THE DECISION TABLE TOOL

Decision variables are cells in your model that you can control, such as how much to charge for a product or how many wells to drill. But, in situations with uncertainty, it is not always obvious what effect changing a decision variable can have on your model's results.

The Decision Table tool automatically runs multiple simulations to test different values for one or two decision variables. You can then analyze the results in Crystal Ball using the forecast, trend, and overlay charts.

- 1	А	В	С		D	E	F		G		Н		1	J		К	L		
1		Oil Field Dev	velop	me	nt										<u>Learn al</u>	bout mode	<u>1</u>		
2																			
3		Input Variables						Oil Pr	roduction	Profil	e			Abbreviati	ons use	ed			
4		STOIIP	15	00.00	mmbbls	-								mmbbls:	milli	on barrel	s		
5		Recovery		42.0	%							May		mbd:	thou	sand barr	rels per d	ay	
6		Time to plateau		2.00	years						F	lateau		\$mm:	milli	on dollar	s		
7		Well rate		10.00	mbd		Buildup /	Plate	au Declir	ie				\$/bbl:	dolla	irs per ba	rrel		
8		Wells to drill		25			Phase	Phas	se Pha	se				STOIIP:	Stoc	k tank oil	initially		
9		Minimum rate		10.00	mbd		• 4	-	· •	-	-	+ time			in pla	ace			
10		Discount factor		10.00	%		Gr	owth	Mature	Decl	ine								
11		Well cost		10.00	\$mm		Ŷ	ears	Years	Yea	IIS								
12		Facility size	2	50.00	mbd														
13		Oil margin		2.00	\$/bbl														
14		Plateau ends at		65.0	% of reserv	ves													
15		Plateau rate is		10.0	% of reserv	ves annuall	ly												
16						_													
17		Calculated values								_									
18		Reserves	6	30.00	mmbbls		Fac	ilities C	osts										
19		Max plateau rate	1	72.60	mbd		Output (n	nbd) Co	ost (\$mm)										
20		Plateau rate	1	72.60	mbd			50	7	D									
21		Build up production		63.00	mmbbls			100	13	D									
22		Plateau production	3	46.50	mmbbls			150	18	D									
23		Plateau ends at		7.50	years			200	22	D									
24		Decline factor	0	.2692				250	25	D									
25		Production life		18.08	years			300	27	D									
26						_		350	28	D									
27		Discounted Reserves	3	79.45	mmbbls														
28		Well Costs	2	50.00	\$mm	(
29		Facilities Costs	2	50.00	\$mm		Objectiv	e: maxi	mize the										
30		NPV	2	58.89	\$mm 🚽		10t	n perce	ntile										
	()	Description	Model		(†)					:	4						1	ŀ	
					0														1

In the oil field development model above, there are several decision variables that you control, such as the number of wells to drill, rate of oil production, and size of the facility to build (shown in yellow). All of these have a direct impact on the net present value (NPV) of the development project.

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Decision Table, continued

DEFINING A DECISION VARIABLE

You are most interested in how the NPV compares for different facility sizes, which can vary from as little as 50 or as much as 350 thousand barrels per day (mbd) of oil. How can you determine the right facility given the uncertainty surrounding well costs, production levels, and reservoir size?

Define Decision Va	riable: Cell C12		×
Name: Facility size			<u></u>
Bounds			
Lower: 50.00	1	<u>U</u> pper: 350.00	N
Туре			
○ Continuous			
● <u>D</u> iscrete	<u>S</u> tep: 50.00	N	
O <u>B</u> inary (Yes-N))		
Category (Non	iinal)		
O Custo <u>m</u> :			1
	(Example: 100, 200	, 400)	
	<u>O</u> K	<u>C</u> ancel	<u>H</u> elp

First you define the facility size as a decision variable in Crystal Ball:

Then you enter the lower and upper bounds of the facility size along with a step size of 50. This will define facility sizes between 50 mbd to 350 mbd in increments of 50 mbd for a total of 7 possible sizes.

RUNNING THE DECISION TABLE TOOL

You are now ready to run the Decision Table tool, a simple, three-step wizard available from the Run menu.

The Welcome screen introduces you to the purpose and features of the tool. In the Target Forecast dialog, you specify which the forecast you want to examine. In the Decision Variable dialog, you select which one or two decision variables you want to analyze.

In this example, the target is the NPV forecast, and the decision variable you wish to examine is the Facility Size.

In the final Options dialog (shown below), you can select how many values to test (7) and the number of trials to run per simulation (1000).

Decision Table, continued

O Decision Table		—		×
Welcome Target Forecast	Choose options and run the tool		Y	
Decision Variables Options	Simulation control Iest 7 values for Facility size Run each simulation for 1000 trials (maximum) While running Show forecasts as defined Image: Show only target forecast Show and target forecasts Hide all forecasts			
	< <u>B</u> ack <u>N</u> ext > <u>R</u> un <u>C</u> anc	el	<u>H</u> elp	

VIEWING THE RESULTS

In this example, the tool ran seven simulations (one for each facility size) for 1000 random trials each. The Decision Table tool compiles the results into a table of forecast cells indexed by the decision variables.

	А	В	С	D	E	F	G	Н	I.	J	К	L		
	Trend Chart		п	п	т	п	п	п						
	Overlay Chart	Facilit	acility	acility	acility	acility	acility	acility						
	Forecast Chart	y size	size (size (· size (size (size (size (
		(50.0	100.0	150.0	200.0	250.0	300.0	350.0						
1		ĕ	8	0	00	0	8	0)						
2		19.26	181.92	255.13	258.11	233.56	213.82	203.82						
3		1	2	3	4	5	6	7	⁄扫					
4														
5														
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8														
9														
10														-
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The mean values of the NPV forecasts are shown in light blue. The facility size that resulted in the best mean NPV was 200 mbd.

Decision Table, continued

COMPARING FORECASTS

Even though the 200 mbd facility resulted in the highest mean NPV, the overlay chart shows that this facility (yellow) has a large amount of uncertainty (and possibly a higher risk) compared to other facility sizes.

In contrast, the 100 mbd curve (in red) is steeper and will always result in a positive NPV. This may be less risky, although it doesn't have the upside of the larger facility sizes.



For more information or to contact us, browse to

http://www.oracle.com/technetwork/middleware/crystalball/overview/index.html.