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**IMPACT OF THE CATALINA COUPON  
PROGRAM ON THE DEMAND FOR  
GRAPEFRUIT JUICE – A PRELIMINARY ANALYSIS**

**BY**

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## **Impact of the Catalina Coupon Program on the Demand for Grapefruit Juice**

### **A Preliminary Analysis<sup>1</sup>**

Facing a product penetration rate of below 10% for grapefruit juice (GJ), the Florida Department of Citrus (FDOC) has contracted Catalina Marketing for a GJ coupon program for the time period from mid November 2006 through June 2007. Catalina covers over 70% of the total grocery business in the U.S., or over 17,500 stores. The main exceptions are Wal-Mart, Wegmans, and Publix. The coupons are delivered at check-out and can be used in the particular store that distributes them. For the lapsed users, those who have purchased GJ in the past but have not purchased GJ in the last 52 weeks, they will be given a coupon when they use their shoppers/loyalty cards and the coupons will be worth \$1.00 off their next GJ purchase. For the current users, when they buy one 64-ounces-or-larger GJ they will be given a coupon that is worth \$1.50 off their next purchase of two; or buy two 64-ounces-or-larger GJ and get \$1.00 off their next purchase of two; or buy two 64-ounces-or-larger GJ and get \$1.50 off their next purchase of three; or buy one 32-ounces of GJ and get \$1.00 off their next purchase of two 32-ounces of GJ.

As shown in Table 1, 76% of the coupons distributed were the buy two 64-ounces of GJ and get \$1.50 off, 9% were buy two get \$1.00 off, 7% were buy three get \$1.50 off, and 8% were buy one get \$1.00 off. Table 2 shows that 96% of the coupons were redeemed by current users. (Note that the coupon type information provided by Catalina is different from the ones redeemed, I have sent a request to Catalina and tried to figure out why they are different, when I get the additional information, the statistics in Table 1 will be revised).

There are several interesting issues regarding the current Catalina coupon program. The current program promotes GJ in containers larger than or equal to 64 ounces. Could the increased purchases of GJ in the large-size containers reduce the sales of GJ in small containers? Could the purchases with coupons just replace users' regular purchases and results in no net increase in GJ sales? Or, could the coupon purchase in

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<sup>1</sup> Prepared by Jonq-Ying Lee, Senior Research Economist, Florida Department of Citrus, Gainesville, FL. July 9, 2007. Staff Report #2007-2.

one store replace the purchases in stores that did not dispense coupons, and results in no net GJ sales increase in a given market? Has the Catalina coupon program become less effective in selling more GJ when customers learn that they can take advantage of the program and replace their regular GJ purchases with coupon purchases?

The purpose of this study is to estimate the impact of the Catalina coupon program on the sales of GJ in \$2MM+ grocery stores in the U.S. In this study we assume that the demand for GJ is a function of its own price, the prices of its substitutes, disposable income, seasonality, retail promotions, and the number of Catalina coupons redeemed. Formally this relationship can be expressed as

$$(1) \quad q_t = \alpha_0 + \sum_j \beta_j p_{jt} + \gamma_0 \text{Income}_t + \gamma_1 \text{Sine}_t + \gamma_2 \text{Cosine}_t + \gamma_3 \text{AB}_t + \gamma_4 \text{Disp}_t + \gamma_5 \text{Redeem}_t + \varepsilon_t;$$

where  $q_t$  is the gallon sales of GJ in week  $t$ ;  $p_{jt}$  is the real price (nominal price deflated by the CPI) of  $j$ th juice beverage in week  $t$ , there are five juice beverage prices in this study: GJ, OJ, GJ cocktails, OJ drinks, and GJ blends;  $\text{Income}_t$  is the real per capita disposable income in week  $t$ ;  $\text{Sine}_t$  and  $\text{Cosine}_t$  are sine and cosine variables for the seasonality;  $\text{AB}_t$  is the %ACV (all commodity volume) for A/B ads in week  $t$ ;  $\text{Disp}_t$  is the %ACV for displays in week  $t$ ;  $\text{Redeem}_t$  is the number of Catalina coupons redeemed in week  $t$ ;  $\varepsilon_t$  is the disturbance term; and  $\alpha$ ,  $\beta$ ,  $\gamma$ s are parameters to be estimated.

Weekly Nielsen ScanTrack sales data for the \$2MM+ grocery stores for the time period from week 12/04/04 through 05/05/07 (124 weeks) were used in the analysis.<sup>2</sup> The redemption information was provided by Catalina. As of 05/05/07, there were 7.28 million Catalina coupons distributed and a total of 289,567 of these coupons were redeemed. Based on the Nielsen data, the %ACV of A/B ads has increased during the weeks when the Catalina coupons were distributed; in addition, %ACV of display has also increased slightly during the coupon distribution weeks (see Figure 1). Three sets of

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<sup>2</sup> Ideally, the sales information in Catalina stores should be used in the analysis. Unfortunately, the information provided by Catalina lacks price information in these stores and the sales were measured by GJ transactions per 1,000 transactions. The GJ transactions per 1,000 transactions were use in lieu of gallon sales in (1) with the average prices of \$2MM+ grocery stores; however, the parameter estimates are mostly not different from zero.

parameters were estimated: (1) All GJ, (2) GJ in containers larger than 50 ounces, and (3) GJ in containers smaller than 50 ounces. Results show that redemption had no impact on the gallon sales of GJ in containers smaller than 50 ounces; therefore, the estimates for this group of GJ products were not presented. Regression results for All GJ and GJ in containers larger than 50 ounces are presented in Table 3.

The results shown in Table 3 indicate that OJ drinks, and GJ blends are substitutes of GJ, when the prices of OJ drinks and GJ blends increase, more GJ would be sold. The coefficient for the income variable has a negative sign, indicating that as income increases, the demand for GJ would decrease. Note that income increases over the study period. The trend in income is closely related to a time-trend variable. Therefore, the negative income coefficient estimate may reflect the time-trend effect instead of the actual-income effect. Since income and time-trend are highly correlated, it would be difficult to separate the income effect from the time-trend effect.

Results also show that there is a seasonal pattern in GJ gallon sales. The coefficient estimate for coupon redemption in equation (1) for All GJ indicates that each coupon redeemed increased GJ sales by 0.89 gallons – this 0.89 gallon is very close to the two units (64-ounces) in future purchase for the \$1.50 off. In other word, the coupons actually generated additional sales and did not replace the GJ that would have been purchased by consumers even without coupons. The result for GJ in containers larger than 50 ounces shows that each coupon redeemed increased the sales of GJ in large containers by 1.31 gallons.

The coefficient estimate of %ACV for A/B ads is statistically not different from zero. The estimate of %ACV for displays indicates that for each one percent ACV increase in all GJ retail displays, GJ gallon sales would increase by 3,799 gallons, or a one percent increase in %ACV in displays of GJ in large containers would increase its sales by 15,960 gallons.

The impact of Catalina coupons on GJ sales can be estimated as

$$(\text{Marginal gallon sales})_t = (\partial q_t / \partial \text{Redeem}_t) * (\text{number of coupons redeemed})$$

Results are shown in Table 4. As shown in Table 4, if we do not differentiate coupons redeemed by lapsed GJ users and current GJ users, Catalina coupons have increased GJ gallon sales by 258,858 gallons, or 3.8% of the total gallon sales during the weeks when coupons were distributed. As of 05/05/07, the FDOC paid \$517,496 for the Catalina program and the face value of coupons redeemed, or the program has cost \$2.00 per additional gallon of GJ generated by the coupon program if the estimate for all GJ was used; or \$1.36 per gallon if the estimate for GJ in large containers is used. If the estimates of All GJ and GJ in larger containers are used, the Catalina coupon program generated \$1.7 million (\$3.32 per dollar spent) and \$2.53 million (\$4.89 per dollar spent) in retail revenue, respectively.

Because the current programs promotes GJ in containers larger than or equal to 64 ounces, the purchases of GJ in large-size containers could increase at the cost of a reduction in the sales of GJ in small containers. Results from (1) on gallon sales of GJ in containers smaller than 50 ounces show that redemption had no impact on the gallon sales of GJ in small containers; therefore, the program did not have a negative impact on the sales of GJ in small containers.

The coupon purchases could replace users' regular purchases and result in no net increase in GJ sales. The results in Table 3 show that coupon redemption increased the gallon sales of All GJ and GJ in large containers; therefore, the coupon program had increased the overall sales of GJ.

Has the Catalina coupon program become less effective in selling more GJ when customers learn that they can take advantage of the program and replace their regular GJ purchase with coupon purchases? To answer these two questions, different length of time periods were used to estimate (1) and the results are presented in the top portion of Table 5. The magnitudes of the estimates of the coupon redemption variable decreased from 1.5084 for the time period from weeks ending 12/04/04 through 02/17/07 to 0.8940 for the time period from weeks ending 12/04/04 through 05/05/07, an indication that the impact of Catalina coupons had decreased over time. The estimated coupon impacts for GJ in containers larger than 50 ounces over time had a similar pattern. To double check if the impact of coupon redemption on GJ sales had decreased over time, the  $\gamma_5$ Redeem<sub>t</sub> in (1) was modified as

$$(2) \quad \sum_t \gamma_{5t} D_t \text{ Redeem}_t$$

Where  $D_t$  is a dummy variable for week  $t$ ,  $t = 12/06/06, \dots, 05/05/07$ . Results are presented in Table 6. As shown in Table 6, the estimated impacts for the weeks between 12/30/06 through 01/27/07 were higher than the rest of the weeks, indicating that the redemption of Catalina coupons did have higher impacts on GJ sales in the beginning of the program weeks than in later weeks and the impacts stabilized after 02/10/07. Note that there are two negative estimates; however, these negative estimates are statistically not different from zero. These parameter estimates were used to derive the impacts of redeemed coupons on GJ gallon sales and retail revenues. Results are presented in Table 7. Results show that it cost 97 cents per additional gallon of GJ generated by the coupon program if the estimates for All GJ were used; or 85 cents per gallon if the estimates for GJ in large containers were used. The Catalina coupon program generated an additional \$3.5 million (\$6.83 per dollar spent) and \$4.048 million (\$7.82 per dollar spent) when All GJ and GJ in large containers are used, respectively.

There are two types of Catalina coupons: one type for lapsed GJ users and the other type for current GJ users. To further investigate if these two types of coupons had different impacts on GJ sales, the  $\gamma_5 \text{ Redeem}_t$  in (1) was modified as

$$(3) \quad \gamma_5 \text{ Lapsed}_t + \gamma_6 \text{ Current}_t$$

Where  $\text{Lapsed}_t$  is the number of coupons redeemed by lapsed GJ users during week  $t$  and  $\text{Current}_t$  is the number of coupons redeemed by current GJ users during week  $t$ . Results are presented at the bottom half of Table 5. Note that  $\text{Lapsed}_t$  and  $\text{Current}_t$  are highly correlated with a simple correlation coefficient of 0.859; therefore, the estimates for  $\gamma_5$  and  $\gamma_6$  may not be very accurate or stable. However, the results show that the coupons redeemed by lapsed generated more GJ sales than the coupons redeemed by current users.

Could the number of coupons distributed have additional advertising impact on GJ sales? Catalina provided us with the information on the number of coupons distributed by type of coupon and by week. However, the number of coupons distributed

is highly correlated with the number of coupons redeemed (0.840) and the inclusion of the number of coupons distributed makes the coefficient for  $Redeem_t$  negative and statistically not different from zero; therefore, the number of coupons distributed was not included in the analysis.<sup>3</sup>

In general, the average GJ price received by grapefruit growers depends on the beginning GJ inventory and the total GJ production during the season. This relationship can be written as

$$(4) \quad PHD Price_t = \alpha + \beta_1 Beg Inv_t + \beta_2 Prod_t + \beta_3 Trend_t + \beta_4 Trend_t^2 + \varepsilon_t;$$

where *PHD Price* is the packinghouse-door price deflated by the consumer's price index; *Beg Inv* is the beginning GJ inventory at the beginning of the season; *Prod* is the total GJ packed from fruit; *Trend* is a trend variable; and  $\varepsilon_t$  is the disturbance term. Ordinary least squares method was used to estimate the relationship and the results are shown in Table 8. Results shown in Table 8 indicate that for every one million decrease in beginning inventory, PHD price would increase by \$0.0191. The estimate in Table 7 shows that, as of 05/05/07 the Catalina coupon program has increased GJ sales by 534,684 gallons. If this amount of GJ were not sold and kept as inventory, it would decrease the average PHD price by \$0.01023 ( $0.0191 * 534684$ ) per PS. With an estimated movement of 77 million gallons for the 2006-07 season, the estimated impact of the Catalina coupon program would be \$788,007 ( $\$0.01023 * 77$  million), or \$1.52 per dollar spent.

### ***Discussion***

Even though the analyses show that there was no negative impact of the Catalina coupon program on the sales of GJ in small containers, the results consistently show that the coupon effects are larger for GJ in large containers than for All GJ. The differences could be the negative impacts of the Catalina coupon program on sales of GJ in small containers.

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<sup>3</sup> The number of coupons distributed was used in (1) instead of, the estimates of  $\gamma_5$  for All GJ and GJ in large containers were negative and statistically not different from zero.



This analysis used two models to evaluate impacts of the Catalina coupon program on the sales of GJ. As presented in the beginning of this study, the target of this coupon program is the GJ gallon sales in 64-ounces and larger containers. However, the program added coupons for GJ in 32-ounce containers in the beginning of 2007. As shown in Table 2, the number of coupons redeemed is relative small; therefore, no analysis was conducted for the impact of coupon redemption on the sales of GJ in 32-ounce containers.

Two models were used in this study, i.e., equations (1) and (2). The results found in these two models are different. Note that the parameter for redemption in (1) is restricted to be the same for all weeks while in (2) the parameters for redemption can vary from week to week – in other words, the parameter in (1) is more restrictive than the ones in (2). In addition, the adjusted  $R^2$ s for (2) are higher than those for (1), an indication that (2) has better fit than (1) even though there are 20 more variables in (2) than in (1). Therefore, the results in (2) should be used in the final analysis.

## Redemption & Promotion

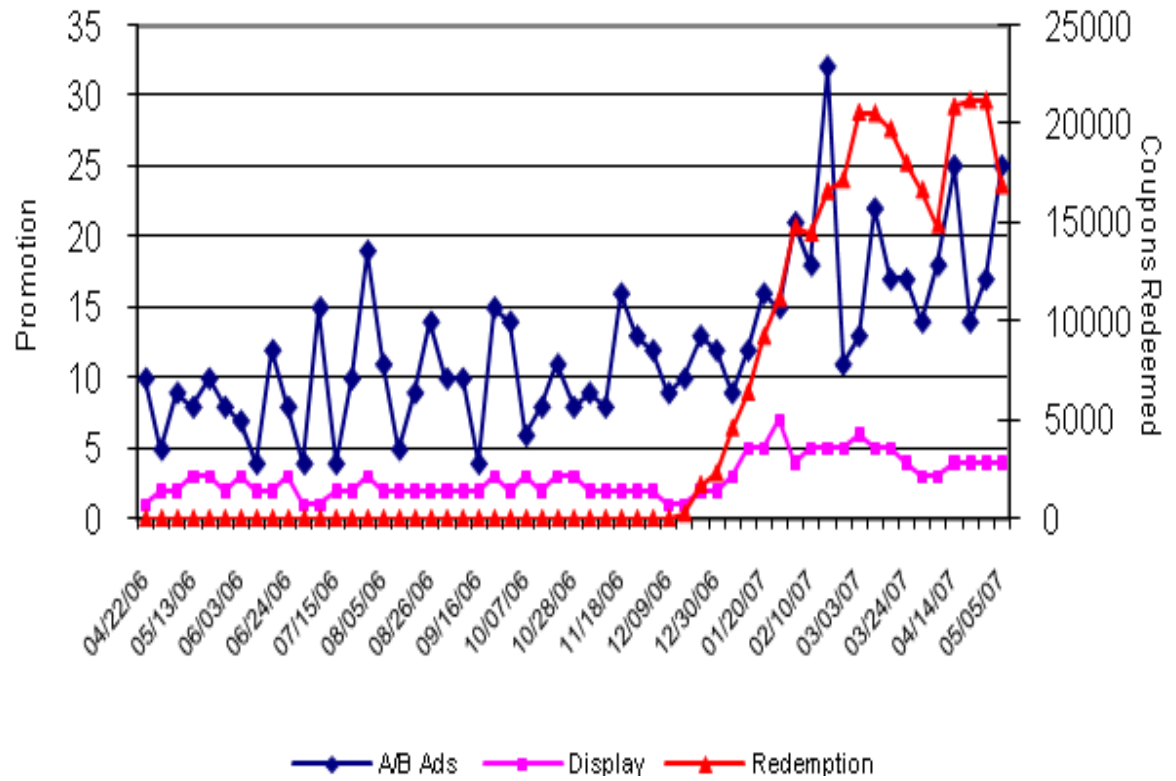


Figure 1. Retail promotion and coupon redemption.

Table 1. Weekly coupon distribution statistics

Week Ending	\$1.50/2	\$1.00/2	\$1.50/3	\$1.00/1
11/25/06	213,326	20,050	13,733	91,275
12/02/06	235,453	20,306	19,750	28,142
12/09/06	228,761	20,307	20,007	12,929
12/16/06	221,712	19,555	19,444	7,708
12/23/06	258,109	22,299	22,154	5,847
12/30/06	231,297	20,322	20,115	2,723
01/06/07	256,715	26,924	20,388	0
01/13/07	253,789	25,425	25,055	0
01/20/07	261,919	32,310	29,087	0
01/27/07	249,204	31,741	28,513	0
02/03/07	251,674	62,656	21,117	73,771
02/10/07	244,619	26,181	22,296	21,181
02/17/07	245,178	26,307	22,666	10,302
02/24/07	259,900	28,712	25,123	6,077
03/03/07	252,166	33,430	23,111	1
03/10/07	245,744	29,289	25,662	0
03/17/07	247,049	29,092	25,422	0
03/24/07	242,414	28,944	25,375	0
03/31/07	229,827	30,487	20,739	65,907
04/07/07	241,111	31,190	27,309	22,816
04/14/07	240,270	29,184	25,661	9,272
04/21/07	228,094	24,651	21,279	5,384
04/28/07	228,183	28,713	18,982	180,741
05/05/07	235,679	27,575	24,023	62,712
Total	5,802,193	675,650	547,011	606,788
% of Total	76.0%	8.9%	7.2%	8.0%

Source: Catalina

Table 2. Weekly coupon redemption statistics

Week Ending	Total		Current				Total
	Lapsed	Current	1/\$1.50 off 2	2/\$1.00 off 2	2/\$1.50 off 3	1-32oz/\$1 off 2	
12/16/06	116	127	64	45	18	0	243
12/23/06	345	1,381	1,093	175	113	0	1,726
12/30/06	390	1,903	1,522	230	151	0	2,293
01/06/07	550	4,047	3,202	471	374	0	4,597
01/13/07	605	5,789	4,534	749	506	0	6,394
01/20/07	579	8,660	6,633	1,171	856	0	9,239
01/27/07	608	10,564	7,814	1,596	1,154	0	11,172
02/03/07	646	14,174	10,771	2,019	1,384	0	14,820
02/10/07	444	14,036	10,253	2,173	1,602	8	14,480
02/17/07	366	16,236	11,578	2,688	1,948	22	16,602
02/24/07	532	16,650	12,081	2,566	1,966	37	17,182
03/03/07	920	19,685	14,072	3,323	2,230	60	20,605
03/10/07	1,093	19,470	13,934	3,244	2,219	73	20,563
03/17/07	633	19,139	13,561	3,199	2,293	86	19,772
03/24/07	444	17,600	12,209	3,057	2,252	82	18,044
03/31/07	353	16,326	11,531	2,691	2,041	63	16,679
04/07/07	276	14,627	10,038	2,597	1,917	75	14,903
04/14/07	300	20,602	14,040	3,800	2,689	73	20,902
04/21/07	490	20,731	14,099	3,799	2,731	102	21,221
04/28/07	694	20,521	13,837	3,913	2,687	84	21,215
05/05/07	638	16,277	10,823	3,130	2,263	61	16,915
Total	11,022	278,545	197,689	46,636	33,394	826	289,567
% of Total	3.8%	96.2%	68.3%	16.1%	11.5%	0.3%	100.0%

Source: NCH

Table 3. Parameter estimates for equation (1)

Variable	Parameter Estimate	Standard Error	Sample Mean	Elasticity Estimate
All GJ				
Intercept	1,943,963*	130,465		
Price				
OJ	16,759	17,729	2.472	0.1214
GJ	-226,672*	16,583	3.243	-2.1982
GJ CKL	1,432	17,871	2.743	0.0135
OJ Drinks	39,321*	20,939	1.589	0.1848
GJ Blends	26,192*	9,136	3.196	0.2371
Income	-230.09*	30.84	4,706	-3.3156
Seasonality				
Sine	-16,614*	2,122		
Cosine	-5,142*	2,015		
Redeem	0.8940*	0.4800	1,857	-0.0021
AB Ads (%ACV)	-69.59	274.32	10.118	0.0312
Display (%ACV)	3,799*	1,253	2.724	0.0061
R <sup>2</sup>	0.8913			
Adj R <sup>2</sup>	0.8809			
GJ in Containers ≥ 50 Ounces				
Intercept	1,504,797*	121,636		
Price				
OJ	1,446	14,620	2.472	0.0139
GJ	-170,409*	14,602	3.303	-2.1889
GJ CKL	1,225	15,390	2.743	0.0131
OJ Drinks	37,734*	17,372	1.589	0.2331
GJ Blends	20,631*	8,056	3.196	0.2565
Income	-175.41*	26.95	4,706.470	-3.2108
Seasonality				
Sine	-12,302*	1,785		
Cosine	-6,464*	1,687		
Redeem	1.3111*	0.3908	2,280.06	-0.0055
AB Ads (%ACV)	-889	1,245	1.5787	0.0179
Display (%ACV)	15,960*	6,716	0.2887	0.0116
R <sup>2</sup>	0.8386			
Adj R <sup>2</sup>	0.8232			

\*Statistically different from zero at  $\alpha = 0.05$  level.

Table 4. Estimated impact of Catalina coupons on GJ sales using (1)

Week Ending	Gallons Sales (gallons)		Retail Revenue (\$)	
	All GJ	GJ in Containers $\geq$ 50 Ounces	All GJ	GJ in Containers $\geq$ 50 Ounces
12/16/06	217	319	1,445	2,132
12/23/06	1,543	2,263	10,351	15,243
12/30/06	2,050	3,006	13,680	20,174
01/06/07	4,109	6,027	26,695	39,709
01/13/07	5,716	8,383	37,550	55,317
01/20/07	8,259	12,113	53,549	78,687
01/27/07	9,987	14,647	64,188	93,996
02/03/07	13,248	19,430	87,925	128,821
02/10/07	12,944	18,984	88,110	130,640
02/17/07	14,841	21,767	99,564	148,056
02/24/07	15,360	22,527	102,737	151,622
03/03/07	18,420	27,015	122,033	179,737
03/10/07	18,382	26,960	119,605	175,863
03/17/07	17,675	25,923	118,104	173,694
03/24/07	16,130	23,657	107,552	157,858
03/31/07	14,910	21,868	98,469	143,977
04/07/07	13,323	19,539	86,461	126,594
04/14/07	18,685	27,404	121,368	178,733
04/21/07	18,971	27,822	126,967	189,000
04/28/07	18,965	27,815	128,792	191,060
05/05/07	15,121	22,177	101,101	149,171
Total	258,858	379,646	1,716,247	2,530,085
	\$Spent/Gallon		Retail \$/\$Spent	
Average	2.00	1.36	3.32	4.89

Table 5. Additional coupon impact analysis for (1) and (3)

Thru Week Ending	User Type	All GJ		GJ in Containers $\geq$ 50 Ounces	
		Coefficient	SE	Coefficient	SE
05/05/07	All User	0.8940*	0.4800	1.3111*	0.3908
04/14/07	All User	0.9341*	0.5188	1.3734*	0.4242
03/17/07	All User	1.1902*	0.5566	1.5657*	0.4507
02/17/07	All User	1.5084*	0.7482	1.7462*	0.6563
05/05/07	Lapsed	16.6458**	10.9758	16.4804*	8.9795
	Current	0.6168	0.5153	1.0454*	0.4183
04/14/07	Lapsed	11.1742	12.0357	12.2392	9.6855
	Current	0.7434	0.5656	1.1653*	0.4625
03/17/07	Lapsed	22.6804**	15.3824	23.5562*	12.2544
	Current	0.5956	0.6986	0.9456*	0.5641
02/17/07	Lapsed	29.8858*	17.8914	33.0318*	14.5781
	Current	0.7536	0.8819	0.8554	0.7670

\*Statistically different from zero at  $\alpha = 0.05$  level.

\*\*Statistically different from zero at  $\alpha = 0.10$  level.

Table 6. Regression results for (2)

Week Ending	All GJ		GJ in Containers $\geq$ 50 Ounces	
	Coefficient	SE	Coefficient	SE
12/16/06	-28.0019	48.2448	-9.2889	39.6612
12/23/06	8.6999**	6.6114	10.0735*	5.3983
12/30/06	-7.2335**	5.0444	-4.1160	4.1384
01/06/07	7.0474*	2.8133	7.1208*	2.2437
01/13/07	5.3210*	2.1869	5.1129*	1.7673
01/20/07	3.9406*	1.5834	4.1849*	1.2463
01/27/07	1.2013	1.4235	1.4023	1.2009
02/03/07	1.9351*	0.9640	1.6978*	0.8059
02/10/07	1.5545**	0.9536	1.4998*	0.8298
02/17/07	1.2401**	0.9538	1.5262*	0.7870
02/24/07	1.6229*	0.8853	2.0177*	0.6974
03/03/07	1.3043*	0.7744	1.6805*	0.6032
03/10/07	1.8992*	0.8049	1.9865*	0.6622
03/17/07	1.6531*	0.7622	1.9969*	0.6000
03/24/07	1.6782*	0.8274	1.7450*	0.6857
03/31/07	2.0790*	0.9207	2.3460*	0.7342
04/07/07	3.4566*	1.1006	3.6811*	0.8719
04/14/07	0.6603	0.7149	1.1549*	0.5739
04/21/07	1.0138**	0.7061	1.3788*	0.5618
04/28/07	1.4892*	0.6661	1.7304*	0.5408
05/05/07	2.6698*	0.8890	2.9111*	0.7214
R <sup>2</sup>	0.9156		0.8801	
Adj. R <sup>2</sup>	0.8881		0.8410	

\*Statistically different from zero at  $\alpha = 0.05$  level.

\*\*Statistically different from zero at  $\alpha = 0.10$  level.



Table 7. Estimated return from the Catalina coupon program

Week Ending	All GJ		GJ in Containers $\geq$ 50 Ounces	
	Gallons	Revenue (\$)	Gallons	Revenue (\$)
12/16/06	-6,804	-45,262	-2,257	-15,014
12/23/06	15,016	100,734	17,387	116,639
12/30/06	-16,586	-110,690	-9,438	-62,984
01/06/07	32,397	210,449	32,734	212,641
01/13/07	34,022	223,504	32,692	214,765
01/20/07	36,407	236,046	38,664	250,681
01/27/07	13,421	86,255	15,666	100,687
02/03/07	28,678	190,329	25,161	166,985
02/10/07	22,510	153,219	21,717	147,820
02/17/07	20,588	138,117	25,338	169,979
02/24/07	27,884	186,510	34,669	231,888
03/03/07	26,875	178,048	34,627	229,407
03/10/07	39,054	254,106	40,849	265,782
03/17/07	32,685	218,395	39,483	263,820
03/24/07	30,282	201,908	31,487	209,947
03/31/07	34,675	229,001	39,128	258,409
04/07/07	51,514	334,317	54,860	356,033
04/14/07	13,801	89,642	24,140	156,797
04/21/07	21,514	143,991	29,260	195,833
04/28/07	31,593	214,548	36,711	249,302
05/05/07	45,159	301,934	49,241	329,225
Total	534,684	3,535,102	612,117	4,048,641
C/B Ratio	0.97 <sup>a</sup>	6.83 <sup>b</sup>	0.85 <sup>a</sup>	7.82 <sup>b</sup>

<sup>a</sup>Dollar per gallon increased.

<sup>b</sup>Retail revenue change per dollar spent.

Table 8. Parameter estimates for (8) – PHD price (\$/PS)

Variable	Parameter Estimate	Standard Error
Real PHD Price		
Intercept	3.2754*	0.3854
Beg Inventory	-0.0191*	0.0043
Production	-0.0074*	0.0029
Trend	0.0546	0.0533
Trend <sup>2</sup>	-0.0027*	0.0020
Adj. R <sup>2</sup>	0.5842	

\*Statistically different from zero at  $\alpha = 0.05$  level.