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Ramadan Effect on Price Movements: Evidence from Pakistan

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Abstract
This paper attempts to verify the widespread perception that general price level tends to rise due to the month of Ramadan in Pakistan. For this purpose, the ARIMA methodology (simple and extended form), along with simple graphical and scenario analysis, has been applied on the monthly data for overall, food and non-food indices of consumer prices in Pakistan from July 1991 to December 2008. Contrary to the general perception, we could not find any evidence of systematic acceleration in overall CPI, food and non-food price levels in the month of Ramadan in Pakistan. The results can be explained by price hikes well before the start of the holy month and government activism in regulating prices of essential food items in Ramadan. However, we do find a significant positive effect on the prices of fruits due to Ramadan.

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1. Introduction

It is a common perception that general price level increases in the holy month of Ramadan due to increased demand for food stuff, clothing, and gift items. The objective of this paper is to make an empirical investigation of the effect of Ramadan on prices. For this purpose we have used different statistical techniques including ARIMA methodology with some adjustments to incorporate Islamic calendar features. The standard technique of X-11 or X-12 do incorporate the effects of recurring events having variable dates in Gregorian calendar like Easter, Chinese New Year etc. on economic time series. However, Islamic events are based on lunar calendar; therefore, their effects on economic time series may not be captured through traditional techniques of identifying seasonality.

The identification of seasonality and recurring events makes it easy to understand the underlying trend in time series. This is why a number of data reporting agencies are using X12-ARIMA[1] procedure for such type of seasonal adjustment. This procedure was developed by US Census of Bureau and now it is widely used in national statistics offices of UK, New Zealand, Denmark and other international agencies e.g. OECD and The World Bank. In X12-ARIMA, predefined regressors for Easter holidays are available.

Singapore Department of Statistics (SDS) provides useful information about the seasonal adjustment of economic time series for moving holiday. The department uses the enhanced version of X-11 ARIMA methodology to capture the seasonal effects in order to incorporate the Chinese New Year and Eid-ul-Fitr effect. SDS has introduced another dummy variable called fractional dummy on the fact that the consumption patterns change due to these festivals.

Soukup and Findley (2000) argue that the monthly economic time series are often systematically influenced by the effects specific to the seven days of the week and when or how often days of the week occur during the month. In order to capture trading day effects they used X-11 ARIMA and also checked the robustness of the results.

Although there exists a significant work related to detection of calendar and seasonal effects in time series data in the world, only a few efforts have been attempted to identify Islamic calendar effects on economic time series. For example, Riazuddin and Khan (2002, 2005) modeled and estimated the seasonal effects in currency in circulation in Pakistan by

[1]For details about the program see http://www.census.gov/srd/www/x12a/

incorporating the effects of Islamic calendar in a standard ARIMA model. For simplicity and conformity with socioeconomic behavior in Pakistan, they selected only four Islamic months of significance: Muharram, Ramadan, Shawwal, and Dhul-Hajj and use fractional dummies for these months. Their results showed the presence of Islamic calendar effects in the currency in circulation.

A study carried out by Yucel (2005) shows Ramadan effect on food prices in Turkey. He performs his analysis under two alternative calendar conventions, namely the Gregorian and Hijri calendars. His results showed that there exists effect of Ramadan on food prices in Turkey and food prices tend to rise in Ramadan. He used fractional dummy for the Ramadan and generates a series according to the Islamic calendar months. He used weighted average of two months to get the value for an Islamic month. However, this method of generating values for Islamic calendar months can be questioned as these might not be fully representative and the timing of recording data on prices also becomes important.

We have investigated the effect of Ramadan on movements in consumer price index (CPI) along with its food and non-food components. First of all we attempted to visualize such effects through graphical analysis, then different scenarios of occurrence of Ramadan in different parts of the Gregorian month vis-à-vis inflation have been analyzed, and lastly ARIMA models with and without fractional dummies have been developed.

The paper is divided into six sections. After introduction and review of some studies in section 1, the graphical analysis of detecting Ramadan effect is discussed in section 2. Scenario analysis is conducted in section 3. The ARIMA methodology and the model are given in section 4. The empirical findings and conclusion are discussed in sections 5 and 6 respectively.

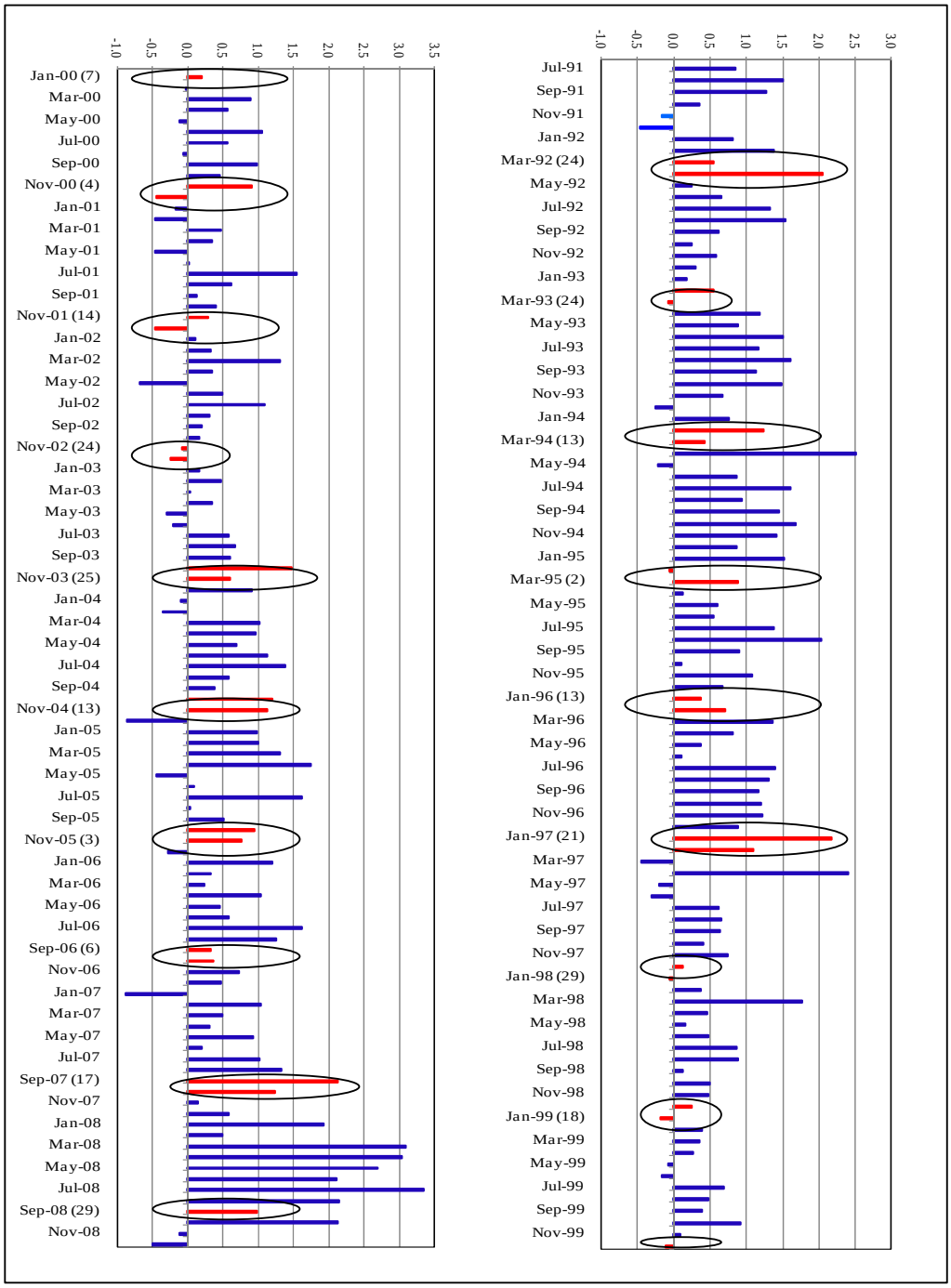
2. Graphical Analysis for Evidence of Ramadan Effect

Our objective is to examine CPI data to get an idea about the incidence of any pattern in a month due to the Ramadan. Before we proceed, it is necessary to mention that our analysis will be based on the following assumptions: (a) Month-on-Month (MoM) CPI inflation will be relevant to our descriptive analysis; (b) we expect the MoM inflation to accelerate for the Gregorian calendar month in which Ramadan falls; and (c) there should be presence of a significant number of accelerated spikes in the selected data.

All these assumptions are quite relevant to our analysis. The MoM inflation was selected because of a general perception that prices increase more rapidly during the month in which Ramadan falls compared to preceding months. Moreover we also expect that during the last 18 years (18 Ramadan months) just by visual inspection of data, frequency of occurrence of the above phenomenon to be significant. We obtained monthly time series data on overall (general) consumer price index (CPI) along with food and non-food sub indices from July 1991 to December 2008. The data were obtained from Federal Bureau of Statistics (FBS). The graphical presentation of the MoM data provides no clear idea about the incidence of Ramadan effect in overall, food and non-food consumer price indices (see ***Figure 1, 2 and 3)***.

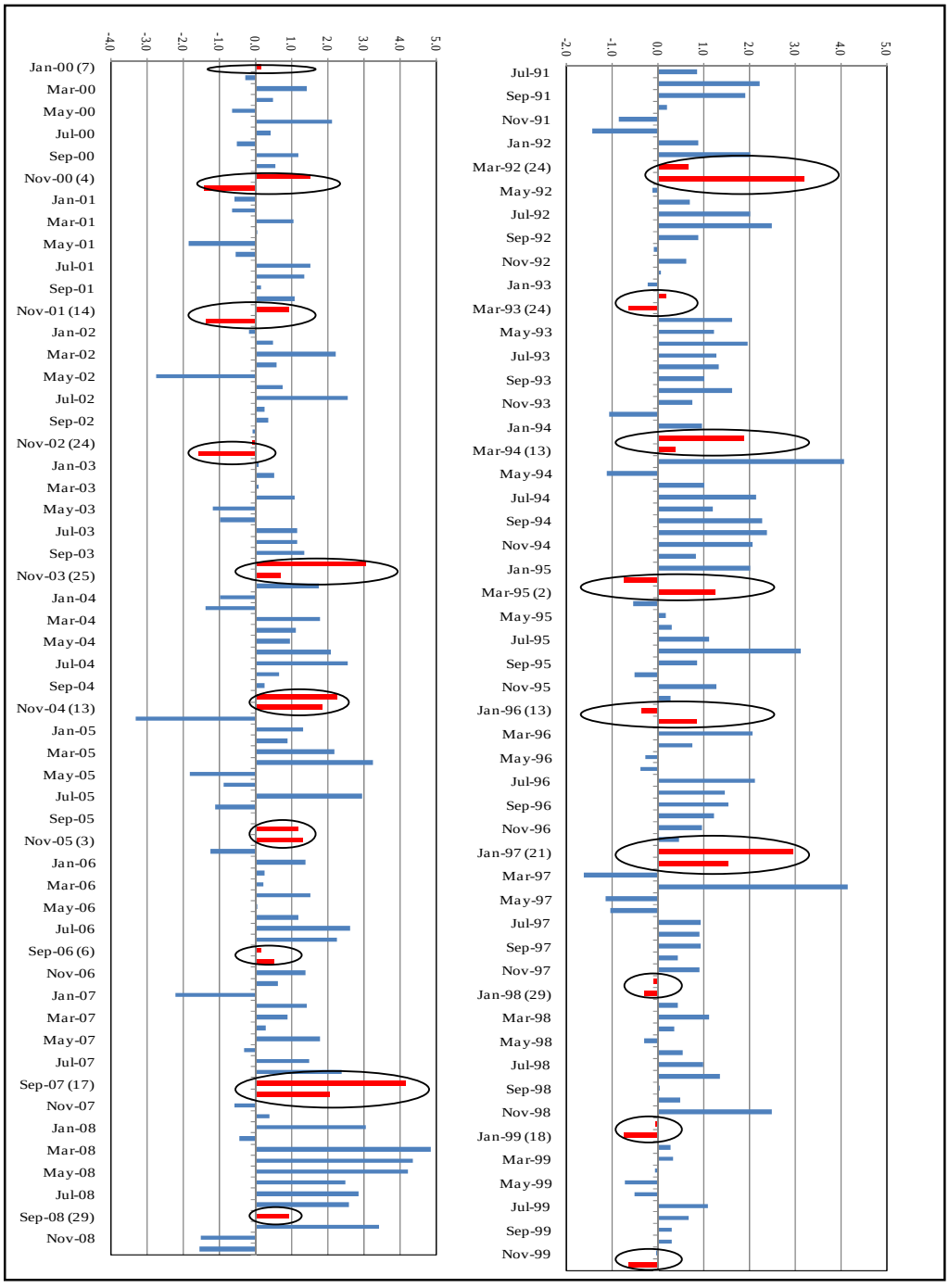
In the figures below, the circled spikes are shown for the Gregorian months in which Ramadan days were witnessed. By looking at circled spikes in the graph we cannot make any conclusive statement about the evidence of Ramadan effect on consumer prices in Pakistan.

Figure 1: Overall Inflation (MoM) from July 1991 to December 2008



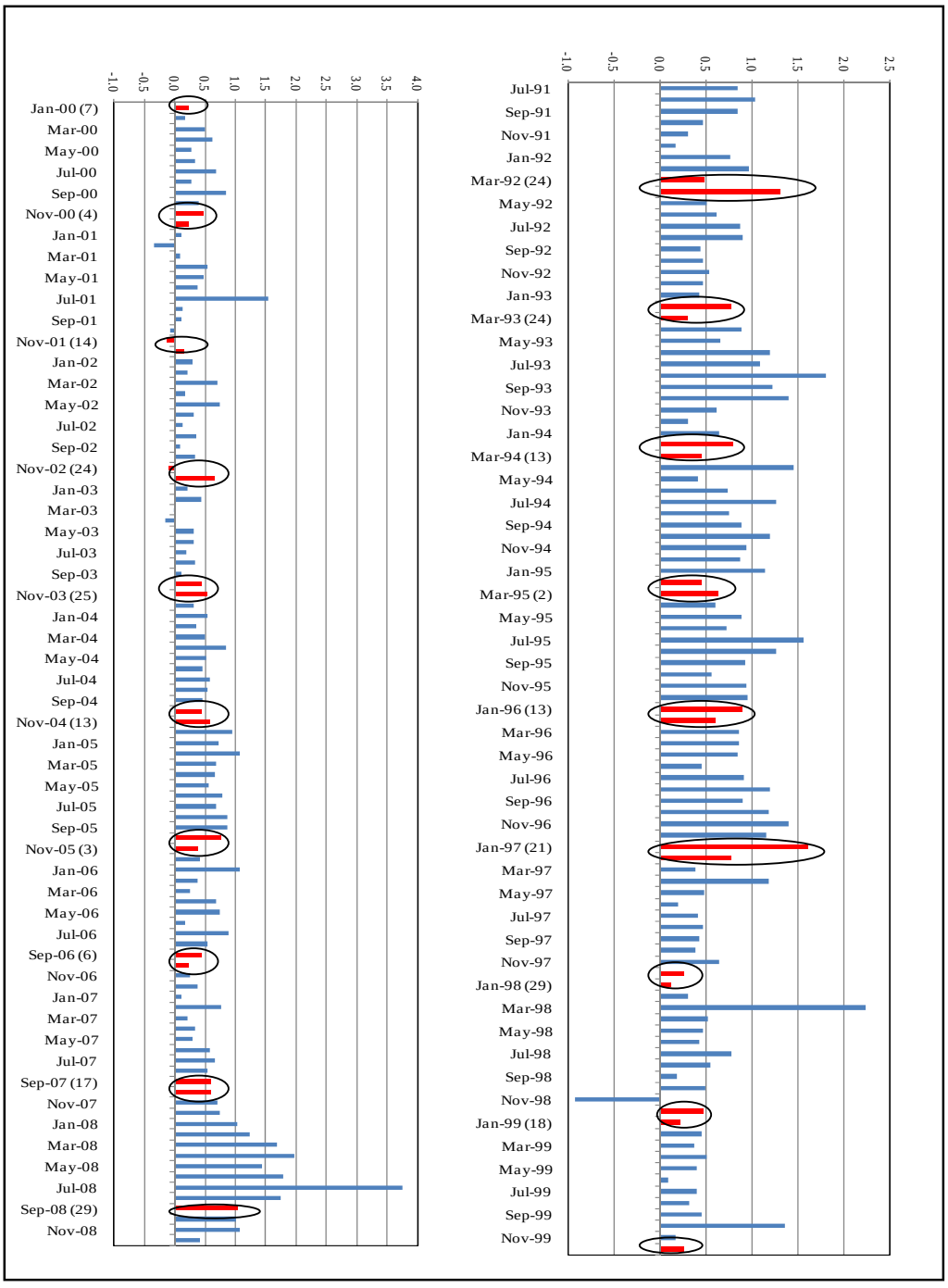
Note: Numbers in parenthesis represent Ramadan days in the Gregorian calendar month e.g. Mar-92 (24) indicates that 24 days of Ramadan fell in March 1992. The circles around the bars indicate the Ramadan months.

Figure 2: Food Inflation (MoM) from July 1991 to December 2008



Note: Numbers in parenthesis represent Ramadan days in the Gregorian calendar month e.g. Sep-08 (29) indicates that 29 days of Ramadan fell in September 2008. The circles around the bars indicate the Ramadan months.

Figure 3: Non-food Inflation (MoM) from July 1991 to December 2008



Note: Numbers in parenthesis represent Ramadan days in the Gregorian calendar month e.g. Sep-07 (17) indicates that 17 days of Ramadan fell in September 2007. The circles around the bars indicate the Ramadan months.

However, this type of observation does not address the issues such as; (a) normalization of data as the figure may be portraying data trends continuing from the past few months, and (b) the time of data collection; as data on prices is collected by the FBS from 1st to 15th day of every Gregorian calendar month. This is important because if Ramadan starts after 15th of a Gregorian calendar month then the price effect is not going to be reflected in that particular month as per our assumption. In order to address the above mentioned issues, we have also conducted scenario analysis.

3. Establishing Evidence of Ramadan Effect through Scenario Analysis

As we discussed in the previous section that visual evidence of Ramadan effect may not provide conclusive results because of the nature of occurrence of Ramadan in a calendar year. This is based on the fact that Gregorian calendar year lasts for 365 or 366 days, whereas a Hijri calendar year lasts for 354 or 355 days. It implies that the latter shifts back by 10 or 11 days every Gregorian year. This observation draws our attention to an important data property i.e. asynchronization[2]. This is obvious when we compare Islamic calendar month with the Gregorian calendar month. Besides in order to make our analysis viable we have also taken into account the timing of data reporting.

These issues are better highlighted in various purposely built scenarios. We have chalked out various data combinations. For example we presented a scenario that MoM inflation accelerates for the month in which Ramadan was observed irrespective of evidence on starting date of Ramadan and counted all those cases. Similarly, another scenario in which MoM inflation accelerated for the month in which Ramadan fell in the data reporting days (1st to 15th day of the month)[3] and counted for favorable cases. A total of 18 cases have been created i.e. 6 for each overall, food and non-food MoM inflation and have been presented in **Table 1**. For example, for overall CPI inflation, MoM inflation accelerated in only 13 out of total 35 occurrences for the months in which Ramadan occurred, which in percentage terms is 37.1 percent of the total. Similarly for overall CPI inflation, MoM inflation accelerated in just 9 out of total 26 occurrences in the case when Ramadan fell in the data reporting days (1st to 15th date of the month), which in percentage terms is 34.6 percent of the total. All other cases

[2] When data cannot be compared due to mismatch between reporting days and occurrence of an event across time.
[3] While the Federal Bureau of Statistics (FBS) reports CPI as a monthly exercise, it collects CPI data during 1st to 15th day of every month and uses other half of the month to construct other price indices.

in **Table 1** can be interpreted in the same way. It is imperative to mention that out of above mentioned scenarios, there was only one evidence (when Ramadan starts in first 15 days of a month for food inflation) in which acceleration ($MoM_t > MoM_{t-1}$) was witnessed in more than 50 percent cases. In case of all other scenarios, the evidence of occurrence of acceleration of MoM inflation was less than 50 percent. On the basis of above analysis no conclusive evidence was found over the last 18 years about the effect of Ramadan on overall CPI, food and non-food inflation measures.

Table 1. Number of months when MoM inflation (%) accelerates for the month in which Ramadan occurs ($MoM_t > MoM_{t-1}$)

	Ramadan falls in the Month	Ramadan falls in data collecting days of the Month	At least 10 days of Ramadan fall in the data collecting days of the Month	Ramadan starts in first 10 days of a month	Ramadan starts in first 15 days of a month	Ramadan starts after 15 of a month
Overall CPI	13 (37.1)	9 (34.6)	2 (15.4)	1 (16.7)	4 (44.4)	4 (44.4)
CPI Food	15 (42.9)	11 (42.3)	2 (15.4)	2 (33.3)	5 (55.6)	4 (44.4)
CPI Non-food	14 (40.0)	10 (38.5)	3 (23.1)	1 (16.7)	4 (44.4)	4 (44.4)
Total Occurrences	35	26	13	6	9	9

Source: Authors calculation
Note: Values in parenthesis are percent of observations in total occurrences
The analysis is based on FBS data from July 1991 to December 2008

In **Table 1** the analysis was based on the assumption that MoM inflation accelerated for the month in which Ramadan fell without considering the data trends of past months. In order to show the relative position of the month under observation, we compared the MoM inflation of a Gregorian calendar month in which Ramadan was evidenced with the average inflation for 12 months i.e. whole fiscal year[4]. **Table 2** gives results about the incidence of Ramadan effect on prices when data was compared to the average inflation. Again there was not enough evidence regarding Ramadan effect on prices in last 18 years data.

[4] The fiscal year corresponds from July to June in Pakistan.

Table 2. Number of months when MoM inflation (%) > average inflation for the fiscal year

	Ramadan falls in data collecting days of the Month			At least 10 days of Ramadan fall in data collecting period			Ramadan starts after 15 of a month		
	Overall	Food	Non-Food	Overall	Food	Non-Food	Overall	Food	Non-Food
Witnessed	8 (30.8)	10 (38.5)	5 (19.2)	1 (7.7)	2 (15.4)	1 (7.7)	2 (25.0)	3 (37.5)	5 (62.5)
Total Occurrences	26	26	26	13	13	13	8	8	8

Source: Authors' calculations

Note: Values in parenthesis are percent of observations in total occurrences
The analysis are based on FBS data from July 1991 to December 2008

This led us to go for more sophisticated analysis that could extract seasonal pattern that arose due to the month of Ramadan. For this, we used ARIMA methodology developed by Riazuddin and Khan (2002, 2005) and Yucel (2005) to capture the effects of Islamic calendar months.

4. ARIMA Methodology and the Model

In order to further explore the effect of Ramadan we used ARIMA methodology by introducing dummy variable in three different manners; (i) the concept of fractional indicator variable to indicate either full presence of Ramadan in a given calendar month (say January), or partial presence of Ramadan in January and remaining in February, with the unit value of dummy distributed in January and February to the extent of length of Ramadan month falling in respective calendar months[5]. Moreover, the usual dummy variables are simultaneously used to account for the effects of Gregorian calendar months; (ii) we also estimated the model by assigning unit value to the month in which Ramadan fell irrespective of the number of days of Ramadan; and (iii) in order to take into account the asynchronization nature of the data, we introduced dummy variable in the third model with respect to the reporting days. i.e. unit value was assigned to Ramadan when at least 10 days of Ramadan overlapped for the reporting days of the Gregorian calendar month.

The specified model is as under:

[5] This is same methodology used by Riazuddin and Khan (2005) and Yucel (2005).

$$Log(\Pi_t) = \alpha_0 + \sum_{i=1}^{11} \beta_i D_i + \sum_j \lambda_j R_{ji} + \sum_{p=1}^{p} \theta_p \log(\Pi_{t-p}) + \sum_{q=1}^{q} \delta_q \varepsilon_{t-q} + \mu_i$$

where Π_t represents the price indices of CPI (general, food and non-food);

D_i are the dummies for the Gregorian calendar months; where $D_i = 1$ if Π_t belongs to *ith* calendar month and $D_i = 0$ otherwise;

θ_p are the coefficients of the autoregressive process and δ_q are the coefficients of the moving average process;

μ_i represents the white noise with usual properties in the ARIMA model.

R_{ji} is the dummy variable for the month of Ramadan and can take value according to three above mentioned definitions. For specification (ii) and (iii) a unit value or zero will be assigned to Ramadan. However, in case of (i) R will take value according to the following procedure;

$$R_{ji} = \frac{w_{ji}}{w_j} + \frac{w_{j(i+1)}}{w_j}$$

Where

w_{ji} is the number of days of the jth Islamic month falling in the ith calendar month;

$w_{j(i+1)}$ is the number of days of the jth Islamic month falling in the (i+1)st calendar month;

w_j is the number of days in jth Islamic month such that $w_j = w_{ji} + w_{ji+1} = 29$ or 30.

$R_{ji} = 1$ if Π_t belongs to jth Islamic month falling partly in ith and (i+1)st months.

For instance if 12 days of Islamic month *Ramadan* out of 30 days fall in January and remaining 18 days fall in February then there will be two fractional dummies for the months of January and February. In this example, according to our specification of dummy variable; wj = 30, $w_{ji} = 12$ and $w_{j(i+1)} = 18$

According to the above example the fractional dummy values for January and February will be; 12/30 = 0.4 (for January) and 18/30 = 0.6 (for February); and $R_{ji} = 0.4 + 0.6 = 1$

5. Results

Before estimating the model, we checked the stationarity of all the variables as it is required for ARIMA. The Augmented Dicky Fuller (ADF) and Phillips Perron (PP) tests were applied and the results suggested that all variables were stationary at first difference [I (1)].

After looking at the statistical and econometric properties of the data, we estimated the model with three types of specifications for overall CPI, food and nonfood price indices. The results obtained are presented in annexures. In order to explain the effect of Ramadan as per existing general perception, we considered two propositions; (a) the sign of estimated coefficient for R (Ramadan dummy) should be positive; and (b) the coefficients should be statistically significant. Both of these are important because only a significant positive relationship will conform to the general explanation that prices tend to rise in Ramadan.

The results obtained on the basis of three specified models witness that consumer price inflation does not tend to rise in the month when Ramadan was observed. In case of third specification, in which results were obtained by considering the reporting days of Ramadan in a Gregorian calendar month and then applying dummies accordingly, the coefficients for Ramadan are statistically significant for overall and non-food inflation. However the signs are negative in contradiction with the existing perception about the prices in Pakistan during the month of Ramadan. The results obtained by using ARIMA provide no exception what we have already concluded in the previous sections.

Since our results are contrary to widely held perceptions about rising level of prices in Ramadan, therefore, it is important to list possible explanations.

First: In order to provide relief to the general public during the month of *Ramadan,* government takes special steps to control price hike. In particular essential items are sold at subsidized rates at utility stores throughout the country. Moreover, government also tries to ensure that retail markets do not sell essential items at very high profit rates. As a result of these measures, effect of changes in prices may not be significant for overall price indices.

Second: There is a possibility that only the prices of some specified items are affected during Ramadan. Hence there may be no significant realization of effect of changes in the prices of such items in overall, food and non-food price indices[6] because of their very small weighted contribution[7] in overall, food and non-food inflation.

Third: The pattern of consumption changes before, during and after the special days of Islamic months. Sales generally increase during Ramadan as most of the families consume

[6] The CPI basket consists of 374 items of which 124 are food and 250 are non-food items.
[7] The combined weight of fruits, vegetables, basen, cooking oil, wheat flour, chicken is 10.3 percent in overall CPI basket and 25.4 percent in food group of CPI.

more of their income for buying before Eid[8]. This increase in consumption generally has a major impact on their savings and people blame increased price levels for explaining this phenomenon. In reality it is the increase in expenditure that hurts individuals saving and not necessarily the increase in general price level.

It is imperative to note that we also estimated Ramadan effect on fruit prices by applying extended ARIMA methodology. Ramadan effect turned out to be significant and positive in case of fruits. As people consider fruits a major ingredient of their diet when they break their fast, the demand for fruits rise and as a consequence their prices rise. Higher fruit prices affect the consumers and general public starts talking of price hike. However, as mentioned earlier, due to its low weight in CPI and food, it does not have a significant effect on overall CPI and food group of CPI[9].

6. Conclusion

There is a general perception that prices accelerate in the month of Ramadan due to increase in demand for a number of consumer goods. However, verification of this perception from economic data (available on Gregorian calendar frequencies) is not a straight forward task because of mismatch between the Islamic and the Gregorian calendars and data recording norms. As a result this asynchronization of data makes it difficult to detect Islamic calendar effects. In order to incorporate such issues, we applied three different approaches to show whether price level increases during Ramadan or not.

The study shows that Ramadan has no significant impact on prices in Pakistan. This might be due to the fact that we are using aggregate data on prices for our analysis i.e. CPI and its broad components (food and non-food). It is also known that prices of certain food items generally tend to change, but not necessarily the prices of items included in the whole basket. Therefore it is quite possible that Islamic calendar effects may appear to be significant in individual commodities (as we found in the case of fruits). However, due to their very small weight in overall basket the effect of an increase in price during Ramadan is not visible in the aggregated basket. Another perception is that the wholesalers are so smart that they increase

[8] Islamic festival that comes when Ramadan is over.
[9] Weight of fruits in CPI basket is 1.62 percent. Also, the Ramadan effect on the prices of cooking oil, wheat flour, sugar, milk, chicken, besan was not significant, confirming that the effect of government regulatory measures to relief the consumers.

the prices of commodities before the Ramadan starts and suppliers also hoard some commodities that also create artificial shortage to put upward pressure on prices.

On the basis of the results we can conclude that the overall CPI inflation (MoM) may not increase in Ramadan. However opposite may be true in case of explaining Ramadan effect on individual items. This is an important finding and will help policy makers to concentrate on other reasons of explaining inflation during Ramadan.

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Table A1: Seasonality in Gregorian and Islamic Calendar Months

Model 1 (Using Fractional Dummies for the month in which Ramadan fell)

	Consumer Price Indices (CPI)		
	General	Food	Non-Food
Jun	0.0054 (2.89)*	0.0048 (1.62)	0.0056 (4.23)*
Jul	0.0074 (3.95)*	0.0125 (2.97)*	0.0040 (3.55)*
Aug	0.0043 (2.26)*	0.0076 (1.81)**	0.0018 (1.56)
Sep	0.0024 (1.25)	0.0046 (1.25)	0.0005 (0.39)
Oct	0.0032 (1.64)**	0.0067 (1.58)	0.0010 (0.83)
Nov	0.0006 (0.30)	0.0026 (0.62)	-0.0008 (-0.61)
Dec	-0.0044 (-2.20)*	-0.0103 (-2.57)*	-0.0003 (-0.24)
Jan	0.0002 (0.08)	-0.0003 (-0.06)	0.0007 (0.53)
Feb	-0.0001 (-0.06)	-0.0010 (-0.23)	0.0002 (0.19)
Mar	0.0028 (1.43)	0.0056 (1.50)	0.007 (0.57)
Apr	0.0055 (2.85)*	0.0104 (2.48)*	0.0021 (1.75)**
May	-0.0027 (-1.42)	-0.0072 (-1.70)**	0.0003 (0.26)
Ramadan	-0.0013 (-0.72)	-0.0003 (-0.09)	-0.0016 (-1.44)
AR	0.8958 (13.99)*	0.2230 (3.12)*	0.8792 (15.90)*
MA	-0.6805 (-6.33)*		-0.5323 (-5.40)*
R-squared	0.35	0.27	0.39
S.E of Regression	0.01	0.01	0.00
Durbin-Watson stat	2.03	1.82	2.04
F-stat	7.41*	5.41*	8.91*
Serial Correlation LM Test	0.25	1.28	0.55

Source: *Authors' estimation*

Note: The values without parenthesis are the coefficients obtained from ARIMA model estimations whereas the values in the parenthesis are t-statistic.

Values with * and ** represent that the t -statistic are significant at 5% and 10% level of significance respectively.

Specified Estimated Model: Specified AR and MA models for CPI General and CPI non-food are AR(1) and MA(1), whereas for CPI food specified AR model is AR(3)

Table A2: Seasonality in Gregorian and Islamic Calendar Months

Model 2 (Assigning value of 1 to Ramadan month Dummies)

	Consumer Price Indices (CPI)		
	General	Food	Non-Food
Jun	0.0054 (2.87)*	0.0048 (1.62)	0.0056 (4.22)*
Jul	0.0074 (3.94)*	0.0125 (2.97)*	0.0040 (3.53)*
Aug	0.0043 (2.25)*	0.0076 (1.82)**	0.0018 (1.55)
Sep	0.0022 (1.12)	0.0042 (1.13)	0.0004 (0.31)
Oct	0.0028 (1.43)	0.0060 (1.40)	0.0009 (0.72)
Nov	0.0002 (0.08)	0.0017 (0.41)	-0.0009 (-0.69)
Dec	-0.0048 (-2.40)*	-0.0111 (-2.78)*	-0.0004 (-0.32)
Jan	-0.0002 (-0.12)	-0.0010 (-0.24)	0.0005 (0.42)
Feb	-0.0005 (-0.26)	-0.0017 (-0.41)	0.0001 (0.09)
Mar	0.0025 (1.26)	0.0050 (1.34)	0.0006 (0.49)
Apr	0.0054 (2.82)*	0.0103 (2.45)*	0.0021 (1.75)**
May	-0.0027 (-1.42)	-0.0072 (-1.70)**	0.0003 (0.25)
Ramadan	0.0007 (0.57)	0.0025 (1.11)	0.0004 (-0.57)
AR	0.9006 (14.38)*	0.2290 (3.20)*	0.8808 (15.96)*
MA	-0.6901 (-6.52)*		-0.5395 (-5.49)*
R-squared	0.35	0.27	0.39
S.E of Regression	0.01	0.01	0.00
Durbin-Watson stat	2.04	1.84	2.03
F-stat	7.39*	5.54*	8.71*
Serial Correlation LM Test	0.44	1.02	0.46

Source: Authors' estimation

Note: The values without parenthesis are the coefficients obtained from ARIMA model estimations whereas the values in the parenthesis are t-statistic.

Values with * and ** represent that the t -statistic are significant at 5% and 10% level of significance respectively.

Specified Estimated Model: Specified AR and MA models for CPI General and CPI non-food are AR(1) and MA(1), whereas for CPI food specified AR model is AR(3)

Table A3: Seasonality in Gregorian and Islamic Calendar Months

Model 3 (Assigning value 1 to Ramadan month dummies with atleast 10 reporting days)

	Consumer Price Indices (CPI)		
	General	Food	Non-Food
Jun	0.0054 (2.90)*	0.0050 (1.70)**	0.0056 (4.21)*
Jul	0.0074 (4.01)*	0.0122 (2.92)*	0.0040 (3.56)*
Aug	0.0043 (2.29)*	0.0080 (1.94)**	0.0018 (1.57)
Sep	0.0025 (1.31)	0.0052 (1.42)	0.0004 (0.34)
Oct	0.0034 (1.77)**	0.0065 (1.56)	0.0010 (0.80)
Nov	0.0008 (0.41)	0.0030 (0.72)	-0.0008 (-0.65)
Dec	-0.0042 (-2.13)*	-0.0099 (-2.39)*	-0.0003 (-0.27)
Jan	0.0004 (0.19)	-0.0001 (-0.03)	0.0006 (0.50)
Feb	0.0001 (0.05)	0.0007 (-0.16)	0.0002 (0.17)
Mar	0.0031 (1.59)	0.0059 (1.59)	0.0007 (0.59)
Apr	0.0054 (2.89)*	0.0102 (2.44)*	0.0021 (1.74)**
May	-0.0027 (-1.45)	-0.0071 (-1.70)**	0.0003 (0.26)
Ramadan	-0.0037 (-2.23)*	-0.0043 (-1.29)	-0.0019 (-1.87)**
AR	0.8944 (14.17)*	0.2294 (3.23)*	0.8817 (16.15)*
MA	-0.6700 (-6.27)*		-0.5354 (-5.47)*
R-squared	0.36	0.27	0.40
S.E of Regression	0.01	0.01	0.00
Durbin-Watson stat	2.01	1.77	2.02
F-stat	7.90*	5.69*	9.08
Serial Correlation LM Test	0.08	2.49	0.26

Source: Authors' estimation

Note: The values without parenthesis are the coefficients obtained from ARIMA model estimations whereas the values in the parenthesis are t-statistic.

Values with * and ** represent that the t -statistic are significant at 5% and 10% level of significance respectively.

Specified Estimated Model: Specified AR and MA models for CPI General and CPI non-food are AR(1) and MA(1), whereas for CPI food specified MA model is MA(3)