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SUPERSTOREUS: BLACK FRIDAY DISCOUNT MODEL

Howard Jiang wrote this case solely to provide material for Art of Modeling Section 2 Group Project. The authors do not intend to illustrate either effective or ineffective handling of a managerial situation. The authors may have disguised certain names and other identifying information to protect confidentiality.

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In the 21st century, with the growth and popularity of the Internet, online shopping has become one of the most favorite options for consumers, because of its convenience and enjoyable experience. SuperstoreUS, a major supermarket store located in every state in the United States, must keep up with consumer demand if they want to continue in being one of the most popular merchants.

Black Friday, the largest shopping holiday in the United States, is seen as a barometer of the retail industry's Christmas sales and is one of the most important and busy days of the year for businesses. It is also one of the busiest days of the year for merchants, who take the opportunity to launch various promotions to stimulate spending.

According to experience and historical data, using sales discounts in retail and e-commerce businesses can help drive sales, attract new customers, and increase customer loyalty.

While companies use dozens of discount types to incentivise customers, the optimal goal is to generate greater profits for the business as well.

In this context, the management of SuperstoreUS wanted a Business Analytics team to analyze and generate valuable insights from the historical shopping data from the first three quarters of 2015 to find the most appropriate discount levels and achieve a 20% increase in demand while maximizing the benefits for the upcoming Black Friday.

Teaching Note

SuperstoreUS

Howard Jiang wrote this teaching note as an aid to instructors in the classroom use of the case: SuperstoreUS: Black Friday Discount Model. This teaching note should not be used in any way that would prejudice the future use of the case.

SYNOPSIS

Black Friday is seen as a key indicator for the retail industry's Christmas sales and is an important and busy day for businesses that use it to launch promotions and discounts to increase sales, attract new customers, and increase customer loyalty. Superstore US must stay up to date with consumer demand for online shopping if it wants to remain a popular merchant in the 21st century.

Superstore US, a major supermarket store in the United States, wanted a Business Analytics team to analyze their historical shopping data from the initial three quarters of 2015 to find the most appropriate discount levels for their following Black Friday to increase demand by 20% while maximizing the benefits for the business.

LEARNING OBJECTIVES

- Develop an understanding of how to formulate a discount model and how it impacts profit and demand
- Examine and improve the discount model using sensitivity analysis
- Examine the relationship between profit, demand and discount using regression
- Understand and distinguish the difference between Null Hypothesis and Alternate Hypothesis
- Learn how to develop informed decisions using data

POSITION IN COURSE

This case can be used in Art of Modeling and Business Statistics at MSc and HBA levels.

RELEVANT READINGS

Badiyani, J. (2019). *US Superstore data*. https://www.kaggle.com/datasets/juhi1994/superstore

Khurana, S. (2021). *Super Store Sales Use-Case Data Analytics and Visualization.* https://medium.com/clique-org/superstore-sales-use-case-data-analytics-and-visualization-62afacd0777

OliverWyman. (2022). What are the advantages of the hard discounter business model? Thinking Retail: A Hard Discounting Journey (Part 5). https://www.oliverwyman.com/our-expertise/insights/2017/feb/What-Are-The-Advantages-Of-The-Hard-Discounter-Business-Model.html

ASSIGNMENT QUESTIONS

- How to clean the data and what is the relationship between Profit, Demand and Unit Price?
- What are the implications of the current standard discount?
- What discount rate will yield most profits for furniture, assuming that an expected 20% increase in demand on Black Friday?
- How to make profits more sustainable, even after Black Friday and peak demand?

TEACHING PLAN

The length of the ideal class session would be around 80 minutes.

Discussion Point	Time (Minutes)
Introduction	5
Assignment Question 1	20
Assignment Question 2	20
Assignment Question 3	30
Conclusion	5

Table 1. Teaching plan time outline

ANALYSIS

Assignment Question 1: How to clean the data and what is the relationship between Profit, Demand and Unit Price?

- Sorted historical data according to furniture category which the focus of the study is on.
- Cleaned data and filled missing values with the use of the column median (*see Exhibit 1*).
- After furniture data was set, a statistical regression analysis was run being the Profit as the dependent variable and the Demand (Order Quantity) + Unit Price as independent variables, in order to examine a hypotheses test of the relationship and influence of the demand and price change on the profit.
  Hypothesis testing (see Exhibit 2):

  H0 = Change in demand and price will not have a positive effect on store profits.

  Halt = Change in demand and price will have a positive effect on store profits.

The regression analysis shows that both Unit Price and Demand have a P-Value < 0.05, which means that they both have a significant relationship with the Profit and they can influence it.

- Unit Price: It shows that with every increase of $1 in the price, it influenced profits to increase by $11.
- Demand: It shows that for every increase of one new order, it influences an increase of $128.28 in profits.

Therefore, we reject the Null Hypothesis (H0), and approve the alternative Hypotheses (Halt) by default. We can say there is a strong relationship between the independent and dependent variables, and we can use them for the purpose of increasing profits for a certain period of time.

Assignment Question 2: What are the implications of the current standard discount?

- Moving forward, after the regression analysis and data structuring has been done, we came up with assumptions to build up a model to generate most profits.
    - We assumed that expected demand in Black Friday will increase by 20%.
    - In the data set, we assumed that the (Quantity Orders) are the historical demand.
    - We assumed that with every 5% fall in price, a 6% positive demand shift happens.
    - We assumed the 'Discount' in the dataset is a standard discount set for each product.
    - *Promotion = New Discount + Standard Discount*
    - Overhead costs were calculated from the equation below;
    *Overhead costs = Sales (Unit Price * Demand) - Profit*

- Model Formulation & Methodology (*see Exhibit 3*)
  The objective of the model was to see the sensitivity of Profits to Demand shifts and Promotional Discounts to assess a logical and data-driven decision for the Black Friday Promotion.

  *Sum Of Profit = Sales (Price Per Order * Orders) - Costs (Overhead - Discount Cost)*

The model assesses the *Profit Difference* between the *current state* of the store sales and the *expected* sales after applying the assumptions and test trials. *The goal* is to have a positive Profit difference after applying the discount and assumed demand shift, which will validate the success of the campaign.

Profit Difference = Sum Of Profit From Model.2 - Sum Of Profit From Model.1

Assignment Question 3: What discount rate will yield most profits for furniture, assuming that an expected 20% increase in demand on Black Friday?

Analysis
- Given the assumptions, we tested the model in applying the discounts; 5%, 10%, and 15% (*see Exhibit 4*).

Results:

Applying Discount at 5%, with a demand shift of 6% (*see Exhibit 5*)

Positive Profit Difference of $2,703.46

Remaining loses in the sub-products [Bookcases & Tables]

[Profits are better, but not much better]

Results:

Applying a discount of 10%, with a demand shift of 12% (*see Exhibit 6*)

Positive Profit Difference of $1,442.70

Remaining loses in the sub-products [Bookcases & Tables]

[Profits are better, but not much better]

Results:

Applying a discount of 10%, with a demand shift of 12% (see Exhibit 7)

Negative Profit Difference of $3,782.28

Remaining loses in the sub-products [Bookcases & Tables]

After examining the effects of the discounts, we wanted to see a wider perspective especially when do the store start losing money with the discount, so we did a sensitivity analysis using the What-If Function in Microsoft Excel. Having (Demand Shift) & (Discount Rate) as driving variables with the objective function being the Profit Difference from the model.

-$ 1,119.25	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%	16%	17%	18%	19%
1%	-$ 386.31	-$ 7,059.43	-$ 13,732.54	-$ 20,405.66	-$ 27,078.77	-$ 33,751.88	-$ 40,425.00	-$ 47,098.11	-$ 53,771.22	-$ 60,444.34	-$ 67,117.45	-$ 73,790.56	-$ 80,463.68	-$ 87,136.79	-$ 93,809.90	-$ 100,483.02	-$ 107,156.13	-$ 113,829.24	-$ 120,502.36
2%	$ 5,834.41	-$ 904.77	-$ 7,643.95	-$ 14,383.14	-$ 21,122.32	-$ 27,861.51	-$ 34,600.69	-$ 41,339.87	-$ 48,079.06	-$ 54,818.24	-$ 61,557.43	-$ 68,296.61	-$ 75,035.79	-$ 81,774.98	-$ 88,514.16	-$ 95,253.35	-$ 101,992.53	-$ 108,731.71	-$ 115,470.90
3%	$ 12,055.14	$ 5,249.89	-$ 1,555.37	-$ 8,360.62	-$ 15,165.88	-$ 21,971.13	-$ 28,776.38	-$ 35,581.64	-$ 42,386.89	-$ 49,192.15	-$ 55,997.40	-$ 62,802.66	-$ 69,607.91	-$ 76,413.16	-$ 83,218.42	-$ 90,023.67	-$ 96,828.93	-$ 103,634.18	-$ 110,439.44
4%	$ 18,275.87	$ 11,404.55	$ 4,533.22	-$ 2,338.10	-$ 9,209.43	-$ 16,080.75	-$ 22,952.08	-$ 29,823.40	-$ 36,694.73	-$ 43,566.05	-$ 50,437.38	-$ 57,308.70	-$ 64,180.03	-$ 71,051.35	-$ 77,922.68	-$ 84,794.00	-$ 91,665.33	-$ 98,536.65	-$ 105,407.98
5%	$ 24,496.60	$ 17,559.20	$ 10,621.81	$ 3,684.41	-$ 3,252.98	-$ 10,190.38	-$ 17,127.77	-$ 24,065.17	-$ 31,002.56	-$ 37,939.96	-$ 44,877.35	-$ 51,814.75	-$ 58,752.14	-$ 65,689.54	-$ 72,626.93	-$ 79,564.33	-$ 86,501.73	-$ 93,439.12	-$ 100,376.52
6%	$ 30,717.33	$ 23,713.86	$ 16,710.40	$ 9,706.93	$ 2,703.46	-$ 4,300.00	-$ 11,303.47	-$ 18,306.93	-$ 25,310.40	-$ 32,313.86	-$ 39,317.33	-$ 46,320.80	-$ 53,324.26	-$ 60,327.73	-$ 67,331.19	-$ 74,334.66	-$ 81,338.12	-$ 88,341.59	-$ 95,345.05
7%	$ 36,938.06	$ 29,868.52	$ 22,798.98	$ 15,729.45	$ 8,659.91	$ 1,590.38	-$ 5,479.16	-$ 12,548.70	-$ 19,618.23	-$ 26,687.77	-$ 33,757.31	-$ 40,826.84	-$ 47,896.38	-$ 54,965.91	-$ 62,035.45	-$ 69,104.99	-$ 76,174.52	-$ 83,244.06	-$ 90,313.59
8%	$ 43,158.78	$ 36,023.18	$ 28,887.57	$ 21,751.96	$ 14,616.36	$ 7,480.75	$ 345.15	-$ 6,790.46	-$ 13,926.07	-$ 21,061.67	-$ 28,197.28	-$ 35,332.89	-$ 42,468.49	-$ 49,604.10	-$ 56,739.71	-$ 63,875.31	-$ 71,010.92	-$ 78,146.53	-$ 85,282.13
9%	$ 49,379.51	$ 42,177.84	$ 34,976.16	$ 27,774.48	$ 20,572.80	$ 13,371.13	$ 6,169.45	-$ 1,032.23	-$ 8,233.90	-$ 15,435.58	-$ 22,637.26	-$ 29,838.93	-$ 37,040.61	-$ 44,242.29	-$ 51,443.96	-$ 58,645.64	-$ 65,847.32	-$ 73,049.00	-$ 80,250.67
10%	$ 55,600.24	$ 48,332.49	$ 41,064.75	$ 33,797.00	$ 26,529.25	$ 19,261.50	$ 11,993.76	$ 4,726.01	-$ 2,541.74	-$ 9,809.49	-$ 17,077.23	-$ 24,344.98	-$ 31,612.73	-$ 38,880.48	-$ 46,148.22	-$ 53,415.97	-$ 60,683.72	-$ 67,951.46	-$ 75,219.21
11%	$ 61,820.97	$ 54,487.15	$ 47,153.33	$ 39,819.52	$ 32,485.70	$ 25,151.88	$ 17,818.06	$ 10,484.24	$ 3,150.43	-$ 4,183.39	-$ 11,517.21	-$ 18,851.03	-$ 26,184.84	-$ 33,518.66	-$ 40,852.48	-$ 48,186.30	-$ 55,520.12	-$ 62,853.93	-$ 70,187.75
12%	$ 68,041.70	$ 60,641.81	$ 53,241.92	$ 45,842.03	$ 38,442.14	$ 31,042.26	$ 23,642.37	$ 16,242.48	$ 8,842.59	$ 1,442.70	-$ 5,957.18	-$ 13,357.07	-$ 20,756.96	-$ 28,156.85	-$ 35,556.74	-$ 42,956.63	-$ 50,356.51	-$ 57,756.40	-$ 65,156.29
13%	$ 74,262.43	$ 66,796.47	$ 59,330.51	$ 51,864.55	$ 44,398.59	$ 36,932.63	$ 29,466.67	$ 22,000.72	$ 14,534.76	$ 7,068.80	-$ 397.16	-$ 7,863.12	-$ 15,329.08	-$ 22,795.04	-$ 30,261.00	-$ 37,726.95	-$ 45,192.91	-$ 52,658.87	-$ 60,124.83
14%	$ 80,483.15	$ 72,951.13	$ 65,419.10	$ 57,887.07	$ 50,355.04	$ 42,823.01	$ 35,290.98	$ 27,758.95	$ 20,226.92	$ 12,694.89	$ 5,162.86	-$ 2,369.17	-$ 9,901.19	-$ 17,433.22	-$ 24,965.25	-$ 32,497.28	-$ 40,029.31	-$ 47,561.34	-$ 55,093.37
15%	$ 86,703.88	$ 79,105.78	$ 71,507.68	$ 63,909.58	$ 56,311.48	$ 48,713.39	$ 41,115.29	$ 33,517.19	$ 25,919.09	$ 18,320.99	$ 10,722.89	$ 3,124.79	-$ 4,473.31	-$ 12,071.41	-$ 19,669.51	-$ 27,267.61	-$ 34,865.71	-$ 42,463.81	-$ 50,061.91
16%	$ 92,924.61	$ 85,260.44	$ 77,596.27	$ 69,932.10	$ 62,267.93	$ 54,603.76	$ 46,939.59	$ 39,275.42	$ 31,611.25	$ 23,947.08	$ 16,282.91	$ 8,618.74	$ 954.57	-$ 6,709.60	-$ 14,373.77	-$ 22,037.94	-$ 29,702.11	-$ 37,366.28	-$ 45,030.45
17%	$ 99,145.34	$ 91,415.10	$ 83,684.86	$ 75,954.62	$ 68,224.38	$ 60,494.14	$ 52,763.90	$ 45,033.66	$ 37,303.42	$ 29,573.18	$ 21,842.94	$ 14,112.70	$ 6,382.45	-$ 1,347.79	-$ 9,078.03	-$ 16,808.27	-$ 24,538.51	-$ 32,268.75	-$ 39,998.99
18%	$ 105,366.07	$ 97,569.76	$ 89,773.45	$ 81,977.14	$ 74,180.83	$ 66,384.51	$ 58,588.20	$ 50,791.89	$ 42,995.58	$ 35,199.27	$ 27,402.96	$ 19,606.65	$ 11,810.34	$ 4,014.03	-$ 3,782.28	-$ 11,578.59	-$ 19,374.91	-$ 27,171.22	-$ 34,967.53
19%	$ 111,586.80	$ 103,724.42	$ 95,862.03	$ 87,999.65	$ 80,137.27	$ 72,274.89	$ 64,412.51	$ 56,550.13	$ 48,687.75	$ 40,825.37	$ 32,962.98	$ 25,100.60	$ 17,238.22	$ 9,375.84	$ 1,513.46	-$ 6,348.92	-$ 14,211.30	-$ 22,073.68	-$ 29,936.07
20%	$ 117,807.53	$ 109,879.07	$ 101,950.62	$ 94,022.17	$ 86,093.72	$ 78,165.27	$ 70,236.82	$ 62,308.36	$ 54,379.91	$ 46,451.46	$ 38,523.01	$ 30,594.56	$ 22,666.10	$ 14,737.65	$ 6,809.20	-$ 1,119.25	-$ 9,047.70	-$ 16,976.15	-$ 24,904.61
21%	$ 124,028.25	$ 116,033.73	$ 108,039.21	$ 100,044.69	$ 92,050.17	$ 84,055.64	$ 76,061.12	$ 68,066.60	$ 60,072.08	$ 52,077.55	$ 44,083.03	$ 36,088.51	$ 28,093.99	$ 20,099.47	$ 12,104.94	$ 4,110.42	-$ 3,884.10	-$ 11,878.62	-$ 19,873.14
22%	$ 130,248.98	$ 122,188.39	$ 114,127.80	$ 106,067.20	$ 98,006.61	$ 89,946.02	$ 81,885.43	$ 73,824.83	$ 65,764.24	$ 57,703.65	$ 49,643.06	$ 41,582.46	$ 33,521.87	$ 25,461.28	$ 17,400.69	$ 9,340.09	$ 1,279.50	-$ 6,781.09	-$ 14,841.68
23%	$ 136,469.71	$ 128,343.05	$ 120,216.38	$ 112,089.72	$ 103,963.06	$ 95,836.40	$ 87,709.73	$ 79,583.07	$ 71,456.41	$ 63,329.74	$ 55,203.08	$ 47,076.42	$ 38,949.75	$ 30,823.09	$ 22,696.43	$ 14,569.77	$ 6,443.10	-$ 1,683.56	-$ 9,810.22
24%	$ 142,690.44	$ 134,497.71	$ 126,304.97	$ 118,112.24	$ 109,919.51	$ 101,726.77	$ 93,534.04	$ 85,341.30	$ 77,148.57	$ 68,955.84	$ 60,763.10	$ 52,570.37	$ 44,377.64	$ 36,184.90	$ 27,992.17	$ 19,799.44	$ 11,606.70	$ 3,413.97	-$ 4,778.76
25%	$ 148,911.17	$ 140,652.36	$ 132,393.56	$ 124,134.76	$ 115,875.95	$ 107,617.15	$ 99,358.34	$ 91,099.54	$ 82,840.74	$ 74,581.93	$ 66,323.13	$ 58,064.32	$ 49,805.52	$ 41,546.72	$ 33,287.91	$ 25,029.11	$ 16,770.31	$ 8,511.50	$ 252.70

Table 2. Sensitivity Analysis

It shows that the more we increase the Discount Rate the bigger the risk it is of losing money, especially with the assumption of a 6% demand shift for every 5% discount applied. Which minimizes the opportunity to have big profit advantages and competitive difference.

Assignment Question 4: How to make profits more sustainable, even after Black Friday and peak demand?

A conclusion has been reached to cancel the 'Standard Discount' in the time of the Black Friday promotion and give all furniture products an equal discount rate.

To achieve the 20% expected demand, the store needs to establish at least a **16% discount rate (*see Exhibit 8*).**

After removing all the standard (current) discounts from the products, we tested the model for a 20% demand shift with a 16% discount rate.

Results:

Positive Profit Difference of $5,285.63

No losses in the sub-products [Bookcases & Tables] - All products are profitable.

We concluded that a 16% discount rate will be profitable and meet the expected 20% demand shift, if we cancel the standard discounts. But we saw that the profit difference is still not much for the size of a superstore, so in order to have a bigger portion of profits, we analyzed the sensitivity table to look for opportunistic insights that can helo the company boost its profits with an expected 20% demand shift. We saw in order to achieve that, we need to decrease the discount rate with the demand shift being still at 20% shift. The projected profit differences of lower rates are showcased below:

PROFIT DIFFERENCE IF REDUCE THE PROMOTION RATE WITH STABLE 20% DEMAND INCREASE
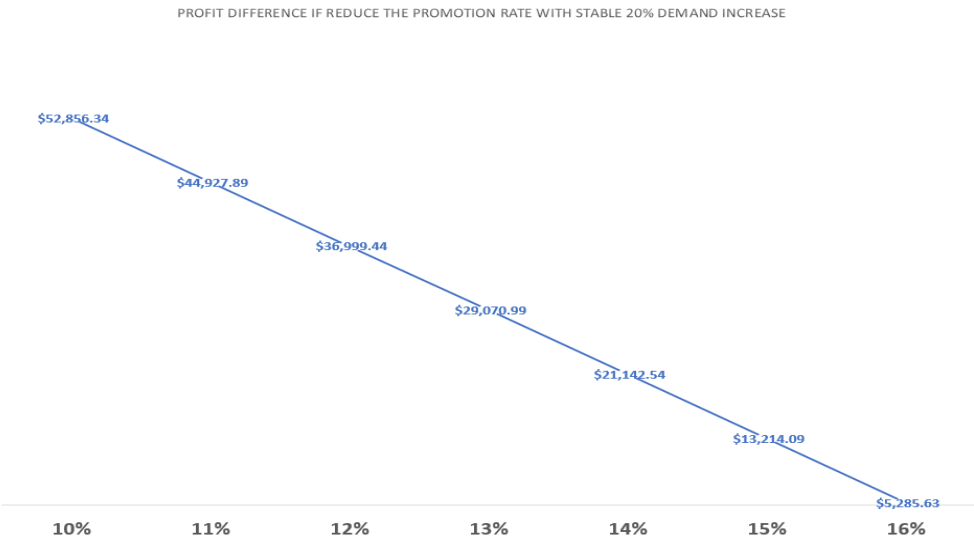
Table 3. Profit Difference if reduce the promotion rate with a stable 20% demand increase

We concluded that applying the model with the cancelation of the standard discounts will boost the profits and make it much healthier during the Black Friday promotion. But as consultants, we take everything into account, and we study decisive implications for what might happen after the Black Friday promotion is finished.

Another insight that has been generated for more sustainable profits (after the Black Friday promotion), as if the store would go back to the regular standard discounts, it will keep losing profits on both Casebooks and Tables – which jointly account for 45.6% of their total sales, and 2.73% of their fluctuated demand.

Without Discount Adjustment

Row Labels	Orderes	Average Price Per Order	Sum of Sales	Overhead & Operating Costs	Discount	Sum of Shipping Cost	Sum of Profit	Sum of Discount
Furniture	5063							
Bookcases	536	201.11	107,796.09	104,591.34	2,177.48	1957.71	- 930.44	2.02%
Chairs & Chairmats	1227	212.77	261,072.73	195,941.66	12,714.24	3720.99	48,695.84	4.87%
Office Furnishings	2356	41.63	98,070.91	69,088.35	8,316.41	1942.03	18,724.12	8.48%
Tables	944	205.26	193,764.58	187,490.85	8,816.29	4697.51	- 7,240.07	4.55%
Grand Total	5063		660,704.31				59,249.45	4.98%

With Discount Adjustment

Discount Level	0.00%
Demand Shift	-2.73%

Casebooks & Tables account for 45.6% of the furtnuture demand, so if standard promotion for them got canceld, demand will shfit backwards as much

Row Labels	Orderes	Average Price Per Order	Sum of Sales	Overhead & Operating Costs	Discount	Sum of Shipping Cost	Sum of Profit	Sum of Discount
Furniture								
Bookcases	521.3672	201.11	104,853.26	104,591.34	-	1957.71	- 1,695.79	0.00%
Chairs & Chairmats	1193.5029	212.77	253,945.44	195,941.66	12,367.14	3720.99	41,915.65	4.87%
Office Furnishings	2291.6812	41.63	95,393.57	69,088.35	8,089.38	1942.03	16,273.82	8.48%
Tables	918.2288	205.26	188,474.81	187,490.85	-	4697.51	- 3,713.56	0.00%
Grand Total	4924.7801		642,667.08		20,456.52		52,780.12	3.34%

	Demand Difference	-138.2199	
	Profit Difference	-$ 6,469.32	

Table 4. Without Discount Adjustment

The two conclusions gave an insight that we need to figure out a way to go against our assumption and search for ways to increase the gap between the discount rate and demand shift, in other words, we must seek a demand shift with the lowest discount rate possible, and that's where creativity comes in handy.

WHAT HAPPENED

As this was a hypothetical case there is no follow-up to what decision was made and what happened to the parties involved.

Exhibit 1: SuperstoreUS data set

	A	B	C	D	E	F	G	H
1	Row ID	Discount	Unit Price	Shipping Cost	Quantity ordered new	Sales	Product Base Margin	Profit
2	20228	0.02	500.98	26.00	12.00	6362.85	0.60	4390.37
3	21776	0.06	9.48	7.29	22.00	211.15	0.45	-53.81
4	24844	0.09	78.69	19.99	16.00	1164.45	0.43	803.47
5	23890	0.05	26.48	6.93	17.00	455.77	0.49	314.48
6	5890	0.05	26.48	6.93	70.00	1876.69	0.49	384.38
7	23967	0.04	4.14	6.60	12.00	54.78	0.49	8.89
8	5272	0.00	291.73	48.80	4.00	1239.06	0.56	-308.93
9	5273	0.07	100.98	45.00	43.00	4083.19	0.69	-1679.76
10	7786	0.09	122.99	70.20	49.00	5718.85	0.74	-2426.55
11	25786	0.09	122.99	70.20	12.00	1400.53	0.74	-2426.55
12	18281	0.04	296.18	54.12	6.00	1821.89	0.76	-715.78
13	23639	0.00	8.09	7.96	11.00	90.98	0.49	-144.56
14	23842	0.01	296.18	54.12	9.00	2875.72	0.76	173.48
15	6243	0.04	160.98	30.00	37.00	6276.34	0.62	116.10
16	24243	0.04	160.98	30.00	9.00	1526.68	0.62	255.42
17	6014	0.04	300.98	54.92	31.00	9459.94	0.55	2023.75
18	24014	0.04	300.98	54.92	8.00	2441.27	0.55	1684.48
19	24319	0.02	1.74	4.08	5.00	10.23	0.53	-37.39
20	25582	0.07	154.13	69.00	3.00	453.62	0.68	-634.73
21	23365	0.01	45.98	4.80	4.00	193.59	0.68	133.58
22	22907	0.06	180.98	26.20	5.00	929.57	0.59	251.41
23	22243	0.01	79.52	48.20	8.00	667.84	0.74	-40.68
24	26102	0.05	100.98	35.84	7.00	715.55	0.62	-111.40
25	23098	0.02	20.28	6.68	3.00	64.75	0.53	44.68
26	21203	0.03	60.89	32.41	7.00	450.49	0.56	36.35
27	25501	0.04	9.65	6.22	12.00	120.47	0.55	-53.62
28	24328	0.06	259.71	66.67	11.00	2809.87	0.61	785.63
29	18849	0.02	146.05	80.20	5.00	798.69	0.71	-101.19
30	18801	0.10	280.98	35.67	5.00	1332.82	0.66	-53.75
31	22370	0.05	31.76	45.51	9.00	304.34	0.65	-2177.99
32	18771	0.03	40.89	18.98	5.00	210.77	0.57	78.98
33	23060	0.00	170.98	13.99	7.00	1287.17	0.75	888.15
34	771	0.03	40.89	18.98	21.00	885.23	0.57	52.92
35	19169	0.10	130.98	54.74	9.00	1155.73	0.69	-530.24
36	18032	0.09	7.38	5.21	9.00	66.55	0.56	-27.16
37	19159	0.06	296.18	54.12	5.00	1170.21	0.76	-715.78

(Total 400 Observations)

Exhibit 2: Regression Analysis between Profit, Demand & Unit Price

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.834722762
R Square	0.69676209
Adjusted R Square	0.693691326
Standard Error	1455.60738
Observations	400

ANOVA

	df	SS	MS	F	Significance F
Regression	4	1923032445	480758111.3	226.9018947	6.2235E-101
Residual	395	836923174.2	2118792.846		
Total	399	2759955619			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-1443.970287	173.8999207	-8.303455696	1.62794E-15	-1785.855421	-1102.085153	-1785.855421	-1102.085153
Unit Price	11.14736555	0.662397305	16.82882082	2.66122E-48	9.84510049	12.44963062	9.84510049	12.44963062
Demand	128.2835393	6.107438426	21.00447525	2.59498E-66	116.2763894	140.2906891	116.2763894	140.2906891

Exhibit 3: Discount Model before Trials

Without Discount Adjustment

Row Labels	Orderes	Average Price Per Order	Sum of Sales	Overhead & Operating Costs	Discount	Sum of Shipping Cost	Sum of Profit	Sum of Discount
Furniture	5063							
Bookcases	536	201.11	107,796.09	104,591.34	2,177.48	1957.71	- 930.44	2.02%
Chairs & Chairmats	1227	212.77	261,072.73	195,941.66	12,714.24	3720.99	48,695.84	4.87%
Office Furnishings	2356	41.63	98,070.91	69,088.35	8,316.41	1942.03	18,724.12	8.48%
Tables	944	205.26	193,764.58	187,490.85	8,816.29	4697.51	- 7,240.07	4.55%
Grand Total	5063		660,704.31				59,249.45	4.98%

With Discount Adjustment

Discount Level	0%							
Demand Shift	0%							

Row Labels	Orderes	Average Price Per Order	Sum of Sales	Overhead & Operating Costs	Discount	Sum of Shipping Cost	Sum of Profit	Sum of Discount
Furniture								
Bookcases	536	201.11	107,796.09	104,591.34	2,177.48	1957.71	- 930.44	2.02%
Chairs & Chairmats	1227	212.77	261,072.73	195,941.66	12,714.24	3720.99	48,695.84	4.87%
Office Furnishings	2356	41.63	98,070.91	69,088.35	8,316.41	1942.03	18,724.12	8.48%
Tables	944	205.26	193,764.58	187,490.85	8,816.29	4697.51	- 7,240.07	4.55%
Grand Total	5063		660,704.31		32,024.42		59,249.45	4.98%

Demand Difference	0		
Profit Difference	$ -		

Exhibit 4: Applying a discount of 5%, with a demand shift of 6%

Without Discount Adjustment

Row Labels	Orderes	Average Price Per Order	Sum of Sales	Overhead & Operating Costs	Discount	Sum of Shipping Cost	Sum of Profit	Sum of Discount
Furniture	5063							
Bookcases	536	201.11	107,796.09	104,591.34	2,177.48	1957.71	- 930.44	2.02%
Chairs & Chairmats	1227	212.77	261,072.73	195,941.66	12,714.24	3720.99	48,695.84	4.87%
Office Furnishings	2356	41.63	98,070.91	69,088.35	8,316.41	1942.03	18,724.12	8.48%
Tables	944	205.26	193,764.58	187,490.85	8,816.29	4697.51	- 7,240.07	4.55%
Grand Total	5063		660,704.31				59,249.45	4.98%

With Discount Adjustment

Discount Level	5%							
Demand Shift	6%							

Row Labels	Orderes	Average Price Per Order	Sum of Sales	Overhead & Operating Costs	Discount	Sum of Shipping Cost	Sum of Profit	Sum of Discount
Furniture								
Bookcases	568.16	201.11	114,263.86	104,591.34	8,021.32	1957.71	- 306.51	7.02%
Chairs & Chairmats	1300.62	212.77	276,737.09	195,941.66	27,313.95	3720.99	49,760.49	9.87%
Office Furnishings	2497.36	41.63	103,955.16	69,088.35	14,013.16	1942.03	18,911.63	13.48%
Tables	1000.64	205.26	205,390.45	187,490.85	19,614.79	4697.51	- 6,412.70	9.55%
Grand Total	5366.78		700,346.57		68,963.22		61,952.91	9.98%

Demand Difference	303.78		
Profit Difference	$ 2,703.46		

Exhibit 6: Applying a discount of 10%, with a demand shift of 12%

Without Discount Adjustment

Row Labels	Orderes	Average Price Per Order	Sum of Sales	Overhead & Operating Costs	Discount	Sum of Shipping Cost	Sum of Profit	Sum of Discount
Furniture	5063							
Bookcases	536	201.11	107,796.09	104,591.34	2,177.48	1957.71	- 930.44	2.02%
Chairs & Chairmats	1227	212.77	261,072.73	195,941.66	12,714.24	3720.99	48,695.84	4.87%
Office Furnishings	2356	41.63	98,070.91	69,088.35	8,316.41	1942.03	18,724.12	8.48%
Tables	944	205.26	193,764.58	187,490.85	8,816.29	4697.51	- 7,240.07	4.55%
Grand Total	5063		660,704.31				59,249.45	4.98%

With Discount Adjustment

| Discount Level | 10% |
| Demand Shift | 12% |

Row Labels	Orderes	Average Price Per Order	Sum of Sales	Overhead & Operating Costs	Discount	Sum of Shipping Cost	Sum of Profit	Sum of Discount
Furniture								
Bookcases	600.32	201.11	120,731.62	104,591.34	14,511.94	1957.71	- 329.37	12.02%
Chairs & Chairmats	1374.24	212.77	292,401.46	195,941.66	43,480.10	3720.99	49,258.71	14.87%
Office Furnishings	2638.72	41.63	109,839.42	69,088.35	20,298.32	1942.03	18,510.72	18.48%
Tables	1057.28	205.26	217,016.33	187,490.85	31,575.88	4697.51	- 6,747.91	14.55%
Grand Total	5670.56		739,988.83		109,866.24		60,692.15	14.98%

| Demand Difference | 607.56 |
| Profit Difference | $ 1,442.70 |

Exhibit 7: Applying a discount of 10%, with a demand shift of 12%

Without Discount Adjustment

Row Labels	Orderes	Average Price Per Order	Sum of Sales	Overhead & Operating Costs	Discount	Sum of Shipping Cost	Sum of Profit	Sum of Discount
Furniture	5063							
Bookcases	536	201.11	107,796.09	104,591.34	2,177.48	1957.71	- 930.44	2.02%
Chairs & Chairmats	1227	212.77	261,072.73	195,941.66	12,714.24	3720.99	48,695.84	4.87%
Office Furnishings	2356	41.63	98,070.91	69,088.35	8,316.41	1942.03	18,724.12	8.48%
Tables	944	205.26	193,764.58	187,490.85	8,816.29	4697.51	- 7,240.07	4.55%
Grand Total	5063		660,704.31				59,249.45	4.98%

With Discount Adjustment

| Discount Level | 15% |
| Demand Shift | 18% |

Row Labels	Orderes	Average Price Per Order	Sum of Sales	Overhead & Operating Costs	Discount	Sum of Shipping Cost	Sum of Profit	Sum of Discount
Furniture								
Bookcases	632.48	201.11	127,199.39	104,591.34	21,649.34	1957.71	- 999.00	17.02%
Chairs & Chairmats	1447.86	212.77	308,065.82	195,941.66	61,212.68	3720.99	47,190.49	19.87%
Office Furnishings	2780.08	41.63	115,723.67	69,088.35	27,171.92	1942.03	17,521.38	23.48%
Tables	1113.92	205.26	228,642.20	187,490.85	44,699.55	4697.51	- 8,245.71	19.55%
Grand Total	5974.34		779,631.09		154,733.48		55,467.16	19.98%

| Demand Difference | 911.34 |
| Profit Difference | -$ 3,782.28 |

Exhibit 8: Applying a discount of 16%, with a demand shift of 20%

Without Discount Adjustment

Row Labels	Orderes	Average Price Per Order	Sum of Sales	Overhead & Operating Costs	Discount	Sum of Shipping Cost	Sum of Profit	Sum of Discount
Furniture	5063							
Bookcases	536	201.11	107,796.09	104,591.34	-	1957.71	1,247.04	0.00%
Chairs & Chairmats	1227	212.77	261,072.73	195,941.66	-	3720.99	61,410.08	0.00%
Office Furnishings	2356	41.63	98,070.91	69,088.35	-	1942.03	27,040.53	0.00%
Tables	944	205.26	193,764.58	187,490.85	-	4697.51	1,576.22	0.00%
Grand Total	5063		660,704.31				91,273.87	0.00%

With Discount Adjustment

| Discount Level | 16% |
| Demand Shift | 20% |

Row Labels	Orderes	Average Price Per Order	Sum of Sales	Overhead & Operating Costs	Discount	Sum of Shipping Cost	Sum of Profit	Sum of Discount
Furniture								
Bookcases	643.2	201.11	129,355.31	104,591.34	20,696.85	1957.71	2,109.41	16.00%
Chairs & Chairmats	1472.4	212.77	313,287.28	195,941.66	50,125.96	3720.99	63,498.66	16.00%
Office Furnishings	2827.2	41.63	117,685.09	69,088.35	18,829.61	1942.03	27,825.10	16.00%
Tables	1132.8	205.26	232,517.50	187,490.85	37,202.80	4697.51	3,126.33	16.00%
Grand Total	6075.6		792,845.17		126,855.23		96,559.50	16.00%

| Demand Difference | 1012.6 |
| Profit Difference | $ 5,285.63 |