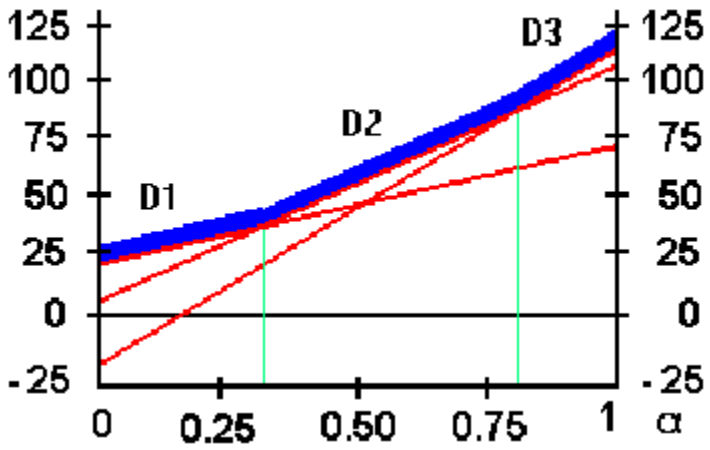
DECISION ANALYSIS NOTES - Prof. Richard B. Goldstein

Hurwicz Decision Analysis - 2 Variables

	States of Nature			
Decision Alternative	s_1	s_2	s_3	s_4
d_1	35	20	70	55
d_2	105	5	45	90
d_3	-15	110	10	80

Let α = level of optimism

$E_1 = E(d_1) = 20 + (70 - 20)\alpha = 20 + 50\alpha$
$E_2 = E(d_2) = 5 + (105 - 5)\alpha = 5 + 100\alpha$
$E_3 = E(d_3) = -15 + (110 - (-15))\alpha = -15 + 125\alpha$



$E_1 > E_2 \rightarrow 20 + 50\alpha > 5 + 100\alpha \rightarrow 50\alpha < 15 \rightarrow \alpha < 0.3$
$E_1 > E_3 \rightarrow 20 + 50\alpha > -15 + 125\alpha \rightarrow 75\alpha < 35 \rightarrow \alpha < 0.46666$

Therefore d_1 is highest for $\alpha < 0.3$

$E_2 > E_1 \rightarrow 5 + 100\alpha > 20 + 50\alpha \rightarrow 50\alpha > 15 \rightarrow \alpha > 0.3$
$E_2 > E_3 \rightarrow 5 + 100\alpha > -15 + 125\alpha \rightarrow 25\alpha < 20 \rightarrow \alpha < 0.8$

Therefore d_2 is highest for $0.3 < \alpha < 0.8$

$E_3 > E_1 \rightarrow -15 + 125\alpha > 20 + 50\alpha \rightarrow 75\alpha > 35 \rightarrow \alpha > 0.46666$
$E_3 > E_2 \rightarrow -15 + 125\alpha > 5 + 100\alpha \rightarrow 25\alpha > 20 \rightarrow \alpha > 0.8$

Therefore d_3 is highest for $\alpha > 0.8$

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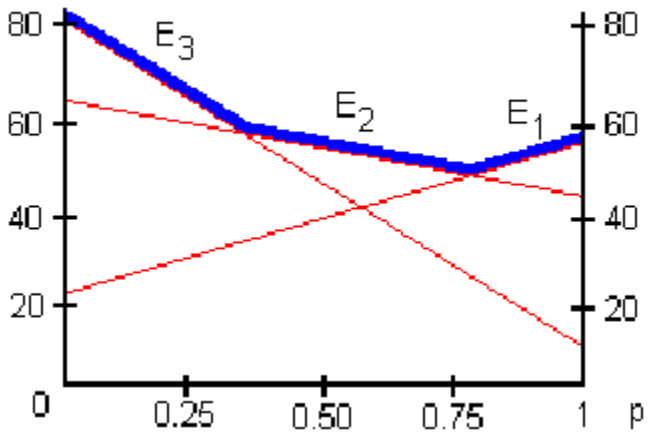
Graphical Sensitivity Analysis - 2 Variables

	State of Nature	
Decision Alternative	S_1	S_2
d_1	55	25
d_2	45	65
d_3	10	80

Let $p = prob(s_1)$; then $prob(s_2) = 1 - p$.

$E_1 = E(d_1) = 55p + 25(1 - p) = 25 + 30p$
$E_2 = E(d_2) = 45p + 65(1 - p) = 65 - 20p$
$E_3 = E(d_3) = 10p + 80(1 - p) = 80 - 70p$



$E_1 > E_2 \rightarrow 25 + 30p > 65 - 20p \rightarrow 50p > 40 \rightarrow p > 0.8$
$E_1 > E_3 \rightarrow 25 + 30p > 80 - 70p \rightarrow 100p > 55 \rightarrow p > 0.55$

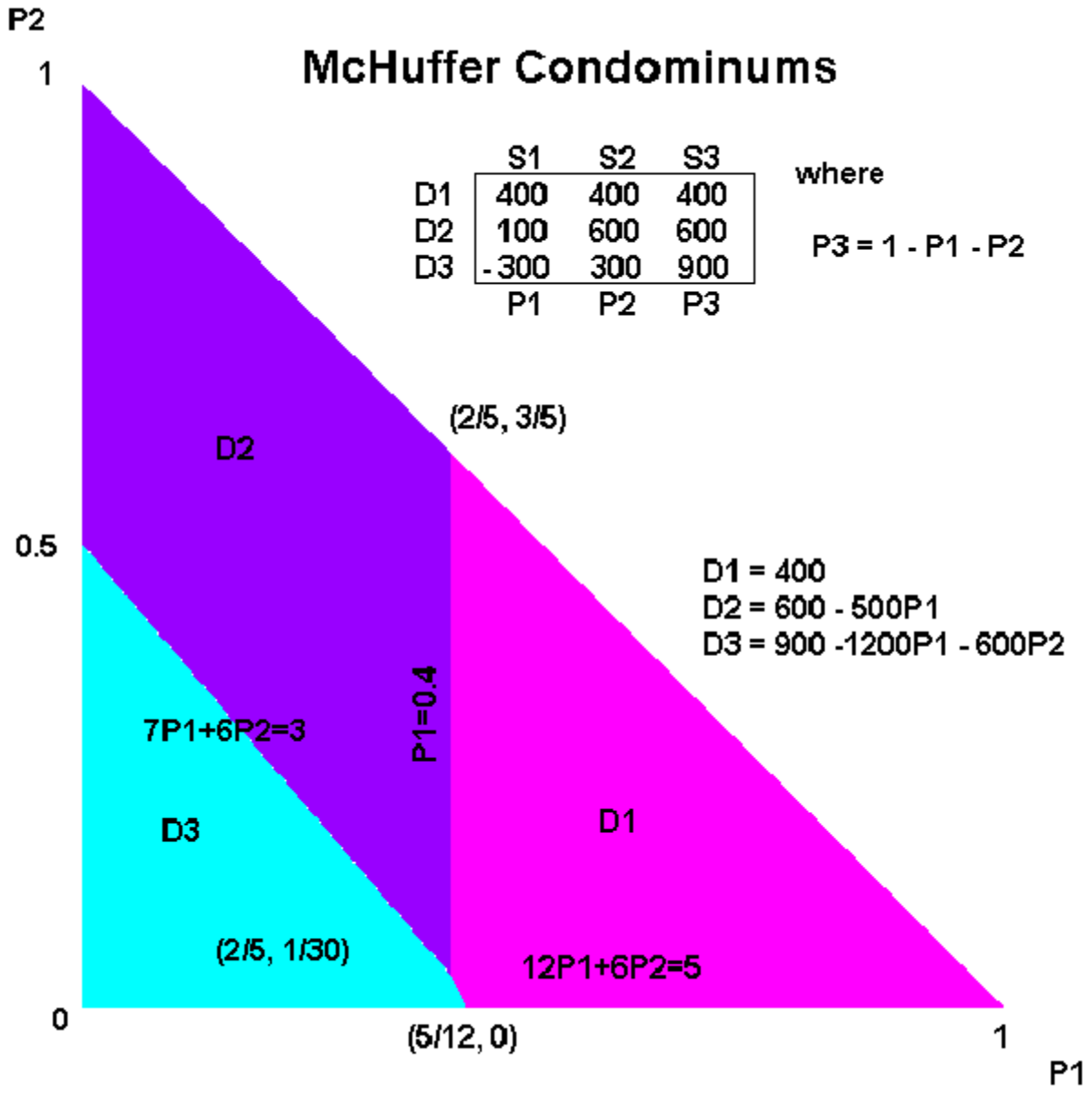
Therefore d_1 is highest for $p > 0.8$

$E_2 > E_1 \rightarrow 65 - 20p > 25 + 30p \rightarrow 50p < 40 \rightarrow p < 0.8$
$E_2 > E_3 \rightarrow 65 - 20p > 80 - 70p \rightarrow 50p > 15 \rightarrow p > 0.3$

Therefore d_2 is highest for $0.3 < p < 0.8$

$E_3 > E_1 \rightarrow 80 - 70p > 25 + 30p \rightarrow 100p < 55 \rightarrow p < 0.55$
$E_3 > E_2 \rightarrow 80 - 70p > 65 - 20p \rightarrow 50p < 15 \rightarrow p < 0.3$

Therefore d_3 is highest for $p < 0.3$


McHuffer Condominums
S1 S2 S3
D1 400 400 400
D2 100 600 600
D3 -300 300 900
P1 P2 P3
where
P3 = 1 - P1 - P2
P2
1
0.5
0
(2/5, 3/5)
D2
D1 = 400
D2 = 600 - 500P1
D3 = 900 -1200P1 - 600P2
7P1+6P2=3
P1=0.4
D3
D1
(2/5, 1/30)
12P1+6P2=5
(5/12, 0)
1
P1