TIME SERIES ANALYSIS OF WHOLESALE AND RETAIL EGG PRICES
IN MAJOR MARKET CENTRES OF SOUTH INDIA

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ABSTRACT
A study was carried out to analyse the trend, seasonal and spatial variations in wholesale and retail egg prices in major market centres of South India. The data on monthly average wholesale NECC prices of egg from major market centres of South India viz., Namakkal, Hyderabad, Nellore, Vijayawada and Mysore and monthly average retail NECC prices of egg from major consumption centres of South India viz., Bangalore, Chennai and Mumbai for the period from August 2000 to July 2009 were collected from various secondary sources. The slope of linear trend equations revealed that the wholesale egg price hiked at rate of four-fifth of a paise per month. The retail egg price trend equation fitted for major consumption centres of South India revealed that the egg price had increased by 0.79 to 0.81 paise per egg. The intercept of trend equations was more (Rs. 99.84 to 107.05) for retail price when compared to the wholesale price (Rs. 92.33 to 96.79). The monthly price indices of egg price in various market centres of South India inferred that the price indices of all the observed centres coincides with each other over various months. The monthly egg price index was observed to be the minimum during the months of March and April and started increasing to reach peak during the month of June. Further, it started decreasing and reached lower value during the months of August and September. The monthly price index was found to increase to reach higher index values during the months of November to January. The seasonal wholesale/retail egg price index was found to be the highest during the month of November and December and the lowest during the month of April.

Key words: Egg price, Trend variation, Seasonal variation Spatial variations.

INTRODUCTION
Increasing disposable household income will continue to result in an expansion in the production and consumption of eggs in Asia. By the year 2010 over 60% of the world’s population will live in Asia; furthermore, the growth in disposable income and purchasing power coupled with rapidly changing food habits will make eggs one of the more popular protein-rich foods with both the rural and urban populations in Asia (Iddamalgoda et al., 2001). Indian poultry sector witnessed drastic growth rate during the last two decades because of its comparative advantage (nutritional, economic and availability) over its substitutes. Among different countries in the world, India ranked fifth in chicken (400 millions) population in the year 2005 (FAO, 2006). In India, poultry sector contributed 51 billion eggs with the per capita availability of 42 eggs per annum in the year 2006-07 (Economic Survey, 2007-08). The perusal of the annual growth rate of eggs between the years 1997-98 to 2006-07 implied that egg production had an impressive growth rate of 6.65 per cent. The consumption of the egg depends mainly on the price of the egg and income.
status of the consumers. Egg marketing is regularized by National Egg Co-ordination Committee (NECC) by fixing the wholesale and retail price of eggs especially in various production and marketing centres of India. The Southern states like Andhra Pradesh and Tamil Nadu, which are considered as the Indian Poultry belts play a major role in egg price variations throughout the country. Hence, the time series analysis of wholesale and retail egg prices in major market centres of South India will be useful in giving a scenario on their future demand and supply, which in turn would aid in suggesting suitable policy implications for the betterment of egg producers and consumers. In this context, the present study was carried out to analyse the trend, seasonal and spatial variations in wholesale and retail egg prices in major market centres of South India.

MATERIALS AND METHODS

The data on monthly average wholesale NECC prices of egg for major market centres of South India viz., Namakkal, Hyderabad, Nellore, Vijayawada and Mysore and monthly average retail NECC prices of egg for major consumption centres of South India viz., Bangalore, Chennai and Mumbai for the period from August 2000 to July 2009 were collected from various secondary sources.

Price trend: To identify the price trend, scatter diagram was examined taking time in X-axis and monthly wholesale and retail egg price in Y-axis. Since, the scatter diagram exhibited straight-line relationship, the following form of linear trend equation was fitted for the present study similar to previous studies by Seema (1990), Rajendran et al. (1991) and Pandian et al. (2004).

\[ P = a + bt + \mu \]

where, P - Monthly average wholesale / retail NECC egg price in paise
a - Intercept to be estimated
b – Slope / Regression parameter to be estimated
t - Time in months (t = 1 for August 2000, t = 2 for September 2000........., t = 108 for July 2009) and
\[ \mu - Error \text{ term.} \]

Seasonal variation in mutton prices

For the present study, to find out the seasonality in wholesale / retail egg prices using multiplicative model, classical decomposition through centered moving average method was used because of its accuracy and forecasting ability. Similar methodology has been adopted in the previous studies of Mani et al. (1995), Mondal and Pandey (1995) and Pandian et al. (2004).

Multiplicative model : 
\[ X_t = T_t \times S_t \times C_t \times I_t \]

where, \( X_t \) - Wholesale / Retail price of egg at time ‘t’
\( T_t \) - Trend component
\( S_t \) - Seasonal component
\( C_t \) - Cyclical component and
\( I_t \) - Irregular component.

Classical Decomposition method : 
\[ \frac{T_t \times S_t \times C_t \times I_t}{T_t \times C_t \times I_t} \]

By calculating the moving average, ‘\( T_t \times C_t \)’ was separated and by taking average, centered moving average was constructed, thereby ‘\( I_t \)’ was also separated and finally the seasonal index ‘\( S_t \)’ was obtained.

RESULTS AND DISCUSSION

Price trend: The trend values obtained by using a linear trend equation of wholesale egg prices for various production and market centres of South India and retail egg prices for major consumption centres of South India are portrayed in Table 1. The Adjusted R² for the Wholesale price trend equations fitted for five major market centres of South India was found to be around 0.50 (0.46 to 0.54), which indicated that about 50 per cent of the variations in wholesale/ retail egg prices in different market centres of South India were due to the trend component of time series. The result concurs with the previous study by Mani et al. (1995).

The slope of linear wholesale price trend equations revealed that the unit egg price increased by 0.83 paise every month in Nellore compared to 0.80 paise in Mysore, 0.79 paise in Namakkal, 0.75 paise in Hyderabad and 0.71 paise in Vijayawada.
The monthly hike in different market centres was ranging from 0.71 to 0.83 paisa and further explained that in general, the wholesale egg price hiked at rate of 0.80 paisa per egg every month. The positive slope of wholesale price trend equation could be due to rising demand, driven by increasing population pressure, confined poultry belt in southern states, high standard of living, more per capita income, awareness about the nutritional status of egg, etc. The egg price could also rise due to decrease in supply which might be due to factors like failure in timely replacement of layer stock, pressure due to sudden export orders and abnormal fluctuations in price of poultry feeds, disease outbreaks, etc.

The retail egg price trend equation fitted for major consumption centres of South India revealed that the egg price increased by 0.79 paisa per month in Chennai and Bangalore and 0.81 paisa in Mumbai. The price hike was observed to be high in Mumbai compared to Chennai and Bangalore, which might be due to its distance from the egg production centres (higher marketing cost) and comparatively higher spending habit of the people in Mumbai. The intercept of trend equations was more (99.84 to 107.05) for retail price when compared to the wholesale price (92.33 to 96.79).

Seasonal variations in egg price

The monthly price indices of egg price in various market centres of South India was depicted in Figure 1. The figure inferred that the price indices of all the observed centres coincides with each other over months. This clearly indicated that the seasonal variations in the egg price index were almost similar irrespective of the location (market centres) and type of market (wholesale and retail price). The reason for uniformity in price behaviour might be due to the organized egg marketing method and uniform price fixation procedures by NECC. Thus the variations in the price index during various months solely depend upon the changes in demand surpassing all the other related factors. The egg price index was observed to be the minimum during the months of March and April and it started increasing to reach the peak during the month of June. Then, it started decreasing to reach lower value during the months of August and September. The price index was found increasing to reach higher index values during the months of November to January. The fluctuation in the price index contradicts the previous findings of Mani et al. (1995). However, the distinct seasonality in egg price indices (the lowest in Summer season and the highest in Winter season) observed in this study was exactly similar with the results of the study conducted by World Bank (1999).

<table>
<thead>
<tr>
<th>Place</th>
<th>Wholesale egg prices in major market centres of South India</th>
<th>Adjusted $R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Namakkal</td>
<td>$P = 96.79 + 0.79^{**} t + \mu$</td>
<td>0.5115</td>
</tr>
<tr>
<td>Hyderabad</td>
<td>$P = 92.33 + 0.75^{**} t + \mu$</td>
<td>0.4723</td>
</tr>
<tr>
<td>Nellore</td>
<td>$P = 95.49 + 0.83^{**} t + \mu$</td>
<td>0.5438</td>
</tr>
<tr>
<td>Vijayawada</td>
<td>$P = 94.57 + 0.71^{**} t + \mu$</td>
<td>0.4641</td>
</tr>
<tr>
<td>Mysore</td>
<td>$P = 96.33 + 0.80^{**} t + \mu$</td>
<td>0.5215</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Place</th>
<th>Retail egg prices in major consumption centres of South India</th>
<th>Adjusted $R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangalore</td>
<td>$P = 99.84 + 0.79^{**} t + \mu$</td>
<td>0.5208</td>
</tr>
<tr>
<td>Chennai</td>
<td>$P = 104.83 + 0.79^{**} t + \mu$</td>
<td>0.5044</td>
</tr>
<tr>
<td>Mumbai</td>
<td>$P = 107.05 + 0.81^{**} t + \mu$</td>
<td>0.5124</td>
</tr>
</tbody>
</table>

** - significant at 1 per cent level

P - Wholesale / Retail price per egg in paisa

$\mu$ - Error term

Table 1: Trend in wholesale / retail egg prices in major market centres of South India.
The seasonal wholesale/retail egg price indices calculated by centered moving average method for various market centres of South India is given in Table 2. Among different months, egg price indices seemed to be the highest during the month of November in Namakkal (110.65), Nellore (112.06), Mysore (110.76), Bangalore (112.23) and Chennai (110.97). However, the egg price indices was the highest during the month of December in Hyderabad (115.63), Vijayawada (113.96) and Mumbai (113.50). The results clearly revealed that the wholesale and retail price indices in observed centres of South India touched the peak during the November and December which might be due to the increased demand for egg during the Winter season. The demand for egg during the month of November and December may also be high due to occurrence of many religious festivals like Diwali, Bakrid, Christmas, New year, etc.

Perusal of monthly price indices of egg, further revealed that the price indices were appeared to be the lowest during the month of April in all the observed market centres of South India. The factors like hot climate (psychologically, it is believed that egg consumption results more body heat production) and school and college examinations during months of March and April, might indirectly slack down the demand for egg during these months. However, the
price index was observed to increase from April to June due to existence of summer holidays. Demand for egg started increasing during the month of May, which might be due to Summer Holidays. The price index during the month of June was observed to increase further, due to increase in egg demand especially institutional demand for school and college hostels and Noon-meal scheme, following the comparatively lower demand during the months of April and May.

**CONCLUSION**

The linear price trend equation was fitted for wholesale and retail egg prices in major market centres of South India and it revealed that in general, the wholesale egg price hiked at rate of 0.80 paise per egg per month. The positive slope of wholesale price trend equation could be due to increasing demand driven by rising population pressure, confined poultry belt in southern states, high standard of living, rising per capita income, awareness about the nutritional status of egg, etc., The retail egg price trend equation fitted for major consumption centres of South India revealed that the unit egg price was increased by 0.79 paise per month in Chennai and Bangalore and 0.81 paise in Mumbai. The intercept of trend equations was more (99.84 to 107.05) for retail price when compared to the wholesale price (92.33 to 96.79). The monthly price indices of egg price in various market centres of South India inferred that the price indices of all the observed centres coincide with each other over various months. The monthly egg price index was observed to be the minimum during the months of March and April and reached the higher index during the month of June. Further, it started decreasing to reach lower value during the months of August and September. The monthly price index was found to increase to reach higher index values during the months of November to January. The seasonal wholesale/retail egg price index was found to be the highest during the month of November and December and the lowest during the month of April.

**REFERENCES**