Analytics: Principals & Applications Homework 1

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Question 1: Business Analytics in Personal life

The best use of business analytics in my personal life will be to manage expenses. I will use descriptive analysis from the data available across all my bank accounts and split the expenses based on money spent on grocery, rent, gym, transportation and other miscellaneous expenses. Although I cannot use the analysis to reduce my rent and other necessary expenses, I would collect that to get an overall estimation of how my money is being spent. I would do an analysis and visualize the grocery and other expenses to see where the spending is unnecessary and would use the results to cut down expenses on those. I can also build a predictive model estimating how much money will be spent next month and be prepared for those expenses.

Question 3: Customer metrics to support decisions at a Hotel

The following metrics can be collected about the customers/guests at hotel to make business decisions

- Customer Survey – This data can be used to make improvements based on the response received
- Reference – This data can be used to find data on how the customer picked this hotel and improve methods to strengthen ways to advertise
- Visit purpose – This data can be used to find out if the customer is visiting for business or personal trip and propose new packages to enhance the hotel business
- Days of stay – This data can again help to propose packages and rates to compare with other hotels and stand different

The above is few of the metrics that will help make business decisions.

Question 6: Classify variables in the Credit Approval decisions excel file

- **Home Owner** – This is **categorical** with only two types – Yes or No
- **Credit Score** – This is **ordinal** since it can be ordered and the score with highest has a different meaning and the difference between scores does not denote anything
- **Years of credit history** – This is **Interval** since it is continuous variable and also has an arbitrary zero point
- **Revolving Balance** – This is **Ratio** since this is also continuous dollar values and the revolving balance can also be zero dollars.
- **Revolving Utilization** – This also is **Ratio** like Revolving Balance; continuous with Zero value
- **Decision -** This is **categorical** with only two categories – Approve or Reject

Question 9: Interpret a model developed by a bank

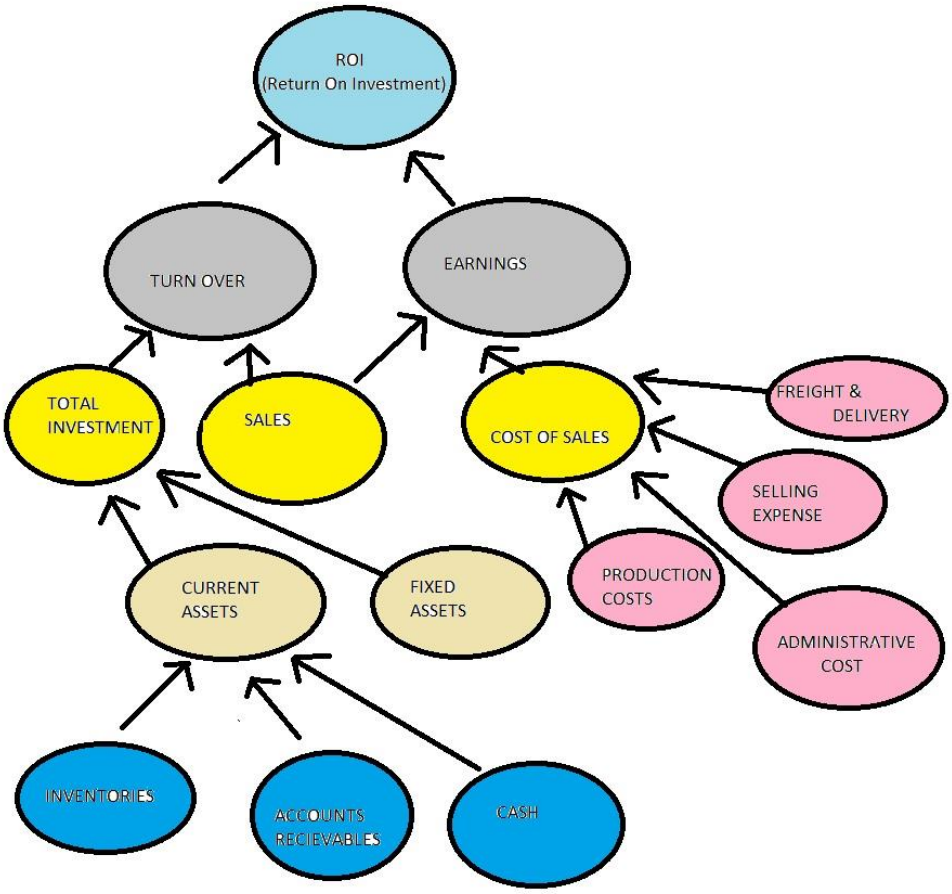
a. Balance=−17,732+367×age+1,300×years education+0.116×household wealth.

In the model that the bank developed, the average checking and savings account balance can be calculated by subtracting 17,732 with 367 times the age of the customer and adding this with 1300 times years of his education along with the sum of 0.116 times his household wealth.
The bank would have conducted various analyses from the customer database to come up with the numbers 17,732 and 367, 1300, 0.116 to get the formula of balance estimation in this model.

b. **Predicted Balance** = -17,732 +367*32 + 1300*16 + 0.116 *150000 = **$32,212**

Question 12: Influence diagram and develop mathematical model

a. INFLUENCE DIAGRAM



b. Mathematical Model

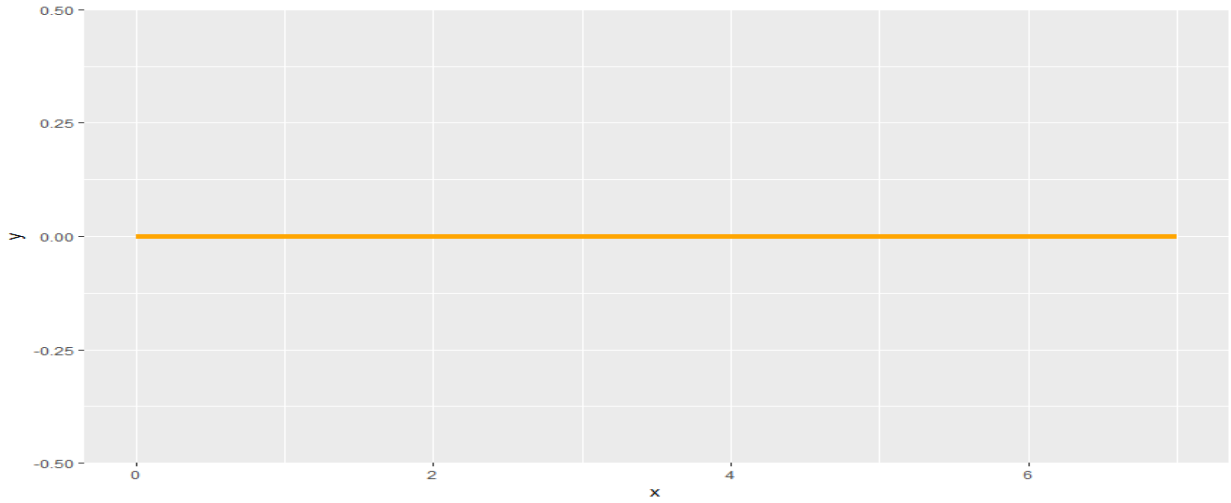
ROI = T * E
= (S/TI) * (S-CS) = (S/(CA+FA)) * (S- (PC + SE + FD +ADC))
= (S/((I+AC+C+FA)) * (S- (PC + SE + FD +ADC))
Where,

T = S/TI
TI= CA + FA
CA = I + AC + C
E = S – CS
CS = PC + SE + FD +ADC
And,

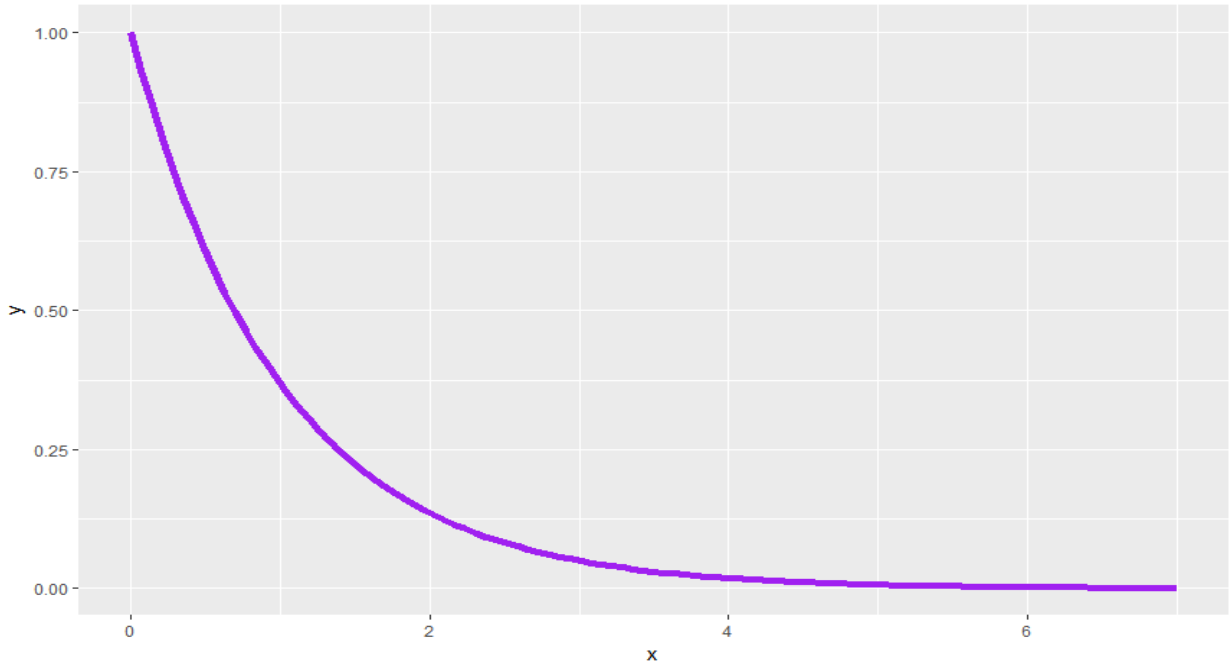
ROI =Return on Investments
T = Turnover
E= Earnings as percent of sales
T = Total investment
CA= Current assets
I = Inventories
AC = Accounts Receivable
C = Cash
FA= Fixed Assets
S= Sales
CS= Cost of Sales
PC= Production Costs
SE= Selling Expenses
FD = Freight and Delivery
ADC = Administrative Costs

Question 13: Plot: $D=ax^b$

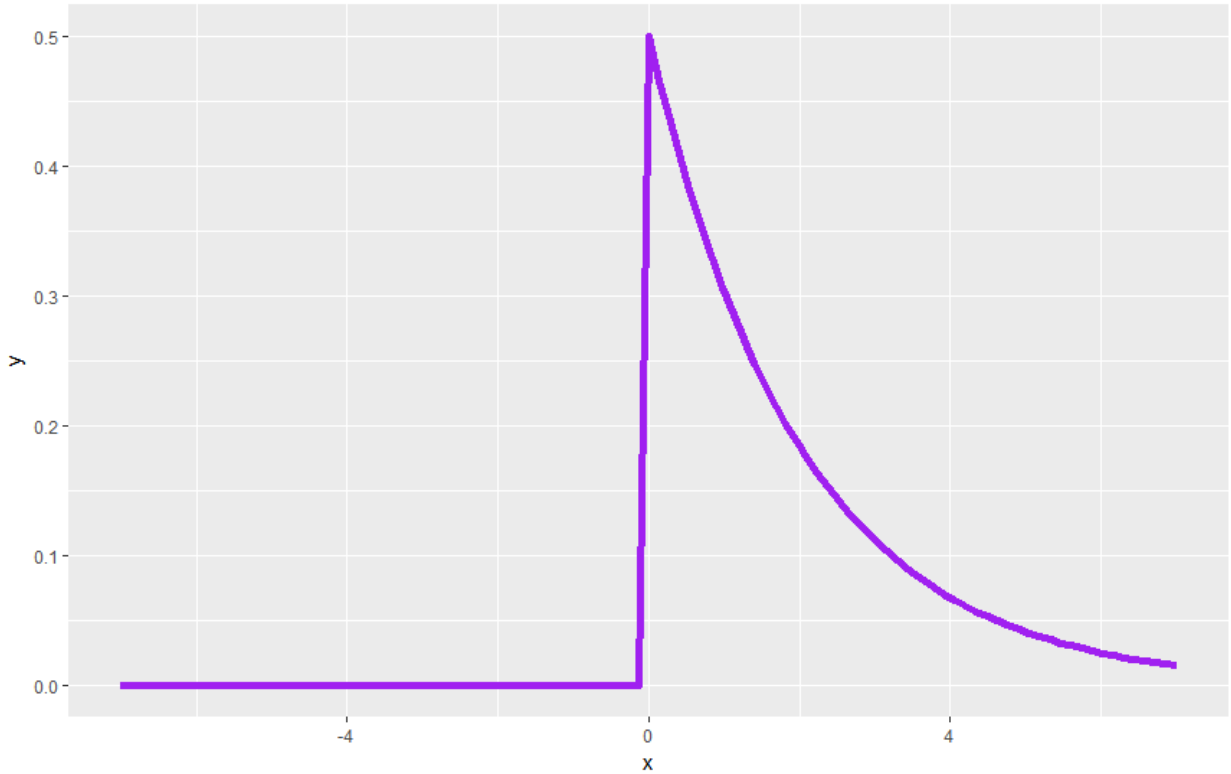
For b=0, the demand is constant.



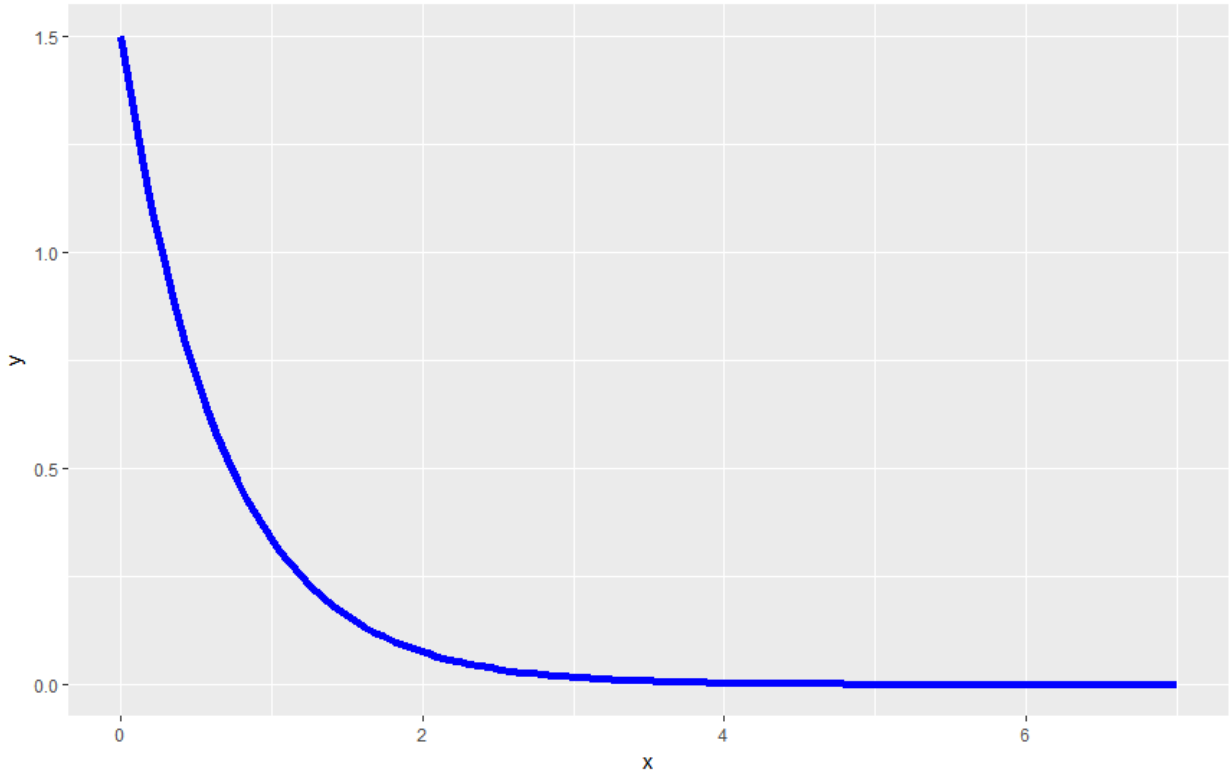
For b = 1, the demand is increasing



When b is between 0 and 1, the demand increases and decreases with marketing effort.



For b>1, demand increases with marketing effort.



The real data might give different analysis results with the linear model equation used. We cannot conclude based on the above plots. Hence, to make actual selection of model, actual data set with values for the variables demand, marketing efforts etc, needs to be analyzed.

Question 15: Plot: Model for price P, Given Demand D=2,500−3P, Cost C=5,000+5D

C=5,000+5D = 5000 + (5*(2500-3P))= 17500 – 15P

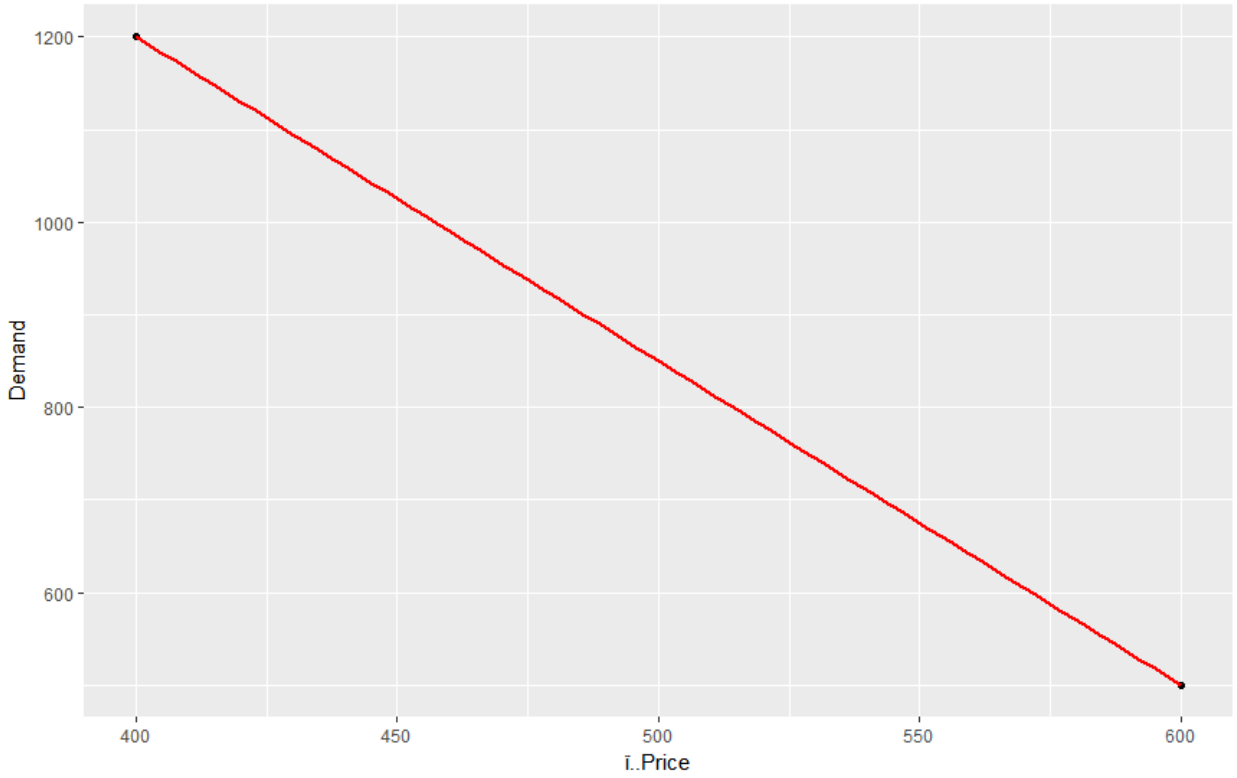
P = (2500 – 3P) *(P) – (17500 – 15P) = **17500+((2515*P) -(3*P) ^(2*P))**

Question 16: Airline Price Vs Demand

a. Price Vs demand Plot in R with linear model specifications in geom_smooth() of ggplot. Fare is the data frame I used for plotting the required variables

   Using slope calculation, the linear model can be expressed as D = 2600-(3.5*P)

   Code: ggplot(aes(x = Price,y=Demand), data = fare) + geom_point() + geom_smooth(method = 'lm', color = 'red')



b. Prescriptive model to maximize the total revenue =P*D

Total Revenue =P*(2600-(3.5*P)) = 2600P – (3.5*P^2)

c. By trial and error, can you find the optimal solution that maximizes total revenue?

Values of the decision variable at maximum or minimum point

For P = 100, D = 2250 , R = 225000

For P = 200, D = 1900 , R = 380000

For P = 300, D = 1150, R = 345000

For P = 500, D = 850 , R = 425000 ← Price of 500$ can be one of the optimal solutions to maximize revenue

For P = 800, D = 200, R = 160000