Short-Run Demand for Commercial Catfish

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Commercial catfish production in the South has expanded rapidly. In 1963, eight Southern states reported 2,370 acres devoted to commercial catfish production. In 1969 commercial catfish production utilized 40,000 acres in twelve states. The estimate for 1970 production was 54,000 acres [1].

Research recently completed [6] indicated there were 16 processing facilities in operation in 1970. Only three of the 16 processors reported marketing any fish prior to 1968. Two plants began operation in 1968, ten in 1969, and one in 1970. Total sales of processed fish increased from 1.9 million pounds in 1969 [2] to 3.7 million pounds in 1970 [6].

The monthly quantity of commercial catfish purchased for processing in 1970 varied from a low of 96 thousand pounds in May to a high of 1,218 thousand pounds in February. This resulted in a variation in monthly quantity available for sale from processed fish from 56 thousand pounds to 706 thousand pounds (Table 1). Variations in sales relative to quantity processed caused the industry inventory to reach a maximum of 228 thousand pounds at the end of February. The industry inventory did not reach low levels until midyear.

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Table 1. Levels of selected variables for commercial catfish industry, 1970.

Mo.	Retail price	Retail sales	Total sales[a]	Quantity available for sale from purchases[b]	End of month inventory	Ratio of quantity sold to quantity available
	(¢/lb.)	(1,000 of pounds)				(%)
1	96	4.353	416.952	463.686	46.734	89.9
2	97	4.271	524.946	706.400	228.188	74.3
3	94	3.515	374.318	343.943	197.813	108.8
4	96	3.082	257.180	137.996	78.629	186.4
5	101	2.600	84.443	55.703	49.889	151.6
6	102	1.900	104.764	85.342	30.467	122.7
7	94	1.600	151.134	129.774	9.107	116.5
8	96	1.800	161.066	142.905	-9.054	112.7
9	94	5.100	242.718	244.907	-6.865	99.1
10	94	6.132	445.970	452.576	-.259	98.5
11	94	5.955	475.819	475.367	-.711	100.1
12	93	4.875	446.850	447.831	-.270	99.8
$\bar{X}$	95.9	3.765	307.180	307.202		
s	2.7	1.525	151.140	195.320		
CV	2.82	40.504	49.202	63.580		

a Wholesale and retail sales.

b 58 per cent (estimated dress-out rate) of quantity purchased.

The industry began the second month of 1970 with a carry-over of 47 thousand pounds. An additional 706 thousand pounds were processed. Only 74 per cent of the fish processed that month were sold. In March the beginning inventory was at its annual maximum of 228 thousand pounds. Although more fish were sold in March than processed, the difference was not sufficient to appreciably reduce the inventory and price fell three cents. April began with an inventory of 198 thousand pounds. While the inventory was large, the industry sold 86 per cent more fish than were processed in April and price rose two cents per pound.

The five cent increase in price that occurred in May was due to two factors. First, industry inventory had declined for three successive months and had become relatively small. Secondly, only 56 thousand pounds of fish were processed. Price increased one cent in June for similar reasons. During the latter part of the year (last four months) the quantity sold and the amount available for sale were essentially equal and prices tended to stabilize.

During 1970, the market was also affected by the changing ratio of fresh to frozen sales. In the first three months fresh fish represented 27.6 per cent of total sales. In the last three months the fresh sale accounted for 75.9 per cent of total volume [6]. Limited information indicates a consumer preference for fresh fish.

Estimates of price-quantity relationships for commercial catfish are not available because of insufficient data. Due to the lack of information in this area, estimation of certain relationships were attempted from data for a single year. Such estimates are crucial in the planning stages for a relatively new potential growth industry.

Methodology

Large shifts in supply aid in the identification of short-run demand. Working [8] has shown how shifts in supply functions aid the identification of the demand functions.

The use of an unusual shift in supply to aid in identification of short-run demand and supply relationships has precedent. Tolley [7] used the Packinghouse Workers' strike of 1948 to develop demand and supply elasticity estimates for the hog-pork industry. Langham [3] used the Florida freezes of 1957-58 and 1962-63 to estimate price relationships for citrus products.

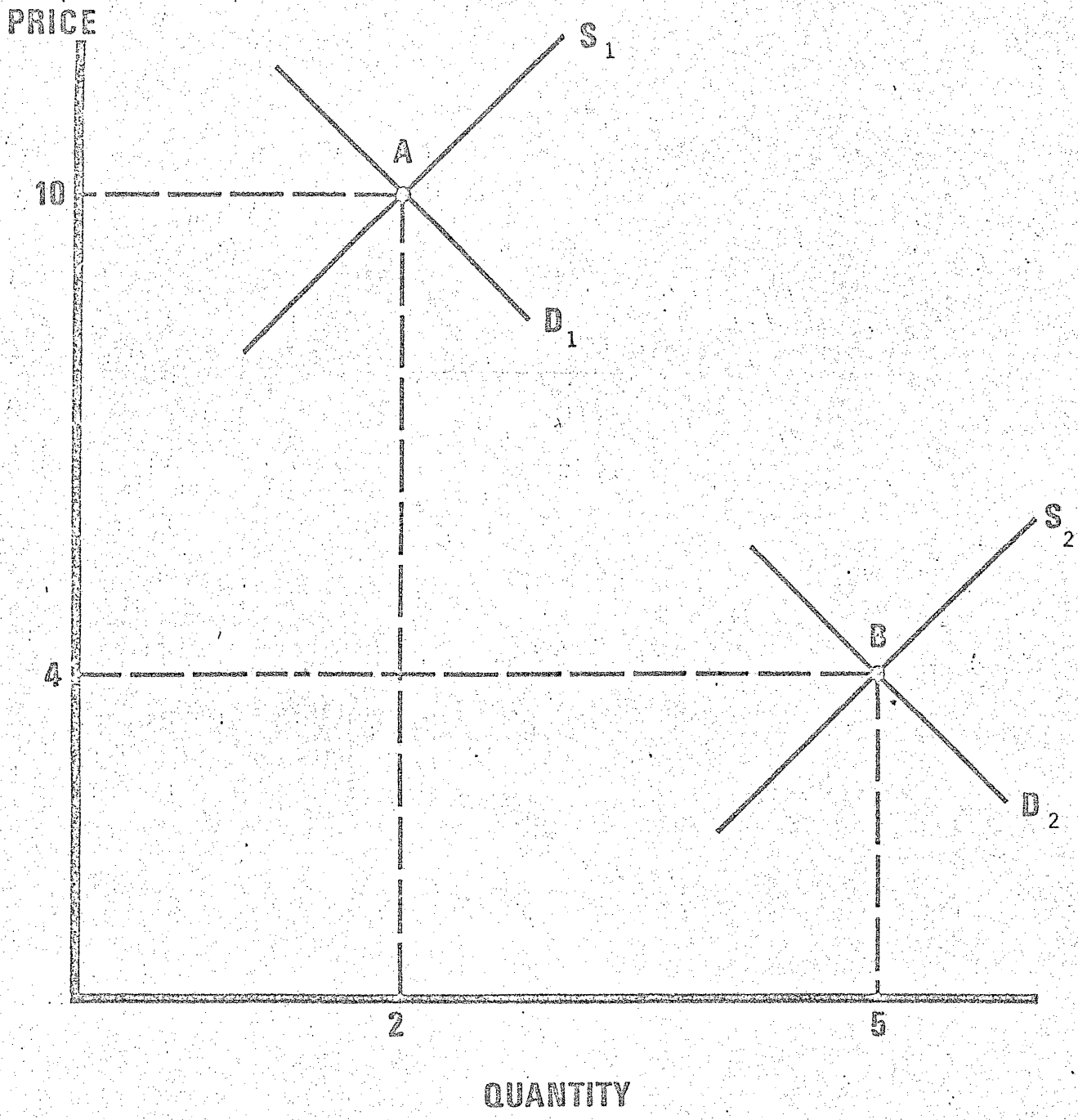
Economic theory states that the price of a product in a given market at a given time is determined by the intersection of a supply and demand curve. If during some period we observe that two units were sold at an average price of 10 we would expect that this observation occurred at the intersection of some demand curve D_1 and some supply curve S_1 (Point A, Figure 1). And, if in some other period we observe that five units sold at an average price of four, our principle of price determination would again tell us that this observation was at the intersection of some supply curve S_2 and some demand curve D_2 (Point B, Figure 1).

If the second price-quantity observation differs from the first because of a shift in supply while the demand remained stable, D_2 would not be a separate distinct demand curve but a continuation of D_1. Point A and B would be on the same demand curve.

Discussion

In this problem we have observations on price and quantity of commercial catfish for one year. The emerging industry lacked knowledge about the

Figure 1. Hypothetical Graph Showing Price Determination at Two Points in Time.



equilibrium price and several adjustments occurred during the year. It is doubtful that the demand for catfish changed significantly over the period of time covered by the data.

Early in the year the relationship between retail price and quantity sold was probably obscured by the large industry inventory and the related problem associated with large volumes of frozen fish. Therefore, considering only the last eight months (when inventory levels were rather low), supplies were relatively small in the fifth and sixth months, and relatively large in the tenth, eleventh, and twelfth months. In the seventh, eighth, and ninth months consumers were probably in the final stages of adjustment to the new mix or ratio of fresh and frozen fish.

By averaging the price and quantity variables sold for the fifth and sixth months, a point similar to Point A, Figure 1 was determined. By averaging the same variables for the tenth, eleventh, and twelfth months, an observation similar to Point B, Figure 1 was determined. It was assumed that the connection of these two points approximated the demand relationship.

Results

Three relationships were estimated -- between retail price and retail sales, total sales, and quantity available for sale from purchases.

Averaging retail price and quantity for months five and six the point (101.50, 2.25) is determined. For months ten, eleven, and twelve the point (93.66, 5.65) is determined. The equation of the line connecting the points is:

$$P^r = 106.68 - 2.30\ Q^r \qquad (1)$$

Where P^r is retail price in cents and Q^r is retail sales in thousands of pounds.

The same technique results in equations (2) and (3) for total sales and quantity available for sale from purchases.

$$P^r = 103.56 - .022\ Q^t \qquad (2)$$

$$P^r = 102.92 - .020\ Q^a \qquad (3)$$

Where Q^t and Q^a are total sale and quantity available for sale from purchases, both measured in thousands of pounds. Equations (2) and (3) are elastic over the entire range of quantities and prices observed in 1970. Equation (1) is inelastic for the larger levels of retail sales observed in 1970. This might indicate that as the emerging industry developes, demand will tend to become more inelastic and the industry may not be able to increase revenue by decreasing price and increasing the quantity sold.

The procedure (estimation of price-quantity relationship from two points) assumes that demand is not seasonal[1] (quantity demanded given a price does not vary by months) and that demand has not shifted. If demand is seasonal or if the demand curve shifted during the year, the demand situation may not be well identified by the data or this procedure.

The advantages of the estimation technique are that it is quite simple and some information is obtained from data that are available. The disadvantage is that probability statements about the distribution of the estimated coefficients is not possible.

When more data become available, the distributed lag techniques of Nerlove [5] or an autoregressive structure should be appropriate for this type of analysis of the commercial catfish industry. In a study of the demand for bread Moriak and Logan [4] employed a first order

autoregressive model with monthly per capita demand for bread formulated as a function of its own price, per capita disposable income, and the seasonal variation. A similar technique could be used to test for seasonality in demand for commercial catfish.

A Concluding Remark

The demand functions presented were estimated with selected prices and quantities observed in a single calendar year. Estimates for longer periods and with larger changes in supplies than have been experienced are not possible with data on past experience. Estimates which allow for a longer adjustment period by consumers would also be desirable.

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FOOTNOTES

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1 Some processors do not feel that the demand for commercial catfish is seasonal.