ECONOMIC IMPACT OF FEDERAL MARKETING ORDERS — THE FLORIDA WINTER TOMATO CASE

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Marketing agreements and orders have been used for several decades by various commodity groups in an effort to stabilize and increase the level of farm income. These programs are tools to be used in a "self-help" fashion. They do not automatically solve an industry's marketing problems. For instance, if an industry has continuous interseasonal supply control difficulties, a marketing agreement may actually aggravate the problem it was intended to solve. However, intraseasonal volume controls can relieve short-run imbalances in supply while not adversely affecting consumers. Merging long-run and short-run perspectives is the problem that creates difficulty in program evaluation.

Recent interest in agricultural marketing orders was stimulated by the President in an address before a joint session of the congress in October, 1974. In response to the President's comments, a task force was created by the Department of Agriculture to determine the inflationary impact of marketing order programs. Basically, that task force reported that the federal marketing order for Florida tomatoes operates in a competitive situation that would suggest the possibility of increasing prices [10, p. 37]. However, the magnitude of these price and quantity adjustments, and their impact on growers, handlers and consumers remained an unanswered question.

In this study, fresh winter tomatoes are analyzed to determine the effects of federal marketing order strategies on Florida growers and other industry participants. Occasionally during the Florida tomato season (November-May), prices received by growers have become severely depressed as the result of excess supply. Some domestic competition from Texas and California occurs in the late fall and spring, but the principal competition is from Mexican imports.

The general objective of this study was to determine aggregate effects, on selected segments of the U.S. winter fresh tomato subsector, of changes in supplies from Mexico and Florida which resulted from marketing order regulations. Aggregate effects were measured in terms of (1) net revenue obtained by domestic tomato growers, (2) volume of tomatoes marketed and consumed in the United States, and (3) consumer expenditures. Such information is valuable to the Florida tomato industry in making marketing decisions, to other commodity groups faced with similar circumstances, and to government agencies responsible for marketing policy.

PROCEDURE AND MODEL

To evaluate the economic impact of changes in supplies from Mexico and Florida, three intermediate objectives were considered prerequisites to the accomplishment of broader overall objectives.

1. Development of a qualitative description of physical, informational and monerary flows within the U.S. winter fresh tomato subsector.
2. Developement of structural relationships of the tomato subsector.
3. Development of a computer simulation model from results of 1 and 2 above.

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Simulation experiments may be broadly classified into two groups: (1) those where a particular response variable is maximized (or minimized) in order to optimize some process and (2) those where the investigator is interested in the general relationship of the response surface to changes in the system: He seeks to gain additional knowledge about the process under study [8]. Experiments in this study fall into the second category.

A base situation was established to compare the response of each experiment. Two types of experiments were performed as modifications of the base situation: changes in projections of exogenous variables and changes in specification of the model. The latter type received most of the attention.

Supply management strategy centers around the controlling or restricting of shipments of tomatoes, in order to stabilize prices at the desired level. Under the authority of a Federal marketing order, the Florida tomato industry can impose restrictions on shipments of tomatoes by grade, size and maturity.

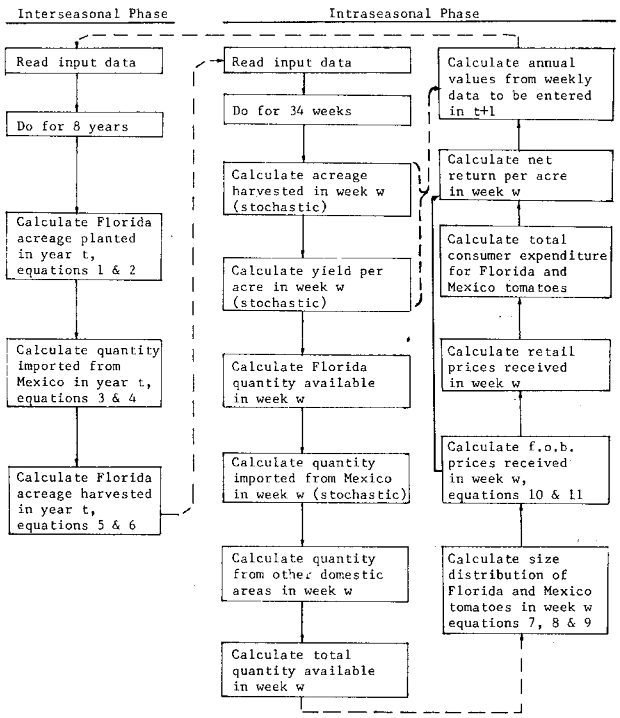
Two supply management policies were examined and interpreted, to determine effects on selected participants in the subsector. One policy was to obtain 75 percent of the parity price and the other was to obtain 100 percent. The basic marketing strategy, or supply management strategy, was to determine the amount of supply restriction necessary to stabilize prices at the desired level.

Supply management strategies explored in this study centered around the use of tomato size and maturity as a means of delineating restricted and nonrestricted tomatoes. Both tomato forms were separated into two size categories — large and small as defined by the Florida Tomato Committee. Large mature green tomatoes include 6 × 7 and larger, while large vine-ripe tomatoes include 6 × 6 and larger.

Two assumptions concerning supply restrictions were examined in separate simulation experiments. The first was that regulations to restrict supply were applicable to both Florida and Mexico. The alternate assumption was that supply restrictions applied only to Florida.

A recursive econometric simulation model was constructed with two major segments, an interseasonal phase and an intraseasonal phase (Figure 1). The interseasonal phase was on an annual time period framework. This phase of the model was designed to determine for year t (1) the total supply expected from Mexico and (2) the total acreage expected to be harvested in Florida. (Year and winter season were used interchangeably throughout this study).

Figure 1. FLOW CHART OF MAJOR COMPONENTS OF SIMULATION MODEL OF THE U.S. WINTER FRESH TOMATO SUBSECTOR



Goal of the model's intraseasonal phase, on a weekly time basis, was to stabilize the f.o.b. price at prespecified levels. This was accomplished by restricting the quantity of tomatoes shipped from Florida and/or Mexico to U.S. markets whenever the price fell below the specified level.

The model was composed of 11 structural equations (Appendix Tables 1 and 2) and 15 identities.[1] Nearly all structures were estimated by ordinary least squares, the entire model being composed of single equation relationships.[2]

[1] A detailed discussion of the equations and variables used in the model may be obtained by interested readers from the authors or ERS [2].

[2] Initially a simultaneous system was formulated to estimate weekly f.o.b. prices; however, the "fit" of this simultaneous system proved to be unsatisfactory.

VALIDATION

Before proceeding with simulation experiments to evaluate the impact of alternative policies, validation of the model was necessary. This process generally means that the researcher must satisfy himself that the model is capable of characterizing the system it is intended to represent.[3]

The major part of the *final* validation process was conducted as a two-step procedure. The first step was to run the simulation model over a historical period. Results for this historical period were compared with actual data from the same period. In the interseasonal phase, major concern was with the number of tuning points, their direction, and fluctuation amplitude for corresponding time segments.[4] In the intraseasonal phase, primary concern was with mean values of target variables and their variance.

The second part of the final verification procedure was to generate output over future time periods and to evaluate it with respect ot reasonableness. The logical consistency and predicative ability of both phases, interseasonal and intraseasonal, were investigated and concluded to be adequate representations of the winter fresh tomato industry for the experimental purposes of this analysis.

SIMULATION EXPERIMENTS

The base situation — established to provide a comparison for planned experiments — assumed no restrictions by market order regulations. The volume of tomatoes imported from Mexico was assumed to be determined by functional relationships, i.e., estimated from historical import data in lieu of estimates of Mexican supply functions. A stochastic element was incorporated in weekly supply estimators for both Florida and Mexico to account for yield variability. These specifications represented, in principle, a freely competitive trade situation with only the current import tariff imposed.

Experiment I was a variation from the base situation. It attempted to stabilize f.o.b. prices. The price goals were expressed as a percentage of parity and set at two levels, 100 and 75 percent (coded A and B, respectively). In this experiment, only Florida supplies were restricted in order to achieve the price goals.

The second set of experiments (II-A and II-B) differed from the first in that supply restrictions were imposed on Mexico as well as Florida (Table 1).

Table 1. SPECIFICATION OF THE SIMULATION MODEL'S BASE SITUATION AND FOUR EXPERIMENTS RESULTING FROM VARIATIONS IN MARKETING POLICY, MEXICAN SUPPLY, AND DISTRIBUTION OF RESTRICTED SUPPLY

Model specifications and assumptions	Base situation	Experiment I A	Experiment I B	Experiment II A	Experiment II B
Market policy:					
1. Free market[a]	X				
2. Supply management to achieve 100 percent of parity price		X		X	
3. Supply management to achieve 75 percent of parity price			X		X
Mexican supply:					
1. Unrestricted	X	X	X		
2. Restricted to certain sizes[b]				X	X
Florida supply:					
1. Unrestricted	X				
2. Restricted to certain sizes[b]		X	X	X	X

[a]Quantity control regulations as part of federal marketing order program not imposed.

[b]Assumption concerning tomatoes removed from the market due to imposition of a federal marketing order regulation restricting shipments.

In experiments where the marketing policy was to stabilize prices at prespecified levels (experiments I and II), the following procedure was

[3]Validation of simulation models is a complex and often overwhelming problem that can easily be expanded beyond the sophistication of the model being analyzed. The basic issue of validation in this study was a concern over the model's adequacy to generate meaningful values of specific endogeneous variables. Validation was continually exercised during the construction, testing and revision of the model.

A good review of system analysis and validation of simulation models is presented by Johnson and Rausser [5]. Also, an interesting discussion of multistage validation, which incorporates the methodology of rationalism, empiricism and positive economics is presented by Naylor [7].

Orcutt [9] refers to this as a building-block approach, where individual sections are tested and modified during the construction stage. Hamilton [4] also discusses this concept of the continual simultaneous nature of model building and validation. Meir [6, p. 294] supports this view by stating that care exercised in the formulation and construction of the model is as important as more specific procedures for validating a model after it is constructed.

[4]For a discussion of the problem of selecting a suitable set of criteria for evaluating the "goodness of fit" on a computer simulation model, see Cyert [3].

utilized. For each week of the intraseasonal phase, the weighted average f.o.b. price of Florida tomatoes was calculated after the total quantity available for market was estimated. This average weekly price was then compared to the prespecified price, to determine whether a supply regulation should be imposed on shipments of smaller-sized tomatoes. If a supply regulation was imposed, smaller-sized tomatoes were dumped at the packinghouse stage, this being an attempt to raise the weighted average weekly price of Florida tomatoes to the prespecified level. The f.o.b. price goal was not always obtained, since the dumped volume of smaller-sized tomatoes was inadequate to bring about the needed price increase.

SIMULATION RESULTS

Simulation of a "system" permits the investigator to analyze direct and indirect effects of alternative situations, given the assumptions of the model and projections of the exogenous variables. From each simulation experiment, as described previously, time paths on an interseasonal and intraseasonal basis were obtained for the endogenous variables. Also, time paths were generated over an 8-year horizon. The average values of fourteen endogenous variables generated by the base situation and the two sets of experiments are shown in Table 2. Of course, most interpretive analysis of the simulation results was based on the series of values generated over the time horizon rather than on average annual values.

Table 2. AVERAGE VALUES OF SELECTED ENDOGENOUS VARIABLES GENERATED BY THE BASE SITUATION AND SIMULATION EXPERIMENTS OVER THE PROJECTED TIME PERIOD FROM 1972-73 THROUGH 1979-80

Variable	Actual values for 1971-72	Base situation	Experiments[a]			
			I-A	I-B	II-A	II-B
Mature green tomatoes:						
Florida acreage planted[b]	38.41	38.64	37.90	38.39	41.23	39.85
Florida quantity shipped[c]	466.60	436.32	386.66	418.34	429.08	434.00
Florida quantity dumped[c]	--	--	22.84	7.25	23.71	7.72
Average f.o.b. price[d]	14.41	19.50	21.96	20.75	21.64	20.60
Total net returns[e]	5.06	7.33	9.71	10.06	11.61	9.94
Mexican quantity shipped[c]	79.00	188.12	177.90	190.49	218.90	203.95
Average retail price[d]	--	36.76	39.27	37.37	39.12	37.29
Vine-ripe tomatoes:						
Florida acreaged planted[b]	5.49	4.97	5.79	5.30	6.08	5.35
Florida quantity shipped[c]	102.88	98.91	99.74	98.84	106.63	100.03
Florida quantity dumped[c]	--	--	6.05	1.47	6.01	1.52
Average f.o.b. price[d]	18.00	21.26	25.04	22.31	24.83	22.23
Total net returns[e]	2.52	0.87	2.56	1.30	3.07	1.30
Mexican quantity shipped[c]	481.24	456.41	519.98	464.24	392.88	418.91
Average retail price[d]	--	42.53	48.49	43.70	48.52	43.65

[a]See Table 1 for explanation of base situation and simulation experiments.

[b]Thousand acres. [c]Million pounds. [d]Cents per pound [e]Millions of dollars.

CONCLUSIONS AND IMPLICATIONS

Evaluating output of simulation experiments for a commodity subsector in terms of benefits to several groups of participants incorporated into the model is not as readily done as for a study that maximizes benefits to one group of participants. In this study, information generated by simulation experiments was used to evaluate relative effects on four groups of subsector participants. Florida growers were assumed to be primarily concerned with obtaining high total net returns. Handlers of Florida tomatoes (packinghouse operators) are more concerned with high volume than with price, since they charge on a per-unit basis. Import handlers, on the other hand, are concerned with both volume and price — they receive a per-unit fee plus a commission based on sales revenue. The final group of participants that was considered important to the tomato subsector was the domestic consumer. Their interests were assumed to be represented by low retail prices and higher (as opposed to lower) volumes consumed.

Many conclusions and implications can be drawn directly from the coefficients used in the model, e.g., price flexibility and income elasticity. basically, graphic and regression analyses were used to examine and evaluate simulation results over the time horizon. However, in order to further evaluate those results, an index was created with the base situation being set equal to 100 (Table 3). Items identified in the previous paragraph are listed as performance criteria. Those measures are intended to show the relative effect of various supply management programs on four groups of subsector participants. The numbers facilitate a direct comparison of various experiments relative effects upon each group of participants.

Table 3. RELATIVE POSITION OF SELECTED PERFORMANCE CRITERIA USED TO EVALUATE THE EFFECT ON SUBSECTOR PARTICIPANTS FROM THE BASE SITUATION AND FOUR EXPERIMENTS OVER THE SIMULATED TIME HORIZON

Participant and criterion	Base situation	Experiments I-A	Experiments I-B	Experiments II-A	Experiments II-B
	index numbers				
Florida growers--					
high total net revenue:					
mature green	100.0	132.5	137.2	158.3	135.6
vine-ripe	100.0	294.2	149.4	352.9	149.4
Florida handlers--					
high volume shipped:					
mature green	100.0	88.6	95.9	98.3	99.5
vine ripe	100.0	100.8	99.9	107.8	101.1
Import handlers--[a]					
high volume shipped:					
mature green	100.0	94.6	101.3	116.4	108.4
vine-ripe	100.0	113.9	101.7	86.1	91.8
high f.o.b. price:					
mature green	100.0	112.6	106.4	111.0	105.6
vine-ripe	100.0	117.8	104.9	116.8	104.6
Consumers--[b]					
low retail price:[c]					
mature green	100.0	93.2	98.3	93.6	98.6
vine-ripe	100.0	86.0	97.2	85.9	97.4
high volume consumed:					
mature green	100.0	90.4	97.5	103.8	102.2
vine-ripe	100.0	111.6	101.4	89.9	93.4

[a]Import handlers are affected by both volume and f.o.b. price because they operate on the basis of a fixed fee per carton plus an ad valorum charge.

[b]Consumers required two entries since low total consumer expenditure can be achieved by low volume and high prices.

[c]Retail prices and f.o.b. prices are not perfectly correlated. Also, the index for retail prices was reversed since the consumer desires "low" prices, i.e., the higher the index number the lower the average retail price.

Evaluation of various simulation experiments' overall effect on the winter fresh tomato subsector necessitates the use of some aggregation criterion. This criterion could be in the form of "weights." Use of an arbitrarily selected set of weights permits the user to choose the "best" course of action, of those choices examined. For example, if equal weights were given each group of participants, policies of experiment II-A would be the preferred choice, i.e., highest average index. The obvious question here is the legitimacy of combining indices of the four participant groups. A check of indices in Table 3 reveals the dominant magnitude of the index for total net revenue of Florida vine-ripe growers. Therefore, before any conclusions can be drawn regarding overall effects of alternative marketing policies on participants collectively, the decision maker must subjectively formulate a set of weights which will enable him to select the best policy.

Florida Growers

The relative effect on Florida growers of each simulation experiment in comparison to the base situation is briefly summarized here to illustrate the kind of information obtainable from this type of simulation study. Total net returns to Florida mature green and vine-ripe tomato growers were calculated for each year of the time horizon. Next, annual net returns for the base situation were subtracted from the annual net returns obtained by Florida growers in each experiment (Table 4). These deviations were then regressed on a single time variable to determine interseasonal ramifications from following the specified intraseasonal supply management policy.

Table 4. DEVIATION OF THE SIMULATION EXPERIMENTS FROM THE BASE SITUATION FOR TOTAL NET RETURNS TO FLORIDA MATURE GREEN AND VINE-RIPE TOMATO GROWERS

Year	Experiment I-A			Experiment I-B		
	Mature green	Vine-ripe	Combined	Mature green	Vine-ripe	Combined
1	5,265	1,351	6,616	3,845	657	4,502
2	-739	842	103	-2,015	-982	-2,997
3	2,518	1,746	4,264	3,952	1,090	5,042
4	-291	1,337	1,046	1,262	-12	1,250
5	2,651	2,068	4,719	4,454	1,048	5,502
6	2,986	1,911	4,897	4,342	574	4,916
7	935	1,341	2,276	646	-165	481
8	4,211	2,338	6,549	3,328	754	4,082
PV[a]	11,644	8,291	19,935	12,762	1,838	14,600

Year	Experiment II-A			Experiment II-B		
	Mature green	Vine-ripe	Combined	Mature green	Vine-ripe	Combined
1	5,265	1,351	6,616	3,845	657	4,502
2	2,738	1,648	4,386	-481	-521	-1,002
3	1,703	1,499	3,202	2,585	605	3,190
4	3,171	2,494	5,665	1,922	279	2,201
5	4,497	2,641	7,138	3,777	974	4,751
6	6,357	3,022	9,379	4,842	822	5,664
7	2,029	1,566	3,595	-152	-439	-591
8	5,146	2,505	7,651	2,530	658	3,188
PV[a]	20,317	10,738	31,055	12,533	1,962	14,496

[a]Present value of net return deviations over the eight year horizon at 10 percent discount rate.

Several important implications were derived from the regression of these differences in annual net returns over the 8-year horizon. In experiment I, where market order restrictions were not imposed on Mexico, Florida mature green growers would prefer less restrictive programs of striving for 75 percent of parity. Vine-ripe growers would prefer the more restrictive program. This conflict of interest between the two Florida segments was not anticipated *a priori*. With total net returns for vine-ripe and mature green tomatoes combined, the preferred policy was the more restrictive one.

When market order restrictions were applied to Mexican imports as well as Florida supplies (experiment II), Florida growers preferred the more stringent policy of striving for 100 percent of parity. This was true for the mature green and vine-ripe segments, individually and collectively.

Florida Handlers

As noted earlier, Florida handlers are primarily interested in volume. With experiment I-A, a continual decline in annual mature green volume was obtained. A continual increase was obtained with experiment I-B. Thus, the more stringent program of striving to seek 100 percent of parity has a long-run potential of seriously diminishing the volume of Florida's mature green industry.

Imposing the same market order regulations on imports from Mexico (experiment II), lessened the decline of Florida's mature green shipments over the projected horizon. Moreover, it tended to stabilize the volume of tomatoes dumped at the packinghouse level as required by the market order restrictions for experiment II-B. Both 100 percent parity or "A" experiments (I-A and II-A) revealed a trend of increasing volumes being dumped each year. Experiment II-B revealed a fairly stable quantity dumped. In experiments I-A and II-A the number of weeks per season that tomatoes were dumped increased each year. With experiments I-B and II-B, tomatoes were dumped 50 percent as frequently as they were in the "A" experiments the first year, and approximately 30 percent as frequently in the eighth year of the simulated time horizon.

Import Handlers

Import handlers desire larger volumes and higher prices. Without market order restrictions affecting their shipments (experiment I), they would prefer the effort of Florida's industry to obtain 100 percent of parity (I-A). Instead of vine-ripe imports declining, as with the base situation and experiment I-B, the annual volume increases each year.

Application of market order regulations to Mexico as well as to Florida (experiment II) causes Mexico's mature green industry to expand more rapidly and the vine-ripe segment to decline more rapidly than either did in the base situation.

Consumers

The marketing policy programs evaluated in this study had the expected undesirable effects upon consumers. Specifically, retail prices were higher and the total quantity of tomatoes consumed was reduced in relation to the base situation. Some consumer benefit was derived in that less fluctuation occurred in the weekly supply of tomatoes as a result of supply controls.

Information generated by the model showed the magnitude of effects on consumers of various supply management policies. For example, in experiment II-A, an average retail price increase of 9.5 percent was associated with a 2.7 percent decline in volume consumed. On the other hand experiment II-B, with more moderate shipping restrictions, increased retail prices by only 1.7 percent while volume consumed declined by only 1.9 percent. This demonstrates the model's ability to provide the user with vital information concerning consequences to other participants of different goals of management programs.

CONCLUDING REMARKS

The analysis presented in this article illustrates the potential of using a econometric simulation model to evaluate alternative courses of supply management action available to highly perishable product industries. A great deal of data is required to develop a dynamic model that can simulate interseasonal effects of alternative actions as well as the intraseasonal effects. This first generation model of the fresh winter tomato subsector supports the view that long-run consequences of short-run policies and programs can be investigated effectively with simulation techniques.

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Appendix Table 1. SIMULATION MODEL VARIABLES USED IN THE STRUCTURAL EQUATION

Variable[a]		Explanation
PAFMG	=	planted acreage of Florida mature green tomatoes
PAFVR	=	planted acreage of Florida vine-ripe tomatoes
HAFMG	=	harvested acreage of Florida mature green tomatoes
HAFVR	=	harvested acreage of Florida vine-ripe tomatoes
NRFMG	=	net return per acre of Florida mature green tomatoes
NRFVR	=	net return per acre of Florida vine-ripe tomatoes
CITOM	=	per capita disappearance of imported tomatoes
CIMG	=	per capita disappearance of imported mature green tomatoes
CIVR	=	per capita disappearance of imported vine-ripe tomatoes
PMG	=	average f.o.b. price of mature green tomatoes in Florida
PVR	=	average f.o.b. price of vine-ripe tomatoes in Florida
MKTORD	=	qualitative variable to represent market order, 1 = yes
CILVR	=	per capita disappearance of imported large vine-ripe tomatoes
CISVR	=	per capita disappearance of imported small vine-ripe tomatoes
CIVR	=	per capita disappearance of imported vine-ripe tomatoes
MXDUM	=	qualitative variable to represent the actions of Mexican growers' union, UNPH
CFSMG	=	per capita disappearance of Florida small mature green tomatoes
CFSVR	=	per capita disappearance of Florida small vine-ripe tomatoes
PSMG	=	average f.o.b. price of small mature green tomatoes in Florida
PSVR	=	average f.o.b. price of small vine-ripe tomatoes in Florida
CTOM	=	per capita disappearance of all tomatoes
PLMG	=	average f.o.b. price of large mature green tomatoes in Florida
CFMG	=	per capita disappearance of Florida mature green tomatoes
CFVR	=	per capita disappearance of Florida vine-ripe tomatoes
CITOM	=	per capita disappearance of imported tomatoes
PCDING	=	per capita disposable income
PLVR	=	average f.o.b. price of large vine-ripe tomatoes in Florida

[a]Subscripts are used to denote the time period of the variables: t = year or season w = week.

Appendix Table 2. STRUCTURAL EQUATIONS USED IN SIMULATION MODEL

Equation[a]	R^2	D-W
1. $\mathrm{PAFMG}_t = 9.168 + \underset{(0.1622)***}{0.88617}\,\mathrm{HAFMG}_{t-1} + \underset{(0.1511)**}{0.04326}\,\mathrm{NRFMG}_{t-1} - \underset{(1.434)**}{3.0863}\,\mathrm{CITOM}_{t-1}$	.83	1.79
2. $\mathrm{PAFVR}_t = 1.273 + \underset{(0.1970)***}{0.87164}\,\mathrm{HAFVR}_{t-1} + \underset{(0.0779)}{0.001157}\,\mathrm{NRFVR}_{t-1} - \underset{(0.6797)}{0.28916}\,\mathrm{CITOM}_{t-1}$	.76	1.67
3.[b] $\mathrm{CIMG}_t = \underset{(0.08247)*}{-0.14276}\,\mathrm{CIVR}_{t-1} + \underset{(0.0652)***}{0.2404}\,\mathrm{MKTORD}_t + \underset{(0.327833)**}{0.69645}\,\mathrm{CIMG}_{t-1} + \underset{(0.03479)}{0.02115}\,\mathrm{PMG}_{t-1}$	.74	2.02
4.[b] $\mathrm{CIVR}_t = \underset{(0.272492)**}{0.73033}\,\mathrm{CIMG}_{t-1} - \underset{(0.134465)**}{0.350312}\,\mathrm{MKTORD}_t + \underset{(0.0258253)***}{0.0840456}\,\mathrm{PVR}_{t-1} + \underset{(0.142505)***}{0.648083}\,\mathrm{CIVR}_{t-1}$	.97	1.95
5. $\mathrm{HAFMG}_t = 7.854 + \underset{(0.1183)***}{0.79054}\,\mathrm{PAFMG}_t - \underset{(1.583)}{0.32355}\,\mathrm{MKTORD}_t - \underset{(1.076)}{0.69339}\,\mathrm{CITOM}_t$	.92	1.51
6. $\mathrm{HAFVR} = -0.01787 + \underset{(0.02754)***}{0.87351}\,\mathrm{PAFVR}_t - \underset{(0.1206)}{0.1349}\,\mathrm{MKTORD}_t + \underset{(0.1055)**}{0.24584}\,\mathrm{CITOM}_t$	.99	2.30
7. $\mathrm{CILVR}_w = -0.3415 + \underset{(0.01751)***}{0.71584}\,\mathrm{CIVR}_w + \underset{(0.1748)***}{0.79014}\,\mathrm{MXDUM}_w$	.99	1.05
8. $\mathrm{CFSMG}_w = 1.172 + \underset{(0.03134)*}{0.05411}\,\mathrm{PSMG}_{w-1} + \underset{(0.01016)***}{0.046077}\,\mathrm{HAFMG}_w - \underset{(0.009897)***}{0.04925}\,\mathrm{CTOM}_{w-1}$	.72	1.73
9. $\mathrm{CFSVR}_w = 0.3028 + \underset{(0.00555)}{0.00105}\,\mathrm{PSVR}_{w-1} + \underset{(0.04206)***}{0.13025}\,\mathrm{HAFVR}_w - \underset{(0.00522)}{0.00756}\,\mathrm{CTOM}_{w-1}$	.65	1.04
10. $\mathrm{PLMG}_w = -169.6 - \underset{(0.2179)**}{0.4358}\,\mathrm{CFMG}_w - \underset{(0.8908)}{0.005769}\,\mathrm{CFVR}_w - \underset{(0.2020)*}{0.3985}\,\mathrm{CITOM}_{w-1} - \underset{(0.2690)**}{0.6538}\,\mathrm{CFMG}_{w-1}$		
$+ \underset{(21.11)**}{53.92}\,\mathrm{PCDING}_w + \underset{(0.1769)***}{0.5175}\,\mathrm{PMG}_{w-1}$	.79	1.89
11. $\mathrm{PLVR}_w = -280.0 - \underset{(0.1650)***}{0.73725}\,\mathrm{CFMG}_w - \underset{(0.9252)}{0.071938}\,\mathrm{CFVR}_w - \underset{(0.2422)}{0.40166}\,\mathrm{CTOM}_{w-1} - \underset{(0.2040)***}{0.69079}$		
$\mathrm{CTOM}_{w-2} + \underset{(25.41)***}{92.577}\,\mathrm{PCDING}_w$	.76	1.23

[a]See Appendix Table 1 for explanation of variables. Standard errors of coefficients are shown in parentheses beneath the coefficient. Significance at 0.10 level indicated by *, significance at 0.05 level by **, and significance at 0.01 level by ***.

[b]Used Hildreth-Lee method to estimate this autoregressive equation. In equation 3, $\rho=0.2$ and in equation 4, $\rho = -0.1$.

NOTE: Equations 1-6 estimated from data base of 22 years and equations 7-11 from 2 years of unpublished weekly price-quantity data.