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REGRESSION ANALYSIS OF GRAPE, POTATO, AND TOMATO PRICES AT EL NOZHA MARKET, ALEXANDRIA, MONTHLY DATA, 1972-1981

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REGRESSION ANALYSIS OF GRAPE, POTATO, AND TOMATO PRICES AT EL NOZHA MARKET, ALEXANDRIA, MONTHLY DATA, 1972-1981[1]

By Jerry Foytik and Nabil Habashy

Price-quantity relationships for grapes, potatoes, and tomatoes sold at the El Nozha market are determined by regressional analysis of monthly data for 1972-1981. Several equations with price as the dependent variable were formulated to describe meaningful relationships presumed to exist on this market. All factors considered to have an important effect on price could not be included because the needed quantitative data were not available. Nevertheless, the computed equations do fit the empirical data well and do indicate how the price-making mechanism operates in response to changes in the variables used in the models formulated.

In brief, the results computed for the various equations indicate a negative price-quantity function and an upward trend in prices during 1972-1981. Furthermore, this function shifts considerably on a monthly basis. These monthly shifts form an orderly movement during the year rather than representing mere random fluctuations.

METHOD

Techniques of ordinary least squares (OLS) are used for relating price at the El Nozha market to the quantity sold (Q), trend (T), and monthly dummy variables (X_i). The X_i variables determine shifts in monthly levels of the price-quantity function. Only linear functions are formulated and computed.

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[1]An analysis of weekly prices for potatoes and tomatoes sold at the Rod El Farag market, Cairo, is reported in Working Paper No. 172 of this series.

These are fitted in pairs--with the median price (Y) and the minimum price (P) of the monthly range of prices as alternate dependent variables. For example, one equation for each commodity is expressed by

$$P = A + B_1Q + B_2T + C_1X_1 + C_2X_2 + . . . + C_nX_n.$$ [2]

The Durbin-Watson test indicates definite positive autocorrelation among successive observations for both potatoes and tomatoes, but not for grapes. Hence, first order autoregressive equations are fitted only for potatoes and tomatoes.

DATA USED

The monthly prices collected by the Egyptian Ministry of Agriculture give the price range separately for each month. These data provide the two price series used for the dependent variable. One is the low end of this monthly range, i.e., the minimum monthly price (P). The other is the median or average (Y) of the range.

Three principal independent variables are used. Quantity is represented by monthly sales as reported by the Ministry. Dummy variables are introduced for determining the month-to-month shifts in the level of the price-quantity function. Thirdly, a trend factor serves as a proxy for the average net effect of omitted variables.

Per capita income data for urban areas were supplied only on an annual basis when this analysis was made. They were used in equations for grapes, but not for potatoes and tomatoes. Since underlying conditions can change

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[2]For each such equation, a companion is computed using Y as the dependent variable. And, of course, a third equation for each set could have been fitted using the high prices of the monthly range. This is not done for no particular reason except to avoid increasing the number of equations fitted.

substantially during ten years, some equations are computed for subperiods of 1972-1981.

The monthly data used in the analyses are given in Tables A, B, and C which are placed at the end of the report. Monthly averages of the ten yearly values (for each month) are in the last column of each table. Averages at the foot of each column are annual averages for the months.

RESULTS FOR GRAPES

Table 1 summarizes the computed values for ten equations. Results for each equation relate price negatively to quantity (Q) and positively to per capita income (I) and to the time trend (T). The other results differ, sometimes markedly, depending on which price series represents the dependent variable. When Y is used, somewhat higher (and better) values are secured for R^2 and DW. Also, the price-quantity function declines as the season advances from June to September. If, on the other hand, the minimum price (P) is used, the price-quantity function is at a low point in June and increases to a higher level maintained during July-August-September.

Four of the equations include another shift variable to compare the levels of the net price-quantity function during 1972-1977 and 1978-1981. Its inclusion changes the net regression coefficients for the other independent variables without materially improving the fits as measured by R^2 values. Furthermore, the average levels are shifted in opposite directions depending on whether price is represented by Y or P. It may be desirable, therefore, to not consider these equations further.

TABLE 1: Grape Prices at El Nozha Market in Alexandria
Regression Analysis of Monthly Data, 1972-1981

Eqn.	Constant	Regression Coefficient							Supplemental Measure		
		Q	T	I	S	X_1	X_2	X_3	R^2	SE	DW
	Y as dependent variable										
1	23.946	- 8.526	19.96			36.04	23.48	15.81	.8128	28.49	1.63
		(1.3)	(11.9)			(1.9)	(1.6)	(1.1)			
2	47.417	-13.079	11.95	.2164					.8095	28.74	1.82
		(3.9)	(2.4)	(1.8)							
3	22.215	- 8.600	12.46	.1900		34.03	21.68	14.00	.8221	27.78	1.63
		(1.4)	(2.6)	(1.6)		(1.8)	(1.6)	(1.0)			
4	38.573	-12.947	13.36	.2533	-19.72				.8102	28.69	1.82
		(3.9)	(2.6)	(2.1)	(1.1)						
5	13.222	- 8.129	13.79	.2264	-19.10	34.54	20.80	13.19	.8228	27.72	1.61
		(1.3)	(2.8)	(1.9)	(1.1)	(1.9)	(1.5)	(1.0)			
	P as dependent variable										
6	41.001	-11.496	15.52			-24.02	2.37	3.00	.7546	24.00	1.31
		(2.1)	(11.0)			(1.5)	(0.2)	(0.3)			
7	19.499	- 4.513	8.46	.1656					.7713	23.18	1.30
		(1.7)	(2.1)	(1.7)							
8	39.415	-11.56	8.64	.1741		-25.86	0.73	1.34	.7704	23.22	1.42
		(2.2)	(2.1)	(1.8)		(1.7)	(0.1)	(0.1)			
9	30.576	- 4.68	6.70	.1192	24.70				.7829	22.58	1.59
		(1.8)	(1.7)	(1.2)	(1.7)						
10	51.534	-12.20	6.85	.1252	25.73	-26.55	1.91	2.44	.7848	22.48	1.77
		(2.4)	(1.7)	(1.3)	(1.8)	(1.8)	(0.2)	(0.2)			

Figures in parentheses are t-statistics for regression coefficients.
Measures R^2 and SE are adjusted for degrees of freedom.
Symbols used:
P - low of high-low range of monthly prices, LE per ton.
Y - middle of this range, LE per ton.
Q - monthly sales, in 1,000 tons.
T - time measured in years from 1971.
I - per capita urban income, LE per year.
S - shift variable indicating average level for 1978-1981 relative to 1972-1977 level.
X_1, X_2, X_3 - shift in level for June, July, and August, respectively, relative to September level.

Equation (3) is selected for added discussion. Separate monthly equations are specified by making appropriate changes in the constant term.[3] These equations are

$$Y = 56.25 - 8.60Q + 12.46T + 0.19I \quad \text{for June}$$

$$Y = 43.90 - 8.60Q + 12.46T + 0.19I \quad \text{for July}$$

$$Y = 36.22 - 8.60Q + 12.46T + 0.19I \quad \text{for August}$$

$$Y = 22.22 - 8.60Q + 12.46T + 0.19I \quad \text{for September}$$

Thus price is related negatively to sales and positively to income. Also the function shifts upward over time and declines as the season advances over the four-month period when grapes are marketed in large volume. About 82 percent of the variance in monthly prices during 1972-1981 is accounted for by fluctuations in sales and changes in the other variables in the formulation.

OLS RESULTS FOR POTATOES AND TOMATOES

Income is omitted as an independent variable because only annual data were available when the study was made. Hence the income effect is reflected indirectly, and possibly inaccurately, by the trend factor. This situation must be considered when the results are interpreted.

Only nine of the regression equations computed for potatoes are listed in Table 2. The equations relate price to different combinations of Q, T, S, and X_i. The first three fit P for the entire 1972-1981 period. The other six fit Y first for the entire period and then for only 1972-1979. Many comparisons can be made among results for these equations.

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[3] This is done by substituting values for the dummy variables: $X_1 = 1$ for June, $X_2 = 1$ for July, $X_3 = 1$ for August, and $X_1, X_2, X_3 = 0$ otherwise.

TABLE 2: Potato Prices at El Nozha Market in Alexandria
Regression Analysis of Monthly Data, 1972-1981

Eqn.	Constant	Regression Coefficient				Supplemental Measure		
		Q	T	S	X	R^2	SE	DW
	P as dependent variable, 1972-1981							
1	25.346	-.2571 (2.3)	.5772 (15.6)		a/	.7710	13.06	1.07
2	25.854	-.2551 (2.3)	.5561 (8.1)	1.726 (0.4)	a/	.7692	13.11	1.07
3	17.834	-.1349 (2.2)	.6470 (7.0)	-4.527 (0.7)		.5449	18.41	0.70
	Y as dependent variable, 1972-1981							
4	34.297	-.3154 (3.6)	.7206 (24.2)		a/	.8790	10.49	0.85
5	34.473	-.3148 (3.5)	.7133 (13.0)	.597 (0.2)	a/	.8779	10.54	0.85
6	24.228	-.1281 (2.3)	.7942 (9.2)	-5.490 (0.9)		.6794	17.08	0.56
	Y as dependent variable, 1972-1979							
7	30.167	-.1885 (1.7)	.7007 (17.0)		a/	.8332	10.31	0.73
8	30.534	-.1840 (1.7)	.6812 (11.0)	1.588 (0.4)	a/	.8316	10.36	0.73
9	24.356	-.0982 (1.7)	.7586 (8.6)	-2.591 (0.5)		.6167	15.63	0.53

Figures in parentheses are t-statistics for regression coefficients.
Measures R^2 and SE are adjusted for degrees of freedom.
Q - monthly sales, in 100 tons.
P, Y, S - have same meanings as indicated for Table 1.
X - shifts in monthly levels from average annual level.

a/ - Monthly shifts were computed for these equations. The following values for equations (1) and (4) are similar to those for other equations.

Month	Equation 1	Equation 4	Month	Equation 1	Equation 4
Jan	- 7.79	-11.20	July	- 3.81	- 0.64
Feb	-14.73	-14.64	Aug	6.14	3.54
Mar	-12.83	-10.59	Sept	19.44	14.29
Apr	-12.07	-10.46	Oct	20.09	24.08
May	-14.11	-14.09	Nov	24.61	30.41
June	- 8.05	-10.82	Dec	3.11	0.07

Examination of the tabulation leads to several conclusions. The shift variable S is not significant statistically since values for its t-statistic vary from 0.2 to 0.9. Hence, adding S to the formulation does not change very much the net regression coefficients for Q and T. It reduces slightly the adjusted value of R^2. On the other hand, introducing dummy variables for the months improves the fit considerably. Comparing the last two equations in each group of three shows that the R^2 value is raised by a third. Also, values for regression coefficients are doubled for Q and decreased 10 percent for T.

The monthly shifts in the price-quantity function are large and form a definite pattern. These shifts for equations (1) and (4) are shown in the footnote to Table 2. The shift is down by about LE 13 per ton during February-May and up by about LE 22 for September-November.

Table 3 lists results for the same nine equations fitted to the tomato data. Generally, the changes are similar, though smaller in magnitude, to those computed for potatoes. Using the shift variable S is more significant, particularly in equations (2) and (8). In these two equations, its inclusion increases the net regression coefficient of T by 14 percent but changes the coefficient of Q and the R^2 value only slightly.

Monthly shifts in the price-quantity function are substantial as for potatoes. However, for tomatoes they do not reveal a strong seasonal pattern. Also, they are not consistent for the two equations listed in the footnote to Table 3.

Among the OLS linear regressions computed, the best fits for both potatoes and tomatoes are the equations relating price to sales, a time trend, and monthly shifts. However, as already mentioned, the monthly changes determined for tomatoes form a somewhat erratic pattern and hence may be

TABLE 3: Tomato Prices at El Nozha Market in Alexandria
Regression Analysis of Monthly Data, 1972-1981

		Regression Coefficient				Supplemental Measure		
Eqn.	Constant	Q	T	S	X	R^2	SE	DW
	P as dependent variable, 1972-1981							
1	52.215	- 5.753 (7.4)	.5216 (14.5)		a/	.7438	13.36	1.48
2	49.367	- 5.702 (7.4)	.6114 (9.1)	-7.444 (1.6)	a/	.7473	13.23	1.50
3	62.247	- 7.306 (12.8)	.5924 (8.6)	-5.317 (1.1)		.7261	13.81	1.57
	Y as dependent variable, 1972-1981							
4	100.847	-11.069 (7.8)	.8267 (12.5)		a/	.6764	24.50	1.18
5	100.462	-11.061 (7.7)	.8409 (6.7)	-1.175 (0.1)	a/	.6734	24.61	1.18
6	101.217	-11.020 (10.2)	.8117 (6.2)	0.553 (0.1)		.6338	26.06	1.34
	Y as dependent variable, 1972-1979							
7	78.684	- 7.126 (9.2)	.6010 (13.1)		a/	.7551	10.92	1.28
8	76.382	- 7.067 (9.2)	.6690 (10.4)	-5.848 (1.5)	a/	.7588	10.84	1.30
9	77.924	- 7.239 (12.1)	.6626 (9.5)	-5.291 (1.2)		.6978	12.13	1.59

Figures in parentheses are t-statistics for regression coefficients.
Measures R^2 and SE are adjusted for degrees of freedom.
Q - monthly sales, in 100 tons.
P, Y, S - have same meanings as indicated for Table 1.
X - shifts in monthly levels from average annual level.

a/ - Monthly shifts were computed for these equations. The following values for equations (1) and (4) are representative of shifts for other equations.

Month	Equation 1	Equation 4	Month	Equation 1	Equation 4
Jan	2.79	1.47	July	-5.91	- 3.86
Feb	- 0.35	-10.41	Aug	-2.52	0.47
Mar	11.20	1.23	Sept	-5.63	- 8.31
Apr	13.90	9.16	Oct	0.08	3.94
May	- 1.69	30.94	Nov	-7.23	-13.66
June	- 5.45	- 8.49	Dec	0.81	- 2.48

difficult to interpret. Values for the Durbin-Watson statistic are low for all 18 equations. Therefore, autoregressive equations are computed in order to obtain more efficient estimators for the structural parameters.

AUTOREGRESSION

A first order autoregressive model is used to correct for the high autocorrelation remaining among the residuals for all equations given in Tables 2 and 3. Examination of the input data presented in Tables B and C reveals substantially higher prices during the later years of 1972-1981. Hence, the decade is divided into two subperiods of four years: 1972-1975 and 1978-1981.[4] The same linear equation, with Y as the dependent variable, is fitted for each period:

$$Y = A + B_1Q + B_2T + \Sigma C_iX_i.$$

This formulation is selected because Q, T, and X_i are the most important variables in the OLS equations. Each OLS equation is recomputed after adding the autoregressive coefficient rho. Thus, there are four equations for potatoes and four for tomatoes. The computed results appear in Table 4.

The last column in the table indicates a sharp increase in Durbin-Watson values, to almost 2.0 for the autoregressive equations. This means that the existence of positive autocorrelation among residuals in OLS equations can be replaced by the assumption of zero autocorrelation.

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[4]For the major variables, 1972-1975 and 1978-1981 averages are:

	Potatoes			Tomatoes		
Average	P	Y	Q	P	Y	Q
1978-1982	69.58	89.52	4568.23	54.06	89.54	821.71
1972-1975	30.10	39.08	3720.10	23.77	41.90	680.10

TABLE 4: OLS and Autoregressive Results for Potatoes and Tomatoes
El Nozha Market, Alexandria, Monthly Data 1972-1975 and 1978-1981
Median price (Y) as dependent variable

		Regression Coefficient[b]			Supplemental Measures		
Eqn.[a]	Constant	Q	T	ρ	R^2	SE	DW
Potatoes, 1972-1975							
11	41.102	- .4169 (2.4)	0.566 (6.6)		.7565	7.55	0.82
11A	25.680	- .0466 (0.6)	0.584 (2.4)	0.773 (8.4)	.6309	4.98	1.80
Potatoes, 1978-1981							
12	31.697	- .4378 (3.6)	0.806 (7.5)		.8332	9.94	1.18
12A	25.376	- .3709 (3.2)	0.849 (4.8)	0.420 (3.2)	.7338	9.12	1.99
Tomatoes, 1972-1975							
11	63.896	- 5.2313 (4.2)	0.661 (5.8)		.7496	9.84	1.29
11A	59.995	- 4.3777 (3.7)	0.584 (3.5)	0.366 (2.7)	.7205	9.13	1.96
Tomatoes, 1978-1981							
12	169.198	-17.2980 (4.1)	0.751 (1.7)		.6131	33.81	1.21
12A	143.21	-16.1340 (4.1)	0.820 (1.3)	0.401 (3.0)	.5525	31.46	1.90

Note: See Tables 2 and 3 for symbols used.

[a]Equations (11) and (12) are OLS; equations (11A) and (12A) are for the autoregressive model.

[b]All equations include dummy variables to indicate monthly shifts from annual levels. Shifts for equations (12) and (12A) are:

	Potatoes		Tomatoes	
Month	Equation 12	Equation 12A	Equation 12	Equation 12A
Jan	-14.14	-15.49	4.65	5.27
Feb	-22.50	-22.96	-15.06	-14.21
Mar	-13.53	-13.31	-11.23	- 9.28
Apr	-12.37	-12.19	13.81	19.23
May	-19.47	-19.36	59.08	57.49
June	-11.21	- 9.46	4.44	2.09
July	1.47	3.69	3.33	0.80
Aug	- 3.73	- 1.24	- 2.62	- 3.93
Sept	16.45	19.21	-17.36	-17.38
Oct	34.16	32.65	-13.40	-13.12
Nov	42.33	37.30	-23.19	-23.36
Dec	2.54	1.16	- 2.45	- 3.60

Introducing the coefficient rho into the formulation also reduces the standard error--sharply for the first equation pair and much less for the other three pairs. This means that the predictive accuracy is improved. However, the tabulated R^2 values are lower in each case. How can this be the case? This apparent contradiction is due to the method used for computing the values.

The equation pairs for tomatoes is used to illustrate the computation of the R^2 listed in the table to a possible alternative method. The three R^2 values are determined similarly. The variance unexplained by the equation is compared with the variance in the dependent variable. The latter variance may be computed with reference to the actual values of Y for (11) or with reference to the rho-transformed values of Y for (11A). Then, of course, R^2 values differ. Specifically, the three values for tomatoes are determined as follows:

	Equation (11)	Equation (11A)	Alternative
Original SD^2	386.44		386.44
Transformed SD^2		298.22	
SE^2	96.68	83.36	83.36
Difference	289.66	214.86	303.08
R^2	.7496	.7205	.7843

Which of the latter two values is appropriate depends on how the researcher will interpret and use the results. The two R^2 values from Table 4 together with R^2 computed in the alternate way are as follows:.

	Potatoes		Tomatoes	
	1972-1977	1978-1982	1972-1977	1978-1982
OLS	.7565	.8332	.7496	.6131
Autoregressive	.6309	.7338	.7205	.5525
Alternative	.8942	.8585	.7843	.6682

Of course, the alterative R^2 is greater than R^2 for the OLS equation because the standard error is reduced by the introduction of rho into the formulation.

The monthly shifts in the price-quantity function for the 1978-1981 period are listed in the footnote to Table 4. For both potatoes and for tomatoes, the shifts in equation (12) follow a definite pattern and are similar to those in equation (12A). The average shift for potatoes is down LE 17 per ton in February-May and up LE 30 during September-November. For tomatoes, the shift ranges from plus LE 37 per ton in April-May to minus LE 18 during September-November.

CONCLUSION

The computed linear OLS regressions are good fits to the monthly data. Several have R^2 values in the 0.75 to 0.88 range. They clearly indicate an empirical price-quantity relationship which is subject to parallel shifts on a month-to-month basis and to an upward trend over time. These results say something about how the price mechanism operates on the El Nozha market. They provide unbiased estimates for net regression coefficients. These OLS equations are satisfactory for making predictions providing the underlying market conditions do not change materially.

Residuals from the OLS equations computed for potatoes and tomatoes have high positive autocorrelation. More efficient estimators of the structural parameters are determined by using a first order autoregressive model. These values are better than the OLS estimates for some purposes--e.g., for computing elasticity coefficients. The OLS equations for grapes do not give evidence of autocorrelation. Hence, autoregressive equations are not needed.

Results might be improved by modifying the formulations. For example, introducing consumer income as a variable in equations for grapes reduces substantially the trend effect. This factor is omitted from equations for potatoes and tomatoes merely because only annual information was available for this analysis. It would be better to include income explicitly as a separate variable, rather than have its effect enter indirectly by the trend factor. Monthly estimates should be used if they can be derived from available data.

Values for monthly shifts in the price-quantity function indicate definite seasonal patterns. These may be related to short-time changes in consumer preferences, in varieties or qualities marketed, or in other factors. If so, the net influence of sales, trend, etc. may be different for various subperiods of a year. This could be tested by computing separate equations for two or three periods of months, e.g., for January-June and July-December in the case of potatoes. Possibly temporal markets are interrelated. That is, the influence of quantity on price may be due both to current sales and the quantity sold during the preceding month. In that case, lagged sales should appear as a separate independent variable in the formulation.

Some researchers prefer to determine equations with quantity as the dependent variable instead of price as used in this study. This can be done. The results will be different and better for some purposes, such as computing the elasticity of demand. However, care must be exercised to avoid introducing multicollinearity if income and price are highly correlated.

Theoretically, some economic relationships are curvilinear. Linear functions are used for all equations to indicate first approximations to the actual relationships. Introducing curvilinearity into the formulation might reveal whether it is reasonable to use linear functions. For example, some equations might be fitted with a logarithmic or parabolic relationship between price and quantity.

TABLE A: Monthly Input Data for Analysis of Grape Prices
El Nozha Market, Alexandria, 1972-1981

Month	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	Average[a]
	P - Minimum actual price, LE per ton[b]										
June	45	50	60	50	90	100	80	100	200	200	97.5
July	40	40	50	70	70	70	100	150	190	120	90.0
Aug	45	52	50	70	55	70	120	150	190	120	92.2
Sept	50	55	50	70	55	120	120	140	150		90.0
Aver.	45.0	49.2	52.5	65.0	67.5	90.0	105.0	135.0	182.5	146.7	92.49
	Y - Median actual price, LE per ton[b]										
June	72	85	90	100	145	175	165	200	300	330	166.2
July	55	75	85	80	120	160	126	166	208	210	128.5
Aug	58	61	80	80	78	195	136	166	208	158	122.0
Sept	60	55	68	80	78	135	120	145	172		101.4
Aver.	61.2	69.0	80.8	85.0	105.2	166.2	136.8	169.2	222.0	236.7	130.26
	Q - Quantity, sales in tons										
June	272	279	304	334	289	206	353	914	538	731	422.0
July	3418	2722	4035	4095	4028	3867	3906	2931	2175	2523	3370.0
Aug	3224	2261	3535	2607	3387	3478	3836	2256	2384	5360	3232.8
Sept	2007	1913	2065	1792	1891	1740	3834	2995	4139		2486.2
Aver.	2230	1794	2485	2207	2399	2323	2982	2274	2309	2871	2374.97
	I - Per capita urban income, LE per year										
Annual	107	109	141	160	177	212	253	316	393	503	237.1

[a]The last average in each block is the average of the 39 actual observations average of monthly averages.

[b]P is the low of the high-low range of monthly prices; Y is the middle of this range.

Source: Data supplied by Ministry of Agriculture, Egypt.

TABLE B: Monthly Input Data for Analysis of Potato Prices
El Nozha Market, Alexandria, 1972-1981

Month	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	Average
	P - Minimum actual price, LE per ton[a]										
Jan	20	13	20	28	30	60	50	65	50	50	38.6
Feb	18	20	18	20	25	40	25	50	50	50	31.6
Mar	16	20	15	25	30	30	40	60	50	60	34.6
Apr	20	18	18	30	40	20	45	50	45	70	35.6
May	15	15	15	23	35	25	40	50	40	70	32.8
June	18	15	20	25	50	25	80	75	80	70	45.8
July	40	15	35	60	50	35	30	100	80	80	52.5
Aug	45	28	45	68	80	50	30	100	90	100	63.6
Sept	50	28	55	70	85	50	90	110	120	130	78.8
Oct	35	40	50	65	60	80	80	85	70	130	69.5
Nov	20	30	35	50	50	80	70	60	80	110	58.5
Dec	23	25	35	33	60	70	70	55	75	80	52.6
Aver.	26.7	22.2	30.1	41.4	49.6	47.1	54.2	71.7	69.2	83.3	49.54
	Y - Median actual price, LE per ton[a]										
Jan	25	23	27	34	35	70	62	78	70	72	49.6
Feb	26	29	26	28	42	60	38	72	70	70	46.1
Mar	27	29	24	40	50	48	55	82	80	80	51.5
Apr	29	28	24	48	55	36	62	75	78	85	52.0
May	24	24	24	39	52	39	60	65	65	82	47.4
June	30	24	32	45	68	42	85	88	90	88	59.2
July	44	26	41	65	68	62	75	105	100	138	72.4
Aug	48	32	52	73	92	75	75	105	108	120	78.0
Sept	58	42	61	80	95	75	105	120	130	145	91.1
Oct	50	52	60	72	100	90	105	108	105	145	88.7
Nov	34	38	50	65	70	95	98	85	85	140	76.0
Dec	26	31	42	44	72	85	85	68	90	105	64.8
Aver.	35.1	31.5	38.6	52.7	66.6	64.8	75.4	87.6	89.2	105.8	64.73
	Q - Quantity, sales in tons										
Jan	3304	3493	3475	4438	4029	4201	4627	4429	4892	4730	4162
Feb	3393	3414	4884	4279	4386	4643	5416	3836	4749	5090	4409
Mar	3208	3748	4788	4509	3896	4652	4059	3752	4530	4943	4208
Apr	3153	4397	4833	3983	4037	4582	3735	5257	4982	4419	4338
May	4091	4868	5285	4467	5766	5066	4591	5433	4735	4282	4858
June	1609	2265	2594	2536	2022	3511	1204	2279	2677	3123	2382
July	1420	2197	1998	1552	1007	2041	448	2083	2167	1603	1652
Aug	1282	2269	1549	1435	1230	1977	713	1204	1220	1433	1431
Sept	654	1421	1285	1085	755	1205	290	758	697	982	913
Oct	4519	2196	1542	3220	4451	6059	3742	10248	9357	4750	5008
Nov	7560	11203	9956	10602	12757	11763	12387	12722	15583	8166	11270
Dec	4815	4909	4516	4366	3951	4772	6753	6754	6630	6815	5428
Aver.	3251	3865	3892	3873	4024	4539	3997	4896	5185	4195	4171.7

[a]P is the low of the high-low range of monthly prices; Y is the middle of this range.

Source: Data supplied by Ministry of Agriculture, Egypt.

TABLE C: Monthly Input Data for Analysis of Tomato Prices
El Nozha Market, Alexandria, 1972-1981

Month	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	Average
	P - Minimum actual price, LE per ton[a]										
Jan	15	25	40	35	25	50	20	40	50	70	37.0
Feb	15	20	30	40	25	35	20	60	60	90	39.5
Mar	20	60	30	40	45	30	35	85	100	100	54.5
Apr	35	55	70	50	70	45	70	60	130	180	76.5
May	10	15	20	8	25	30	20	50	40	60	27.8
June	10	15	20	20	40	25	20	30	40	60	28.0
July	10	15	20	15	20	30	20	25	50	40	24.5
Aug	10	13	20	10	30	60	50	30	30	35	28.8
Sept	13	25	25	20	20	80	25	50	40	60	35.8
Oct	15	7	20	25	20	50	20	50	50	100	35.7
Nov	10	10	25	20	25	30	40	50	40	80	33.0
Dec	20	30	40	25	50	40	30	50	60	80	42.5
Aver.	15.2	24.2	30.0	25.7	32.9	42.1	30.8	48.3	57.5	79.6	38.63
	Y - Median actual price, LE per ton[a]										
Jan	22	52	52	52	40	67	50	60	85	100	58.0
Feb	22	42	55	60	45	52	35	72	70	115	56.8
Mar	30	80	65	60	60	52	52	95	115	140	74.9
Apr	60	90	98	75	90	60	102	88	315	220	119.8
May	32	32	72	19	72	50	50	75	270	105	77.7
June	19	22	34	35	62	40	40	50	60	95	45.7
July	16	22	32	38	40	58	35	32	110	60	44.3
Aug	16	18	35	20	40	80	75	50	90	78	50.2
Sept	30	45	44	40	35	95	58	90	75	95	60.7
Oct	38	24	40	48	25	82	32	105	100	122	61.6
Nov	20	30	40	42	40	55	55	75	60	110	52.7
Dec	35	50	60	48	82	58	55	85	82	110	66.5
Aver.	28.3	42.2	52.2	44.8	52.6	62.4	53.2	73.1	119.3	112.5	64.08
	Q - Quantity, sales in tons										
Jan	674	537	586	792	999	865	953	948	951	812	811.7
Feb	692	467	433	744	880	768	919	768	760	796	722.7
Mar	672	397	600	625	838	873	647	740	672	654	671.8
Apr	295	199	299	217	303	698	416	832	95	99	345.3
May	1040	1073	713	990	666	1010	1157	1183	761	706	929.9
June	656	881	784	972	600	774	1242	940	961	892	870.2
July	742	904	882	960	877	884	1114	1144	867	948	932.2
Aug	775	925	834	1161	1058	872	929	983	922	795	925.4
Sept	529	658	809	877	1064	489	988	747	825	601	758.7
Oct	810	1275	885	853	1089	743	1079	642	692	620	868.8
Nov	752	683	726	839	867	944	742	874	890	659	797.6
Dec	640	622	642	924	586	923	878	836	944	819	781.4
Aver.	689.8	718.4	682.8	829.5	818.9	820.2	922.0	886.4	778.3	700.1	784.64

[a]P is the low of the high-low range of monthly prices; Y is the middle of this range.

Source: Data supplied by Ministry of Agriculture, Egypt.