

## *Chapter 4-Onion Price- Production Relationship*

### **4.1 CONCEPT OF PRICE-PRODUCTION RELATIONSHIP MODEL**

Onion price - production relationship is examined with the main objective of finding a possibility of production planning. If the local or market production (Lasalgaon market arrival) is an important determinant of the local prices (Lasalgaon market prices) then production quantity can be planned so as to have the required onion supply to stabilize prices and derive optimum returns. Onion prices are determined by local factors as well as national factors. Local factors mainly include the arrivals in a particular market and national factors include factors like the supply from other states, the demand, the export price, export quantity etc. Therefore a statistical model which first separates out the impact of all national factors (which are reflected by the national price index of onions) from market prices, and then the residuals of prices of this model are taken as dependent on the market or local production. This model brings forth the importance of local production on influencing prices. Further, a model which takes into account the impact of both factors i.e. the national price index of onion and the local production simultaneously on influencing local prices is examined with the objective of formation of a price prediction equation which will be required for storage policy. To assess the benefits from the storages, prices of the stock release months need to be predicted. For predicting the prices, the equation which takes into account all the factors (like national price index as well as local production) influencing prices is applied. The relationship between current year onion production and previous year onion prices is examined with the purpose of predicting the current year production. For such prediction, simple linear regression of Maharashtra state current year production on lag of national onion price index is examined.

### **4.2 MODEL FOR ESTABLISHING MARKET PRICE AND MARKET ARRIVAL RELATIONSHIP**

The national onion price index is determined by two factors, the total onion supply and total onion demand. Since markets are integrated without large price difference, it is assumed that prices in local markets (here Lasalgaon) move as per the national onion price index. Therefore, local market prices are influenced by two types of factors; 1) market or local factors, 2) national factors. Market factors mainly include the supply of onion by the nearby farmers in local markets (Lasalgaon arrivals) which is reflected by the quantity of

market arrivals. Whereas the national level factors affecting prices get reflected in the national price index of onions. Since the local prices are very much related to the national price index, the impact of all these national level factors on local market prices can be examined by a simple linear regression of market prices on national price index.

#### 4.2. 1 INFLUENCE OF ONION NATIONAL PRICE INDEX ON MARKET ONION PRICES

A model of monthly market prices dependent on monthly onion national price index (base 2004-05) would indicate the influence of national factors on the local prices. The three market viz. Lasalgaon, Pimpalgaon and Nashik monthly data of arrivals and prices is examined. The common period for the three markets selected is from year 2000 to 2009, the period of 10 years with total 120 observations each. Model No.3,  $P = a + bI$ , where: P is local monthly price of onions in market (Rs. per quintal) and I is the monthly national index of onion prices (Base: 2004-05); a and b are regression coefficients.

Table 4.1: Regression Results showing the Influence of National Onion Price Index on Local Onion Prices during 2000 to 2009.

Dependent variable	Markets	Constant term	Independent variable (National Onion Price Index)	Overall Significance of model	R <sup>2</sup>
Local Monthly Price (Rs./Qtl.)	Nashik	-177.50 (-6.18)	3.93 (24.97)	0.00	0.84
	Lasalgaon	-160.02 (-4.40)	3.89 (19.51)	0.00	0.76
	Pimpalgaon	-167.52 (-5.07)	3.98 (21.93)	0.00	0.80

Figures in parentheses are the values of the 't' statistic  
 Number of observations is 120 in each case.  
 P-value significant at 0.01 levels

It is clear from the regression statistics (table 4.1) that there is large influence of the national price index on local prices. In other words local prices are significantly influenced by national level factors.

#### 4.2.2 INFLUENCE OF MARKET ARRIVALS ON MARKET PRICES

In order to remove the influence of the onion national price index from the market prices, the errors of model number 3 are examined and are regressed on local arrivals. It is assumed that the deviations or the residuals of the local prices (after removing the national price index influence) are the result of local factors, under which the arrivals or the market

supply is an important factor determining prices. Therefore the price residuals of the above models are considered as dependent on local arrivals.

In order to examine the linear relationship, different forms of the variables are tested. Variables (in their original form) explain the linear relationship in best possible way therefore change of variables into logarithms is avoided.

Model No. 3.1:  $Pr=a+bA$ , where: Pr is the price residual (Rs. /Quintal) of model 3 and A is arrival (in quintals): a and b are coefficients.

Table 4.2: Regression Results showing the Influence of Arrivals on the Price Residuals of Model no. 2 during 2000-2009.

Dependent variable	Markets	Constant term	Independent variable (Arrivals in qtl.)	Overall significance of model	R <sup>2</sup>
Residual prices of model no. 3	Nashik	5.53 (0.22)	-0.00023 (-0.25)	0.88	0.0005
	Lasalgaon	112.32 (2.93)	-0.00044* (-3.11)	0.00	0.07
	Pimpalgaon	129.06 (4.16)	-0.00053* (-4.47)	0.00	0.14

Note: Figures in parentheses are the values of the 't' statistic

Number of observations is 120 in each case.

\*P-value significant at 0.01 levels

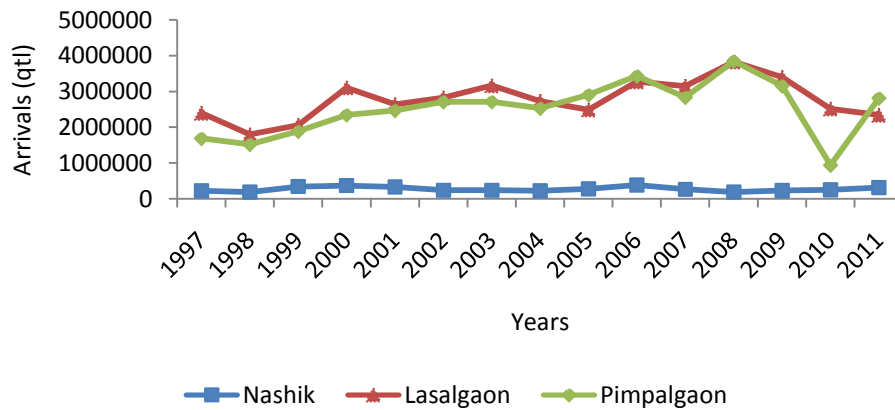
#### OBSERVATIONS:

The regression statistics (P-value) of Lasalgaon and Pimpalgaon are significant but for the Nasik market, the results are not significant. The arrival coefficient is negative but the t-statistic is not significant. The price arrival relation is not significant in Nasik market. The reason for this is that in Nasik market mainly export traders bring their produce for trading. Nasik market has very small quantity of arrivals as compared to other two markets. Further, nearly 80 percent of the packed and graded produce is exported from Nasik. Since there is compulsion of packing and grading, farmers are reluctant to bring their produce in Nasik market. But traders and exporters respond to export demand by selling the produce at prices prevailing at national level. Hence, stocks are released as per the export demand and export prices.

Lasalgaon and Pimpalgaon are the main producing areas where bulk of onion is produced, whereas Nasik is a city area and an assembling market. Hence the impact of local

arrivals on dampening prices is more in case of Lasalgaon and Pimpalgaon than Nasik. Figure 4.1 shows the yearly quantity of onions in the three selected markets. It is clear that the quantity in Nasik market is lower than the other two markets.

Figure 4.1: Onion Yearly Arrivals in Selected Markets, 1997 to 2011



Market	Effect of 100 tons of Arrivals
Lasalgaon	-0.43
Pimpalgaon	-0.52

Note: Equation for calculating the effect of 100 tons of arrivals = arrival coefficient\*1000.

The table 4.3 brings out the impact of local arrivals in influencing the prices. The prices reduce by Rs. 0.40 to 0.50 (rounded off) for addition 100 tons of arrivals.

#### 4.3 INFLUENCE OF NATIONAL PRICE INDEX AND MARKET ARRIVALS ON MARKET PRICES

A model of local prices dependent on national price index and local arrivals (both simultaneously) is also examined to derive the price prediction equation.

The three markets: Lasalgaon, Pimpalgaon and Nasik data on monthly prices and monthly arrivals is selected with a common period of 2005-2009, i.e. the period of 5 years with 60 observations each.

Model no. 4:  $P = a + bI + cA$ , where: P is local price of onions in local market (Rs. per quintal) and I is the monthly national index of onion prices (base: 2004-05) and A is the monthly arrivals of onion (quintals); a, b and c are regression coefficients.

Table 4.4: Regression Results showing the Influence of Onion National Price Index and Onion Arrivals on Onion Prices during 2005 to 2009

Dependent Variable	Markets	Constant Term	Independent Variable 1- National Price Index	Independent Variable 2- Arrivals (qtl.)	R <sup>2</sup>
Local Monthly Prices (Rs./qtl)	Nashik	9.94 (0.13)	4.38 (14.40)	-0.0038 (-2.53)	0.81
	Lasalgaon	243.13 (1.89)	3.644 (7.52)	-0.00067 (-2.15)	0.55
	Pimpalgaon	219.21 (1.99)	3.968 (10.27)	-0.00078 (-3.14)	0.74

Figures in parentheses are the values of the 't' statistic

Number of observations is 60 in each case.

P-value significant at 0.01 levels

Overall significance of all regression is 0.00.

Onion price prediction equation no. 2:  $P = 243.13 + 3.64 * ONPI + (-0.00067 * Arrival)$ .

On the basis of this regression, the impact of arrivals and national index on prices is calculated and summed up in table 4.5.

Table 4.5: Influence of National Onion Price Index and Arrivals on Onion Prices

Markets	Effect of 100 tones of Arrivals on Price	Effect of Increase in Index by 10
Pimpalgaon	-0.78	39.68
Lasalgaon	-0.67	36.44
Nasik	-3.82	43.84

Notes: Equation for calculating the effect of 100 tons of arrivals = arrival coefficient\*1000.

Equation for calculating the effect of National Index by 10 = National Index coefficient\*10.

Source: Author's own estimates.

The negative relationship of the local prices and the local arrivals indicate that for 100 tons of arrivals the prices fall by Rs. 0.70 to Rs. 0.80 (rounded off). Whereas the national price index has positive impact on local prices. Prices rise by Rs.36 to Rs. 40 with an increase in index by 10.

#### 4.4 MODEL FOR ESTABLISHING CURRENT YEAR STATE PRODUCTION AND LAGGED NATIONAL ONION PRICE INDEX RELATIONSHIP

A peculiar phenomenon of responding to prices received in previous year is very common amongst farmers. Previous year prices are a deciding factor of the current year's production. If prices were remunerative last year, then many farmers undertake onion cultivation in present year and if prices were not rewarding then farmers avoid cultivation of

the crop in the current year. On the basis of this analogy, the possibility of dependency of current year state production on previous year ONPI is examined by simple linear regression. A model of Maharashtra state production on lag of ONPI is examined for period 2006-07 to 2012-13, for 7 years with 7 observations.

Model no. 5:  $Prod_t = a + b(ONPI_{t-1})$ , where: Prod= the Maharashtra state yearly onion production (in '000MT),  $ONPI_{t-1}$  is the lag of yearly onion national price index (base: 2004-05), a and b are regression coefficients.

Table 4.6 Regression Results Showing the Influence of Lag of Onion National Price Index on Current Year State Production

Dependent variable	Constant	Independent variable	Overall Sig. of Model	R <sup>2</sup>
State Onion Production (000ton)	-83.45 (-0.11)	22.94 Lag of Price Index (5.92)	0.00	0.87

Note: Number of observations 7.

P- Value significant at 0.01.

Figures in the parenthesis indicate t values.

#### OBSERVATIONS:

As observed in table 4.6 the state onion production is significantly determined by the lag of national onion price index. 87 percent of production variation is explained by the regression model. As per the results of the model, the production forecast equation no. 3 is; State Prod= -83.45+22.94\*Lag of national price index.

#### 4.5 RESULTS:

- ❖ Market onion prices are dependent on market production as well as national price index of onion.
- ❖ Market prices are positively related with the ONPI. Price variation up to 84 percent is explained by the regression. ONPI impact is large on market prices i.e. a rise of Rs.44 in market prices for increase in index by 10.
- ❖ Market prices are negatively related with the market arrivals. Although the arrival coefficient appears small, (for 100 tons of arrivals the prices

fall by Rs. 0.42, Rs. 0.54 for Lasalgaon and Pimpalgaon respectively), but the arrival impact is significant.

- ❖ Current year state onion production is significantly determined by the previous year national onion price index. Production variation up to 87 percent is explained by the regression.