

Second Midterm Exam

Question I

The web site drugstore.com conducts a coupon campaign to induce consumers to try ordering from their web site. Coupons are included in packages ordered from other web sites such as amazon.com. A marketing study is conducted of the effectiveness of these coupons. The following data are available for a random sample of those receiving the coupons.

BUY	The amount in dollars ordered from drugstore.com using the coupon. [Note: this is the dependent variable in most of the questions below.]
COUPON	The dollar amount of the coupon. Consumers randomly received coupons offering different deductions, ranging in value from \$1 to \$25, for the consumer's first order at drugstore.com.
STORES	The number of different stores at which the consumer has purchased nonprescription drugs, health and beauty items, and other drug store items over the past six months.
EXPER	Self-rating of web experience on 1(least) to 7 (most) scale
PRIVACY	Self-rating of concern about online privacy on 1 (least concerned) to 7 (most concerned) scale

Using the above variables and variables you construct from them, specify MODEL A/C comparisons using the above variables that would answer the theoretical and practical questions posed. Also give the value of PA – PC.

1. Does the amount of the coupon induce consumers to buy more?
2. For the coupon campaign to be economically viable (dot.com's do need to worry about that these days), the average order from those using the \$10 coupons must exceed \$20. Assuming that the amount of the coupon is related to amount purchased, specify a test of this question.
3. Also, economical viability requires that for each additional dollar in discount (the amount offered by the coupon), the amount purchased must increase by \$2. What models test that aspect of economic viability?
4. Do all the variables (amount of coupon, number of stores shopped, web experience, and privacy concerns) predict the amount purchased at the web site?

5. The number of stores at which the consumer has purchased products is a proxy measure of loyalty (fewer stores implies greater loyalty to those few stores). Controlling for the other variables, is loyalty related to amount purchased at the web site?
6. Is loyalty at least partially redundant with the two self-ratings of web experience and privacy concerns?
7. Over and above the other variables, are the two self-ratings of web experience and privacy concerns as a group useful predictors of purchases at the web site?
8. Ignoring for the moment all predictors but the amount of the coupon and the number of stores shopped, is the amount of the coupon more effective for less loyal consumers?
9. Assuming that the amount of the coupon is more effective for less loyal consumers, does the amount of the coupon have any effectiveness for the most loyal consumers (i.e., those consumers who made their purchases at only one store)?
10. Ignoring the number of stores at which the consumer shopped, does the effectiveness of the coupon depend on both of the self ratings (as a group)?

Question II

A researcher interested in public opinion toward a proposed low-income housing development collects data to find out how much support there is in the community for affordable housing. The following variables are available in the dataset:

LIHA	attitude toward low-income housing; ranges from 0 to 100 with higher numbers indicating greater support for low-income housing
INC	respondent's household income in thousands of dollars
CON	respondent's general political ideology; ranges from 0 (very liberal) to 100 (very conservative)
AGE	age of respondent in years
INT	INCOME*CON
INCD	INCOME – Mean INCOME
COND	CON – Mean CON
INTD	INCD*COND

Based on the SAS output on the following pages, answer the following questions.

1. Do more liberal people show more support for low-income housing? (Provide PRE, F*, p and a substantive conclusion.)
2. Are older people more likely to be liberal? (Provide PRE, F*, p and a substantive conclusion.)
3. As a set do the demographic variables of income and age predict attitudes toward low-income housing once political ideology has been controlled? (Provide PRE, F*, p and a substantive conclusion.)
4. Another researcher suggests that when controlling for demographic variables, the relationship between political ideology and support for low-income housing should be one-to-one. As ideology becomes more conservative by one unit on the scale, support for low-income housing should decrease by one unit. Is there any evidence for this argument based on the data? (Be sure to include a statistical and substantive conclusion.)
5. Provide a substantive interpretation of the coefficient of INC in Model 7.
6. If we were to estimate the following model, what would the tolerances be for each of the predictors?

$$LIHA_i = \beta_0 + \beta_1 AGE_i + \beta_2 INC_i + \epsilon_i$$

7. Using the simplest model, is there support for the researcher's primary hypothesis that the relationship between political ideology and attitudes toward low-income housing is stronger for people with higher incomes? (Provide PRE, F*, p and a substantive conclusion.)
8. Provide a substantive interpretation for INT in Model 5. (In this case there is a particular interpretation that will be most relevant to the hypothesis.)
9. Again using Model 5, what is the predicted relationship between political ideology and low-income housing attitudes for people with household incomes of \$25,000 (i.e., INC=25)?
10. Provide a substantive interpretation for the parameter estimate for INCD in Model 6.
11. Allowing for the relationship between ideology and low-income housing attitudes to vary with income level, is there evidence that age is related to housing attitudes over and above ideology and income?

The CORR Procedure

4 Variables: age con inc liha

Variable	N	Simple Statistics				
		Mean	Std Dev	Sum	Minimum	Maximum
age	250	43.22400	14.43716	10806	18.00000	68.00000
con	250	40.78400	15.98573	10196	2.00000	98.00000
inc	250	73.11200	15.32602	18278	12.00000	116.00000
liha	250	49.36000	11.78345	12340	8.00000	82.00000

Pearson Correlation Coefficients, N = 250

	age	con	inc	liha
age	1.00000	0.23826 0.0001	0.32721 <.0001	-0.30768 <.0001
con	0.23826 0.0001	1.00000	0.17956 0.0044	-0.70346 <.0001
inc	0.32721 <.0001	0.17956 0.0044	1.00000	-0.41523 <.0001
liha	-0.30768 <.0001	-0.70346 <.0001	-0.41523 <.0001	1.00000

Model: MODEL1

Dependent Variable: liha

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	3272.92948	3272.92948	25.93	<.0001
Error	248	31301	126.21238		
Corrected Total	249	34574			

Root MSE	11.23443	R-Square	0.0947
Dependent Mean	49.36000	Adj R-Sq	0.0910
Coeff Var	22.76019		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	60.21455	2.24685	26.80	<.0001
age	1	-0.25112	0.04931	-5.09	<.0001

Model: MODEL2
 Dependent Variable: liha

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	17109	17109	242.95	<.0001
Error	248	17465	70.42244		
Corrected Total	249	34574			

Root MSE 8.39181 R-Square 0.4949
 Dependent Mean 49.36000 Adj R-Sq 0.4928
 Coeff Var 17.00123

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	70.50793	1.45691	48.40	<.0001
con	1	-0.51854	0.03327	-15.59	<.0001

Model: MODEL3
 Dependent Variable: liha

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	5961.10900	5961.10900	51.67	<.0001
Error	248	28612	115.37295		
Corrected Total	249	34574			

Root MSE 10.74118 R-Square 0.1724
 Dependent Mean 49.36000 Adj R-Sq 0.1691
 Coeff Var 21.76090

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	72.70119	3.31752	21.91	<.0001
inc	1	-0.31925	0.04441	-7.19	<.0001

Model: MODEL4
 Dependent Variable: liha

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	20091	10045	171.33	<.0001
Error	247	14483	58.63409		
Corrected Total	249	34574			

Root MSE	7.65729	R-Square	0.5811
Dependent Mean	49.36000	Adj R-Sq	0.5777
Coeff Var	15.51315		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t	Type II SS
Intercept	1	85.67823	2.50842	34.16	<.0001	68405
inc	1	-0.22954	0.03219	-7.13	<.0001	2982.14360
con	1	-0.47902	0.03086	-15.52	<.0001	14130

Parameter Estimates

Variable	DF	Squared Partial Corr Type II	Tolerance	95% Confidence Limits	
Intercept	1	.	.	80.73761	90.61885
inc	1	0.17075	0.96776	-0.29293	-0.16614
con	1	0.49384	0.96776	-0.53980	-0.41824

The REG Procedure
 Model: MODEL5
 Dependent Variable: liha

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	20381	6793.55019	117.75	<.0001
Error	246	14193	57.69492		
Corrected Total	249	34574			

Root MSE	7.59572	R-Square	0.5895
Dependent Mean	49.36000	Adj R-Sq	0.5845
Coeff Var	15.38841		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t	Type II SS
Intercept	1	71.46907	6.81210	10.49	<.0001	6350.55930
inc	1	-0.02959	0.09478	-0.31	0.7552	5.62229
con	1	-0.14724	0.15120	-0.97	0.3311	54.70677
int	1	-0.00461	0.00206	-2.24	0.0259	289.67086

Parameter Estimates

Variable	DF	Squared Partial Corr Type II	Tolerance	95% Confidence Limits	
Intercept	1	.	.	58.05159	84.88654
inc	1	0.00039598	0.10982	-0.21626	0.15709
con	1	0.00384	0.03966	-0.44505	0.15058
int	1	0.02000	0.02613	-0.00866	-0.00055737

The REG Procedure
 Model: MODEL6
 Dependent Variable: liha

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	20381	6793.55019	117.75	<.0001
Error	246	14193	57.69492		
Corrected Total	249	34574			

Root MSE	7.59572	R-Square	0.5895
Dependent Mean	49.36000	Adj R-Sq	0.5845
Coeff Var	15.38841		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t	Type II SS
Intercept	1	49.56189	0.48877	101.40	<.0001	593227
incd	1	-0.21751	0.03238	-6.72	<.0001	2604.10811
cond	1	-0.48411	0.03069	-15.77	<.0001	14353
intd	1	-0.00461	0.00206	-2.24	0.0259	289.67086

Parameter Estimates

Variable	DF	Squared Partial Corr Type II	Tolerance	95% Confidence Limits	
Intercept	1	.	.	48.59918	50.52460
incd	1	0.15503	0.94114	-0.28127	-0.15374
cond	1	0.50280	0.96245	-0.54457	-0.42366
intd	1	0.02000	0.97060	-0.00866	-0.00055737

The REG Procedure
 Model: MODEL7
 Dependent Variable: liha

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	20213	6737.77608	115.42	<.0001
Error	246	14360	58.37509		
Corrected Total	249	34574			

Root MSE	7.64036	R-Square	0.5846
Dependent Mean	49.36000	Adj R-Sq	0.5796
Coeff Var	15.47885		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t	Type II SS
Intercept	1	86.52396	2.57015	33.67	<.0001	66158
age	1	-0.05237	0.03617	-1.45	0.1490	122.34853
con	1	-0.47025	0.03138	-14.99	<.0001	13109
inc	1	-0.21504	0.03364	-6.39	<.0001	2385.34796

Parameter Estimates

Variable	DF	Squared Partial Corr Type II	Tolerance	95% Confidence Limits	
Intercept	1	.	.	81.46166	91.58626
age	1	0.00845	0.85964	-0.12361	0.01888
con	1	0.47723	0.93167	-0.53205	-0.40844
inc	1	0.14245	0.88199	-0.28130	-0.14878

The REG Procedure
 Model: MODEL8
 Dependent Variable: liha

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	4	20461	5115.26178	88.80	<.0001
Error	245	14113	57.60226		
Corrected Total	249	34574			

Root MSE	7.58962	R-Square	0.5918
Dependent Mean	49.36000	Adj R-Sq	0.5851
Coeff Var	15.37604		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t	Type II SS
Intercept	1	73.12153	6.94886	10.52	<.0001	6378.27898
age	1	-0.04280	0.03623	-1.18	0.2386	80.39657
con	1	-0.16251	0.15163	-1.07	0.2849	66.16282
inc	1	-0.03126	0.09471	-0.33	0.7416	6.27651
int	1	-0.00430	0.00207	-2.07	0.0391	247.71889

Parameter Estimates

Variable	DF	Squared Partial Corr Type II	Tolerance	95% Confidence Limits	
Intercept	1	.	.	59.43441	86.80865
age	1	0.00566	0.84569	-0.11415	0.02856
con	1	0.00467	0.03937	-0.46118	0.13616
inc	1	0.00044455	0.10980	-0.21781	0.15529
int	1	0.01725	0.02571	-0.00838	-0.00021560