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How Frequently Do Prices Change? State-dependent or Time-dependent Pricing: Does it Matter for Monetary Policy in Pakistan?

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Abstract

One of the basic differences between Classical and Keynesian economists were on the is the wages and price adjustment following changes in economy. This issue is practically important for the effectiveness of monetary policy. This is pioneer study on this topic. The study finds the price flexibility and price setting behavior using the larger data sets of aggregate and disaggregate consumer price index (CPI) from 1991-07 to 2020-06 by duration, frequency, size of price change and panel logit random effect model. CPI in Pakistan shows some degree of price flexibility but not fully flexible. Regulated products are less flexible as compared to unregulated products. Furthermore, prices confirmed the Keynesians models that prices are downward rigid and upward flexible. Pakistan's firms are using the combination of state and time dependent pricing policy.

Keywords: *Price Flexibility, Consumer Price Index, Pricing Policies, Random Effect Logit Model*.

Introduction

Two major group of economists differ on the important issue of the price and wage flexibility. Before the 1930, Classical economists assumed that prices and wages are fully flexible to bring back the economy to equilibrium after shock. whereas Keynes were of the view that prices and wages are sticky in the short run and market could not restore equilibrium once it diverges by any shock.

The prices are said to be flexible when nominal prices change in response to changes in the optimal price (Dhyne et al 2009). When menu cost and monopolistic competition do not allow the prices to change in the response of demand and supply shocks, then prices are said to be rigid (Mankiw 1985).

Price sickness and flexibility has important role for the monetary policy effectiveness and forecasting the economic variables (Aucremanne and Dhyne 2004; Hansen and Hansen 2006; Gouvea 2007; Creamer and Rankin 2008; Kaufmann 2008; Benkovsbis et al 2010). In many monetary policy models, price rigidity is the basic assumption for its effectiveness. If the prices are rigid, economy will not fully respond the shocks and monetary authorities can affect the real variables (Fischer 1977).

According to new Keynesian, when micro level prices is flexible than the aggregate level of prices is also flexible (Ozmen and Sevinc 2011). Taylor (1980) and Calvo (1983) have established the micro foundation

price behavior models, but their practical evolution is rather limited. In previous studies mostly survey data is used for specific product or area (e.g., Weiss 1993; Wolman 2000; Cecchetti 1986; Kashyap 1995). Two main approaches are used to measure the price changes i.e. time duration and frequency approach (Bils and Kleenow 2004; Aucremanne and Dhyne 2004; Baudry et al 2004; Benkovskis et al 2010). Only one study is available on this topic to measure the price changes in Pakistan i.e. Sohail and Fatima (2018) using the Sensitive Price Index (SPI) data. But study is limited because span of date and limited number of the products.

This paper is pioneer research work to measure the degree of price changes by using the large micro data of consumer price index (CPI) for regulated and unregulated products and services. The first objective of this study is to measure the price flexibility regulated and unregulated products and second is to test the Keynesian theory that prices are downward rigid and upward flexible for Pakistan. This research work will provide the complete information about price change, average time duration between two price adjustment, size of last price adjustment, frequency of price change and asymmetric behavior of price rigidity.

The price changed model can be divided into two border categories time and state dependent models. Calvo (1983) said that firms revised the prices randomly and Cecchetti (1986) prices are changed by macro factors like changes in wages, money supply, financial cost, demand and supply shocks. In Pakistan, Malik et al (2010), Choudhary et al (2011), Iqbal et al (2020) conduct the survey of firms in specific geographical areas of Pakistan to analysis their price setting behavior.

Third objective of the study is finding out the which pricing policy i.e. state or time dependent is used in Pakistan by using the Calvo (1983) and Cecchetti (1986) models. The paper is structured as: in part two literature review is discussed, in section three data and methodology is presented, in section four results are discussed and section five include conclusion and policy recommendation.

Literature Review

The main difference between Classical and Keynesian is how often prices changes so that effectiveness of monetary and fiscal policies can be established. In literature different studies are available for price and wage flexibilities based on different models. Most common one is menu cost model of price sickness by Barro (1972). Sheshinski and Weiss (1977) extended the Barro (1972) model and added the reason of the price rigidity is the presence of monopolistic competition in market. Benabou (1989) explained that firm will adjust the prices when they produce the storable goods.

Dahlby (1992) analyzed that regulated goods price are changed less as compared to non-regulated goods. Sheshinski and Weiss (1992) found that monopoly firms are producing many goods and these firms prefer to stagger price change. Levy et al (1997) introduced new idea in pricing models that many superstores introduce the new technologies i.e., scanner machines. So, all system is control by computers so it's easy to change the prices and price change cost is very small. The new technologies reduce the price change cost and prices become more flexible.

Cecchetti (1986) found that prices are more flexible because demand and cost are changing with market condition. The prices are more flexible because of idiosyncratic shocks. In his study he took the data of magazine prices for Canada and found that of price change based on the cost of price adjustment, size of last price adjustment and frequency of price adjustment. Akerlof and Yellen (1985), Mankiw (1985) explained that small menu cost can increase the price rigidity because when price adjustment is expensive then firms are not ready to change the price. And when price changing cost is so small than profit function is become flat.

Kashyap (1995) introduced new concept of pricing points, means that firms set their prices to the certain values or number which are not different from optimal price i.e., 99 or 6.49. Aucremanne and Dhyne (2004,

2005) found that mostly firms used the pricing points. Consumer mostly focus on the final price, save the information processing cost, and does not care the last digit of the price. Other important point is that pricing point play the psychological effect because consumer consider they are bargaining. Firms convey their message that they are trying hard to decrease the price level. All this the pricing end at the nine and this type of strategy is called the attractive pricing strategy.

Rotemberg (2005, 2006) extended the model and introduce the new concept which is fair pricing. Firms are always care its relationship with costumers and they are not ready to change the prices again and again because this can annoy their customers. So fair pricing mean is that when inflation is high in the country and the firm increase its prices of the product then customers will not show any resistance. Another important point is that consumers do not like the larger change in the price level. So, firm can relate its price change with the raise in the tax rate or increase in the general price level. So, firms mostly sell their product to their same costumers so they will increase the prices with less magnitude.

Mankiw and Reis (2002, 2006) explained the costly information model. The market condition information is so much expensive, and firm mostly use the outdated information. Calvo (1983) also explained that some of the firms will get the signal from market to change the price.

Recent macroeconomics model starts with time dependent models. Taylor (1980) explained staggered pricing behaviors of the firms, before adjustment of price firm keeps in mind forward looking and past decisions. He explained that firms are in fixed contracts of wages and prices and friction of the firms changed the price level. Calvo (1983) extended the Taylor (1980) time dependent model and explained that few firms will get the price change signals from the market and revised its prices. He explained the model staggered prices in which prices are not continuously revised and synchronized because price changing cost is high.

State dependent model can easily estimate the price flexibility. Cecchetti (1986) found that firms mostly followed the state dependent behavior, before the changing the price level firms consider the following important points i.e. the last price change, cumulative inflation, industry sales, costs, and demand for product. Aucremanne and Dhyne (2004) measured the degree of price rigidity by using consumer price Index (CPI) data for Belgium. Baudry et al (2004) used the same type of methodology for French survey data with introduction some dummies variables. They found that price is less sticky and both state and time dependent policy are used. Ozmen and Sevinc (2011) obtained the same results by using the different methodology. Benkovsbis et al (2010, 2011) used the CPI data and tested econometrically Calvo (1983) and Cecchetti (1986) models. They found that prices are more flexible and both state and time dependent policies are used for price changes. The macroeconomic variable has major impact on the probability of price change (Khan and Malik 2016; Khan and Malik 2017; Khan et al 2020).

Limited numbers of studies are available on this topic in the context of Pakistan, and these are survey based on specific geographical areas and no econometric techniques. Malik et al (2010), Choudhary et al (2011) and Iqbal et al (2020) conducted the survey for specific areas of Pakistan. They found that mostly firms used both time dependent and state dependent pricing policy and cannot estimated the exact magnitude of the price flexibility. Sohail and Fatima (2018) also analysis same topic but this study only covers very short data span and used the SPI data which contain the prices information of only 53 products. They also found that both state and time dependent pricing policy are used.

Overall, we can conclude from literature that prices are not fully flexible and both state and time dependent policies are used in Pakistan. As price sickness is important for policy effectiveness, so this study cover the gap and calculate the price flexibility and which pricing strategy are used in Pakistan by using large data sets with proper econometrics techniques.

Methodology and Data

Theoretical Methodology of Price Flexibility

The basic difference between classical and Keynesian is about wage and price flexibility for policy effectiveness. Classical economists assumed that prices and wages are fully flexible, and Keynesians believe on the short run rigidities of prices and wages and reasons of the price sickness are

1. Monopolistic Competition
2. Menu Cost

Empirical Methodology of Price Rigidity

In this section we discuss how we can measure degree of price flexibility, size of price adjustment and duration of last last price adjustment. The price flexibility can be measured by two approaches duration and frequency approach based on the same methodology Baudry et al (2004), Hansen and Hansen (2006), Aucurman and Dyne (2005) for Belgium, Benkoveshis et al (2010) for Latviain CPI basket of goods and services.

Duration Approach

Duration is defined as the number of months for which price remains constant.

Average price duration is

$$\overline{D}_{j=}\frac{\sum_{i=1}^{N_j} D_{j,t}}{\sum_{N=1}^{N_j} NS_j}$$

$\overline{D_j}$ = number of months for which the price remains same.

$D_{j,t}$ = total length of price spell.

$\sum_{N=1}^{N_j} NS_j$ = number of price spell.

Frequency Approach

Let $P_{j,t}$ be the price of the product j in period t.

$Fr_{j,t} = 1$ {if price is different from that in previous time}

$Fr_{j,t} = 0$ {price is same as that in previous time}

$$F_j = \frac{\sum_{t=2}^{\Gamma_j} Fr_{j.t}}{(\Gamma - 1)H_j} = \frac{numberofpricechanges}{totalnumberofobsevations}$$

Average Size of Price Change

Average size of price change measured by using the same methodology by Baudry et al (2004), Hansen and Hansen (2006), Aucurman and Dyne (2005) for Belgium, Benkoveshis et al (2010) for Latviain CPI basket of goods and services.

$$SP_j = \frac{\sum_{t=2}^{\Gamma_j} S_{j,t}}{\sum_{t=2}^{\Gamma_j} Fr_{j,t}} = \frac{Average\ price\ size}{Average\ price\ change}$$

Theoretical Methodology for Time Dependent and State Dependent

Time dependent model.

Price flexibility is basic concept to be measured as policy effectiveness depends on whether prices are rigid or flexible. Price rigidities depend on how prices are set by the firms. Number of price setting models is proposed to check policy effectiveness. In Fisher (1977) prices are predetermined by firms in different periods of time but they do not remain fixed. Taylor (1980) modified Fischer (1977) model by assuming that firms set prices for future period and remain fixed during that particular period. Calvo (1983) proposed that prices are staggered because of the cost of price change is high. The model assumes that price will be changed when they get random signal from market. The model assumes that number of firms receive signals for price change in 'h' periods follows the geometric distribution.

According to the model, all firms will not change price simultaneously because all firm does not get the signals.

The probability of receiving a signal h is given by

$$\partial\ e^{-\partial h}, \partial > o \quad \ldots\ldots. (1)$$

When a firm receives price change signal and the price quotation is $(\frac{1}{\partial})$. Price change decision depends on the fore cost others price and demand.

$$v_t = \partial \int_t^{\alpha} [P_s + \beta E_s] e^{-\partial(s-t)} ds \quad \beta > 0 \ldots\ldots.. (2)$$

v_t =log of price quotation.

P_s = price level at time "s

The v_t depends on the sum of current and future price levels together with the current and future levels of excess demand. Also, this factor $[P_s + \beta E_s]$ is weighted by price quotation could be revised at time 's' is $\partial\ e^{-\partial(s-t)}$

The price level at time "t".

$$P_t = \partial \int_{-\alpha}^{t} V_s e^{-\partial(t-s)} ds \ldots\ldots (3)$$

Under the assumption of our model P_t is predetermined variable at time t and equal to past price equation. Whereas v_t is the function of entire future. However, by equation (2), where P and E are uniquely determining, v is necessary a continuous function of time.

At the point in time where E_t is continuous we can differentiate (2) and (3) w.r.t time, by using (Leibniz integral rule)[1] , to get

$$\frac{dv}{dt} = \frac{d}{dt}\partial\int_t^{\alpha}[P_s + \beta E_s]e^{-\partial(s-t)}ds$$

$$= \partial[\partial(\int_t^{\alpha}\{P_s + \beta E_s\}e^{-\partial(s-t)}ds - (P_t + \beta E_t)]$$

$$\dot{v_t} = \partial[v_t - P_t - \beta E_t] \ldots\ldots. (4)$$

$$\frac{dp}{dt} = \frac{d}{dt}\partial\int_{-\alpha}^{t} v_s e^{-\partial(t-s)}ds$$

$$= \partial[-\partial(\int_t^{\alpha} V_s e^{-\partial(t-s)}ds + v_t)]$$

$$\dot{p_t} = \partial[-P_t + v_t]$$

$$\dot{p_t} = \partial[v_t - P_t] \ldots\ldots\ldots\ldots (5)$$

Now identify the actual (=expected) rate of inflation, $\pi_t = \dot{p_t}$ we can write eq (5) as

$$\pi_t = \dot{p_t} = \partial[v_t - P_t]$$

Differentiate w.r.t time.

$$\dot{\pi_t} = \dot{p_t} = \partial[\dot{v_t} - \dot{P_t}]$$

$$\dot{\pi_t} = \partial[\dot{v_t} - \dot{P_t}]$$

$$\dot{\pi_t} = \partial[\partial(v_t - P_t - \beta E_t)] - [\partial(v_t - P_t)]$$

$$\dot{\pi_t} = \partial[\cancel{\partial v_t} - \cancel{\partial P_t} - \partial\beta E_t - \cancel{\partial v_t} + \cancel{\partial P_t}]$$

$$\dot{\pi_t} = -\partial^2\beta E_t \ldots\ldots\ldots\ldots\ldots\ldots (6)$$

$$b = \partial^2\beta$$

$$\dot{\pi_t} = -bE_t \ldots\ldots\ldots\ldots\ldots\ldots (7)$$

[1] (Leibniz integral rule)

$$\frac{\partial}{\partial z}\int_{a(z)}^{b(z)} f(x,z)dx = f(b(z),z)\frac{\partial a}{\partial z} + \int_{a(z)}^{b(z)} \frac{\partial f}{\partial z}dx$$

Thus, rate of inflation $\pi_t^{\cdot}$ depends negatively on excess demand, E_t. In subsection methodology is based on Baudry et al (2004), Aucurman and Dyne (2005), Baumgartner, et al (2005), Benkoveshis, et al (2011). Here we provide insight how to use logit model for price changing using time dependent pricing.

Following Calvo (1983), the model of probability of price change where Y_{jt} as a binary variable,

$Y_{jt} =$ 1 if $P_{jt} \neq P_{jt-1}$

Y_{jt} = 0 otherwise

Y_{jt} = indicates whether price of product j sold by firm k is changed at the beginning of period t.

P_{jt} = price quote of product j sold by firm k at period t.

Here we assume that price setting firms follow Calvo (1983) pricing rule, so the probability of price change does not depend on economic variables. The logit model is

$$P_r(Y_{jt} = 1) = \frac{e^{\beta_1}}{1+e^{\beta_1}} \text{.....(8)}$$

The larger βo, the less rigid are the prices and vice versa.

State Dependent Model

According to the state dependent model, the probability of price change depends on economic variables, so firm will change price when price changing benefit is greater than cost of price changing. Cecchetti (1986) used assumption of fixed effect logit model for probability of changing the price depends on various economic variables describing the last price change, inflation and demand conditions and later models presents a combination of Calvo approach.

Explicit modeling of the timing of the firm's price change in environment of high adjustment cost and an uncertain future is difficult. Iwai (1981) presented a solution using a target threshold model. To cope with such a situation, firm develops a rule for price change.

According to this rule when the nominal fixed price P(t) is for away from the short run optimal price $P^*(t)$, firm have no cost to change price.

Let

$$Z(t) = \log \frac{P^*(t)}{P(t)} = hc \text{.....(9)}$$

Is the maximum distance that can $P(t)^*$ take from P (t) i.e., the barrier, and h_0 is the distance from $P(t)^*$ at which P (t) is changed i.e., return point.

In stable environment the price change rule will be constant. At t=0, the fixed price is set so that $Z_0 = h_0$ or

$$\log P(0) = \log P^*(0) - ho \,.$$

With positive inflation rate the fixed price P(o) is set above $P(o)^*$ so ho is negative with time P* grows and when it exceeds the distance from the return point to the barrier, so the price is changed.

$$\log P(t)^* - \log P(0)^* \geq (hc - ho) \text{.....(10)} \,.$$

Yit= Price change at time t,
$\Delta \log P(t)^*$= Δ in short run optimal price since last change in nominal price.
hc_{it} , ho $_{it}$=it rule at time t. then

$$\Pr(Y_{i,t} = 1) = \Pr[\Delta \log P^*(i,t) > hc_{(i,t)} - ho_{(i,\tilde{t})} \ldots\ldots\ldots\ldots\ldots\ldots\ldots(11)$$

T= time of last price change.
Taking the assumption of monopolistic competition,

$$Q^d(i,t) = [P(i,t) / \overline{P}(t)]^a X(t)^b \ldots\ldots\ldots(12)$$

$$C(Q(i,t)) = Ae^{\delta t} Q(i,t)^{\alpha} W(t) \ldots\ldots\ldots\ldots\ldots(13)$$

$\overline{P}$ = aggregate price level, X (t) = total industry sale,
$e^{\delta t}$ = technological change, W (t) = input prices,

And a, b, A and α are constants.

Substitute eq $_{(12)}$ in eq $_{(13)}$ for profit maximum function.
Taking derivative of profits with respect to the price, solving for P $_{(i,t)}$ yielding P*$_{(i,t)}$ and $\overline{P}$ and W (t) change at the same constant rate π , a stochastic error $U_{i,t}$.

$$\Delta \log P^*(i,t) = b_1(T_{i,t}) + b_2(\pi T)_{i,t} + b_3 X^*_{i,t} + U_{i,t} \ldots\ldots\ldots\ldots(14)$$

Where $T_{i,t}$ = time since last price change,

$\pi T_{i,t}$ = cumulative inflation since last price change,

$X^*_{i,t}$ = cumulative inflation changes in industry sales.

$U_{i,t}$ = costs and demand which are not readily observable.

Change of equation (11) specification,

$$S_{i,t} = \Delta \log P^*_{(i,t)} - \left[hc_{(i,t)} - ho_{(i,\tilde{t})} \right]$$

Putting S_{it}= Δ log P*$_{(i,t)}$+a_{it}

Assume a_{it}= -$\left[hc_{(i,t)} - ho_{(i,\tilde{t})} \right]$

Putting the value of Δ log P*$_{(i,t)}$ from equation (14) in above

$$S_{i,t} = a_{i,t} + b_1(T_{i,t}) + b_2(\pi T)_{i,t} + b_3 X^*_{i,t} + U_{i,t} \ldots\ldots\ldots\ldots\ldots(15)$$

a_{it}= price change rule at time t.
By assuming U_{it} has cumulative logistic distribution.

$$\Pr(Y_{i,t} = 1) = F(\overline{S}_{i,t}) \ldots\ldots\ldots(16)$$

$$\Pr(Y_{i,t} = 1) = F(a_{i,t} + b_1(T_{i,t}) + b_2(\pi T)_{i,t} + b_3 X^*_{i,t} + U_{i,t})$$

It contains both rule for price change component and a component that is explained by P* movements.
Modifying equation (15)

$$\Delta \log P^*(i,\tilde{t}) = hc_{(i,\tilde{t})} - ho_{(i,\tilde{t})} \text{.....(17)}$$

Adding a_{it} on both sides

$$a_{i,t} + \Delta \log P^*(i,\tilde{t}) = hc_{(i,t)} - ho_{(i,t)} + \left[-\left[hc_{(i,\tilde{t})} - ho_{(i,\tilde{t})} \right] \right]$$

$$a_{i,t} + \Delta \log P^*(i,\tilde{t}) = hc(i,\tilde{t}) - \cancel{ho(i,\tilde{t})} - hc(i,t) + \cancel{ho(i,\tilde{t})}$$

$$a_{i,t} + \Delta \log P^*(i,\tilde{t}) = hc(i,\tilde{t}) - hc(i,t)$$

Define

$$a_{i,t} + \Delta \log P^*(i,\tilde{t}) = a^*_{i,t}$$

Or

$$a_{i,t} = a^*_{i,t} + \Delta \log P^*(i,\tilde{t})$$

Putting equation (15)

$$S_{i,t} = a^*_{i,t} - \Delta \log P^*(i,\tilde{t}) + b_1(T_{i,t}) + b_2(\pi T)_{i,t} + b_3 X^*_{i,t} + U_{i,t} \text{.....(18)}$$

Empirical Methodology of State and Time Dependent

The methodology described in subsection for state dependent pricing is based on, Cecchetti(1986), Baudry et al (2004), Aucurman and Dyne (2005), Benkoveshis, et al (2011) studies. Hence change the price of product $_j$ only is the difference between desired price P^*_j, t and actual price $P_{j,t}$ exceeds a threshold h^*_j (specific for each product and firm).

$$\Pr(Y_{i,t} = 1) = \Pr[\ln(\frac{P^*_{j,t}}{P_{j,t}}) \geq h^*_j] \text{.....(19)}$$

According to Cecchetti (1986) the threshold h^*_{jk} depends on many factors like, accumulated inflation since the previous price change, size of the last price change and accumulated change in demand variable since previous price adjustment. Thus, the logit model for state dependent pricing will be

$$\Pr(Y_{i,t} = 1) = \frac{e^{(\beta_1 + \sum_{i=1}^{N} \beta_i X_{i,jt})}}{1 + e^{(\beta_1 + \sum_{i=1}^{N} \beta_i X_{i,jt})}} \text{.....(20)}$$

Where $X_{i,jt}$ = all explanatory variables this equation allow us to test whether firms follows time dependent pricing. If parameter B_2,……,B_n are not significantly different from zero then firm follow time dependent pricing. If they are significantly different from zero; then firms, follow state dependent pricing. In Pakistan there are only three survey-based studies on this topic identifying few factors like financial cost, energy cost, money supply, wage rate, and exchange rate changes. We will empirically measure the effect of the following five important variables on the probability of price change.

(1) Interest Rate
(2) Crude Oil Prices
(3) Wage Rate
(4) Exchange Rate
(5) Money Supply

$$\Pr(Y_{i,t} = 1) = \frac{e^{(X_{jt}\beta + U_j + \varepsilon_{jt})}}{1 + e^{(X_{jt}\beta + U_j + \varepsilon_{jt})}} \text{.....(21)}$$

$X_{i,jt}$ = Row vectors of exogenous variables.

β = Column vector of logit model coefficients.

ε_{jt} = Error term.

$$X_{jt}\beta = \beta_0 + \beta_1 \pi_{j,t-T,t} + \beta_2 M2 + \beta_3 wagerate + \beta_4 QIM + \beta_5 TBR + \beta_6 OIL$$

$$+ \beta_7 EP + \beta_8 \ln(DP_{jt}) + \beta_9 \sum_{i=1}^{11} \alpha_i month + \beta_{10} \sum_{1991}^{2020} \Omega_i year_{i,t}$$

Data Sources

In this study we are using the monthly data from 1991-07 to 2020-06. The data are taken from different sources. The consumer price index (487 products) data are obtained from Inflation monitor published by Pakistan Bureau of Statistics. The average wage, domestic oil prices, Quantum Index of Manufacturing (QIM) are used as proxy for demand are taken from Monthly Review on Price Indices published by Pakistan Bureau of Statistics. Monthly Average exchange Rates (Pak Rupee per US Dollar) and Money Supply (M2) are taken from website of State Bank of Pakistan. Six months Treasury Bill Rate (TBR) monthly data are obtained from website of International Monetary Fund.

Results and Discussion

Inflation is mostly measured by following three indexes

(A) Consumer Price Index (CPI)
(B) Wholesale Price Index (WPI)
(C) Sensitive Price Indicator (SPI)

In Pakistan inflation is measured by consumer price index. Consumer price index is more border measure of the inflation because of the different reasons. First it has the 487 products and have the twelve groups which are explain with their weights.

Table 1: CPI Groups and Weights

PRODUCTS	WEIGHTS
Food & non-alcohalic beverages (cpif)	34.8
Alcohalic beverages, tobacco (cpia)	1.4
Clothing & footwear (cpic)	7.6
Housing,water,elect,gas & fuel (cpigf)	29.4
Furnished h. Hold equip & maint. (cpifh)	4.2
Health (cpih)	2.2
Transport (cpit)	7.2
Communication (cpicm)	3.2
Recreation & culture (cpir)	2.0
Education (cpie)	3.9
Restaurants and hotels (cpirh)	1.2
Miscellaneous goods and services (cpim)	2.8

The food and housing, water, elect, gas & fuel are highly weighted groups in CPI basket. In table 2 is explaining the average inflation, variance, and standard deviation of all groups. The general average

inflation is 7.46, variance is 14.73 and standard deviation 3.84. The table 2 is showing high inflation sectors are food, tobacco, electric & fuel and restaurants and hotel sector. The high price variation is found in the Tabaco, communication, and transport sector.

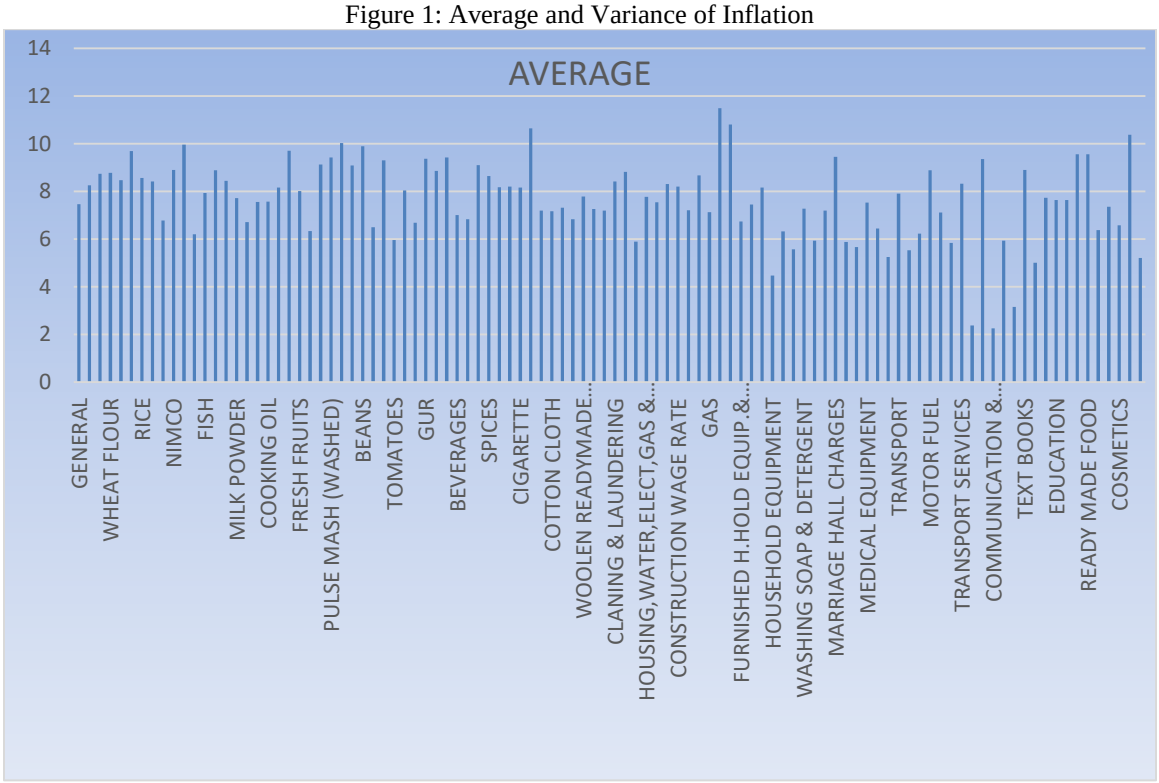
Table 2: Group Wise Inflation (1991-7 TO 2020-6)

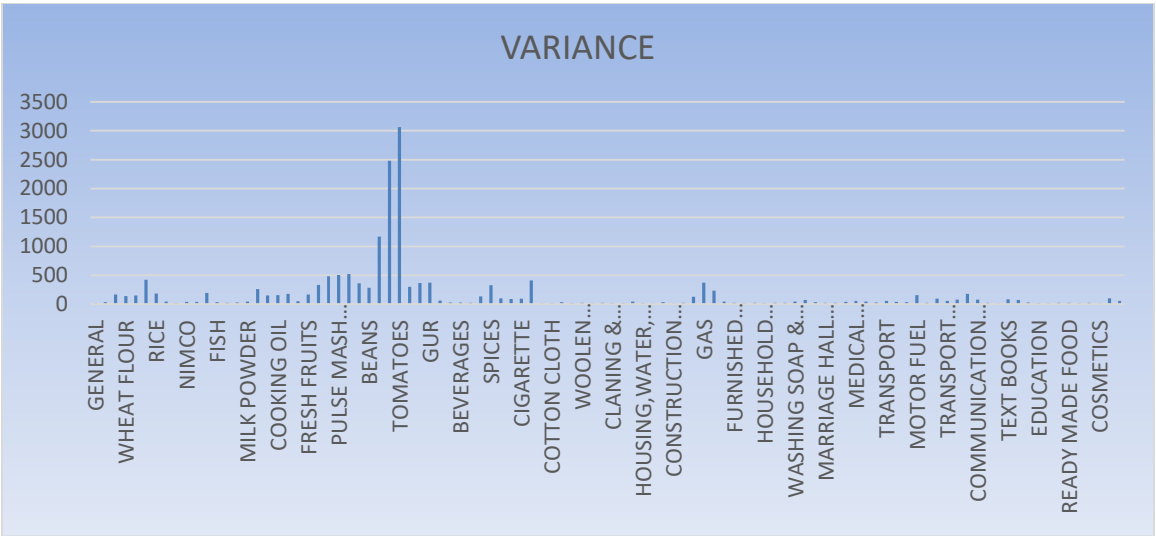
Products	Average	Variance	Standard Deviation
General	7.46	14.73	3.84
Food & non-alcohalic beverages	8.25	35.02	5.92
Alcohalic beverages, tobacco	8.20	89.08	9.44
Clothing & footwear	7.20	13.73	3.71
Housing,water,elect,gas & oth fuel	7.77	15.59	3.95
Furnished h.hold equip.& mant etc	6.74	20.96	4.58
Health	5.87	24.23	4.92
Transport	7.90	55.08	7.42
Communication	2.37	78.02	8.83
Recreation & culture	5.93	24.43	4.94
Education	7.63	16.47	4.06
Restaurants and hotels	9.56	21.95	4.69
Miscellaneous goods and services	6.37	16.71	4.09

Source: Author's Calculation

The figure 4.1 are showing the overall results of average inflation and variance. The high average inflation is found in the food, tabacoo and energy products.

Figure 1: Average and Variance of Inflation





The disaggregate calculation of 89 items of CPI are reported in the table A 1 and figure A 1 in appendix. In the food group the high average inflation is found in the pulses, dry fruit, sweet meet, meat, and wheat products. High price variation is found in the products tomato's potatoes and vegetables. In other daily uses products groups have high inflation and more variation. Overall, in Pakistan high average inflation in food, tobacco, restaurant and hotel, transport and energy sectors and high variation are found in the food and energy products.

Low and High Category Products

Second important finding of the study is the divide the goods in high and low inflation products using the average inflation criteria. The high inflation products are those whose average inflation are greater than the aggregate monthly CPI inflation. So, we select the low and high inflation products based on the monthly aggregate CPI inflation.

Table 3: Products in low and high inflation Categories

AGGREGATE CPI INFLATION		**7.46**	
LOW INFLATION PRODUCTS	**AVERAGE**	**HIGH INFLATION PRODUCTS**	**AVERAGE**
Furnished h.hold equip& mant	6.74	Food & beverages	8.25
Health	5.87	Alcohalic & tobacco	8.20
Communication	2.37	Transport	7.90
Recreation & culture	5.93	Restaurants and hotels	9.56
		Clothing & footwear	7.20
Miscellaneous good & service	6.37	Housing, elect, gas & fuel	7.7
		Education	7.63

Source: Author's Calculation

According to the table 3 the high inflation products are food, tobacco, transport, hotel, and energy sectors. This divisions of the products into low and high inflation products are checked by the t-test in table 4.4. So, the t-test results confirmed our divisions of products in high and low inflation products.

Table 4: Comparisons Of Inflation Rates On The Basis Of T-TEST

Method	df	Value	Probability
t-test	670	6.12	0.00
Satterthwaite-Welch t-test*	664.31	6.12	0.00
Anova F-test	(1,670)	37.53	0.00
Welch F-test*	(1,664.31)	37.53	0.00

Mostly high inflation products are based on the imported goods and the study recommend us that there is role of the different macroeconomic variables.

Price Flexibility at aggregate and disaggregate level

In this section the degree of price flexibility is calculated by using the duration, frequency, and size approach.

Table 5: Frequency, Duration and Size Of Price Changes

Product	Average Duration	Frequency	Size of Price Change	Frequency of Positive Price change	Frequency of Negative Price change
General	1.44	0.68	0.009	0.60	0.11
Food & non beverages.	1.18	0.88	0.007	0.59	0.29
Alcohalic & tobacco	1.87	0.86	0.008	0.69	0.17
Clothing & footwear	2.14	0.66	0.009	0.65	0.005
Housing, elect, gas & fuel	2.09	0.68	0.009	0.68	0.008
Furnished h.hold equip& mant	3.16	0.66	0.008	0.64	0.02
Health	2.89	0.46	0.011	0.44	0.02
Transport	2.17	0.53	0.011	0.42	0.11
Communication	10.06	0.12	0.019	0.09	0.03
Recreation & culture	3.4	0.41	0.011	0.38	0.02
Education	3.02	0.41	0.015	0.39	0.02
Restaurants and hotels	1.57	0.76	0.009	0.75	0.008
Miscellaneous good & service	2.18	0.58	0.009	0.54	0.04

Source: Author's Calculation

Table 5 shows results of price flexibility in aggregate CPI and its sub-groups. In aggregate CPI price is fixed for 1.4 months duration which are showing high degree of price flexibility in Pakistan. The 68% prices are revised at every month. The size of the price change is very low and mostly prices are increased as compared to decrease. High price flexibility is observed in food, tobacco, and energy sectors. Food prices are more flexible in Pakistan. The disaggregated CPI results are confirmed the aggregate price flexibility results. The disaggregated results in table A 2 are showing high price flexibility in wheat, rice, chicken, fruits, eggs, and pulses. So, food items have more weight in the CPI baskets and it's also more flexible which lead to frequent high inflation in the country. Asymmetric behavior of price changes is observed in the data. Which confirm the the Keynesian theory that prices are upward flexible and downward rigid. These results also confirmed that high inflation products prices are more flexible, and size of price change is small. Whereas a low inflation product shows lower number of prices revisions but once they are revised, the size of revisions is larger.

Another important finding of the paper is that we categories the products in regulated and unregulated products according to Hanif and Iqbal (2016). Government of Pakistan mostly controlled the essentials

prices of food, energy, health, and education related items. According to the table A 3 and A 4 the regulated products have high average duration, low frequency of price adjustment and large size of price change observed.

Overall Pakistan has observed the high level of price flexibility, but prices are not fully flexible. Results in this section recommended that there are many factors impacting the flexibility of price adjustment and in next section we try to find the impact of these factors.

Price setting and its determinants in Pakistan

In this section results are found by using the panel logit random effect model. The results of price setting behavior and its determinants are reported in table 4.6. This study used the eight economic variables and seasonal dummies to determine the price setting behavior and to check if firms are following state dependent or time dependent pricing policies.

Size of last price change and monthly and yearly dummies represents the time dependent pricing policy. The increase in the size of last price adjustment increases the probability of the price adjustment by 24%. The result is showing that prices are mostly changed in the month of May, June November, and December. And yearly dummies have positively and significant to effect on the probability of price adjustment. These results are showing that time dependent pricing policy is also affect the price setting behavior in Pakistan. Because the seasonal factors have more important impact on the Pakistani economy.

Table 6: Model of Price Setting Mechanism Group Analysis

Variables	Coefficient	p-value	Marginal effects	p-value
LDP	108	0.00	24	0.00
TBR	.08	0.00	0.01	0.00
WAGE	.46	0.00	.10	0.00
ER	1.68	0.57	.37	0.57
MP	-.31	0.05	-.07	0.05
OIL	.37	0.09	.08	0.09
INF	.19	0.00	.04	0.00
GM2	.33	0.08	.07	0.08
Seasonal Effects				
Month 2	-.50	0.05	.54	0.12
3	-.01	0.92	.03	0.91
4	.76	0.00	.52	0.13
5	-.12	0.47	1.31	0.00
6	.11	0.53	.41	0.07
7	.05	0.77	.43	0.22
8	-.03	0.85	.59	0.09
9	-.30	0.08	.51	0.15
10	-.11	0.52	.23	0.50
11	-.08	0.00	.43	0.00
12	-.22	0.20	.46	0.01
Year 1992	-.67	0.07	.67	0.08
1993	-.02	0.94	1.36	0.00
1994	-.27	0.47	1.05	0.00

1995	.22	0.57	1.56	0.00
1996	.60	0.13	1.94	0.00
1997	-.93	0.01	.40	0.29
1998	-1.08	0.00	.25	0.50
1999	-1.36	0.00	-.02	0.94
2000	-1.46	0.00	-.13	0.73
2001	-2.19	0.00	-.85	0.02
2002	-1.50	0.00	-.16	0.66
2003	-1.78	0.00	-.45	0.23
2004	-1.50	0.00	-.16	0.66
2005	-1.39	0.00	-.06	0.87
2006	-1.04	0.06	.29	0.44
2007	-.71	0.06	.62	0.10
2008	.38	0.34	1.71	0.00
2009	-.19	0.18	1.14	0.00
2010	-.15	0.69	1.18	0.00
2011	-.19	0.61	1.14	0.00
2012	-.15	0.69	1.18	0.00
2013	-.44	0.25	.89	0.02
2014	-1.15	0.02	.18	0.62
2015	-1.89	0.00	-.56	0.14
2016	-1.78	0.00	-.45	0.38
2017	-1.75	0.00	-.41	0.69
2018	-1.18	0.002	.15	0.39
2019	-.52	0.17	.81	0.03
2020	-.99	0.02	.34	0.42

Source: Author's Calculation

The seven variables inflation, money supply, demand and supply shocks, labor cost, exchange rate and financial cost are representing the state dependent price setting behavior. All variables have the positive and significant effect on the probability of price adjustment. Increase in inflation, exchange rate, supply shocks, financial cost, labor cost, and money supply are increasing the probability of price adjustment. But when demand increase 1% will decrease the probability of price change. In developing countries like Pakistan demand has not so much impact on the price setting decisions as comparing with the other macroeconomic variables. The results are showing that in Pakistan economic variables have major impact on the price setting behavior.

To conclude, price setting policy in the Pakistan is combination of both state and time dependent pricing strategies and our result are consistent with the previous Pakistan survey-based studies.

Conclusion and Policy Recommendation

This study finds out the degree of price flexibility and firms price setting behavior in Pakistan using the disaggregated CPI data for period of 1991M07 to 2020M06. To measure the price flexibility, use the duration and frequency approach and for the second objective used the panel logit random effect model

using the Calvo (1983) and Ceccthi (1986) models for pakistani economy. The main findings are explained as follow:

1. Average inflation is high in food, tobacco, hotel, transport, and energy sectors. High price variation is found in the food items, Tabaco, communication, transport sector and energy products
2. The result of the duration, frequency of price adjustment and size of last price change are reporting that prices are flexible in Pakistan but not fully flexible in Pakistan. The 68% prices are changed in Pakistan. Prices are more flexible in food, tobacco, and energy sectors. when inflation is high then duration is low, frequency of price adjustment is high and small size of price adjustment. Price flexibility results confirmed the Keynesians theory that prices are downward rigid and upward flexible.
3. Regulated products are less flexible as compared to unregulated products.
4. The study finds out the probability of the price adjustment extended the basic models of Ceccehti (1986) using the panel logit random effect model. Overall firms in Pakistan are following the combination of both state and time dependent pricing policy.

Some important policy recommendations are as follows:

1. Food group inflation is high in Pakistan and has more variation as compared to other groups. As monetary channels are not affective to curtail food inflation. Pakistan should focus on the supply chain and other polices.
2. Pakistan is using the combination of both time and state dependent policy and state dependent policy has more impact on price setting behavior. So, policy makers should give more focus on the behavior of the economic variables.
3. Mostly the monetary policy models assume the price sickness to effect real output and employment. But in the Pakistan, prices are 68% flexible, so monetary policy may not be effective. Therefore, monetary authorities should look another monetary transmission channel which work to achieve the objectives to stabilize inflation.
4. In Pakistan combination of time and state dependent pricing policy are used. Results shows that macroeconomics variables have more impact on price setting decisions. So, State Bank of Pakistan should pursue state contingent policy and conduct the monetary policy committees meeting more frequent at time of more flexible prices.

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Appendix

Table A.1 Average inflation, Variance and Standard Deviation (1991-7 to 2020-6)

Products	Average	Variance	Standard Deviation
General	7.46	14.73	3.84
Food & non-alcohalic beverages.	8.25	35.02	5.92
Wheat	8.74	169.00	13.00
Wheat flour	8.77	140.41	11.85
Wheat product	8.47	152.11	12.33
Besan	9.69	423.58	20.58
Rice	8.56	183.16	13.53
Cereals	8.42	46.54	6.82
Bakery & confectionary	6.78	18.41	4.29
Nimco	8.90	38.07	6.17
Meat	9.95	41.53	6.44
Chicken	6.20	195.64	13.99
Fish	7.92	34.58	5.88
Milk fresh	8.88	24.65	4.97
Milk product	8.44	27.34	5.23
Milk powder	7.72	46.49	6.82
Egg	6.71	262.51	16.20
Mustard oil	7.55	152.41	12.35
Cooking oil	7.57	153.77	12.40
Vegetable ghee	8.16	176.74	13.29
Dry fruits	9.69	49.03	7.00
Fresh fruits	8.00	168.13	12.97
Pulse masoor	6.33	330.80	18.19
Pulse moong	9.12	481.87	21.95
Pulse mash (washed)	9.41	506.85	22.51
Pulse gram	10.02	523.41	22.88
Gram whole	9.09	359.12	18.95
Beans	9.89	284.75	16.87
Potatoes	6.49	1169.51	34.20
Onion	9.30	2482.01	49.82
Tomatoes	5.95	3065.57	55.37
Fresh vegetable	8.04	300.83	17.34
Sugar	6.68	366.76	19.15
Gur	9.37	373.21	19.32
Honey	8.85	61.23	7.83
Sweet meet	9.42	28.80	5.37
Beverages	7.00	27.11	5.21

Jam, tomato ketchup & pickle	6.83	22.30	4.72
Condiments	9.09	135.46	11.64
Spices	8.64	328.30	18.12
Tea	8.17	103.22	10.16
Alcohalic beverages, tobacco	8.20	89.08	9.44
Cigarette	8.15	94.50	9.72
Betel leaves & nuts	10.64	408.41	20.21
Clothing & footwear	7.20	13.73	3.71
Cotton cloth	7.17	17.79	4.22
Woolen cloth	7.31	32.53	5.70
Ready made garment	6.83	15.18	3.90
Woolen readymade garments	7.79	23.84	4.88
Hosiry	7.26	12.46	3.53
Dopatta	7.19	22.55	4.75
Claning & laundering	8.42	15.72	3.96
Tailoring	8.81	17.07	4.13
Footware	5.89	45.32	6.73
Housing,water,elect,gas & oth fuel	7.77	15.59	3.95
House rent	7.54	12.30	3.51
Construction input item	8.30	32.53	5.70
Construction wage rate	8.20	14.56	3.82
Water supply	7.21	24.51	4.95
Electricity	8.66	127.14	11.28
Gas	7.13	372.79	19.31
Kerosene oil	11.48	231.65	15.22
Fire wood whole	10.81	44.01	6.63
Furnished h.hold equip.& mant etc	6.74	20.96	4.58
Furniture	7.45	17.17	4.14
Household textile	8.15	23.44	4.84
Household equipment	4.47	19.66	4.43
Utensils	6.32	24.13	4.91
Plastic products	5.56	23.29	4.83
Washing soap & detergent	7.27	45.10	6.72
Sewing needle & dry cell	5.93	71.10	8.43
Household servent	7.19	33.70	5.80
Marriage hall charges	9.44	23.19	4.82
Health	5.87	24.23	4.92
Drug medicine	5.66	40.85	6.39
Medical equipment	7.53	55.70	7.46
Doctor (mbbs) clinic fee	6.44	44.01	6.63
Medical test	5.25	31.02	5.57
Transport	7.90	55.08	7.42

Motor vehicles	5.53	41.33	6.43
Motor vehicle accessories	6.22	33.88	5.82
Motor fuel	8.88	153.96	12.41
Mechanical service	7.11	22.35	4.73
Motor vehicles tax	5.83	97.35	9.87
Transport services	8.32	57.03	7.55
Communication	2.37	78.02	8.83
Postal services	9.35	178.52	13.36
Communication & apparatus	2.25	80.03	8.95
Recreation & culture	5.93	24.43	4.94
Recreation & culture	3.15	12.22	3.50
Text books	8.89	81.71	9.04
News papers	5.01	74.10	8.61
Stationery	7.73	29.72	5.45
Education	7.63	16.47	4.06
Education	7.63	16.47	4.06
Restaurants and hotels	9.56	21.95	4.69
Ready made food	9.56	21.95	4.69
Miscellaneous goods and services	6.37	16.71	4.09
Personal care	7.36	21.43	4.63
Cosmetics	6.58	13.01	3.61
Blades	10.37	100.42	10.02
Personal equipments	5.21	58.44	7.64

Figure A 1. Group Inflation
Food & Non-Alcohalic Beverages

Products	Average	Variance	Standard Deviation
Food & non-alcohalic beverages.	8.25	35.02	5.92
Wheat	8.74	169.00	13.00
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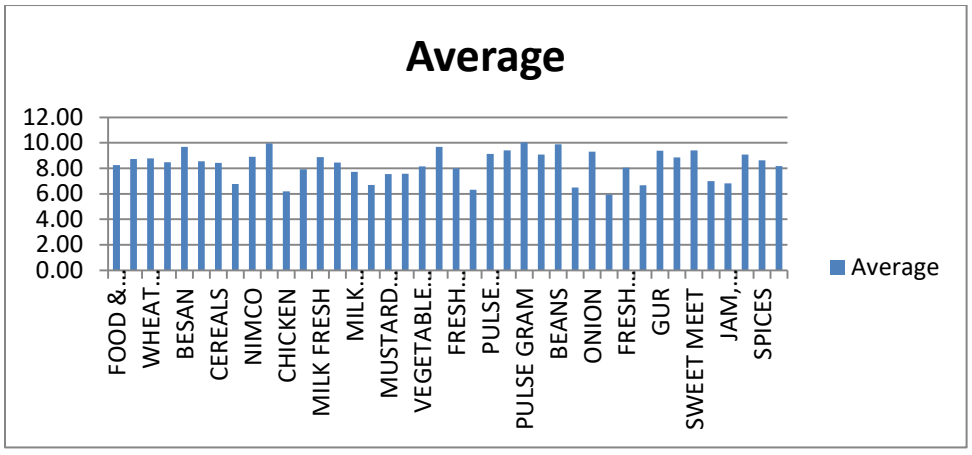
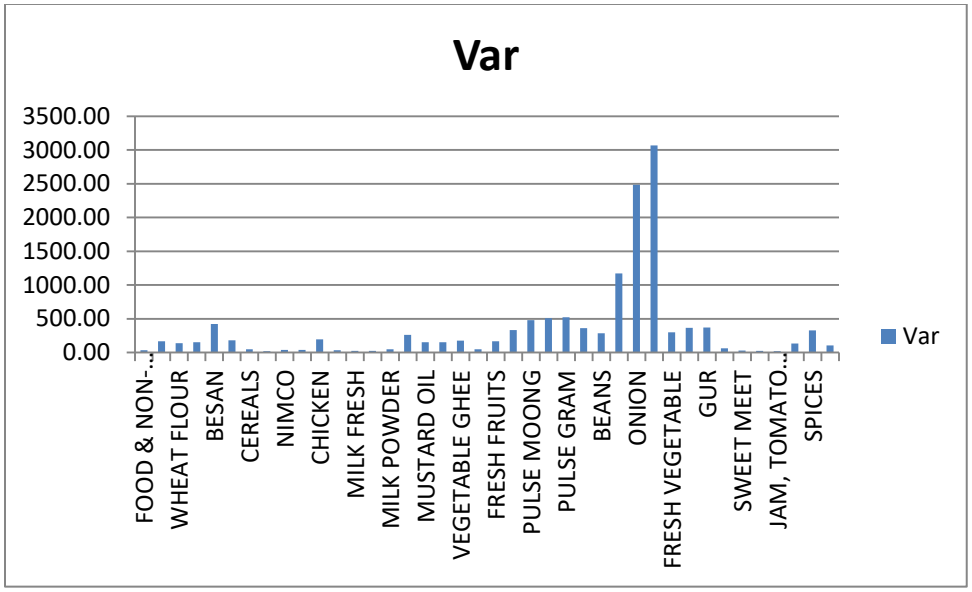
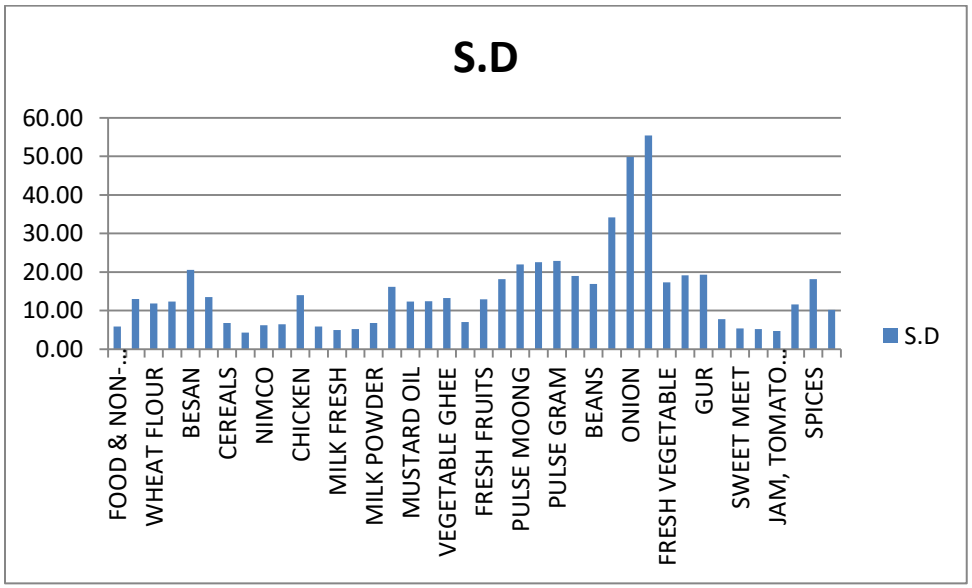
Potatoes	6.49	1169.51	34.20
Onion	9.30	2482.01	49.82
Tomatoes	5.95	3065.57	55.37
Fresh vegetable	8.04	300.83	17.34
Sugar	6.68	366.76	19.15
Gur	9.37	373.21	19.32
Honey	8.85	61.23	7.83
Sweet meet	9.42	28.80	5.37
Beverages	7.00	27.11	5.21
Jam, tomato ketchup & pickle	6.83	22.30	4.72
Condiments	9.09	135.46	11.64
Spices	8.64	328.30	18.12
Tea	8.17	103.22	10.16

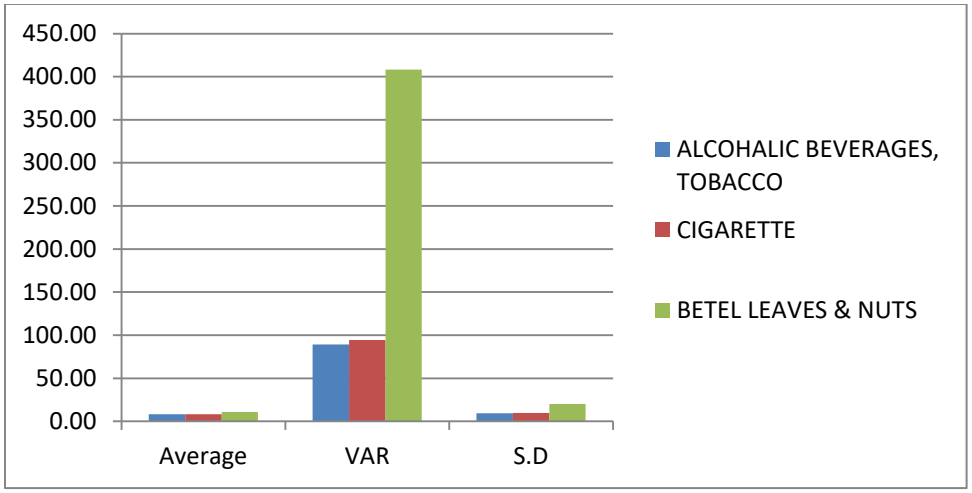






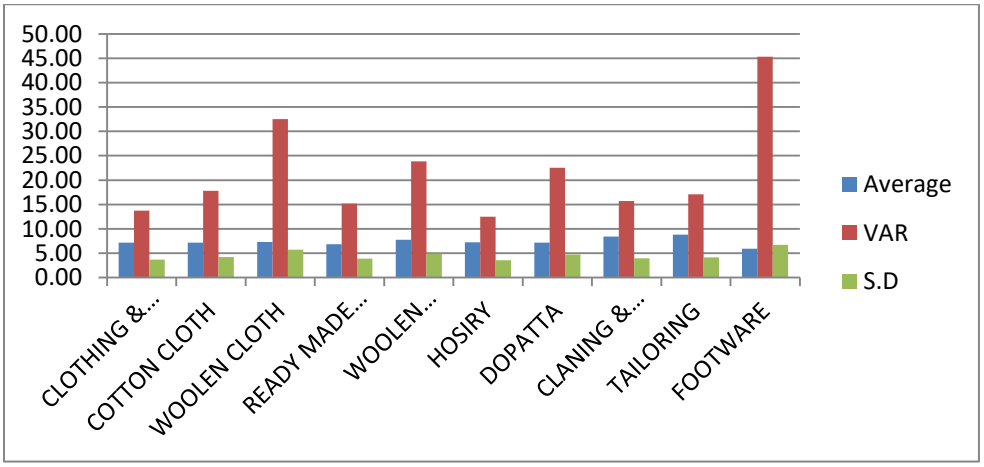
Alcohalic Beverages, Tobacco

Products	Average	Variance	Standard Deviation
Alcohalic beverages, tobacco	8.20	89.08	9.44
Cigarette	8.15	94.50	9.72
Betel leaves & nuts	10.64	408.41	20.21



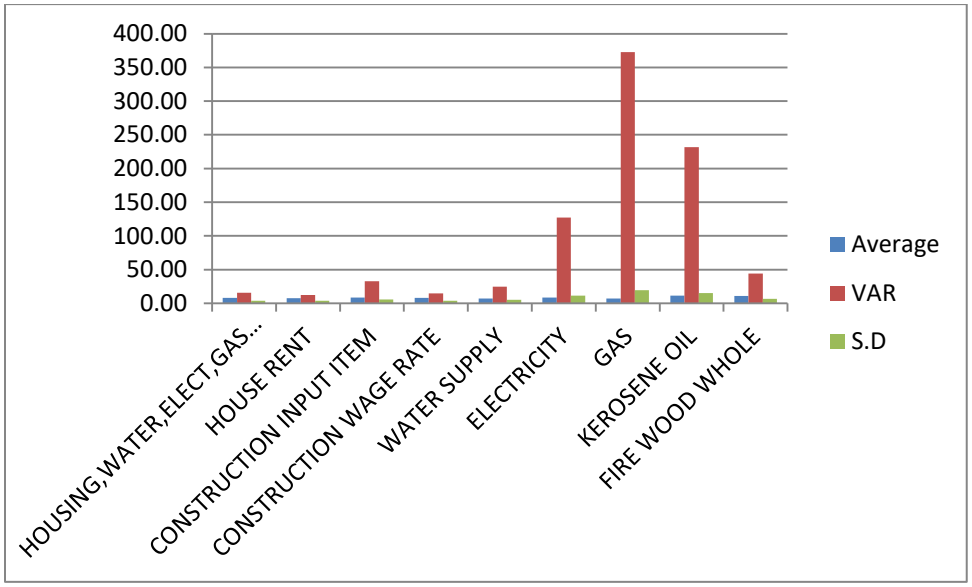
Clothing & Footwear

Products	Average	Variance	Standard Deviation
Clothing & footwear	7.20	13.73	3.71
Cotton cloth	7.17	17.79	4.22
Woolen cloth	7.31	32.53	5.70
Ready made garment	6.83	15.18	3.90
Woolen readymade garments	7.79	23.84	4.88
Hosiry	7.26	12.46	3.53
Dopatta	7.19	22.55	4.75
Claning & laundering	8.42	15.72	3.96
Tailoring	8.81	17.07	4.13
Footware	5.89	45.32	6.73



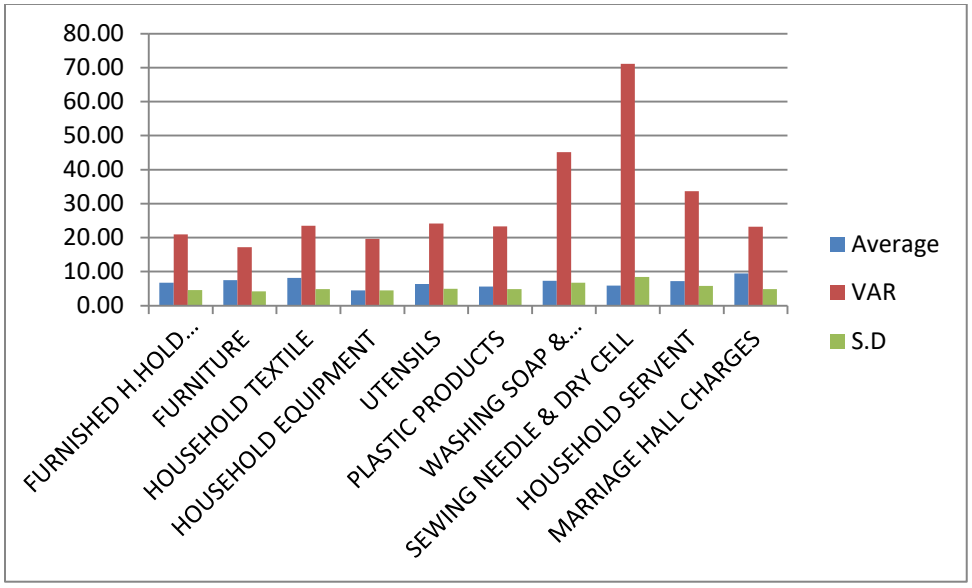
Housing, Water, Elect, Gas & Oth Fuel

Products	Average	Variance	Standard Deviation
Housing,water,elect,gas & oth fuel	7.77	15.59	3.95
House rent	7.54	12.30	3.51
Construction input item	8.30	32.53	5.70
Construction wage rate	8.20	14.56	3.82
Water supply	7.21	24.51	4.95
Electricity	8.66	127.14	11.28
Gas	7.13	372.79	19.31
Kerosene oil	11.48	231.65	15.22
Fire wood whole	10.81	44.01	6.63



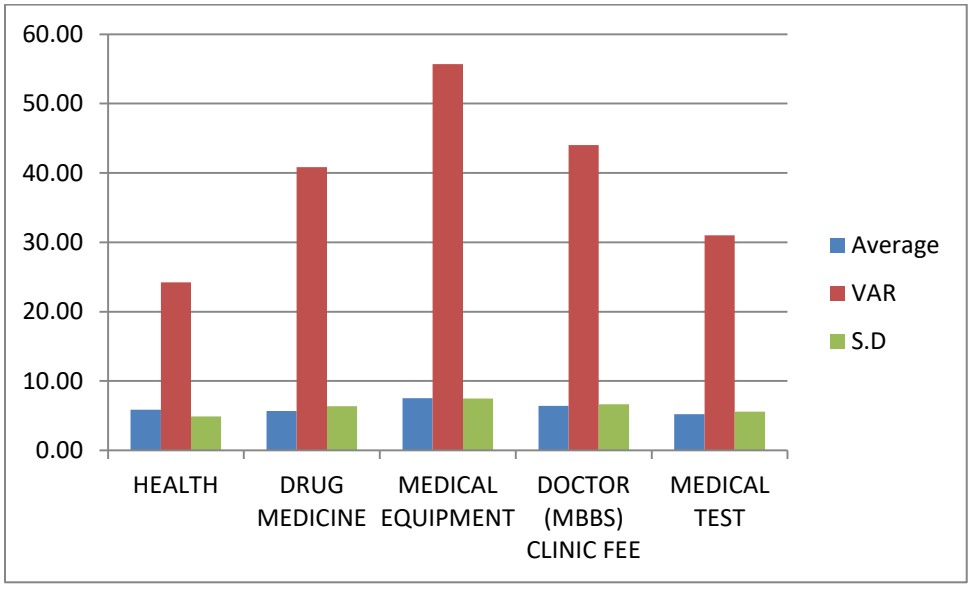
Furnished H.hold Equip. & Mant etc

Products	Average	Variance	Standard Deviation
Furnished h.hold equip.& mant etc	6.74	20.96	4.58
Furniture	7.45	17.17	4.14
Household textile	8.15	23.44	4.84
Household equipment	4.47	19.66	4.43
Utensils	6.32	24.13	4.91
Plastic products	5.56	23.29	4.83
Washing soap & detergent	7.27	45.10	6.72
Sewing needle & dry cell	5.93	71.10	8.43
Household servent	7.19	33.70	5.80
Marriage hall charges	9.44	23.19	4.82



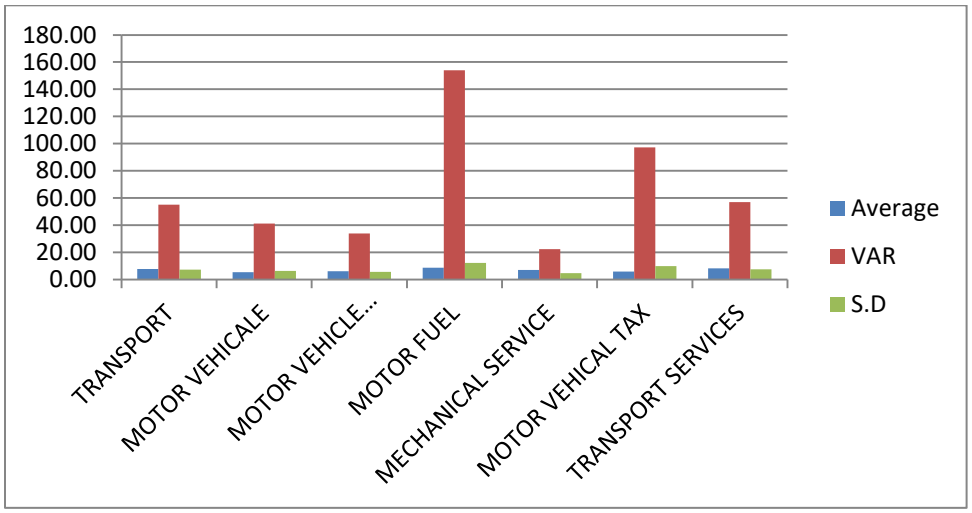
Health

Products	Average	Variance	Standard Deviation
Health	5.87	24.23	4.92
Drug medicine	5.66	40.85	6.39
Medical equipment	7.53	55.70	7.46
Doctor (mbbs) clinic fee	6.44	44.01	6.63
Medical test	5.25	31.02	5.57



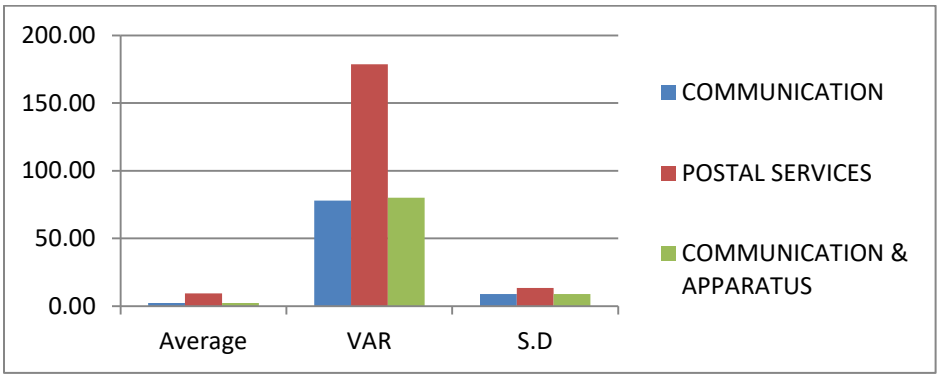
Transport

Products	Average	Variance	Standard Deviation
Transport	7.90	55.08	7.42
Motor vehicale	5.53	41.33	6.43
Motor vehicle accessories	6.22	33.88	5.82
Motor fuel	8.88	153.96	12.41
Mechanical service	7.11	22.35	4.73
Motor vehical tax	5.83	97.35	9.87
Transport services	8.32	57.03	7.55



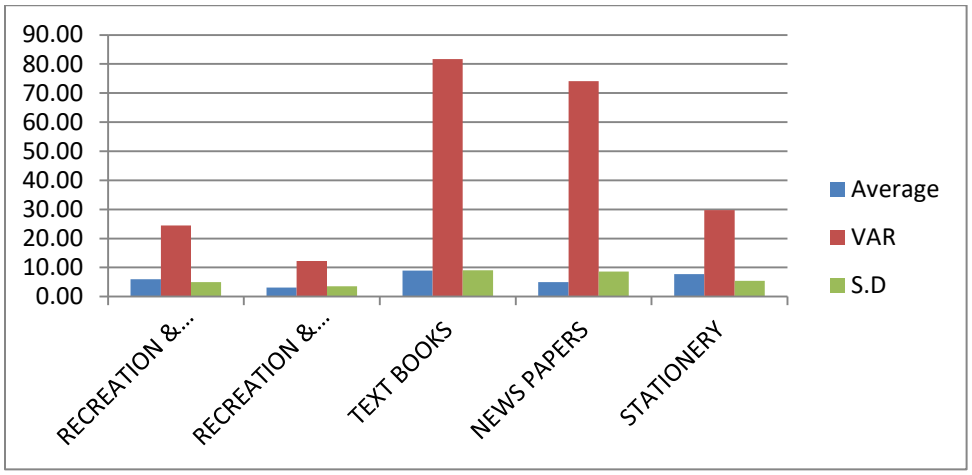
Communication

Products	Average	Variance	Standard Deviation
Communication	2.37	78.02	8.83
Postal services	9.35	178.52	13.36
Communication & apparatus	2.25	80.03	8.95



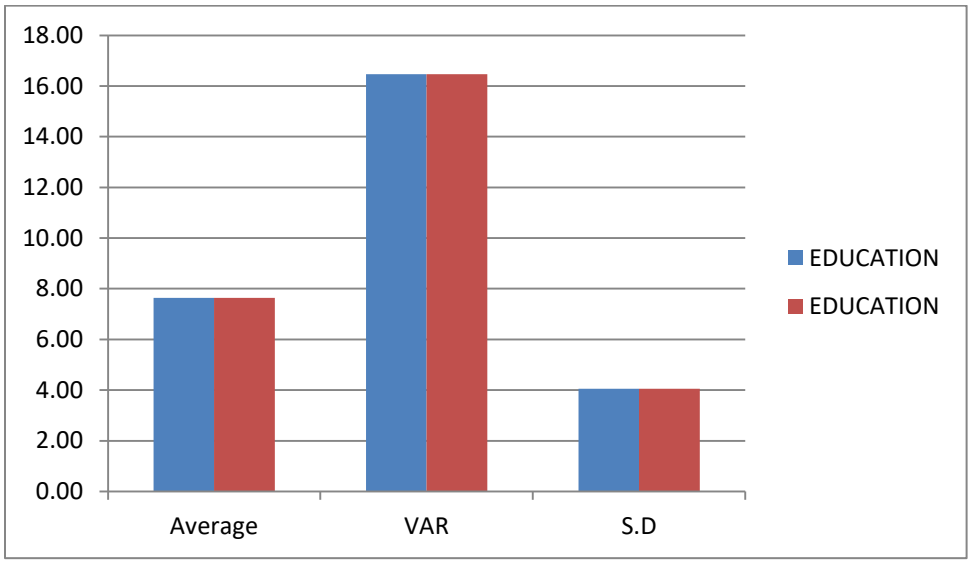
Recreation & Culture

Products	Average	Variance	Standard Deviation
Recreation & culture	5.93	24.43	4.94
Recreation & culture	3.15	12.22	3.50
Text books	8.89	81.71	9.04
News papers	5.01	74.10	8.61
Stationery	7.73	29.72	5.45



Education

PRODUCTS	Average	VARIANCE	STANDARD DEVIATION
Education	7.63	16.47	4.06
Education	7.63	16.47	4.06



Restaurants and Hotels

Products	Average	VARIANCE	STANDARD DEVIATION
Restaurants and hotels	9.56	21.95	4.69
Ready made food	9.56	21.95	4.69

Miscellaneous Goods and Services

Products	Average	VARIANCE	STANDARD DEVIATION
Miscellaneous goods and services	6.37	16.71	4.09
Personal care	7.36	21.43	4.63
Cosmetics	6.58	13.01	3.61
Blades	10.37	100.42	10.02
Personal equipment's	5.21	58.44	7.64

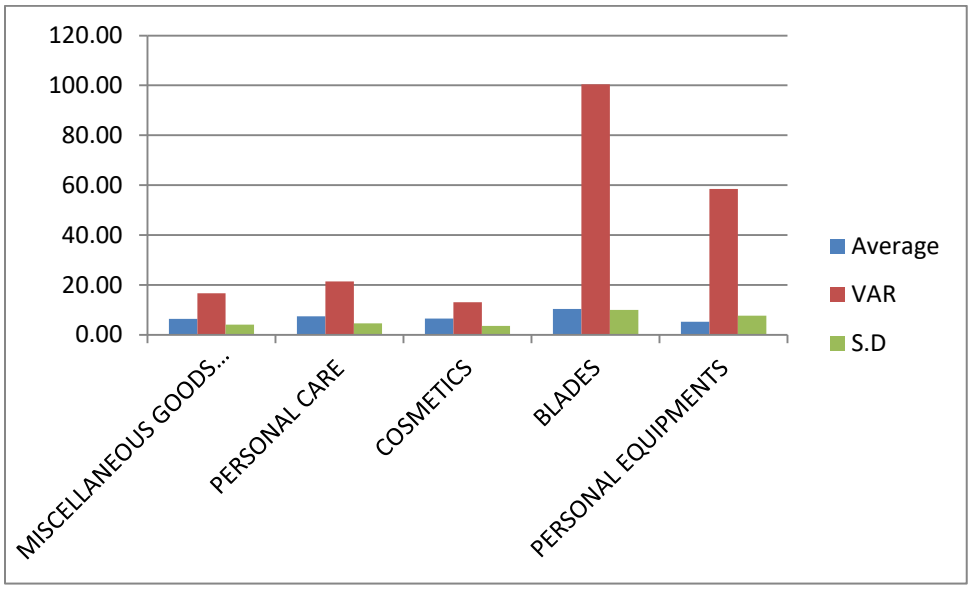


Table A 2. Frequency of price changes, Duration of price spells and Sized of price changes

Product	Average Price Duration	Frequency Of Price Change	Size of Price Change	Positive Frequency	Negative Frequency
GENERAL	1.44	0.68	0.009	0.60	0.11
Food & Non-alcohalic Beverages.	1.18	0.88	0.007	0.59	0.29
Wheat	1	0.98	0.007	0.69	0.29
Wheat flour	1.22	0.96	0.007	0.64	0.32
Wheat product	1.11	0.94	0.007	0.63	0.30
Besan	1	0.97	0.008	0.58	0.39
Rice	1	0.98	0.007	0.74	0.23

Cereals	1.79	0.71	0.010	0.67	0.04
Bakery & confectionary	3.44	0.48	0.011	0.46	0.01
Nimco	1.96	0.71	0.010	0.66	0.04
Meat	1.19	0.92	0.008	0.89	0.03
Chicken	1	0.99	0.005	0.49	0.5
Fish	1	0.98	0.006	0.61	0.37
Milk fresh	2.44	0.61	0.01	0.60	0.01
Milk product	1.59	0.80	0.008	0.78	0.02
Milk powder	2.67	0.59	0.010	0.56	0.02
Egg	1	0.99	0.006	0.54	0.44
Mustard oil	1	0.97	0.006	0.66	0.30
Cooking oil	2.8	0.75	0.008	0.53	0.21
Vegetable ghee	1.51	0.81	0.008	0.51	0.30
Dry fruits	1	0.98	0.008	0.71	0.27
Fresh fruits	1	0.99	0.006	0.57	0.41
Pulse masoor	1	0.98	0.005	0.57	0.41
Pulse moong	1	0.97	0.008	0.52	0.45
Pulse mash (washed)	1	0.98	0.008	0.55	0.43
Pulse gram	1	0.99	0.008	0.57	0.41
Gram whole	1	0.98	0.007	0.55	0.43
Beans	1	0.98	0.005	0.63	0.34
Potatoes	1	0.99	0.005	0.56	0.42
Onion	1	0.98	0.005	0.49	0.49
Tomatoes	1	0.98	0.003	0.50	0.48
Fresh vegetable	1	0.99	0.006	0.52	0.47
Sugar	1	0.98	0.005	0.46	0.52
Gur	1	0.98	0.005	0.62	0.36
Honey	1.5	0.89	0.008	0.74	0.14
Sweet meet	1.08	0.95	0.008	0.91	0.04
Beverages	2	0.60	0.009	0.49	0.11
Jam, tomato ketchup & pickle	2.16	0.76	0.007	0.72	0.04
Condiments	1.81	0.65	0.011	0.52	0.12
Spices	2.36	0.64	0.012	0.41	0.22
Tea	3.4	0.53	0.012	0.43	0.10
Alcohalic beverages, tobacco	1.87	0.86	0.008	0.69	0.17
Cigarette	2.45	0.56	0.011	0.46	0.10
Betel leaves & nuts	1	0.98	0.009	0.65	0.32
Clothing & footwear	2.14	0.66	0.009	0.65	0.005
Cotton cloth	1.52	0.81	0.007	0.71	0.09
Woolen cloth	1.44	0.80	0.007	0.74	0.05
Ready made garment	1.64	0.83	0.006	0.79	0.04
Woolen readymade garments	2.31	0.70	0.009	0.51	0.19

Hosiry	1.53	0.74	0.008	0.71	0.02
Dopatta	1.52	0.77	0.007	0.72	0.04
Claning & laundering	1.40	0.82	0.008	0.79	0.03
Tailoring	1.35	0.82	0.008	0.81	0.01
Footware	3.44	0.32	0.01	0.30	0.02
Housing,water,elect,gas & oth fuel	2.09	0.68	0.009	0.68	0.008
House rent	1.95	0.77	0.007	0.77	0
Construction input item	3	0.86	0.007	0.83	0.03
Construction wage rate	2	0.84	0.006	0.83	0.005
Water supply	2.92	0.78	0.007	0.74	0.04
Electricity	8.5	0.10	0.059	0.09	0.01
Gas	9.5	0.09	0.07	0.08	0.008
Kerosene oil	2.73	0.72	0.012	0.51	0.20
Fire wood whole	1.06	0.94	0.008	0.83	0.10
Furnished h.hold equip.& mant etc	3.16	0.66	0.008	0.64	0.02
Furniture	1.42	0.91	0.006	0.88	0.03
Household textile	1.45	0.84	0.007	0.80	0.03
Household equipment	1.85	0.74	0.004	0.65	0.09
Utensils	1.65	0.80	0.006	0.74	0.05
Plastic products	2.9	0.57	0.008	0.54	0.03
Washing soap & detergent	3.23	0.60	0.009	0.54	0.06
Sewing needle & dry cell	3.74	0.36	0.014	0.26	0.09
Household servent	1.57	0.91	0.006	0.83	0.07
Marriage hall charges	1.5	0.90	0.008	0.85	0.05
Health	2.89	0.46	0.011	0.44	0.02
Drug medicine	5.56	0.26	0.011	0.25	0.01
Medical equipment	3.46	0.52	3	0.50	0.02
Doctor (mbbs) clinic fee	1.66	0.70	0.008	0.64	0.06
Medical test	2.01	0.62	0.007	0.57	0.04
Transport	2.17	0.53	0.011	0.42	0.11
Motor vehicale	1.66	0.76	0.006	0.63	0.13
Motor vehicle accessories	1.39	0.84	0.005	0.70	0.13
Motor fuel	2.66	0.66	0.009	0.42	0.23
Mechanical service	1.71	0.75	0.007	0.72	0.03
Motor vehical tax	10.34	0.13	0.032	0.094	0.040
Transport services	5.82	0.20	0.030	0.18	0.02
Communication	10.06	0.12	0.019	0.09	0.03
Postal services	10.43	0.09	0.007	0.09	0.002
Communication & apparatus	7.91	0.17	0.013	0.12	0.04
Recreation & culture	3.4	0.41	0.011	0.38	0.02
Recreation & culture	2.70	0.5	0.005	0.38	0.11
Text books	4.03	0.31	0.020	0.27	0.03
News papers	14	0.07	0.061	0.06	0.01

Stationery	0.5	0.60	0.010	0.58	0.017
Education	3.02	0.41	0.015	0.39	0.02
Education	3.02	0.41	0.015	0.39	0.02
Restaurants and hotels	1.57	0.76	0.009	0.75	0.008
Ready made food	1.57	0.76	0.009	0.75	0.008
Miscellaneous goods and services	2.18	0.58	0.009	0.54	0.04
Personal care	3.09	0.43	0.013	0.40	0.02
Cosmetics	2.4	0.57	0.009	0.54	0.03
Blades	2.06	0.71	0.010	0.62	0.09
Personal Equipment's	1.93	0.72	0.005	0.56	0.16

Table A 3. Frequency of Regulated Product Price changes, Duration of price spells and Sized of price changes

Product	**Average Price Duration**	**Frequency Of Price Change**	**Size of Price Change**	**Positive Frequency**	**Negative Frequency**
Wheat	1	0.98	0.007	0.69	0.29
Wheat flour	1.22	0.96	0.007	0.64	0.32
Sugar	1	0.98	0.005	0.46	0.52
Cigarette	2.45	0.56	0.011	0.46	0.10
Construction wage rate	2	0.84	0.006	0.83	0.005
Water supply	2.92	0.78	0.007	0.74	0.04
Electricity	8.5	0.10	0.059	0.09	0.01
Gas	9.5	0.09	0.07	0.08	0.008
Kerosene oil	2.73	0.72	0.012	0.51	0.20
Fire wood whole	1.06	0.94	0.008	0.83	0.10
Drug medicine	5.56	0.26	0.011	0.25	0.01
Medical equipment	3.46	0.52	3	0.50	0.02
Motor vehicale	1.66	0.76	0.006	0.63	0.13
Motor vehicle accessories	1.39	0.84	0.005	0.70	0.13
Motor fuel	2.66	0.66	0.009	0.42	0.23
Motor vehical tax	10.34	0.13	0.032	0.094	0.040
Transport services	5.82	0.20	0.030	0.18	0.02
Postal services	10.43	0.09	0.007	0.09	0.002
Communication & apparatus	7.91	0.17	0.013	0.12	0.04
Recreation & culture	2.70	0.5	0.005	0.38	0.11
Text books	4.03	0.31	0.020	0.27	0.03
Education	3.02	0.41	0.015	0.39	0.02

Table A 4. Frequency of Unregulated Products price changes, Duration of price spells and Sized of price changes

Product	Average Price Duration	Frequency Of Price Change	Size of Price Change	Positive Frequency	Negative Frequency
Wheat product	1.11	0.94	0.007	0.63	0.30
Besan	1	0.97	0.008	0.58	0.39
Rice	1	0.98	0.007	0.74	0.23
Cereals	1.79	0.71	0.010	0.67	0.04
Bakery & confectionary	3.44	0.48	0.011	0.46	0.01
Nimco	1.96	0.71	0.010	0.66	0.04
Meat	1.19	0.92	0.008	0.89	0.03
Chicken	1	0.99	0.005	0.49	0.5
Fish	1	0.98	0.006	0.61	0.37
Milk fresh	2.44	0.61	0.01	0.60	0.01
Milk product	1.59	0.80	0.008	0.78	0.02
Milk powder	2.67	0.59	0.010	0.56	0.02
Egg	1	0.99	0.006	0.54	0.44
Mustard oil	1	0.97	0.006	0.66	0.30
Cooking oil	2.8	0.75	0.008	0.53	0.21
Vegetable ghee	1.51	0.81	0.008	0.51	0.30
Dry fruits	1	0.98	0.008	0.71	0.27
Fresh fruits	1	0.99	0.006	0.57	0.41
Pulse masoor	1	0.98	0.005	0.57	0.41
Pulse moong	1	0.97	0.008	0.52	0.45
Pulse mash (washed)	1	0.98	0.008	0.55	0.43
Pulse gram	1	0.99	0.008	0.57	0.41
Gram whole	1	0.98	0.007	0.55	0.43
Beans	1	0.98	0.005	0.63	0.34
Potatoes	1	0.99	0.005	0.56	0.42
Onion	1	0.98	0.005	0.49	0.49
Tomatoes	1	0.98	0.003	0.50	0.48
Fresh vegetable	1	0.99	0.006	0.52	0.47
Gur	1	0.98	0.005	0.62	0.36
Honey	1.5	0.89	0.008	0.74	0.14
Sweet meet	1.08	0.95	0.008	0.91	0.04
Beverages	2	0.60	0.009	0.49	0.11
Jam, tomato ketchup & pickle	2.16	0.76	0.007	0.72	0.04
Condiments	1.81	0.65	0.011	0.52	0.12
Spices	2.36	0.64	0.012	0.41	0.22
Tea	3.4	0.53	0.012	0.43	0.10
Betel leaves & nuts	1	0.98	0.009	0.65	0.32
Cotton cloth	1.52	0.81	0.007	0.71	0.09
Woolen cloth	1.44	0.80	0.007	0.74	0.05

Ready made garment	1.64	0.83	0.006	0.79	0.04
Woolen readymade garments	2.31	0.70	0.009	0.51	0.19
Hosiry	1.53	0.74	0.008	0.71	0.02
Dopatta	1.52	0.77	0.007	0.72	0.04
Claning & laundering	1.40	0.82	0.008	0.79	0.03
Tailoring	1.35	0.82	0.008	0.81	0.01
Footware	3.44	0.32	0.01	0.30	0.02
House rent	1.95	0.77	0.007	0.77	0
Construction input item	3	0.86	0.007	0.83	0.03
Construction wage rate	2	0.84	0.006	0.83	0.005
Furniture	1.42	0.91	0.006	0.88	0.03
Household textile	1.45	0.84	0.007	0.80	0.03
Household equipment	1.85	0.74	0.004	0.65	0.09
Utensils	1.65	0.80	0.006	0.74	0.05
Plastic products	2.9	0.57	0.008	0.54	0.03
Washing soap & detergent	3.23	0.60	0.009	0.54	0.06
Sewing needle & dry cell	3.74	0.36	0.014	0.26	0.09
Household servent	1.57	0.91	0.006	0.83	0.07
Marriage hall charges	1.5	0.90	0.008	0.85	0.05
Doctor (mbbs) clinic fee	1.66	0.70	0.008	0.64	0.06
Medical test	2.01	0.62	0.007	0.57	0.04
Mechanical service	1.71	0.75	0.007	0.72	0.03
News papers	14	0.07	0.061	0.06	0.01
Stationery	0.5	0.60	0.010	0.58	0.017
Ready made food	1.57	0.76	0.009	0.75	0.008
Personal care	3.09	0.43	0.013	0.40	0.02
Cosmetics	2.4	0.57	0.009	0.54	0.03
Blades	2.06	0.71	0.010	0.62	0.09
Personal equipments	1.93	0.72	0.005	0.56	0.16