CONVENIENCE FOODS:

The Relationship Between Sales Volume And Factors Influencing Demand

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CONTENTS

SUMMARY

The estimating equation developed from available data explained 87 percent of variation in the log of sales of 110 convenience foods. Taking into account those factors found to be significantly associated with sales should be a positive aid in guiding the development and sales promotion of new products and in reducing the high rate of product failure.

The factors found to be significantly related to sales of convenience foods were: (1) Cost per serving, (2) degree of competition from similar products, (3) importance of food group in the consumer purchase pattern, (4) availability of the product, (5) success of similar convenience foods, and (6) special variables for specialty and ready-to-serve products. Within the framework of the model, these relationships have less than 1 percent probability of being caused by chance.

No doubt, quality and promotion also are important in explaining variation in sales volume of convenience foods. Because of lack of data, these factors were not used in the analysis.

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CONVENIENCE FOODS: THE RELATIONSHIP BETWEEN SALES VOLUME AND FACTORS INFLUENCING DEMAND 1/

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INTRODUCTION

This report identifies measureable factors associated with sales volume of convenience foods, and gives an equation based on these factors which may be of use in predicting success of new products.

The research on which this report is based is part of a broad program of market potentials research to provide guidelines to direct new product research and development activities into product lines with the greatest potential.

Many millions of dollars are invested each year to develop new and improved products, and a significant improvement in predicting the probable success of these products could be of great value to producers and processors in their search for new markets and larger profits (15). 4/

Annually food manufacturers offer an estimated 5,000 to 6,000 new products or product variations for distribution in grocery stores. Of these, only one-third are accepted for sale by grocers and only 500 survive the first year (7). This high rate of new product failure adds to marketing costs which may be reflected in prices to consumers and returns to growers.

The high rate of new product failure has not halted new product development because each successful new product has great impact on profits. Successful new products often make better sales and profit performance records than regular products in the same line (12). One large food manufacturer estimates that $1 of every $3 of its income comes from products which were unheard of 10 years ago (10).

Many of the successful new food products are convenience foods. Their success is attributed partly to rising family incomes and the fact that families in the middle and upper-middle income groups are generally willing to pay for and, in fact, demand built-in services in the foods they purchase (5).

1/ Kenneth J. McCallister of the Marketing Economics Division, Economic Research Service, provided guidance and consultation on technical matters related to the statistical and computer techniques.

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3/ Chief, Market Potentials Branch, Marketing Economics Division, Economic Research Service.

4/ Underscored numbers in parentheses refer to items in List of References, p. 21.

It is not too surprising that adding services to food increases its income elasticity, since the income elasticity is much greater for services than for food.

Much interest has been expressed in minimizing new product failures and lowering the cost of innovation. The goal of this research was the development of techniques for estimating sales of new food products prior to their development by finding measures associated with volume of sales. However, it is recognized that subjective factors will always remain to prevent precise measurement of all forces associated with sales.

Additional analysis of sales and other economic data is being planned to further define and delineate those primary or essential new product characteristics associated with success in the market place.

SOURCE OF DATA

Data used in the analysis mainly are from the Department's previous studies of convenience foods. These earlier studies gave monthly prices and information as to availability of 110 convenience foods and their home-prepared counterparts in Philadelphia, Milwaukee, New Orleans, and Oakland for 1960 (6). Data on preparation time and yields were obtained from the Food Quality Laboratory, Human Nutrition Research Division, Agricultural Research Service, U.S. Department of Agriculture, and the National Home Economics Research Center and Technological Laboratory, Bureau of Commercial Fisheries, U.S. Department of the Interior. Expenditures for food in grocery stores were obtained from several sources. When detailed data were not available from Department sources, estimates were made from the Dillon Study (11) and the Food Field Reporter (4).

DEVELOPMENT OF THE MODEL

"Convenience Foods" were defined as foods which have services added that reduce the amount of preparation required in the home and that have a fresh or home-prepared counterpart being sold at retail. This definition selects out as convenience foods those items which offer the housewife an alternate way of obtaining a given food item.

It was hypothesized that the sales volume of a convenience item is related to (1) cost per serving, (2) degree of competition from similar products, (3) importance of the food group in the consumer purchase pattern as reflected by sales volume of all forms of the item, (4) availability of the product, (5) success of similar convenience foods, (6) special variables for food groups, and (7) degree of convenience.

The specific quantitative measures developed within the framework of the hypothesis are as follows:

1. Cost per serving.--Cost per serving was calculated on the basis of retail costs of convenience foods in Philadelphia, Milwaukee, New Orleans, and Oakland during the period May 1959 through April 1960 (6). The size of serving was usually the weight of one-half cup. Costs of fuel and labor were not included in the calculation.

2. Degree of competition from similar products.--The three variables used to represent the degree of competition included sales of other convenience foods as percent of the product group, cost of fresh or home-prepared counterpart, and cost of highest-volume competing convenience food.

Sales of other convenience items as percent of product group refers to the sales of other items in the product group divided by the total sales of the product group. For example, when calculating this percent for brown-and-serve yeast rolls, the sales of all of the convenience forms of yeast rolls except brown-and-serve are added (861 million servings frozen and chilled plus 845 million servings ready-to-serve and 223 million servings of complete mix) and divided by the sales of the product group (3,847 million servings), which equals 50 percent.

The cost per serving of fresh or home-prepared counterparts was calculated from prices of the basic separate ingredients and from standard home recipes.

The cost per serving of the highest volume convenience item in the same group was selected to represent the cost of competing items. For instance, the cost per serving of brown-and-serve rolls was used in the model to help estimate the sales of a complete mix for rolls.

3. Importance of food group in consumer purchase pattern.--Importance of food group in consumer purchase pattern refers to annual sales of all items in the product group sold in supermarkets in terms of 100 million servings. This factor was used because it is reasonable to expect that the type of product involved would have a significant effect on probable demand. For example, assuming acceptable quality, a new potato product could reasonably be expected to have a higher sales level than a product of a type which has a low per capita consumption. The calculation of the product group for rolls may be illustrated as follows: Brown and serve rolls, 1,043 million servings; home-prepared, 875 million servings; frozen and chilled, 861 million servings; ready-to-serve, 845 million servings; and complete mixes, 223 million servings total 3,847 servings of all forms of rolls sold annually in grocery stores.

4. Availability.--The three variables which were found to represent the effect of availability on sales were availability of the convenience item, availability of the fresh or home-prepared counterpart, and availability of the highest volume competing product.

The percent availability was expressed in terms of the percent of times the products were observed by the price enumerators in a sample of supermarkets in four metropolitan areas during a 12-month period of observation.

5. Success of similar convenience products.--The success of similar items was reflected in the analysis by sales of the highest volume convenience product in the same product group in terms of 100 million servings sold annually in supermarkets.

6. Special variables.--Dichotomous explanatory values of 1 or 0 were used to allow for an adjustment in the level of sales for product groups with unusually low or unusually high predicted sales. Thus such specialty products as prepared foreign dishes with low observed sales were predicted more accurately by subtracting .58 from the predicted log sales of all specialty products. This technique also proved significant in more accurately predicting sales of baked products where predicted log sales rates were consistently underestimated. The deviation of predicted from observed sales of this group was minimized by adding .33 to the predicted log sales of all ready-to-serve baked products. The adding of explanatory variables reduced the deviation between estimated and observed sales for these products because these variables expressed some of the factors at work for which data were not available. However, this procedure did not prove significant in improving the predictive value of the model for other product groups.

7. Degree of convenience.--The measure of convenience developed for this analysis was work time per serving. Work time was defined as the time requiring the attention of the worker. Work time did not include waiting time while foods were thawing, cooking, baking, and the like. It was calculated from standard home recipes and family-size market units for the various foods under simulated home conditions. Data included in the analysis, in addition to work time of convenience items, were work time of the fresh or home-prepared counterparts, difference in work time per serving of convenience food and home-prepared, and work time per serving of highest volume competing convenience item in the same product group.

Each of the above seven measures in the hypothesis was evaluated by comparing them simultaneously with each other and with corresponding sales volume in a large multiple regression computer program. Six of these measures were found to be significantly related to sales on the basis of the reasonableness of signs of the regression coefficients, and "t" values of the independent variables which are given in the following discussion of the estimating equation.

Somewhat surprising is the fact that sales of convenience foods did not appear significantly related to degree of convenience. However, the analysis does not rule out the possibility that sales of convenience items are influenced by their relative convenience. Rather it merely shows that the available data on work time per serving were not significantly related to observed sales. Perhaps degree of convenience would have been better expressed in terms of total preparation time or consumers' conception of the relative convenience of various food forms.

One of the major limitations of the model is that quality, promotion, and stage of market maturity were not used in the analysis because of the lack of data. These variables may have indirectly influenced the results through intercorrelation with the variables which were used.

It should be noted that the model deals with the economic environment of products which had achieved varying degrees of market success and which possessed at least minimum acceptable quality characteristics. Quality undoubtedly would be a major factor in distinguishing successful new products from those which do not establish a foothold in the marketplace. Therefore quality should not be discounted as an important criterion in demand analysis. Further work needs to be done on the quality attributes of product failures compared with product successes.

THE ESTIMATING EQUATION

From nine variables an estimating equation was derived, which accounted for 87 percent of the variance in the logarithms of sales of convenience foods. 5/ Each of the nine had less than 1 percent probability of being caused by chance variation within the framework of the study. This equation is as follows:

$$\text{Log } \hat{Y} = -.60 - .60 \log X_1^2 - .85 \log X_2 + .28 \log X_3^2 + .31 \log X_4 + .65 \log X_5 - .16 \log X_5^2 + .44 \log X_6 + .23 X_7 - .58 X_8 + .33 X_9$$

Where:

$\hat{Y}$ = Sales of convenience foods in terms of 100 million servings sold annually in supermarkets.

X_1 = Cents per serving of convenience foods.

X_2 = Sales of all other convenience items in same product group as percent of product group.

X_3 = Cents per serving of fresh or home-prepared foods.

X_4 = Cents per serving of highest volume competing convenience item in product group.

X_5 = Sales of product group in terms of 100 million servings sold annually in supermarkets.

5/ The total variance explained in terms of antilogarithms of convenience food sales was 84 percent.

X_6 = Percent availability of convenience items.

X_7 = Sales of highest volume competing convenience item in same product group (100 million servings sold annually in supermarkets).

X_8 = Specialty products, i.e., foreign specialty products.

X_9 = Ready-to-serve baked products.

Logarithms were used in the equation to measure the elasticity effect of demand factors on sales volume. The regression coefficients, therefore, measure percentage changes in sales of convenience foods resulting from a 1 percent change in one of the demand factors. These values were squared for several of the variables because in this form the relationship between sales volume and demand factors gave a better fit.

The coefficients for the model and their standard errors are shown in table 1. The "t" values were calculated from the coefficients and their standard errors to determine the statistical significance of each independent variable (col. 3, table 1). With 99 degrees of freedom, all of the variables shown in this report had a probability of less than 1 percent of being caused by chance variations in the data.

The relationships shown by the equation represent an average for all of the products studied and do not necessarily reflect the expected sales response to changes in demand factors for individual products. How well this equation estimates sales of individual products is given in table 2.

EFFECT OF INDIVIDUAL FACTORS ON SALES

The regression of sales on factors used in the estimating equation is shown on the accompanying charts. On each chart, the other factors not shown are held constant at their respective means.

An inverse relationship was observed between sales volume and cents per serving of the convenience product (figure 1). Sales of convenience items decreased from 419 million to 120 million servings as the cost per serving increased from 2 to 10 cents. Sales declined at a more gradual rate as the cost increased over 10 cents per serving.

Estimated sales of a convenience food decreased as the share of the product group already consisting of convenience foods increased (figure 2). Estimated sales dropped from 336 million to 85 million servings as the percent of the product group accounted for by other convenience products increased from 5 to 25 percent.

Table 1.--Regression coefficients used in estimating equation

Variable	Regression coefficients	Standard error of coefficients	t 1/
	(1)	(2)	(3)
Cost			
Cents per serving of convenience forms (X_1)	-.60	.07	8.6
Degree of competition			
Sales of all other convenience items in same product group as percent of product group (X_2)	-.85	.10	8.5
Cents per serving fresh or home-prepared (X_3)	.28	.09	3.1
Cents per serving highest volume competing convenience product (X_4)	.31	.05	6.2
Importance in purchase patterns			
Sales of all items in product group (X_5)	.65	.10	6.5
Squared value of sales of all items in product group $(X_5)^2$	-.16	.05	3.2
Availability			
Availability of convenience forms (X_6)	.44	.14	3.1
Success of similar items			
Sales of highest volume competing convenience product (X_7)	.23	.08	2.9
Special food groups			
Specialty products (X_8)	-.58	.12	4.8
Ready-to-serve baked products (X_9)	.33	.08	4.1

1/ Column 1 divided by column 2 gives the statistic "t" test. With 99 degrees of freedom, the probability of the "t" value being as much as 2.6 is 1 in 100 because of chance variation in the data.

Table 2.--Estimated and observed sales volume of 110 convenience foods

Convenience foods	Sales volume, 100 million servings: Observed	Estimated	Deviation	Convenience foods	Sales volume, 100 million servings: Observed	Estimated	Deviation
BAKED PRODUCTS				DESSERTS & CANDIES			
Incomplete mixes:				Mixes:			
Brownies	1.68	1.75	.07	Orange sherbet	1.42	1.10	-.32
Waffles	1.27	1.39	.12	Chocolate fudge	3.38	4.20	.82
Yellow cake	4.65	4.19	-.46	Chocolate pudding:			
Apple pie	.84	1.32	.48	Cooked	.89	1.27	.38
Devil's food cake	5.56	4.85	.71	Instant	.90	1.29	.39
Coconut pie	.93	1.81	.88				
Pound cake	1.72	2.69	.97	Ready to serve:			
Pancakes	2.48	1.50	-.98	Orange sherbet	5.28	5.64	.36
Corn muffins	4.51	3.17	-1.34	Chocolate fudge	2.58	3.70	1.12
Complete mixes:				PIZZA			
Brownies	1.58	1.75	.17				
Yeast rolls	2.23	2.52	.29	Frozen	.11	.11	0
Cherry pie	3.83	2.39	-.44	Chilled	.16	.24	.08
Chocolate frosting	2.28	2.87	.59	Packaged			
Waffles	2.43	1.81	-.62	combination	1.08	.85	-.23
White frosting	3.23	2.59	-.64				
Pancakes	2.10	1.22	-.88	FRUIT			
Angel food cake	2.43	3.45	1.02				
Apple pie	3.15	1.97	-1.18	Canned:			
Biscuits	2.44	4.02	1.58	Coconuts	3.37	4.48	1.11
				Orange juice	10.28	8.47	-1.81
Frozen and chilled:				Lemon juice			
Waffles	.27	.37	.10	bottle	1.13	4.08	2.95
Pancakes	.16	.31	.15	Pineapple	13.20	16.72	3.52
Brownies	1.20	1.39	.19	Cherries	8.09	14.59	6.59
Coconut pie	1.04	.75	-.29	Peaches	26.40	37.58	11.18
Pound cake	1.57	1.05	-.42				
Devil's food cake	1.40	.78	-.62	Frozen:			
Cherry pie	1.84	1.18	-.66	Pineapple	.46	.81	.35
Biscuits, frozen	.89	1.57	.68	Cherries	.58	1.21	.63
Apple pie	1.85	1.12	-.73	Peaches	1.80	2.68	.88
Biscuits, refrig	3.04	3.79	.75	Coconuts	3.23	1.85	-1.38
Yeast rolls	8.61	3.38	-5.23				
				Fresh:			
Ready to serve:				Orange juice	6.87	4.25	-2.62
Cherry pie	1.13	1.32	.19				
Coconut pie	1.08	1.28	.20	VEGETABLES			
Apple pie	1.16	1.42	.26				
Angel food cake	4.00	4.34	-.34	Canned:			
Pound cake	6.95	6.50	-.45	Brussels sprouts	.44	.27	-.17
Yellow cake	6.33	5.66	-.67	Beets, diced,			
Devil's food cake	4.14	3.30	-.84	plain	1.57	1.84	.27
Brownies	1.59	2.79	1.20	Beets, harvard	1.68	1.96	.28
Yeast rolls	8.45	3.87	-4.58	Asparagus	5.05	4.69	-.36
Rolls, brown & serve	10.43	2.55	-7.88	Lima beans	2.41	2.00	-.41
				Corn	10.93	11.37	.44
BERRIES				Spinach	5.28	6.79	1.51
				Carrots, diced	.55	2.87	2.32
Canned:				Green beans	39.70	36.66	-3.04
Red raspberries	.38	.41	.03				
Strawberries	1.09	1.27	.18	Frozen:			
Cranberry sauce	3.03	3.26	.23	Asparagus	1.91	1.92	.01
				Brussels sprouts	1.98	1.97	-.01
Frozen:				Lima beans	3.29	2.82	-.47
Red raspberries	.32	.33	.01	Spinach	1.20	2.29	1.09
Strawberries	5.11	5.32	.21	Corn on cob	.46	1.56	1.10

Table 2.--Estimated and observed sales volume of 110 convenience foods-Con.

Convenience foods	Sales volume, 100 million servings			Convenience foods	Sales volume, 100 million servings		
	Observed	Estimated	Deviation		Observed	Estimated	Deviation
VEGETABLES-Con.				SPECIALTY PROD'S			
Frozen:				Chicken:			
Green beans	1.67	3.63	1.96	Chow mein, frozen	.06	.04	-.02
Corn	7.94	5.45	-2.49	Chow mein, canned	.29	.24	-.05
Broccoli	3.60	1.10	-2.50	Fricassee, canned	.10	.15	.05
Peas	10.93	4.28	-6.65				
POTATOES				Frozen fish:			
Dehydrated:				Shrimp creole	.03	.03	0
Au gratin	.59	.65	.06	Haddock dinner	.08	.05	-.03
Scalloped	.65	.72	.07	Shrimp, cooked, peeled, deveined	.11	.15	.04
Hashed brown	.72	1.51	.79	Shrimp, fried, peeled, deveined	.13	.07	-.06
Mashed	5.39	3.39	-2.00	Shrimp, prefried	.02	.10	.08
Frozen:				Shrimp, fried, breaded	1.60	1.23	-.37
Puffs	.81	.83	.02	Codfish sticks	1.21	.58	-.63
Patties	.89	.98	.09	Haddock fishsticks	1.25	.38	-.87
French fries	3.29	2.25	-1.04				
Canned:				Canned:			
Boiled whole	1.04	2.44	1.40	Cooked crab	.02	.03	.01
				Salmon	.84	.67	-.17
RICE				Cooked shrimp	.51	.30	-.21
Frozen fried	.38	.30	-.08	Beef stew	.91	1.08	.17
Canned Spanish	2.32	1.30	-1.02				
SPAGHETTI							
Packaged combination	3.42	2.85	-.57				
Canned	5.44	3.57	-1.87				

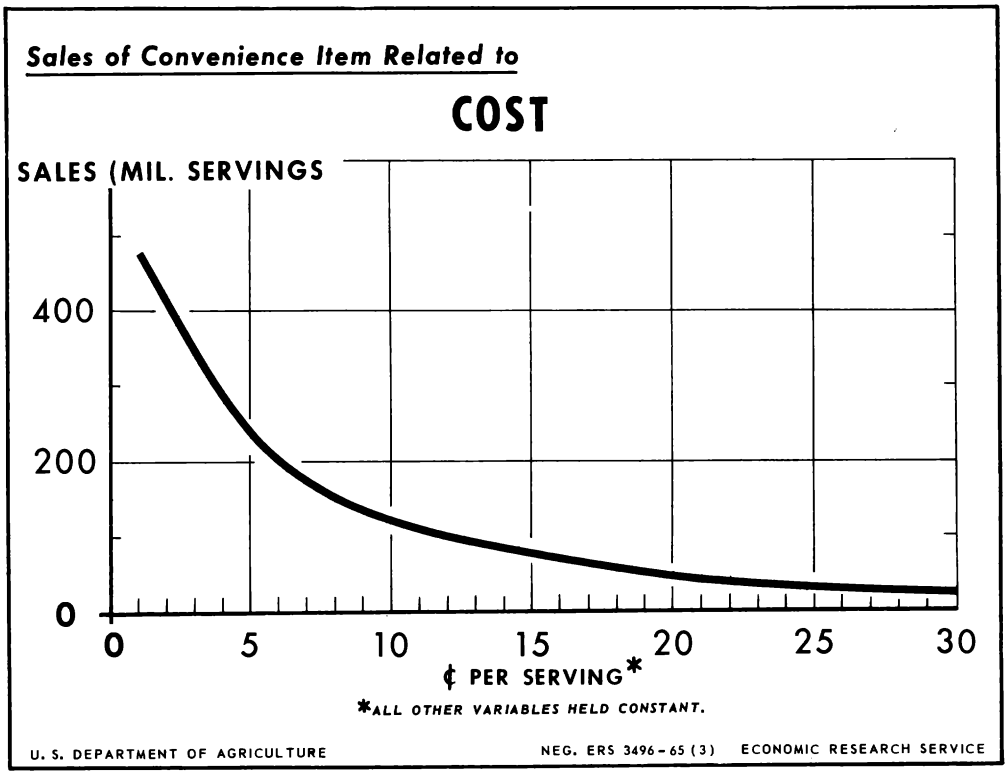

Figure 1

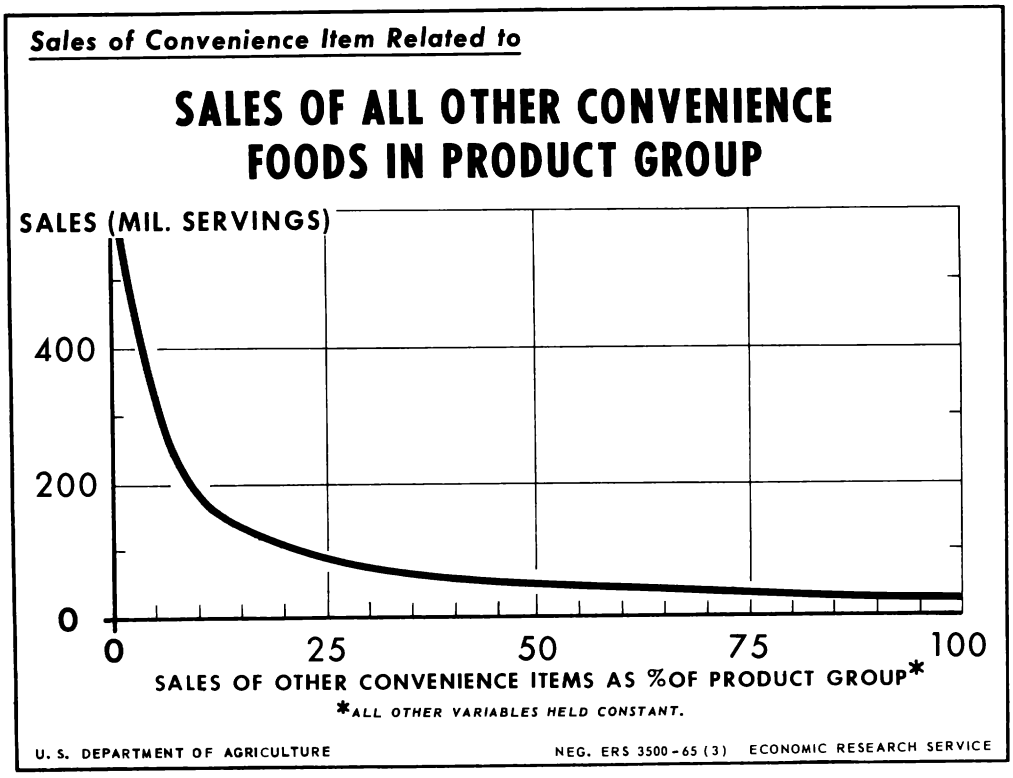

Figure 2

Consumers apparently substitute more convenience foods for home-prepared foods as the relative cost of the home-prepared is increased. Estimated sales of convenience foods increased from 95 million to 396 million servings as the cost per serving of home-prepared was increased from 1 to 30 cents per serving (figure 3). This relationship is not apparent from the input data, which show sales of convenience foods varying inversely with cost of home-prepared foods. However, when the data are adjusted by removing the effects of other variables, this relationship is brought out.

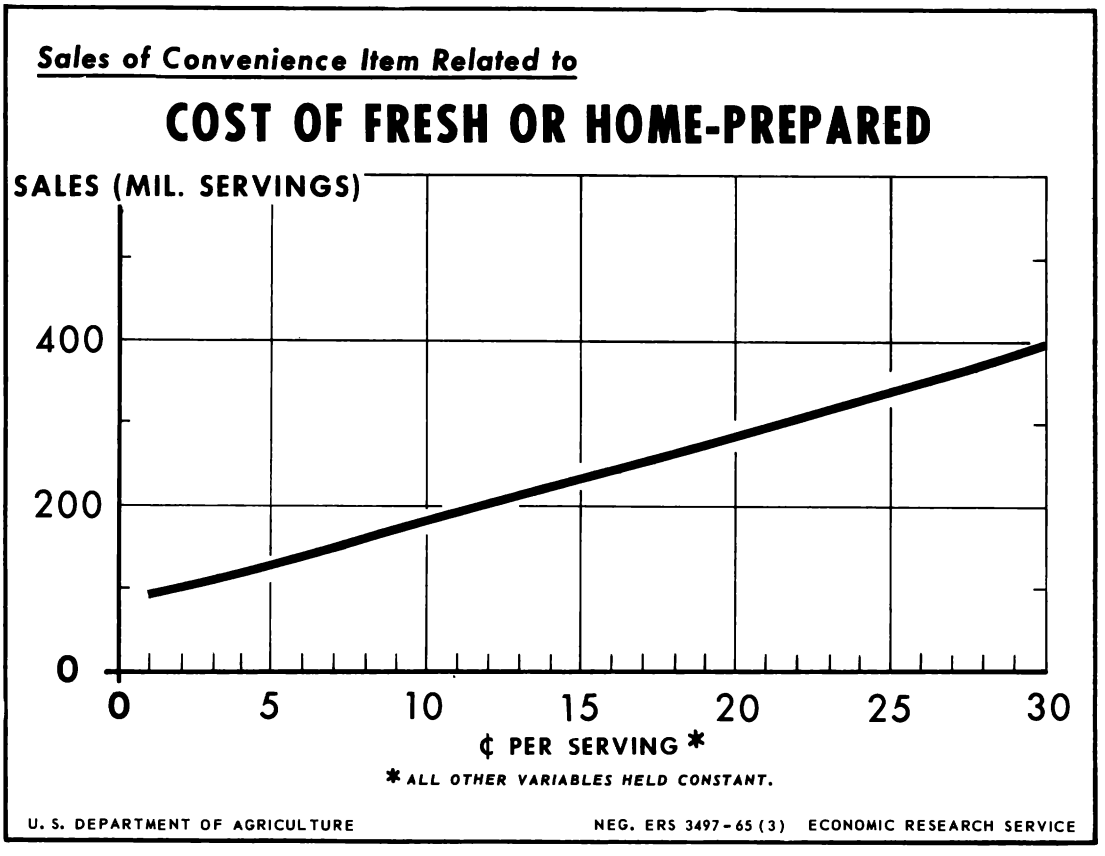

Figure 3

Estimated sales of a convenience item varied directly with the cost of the highest volume convenience product in the same product group (figure 4). This suggests that consumers tend to substitute lower cost convenience items for other convenience products when possible.

A direct relationship was observed between the sales of all items in the product group and sales of a convenience item (figure 5). Thus sales of the product group no doubt reflect the potential importance of the item in the menu. As sales of the product group increased from 100 million to 500 million servings, estimated sales of a convenience item in the group increased from 59 million to 140 million servings; and, as the sales of the product group

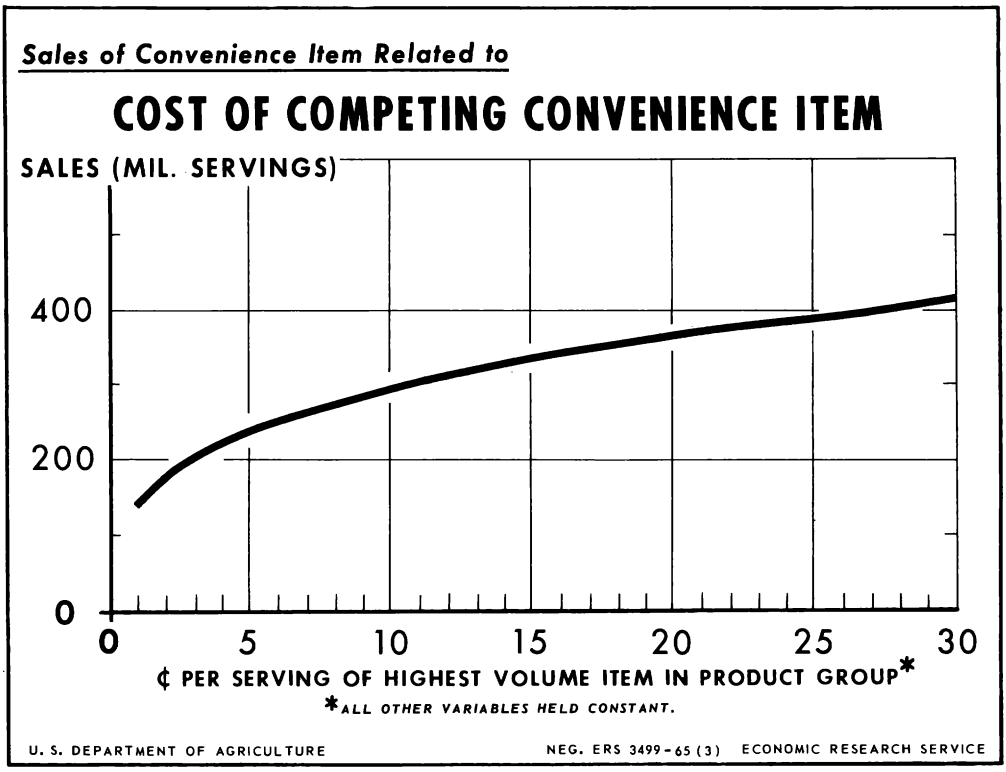

Figure 4

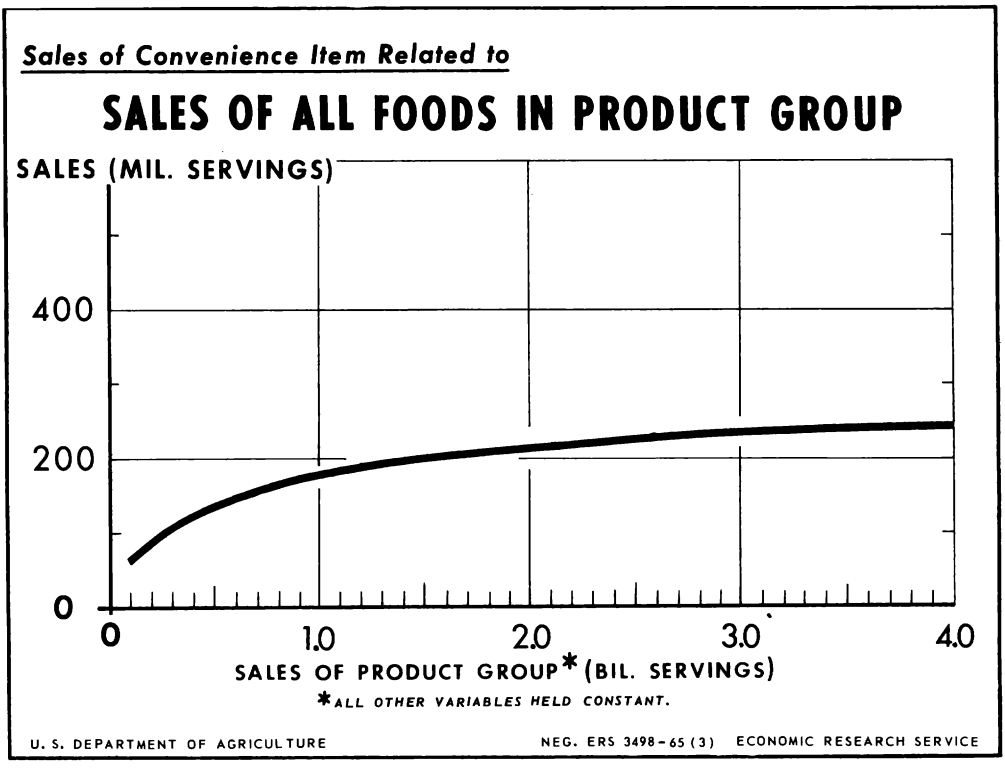

Figure 5

increased from 500 million to 1 billion servings, estimated sales of the convenience item increased from 140 million to 180 million servings. As sales of the product group increased over 1 billion servings, responsiveness of estimated sales to increases in sales of the product group was at a greatly diminished rate.

As expected, estimated sales increase with the availability of the product in grocery stores (figure 6). The responsiveness of sales to increased availability was greater for an increase from 1 to 50 percent than from 50 to 100 percent. As the percent availability increased from 1 to 50 percent, predicted sales increased from 22 million to 123 million servings.

The success of similar items in the same product group appears to increase the probability that another convenience item in the same group will have high sales volume (figure 7). As sales of the highest volume competing product increased from 100 million to 1 billion servings, estimated sales of the convenience product rose from 165 million to 288 million servings. A successful convenience item in the group may result in consumers looking for similar new convenience items. Thus, successful new product innovations appear to enhance the potential of others.

VARIANCE IN SALES EXPLAINED BY ESTIMATING FACTORS

As previously noted, the demand factors in the analysis explained an aggregate of 87 percent of the variation in the logarithms of sales of convenience foods. 6/ About 49 percent of the variance in logarithms of sales was explained by joint effects of the nine independent variables included in the analysis, and 38 percent was explained by their independent effects.

The increase in explained variance due to individual items was computed as the difference between total variance explained in a multiple correlation of all factors except the one in question, and total variance explained when all factors were included in the multiple correlation. These results are given in column 3 of table 3. The partial correlation coefficients squared shows the percent each variable reduced variance after all of the other independent variables were taken into account.

The most important variables in independently explaining variance in sales of convenience foods were cost per serving (X_1) and sales of other convenience foods as a percent of the product group (X_2). Each independently explained 9 percent of the variance. Sales of all the items in the product group (X_5) and cost of the highest competing product (X_4) also had considerable direct effect in explaining variance in sales.

6/ The total variation explained in terms of antilogarithms of sales of convenience foods was 84 percent.

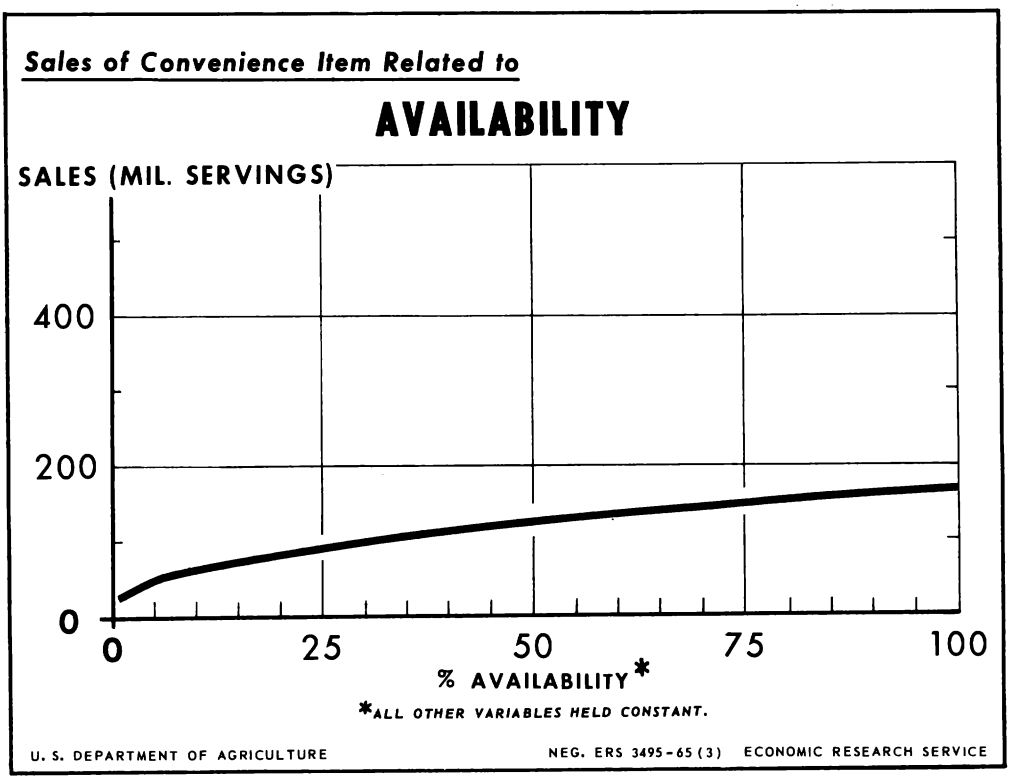

Figure 6

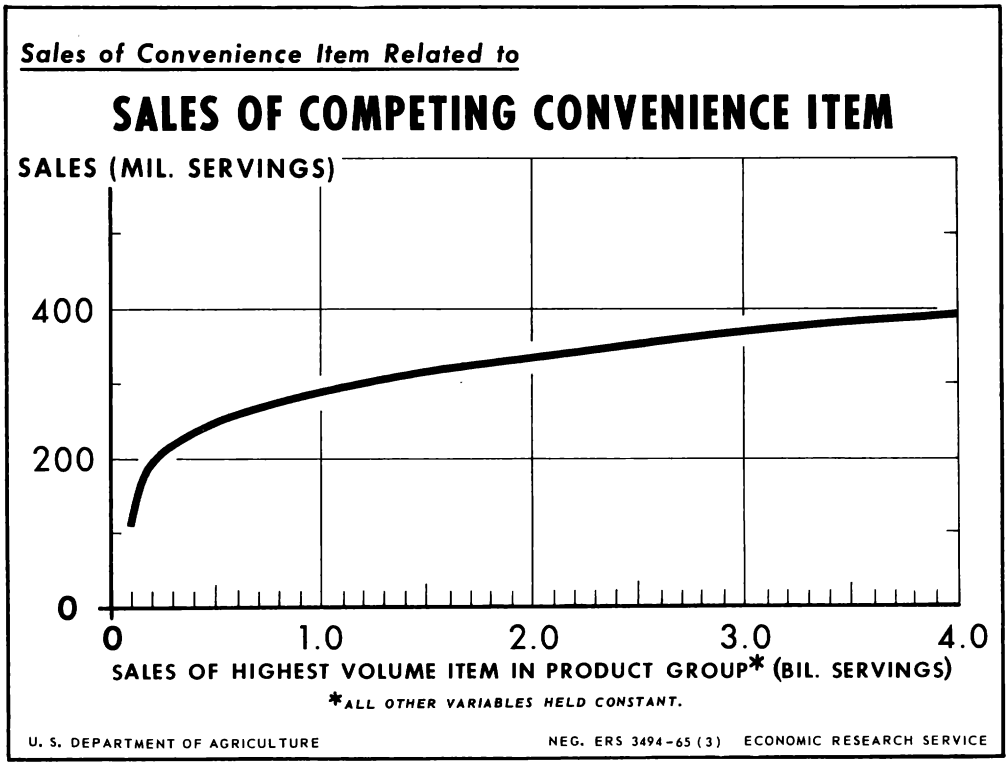

Figure 7

Table 3.--Independent and interaction effects of demand factors on sales of convenience foods

Demand factor	Variance in sales explained: Amount (100 mil. servings) (1)	Variance in sales explained: Percent of total (2)	Partial correlation coefficient squared (3)
INDEPENDENT EFFECT			
Cost			
Cents per serving of convenience foods (X_1)	3.70	9	.40
Degree of competition			
Sales of all other convenience items as percent of product group (X_2)	3.76	9	.40
Cents per serving of fresh or home-prepared (X_3)	.53	1	.08
Cents per serving of highest volume competing convenience item in product group (X_4)	2.13	5	.27
Importance in purchase pattern			
Sales of product group (X_5 and X_5^2)	2.84	7	.34
Availability			
Availability of convenience items (X_6)	.55	1	.09
Success of similar items			
Sales of highest competing product (X_7)	.50	1	.08
Special groups			
Specialty products (X_8)	1.34	3	.19
Ready-to-serve baked products (X_9)	.93	2	.14
JOINT EFFECTS OF ABOVE VARIABLES	20.00	49	--
TOTAL EXPLAINED VARIANCE	36.28	87	--
UNACCOUNTED-FOR VARIANCE	5.42	13	--

ESTIMATED AND OBSERVED SALES

The annual sales volume of the 110 convenience foods studied ranged widely. Sales of the convenience foods included in the study ranged from 2 million servings for the smallest seller to 3,970 million servings for the largest (table 2).

The estimated sales tended to follow the same distribution pattern as the observed sales, and the two values were quite close for many products. The deviation of the estimated values from the observed sales differed considerably for a few items (table 2). For instance, sales of convenience forms of yeast rolls were considerably larger than predicted from the regression equation. The relatively low cost per serving of the home-prepared rolls was primarily responsible for the low estimated sales for the convenience counterparts.

Further research could be of value to delineate variables other than those in the equation, which may be of importance in explaining variations in demand for products of unusual characteristics. One avenue could be to try to develop individual equations for different types or groups of products.

APPLICATION OF THE MODEL

An illustration of the computation of estimated annual sales for brownie mix is shown in table 4. Sales of other convenience items could be estimated by placing new input data in column 2 and calculating column 3 of the table.

A quicker, but less accurate, way of estimating sales for items not in the study would be to find a product in table 5 with similar input data. Once the input data are matched, the estimated sales of the similar item could be read from table 2.

Table 4.--Calculation of predicted sales of brownie mix

Independent variable	Regression coefficients (Col. 1)	Log of independent variable (Col. 2)	Product of coefficients and log of input variable Col. 1 x Col. 2)
CONSTANT TO BE ADDED TO COL. 3	--	--	-.5974
Cost			
Cents per serving of convenience forms (X_1)	-.60	.48[2]	-.1380
Degree of competition			
Sales of all other convenience foods as a percent of product group (X_2)	-.85	-.36	.3060
Cents per serving fresh or home-prepared (X_3)	.28	.48[2]	.0644
Cents per serving highest volumn competing convenience product (X_4)	.31	.45	.1395
Importance in purchase pattern			
Sales of all items in product group (X_5)	.65	1.01	.6565
Squared value of sales of all items in product group (X_5^2)	-.16	1.01[2]	-.1632
Availability			
Availability of convenience forms (X_6)	.44	-.15	-.0660
Success of similar item			
Sales of highest volume competing convenience product (X_7)	.23	.23	.0529
Special groups			
Specialty products (X_8)	-.58	1/ 0	0
Ready-to-serve baked products (X_9)	.33	1/ 0	0
TOTAL LOGS COL. 3	--	--	.2547
ANTILOG OF TOTAL COL. 3	--	--	1.8 (100 mil. servings)

1/ Substitute 1 for 0 if product is specialty product or ready-to-serve baked.

Table 5.--Input data used to develop predictive equation

Convenience foods	Cents per serving convenience foods X_1	Sales of other convenience foods as percent of prod. group[1/] X_2	Cents per serving fresh or home-prepared X_3	Cents per serving, highest vol. convenience prod. in same prod. group X_4	Sales of prod. group (100 mil. servings) X_5	Percent availability, convenience foods[1/] X_6	Sales of highest volume convenience prod. in same product group X_7
BAKED PRODUCTS							
Incomplete mixes:							
Brownies	2.82	43	2.99	4.21	10.19	99	1.59
Waffles	3.73	54	3.58	3.26	5.00	100	2.43
Yellow cake	2.04	38	2.38	4.04	16.69	78	6.33
Apple pie	5.62	65	5.60	7.37	9.47	53	3.15
Devil's food cake	2.49	37	3.59	6.21	14.98	100	4.14
Coconut pie	7.68	37	7.13	12.87	5.66	100	1.08
Pound cake	2.76	58	2.70	4.04	14.76	88	6.95
Pancakes	5.57	44	5.31	6.59	5.09	76	2.10
Corn muffins	2.06	1	1.70	.01	12.63	100	.01
Complete mixes:							
Brownies	3.01	44	2.99	2.82	10.19	70	1.68
Yeast rolls	2.13	71	1.57	2.16	38.47	98	8.61
Cherry pie	7.27	34	6.74	10.09	8.85	93	1.84
Chocolate frosting	2.13	1	2.46	.01	7.89	99	.01
Waffles	3.26	31	3.58	3.73	5.00	65	1.27
White frosting	1.46	1	.69	.01	5.53	100	.01
Pancakes	6.59	52	5.31	5.57	5.09	98	2.48
Angel food cake	4.12	41	3.60	7.31	9.73	100	4.00
Apple pie	7.37	40	5.60	10.03	9.47	97	1.85
Biscuits	1.58	27	1.56	1.93	14.64	100	3.04
Frozen & chilled:							
Waffles	11.06	74	3.58	3.26	5.00	98	2.43
Pancakes	14.51	90	5.31	6.59	5.09	100	2.10
Brownies	3.95	48	2.99	2.82	10.19	73	1.68
Coconut pie	14.83	36	7.13	12.87	5.66	80	1.08
Pound cake	7.32	59	2.70	4.04	14.76	50	6.95
Devil's food cake	8.19	65	3.59	2.49	14.98	63	5.56
Cherry pie	10.09	56	6.74	7.27	8.85	97	3.83
Biscuits, frozen	5.33	37	1.56	1.93	14.64	100	3.04
Apple pie	10.03	54	5.60	7.37	9.47	99	3.15
Biscuits, refrig.	1.93	23	1.56	1.58	14.64	94	2.44
Yeast rolls	2.16	55	1.57	4.96	38.47	66	8.45
Ready-to-serve:							
Coconut pie	12.87	35	7.68	14.83	5.66	25	1.04
Apple pie	13.03	62	5.60	7.37	9.47	83	3.15
Cherry pie	13.62	64	6.74	7.27	8.85	69	3.83
Pound cake	4.04	23	2.70	2.76	14.76	89	1.72
Yellow cake	4.04	28	2.38	2.04	16.69	70	4.65
Devil's food cake	6.21	46	3.59	2.49	14.98	80	5.56
Brownies	4.21	44	2.99	2.82	10.19	59	1.68
Angel food cake	7.31	25	3.60	4.12	9.73	94	2.43
Yeast rolls	4.96	55	1.57	2.16	38.47	90	8.61
Rolls, brown & serv	4.01	50	1.57	2.16	38.47	100	8.61
BERRIES							
Canned:							
Red raspberries	12.64	28	10.70	14.80	1.14	53	.32
Strawberries	17.22	41	12.10	14.56	12.45	64	5.11
Cranberry sauce	3.13	1	2.16	.01	31.99	97	.01

Table 5.--Input data used to develop predictive equation--Con.

Convenience foods	Cents per serving convenience foods X_1	Sales of other convenience foods as percent of prod. group 1/ X_2	Cents per serving fresh or home-prepared X_3	Cents per serving, highest vol. convenience prod. in same prod. group X_4	Sales of prod. group (100 mil. servings) X_5	Percent availability, convenience foods 1/ X_6	Sales of highest volume convenience prod. in same product group X_7
BERRIES-Con.							
Frozen:							
Red raspberries	14.80	33	10.70	12.64	1.14	72	.38
Strawberries	14.56	9	12.10	17.22	12.45	100	1.09
DESSERTS & CANDIES							
Mixes:							
Orange sherbet	4.20	68	3.34	6.17	7.83	34	5.28
Chocolate fudge	1.40	21	.75	1.84	12.28	83	2.58
Chocolate pudding:							
Cooked	5.32	35	6.23	5.28	2.55	98	.90
Instant	5.28	35	6.23	5.32	2.55	100	.89
Ready-to-serve:							
Orange sherbet	6.17	18	3.34	4.20	7.83	100	1.42
Chocolate fudge	1.84	27	.75	1.40	12.28	22	3.38
FRUIT							
Canned:							
Coconuts	1.41	22	.57	1.47	14.45	93	3.23
Orange juice	4.08	43	7.57	3.71	184.66	95	72.71
Lemon juice, bottle	2.10	1	3.03	.01	23.01	99	.01
Pineapple	7.40	3	7.08	10.20	14.38	100	.46
Cherries	6.89	6	17.13	8.15	10.30	94	.58
Peaches	7.76	2	5.80	11.88	75.70	100	1.80
Frozen:							
Pineapple	10.20	92	7.08	7.40	14.38	49	13.20
Cherries	8.15	79	17.13	6.89	10.30	21	8.09
Peaches	11.88	35	5.80	7.76	75.70	67	26.40
Coconuts	1.47	23	.57	1.41	14.45	14	3.37
Fresh:							
Orange juice	7.14	45	7.57	3.71	184.66	66	72.71
VEGETABLES							
Canned:							
Brussels sprouts	10.76	71	7.35	8.08	2.79	23	1.98
Beets, diced, plain	4.41	1	4.39	.01	5.36	89	.01
Beets, harvard	4.12	1	4.39	.01	5.36	92	.01
Asparagus	8.30	18	9.73	9.73	10.37	100	1.91
Lima beans	7.72	51	12.00	7.09	6.45	94	3.29
Corn	6.18	14	7.45	6.18	56.89	100	7.94
Spinach	7.04	13	12.11	7.91	9.14	100	1.20
Carrots, diced	4.28	1	3.05	.01	31.47	98	.01
Green beans	5.38	2	4.26	5.67	61.00	100	1.67
Frozen:							
Asparagus	9.73	49	9.51	8.30	10.37	96	5.05
Brussels sprouts	8.08	16	7.35	10.76	2.79	98	.44
Lima beans	7.09	37	12.00	7.72	6.45	100	2.41
Spinach	7.91	57	12.11	7.04	9.14	99	5.28

Table 5.--Input data used to develop predictive equation--Con.

Convenience foods	Cents per serving, convenience foods X_1	Sales of other convenience foods as percent of prod. group 1/ X_2	Cents per serving, fresh or home-prepared X_3	Cents per serving, highest vol. convenience prod. in same prod. group X_4	Sales of prod. group (100 mil. servings) X_5	Percent availability, convenience foods 1/ X_6	Sales of highest volume convenience prod. in same product group X_7
VEGETABLES-Con.							
Frozen:							
Corn on cob	10.30	1	8.20	.01	56.89	61	.01
Green beans	5.67	65	4.26	5.38	61.00	100	39.70
Corn	5.88	51	7.45	**6.18**	56.89	100	**10.93**
Broccoli	9.04	1	6.12	.01	5.12	100	.01
Peas	5.97	1	12.95	5.38	34.72	100	**23.19**
PIZZA							
Frozen	43.09	62	21.07	25.72	2.01	76	1.08
Chilled	29.80	59	21.07	25.72	2.01	76	1.08
Packaged combination	25.72	13	21.07	29.80	2.01	100	.16
POTATOES							
Dehydrated:							
Au gratin	7.99	1	5.33	.01	1.52	100	.01
Scalloped	7.33	1	3.66	.01	2.00	100	.01
Hashed brown	6.61	1	3.04	.01	9.89	100	.01
Mashed	3.45	1	2.25	.01	78.50	100	.01
Frozen:							
Puffs	5.86	1	4.56	.01	1.62	92	.01
Patties	5.34	1	2.54	.01	2.76	87	.01
French fries	5.65	1	5.29	.01	12.07	100	.01
Canned:							
Boiled whole	4.56	1	2.26	.01	23.66	100	.01
RICE							
Frozen fried	12.50	1	8.56	.01	.93	72	.01
Canned Spanish	5.97	1	3.87	.01	4.23	100	.01
SPAGHETTI							
Packaged combination	8.16	46	10.65	8.58	11.90	98	5.44
Canned	8.58	29	10.65	8.16	11.90	100	3.42
SPECIALTY PRODUCTS							
Chicken:							
Chow Mein, frozen	21.33	41	25.49	16.42	.70	60	.10
Chow Mein, canned	16.42	9	25.49	21.33	.70	83	.06
Fricasse, canned	12.56	1	15.10	.01	.20	92	.01
Frozen fish:							
Shrimp creole	43.36	1	27.78	.01	.40	32	.01
Haddock dinner	62.64	1	26.38	.01	1.58	55	.01
Shrimp, cooked, peeled deveined	36.73	30	22.35	27.76	1.68	64	.51
Shrimp, fried, peeled deveined	31.39	41	21.21	19.57	4.00	31	1.60
Shrimp, prefried	32.97	43	21.21	19.57	4.00	25	1.60
Shrimp, fried, breaded	19.57	4	21.21	31.39	4.00	90	.13
Codfish sticks	12.03	1	9.57	.01	1.98	88	.01
Haddock fish sticks	11.39	1	10.54	.01	2.07	24	.01
Canned:							
Cooked crab	25.52	1	**20.56**	.01	.10	100	.01
Salmon	15.12	1	15.51	.01	2.39	98	.01
Cooked shrimp	27.76	7	22.35	36.73	1.68	98	.11
BEEF STEW							
Canned	17.83	1	19.15	.01	8.92	100	.01

1/ Percentage values were entered as decimal fractions.

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