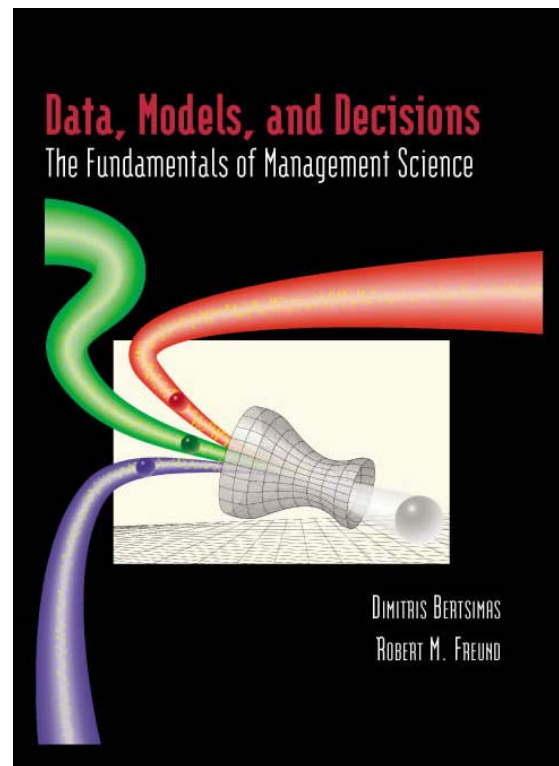


Dynamic Decision-Making Exercise: San Carlos Mud Slides

San Carlos Mud Slides

- Case study on pages 98-99 of *Data, Models, and Decisions: The Fundamentals of Management Science* (Bertsimas and Freund 2004)



Datasets:

diamonds ▾

 Add/edit data description Rename data

Load data of type:

state ▲

rda ▲

rds ▲

state ▲

csv ▲

clipboard ▲

from global workspace ▲

examples ▲

feather ▲

📄 Save

 Remove data from memory

?

Manage

View

Visualize

Pivot

Explore

Transform

Combine

price	carat	clarity	cut	color	depth	table	x	y	z
580	0.32	VS1	Ideal	H	61.00	56.00	4.43	4.45	2.71
650	0.34	SI1	Very Good	G	63.40	57.00	4.45	4.42	2.81
630	0.30	VS2	Very Good	G	63.10	58.00	4.27	4.23	2.68
706	0.35	VVS2	Ideal	H	59.20	56.00	4.60	4.65	2.74
1080	0.40	VS2	Premium	F	62.60	58.00	4.72	4.68	2.94
3082	0.60	VVS1	Ideal	E	62.50	53.70	5.35	5.43	3.38
3328	0.88	SI1	Ideal	I	61.70	56.00	6.14	6.18	3.80
4229	0.93	SI1	Premium	E	61.40	57.00	6.34	6.23	3.86
1895	0.51	VVS2	Very Good	G	63.40	57.00	5.09	5.06	3.22
3546	1.01	SI2	Good	E	63.90	58.00	6.31	6.37	4.05

10 of 3,000 rows shown. See View-tab for details.

Load: *san-carlos-state.rda*

Diamond prices

Prices of 3,000 round cut diamonds

Description

A dataset containing the prices and other attributes of a sample of 3000 diamonds. The variables are as follows:

```
1 name: San Carlos Mud Slides
2 variables:
3   ## Given probabilities
4   P(MS): .01
5   P(N): 1 - P(MS)
6   P(B): .05
7   P(NB): 1 - P(B)
8   ## Costs
9   wall cost: 40000
10  slide cost: -1000000
11 type: decision
12 Build Wall:
13   cost: wall cost
14   type: chance
15   Mud Slide:
16     p: P(MS)
17     type: chance
18   Wall Breaks:
19     p: P(B)
20     payoff: slide cost
21   Wall Stands:
22     p: P(NB)
23     payoff: 0
24   Nothing:
25     p: P(N)
26     payoff: 0
27 Do nothing:
28   type: chance
29   Mud Slide:
30     p: P(MS)
31     payoff: slide cost
32   Nothing:
33     p: P(N)
34     payoff: 0
```

Click Calculate to compute the tree

Go to Plot tab to see tree computed visually

Model Plot Sensitivity

? Max Min **Calculate** no-test no-test Remove No file chosen

```
1 name: San Carlos Mud Slides
2 variables:
3   ## Given probabilities
4   P(MS): .01
5   P(N): 1 - P(MS)
6   P(B): .05
7   P(NB): 1 - P(B)
8   ## Costs
9   wall cost: 40000
10  slide cost: -1000000
11 type: decision
12 Build Wall:
13   cost: wall cost
14   type: chance
15   Mud Slide:
16     p: P(MS)
17     type: chance
18     Wall Breaks:
19       p: P(B)
20       payoff: slide cost
21     Wall Stands:
22       p: P(NB)
23       payoff: 0
24   Nothing:
25     p: P(N)
26     payoff: 0
27 Do nothing:
28   type: chance
29   Mud Slide:
30     p: P(MS)
31     payoff: slide cost
32   Nothing:
33     p: P(N)
34     payoff: 0
```

Input values:

```
P(MS)      0.01
P(N)       0.99
P(B)       0.05
P(NB)      0.95
wall cost  40000.00
slide cost -1000000.00
```

Initial decision tree:

	Probability	Payoff	Cost	Type
San Carlos Mud Slides				
--Build Wall			40,000.00	decision
--Mud Slide	1.00 %			chance
--Wall Breaks	5.00 %	-1,000,000.00		chance
°--Wall Stands	95.00 %	0.00		chance
°--Nothing	99.00 %	0.00		chance
°--Do nothing				decision
--Mud Slide	1.00 %	-1,000,000.00		chance
°--Nothing	99.00 %	0.00		chance

Final decision tree:

	Probability	Payoff	Cost	Type
San Carlos Mud Slides		-10,000.00		
--Build Wall		-40,500.00	40,000.00	decision
--Mud Slide	1.00 %	-50,000.00		chance
--Wall Breaks	5.00 %	-1,000,000.00		chance
°--Wall Stands	95.00 %	0.00		chance
°--Nothing	99.00 %	0.00		chance
°--Do nothing		-10,000.00		decision
--Mud Slide	1.00 %	-1,000,000.00		chance
°--Nothing	99.00 %	0.00		chance

Model

Plot

Sensitivity

Plot decision tree:

Plot direction:

? 

Initial



Final



Left-right

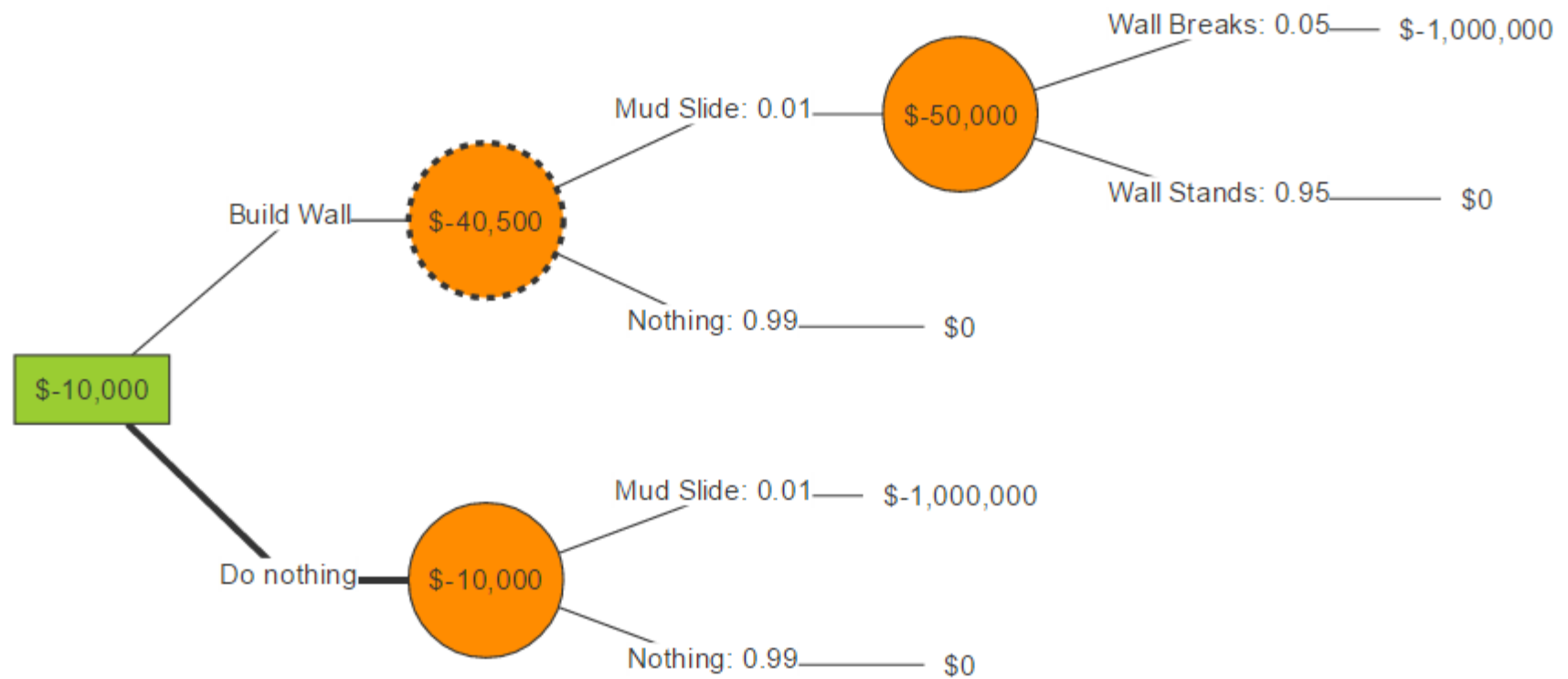


Top-down

Calculate

0

\$



Select full model

Model Plot Sensitivity

Max Min Calculate mudslide **mudslide** Save input Save output Remove Choose File No file chosen

```

1 name: San Carlos Mud Slides
2 variables:
3   ## Given probabilities
4   P(MS): .01
5   P(N): 1 - P(MS)
6   P(B): .05
7   P(NB): 1 - P(B)
8   P(Pos|MS): .9
9   P(Neg|MS): 1 - P(Pos|MS)
10  P(Neg|N): .85
11  P(Pos|N): 1 - P(Neg|N)
12  ## Costs
13  wall cost: 40000
14  slide cost: -1000000
15  test cost: 0
16  ## Derived probabilities
17  P(Pos and MS): P(Pos|MS) * P(MS)
18  P(Pos and N): P(Pos|N) * P(N)
19  P(Neg and MS): P(Neg|MS) * P(MS)
20  P(Neg and N): P(Neg|N) * P(N)
21  P(Neg): P(Neg and MS) + P(Neg and N)
22  P(Pos): P(Pos and MS) + P(Pos and N)
23  P(MS|Pos): P(Pos and MS) / P(Pos)
24  P(MS|Neg): P(Neg and MS) / P(Neg)
25  P(N|Pos): P(Pos and N) / P(Pos)
26  P(N|Neg): P(Neg and N) / P(Neg)
27 type: decision
28 Build Wall:
29   cost: wall cost
30   type: chance
31 Mud Slide:
32   p: P(MS)
33   type: chance
34 Wall Breaks:
35   p: P(B)
36   payoff: slide cost
37 Wall Stands:
38   p: P(NB)
39   payoff: 0
40 Nothing:
41   p: P(N)
42   payoff: 0
43 Do nothing:
44   type: chance
45 Mud Slide:
46   p: P(MS)
47   payoff: slide cost
48 Nothing:
49   p: P(N)
50   payoff: 0
51 Test:
52   cost: test cost
53   type: chance

```

Input values:

P(MS)	0.010000000
P(N)	0.990000000
P(B)	0.050000000
P(NB)	0.950000000
P(Pos MS)	0.900000000
P(Neg MS)	0.100000000
P(Neg N)	0.850000000
P(Pos N)	0.150000000
wall cost	40000.000000000
slide cost	-1000000.000000000
test cost	0.000000000
P(Pos and MS)	0.009000000
P(Pos and N)	0.148500000
P(Neg and MS)	0.001000000
P(Neg and N)	0.841500000
P(Neg)	0.842500000
P(Pos)	0.157500000
P(MS Pos)	0.057142857
P(MS Neg)	0.001186944
P(N Pos)	0.942857143
P(N Neg)	0.998813056

Initial decision tree:

	Probability	Payoff	Cost	Type
San Carlos Mud Slides				
--Build Wall			40,000.00	decision
--Mud Slide	1.00 %			chance
--Wall Breaks	5.00 %	-1,000,000.00		chance
°--Wall Stands	95.00 %	0.00		chance
°--Nothing	99.00 %	0.00		chance
--Do nothing				decision
--Mud Slide	1.00 %	-1,000,000.00		chance
°--Nothing	99.00 %	0.00		chance
°--Test			0.00	decision
--Positive	15.75 %			chance
--Build Wall			40,000.00	decision

Plot decision tree: Plot direction: Decimals Symbol

? Initial Final Left-right Top-down

