MEAT PRICE HIKES AND IT`S FORECASTING IN PAKISTAN

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ABSTRACT

Meat production is one of the major activities of Pakistani Livestock Sector. Currently owing to changing lifestyle and awareness regarding Balanced diet, meat demand has drastically increased. On the other hand increasing Pakistani meat export has reduced the supply of meat for local Pakistani consumers. This scenario has led to an exponential increase in meat prices during last decades and this trend is continuously in progress. Present study is an attempt leading to empirical modeling and forecasting of meat production and meat price index to access it`s future implications upto the year 2020. The data used in this study was collected from secondary sources such as Economic Survey of Pakistan, Federal Bureau of Statistics, FAO and MinFAL sources etc. Auto regressive integrated Moving Average (ARIMA) model was applied on the collected data. Various diagnostic checks were carried out for analysis of data which showed that ARIMA (4,2,4) is an appropriate model for the time series data of meat production and price index from the year 1991 to 2008. Further diagnostic checks using NPar test exhibited that upto the year 2020; there will be a significant increase in the price index of meat. The study suggests the need for immediate policy measures and actions from the policy parlors of Pakistan.

Key words: ARIMA model, Meat prices, Pakistan.

INTRODUCTION

Regardless of the nature of economy, agriculture sector plays a pivotal roles in the economic development of the developing countries like Pakistan. "In Pakistan agriculture sector continues to play a central role in it`s economy. It is the second largest sector, accounting for over 21 percent of GDP. However, Livestock is the single largest contributor to overall agriculture i.e. 53.2 percent (Anonymous, 2009-10). Pakistan has a huge population of livestock in the country due to it`s unique environment and geographical location as evidenced by the fact that Pakistan has the second largest Buffalo population in the world (PBIT, 2011). Pakistani meat has a unique taste that`s why it is being exported to many countries predominantly Arabian countries including Saudi Arabia, Kuwait, UAE, Oman, Qatar, Bharain and some others. This export has a continuous increasing trend as there is around 56 % increase in meat export from Pakistan as compared to the previous years. Pakistan is also exporting the live animals and earning around US$ 13.95 million from their export (Anonymous 2009-10). This situation has resulted in less meat availability for local Pakistani population.

On the other hand, the population growth, increase in per capita income and export revenue is fueling the demand of livestock and livestock products and population growth, urbanization and income growth in developing countries are fuelling a massive global increase in demand for food of animal origin (Delgado and Rosegrant, 1999). The demand and supply gap in meat production in Pakistan is estimated to grow at 4.1% per annum (PBIT, 2011). A sharp increase in global commodity prices, mainly related to food and energy, noticed in early 2009, has exerted strong upward pressure on the domestic price level. In Pakistan Food inflation has remained elevated in the past few months, stabilizing at around 14,5%" (Anonymous, 2009-10). This demand and supply gap has resulted in soaring meat prices for local people as evident from continuous increase in meat prices in Pakistan

MATERIALS AND METHODS

The study was based on time series data related to prices of meat (1991-2008), which was collected from economic survey of Pakistan. The data thus was thoroughly edited and discrepancies were removed before it`s use to make forecasts for the meat price hikes in Pakistan.

Forecasts can be obtained by various methods such to purely judgmental approval, Structural econometric models, invariant time series models or in combination (Bessler Chamberlain, 1989); (Olorunnipa 1989) and (Rosa, 1990). Univariate time series methods are usually cheaper than causal models and may be used where casual models are inappropriate due to pack of data or incomplete knowledge regarding the casual structure. From a class of univariate time series models we have made a choice of auto regressive integrated moving average (ARIMA) model for making meat price

forecasts. ARIMA model are marginally superior to conventional econometric forecasting models (Miller, 1985); (Albiac, 1989) .

The acronym ARIMA stands for Auto Regressive Integrated Moving Average Model showing a combination of auto regressive and moving averages models. Lags of the differenced series appearing in the forecasting equation are called auto regressive terms. Lags of the forecast errors are called moving averages and a time series which need to be differenced is said to be an integrated version of stationary series. The autoregressive (AR) , Randoms were first introduced by (Yule, 1926) and were generalized by (Walker, 1964). The moving average (MA) models were first introduced by (Chatfield 1984); and the later provided the theoretical foundations to a combined ARIMA process. The basis of ARIMA approach of (Box and Jenkins, 1970) consisted of three phases namely identification (specification), estimation, testing and application (forecasting). This method has been used extensively in economic research (Zhang, 1986) and (Muhammad, Bashir, 1992). ARIMA model explains the movement of a time series. Unlike the regression model, here a set of explanatory past values and to weighted average of current and lagged random distributions are used (Muhammad and Bashir, 1992). According to (Box and Jenkins 1970), the ARIMA model is denoted by ARIMA (p,d.q),, where 'p' is the order of the autoregressive process, 'd' is the order of homogeneity i.e. the number of difference to make the series stationary and 'q' is the order of the moving average process. These are the mixture of AR and MA process or models. The time series x_t for

$t = 0, \square\square 1, \square\square 2, \square\square$. is said to be ARMA (p, q) if x_t is stationary and

$x_t \square\square\square \phi_1 x_{t-1} \square\square\square \phi_2\ x_{t-2} \square\square\ ....\square\square\square \phi_p\ x_{t-p} \square\square$
$w_t \square\square\square \theta_1 w_{t-1} \square\square\ ..\square\square\square \theta_q\ w_{t-q}$

The parameter p and q are called the auto regressive and moving average orders. If x_t has non-zero mean $\square\mu$ then ARMA (p, q) can be written as given bellow

$x_t \square\square\square \alpha \square\square\square \phi_1 x_{t-1} \square\square\square \phi_2\ x_{t-2} \square\square\ ..\square \phi_p\ x_{t-\ p} \square\square$
$w_t \square\square\square \theta_1 w_{t-1} \square\square\ ..\square\square\square \theta_q\ w_{t-q}$

The ARMA models become AR if q=0 and if p=0 these become MA models. The
ARMA models can be written as bellow:
$\phi\square\square\ B\square\ x_t \square\square\square \theta\square\square\ B\square\ w_t$

For the specification and estimation of model edited time series data were analyzed by using the "SPSS" package. The results thus obtained were put to various diagnostic checks like Residual analysis, Normality tests and Goodness of fit. Bsed on these analyses, forecasts for the coming 10 years (i.e. upto 2020) were worked out.

Assumptions: To make the projections more precise and realistic, certain assumptions were made as under:
1. Absence of exogenous disturbances such as war, social upheavals and abnormal climatic conditions.
2. The relative price structure and policies regarding meat and other meat products will remain unchanged during the projected period.
3. The projections will take into account those measures which have already been decided upon under the Government policy.

RESULTS AND DISCUSSION

Stationarity Test

		Pakistan
Level	Co-efficient	
	P- Value	
First Difference	Co-efficient	
	P- Value	
Second Difference	Co-efficient	-3.991
	P- Value	0.034

From the above table it is concluded that meat prices become stationary at the second difference, so ARIMA Model will be used at d=2. (It was checked by Eviews software Version 5)

Step 1. Model Specification: The model specification was automatically made by the SPSS package. Parameters p, d. q were determined and ARIMA (4,2,4) was considered an appropriate model.

Step 2. Model Estimation: The brief output of the estimation is as under

Final Estimates of Parameters		Estimates	Std Error	T	Approx Sig
Non-Seasonal Lags	AR1	.813	5.711	.142	.891
	AR2	.159	3.408	.047	.964
	AR3	-.765	3.956	-.193	.853
	AR4	.098	5.175	.019	.985
	MA1	1.507	47.150	.032	.976
	MA2	.346	25.848	.013	.990
	MA3	-1.494	51.620	-.029	.978
	MA4	.580	25.139	.023	.982
Regression Coefficients	production	.074	.037	2.019	.090
	Constant	1.248	.626	1.994	.093

Step 3. Diagnostic Checking: Different diagnostic checks were applied on the estimated model. Time series plot of residuals of the estimated model did not show any trend, indicating that the model was fitted properly. In order to find the fitness of model, two normality tests i.e.

normality test 1 and normality test 2 (NPAR Test) were carried out. In normality test 1 normal scores of residuals when plotted vs residuals, gave almost a straight line which was an indication of normality. In normality test 2, histogram of the residuals was determined that showed the results were very close to normality.

Melard's algorithm was used for estimation.

$$y_{MPI.PK} = 1.248 + 0.813\,y_{t-1} + 0.159\,y_{t-2} - 0.765\,y_{t-3} + 0.098\,y_{t-4} + 1.507\,z_{t-1}$$
$$+ 0.346\,z_{t-2} - 1.494\,z_{t-3} + 0.580\,z_{t-4} + 0.074\,X_{M\,Pr}$$

The ARIMA Model is

In addition, plot of residuals vs fitted values depicted that patterns of any kind were absent hence model was a good fit. The graph of the original and fitted values and forecasts of meat price are given. It is apparent from the graph that the forecasts are acceptable, as observed and fitted values overlap to a greater extent. The model ARIMA (4,2,4) was found appropriate for the data from 1990-2008. Forecasts for the next 10 years (up to 2020) and their 95% confidence intervals are given. From the given model meat price can be calculated by putting the concerned values in this model.

The results of this study reveal that the prices of meat for the local consumers will keep increasing day by day and may be unaffordable by the year 2020. So it will reduce meat consumption indirectly; which is evident by the findings of (Delgado and Courbois 1998) as per capita meat consumption in 2020 is projected to remain low in Sub-Saharan Africa, partially vegetarian India, and other countries in South Asia. These findings are in line with the findings of other workers. As (Delgado and Courbois, 1998) briefly surveyed elasticities from several rigorous econometric demand analyses that included disaggregated animal products demand using multi-year samples and national level data for individual countries. They found a consumption response to own prices for meats of - 0.5 to -1.0, suggesting that price responsiveness within countries is much higher than across countries.

The prices of meat are becoming increasingly variable as per findings of (Delgado and Rosegrant, 1999). According to them world prices differ from domestic ones by means of fixed price wedges specified for each country group that catch the effect of protectionist policies or major transport costs to remote markets. Domestic prices in equilibrium may always be above or below the world prices for meat and feed, depending on the country group in question, but they are always affected in the model by movements in world prices."

In view of the above situation, if solid policies are not adopted there will be much less meat available for local consumers as evident by soaring meat prices. This finding is as per the findings of other researchers like

(Delgado and Rosegrant, 1999) beef is projected to become the most significant meat import of developing countries in 2020, at 2.7 million metric tons net (Delgado and Rosegrant, 1999).
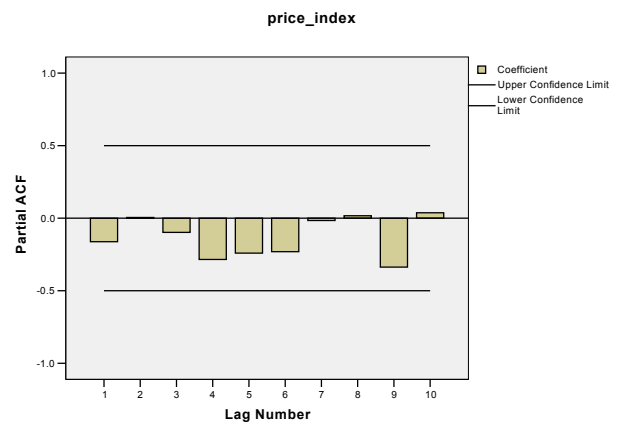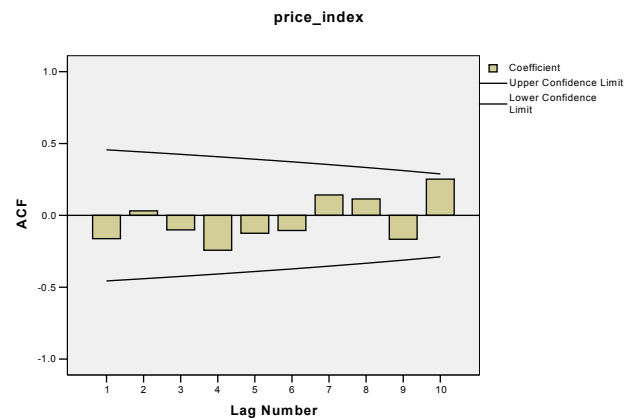
Conclusions and Suggestions: Future forecasts exhibited that up to the year 2020, there will be a significant increase in the meat prices for local consumers of Pakistan. These forecasts were based on past data which were affected by the situations like trade policy, agricultural policy and international market. So efficient and increased production and prudent Governmental policies regarding meat and live animal export as well as local demand management are the only solutions. Following steps should be helpful in this respect.

- 　　Production of meat: The meat production must be enhanced to a level where after meeting the local demand extra meat could be exported without affecting local meat supply. And if such production is not possible so export of meat must be regulated keeping in mind the requirements of local consumers.

- The policy regarding live animal export must be revised keeping in view of local consumption levels.
- The urgent measures must be adopted for introduction and development of meat breed in Pakistan.
- The animal farming must be managed on the modern scientific principles to get an increased meat production per animal.
- 　Government initiatives on improving the livestock sector must be implemented in letter and spirit.
- There is a need to create awareness among the farmers and to educate them to enable them to realize optimum production from animals through modern techniques.
- Liberal credit facility should be provided to farmers to enable them to buy the necessary farm machinery and needed equipments.
- Replacement of outdated machinery with new modernized machinery is need of the day to increase production.

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