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Asymmetry in Farm-Retail Price Transmission for Major Dairy Products

Henry W. Kinnucan and Olan D. Forker

An econometric model is used to estimate the net relationship between changes in the farm-level price of milk and changes in the retail prices of four major dairy products—fluid milk, butter, cheese, and ice cream. Results indicate that the farm-retail price transmission process in the dairy sector is asymmetric. Retail dairy product prices adjust more rapidly and more fully to increases in the farm price of milk than to decreases. The role in pricing asymmetry of retail demand versus farm supply shifts is tested via a Chow-type test. Asymmetry is tested using the Houck procedure for estimating nonreversible functions.

Key words: asymmetry, dairy policy, nonreversible functions, price transmission, retail pricing.

This article focuses on price transmission processes in the dairy subsector. Because of industry concentration beyond the farm gate, it is commonly asserted that middlemen use market power to employ pricing strategies which result in complete and rapid pass-through of cost increases but slower and less complete transmission of cost savings. Hence, a common feature of recent studies of food sector price transmission is the testing for retail pricing asymmetry (Ward, Heien, Hall et al.). These studies suggest that interstage price "stickiness" occurs for some but not all food commodities. Because of its obvious relevance for dairy policy and the paucity of empirical evidence on the topic specific to the dairy sector, the asymmetry hypothesis serves as a focal point of this analysis. In addition to positing reasons for suspecting price transmission asymmetry in the dairy subsector, empirical evidence is provided based on the Houck procedure for estimating nonreversible func-

tions. The role of shifts in retail demand vis-à-vis farm supply as an alternative explanation for price transmission asymmetry is explored via a Chow-type test for parameter stability. A major research objective was to determine the extent to which downward adjustments in the dairy price support level specified in 1983 and 1985 legislation result in lowered retail prices for four dairy products—fluid milk, butter, cheese, and ice cream.

A Price Transmission Model

Theoretical models have been useful in establishing basic economic forces governing the farm-retail price transmission process in long-run competitive equilibrium (Gardner 1975), in describing relevant dynamic features of the transmission process (Wohlgenant, Heien, Popkin), and in identifying nonconventional forces affecting price spreads (Brorsen et al.). Because this study provides empirical evidence on the nature of farm-retail price linkages useful for dairy policy analysis and short-interval (monthly) data are used, the markup pricing model of Heien was deemed most appropriate to use. Assuming competitive conditions, fixed-proportions production technology, and constant returns to scale (CRTS) in the food-marketing system, a pricing rule of the following general form is obtained:

$$(1) \quad R = b_1F + b_2Z,$$

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where R is retail price, F is farm price, and Z is a price vector (assumed exogenous) of marketing inputs. Equation (1) is additive in input costs and, in contrast to the Gardner model (to be discussed later), the price coefficients (b_1 , b_2) are considered exogenous because they are assumed "set in place" by past prices (Heien, p. 14).

In applying the markup model to the present problem, the underlying assumptions (Leontief production technology, constant returns to scale (CRTS), and competitive markets) need to be assessed and estimation issues delineated. The assumption of a Leontief production technology for milk-processing and retailing sectors appears acceptable because the possibilities for substituting marketing inputs for milk in response to changing factor prices are limited, especially in the short-run situation considered here. The CRTS assumption is equivalent to assuming constant marginal costs which, in turn, implies that the volume of farm product moving through the system is not a relevant variable in the price transmission model. Because preliminary analysis showed no statistically significant relationship between retail price and volume of milk processed for any of the four dairy products considered, the CRTS assumption was considered acceptable. Least defensible may be the notion of competitive markets. The existence of large dairy cooperatives, milk handlers, distributors, and processors suggests a relatively concentrated marketing channel for milk and dairy products. However, competition may be sufficient in a contestable market sense (Baumol, Panzer, and Willig) that price-taking behavior is more prevalent than otherwise might be assumed (see, e.g., Gardner 1984). In any case, competition or lack thereof has not prevented the application of the markup model to other commodities. Thus, a maintained hypothesis is that potential violation of this assumption does not seriously affect the results.

Causality, lags, and asymmetry are important elements to consider when estimating or testing the markup model. Implicit in the model's development is the notion that retail prices change in response to changing wholesale or farm prices. In the terminology of Granger, farm or wholesale prices are assumed to "cause" retail prices and not vice versa.

An approach to testing statistically for the direction of causality was developed by Gran-

ger and by Sims. These tests have been used in empirical studies of price transmission (Heien, Lamm and Westcott, Ward). Lamm and Westcott indicate that for dairy products as a group, the direction of causality runs from farm to retail. For the two individual dairy products studied by Heien, a joint causal relationship between wholesale and retail price was found for butter and a unidirectional-downward relationship was found for milk.

Because these tests are controversial (Conway et al.), tests of causality were not made in this study. Instead, a unidirectional-upward causal relationship between farm-level input prices and retail prices is assumed. Some supporting evidence for this assumption is discussed below.

Response of retail prices to changes in wholesale or farm-level prices is generally not instantaneous but instead is distributed over time. Reasons for the delayed response include: (a) normal inertia in the food-marketing system associated with storing, transporting, and processing the farm product (Hall et al.); (b) costliness of repricing items at retail (Heien); (c) market imperfections such as diversity in market structure and differences in information transmission and assimilation at vertical exchange points (Ward); and (d) the nature of price reporting and collection methods (Hall et al.). Evidence specific to the dairy sector suggests that six months or less are required for retail dairy product prices to adjust fully to changes in the farm price of milk (Lamm and Westcott).

Asymmetry in farm-retail price transmission is hypothesized to exist because of (a) industry concentration at market levels beyond the farmgate as mentioned previously, (b) government intervention in the pricing of farm milk, or (c) differential impacts of shifts in retail demand versus farm supply (Gardner 1975). Deferring discussion of item (c) to later, the policy connection is explained as follows. Retailers or wholesalers face some uncertainty when attempting to base prices on changes in cost. If changes in costs are viewed as temporary, the need to reprice the item later may be an incentive to not change present price. Government intervention that establishes a floor on farm prices for extended periods can in part reduce the uncertainty associated with interpreting cost changes. For example, middlemen may view increases in farm prices caused by higher price supports as permanent increases in costs that may have

been anticipated in advance. Under these conditions, an increase in cost likely is transmitted rapidly and completely through the marketing system. Because reductions in price support levels occur only infrequently, middlemen may view these effects as largely transitory, resulting in a slower and less complete passthrough.

To accommodate the above considerations regarding lags and asymmetry, an empirical counterpart to equation (1) of the following form was specified:

$$(2) \quad RD_t = \pi_0 TR + \sum_{i=0}^{m_1} \pi_{1,i} FR_{t-i} + \sum_{i=0}^{m_2} \pi_{2,i} FF_{t-i} + \pi_3 MD_t + \epsilon_t,$$

where RD_t and MD_t are retail price and marketing cost variables, respectively, expressed as deviations from their respective initial values, TR is a trend term, FR_t and FF_t are variables denoting the rising and falling phases of farm milk prices and are computed via the Houck procedure, and ϵ_t is a random error term. Finite distributed lag structures in the farm price variables are hypothesized. Following Heien, MD_t was not specified in distributed lag form under the assumption that middlemen such as retailers wish to use a "smoothed" value of input cost as a basis for pricing. Also, the MD_t variable tended to change gradually over time in a predictable fashion.¹

The $\pi_{1,i}$ coefficients in equation (2) represent the net effect of rising farm prices on retail prices and the $\pi_{2,i}$ coefficients represent the net effect of falling farm prices on retail prices. A formal test of the asymmetry hypothesis is

$$(3) \quad H_N : \sum_{i=0}^{m_1} \pi_{1,i} = \sum_{i=0}^{m_2} \pi_{2,i}$$

$$H_A : H_N \text{ not true.}$$

Hypothesis (3) is a test of linear restrictions, hence a t -test is appropriate (for details about the test statistic see Johnston, pp. 155–57).

¹ An argument could be made in favor of including asymmetric terms for the marketing cost variable as well. However, as a practical matter this would not be a meaningful refinement because the marketing cost index exhibits no incidence of price decline throughout the eleven-year period considered in this study.

Data and Estimation Procedures

Equation (2) was estimated for four major dairy products—fluid milk, cheese, butter, and ice cream. In 1980, these four dairy products accounted for 95% of the utilization of farm milk (USDA). Monthly undeflated retail price, the undeflated farm price of Class I and Class II milk, and food-marketing cost indices for labor, packaging, transportation, and total marketing costs for the period January 1971–December 1981 were used.² About one-third of the observations in the sample were months of farm price decline. This provided a sufficient number of price declines to reliably assess the asymmetry issue by the statistical procedures used here. An example of the segmentation procedure is presented in table 1. Note that it makes no difference whether the variable is lagged and then segmented or segmented and then lagged.

Significant serial correlation was evident in all the equations estimated. Therefore, only generalized least squares estimates are presented. These estimates were obtained by using the first-order autoregressive adjustment procedure available in the TROLL (MIT) econometric software program.

Lag structures of the equations were estimated using the Almon procedure. Lag structures were assumed to lie on a low-order polynomial. The additional restriction that the lag structure terminates in a zero coefficient was imposed on the ice cream equation. The length of the lag distribution was determined by adding additional lagged variables to the model until a statistically insignificant effect was found.

Initially, equation (2) was estimated with labor, packaging materials, and the transportation cost variables specified separately. However, the high collinearity among these variables gave results that were inconsistent with a priori expectations. Therefore, an index of total food-marketing cost was used in place of the component marketing cost variables. The equations were also estimated with various subperiods of the data to determine the structural stability of the coefficients. Results showed some tendency for the price transmission coefficients to become larger in later sub-

² The exception is ice cream, where the data period terminates in December 1980 rather than 1981. The retail price series for this commodity in 1981 was inconsistent with the earlier data. A more complete description of the data and sources is provided in a data appendix available upon request from the authors.

Table 1. Example of Segmented Variable Using the First Ten Observations of the Class I Farm Price Variable

Date	Class I Price (P_t)	P'_t	P''_t	FR_t	FF_t
1971.1	6.92				
.2	6.88	0	-.04	0	-.04
.3	6.93	.05	0	.05	-.04
.4	6.91	0	-.02	.05	-.06
.5	6.93	.02	0	.07	-.06
.6	6.88	0	-.05	.07	-.11
.7	6.85	0	-.03	.07	-.14
.8	6.87	.02	0	.09	-.14
.9	6.86	0	-.01	.09	-.15
.10	6.92	.06	0	.15	-.15

Note: $P'_t = P_t - P_{t-1}$ if $P_t > P_{t-1}$
 $= 0$ otherwise

$P''_t = P_t - P_{t-1}$ if $P_t < P_{t-1}$
 $= 0$ otherwise

$FR_t =$ cumulative sum of P'_t
 $FF_t =$ cumulative sum of P''_t

periods, but differences were not large enough to be statistically significant. The hypothesis that regression coefficients pertaining to the first half of the sample period are identical to those of the second half could not be rejected at even the 10% probability level for any of the dairy products studied. Therefore, only results pertaining to the overall period are presented.

Empirical Results

The generalized least squares estimates of equation (2) (summarized in table 2) indicate that the model provides a reasonably good specification of the price transmission process for the dairy sector. R^2 's show that 55% to 95% of the variation in retail prices is "explained" by the lagged farm price variables, the trend term, and the total food-marketing cost variable with the butter equation having the lowest R^2 and cheese the highest. Estimated coefficients, in general, are significant and agree with a priori expectations. Results discussed below will focus on the findings relating to the asymmetry question.

The hypothesis of asymmetry in the retail pricing of dairy products requires that the empirical evidence show a significant difference in the sum of the coefficients of the rising, vis-à-vis the falling, farm price variables as specified in equation (2). Results indicate that

for all four dairy products studied, the cumulative effect on retail dairy prices of an increase in the farm price of milk exceeds the cumulative effect of a farm price decrease (table 2). The t -test (discussed above) of the null hypothesis that retail prices respond symmetrically to increases and decreases in the farm prices is rejected at the 10% level or lower for all four products. Moreover, the mean lags (Rao and Miller, pp. 174-76) associated with the rising farm price variables are uniformly smaller than the corresponding mean lags of the falling farm price variables, indicating that retail dairy product prices adjust more slowly to decreases in the farm price of milk than to increases. This last result follows even though the lag lengths for falling and rising farm prices are identical for each dairy product (three months for fluid milk and butter, six months for cheese, and five months for ice cream).

Elasticities of price transmission, evaluated at mean data points, further illustrate the unequal retail response to changes in the farm price of milk (table 3). The long-run rising-price elasticities exceed corresponding falling-price elasticities by 40% for fluid milk, 16% for cheese, 69% for butter, and 238% for ice cream.³ Thus, increases in the farm price of milk are passed through to the retail level more fully than are farm price decreases. The slower retail response to decreases in the farm price of milk is illustrated by the small size of short-run elasticities relative to long-run elasticities.

An Alternative Explanation for Pricing Asymmetry

The discussion thus far has identified industry concentration and government price support activities as possible explanations for the observed asymmetry in farm-retail price transmission in the dairy sector. An alternative explanation is suggested in the static marketing margin model set forth by Gardner (1975). Gardner's model is developed under the twin assumptions of long-run competitive equilib-

³ The relatively small estimates of price transmission elasticities for ice cream may reflect the marketing channel for ice cream. In particular, ice cream manufacturers tend not to purchase milk directly from farmers but rather to obtain ice cream mix from fluid milk bottling plants which produce it as a by-product in order to utilize excess cream. Thus, ice cream manufacturers may observe the farm price only indirectly via the wholesale price of ice cream mix. Hence, a weaker link between farm and retail prices is expected.

Table 2. Asymmetry in the Retail Response to Changes in the Farm Price of Milk: Statistical Results Summarized, United States Data, January 1971–December 1981

Commodity	Retail Units	Mean Price		Mean Lag		Cumulative		Statistics				
		Retail	Farm	Rising	Falling	Rising	Falling	N	R ²	D.W.	P	t-value ^a
Fluid milk	¢½ gal.	83.6	10.43	0.482	0.553	3.703	2.648	128	0.76	1.65	0.980	2.30
			(\$/cwt)	(0.180) ^b	(0.240)	(0.459)	(0.486)					
Butter	¢/lb.	131.5	8.52	0.281	0.906	10.930	7.689	128	0.55	1.62	0.981	1.85
				(0.255)	(0.364)	(1.753)	(1.937)					
Cheese	¢½ lb.	84.4	8.52	1.631	2.116	5.760	4.972	127	0.95	1.91	0.872	1.62
				(0.278)	(0.314)	(0.487)	(0.538)					
Ice cream	¢½ gal.	125.2	8.52	1.426	7.205	3.307	0.799	115	0.94	1.89	0.882	2.72
				(0.833)	(2.463)	(0.923)	(0.980)					

^a The *t*-statistic is computed under the null hypothesis that retail prices respond symmetrically to increases and decreases in the farm price. The critical *t*-values at the 10%, 5%, and 1% levels are 1.654, 1.960, and 2.326, respectively.

^b Numbers in parentheses are standard errors.

Table 3. Elasticities of Farm-Retail Price Transmission for Major Dairy Products under Rising and Falling Farm Prices, United States, Based on Data Covering January 1971–December 1981

Commodity	Elasticity When Farm Prices Are:			
	Rising		Falling	
	SR	LR	SR	LR
Fluid milk	0.274	0.462	0.184	0.330
Cheese	0.159	0.581	0.059	0.502
Butter	0.491	0.706	0.190	0.418
Ice cream	0.068	0.220	0.000	0.065 ^a

^a Not statistically significantly different from zero.

rium and constant returns to scale. In the model, the mathematical expression defining the farm–retail price transmission elasticity differs depending on whether observed changes in the marketing margin are caused by retail-level demand shifts for food or farm-level supply shifts for the agricultural product. In particular, if strictly cost-push elements are the case, the farm–retail price transmission elasticity is shown to be smaller in numerical value than if strictly demand-pull forces are at work.

The potential importance for price transmission work of distinguishing retail demand from farm supply shifts is emphasized by some numerical results derived from the Gardner model. We specified a range of relevant values for the parameters governing the price transmission mechanism in long-run competitive equilibrium as shown in footnote a of table 4.

The results showed that a substantially larger price transmission elasticity is obtained when retail demand shifts are relevant vis-à-vis farm supply shifts (table 4). The greatest difference occurs when the farm based input is more elastic in supply than the marketing services input. In this case, the price transmission elasticity under demand shocks is 3.75 times larger than under supply shocks.⁴ Price transmission elasticity differences for other assumed parameter values are smaller but nonetheless substantial enough to further investigate this potential source of asymmetry.

The Gardner theory is relevant to this study because the markup pricing model represented by equation (1) is based on the assumption that only farm-level supply shifts are relevant; that is, farm prices “cause” retail prices and not vice versa. The assumption of unidirectional causality from farm to retail appears plausible for dairy products as a group because government net purchases over the sample period were at least 1% of total production (Novakovic), meaning that government was setting farm prices. However, the assumption is less plausible for individual dairy products. For example, cheese consumption has increased steadily over time. If retail demand shifts for cheese were dominating farm supply shifts for milk during specific

⁴ Although the farm supply elasticity for milk normally is quite small, in the short run where plant capacity is fixed, the farm supply elasticity (e_a) could exceed the supply elasticity for marketing services (e_b). In the Gardner model, if $e_a > e_b$ and retail demand shifts dominate, the price transmission elasticity could exceed unity. Thus, even this extreme result from the Gardner model has potential relevance for the problem under study.

Table 4. Theoretical Values of Price Transmission Elasticities under Retail Demand versus Farm Supply Shifts

σ	Parameter ^a				Transmission Elasticity ($E_{r,f}$) When the Margin Change Is Due Exclusively to a:	
	e_a	e_b	η	S_b	Retail Demand Shift ^b	Farm Supply Shift ^c
0.5	1.0	2.0	-0.5	0.5	0.80	0.50
0	1.0	2.0	-0.5	0.5	0.75	0.44
0	1.5	2.0	-0.5	0.5	0.88	0.44
0	2.0	2.0	-0.5	0.5	1.00	0.44
0	2.0	1.0	-0.5	0.5	1.50	0.40
0	1.0	2.0	-1.0	0.5	.75	0.40

^a Parameters are defined as follows: σ is elasticity of substitution between the farm based input and marketing services; e_a , farm supply elasticity; e_b , marketing services supply elasticity; η , retail demand elasticity for food; and S_b , $1 - S_a$, where S_a = farmers' share of the consumer dollar.

^b Based on the equation $E_{r,f} = \frac{\sigma + S_a e_b + S_b e_a}{\sigma + e_b}$.

^c Based on the equation $E_{r,f} = \frac{S_a(\sigma + e_b)}{e_b + S_a\sigma - S_b\eta}$.

time intervals over the sample period, asymmetry in long-run farm-retail price transmission would be expected a priori.

Examination of actual data on commercial disappearance suggests that retail demand shifts over the study period were important for butter and cheese but not for fluid milk or ice cream. However, inventories of butter and cheese were quite large in many years, especially since 1977 for butter and in 1980-81 for cheese. The existence of large inventories is expected to neutralize the effect of demand shifts because stocks and not prices would be affected. Thus, only those periods in which inventories were small need to be considered here in testing the asymmetry hypothesis.

To test whether retail demand shifts play a role in explaining the observed pricing asymmetry in the dairy sector, the following equation was estimated:

$$(4) R_t = \alpha + \beta \bar{F}_t + \gamma \bar{F}_t \cdot D_t + \zeta M_t + \mu_t,$$

where R_t is the retail price of butter (cheese), \bar{F}_t is the Class II price of milk expressed as a weighted moving average of current and past prices,⁵ M_t is a food-marketing cost index, and

⁵ The theory underlying equation (4) refers to long-run transmission elasticities; therefore, to simplify testing yet maintain consistency with the theory, a weighted farm price variable was specified. The formula for constructing \bar{F}_t is $\bar{F}_t = \sum_{i=0}^N w_i P_{t-i}$, where w_i 's are the weighting factors, P_{t-i} is the Class II price of milk in month t , and N is the length (in months) of the weighting period. Based on the regression results presented earlier, $N = 2$ and $N = 5$ were assumed for butter and cheese, respectively. Specific weights used were $w_0 = .51$, $w_1 = .33$, and $w_2 = .16$ for butter and $w_0 = .035$, $w_1 = .313$, $w_2 = .332$, $w_3 = .214$, $w_4 = .075$, and $w_5 = .031$ for cheese.

D_t is a dummy variable assigned a value of one for the period Jan. 1973-Dec. 1976 when butter price is the dependent variable (zero otherwise) and the value of one for Jan. 1972-Dec. 1976 and Jan.-Dec. 1979 when cheese price is the dependent variable (zero otherwise). The dummy variable indicates periods of simultaneously tight inventories and significant retail demand shifts. Because the theory suggests a larger price transmission elasticity under retail demand shifts vis-à-vis farm supply shifts, a positive sign for γ is expected. Thus, a right-tail t -test is used to implement the test.

Generalized least squares estimates of equation (4) show that γ is positive as expected for both commodities but significant only for cheese (table 5). Moreover, the numerical value of γ is small in each equation, suggesting an elasticity differential of 6% or less in periods of apparent significant retail demand shifts. These results suggest that retail demand shocks play a relatively unimportant role in explaining the farm-retail price transmission asymmetry observed in this study.

As a final comment on the Gardner model, note that the estimated long-run price transmission elasticities in table 3 are uniformly less than one and are smaller or differ only slightly from respective farmers' share values. According to USDA estimates (Jones, Dunham), the farmers' share of the consumer dollar for each dairy product is milk, .54; cheese, .48; butter, .66; and ice cream, .34. From the Gardner model, if (a) only farm supply shifts are operant, (b) the marketing "pro-

Table 5. Regression Results for Testing Alternative Asymmetry Hypothesis

Commodity	Parameter Estimate					R^2	D.W.
	α	β	γ	ζ	ρ^a		
Butter	-20.6 (-1.71) ^b	8.44 (7.76)	0.19 (.89)	0.38 (6.10)	0.939 (40.84)	.984	1.47
Cheese	7.20 (4.27)	4.89 (14.09)	0.29 (4.98)	0.17 (11.09)	0.887 (21.00)	.997	1.98

^a First-order autoregressive parameter.

^b Numbers in parentheses are *t*-statistics.

duction" process is characterized by fixed proportions, and (c) the retail demand elasticity is arithmetically less than the marketing services supply elasticity, the farmers' share sets an upper bound on the (long-run) elasticity of price transmission. If marketing services are perfectly elastic in supply, farmers' share and the price transmission elasticity are identical (assuming only farm supply shocks are relevant).

The consistency of the empirical results with theory supports the basic assumption underlying the markup model that the direction of causation in price transmission is from farm to retail. This consistency increases confidence in the accuracy of the estimated price transmission elasticities.

Concluding Comments

Empirical results suggest that the farm-retail price transmission process in the dairy sector is characterized by asymmetry. Price transmission elasticities for rising farm prices were 16% to 238% larger than corresponding elasticities associated with falling farm prices depending on the dairy product. Moreover, although lag lengths were identical for rising and falling farm prices, mean lags corresponding to rising farm prices were much smaller than for falling farm prices. Thus, the major impact on retail prices of a change in the farm price of milk is felt sooner when farm prices are increasing than when farm prices are decreasing. The slower response of retail prices to downward movements in farm prices helps explain the commonly held belief that consumers do not benefit from decreases in farm prices. Still, however, the decreases in the farm price of milk are eventually passed along to consumers.

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References

- Almon, Shirley. "The Distributed Lag Between Capital Appropriations and Expenditures." *Econometrics* 33(1965):178-96.
- Baumol, W., J. Panzer, and R. Willig. *Contestable Markets and the Theory of Industry Structure*. New York: Harcourt, Brace, Jovanovich, 1982.
- Brorsen, B. W., J.-P. Chavas, W. R. Grant, and L. D. Schnake. "Marketing Margins and Price Uncertainty: The Case of the U.S. Wheat Market." *Amer. J. Agr. Econ.* 67(1985):521-28.
- Conway, R. K., P. A. V. D. Swamy, J. F. Yanagida, and P. von zur Muehlen. "The Impossibility of Causality Testing." *Agr. Econ. Res.* 36(1984):1-19.
- Dunham, Denis. USDA ERS. Personal correspondence, 1982.
- Gardner, Bruce L. "Price Discrimination and Price Stabilization: Debating with Models of U.S. Dairy Policy." *Amer. J. Agr. Econ.* 66(1984):763-68.
- . "The Farm-Retail Price Spread in a Competitive Food Industry." *Amer. J. Agr. Econ.* 57(1975):339-409.
- Granger, C. W. "Investigating Causal Relationships by Econometric Models and Cross-Spectral Methods." *Econometrics* 37(1969):424-38.
- Hall, L. L., W. G. Tomek, D. L. Ruther, S. S. Kyerine. "Case Studies in the Transmission of Farm Prices." Dep. Agr. Econ. A. E. Res. No. 81-12, Cornell University, Aug. 1981.
- Heien, Dale M. "Markup Pricing in a Dynamic Model of the Food Industry." *Amer. J. Agr. Econ.* 62(1980):10-18.
- Houck, J. P. "An Approach to Specifying and Estimating Nonreversible Functions." *Amer. J. Agr. Econ.* 59(1977):570-72.
- Johnston, J. *Econometric Methods*, 2nd ed. New York: McGraw-Hill Book Co., 1972.
- Jones, Webster. "Costs and Margins for Fluid Whole Milk and Butter." *Dairy Outlook and Situation*. Washington DC: U.S. Department of Agriculture, DS-388, March 1982.
- Lamm, R. M., and P. C. Westcott. "The Effects of Changing Input Costs on Food Prices." *Amer. J. Agr. Econ.* 63(1981):187-96.
- Novakovic, A. "Recent Trends in the U.S. Dairy Price

- Support Program and Their Implications." Dep. Agr. Econ. Pap., 80-25, Cornell University, Aug. 1980.
- Popkin, J. "Consumer and Wholesale Prices in a Model of Price Behavior by Stage of Processing." *Rev. Econ. and Statist.* 56(1974):486-501.
- Rao, Potluri, and Roger L. Miller. *Applied Econometrics*. California: Wadsworth Publishing Co., 1971.
- Sims, C. A. "Money, Income and Causality." *Amer. Econ. Rev.* 62(1972):540-52.
- TROLL: The State of the Art in Econometrics and Statistical Modeling*. Center for Computational Research in Economics and Management Science, Massachusetts Institute of Technology, March 1983.
- U.S. Department of Agriculture, Economic Research Service. *Dairy Outlook and Situation*, DS-387. Washington DC, Dec 1981.
- Ward, R. W. "Asymmetry in Retail, Wholesale, and Shipping Point Pricing for Fresh Vegetables." *Amer. J. Agr. Econ.* 64(1982):205-12.
- Wohlgenant, M. K. "Competitive Storage, Rational Expectations, and Short-Run Food Price Determination." *Amer. J. Agr. Econ.* 67(1985):739-48.