Optimizing Product Pricing

- Excel Workbook Attached with assignment showing work and calculations.

1. Regression analysis (40%)
    a. Graph the percent purchased against price (5%)

b. Perform a regression using power regression to determine the predicted % column.
    i. Graph the new curve (5%)

ii. Estimate the equation of the line (5%)

$$y = 14.098x^{-1.872}$$

iii. What does the $R2$ mean? (5%)

- Using the power regression, your $R^2 = 0.9908$ means that 99% of the change of % purchased can be explained by the change in Price using the model coefficients calculated by excel.

c. Assuming there are 100,000 customers who visit your website and the publisher cost is $5.00, estimate the number of books sold (predicted sales column) (5%)

Price	% Purchased	Predicted % 14.098*Price^-1.872	Predicted Sales Predicted % Purchased*100,000
$ 5.00	65%	69.29%	69,292
$ 6.00	50%	49.26%	49,256
$ 7.00	40%	36.91%	36,909
$ 8.00	32%	28.75%	28,746
$ 9.00	25%	23.06%	23,058
$ 10.00	20%	18.93%	18,930
$ 11.00	16%	15.84%	15,837
$ 12.00	13%	13.46%	13,456
$ 13.00	11%	11.58%	11,584
$ 14.00	10%	10.08%	10,083
$ 15.00	8%	8.86%	8,862
$ 16.00	7%	7.85%	7,853
$ 17.00	6%	7.01%	7,011
$ 18.00	6%	6.30%	6,299
$ 19.00	5%	5.69%	5,693
$ 20.00	5%	5.17%	5,172
$ 21.00	5%	4.72%	4,720
$ 22.00	4%	4.33%	4,327
$ 23.00	4%	3.98%	3,981
$ 24.00	4%	3.68%	3,676
$ 25.00	4%	3.41%	3,406

d. Calculate the revenue column (price * predicted sales) (5%)

Revenue Price*Predicted Sales
$ 346,462.04
$ 295,535.47
$ 258,364.01
$ 229,965.69
$ 207,519.08
$ 189,303.00
$ 174,205.99
$ 161,477.29
$ 150,590.96
$ 141,167.22
$ 132,924.77
$ 125,650.69
$ 119,180.73
$ 113,386.12
$ 108,164.41
$ 103,433.05
$ 99,124.79
$ 95,184.21
$ 91,565.28
$ 88,229.40
$ 85,143.95

e. Calculate the profit column ((price – book cost) * predicted sales) (5%)

and

f. Use conditional formatting to highlight the profit values for all prices (5%)

Predicted Profit (Price-Book Cost)*Predicted Sales
$ -
$ 49,255.91
$ 73,818.29
$ 86,237.13
$ 92,230.70
$ 94,651.50
$ 95,021.45
$ 94,195.09
$ 92,671.36
$ 90,750.36
$ 88,616.52
$ 86,384.85
$ 84,127.58
$ 81,889.97
$ 79,700.09
$ 77,574.79
$ 75,523.65
$ 73,551.44
$ 71,659.79
$ 69,848.27
$ 68,115.16

2. Optimization analysis (with constraints) (30%)
   a. Calculate the price point for the highest profit possible
      i. The publisher will sell the books to you at $5.00 each with no minimum order (10%)

Book Cost	Price	% Purchased	Predicted %	Predicted Sales	Revenue
$ 5.00	$ 10.73	50%	17%	16,580	177,965

      ii. The publisher has agreed to sell you the books at $4.50 each if you sell at least

Book Cost	Price	% Purchased	Predicted %	Predicted Sales	Revenue
$ 4.50	$ 7.82	50%	30%	30,000	234,586

      iii. 30,000 (10%) iii. The publisher has agreed to sell you the books at $4.00 each if you sell at least 50,000 (10%)

Book Cost	Price	% Purchased	Predicted %	Predicted Sales	Revenue
$ 4.00	$ 5.95	50%	50%	50,000	297,607

   b. Run a constrained optimization for each of the above situations to determine which cost point (from the publisher) and price (to your customer) maximizes your profit. Which cost point should you accept from the publisher?

Scenario	Book Cost	Price	% Purchased	Predicted %	Predicted Sales	Revenue	Profit	Profit Margin	Constraints
i	$ 5.00	$ 10.73	50%	17%	16,580	177,965	95,066.94	53.4%	
ii	$ 4.50	$ 7.82	50%	30%	30,000	234,586	99,586.50	42.5%	30,000
iii	$ 4.00	$ 5.95	50%	50%	50,000	297,607	97,606.78	32.8%	50,000

- *At first glance, I would have chosen option 2 because it had the highest profit listed price but after closely looking at the data, you see that the profit margin percentage is higher with the option 1.*
- *While it is true that option 2 makes more in profit, they have to do a lot more sales in order to make that profit. Given that there are risks with using this data to make predictions on a future book (see question 3) it is wiser to go with option 1.*

3. Discussion (30%)
   a. What are the risks of using Harry Potter 7 data in predicting your new demand curve for the Harry Potter sequel? (15%)
      i. *The data we have from Harry Potter (HP) 7 is older and a different book.*
      ii. *Demand could have increased since HP7 came out given the fame that the franchise has amassed through the movie series.*
         i. *This could mean our audience is larger (or even different audience) than HP7, and therefore so will be demand.*
         ii. *This could lead to the risk of under-producing HP8, which would result in back orders. This could be a potential problem, because it may deter some people from buying the book because they do not want to wait.*
      iii. *On the other hand, it is possible that some fans are tired out from the series and just want to move on - thus lowering demand.*
      iv. *Unless noted, we do not know about any additional events or occurrences that may have effected HP7 demand and sales. For example:*
         i. *There may have been a boycott of the authors work by some demographics due to content in HP7, they may find HP8 to be more acceptable to buy, or vice-versa.*
         ii. *Some book stores may have chosen not to carry it then but seek to carry it now, vice versa.*
         iii. *Maybe HP7 was not available to buy online, now due to better technology and logistics, HP8 can be bought online.*

   b. What other data would you like to have to perform your analysis? (15%)
      i. *There are two data sets that could be useful. First, a survey of a well sampled population could be used to determine interest in the book before it is officially announced. Second, once the book is announced, Google Analytics on the book website (or publisher's website) would also demonstrate the demand. However, you would need to be able to model the google analytics to predict demand as well.*
      ii. *Additionally, it would be useful to have a pre-order option on the website, this is a common option in the world of publishing and allows for better forecasting models to be created.*
      iii. *Alternative Production Methods: It would helpful to understand the demand of Audio Book and E-book for HP8. If the demand is greater than for HP7, it may be helpful to focus some resources on creating an e-book and audio-book option for HP8.*