ECON 7010: Applied Microeconomics

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Problem Set 3

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Exercise 1: Describe the data

(a) Please refer to the R code PS3_Q1.R for the codes.

(b) The cleaning for this question, involved a few assumptions. There were stores where data was missing for more than 60% of the weeks. In such cases, instead of imputing the values, the store-brands were dropped from the data since across-week variation would be close to 0.

(c) The final table of summary statistics is shown in Table 1.

Exercise 2: Logit demand model

The results are shown in Table 2. In all models, the coefficient for Promotion is positive and statistically significant at the 1 percentage level, which means that promotions are associated with an increase in consumer demand. Consistent significant and positive coefficients across different model specifications support the robustness of the result. There is a Dummies row for 'Brand' and 'Store-Brand' for some models, indicating that brand-specific effects are controlled for, though the positive effects of promotions are still evident.

Exercise 3: Elasticity

(a) Please refer to the R code PS3_Q3.R for the codes. The results make sense in total, since they are all negative and are about between -0.1 and -3. This is consistent with our knowledge on elasticity.

(b) In Column (iv) to Column (vi), the elasticities are far smaller than those in part (a). This may be caused by the nature of instrumental variables. Here we use wholesale cost as the instrument variable of price, which may mitigate (or enlarge) the possible endogeneity problems. In Column (vii) to Column (ix), the results are similar with those in part (a).

(c) The cross-elasticity is also negative, and the cross-elasticity of different products to the same product is also the same.

Table 1: Summary statistics

	Data ID	Brand	Market share	Unit price	Wholesale price	% units sold during promotion
1	Tylenol 25	1	0.077	3.417	2.181	4.08
2	Tylenol 50	2	0.096	4.888	3.671	9.496
3	Tylenol 100	3	0.062	6.944	5.749	13.108
4	Advil 25	4	0.063	2.94	2.029	10.66
5	Advil 50	5	0.041	5.025	3.605	15.549
6	Advil 100	6	0.019	8.072	6.106	14.101
7	Bayer 25	7	0.022	2.67	1.842	16.2
8	Bayer 50	8	0.018	3.6	2.485	22.493
9	Bayer 100	9	0.043	3.938	3.709	27.527
10	Store brand 50	10	0.051	1.862	0.908	11.038
11	Store brand 100	11	0.039	4.307	1.873	22.47
12	Outside good		99.469			

Table 2: Logit demand model

	OLS		
	(i)	(ii)	(iii)
Price	−0.051***	−0.337***	−0.094***
	(0.003)	(0.010)	(0.003)
Promotion	0.211***	0.329***	0.349***
	(0.016)	(0.013)	(0.013)
Dummies	–	Brand	Store-Brand
	Wholesale Cost IV		
	(iv)	(v)	(vi)
Price	−0.011***	−0.007	−0.033***
	(0.003)	(0.020)	(0.004)
Promotion	0.234***	0.430***	0.374***
	(0.016)	(0.014)	(0.013)
Dummies	–	Brand	Store-Brand
	Hausman IV		
	(vii)	(viii)	(ix)
Price	−0.039***	−0.337***	−0.068***
	(0.003)	(0.010)	(0.003)
Promotion	0.217***	0.329***	0.360***
	(0.016)	(0.013)	(0.013)
Dummies	–	Brand	Store-Brand

Table 3

Brand	(i)	(ii)	(iii)
Tylenol 25	-0.160	-1.062	-0.295
Tylenol 50	-0.225	-1.488	-0.414
Tylenol 100	-0.331	-2.194	-0.610
Advil 25	-0.140	-0.928	-0.258
Advil 50	-0.245	-1.623	-0.451
Advil 100	-0.403	-2.667	-0.742
Bayer 25	-0.133	-0.879	-0.245
Bayer 50	-0.180	-1.191	-0.331
Bayer 100	-0.192	-1.269	-0.353
Store brand 50	-0.090	-0.595	-0.166
Store brand 100	-0.210	-1.394	-0.388

Brand	(iv)	(v)	(vi)
Tylenol 25	-0.033	-0.021	-0.105
Tylenol 50	-0.047	-0.03	-0.148
Tylenol 100	-0.069	-0.044	-0.217
Advil 25	-0.029	-0.019	-0.092
Advil 50	-0.051	-0.033	-0.161
Advil 100	-0.084	-0.054	-0.264
Bayer 25	-0.028	-0.018	-0.087
Bayer 50	-0.037	-0.024	-0.118
Bayer 100	-0.04	-0.025	-0.126
Store brand 50	-0.019	-0.012	-0.059
Store brand 100	-0.044	-0.028	-0.138

Brand	(vii)	(viii)	(ix)
Tylenol 25	-0.123	-1.062	-0.214
Tylenol 50	-0.172	-1.488	-0.3
Tylenol 100	-0.253	-2.194	-0.442
Advil 25	-0.107	-0.928	-0.187
Advil 50	-0.188	-1.623	-0.327
Advil 100	-0.308	-2.667	-0.537
Bayer 25	-0.102	-0.879	-0.177
Bayer 50	-0.138	-1.191	-0.24
Bayer 100	-0.147	-1.269	-0.256
Store brand 50	-0.069	-0.595	-0.12
Store brand 100	-0.161	-1.394	-0.281

Table 4

	Tylenol 50	Advil 50	Bayer 50
Tylenol 50	-0.300	-0.032	-0.032
Advil 50	-0.014	-0.327	-0.014
Bayer 50	-0.004	-0.004	-0.240