

Additech Demand Estimation and Price Optimization

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ADDITECH PRICING MODELS

Table of Contents

EXECUTIVE SUMMARY 2

DATA PREPERATION..... 3

ANALYSIS FOR PRODUCT TYPE 22 4

ANALYSIS FOR PRODUCT TYPE 23 8

APPENDIX: 12

ADDITECH PRICING MODELS

EXECUTIVE SUMMARY

This report provides the analysis and evaluation of the relationship between price and demand for Additech products, based on point-of-sale data from 2015.

Our analysis focuses on Product 22 and Product 23, as these are the only products with a large enough variation in price to do meaningful analytics, and so the analysis has focused on these products and on data from sales at customer “Murphy” since it is at this customer that variations in prices occurred. Our analysis indicates that these products are priced, in general, below what they should be priced at. The recommendation is therefore that Additech incrementally increase their prices to realize increased revenue, and then revisit the models presented here when more data, at the elevated prices, is gathered, for each customer and for each product.

ADDITECH PRICING MODELS

DATA PREPERATION

The records with Status code 6 were discarded as they were erroneous transactions, according to the DBA who provided the data to us.

Below are the distinct prices that Additech products were sold for in 2015:

PRODUCT TYPE	PRICE POINTS
TYPE6	19.95,19.99
TYPE7	19.95, 19.99
TYPE22	1.99,2.99,3.49,3.99,4.49,4.99,5.99
TYPE23	3.49,4.49,5.49,5.99,6.49,6.99,7.49,7.99
TYPE24	7.99
TYPE25	9.99
TYPE26	1.99
TYPE27	2.99
TYPE28	4.99
TYPE29	6.99

This table indicates that only Product 22 and Product 23 can be used for the present analysis, and it is recommended that Additech vary prices for other product offerings as well, so that a similar analysis can be conducted.

For product type 22 and 23, below are the distinct prices by various customers.

CUSTOMER	PRICE POINTS - TYPE22	PRICE POINTS - TYPE23
Fred Meyer	4.99	6.99;7.99
Kroger Southwest	4.99	6.99
Kroger Atlanta/King Soopers/City Market	4.99	6.99
Murphy	1.99;2.99;3.49;3.99;4.49;5.99	3.49;4.49;5.49;5.99;6.49;7.49
Smith	4.99	6.99

This table indicates that analysis can be performed only for customer “Murphy” since it has sufficient data points.

ADDITECH PRICING MODELS

ANALYSIS FOR PRODUCT TYPE 22

ANALYSIS FOR CUSTOMER: MURPHY

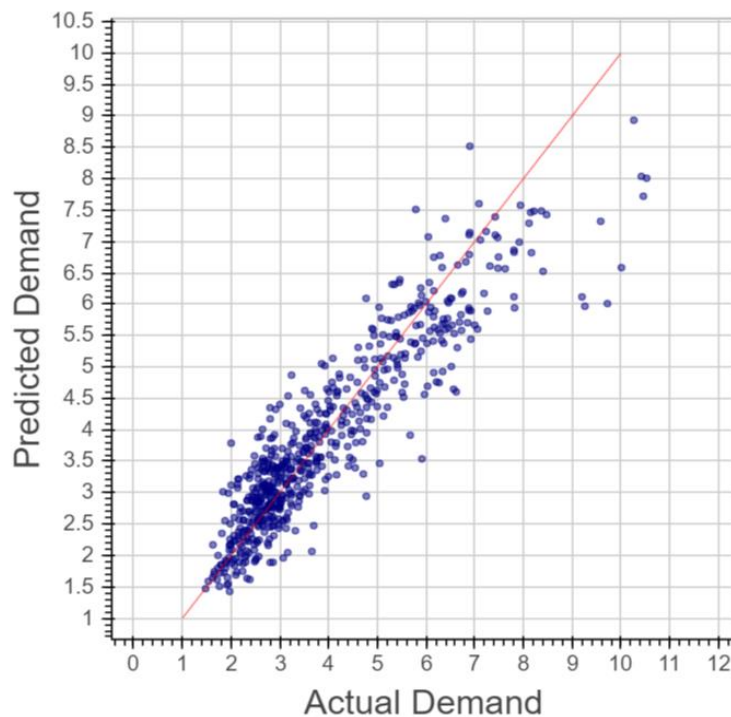
Demand vs Price Relationship

(GasTrans is the number of gas transactions at the site)

$$\text{Demand} = 0.05169 * \text{GasTrans}^{0.7739} * e^{-0.1432(\text{Price})}$$

R-squared: 0.82

RMSE: 0.17



Actual vs Predicted daily demand graph

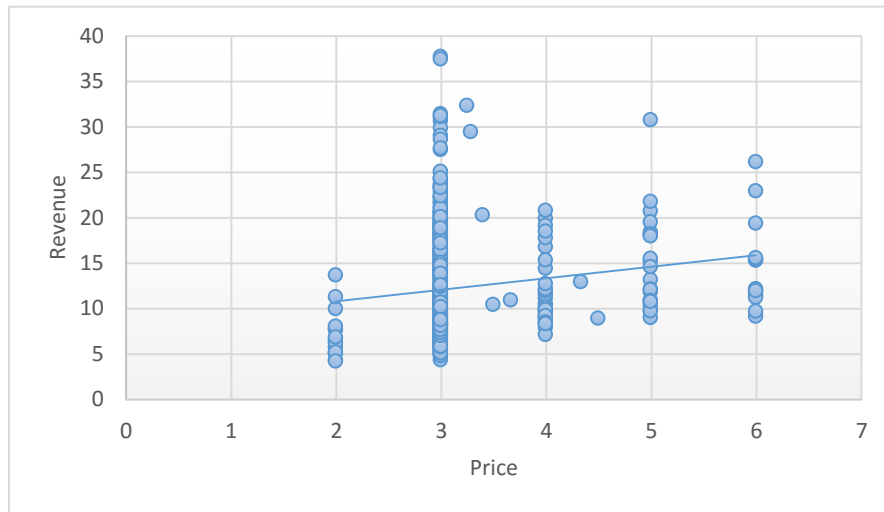
Recommended price = \$6.98 (to maximize revenue based on models)

$$\text{Expected Revenue} = 0.13279 * \text{GasTrans}^{0.7739}$$

$$\text{Elasticity} = 0.1432 * \text{Price}$$

ADDITECH PRICING MODELS

Empirical verification:



Price vs Average Daily Revenue for all sites

From the above revenue trend lines, we can infer that the revenue increases as price increases.

ADDITECH PRICING MODELS

ANALYSIS FOR CUSTOMER: MURPHY (Only sites with price variation)

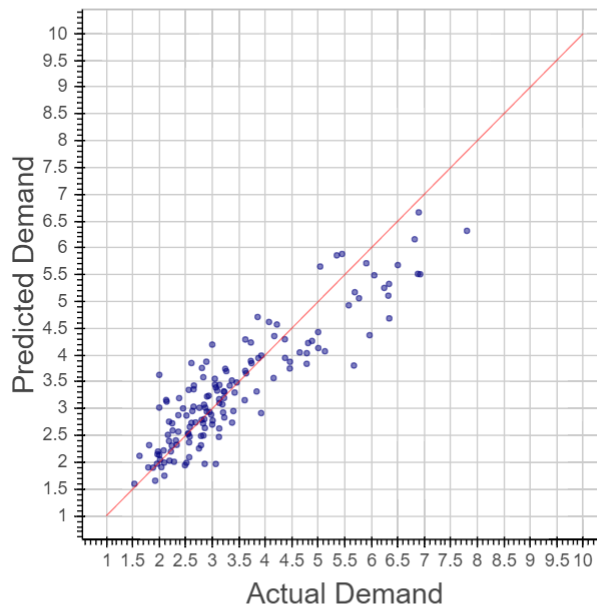
Demand vs Price Relationship

(GasTrans is the number of gas transactions at the site)

$$\text{Demand} = 0.08058 * \text{GasTrans}^{0.6987} * e^{-0.1464(\text{Price})}$$

R-squared: 0.78

RMSE: 0.17



Actual vs Predicted daily demand graph

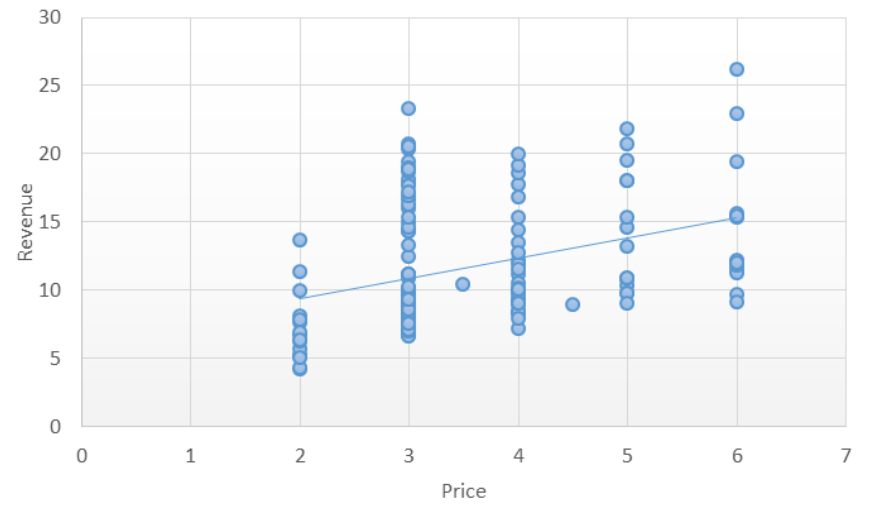
Recommended price = \$6.83 (to maximize revenue based on models)

$$\text{Expected Revenue} = 0.2024 * \text{GasTrans}^{0.6987}$$

$$\text{Elasticity} = 0.1464 * \text{Price}$$

ADDITECH PRICING MODELS

Empirical verification:



Price vs Average Daily Revenue

From the above revenue trend lines, we can infer that the revenue increases as price increases.

ADDITECH PRICING MODELS

ANALYSIS FOR PRODUCT TYPE 23

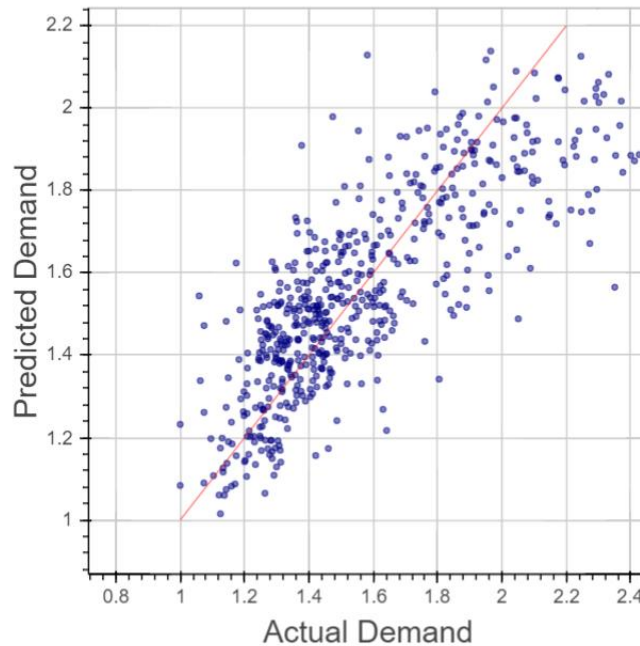
ANALYSIS FOR CUSTOMER "MURPHY"

Demand vs Price Relationship:

$$Demand = 0.2936 * GasTrans^{0.3329} * e^{-0.0806(Price)}$$

R-squared=0.654

RMSE=0.11



Actual vs Predicted daily demand graph

Recommended price = \$12.40 (to maximize revenue based on models)

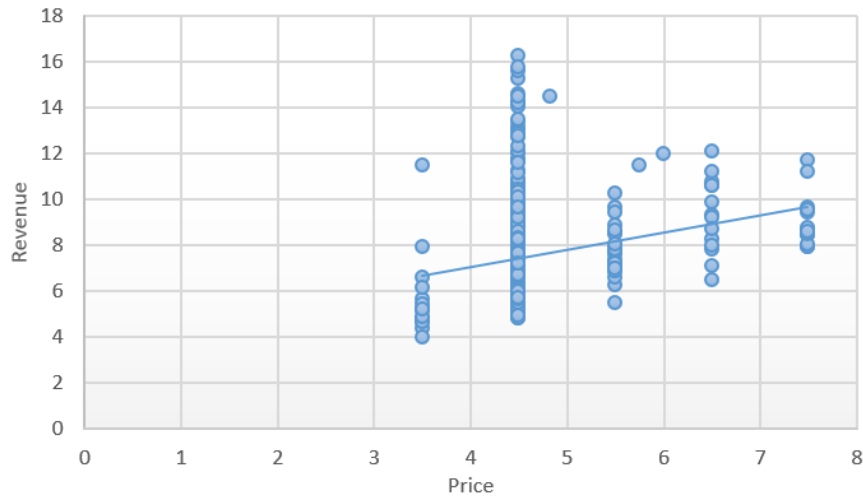
$$\text{Expected revenue} = 1.3405 * GasTrans^{0.3349}$$

$$\text{Elasticity} = 0.0806 * Price$$

ADDITECH PRICING MODELS

The product is inelastic until the price of \$12.40 and becomes elastic after that price. This implies that the revenue keeps increasing until the price of \$12.40 but decreases after that price.

Empirical verification:



Price vs Average Daily Revenue for all sites

From the above revenue trend lines, we can infer that the revenue increases as price increases.

ADDITECH PRICING MODELS

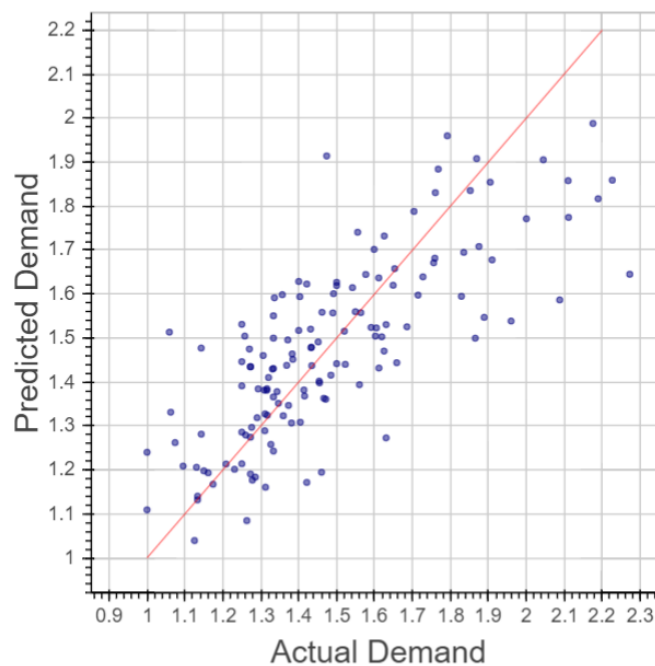
ANALYSIS FOR CUSTOMER “MURPHY” (for sites with price variation)

Demand vs Price Relationship:

$$Demand = 0.9 * GasTrans^{0.3} * e^{-0.0753(Price)}$$

R-squared=0.6

RMSE=0.11



Actual vs Predicted daily demand graph

Recommended price = \$13.45 (to maximize revenue based on models)

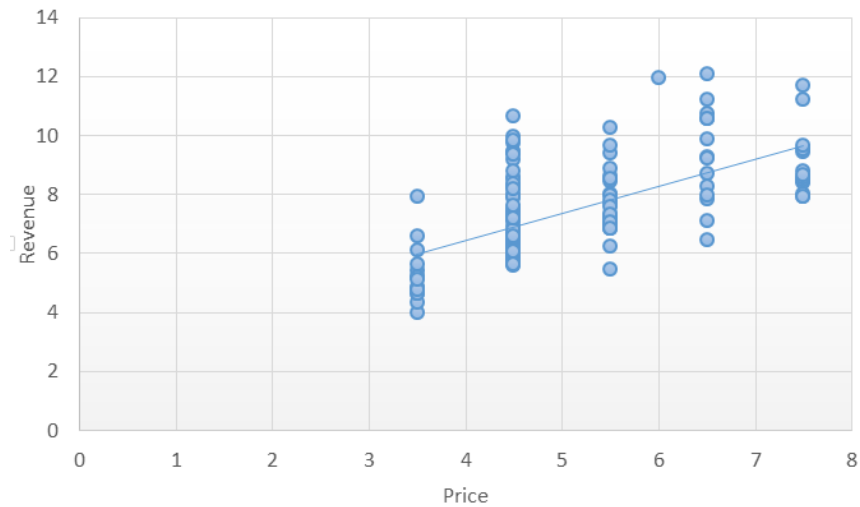
Expected revenue = $4.396 * GasTrans^{0.3}$

Elasticity = $0.0753 * Price$

ADDITECH PRICING MODELS

The product is inelastic until the price of \$13.45 and becomes elastic after that price. This implies that the revenue keeps increasing until the price of \$13.45 but decreases after that price.

Empirical verification:



Price vs Average Daily Revenue for sites with price variation

From the above revenue trend lines, we can infer that the revenue increases as price increases.

ADDITECH PRICING MODELS

APPENDIX:

PRODUCT TYPE 23 MODEL SPECIFICATION:

Customer Murphy:

Demand vs Price Relationship

(GasTrans is the number of gas transactions at the site)

$$\text{Demand} = 0.05169 * \text{GasTrans}^{0.7739} * e^{-0.1432(\text{Price})}$$

R-squared: 0.82

RMSE: 0.17

	coef	std err	t	P> t	[95.0% Conf. Int.]
const	-2.9626	0.095	-31.097	0.000	-3.150 -2.775
AddiAvgPriceType_22	-0.1432	0.011	-13.155	0.000	-0.165 -0.122
ttrTran	0.7740	0.015	52.936	0.000	0.745 0.803

The regression results are quite convincing. Using the above function, it signifies that both the price of Additech products and the number of gas transactions play a significant role in determining the demand for Additech products. The model takes into the account the fact that the Additech product demand is limited by the number of gas transactions. The model enforces that, when price tends to 0, demand will never go to infinity.

EMPIRICAL VERIFICATION:

Site Id	Price Change in \$	% Change in Average Daily Revenue
17063	0.28	117%
17117	2	17%
17119	1	-10%
17141	1	24%
17184	1	23%
17208	1	24%
17222	2	19%
17223	2	20%
17246	3	-5%

ADDITECH PRICING MODELS

17296	1	17%
17299	1	36%
17300	1	47%
17311	1	58%
17317	2	1%
17335	2	22%
17364	1	9%
17366	2	-3%
17367	1	42%
17409	3	5%
17469	3	23%
17506	3	58%
17509	1	115%
17515	1	53%
17523	1	1%
17538	1	5%
17545	1	-6%
17584	1	60%
17585	3	20%
17587	3	8%
17589	2	86%
17592	3	7%
17611	0.25	84%
17623	2	46%
17642	3	0%
17664	3	17%
17666	2	27%
17674	1	44%
17680	1	28%
17744	0.6666	44%
17767	1	67%
17771	1	29%
17782	1	36%
17788	3	16%
17849	3	22%
17937	3	17%

The increase in revenue in 41 sites out of 45 sites corroborates the fact that an increase in price results in increased revenue.

ADDITECH PRICING MODELS

PRODUCT TYPE 23 MODEL SPECIFICATION:

Customer Murphy:

Demand vs Price Relationship

$$Demand = 0.2936 * GasTrans^{0.3329} * e^{-0.0806(Price)}$$

R-squared=0.654

RMSE=0.11

	coef	std err	t	P> t	[95.0% Conf. Int.]
const	-1.2252	0.072	-17.073	0.000	-1.366 -1.084
AddiAvgPriceType_23	-0.0806	0.008	-10.501	0.000	-0.096 -0.066
t1lTran	0.3349	0.011	31.873	0.000	0.314 0.356

EMPIRICAL VERIFICATION:

Site Id	Price Change in \$	% Change in Average Daily Revenue
17119	1	-6%
17117	2	26%
17246	3	-1%
17141	1	8%
17208	1	13%
17223	2	31%
17523	1	-6%
17296	1	19%
17300	1	54%
17317	2	28%
17342	1.25	91%
17366	2	8%
17409	3	30%
17506	3	37%
17515	1	16%
17538	1	16%
17545	1	23%
17584	1	38%
17585	3	42%

ADDITECH PRICING MODELS

17587	3	45%
17592	3	23%
17623	2	40%
17642	3	11%
17664	3	30%
17666	2	14%
17674	1	22%
17680	1	1%
17767	1	41%
17771	1	4%
17782	1	13%
17788	3	31%
17849	3	5%
17937	3	21%

This tables shows that for Product 23, 39 sites out of 42 realized an increase in revenue at higher prices.