DISS 710 - Decision Support Systems: Assignment One

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Problem 1 - Cases of Perishable Food

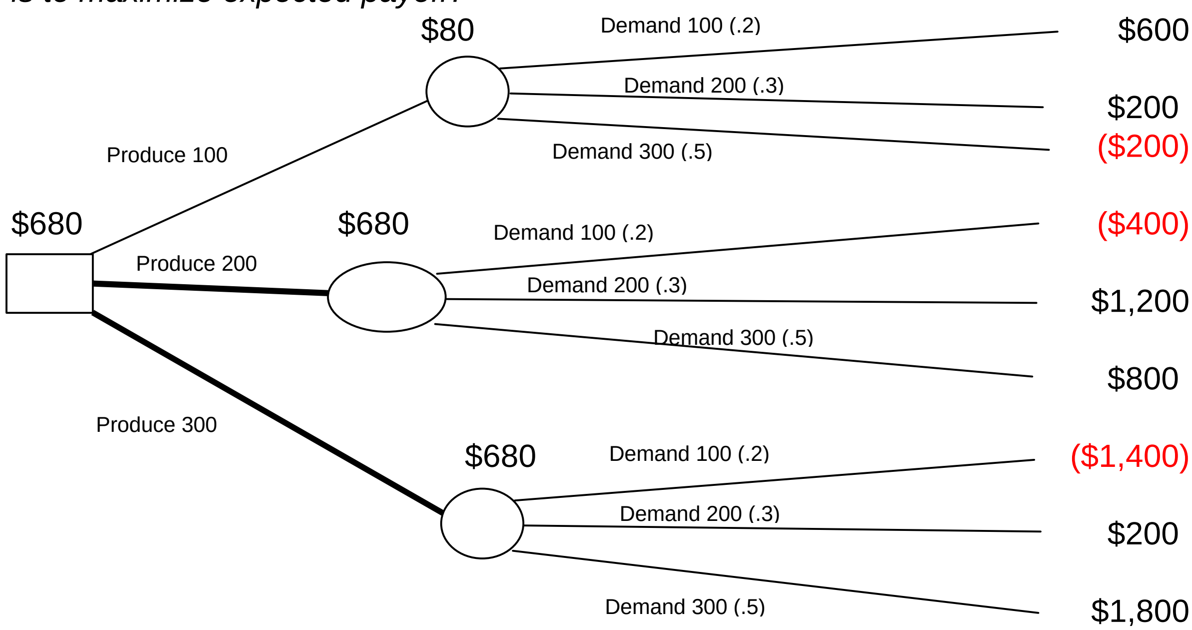
1a. Set up the payoff table for this problem

Cost:	$10	per case
Selling Price:	$16	per case
Profit:	$6	per case
Excess Demand Cost:	$20	per case
Excess Demand Profit:	($4)	per case

Payoff Table

	Demand		
Produced	100	200	300
100	$600	$200	($200)
200	($400)	$1,200	$800
300	($1,400)	$200	$1,800

1b. What should be the firm's production decision if the objective is to maximize expected payoff?



1b. Continued..

Event 100 = (600*.2)+(200*.3)+(-200*.5) = $80
Event 200 = (-400*.2)+(1200*.3)+(800*.5) = $680
Event 300 = (-1400*.2)+(200*.3)+(1800*.5) = $680

Since the expected payoff is $680 for producing 200 and 300 cases, the company could produce either quantity and maximize payoff

1c. How much discount (per case) should the firm be willing to offer for specifying the demand in time for each day's production run?

Best situation with perfect information (EPVI) =
.2(600)+.3(1200)+.5(1800) = $1,380

Profit (Expected Payoff) with imperfect information = $680

Difference $700

Average # of Cases = (100*.2)+(200*.3)+(300*.5)= 230.00
Maximum discount per case (700/230)= $3.04

Problem 2 - Neural Networks and Stocks

What is the probability that a neural network rated "good buy" performs much better than the market average?

Events of Interest

B = Stocks that performed better than average
A = Stocks that performed average
W = Stocks that performed worse than average
G = Good buy
not G = Not a good buy

P[B] = 0.25
P[A] = 0.5
P[W] = 0.25
P[G/B] = 0.6
P[G/A] = 0.3
P[G/W] = 0.1

Problem 2 continued …

Given Probabilities

Joint Probabilities Distribution Table

	G	not G	Marginal
B	0.15	0.1	0.25
A	0.15	0.35	0.5
W	0.025	0.225	0.25
Marginal	0.325	0.675	

P[G&B] = P[G/B]*P[B] = 0.15
P[G&A] = P[G/A]*P[A] = 0.15
P[G&W] = P[G/W]*P[W] = 0.025

P[B/G] = P[B & G] / P[G]

P[B & G] = P[B/G] * P[G] = P[G & B]
= P[G/B] * P[B] = .6 * .25
= 0.15

P[G] = 0.325

P[B/G] = .15 / .325
= 0.462

The probability that a neural network rated "good buy" performs much better than the market average is .462

Problem 3 - Investment using Linear Programming

3a. Formulate the investment decision as a linear program.

Decision Variables

A = Investment in Atlantic Oil
B = Investment in Pacific Oil
C = Investment Midwest Steel
D = Investment in Southern Steel
E = Investment in Government Bonds

Formula

Maximum Profits = .083*A + .103*B + .064*C + .085*D + .045*E

Problem 3 Continued …

3b. Solve the LP to determine the optimal investment allocation strategy.

Oil Industry Investment =	50000
Steel Industry Investment =	40000
Total Investment =	100000

Investment	Atlantic Oil	Pacific Oil	Midwest Steel	Southern Steel	Govt. Bonds
Rate of Return	8.3%	10.3%	6.4%	8.5%	4.5%
Optimal Strategy	20000	30000	0	40000	10000

Profit = **$8,600**

3c. Identify all the binding constraints.

A + B + C+ D + E <= $100,000
A,B,C,D,E >= $0
A+B <= (A + B + C + D + E)*.5
C + D <= (A + B + C + D + E)*.5
E >= (C + D)*.25
B <= (A + B)*.6

3d. Up to what rate should the firm be willing to pay in order to borrow an additional $1000 for investments?

Interest earned from optimal strategy = $8,600/$100,000
= 8.60%

Thus, the firm should pay less than 8.6% or less than $86 for an additional $1000

Problem 4 - Two-server Poisson Process Queuing Problem

Arrival rate = 10 per hour
Service rate = 6 per hour

Results from M/M/2 (sheet 2) - Press F9 to update

	Theoretical	Simulated	% Error
Expected Waiting Time in System (W)	0.55	0.42	22.9%
Expected Waiting Time in Queue (Wq)	0.38	0.25	34.5%
Expected Number in the System (L)	5.45	3.87	29.0%
Expected Number in the Queue (Lq)	3.79	2.28	39.7%
Service Utilization Factor (SUF)	0.83	0.79	4.7%