2 \sum_{t=T}^{t} \left| mxate_{j,t-T} \right| + \alpha_3 \sum_{t=T}^{t} \left| mwti_{j,t-T} \right| + \alpha_4 \sum_{t=T}^{t} \left| mtot_{j,t-T} \right| + \alpha_5 \sum_{t=T}^{t} \left| mtbill_{j,t-T} \right| \\
&+ \delta_1 lsizeup_{ij,t-T} + \delta_2 lsizedn_{ij,t-T} \\
&+ \gamma_1 attract + \gamma_2 psycho + \gamma_3 fraction + \gamma_4 round1 + \gamma_5 round2 \\
&+ \phi_1 lendur + \phi_2 dur3 + \phi_3 dur7 + \phi_4 dur8 + \phi_5 dur10 + \phi_5 dur12 \\
&+ \zeta_1 energy + \zeta_2 service + \zeta_3 nprocessf + \zeta_4 processf + \zeta_5 ndurable + \zeta_5 durable \\
&+ \sum_{m=2}^{12} \xi_m month\_m + \sum_{y=2}^{12} \psi_m year\_y
\end{aligned}
$$

where u_i represents the products random effects and ε_{ijt} represents the independently distributed error term. The range of additional independent variables used to capture both state and time dependent factors are representedin x_{ijt} .

Among the range of state dependent variables included in the specification are the absolute accumulated per cent changes for the consumer price index $\sum mcpi_{j,t-T,t}$, exchange rate $\sum mxrate_{j,t-T,t}$, West Texas Intermediate (WTI) crude oil price $\sum mwti_{j,t-T,t}$,Terms of Trade $\sum mtot_{j,t-T,t}$ andJamaica's 6-month treasury bill rate $\sum mtbill_{j,t-T,t}$ since the beginning of each price spell.The impacts of these factors areanalysed for price changes in general but also separately for price increases and decreases. (Cecchetti 1986)and(Lunnemann and Matha 2005) utilized the impact of absolute cumulative inflation and wage following a products' price adjustment to proxy menu costs specific to firms. Among the other variables used to proxy firm specific costs were: the accumulated time in months since last price change, relative size of previous price change and changes in demand conditions.

The variables $lsizeup_{ij,t-T}$ and $lsizedn_{ij,t-T}$ represents the sizes of price change ushering in the endof a price spell. Consideration is given to the impact of upward and downward price adjustmentsindetermining whether or not price changes are sticky or flexible. Sticky prices are

likely to be characterized by single and large price adjustments while flexible prices will more likely display frequent and marginal price changes.

The binary variables $attract_{ijt}$, $psycho_{ijt}$, $fraction_{ijt}$ and $round_{ijt}$ captures price setting patterns across products and firms.*Attract* represents the overall indicator which indicates whether or not firms participate in any attractive price setting strategy. The binary variable attract is a composite of: psychological prices that ends with the values of 0.99, 0.95, 0.90 or 0.49; fractional prices ending with 0.25, 0.50 0.75 and 5.0;and round numbers ending with 0.00.

The length of time that has expired since the last price change of a product is reflected in the variable $lendur_{ijt}$ representing the length of duration. This variable is expected to capture characteristics ofedogenietyin the price setting behaviour of firms over time. This is in contrast to the Taylor and Calvotype models which assume constant durations.The coefficient on this variable will give an indication of the likelihood of a price change as a price spell gets longer.

Figure 4) features significant risk of a price change at duration periods of 3-months, 7-months, 8-months, 10-months and 12-months. The specific binary variables used in the analysis are to capture these effects are $dur03$, $dur07$, $dur08$, $dur10$ and $dur12$.

Seasonal variables are included in the model to capture inter-temporal effects on price setting patterns. There are both monthly and annual seasonal variables. Month-by-month binary variables will give insight about which month price changes would be most likely for a product group. Year-by-year binary variables will indicate which year inflation changes would be most likely considering the economic state during the specificyear.

Sectoral effects were also included in the specification as binary variables. The range of classifications includesenergy, services, processed foods, unprocessed foods, durables and non-durable goods. According to (Aucremanne and Dhyne 2005), including sectoral groups will address any observed heterogeneity across the sample space. The results will highlight if there are any distinctive behavioural patterns among firms classified within a specific sector.

Considering the impact of time and state dependent variables on both price increases and decreases, the following LOGIT specifications were also estimated in line with(Aucremanne and Dhyne 2005) and (Lunnemann and Matha 2005).

$$P\left[y_{ijt}^{+}\right]=\frac{\exp\left(x_{ijt}\beta+u_i+\varepsilon_{ijt}\right)}{1+\exp\left(x_{ijt}\beta+u_i+\varepsilon_{ijt}\right)}$$

Eq. 12: Logit representation of a price increase

$$P\left[y_{ijt}^{-}\right]=\frac{\exp\left(x_{ijt}\beta+u_i+\varepsilon_{ijt}\right)}{1+\exp\left(x_{ijt}\beta+u_i+\varepsilon_{ijt}\right)}$$

Eq. 13: Logit representation of a price decline

where:

$$\begin{aligned}
x_{ijt} &= \alpha_1\sum_{t=T}^{t}\left|mcpi_{j,t-T}^{+}\right|+\alpha_2\sum_{t=T}^{t}\left|mxate_{j,t-T}^{+}\right|+\alpha_3\sum_{t=T}^{t}\left|mwti_{j,t-T}^{+}\right|+\alpha_4\sum_{t=T}^{t}\left|mtot_{j,t-T}^{+}\right|+\alpha_5\sum_{t=T}^{t}\left|mtbill_{j,t-T}^{+}\right| \\
&+\alpha_6\sum_{t=T}^{t}\left|mcpi_{j,t-T}^{-}\right|+\alpha_7\sum_{t=T}^{t}\left|mxate_{j,t-T}^{-}\right|+\alpha_8\sum_{t=T}^{t}\left|mwti_{j,t-T}^{-}\right|+\alpha_9\sum_{t=T}^{t}\left|mtot_{j,t-T}^{-}\right|+\alpha_{10}\sum_{t=T}^{t}\left|mtbill_{j,t-T}^{-}\right| \\
&+\delta_1 lsizeup_{ij,t-T}+\delta_2 lsizedn_{ij,t-T} \\
&+\beta_1 cpi+\beta_2 xrate+\beta_3 wti+\beta_4 tot+\beta_5 tbill \\
&+\gamma_1 attract+\gamma_2 psycho+\gamma_3 fraction+\gamma_4 round1+\gamma_5 round2 \\
&+\phi_1 lendur+\phi_2 dur3+\phi_3 dur7+\phi_4 dur8+\phi_5 dur10+\phi_6 dur12 \\
&+\zeta_1 energy+\zeta_2 service+\zeta_3 nprocessf+\zeta_4 processf+\zeta_5 ndurable+\zeta_6 durable \\
&+\sum_{m=2}^{12}\xi_m month_m+\sum_{y=2}^{12}\psi_m year_y
\end{aligned}$$

The superscript of (+) and (-) on the accumulated inflation and other cumulative state dependent variables are incorporated to capture potential asymmetric behaviour among firms. Asymmetric effects are displayed when either a positive or negative adjustment in any of the observed regressorsdisplay significant differences in the probability of a price change.

RESULTS - MEASURES OF INTEREST

Results pertaining to frequency, duration and synchronization on the micro data gathered from the eight 8-class dataset are reported in Table 2. On average, the duration of a price spell in Jamaica during the period 1995 to 2006 lasted7months. This reflecteda 10 month spell between two price increasesand 23 months between two price declines. The results demonstrate that on average,

18% of monthly price quotes reflected price changes,where the proportion of price quotes reflecting price increases and decreaseswas11% and 7% respectively. On average 42% of firms changed prices at the same time.Synchronization is neither skewed to a price increase or decrease as 38% of firms uniformly adjust prices upward versus 37% of firms reflecting similar uniformity when lowering prices (see Table 2).

Non-processed foods include agriculture related produce such as vegetables and starches along with fruits and some unprocessed meats and fish. This classification reflected the highest frequency (31%) of monthly price adjustments when compared to other local industry segments (see Table 2). Average price spells lasted for approximately four (4) months and was the lowest among domestic industry segments. The frequency of price adjustments for non-processed foods was comparable to European territories which rangedfrom 19% to 55% (see Table 5). Considering available information, France reflected a comparable duration period of approximately 4.7 months when compared to the 4.1 month duration for non-processed foods in Jamaica. There was however a marginal variation in the responsiveness of firms when increasing prices relative to a reducing pricesfor non-processed foods.

Energy related components reflected high frequencies of price change. Approximately 18% of price quotes within the Energy group reflected a price change on a monthly basis. Also, a price change each month was approximately 3 times more likely to be a price increase than a price decrease. Data from the 8-class basket suggests that energy related prices are typically adjusted every six (6) months where price increases are expected at least once every 9 months and price declines once every 27 months. This result is inconsistent with the common perception that energy related prices change very frequently.Select European territories reflected monthly frequency rates within the range of 74% to 82% within the energy industry (see Table 5). The extended duration of energy related price changesmay be due to the less than comprehensive coverage of energy-related components within the 8-class basket as well as anti-competitive type policies during the period of investigation.[3]Transport was also classified among energy components and represented the most frequently adjusted division within the 8-class basket. However, the average price spell of 4 months for transport related costs is still higher than typical.

[3] Fuel was comprised of only kerosene, charcoal, and cooking gas in the 8-class basket.

Energy prices are reasonably synchronized with 33% and 30% of firm's respectively raising and lowering prices together. Transportation reflected the highest level of synchronization among service providers. Approximately 72% of transport related prices adjusted in unison with similar patterns reflected for both price increases and decreases (see Table 2).

Both Durable and Non-durable goods reflect notable frequency in price adjustments. Among durable goods, 27% of price quotes in a month reflected an adjustment. On average, price increases accounted for 15% of price quotes within a month while price declines represent 12%. The duration between two price changes for durable goods was 4 months. On average firms selling durable goods waited7 months before passing through a second price increase. Nevertheless, price declines are reflected once every 10 months. This may reflect the practice of annual product sales among merchants of durable goods whereby prices are lowered and reversed when the sale period ends. Price changes among durable goods reflect average synchronization levels of 45% with relatively similar patterns for both price increases and decreases. Durable goods are largely imported and may reflect relatively high levels of synchronization as firms respond in similar fashion to variations in import costs as well as accustomed periods of sales. Durable goods include household furniture's, large appliances such as refrigerators, televisions and motor vehicles, among others.

The non-durable goods category was the next most frequent in price adjustments (see Table 2). Approximately 21% of non-durable price quotes reflected price changes each month. However, price increases were more likely to occur than price declines as represented by frequencies of 13% and 8% respectively. The duration of price spells among non-durables was approximately six (6) months with an average of 8 months between price increases and 18 months between price declines. Firms selling non-durables are slightly less synchronized than average but relatively more so for price increases than for price declineswith values of 30% and 7% respectively.

Services represent the least frequent price changes among selected groups. Approximately 12% of price quotes were likely to represent a price change within a month. Additionally, services were 3-times more likely to reflect a price increase than a decrease with monthly frequencies of 9% and 3%, respectively. Services typically reflect a price spell of nine (9) months while reflecting a price increase at least once every eleven (11) months. Nevertheless, service providers reflect levels of uniform price movement comparable to behaviour among energy providers. Price

increases and decreases reflected respective co-movement of 33% and 31% among service providers.

A comparison of the calculated measures was provided for select regional and international territories (see Table 5). The results show that total frequency of price adjustments in Jamaica fell within the corresponding decile as for Luxembourg, Italy and France within the European market. A similar result was featured for processed foods when Jamaica was compared to Belgium and France. There were also similarities for frequencies of service rate changesbetween Jamaica and all European territories, however with Jamaica at the highest end. Energy pricechanges in the observed European states were, on average, four (4) times more frequent than that observed in Jamaica. This may be due to the strong reliance on a monopoly structure in running the industry. Regional counterparts who underwent similar studies included Barbados, Belize and St. Lucia. All three reflected very high levels of frequency in price movements with average duration of price spells between 1 and 2 months relative to the 7 month average for Jamaica. Jamaica's duration between price spells was however comparable to the results presented by France (see Table 5).

RESULTS - ECONOMETRIC ANALYSIS

TIME DEPENDENT FACTORS:

Length of Duration – Duration is a time dependent factor among the components that explain price setting behaviours. One indicator used to capture this effect was the length of time elapsed since the start of a products price spell (*len_duration*). This represents the duration length at any point in time for a particular product.Table 3 demonstrates that the odds of a price change when the duration period increase by a unit of time is(1:1) and is largely significant.[4]The odds of a price increase after an increase in the duration length is also (1:1) but displays some asymmetry for price declines which reflects lower odds of (1:1.1). This indicates that the odds were 10% less likely to occur. All instances are largely significant. The marginal effects for the duration length on the probability of a price change, increase and decrease were all negative. The negative sign suggests that when the elapsed times since each price spell increased, the probability of a price change lessened, giving rise to downward sloping hazard functions.

[4] In this paper the terms, "largely significant", "significant", and "slightly significant" is used when referring to statistical significance at the 1%, 5% and 10% levels respectively.

Last size up and down - captures the magnitude of a price change ending a price spell. In Table 1, these are featured as (*up_lastsize* and *dn_lastsize*) and are all largely significant. The results demonstrate that the odds of a price change, to no-price change is the same for varying magnitudes of price adjustments terminating a price spell. A similar result is observed for both the likelihood of price increases and decreases. In all three scenarios, the marginal effects are approximately zero. (Cecchetti 1986)indicates that small effects of the price change ending a price spell may suggest that firms face small adjustment costs and thereby reset prices frequently as opposed to large and infrequent price adjustments. The marginal effects are approximately zero in all there instances, supporting this argument.

Figure 4). These include (*dur_03, dur_07, dur_08, dur_10* and *dur_12*) as identified in Table 3&Table 4. The results highlight price setting behaviour that relates to the time expired since a former price change. All five (5) time intervals are largely significant for price changes, increases and decreases excepting for price declines after 12-month intervals (dur_12) which was insignificant at the 10% level (see Table 3). The results demonstrate that the odds of a price increase are all strong when duration periods of 7, 8, 10 and 12 months have expired. However, after three (3) months have expired since a price adjustment, the odds that prices would change, increase or decrease were not good (see Table 3). In such cases the marginal effects were all negative indicating that, on average, in three (3) months subsequent to a price change, any price change would quite likely be in the opposite direction or no change.

Monthly seasonality effects–Monthly seasonality was incorporated in the baseline model to capture inter-temporal behavioural patterns among price setters. Using January as the base year, the odds of a [price increase : no-price-increase] was notably higher in the months of April, May, June, July, October, and November relative to the odds of a [price-decline : no-price-decline]. This was also reflected in monthly frequency plots (see Figure 2) where greater price changes occurred in April to May and October to November mainly among durables, non-durables, processed foods and services. The June to July effect was primarily among non-processed foods, and to some extent processed foods and non-durables. Adverse weather patterns with heavy rainfall in May-June, October-November and drought conditions in early months of the yeartend to disrupt domestic agriculture supplies and distribution chains. Additionally new fiscal measures at the beginning of a fiscal period may adversely affect rates within the service sector. January

typically displayed low frequency of price change across all major sectors (see Figure 2). On average, the proportion of firms lowering prices on a monthly basis exceeds the number of firms increasing prices. This is true for all industries except for Services which displays longer duration between price adjustments.

When price increases and decreases were addressed independently, the results showed that price increases are weakest in the months of August, September and December reflecting the back to school and Christmas period (see seasonal impacts in Table 3&Table 4), This may be attributed to high demand for specific types of goods during those periods. These periods also reflect low frequency of price changes among energy, durables, non-durables, processed foods and to some extent services (see Figure 2). Price declines however, are strongest in the first half of each year(February to June) and also in (November and December) which coincides with some seasonal declines in agriculture prices and falling commodity prices following peaks in the winter period. The marginal effects were all positive and largely significant highlighting a definite seasonal pattern in the price setting behaviour of firms. Price declines and increases were equally likely during the period July to October when frequencies of price increase and decreases moved in tandem (see Table 3, Table 4&Figure 2). The mixture of price increases and decreases may be characteristic of periodic sales followed by price reversals across the wide cross-section of firms which (Lunnemann and Matha 2005) addressed as a key feature of explaining price changes.

STATE DEPENDENT FACTORS:

Macroeconomic factors– The macroeconomic state-dependent factors included in the model are per cent changes in *cpi, exrate, wti, tot* and*tbill*. The baseline model distinguishes between accumulated changes, increases and decreases for each macro component. (Cecchetti 1986)relied on the absolute accumulated change in cpi as a proxy for menu costs suggesting that this variablewould indicate the costs faced by each firm within the prevailing economic environment. As such, the cost of doing business increased with higher inflation, depreciated exchange rate, higher energy costs, rising interest rates and even more when the terms of trade deteriorates.

- *CPI changes (cpi)* - Table 3 demonstrates that the odds of a price change following strong changes in inflation were weak with odds of[1:1.2].This suggests that the odds of a price change as inflation increases would be lessened by 20% for every per cent point increase in inflation. However, this outcome conflicts with the expectation that rising inflation would indicate higher menu cost of doing business, and may be indicative of

underlying asymmetric patterns for price increases separate for price decreases. When the odds of a price increase and decrease were observed separately, the odds of a price increase in the CPI was approximately [1:1] but worsens considerably in the case of a decline in the CPI. This result suggests that prices are equally likely to rise or fall when the CPI increase but becomes very unlikely to either increase or decrease when the CPI decline. This suggests that menu costs are high and are considered a hindrance to price adjustment especially when a price decline is warranted. Additionally, the strong and significant odds that prices will not decline when CPI declines, are indicative of downwardlysticky prices. It may also be deduced that prices are generally rigid downward since the marginal effects (coefficient) for declines in CPI are bothstrong and largely significant.

- *Exchange rate changes (xrate)* - The results in Table 3 demonstrates that the odds of a price change when depreciation of the exchange rate is large, is significant and consistent with a ratio of [2.9:1]. The marginal effect is positive suggesting that higher exchange rate is likely to be met with increased prices while declining exchange rates will reflect a high likelihood of firms lowering prices.This result, however, was not justified when distinction was made between rising and declining exchange rates. The results suggested that price increases and decreaseswere equally likely when the exchange rate either depreciate or appreciate. Both odds were [1:1] (see Table 3).

- *Other macroeconomic factors* - The odds of accumulated changes in the Terms of Trade (*tot*) and Treasury Bills (*tbill*) reflected similar characteristics to accumulated deviations in the exchange rate when explaining the likelihood of a change, increase or decrease ina firm's price. The accumulated deviation in the WTIcrude oil price (*wti*) since the initiation of a price spell did not reflect any higher odds of a price increase or decrease. This was the same for higher and lower *wti* prices.

Commercial pricing strategies– The literature suggests that firms generally employ attractive pricing strategies when making decisions about price adjustments. The group of attractive pricing strategies captured in the dataset includes psychological, fractional, and round prices. The literature suggests that firms which set prices with desired properties may adjust prices less frequently because some price changes may be too small to adjust to the next desired price level e.g. from one round price to another round price. When all attractive prices are grouped, the result

in Table 3 shows that pricing strategies neither increase nor lower the odds of a price change. This result was insignificant however and may suggest asymmetric behaviours among firms when reacting to a price increase relative to a price decrease. This was confirmed by the estimates which discriminate between a price increase and decrease. The results demonstrated that the odds of a price increase werelowered to [1:1.1] when a price setting strategy was used. However, the odds of a price decline increases to[1.2:1] when a price decline wasexperienced. The marginal effects of a price increase in response to attractive price setting patterns were negative while positive when explaining price declines. This supports the notion that the greater the number of firms practicing attractive pricing strategies, the less likely will price increases be, however price declines are more likely when firms practice attractive pricing strategies.

This type of behaviour among firms may be due to the nature of setting optimal prices. When a price increase is warranted, firms will set prices at optimal levels so as to maximize margins and minimize the need for readjusting prices within the interim. Hence, when reasons for a price increase surfaces, the firm is able to absorb some costs without charging customers more or until conditions normalize. However, when conditions warrant price declines, given that firms are at or close to optimal prices with reasonable margins, they may find it in their best interest to pass on some of the savings to customers and increase competitiveness. Being at the top of the threshold, lowering prices to an attractive price may be well within grasp. Firms that display such characteristics may practice fair pricing strategies in conjunction with attractive pricing, where the former reflects a strongcommitment to customer loyalty and stability in prices.

In Table 4, the Logit model was re-estimated with different indicators for the three classes of attractive prices. The results demonstrate that the indicator for psychological pricing is insignificant for price changes, increases and decreases. Hence firms in Jamaica are not accustomed to setting prices that end with a nine (9). This may be due to the culture of Jamaican consumers which may pay more attention to round numbers (i.e. numbers ending with 0 or 5). This was reflected high significancefor fractional pricing strategies and round pricing strategies across models explaining a price change, increaseanddecrease. The most common attractive pricing strategy is fractional pricing where prices end with a 0.75, 0.50 or 0.25. Fractional prices reflected odds of [1.4:1] for price changes; and odds of [1.3:1] for both price increases and decreases. Whereas fractional pricing displays symmetric behaviour for price increases and decreases, round prices did explain the asymmetric behaviour observed in the grouped indicator for attractive prices in the baseline model. Among firms that practice round pricing strategies, the

odds that prices would increase as opposed to not increasing is [1:1.3]. On the contrary, the odds that prices would decline as opposed to not declining, was [1.1:1]. Hence, firms practicing round pricing strategies are more likely to lower prices and less likely to increase prices. The band between two round prices would be greater than the band between two fractional prices. Hence the principle of optimizing prices for reasonable margins; lowering the frequency of price increases; and passing on savings within a fair pricing framework would be a reasonable policy for firms setting round prices. This is consistent with previous discussion.

Competition amongst firm's–The indicator of competitiveness captures the number of outlets selling a specific product. The theory suggests that prices would be less sticky among competitive industries than among industries with significant market power (dominance). This was incorporated in our model as (*compete*). The results however, showed that the level of competition did not affect the likelihood of a price change, increase or decrease. In all cases, the odds of a price adjustment was [1:1] and largely significant. This might be due to sample selection criteria where the number of outlets may be censoredat a maximum level and ignored at a minimum level.Additionally, the range of goods and services captured within the CPI may be classified as goods whichare generally competitive or display competitive price setting patterns.

Industry classification–Industry classification is essential as it plays two significant roles in the analysis. Firstly, it highlights industry specific characteristics in the likelihood of price changes. Secondly, it accounts for observed heterogeneity across groups within the data, thereby enhancing the reasonability of estimates from the LOGIT specification.(Aucremanne and Dhyne 2005)noted that omitting industry specific dummies may lead to declining hazard functions which conflicts theoretical perspectives. Among the industries that reflect significant adjustments to the likelihood of price changes, increases and decreases are non-processed foods, durable goods, and energy goods, while services reflect generally lower odds. This reflects heterogeneity of price setting behaviours across industries, a feature that is strongly supported by the literature.Energy products for instance typically reflect higher frequency of price adjustments relative to Services which may change prices only once a year.

Table 3displays the odds of price adjustments for non-processed foods as $[1.8:1]^{cg}$, $[1.5:1]^{up}$and $[2.1:1]^{dn}$; durable goods as $[1.5:1]^{cg}$and $[2.6:1]^{dn}$ where impacts on price increases was

insignificant.[5] The odds of energy goods were [1.4:1]^{cg}, [1.3:1]^{up}and [1.3]^{dn}. Services however reflected lower odds of [1:1.4]^{cg}, [1:1.3]^{up}and [1.1.5]^{dn} which is consistent with expectations that service oriented firms will adjust prices less frequently than non-service oriented firms. However, the reduced tendency to lower prices reflects asymmetric behaviours among service providers when adjusting prices up or down. Figure 1 demonstrates the distribution of price increases relative to declines and shows a bias towards price increases among service industries. In general, the greater the number of service oriented firms in Jamaica, the less likely will prices change, increase or decrease. Instead, prices will remain generally stable among this group. The results also demonstrated that non-durable goods (*ndurable*) displayed greater odds of lowering prices and reduced odds of increasing prices (see Table 4&Figure 1)

Annual economic impacts– Annual dummies are used to capture the economic conditions prevailing in a specific year. Therefore, the model seeks to identify to what extent, a given year may affect the likelihood of price adjustments. The baseline model demonstratesthat the odds of price changes, increases and decreases where highest in the early years (1995) and gradually lessened to odd-ratios of [1:1] in 2001. The odds became weak until 2003 where Jamaica suffered significant instability in the foreign exchange market following a ratings downgradeby S&P of Jamaican sovereign bonds. In the year that followed however, the likelihood of price changes, increases and decreased once more weakened in favour of low inflation conditions.

SUMMARY & RECOMMENDATIONS

The results from the 8-class CPI basket demonstrate that during the period 1995 to 2006, a price spell typically lasted 7 months. Approximately 16% of prices were expected to adjust on a monthly basis with some bias toward price increases relative to price declines. On average, 39% of firms adjust prices at the same time with no real difference in this pattern when increasing or lowering prices. Among the main results stemming from the study are the following:

1. There was significant heterogeneity in price setting behaviours across industries. This was revealed in higher frequencies of price adjustments among energy, durable and no-

[5]The symbols cg, up, and dn represents change, upward and downward price adjustments respectively.

durable goods relative to low frequencies among processed foods and service based industries.

2. Unlike major international markets for consumer goods such as the US or Europe which practice psychological pricing strategies, Jamaican firms display no such tendency. Instead, firms which engage in attractive pricing tend to utilize either fractional or round pricing strategies where prices end with 0.25, 0.50 & 0.75; or zero respectively.

3. Price setting behaviour among Jamaican firms are largely consistent with international patterns where frequencies and duration measures nest within typical bands while maintaining heterogeneity across local industry types. These patterns were not explicitly reflected in results from our regional counterparts.

4. Firms display asymmetric behavioural patterns when dealing with price increases relative to declines. This was displayed in a strong resistance to lowering prices when the general price level falls but displaying equal tendencies to raise or lower prices when the general price level rise. Firms that practice round pricing strategy also display asymmetric behaviour patterns by resisting frequent price increases but quite ready to pass savings to loyal customers by lowering prices.

Firms display some consistency in price setting behaviour, but much lower than expected in competitive industries. This reflects the prevalence of asymmetric information in the domesticpricing mechanism which is an indication of some degree of rigidity in price setting behaviour. However, the results point to a mature system of adjusting prices which have adopted to generally low economic growth, frequent instability and numerous anti-competitive type policies. The energy sector for instance reflected very low frequencies of price changerelative to international counterparts which may be attributed to anticompetitive type policies. Also service based industries reflected much shorter price spells than observed internationally and may be attributed to the unstable conditions within foreign currency, capital and domestic goods markets.

Government policies should therefore be directed towards enhancing economic stability, eliminating counter-productive and anti-competitive type policies which promotes rigid prices, and instead, seek to facilitate and advancethe delivery of crucial information that will enablecompetitive-type decision making among businesses and consumers.

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TABLES & FIGURES

Table 1: Old and New CPI Basket of Goods & Services

Count	Weights	Eight (8) Division Classification (Previous Basket)
1	55.6	FOOD & DRINK
		Starches
		Vegetable & Fruits
2	7.4	FUELS & OTHER HOUSEHOLD SUPPLIES
		Fuels
		Household Supplies
3	7.9	HOUSING & OTHER HOUSING EXPENSES
4	2.8	HOUSEHOLD FURNISHINGS & FURNITURE
5	7.0	HEALTHCARE & OTHER PERSONAL EXPENSES
6	5.1	PERSONAL CLOTHING FOOTWARE & OTHER ACCESSORIES
7	6.4	TRANSPORTATION
8	7.9	MISCELLANEOUS EXPENSES
8	100.0	All Jamaica

Count	Weights	Twelve (12) Division by COICOP (Current Basket)
1	37.5	FOOD & NON-ALCOHOLIC BEVERAGES
	35.1	Food
	6.9	Vegetables and Starchy Foods
	2.4	Non-Alcoholic Beverages
2	1.4	ALCOHOLIC BEVERAGES & TOBACCO
3	3.3	CLOTHING & FOOTWEAR
4	12.8	HOUSING, WATER, ELECTRICITY, GAS & OTHER FUELS
	3.5	Rentals for Housing
	7.1	Electricity, Gas and Other Fuels
5	4.9	FURNISHINGS, HOUSEHOLD EQUIPMENT & ROUTINE HOUSEHOLD MAINTENANCE
6	3.3	HEALTH
7	12.8	TRANSPORT
8	4.0	COMMUNICATION
9	3.4	RECREATION & CULTURE
10	2.1	EDUCATION
11	6.2	RESTAURANTS & ACCOMMODATION SERVICES
12	8.4	MISCELLANEOUS GOODS & SERVICES
8	100.0	All Jamaica

Table 2: Measures of Price Setting Behaviour

	Freq(+/-)	Freq(+)	Freq(-)	Dur(+/-)	Dur(+)	Dur(-)	Sync(+/-)	Sync(+)	Sync(-)
All Jamaica	**0.18**	**0.11**	**0.07**	**6.54**	**9.55**	**23.12**	**0.42**	**0.38**	**0.37**
Food & Drink	**0.21**	**0.13**	**0.07**	**5.62**	**8.21**	**19.00**	**0.32**	**0.30**	**0.26**
Starches	0.37	0.20	0.17	2.75	5.05	6.06	0.25	0.23	0.23
Vegetable & Fruits	0.34	0.18	0.16	3.39	6.03	7.99	0.26	0.27	0.28
Fuels & Other Household Supplies	**0.15**	**0.11**	**0.04**	**6.85**	**9.77**	**24.28**	**0.33**	**0.28**	**0.28**
Fuels	0.16	0.13	0.03	6.44	8.04	34.68	0.33	0.31	0.30
Household Supplies	0.15	0.10	0.05	6.91	10.01	22.80	0.34	0.27	0.28
Housing & Other Housing Expenses	**0.17**	**0.13**	**0.05**	**6.24**	**8.50**	**23.83**	**0.37**	**0.33**	**0.33**
Household Furnishings & Furniture	**0.23**	**0.14**	**0.10**	**5.19**	**8.33**	**14.81**	**0.43**	**0.38**	**0.38**
Healthcare & Other Personal Expenses	**0.14**	**0.10**	**0.04**	**7.57**	**10.25**	**29.70**	**0.38**	**0.35**	**0.32**
Personal Clothing Footwear & Other Accessories	**0.12**	**0.08**	**0.04**	**8.38**	**12.02**	**28.71**	**0.42**	**0.37**	**0.35**
Transportation	**0.31**	**0.14**	**0.17**	**4.37**	**7.99**	**13.34**	**0.72**	**0.71**	**0.69**
Miscellaneous Expenses	**0.13**	**0.09**	**0.04**	**8.09**	**11.37**	**31.29**	**0.39**	**0.36**	**0.34**
Durable	0.27	0.15	0.12	4.15	7.11	10.49	0.45	0.41	0.40
Non Durable	0.21	0.13	0.08	5.55	8.23	18.22	0.32	0.30	0.27
Processed Foods	0.17	0.12	0.05	5.95	8.61	19.73	0.32	0.29	0.25
Non Processed Foods	0.31	0.17	0.14	4.14	6.67	12.58	0.27	0.26	0.27
Services	0.12	0.09	0.03	8.60	11.39	35.54	0.37	0.33	0.31
Energy	0.18	0.14	0.05	6.33	8.51	26.91	0.34	0.33	0.30

Table 3: Baseline with Macro Changes vs. Increases & Decreases

	Specification	Baseline (macro [+/-])			Base (macro [+])			Base (macro [-])		
	Est. Technique	RE LOGIT			RE LOGIT			RE LOGIT		
	No. of obs.	1643052			1643052			1643052		
	No. of groups	18570			18570			18570		
	Max Obs per group									
	Min | Avg | Max	12 | 8.5 | 132			12 | 8.5 | 132			12 | 8.5 | 132		
	Dep. Variable	pricecg			priceup			pricedn		
	Odds Ratio / Marginal Effect	OR	ME	p-val	OR	ME	p-val	OR	ME	p-val
(state)	cg_cpi	1 : 1.2	-0.200	0.000	---	---	---	---	---	---
macro	cg_xrate	2.9 : 1	1.079	0.000	---	---	---	---	---	---
changes	cg_wti	1.1 : 1	0.056	0.012	---	---	---	---	---	---
	cg_tot	1.9 : 1	0.652	0.000	---	---	---	---	---	---
	cg_tbill	1.4 : 1	0.300	0.000	---	---	---	---	---	---
(state)	up_cpi	---	---	---	1 : 1	-0.007	0.000	1 : 1.0	0.001	0.040
macro	up_xrate	---	---	---	1 : 1	0.022	0.000	1.0 : 1	-0.005	0.000
increase	up_wti	---	---	---	1 : 1	-0.001	0.000	1 : 1.0	0.001	0.000
	up_tot	---	---	---	1 : 1	0.012	0.000	1 : 1.0	0.036	0.000
	up_tbill	---	---	---	1 : 1	0.010	0.000	1.0 : 1	-0.002	0.003
(state)	dn_cpi	---	---	---	1 : 34.9	-3.553	0.000	1.0 : 21.2	-3.053	0.000
macro	dn_xrate	---	---	---	1 : 1	-0.045	0.000	1.0 : 1	-0.038	0.000
down	dn_wti	---	---	---	1 : 1	-0.005	0.000	*1.0 : 1*	*-0.001*	*0.156*
	dn_tot	---	---	---	1 : 1	0.011	0.000	*1 : 1.0*	*0.001*	*0.672*
	dn_tbill	---	---	---	1 : 1	0.007	0.000	1 : 1.0	0.008	0.000
(state)	*attract*	*1 : 1*	*0.003*	*0.555*	*1 : 1.1*	*-0.124*	*0.000*	*1.2 : 1.0*	*0.200*	*0.000*
price	compete	1 : 1	0.009	0.000	1 : 1	0.007	0.000	1 : 1.0	0.008	0.000
setting	psycho	---	---	---	---	---	---	---	---	---
patterns	fraction	---	---	---	---	---	---	---	---	---
	round01	---	---	---	---	---	---	---	---	---
(state)	energy	1.3 : 1	0.288	0.000	1.3 : 1	0.240	0.000	1.3 : 1.0	0.256	0.000
group	service	1 : 1.4	-0.326	0.000	1 : 1.3	-0.277	0.000	1.0 : 1.5	-0.415	0.000
impacts	nprocessf	1.8 : 1	0.565	0.000	1.4 : 1	0.358	0.000	2.1 : 1.0	0.759	0.000
	processf	*1 : 1*	*0.016*	*0.267*	1 : 1	0.038	0.002	*1.0 : 1*	*-0.012*	*0.514*
	ndurable	*1.1 : 1*	*0.053*	*0.275*	1 : 1.1	-0.084	0.038	1.3 : 1.0	0.254	0.000
	sdurable	*1 : 1.1*	*-0.060*	*0.224*	1 : 1.2	-0.209	0.000	1.2 : 1.0	0.211	0.001
	durable	1.6 : 1	0.458	0.000	1.1 : 1	0.105	0.017	2.6 : 1.0	0.958	0.000
(state)	year_95	4.7 : 1	1.549	0.000	3.3 : 1	1.204	0.000	3.3 : 1.0	1.198	0.000
annual	year_96	3.5 : 1	1.261	0.000	2.8 : 1	1.025	0.000	3.2 : 1.0	1.169	0.000
impacts	year_97	2.6 : 1	0.956	0.000	2.3 : 1	0.851	0.000	2 : 1.0	0.671	0.000
	year_98	2.1 : 1	0.752	0.000	2.3 : 1	0.848	0.000	1.9 : 1.0	0.632	0.000
	year_99	1.7 : 1	0.541	0.000	1.6 : 1	0.492	0.000	1.5 : 1.0	0.388	0.000
	year_00	1.1 : 1	0.136	0.000	*1 : 1*	*0.035*	*0.204*	1.2 : 1.0	0.141	0.001
	year_01	*1 : 1*	*0.012*	*0.589*	1 : 1.1	-0.099	0.000	*1 : 1.0*	*0.046*	*0.280*
	year_02	1 : 1.1	-0.057	0.008	1 : 1.2	-0.197	0.000	*1 : 1.0*	*0.044*	*0.283*
	year_03	1.3 : 1	0.273	0.000	1 : 1	0.040	0.076	1.4 : 1.0	0.360	0.000
	year_04	1 : 1.2	-0.171	0.000	1 : 1.4	-0.345	0.000	1.0 : 1.2	-0.148	0.000
	year_05	---	---	---	---	---	---	---	---	---
(time)	up_lastsize	1 : 1	0.000	0.001	1 : 1	0.000	0.000	1 : 1.0	0.000	0.000
duration	dn_lastsize	1 : 1	0.000	0.000	1 : 1	0.000	0.000	1.0 : 1	0.000	0.000
effects	len_duration	1 : 1	-0.018	0.000	1 : 1	-0.012	0.000	1.0 : 1.1	-0.050	0.000
(time)	dur_03	1 : 1.2	-0.222	0.000	1 : 1.1	-0.121	0.000	1.0 : 1.3	-0.234	0.000
hazzard	dur_07	1.3 : 1	0.227	0.000	1.2 : 1	0.197	0.000	1.3 : 1.0	0.240	0.000
durations	dur_08	1.3 : 1	0.294	0.000	1.3 : 1	0.259	0.000	1.4 : 1.0	0.319	0.000
	dur_10	1.5 : 1	0.399	0.000	1.4 : 1	0.361	0.000	1.5 : 1.0	0.395	0.000
	dur_12	1.4 : 1	0.345	0.005	1.5 : 1	0.419	0.000	*1.2 : 1.0*	*0.211*	*0.230*
(time)	month_02	1.3 : 1	0.284	0.000	1.3 : 1	0.238	0.000	1.2 : 1.0	0.220	0.000
seasonal	month_03	1.3 : 1	0.247	0.000	1.2 : 1	0.193	0.000	1.2 : 1.0	0.202	0.000
impacts	month_04	1.4 : 1	0.346	0.000	1.4 : 1	0.311	0.000	1.2 : 1.0	0.211	0.000
	month_05	1.5 : 1	0.423	0.000	1.5 : 1	0.376	0.000	1.3 : 1.0	0.283	0.000
	month_06	1.5 : 1	0.425	0.000	1.5 : 1	0.406	0.000	1.3 : 1.0	0.282	0.000
	month_07	1.3 : 1	0.293	0.000	1.4 : 1	0.315	0.000	1.1 : 1.0	0.136	0.000
	month_08	1.2 : 1	0.193	0.000	1.2 : 1	0.210	0.000	1.1 : 1.0	0.092	0.000
	month_09	1.2 : 1	0.152	0.000	1.1 : 1	0.136	0.000	1.1 : 1.0	0.126	0.000
	month_10	1.3 : 1	0.276	0.000	1.4 : 1	0.316	0.000	1.1 : 1.0	0.129	0.000
	month_11	1.3 : 1	0.282	0.000	1.4 : 1	0.338	0.000	1.2 : 1.0	0.151	0.000
	month_12	1.3 : 1	0.231	0.000	1.2 : 1	0.212	0.000	1.3 : 1.0	0.234	0.000
	constant		-4.855	0.000		-4.918	0.000		-5.824	0.000
	/lnsig2u		-1.685	0.000		-2.596	0.000		-1.851	0.000
	sigma_u		0.431	0.000		0.273	0.000		0.396	0.000
	rho		0.053	0.000		0.022	0.000		0.046	0.000
	Wald-Chi2		---	---		---	---		---	---

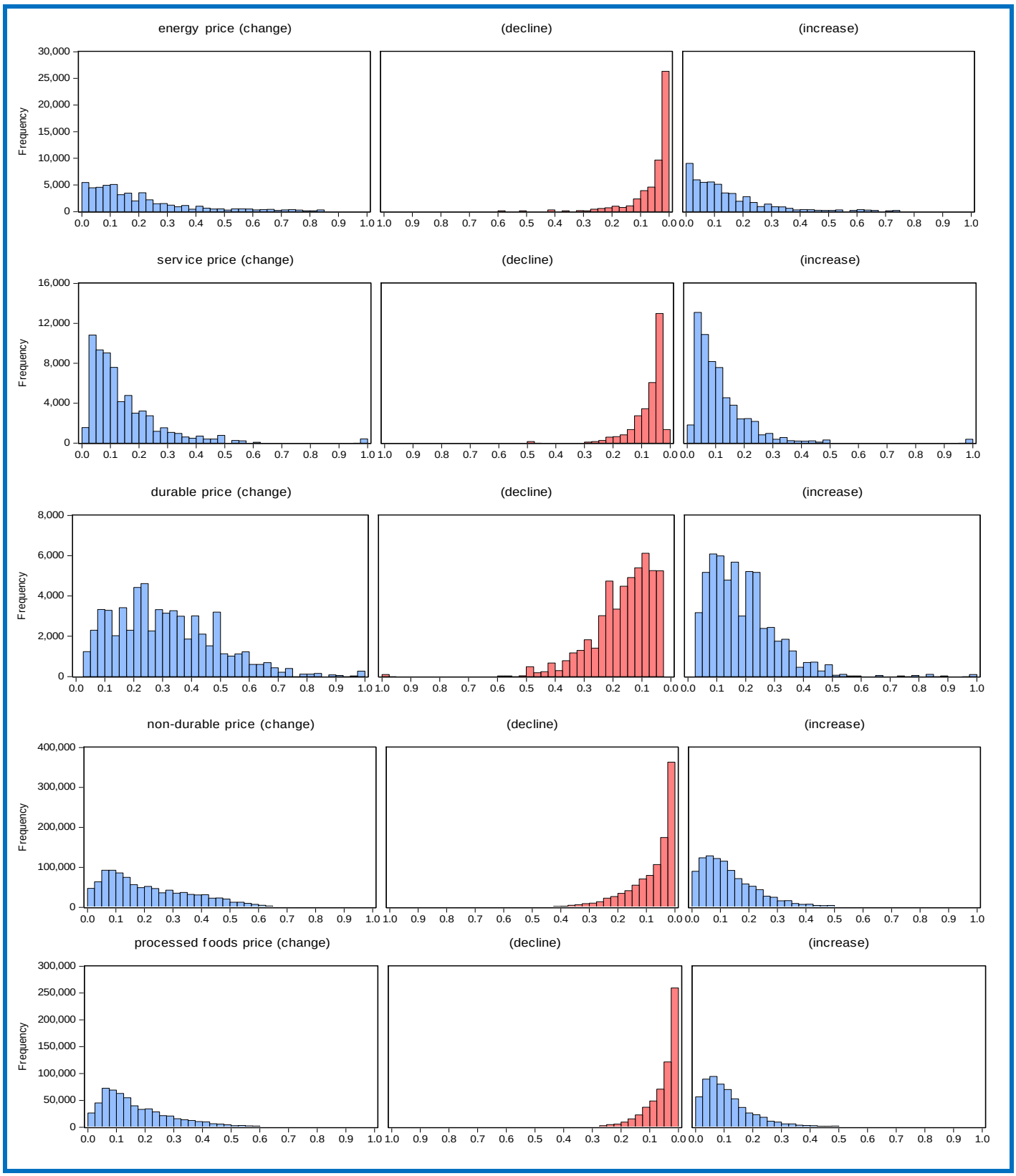
shaded = insignificant at 5% critical level, shaded & italics = insignificant at 10% critical level

Table 4: Baseline with Attractive Pricing Patterns

	Specification	Baseline (macro [+/-])			Base (macro [+])			Base (macro [-])		
	Est. Technique	RE LOGIT			RE LOGIT			RE LOGIT		
	No. of obs.	1643052			1643052			1643052		
	No. of groups	18570			18570			18570		
	Max Obs per group									
	Min | Avg | Max	12 | 8.5 | 132			12 | 8.5 | 132			12 | 8.5 | 132		
	Dep. Variable	pricecg			priceup			pricedn		
	Odds Ratio / Marginal Effect	OR	ME	p-val	OR	ME	p-val	OR	ME	p-val
(state)	cg_cpi	1 : 1.2	-0.190	0.000	---	---	---	---	---	---
macro	cg_xrate	3 : 1	1.094	0.000	---	---	---	---	---	---
changes	cg_wti	1.1 : 1	0.055	0.014	---	---	---	---	---	---
	cg_tot	1.9 : 1	0.648	0.000	---	---	---	---	---	---
	cg_tbill	1.4 : 1	0.309	0.000	---	---	---	---	---	---
(state)	up_cpi	---	---	---	1 : 1	-0.007	0.000	---	---	---
macro	up_xrate	---	---	---	1 : 1	0.022	0.000	1.0 : 1	-0.003	0.000
increase	up_wti	---	---	---	1 : 1	-0.001	0.000	1 : 1.0	0.001	0.000
	up_tot	---	---	---	1 : 1	0.013	0.000	1 : 1.0	0.036	0.000
	up_tbill	---	---	---	1 : 1	0.010	0.000	1.0 : 1	-0.003	0.001
(state)	dn_cpi	---	---	---	1 : 34.2	-3.532	0.000	1.0 : 20.5	-3.018	0.000
macro	dn_xrate	---	---	---	1 : 1	-0.045	0.000	1.0 : 1	-0.039	0.000
down	dn_wti	---	---	---	1 : 1	-0.005	0.000	*1.0 : 1*	*-0.001*	*0.134*
	dn_tot	---	---	---	1 : 1	0.011	0.000	*1 : 1.0*	*0.001*	*0.472*
	dn_tbill	---	---	---	1 : 1	0.007	0.000	1 : 1.0	0.009	0.000
(state)	*attract*	---	---	---	---	---	---	---	---	---
price	compete	1 : 1	0.009	0.000	1 : 1	0.007	0.000	1 : 1.0	0.008	0.000
setting	psycho	1.4 : 1	0.301	0.810	2.2 : 1	0.769	0.537	.0 : 8695652.	-15.977	0.997
patterns	fraction	1.4 : 1	0.353	0.000	1.3 : 1	0.268	0.000	1.3 : 1.0	0.299	0.000
	round01	1 : 1.1	-0.122	0.000	1 : 1.3	-0.241	0.000	1.1 : 1.0	0.115	0.000
(state)	energy	1.4 : 1	0.301	0.000	1.3 : 1	0.252	0.000	1.3 : 1.0	0.268	0.000
group	service	1 : 1.4	-0.306	0.000	1 : 1.3	-0.259	0.000	1.0 : 1.5	-0.401	0.000
impacts	nprocessf	1.8 : 1	0.611	0.000	1.5 : 1	0.409	0.000	2.2 : 1.0	0.779	0.000
	processf	*1 : 1*	*0.034*	*0.021*	1.1 : 1	0.057	0.000	*1.0 : 1*	*-0.003*	*0.876*
	ndurable	*1 : 1*	*0.023*	*0.635*	1 : 1.1	-0.116	0.004	1.3 : 1.0	0.240	0.000
	sdurable	*1 : 1.1*	*-0.094*	*0.056*	1 : 1.3	-0.245	0.000	1.2 : 1.0	0.195	0.002
	durable	1.5 : 1	0.427	0.000	1.1 : 1	0.066	0.130	2.6 : 1.0	0.946	0.000
(state)	year_95	4.6 : 1	1.535	0.000	3.3 : 1	1.196	0.000	3.2 : 1.0	1.165	0.000
annual	year_96	3.5 : 1	1.252	0.000	2.8 : 1	1.023	0.000	3.2 : 1.0	1.162	0.000
impacts	year_97	2.6 : 1	0.940	0.000	2.3 : 1	0.842	0.000	1.9 : 1.0	0.656	0.000
	year_98	2.1 : 1	0.740	0.000	2.3 : 1	0.845	0.000	1.9 : 1.0	0.635	0.000
	year_99	1.7 : 1	0.535	0.000	1.6 : 1	0.490	0.000	1.5 : 1.0	0.384	0.000
	year_00	1.1 : 1	0.138	0.000	*1 : 1*	*0.043*	*0.121*	1.1 : 1.0	0.133	0.002
	year_01	*1 : 1*	*0.018*	*0.436*	1 : 1.1	-0.088	0.001	*1 : 1.0*	*0.035*	*0.400*
	year_02	1 : 1.1	-0.056	0.010	1 : 1.2	-0.191	0.000	*1 : 1.0*	*0.031*	*0.447*
	year_03	1.3 : 1	0.277	0.000	1 : 1	0.045	0.044	1.4 : 1.0	0.340	0.000
	year_04	1 : 1.2	-0.175	0.000	1 : 1.4	-0.348	0.000	1.0 : 1.2	-0.171	0.000
	year_05	---	---	---	---	---	---	1 : 1.0	0.000	0.000
(time)	up_lastsize	1 : 1	0.000	0.003	1 : 1	0.000	0.000	1 : 1.0	0.000	0.000
duration	dn_lastsize	1 : 1	0.000	0.000	1 : 1	0.000	0.000	1.0 : 1	0.000	0.000
effects	len_duration	1 : 1	-0.018	0.000	1 : 1	-0.011	0.000	1.0 : 1.1	-0.049	0.000
(time)	dur_03	1 : 1.3	-0.228	0.000	1 : 1.1	-0.130	0.000	1.0 : 1.3	-0.233	0.000
hazzard	dur_07	1.3 : 1	0.225	0.000	1.2 : 1	0.194	0.000	1.3 : 1.0	0.239	0.000
durations	dur_08	1.3 : 1	0.282	0.000	1.3 : 1	0.248	0.000	1.4 : 1.0	0.311	0.000
	dur_10	1.5 : 1	0.386	0.000	1.4 : 1	0.347	0.000	1.5 : 1.0	0.388	0.000
	dur_12	1.3 : 1	0.292	0.016	1.4 : 1	0.368	0.000	*1.2 : 1.0*	*0.171*	*0.329*
(time)	month_02	1.3 : 1	0.283	0.000	1.3 : 1	0.236	0.000	1.2 : 1.0	0.217	0.000
seasonal	month_03	1.3 : 1	0.244	0.000	1.2 : 1	0.190	0.000	1.2 : 1.0	0.197	0.000
impacts	month_04	1.4 : 1	0.340	0.000	1.4 : 1	0.306	0.000	1.2 : 1.0	0.203	0.000
	month_05	1.5 : 1	0.416	0.000	1.4 : 1	0.371	0.000	1.3 : 1.0	0.274	0.000
	month_06	1.5 : 1	0.416	0.000	1.5 : 1	0.399	0.000	1.3 : 1.0	0.274	0.000
	month_07	1.3 : 1	0.294	0.000	1.4 : 1	0.318	0.000	1.1 : 1.0	0.135	0.000
	month_08	1.2 : 1	0.192	0.000	1.2 : 1	0.211	0.000	1.1 : 1.0	0.089	0.000
	month_09	1.2 : 1	0.150	0.000	1.1 : 1	0.135	0.000	1.1 : 1.0	0.123	0.000
	month_10	1.3 : 1	0.274	0.000	1.4 : 1	0.315	0.000	1.1 : 1.0	0.125	0.000
	month_11	1.3 : 1	0.279	0.000	1.4 : 1	0.336	0.000	1.2 : 1.0	0.149	0.000
	month_12	1.3 : 1	0.227	0.000	1.2 : 1	0.210	0.000	1.3 : 1.0	0.232	0.000
	constant	1 : 112.7	-4.724	0.000	1 : 120.8	-4.794	0.000	1.0 : 310.5	-5.738	0.000
	/lnsig2u	1 : -0.6	-1.702	0.000	1 : -0.4	-2.617	0.000	1.0 : -0.5	-1.870	0.000
	sigma_u	1 : 2.3	0.427	0.000	1 : 3.7	0.270	0.000	1.0 : 2.5	0.393	0.000
	rho	1 : 19	0.053	0.000	1 : 46	0.022	0.000	1.0 : 22.3	0.045	0.000
	Wald-Chi2	---	---	---	---	---	---	---	---	---

shaded = insignificant at 5% critical level, shaded & italics = insignificant at 10% critical level

Figure 1: Frequency distributions for price changes, increases and decreases by group



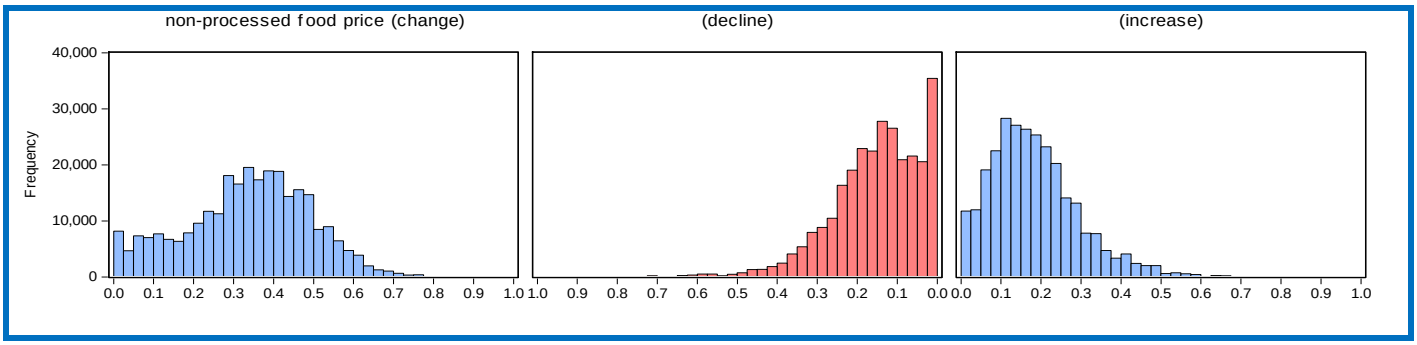


Figure 2: Frequency of Price Changes by Calendar Month

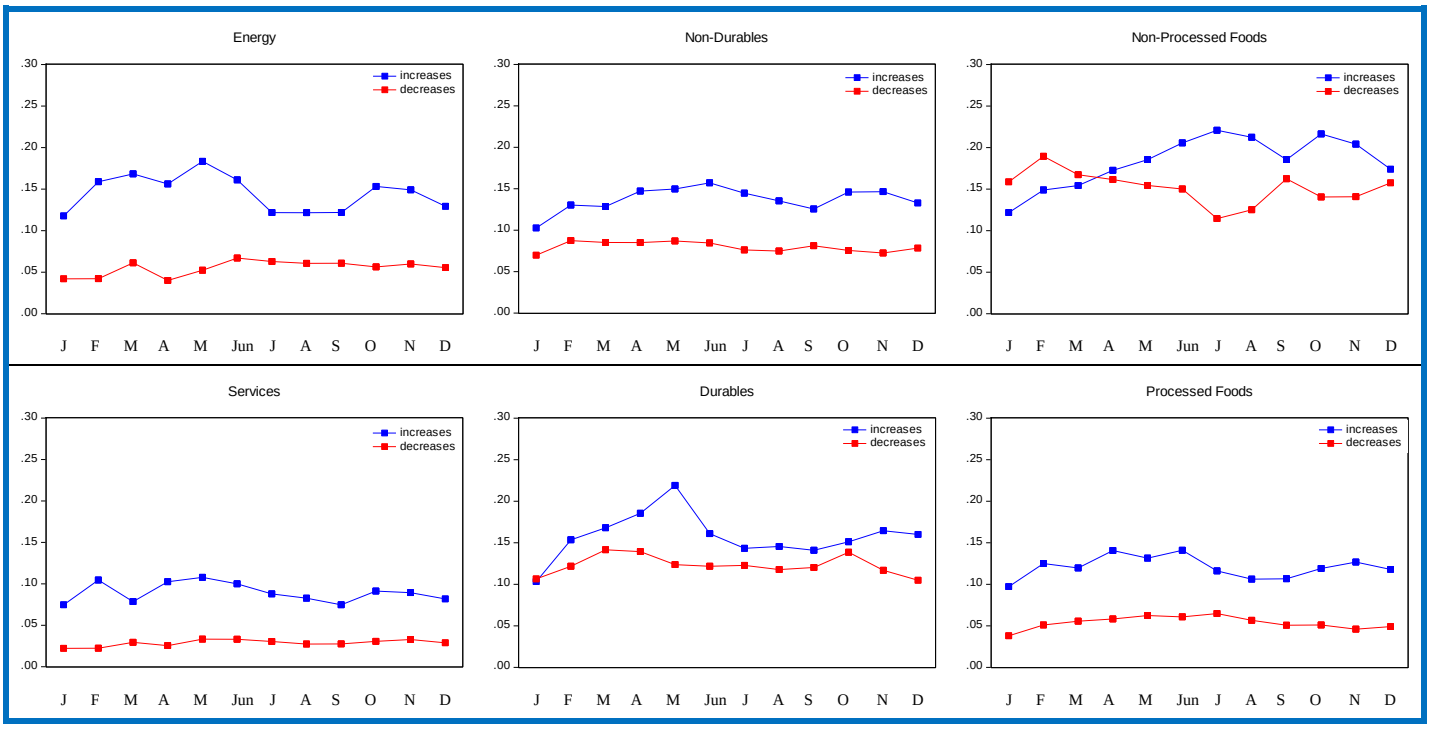
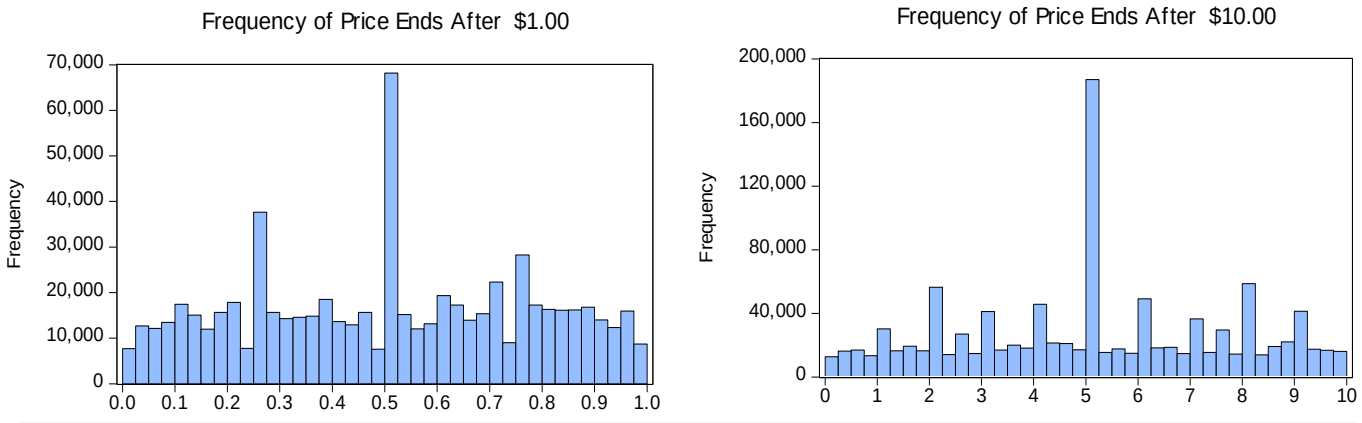


Figure 3: Frequency of Price End Points



The graph demonstrates that attractive pricing behaviours are practiced among price makers. For pricing points less than $1.00 attractive prices end with 25 cents, 50 cents and 75 cents. For pricing points less than $10 the main attractive price ends with $5.

Figure 4: Hazard Functions for first 12 months (draft)

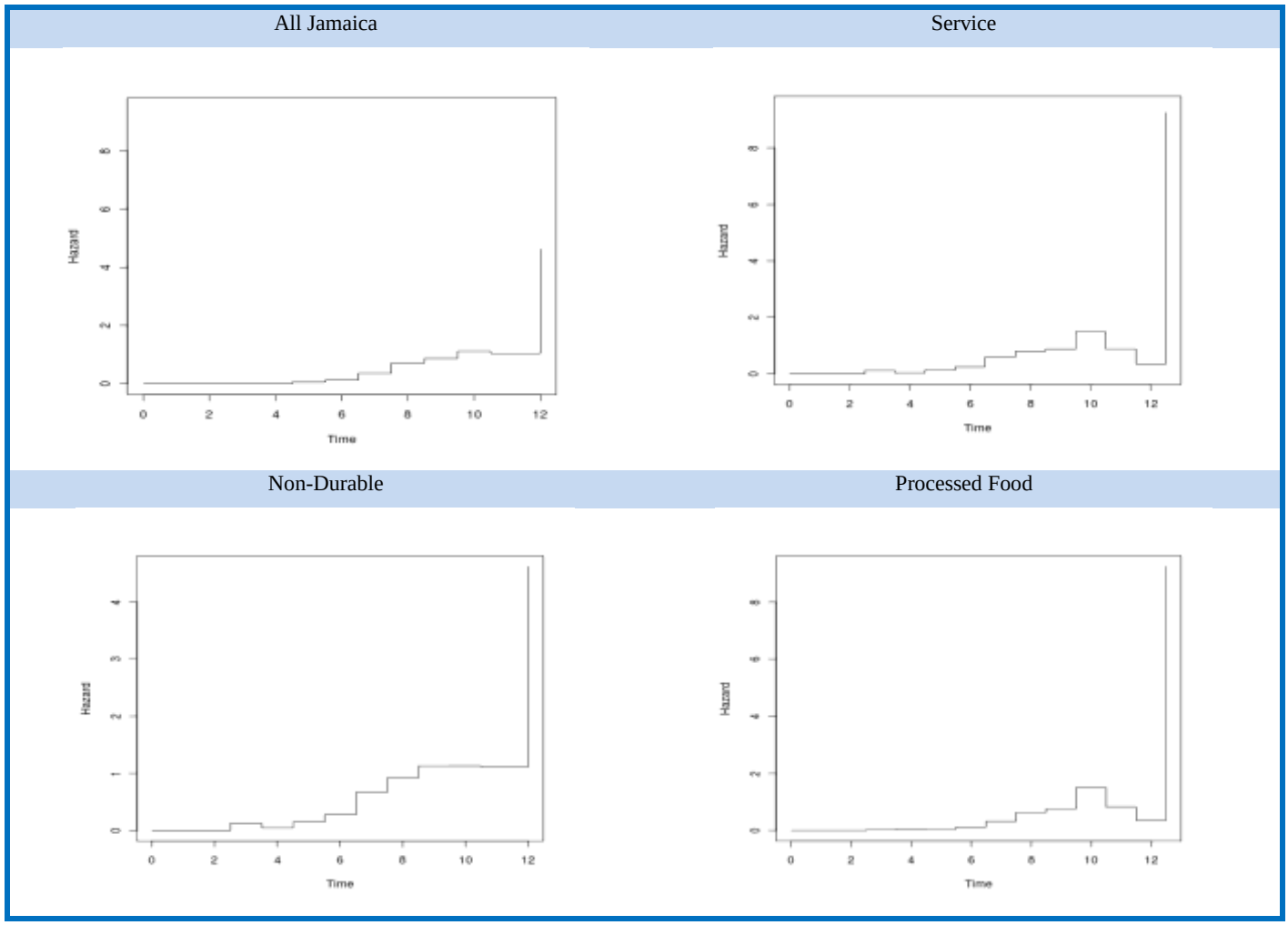


Table 5: Country Comparison Statistics

		Jamaica	St. Lucia	Barbados	Belize	Luxembourg	Italy	Belgium	France
Frequency	Total	0.2	1.0	0.7	1.0	0.2	0.1	0.2	0.2
	Energy	0.2	---	---	---	0.7	0.6	0.8	0.8
	Services	0.1	---	---	---	0.0	0.0	0.0	0.1
	Processed	0.2	---	---	---	0.1	0.1	0.2	0.2
	Unprocessed	0.3	---	---	---	0.5	0.2	0.3	0.2
Duration	Total	7.2	0.3	1.5	1.0	---	10.0	13.0	7.2
	Energy	6.2	---	---	---	---	2.0	---	1.9
	Services	9.2	---	---	---	---	15.0	15.0	11.4
	Processed	6.5	---	---	---	---	9.0	---	5.7
	Unprocessed	4.1	---	---	---	---	9.0	---	4.7
Synchronization	Total	0.4	---	0.6	---	0.5	0.1	---	---
	Energy	0.3	---	---	---	0.9	---	---	---
	Services	0.3	---	---	---	0.6	---	---	---
	Processed	0.3	---	---	---	0.3	---	---	---
	Unprocessed	0.3	---	---	---	0.3	---	---	---