



ORACLE®

Adding Risk Measurement to Enterprise Performance Management Analytics

A short demonstration of Oracle Crystal Ball and Hyperion Planning – Driver
Based Forecasting

	FY10					FY11					FY12				
					-YearTotal					-YearTotal					-YearTotal
	Q1	Q2	Q3	Q4		Q1	Q2	Q3	Q4		Q1	Q2	Q3	Q4	
3 Market Size (billions)	21	22	24	33	100	22	23	25	35	105	-	-	-	-	-
4 Market Share %	1%	1%	2%	4%	2%	2%	2%	2%	3%	2%	-	-	-	-	-
5 Hardware	270,900,000	281,600,000	477,148,152	1,243,337,420	2,272,985,572	374,850,000	369,600,000	504,000,000	1,074,150,000	2,322,600,000	-	-	-	-	-
6 Contract Renewals	3,021	3,016	3,500	4,000	13,537	3,000	3,000	4,000	5,000	15,000	-	-	-	-	-
7 Renewal Rate %	93%	96%	95%	95%	95%	95%	95%	95%	95%	95%	-	-	-	-	-
8 New Contracts	275	302	400	500	1,477	300	400	450	500	1,650	-	-	-	-	-
9 Support Rate	5,072	5,368	5,000	6,500	5,485	5,000	5,000	5,000	5,000	5,000	-	-	-	-	-
10 Support	15,675,134	17,197,090	18,625,000	27,950,000	79,447,224	15,750,000	16,250,000	21,250,000	26,250,000	79,500,000	-	-	-	-	-
11 Consultants	267	295	340	350	350	270	300	350	375	375	-	-	-	-	-
12 Working Days	62	64	64	63	253	63	64	64	62	253	-	-	-	-	-
13 Utilization Rate %	83%	85%	95%	95%	90%	85%	85%	90%	90%	88%	-	-	-	-	-
14 Consulting Rate	378	356	350	350	358	350	350	350	350	350	-	-	-	-	-
15 Consulting	41,599,752	45,639,393	57,881,600	58,653,000	203,773,745	40,483,800	45,696,000	56,448,000	58,590,000	201,217,800	-	-	-	-	-
16 Training % of Sales	22%	24%	15%	15%	19%	20%	20%	20%	20%	20%	-	-	-	-	-
17 Training	60,708,690	66,851,840	71,572,223	186,500,613	385,633,366	74,970,000	73,920,000	100,800,000	214,830,000	464,520,000	-	-	-	-	-
18 Commodity Price Index	43	53	60	62	62	74	85	65	42	42	-	-	-	-	-
19 Change in Price Index	-57%	24%	12%	4%	-39%	20%	14%	-24%	-35%	-32%	-	-	-	-	-
20 Cost of Sale % - Hardware	69%	69%	70%	70%	70%	71%	72%	70%	69%	69%	-	-	-	-	-
21 Cost of Sale % - Services	45%	43%	50%	50%	47%	50%	50%	50%	50%	50%	-	-	-	-	-
22 Cost of Sales	242,745,272	256,240,978	411,644,175	1,014,596,812	1,925,227,236	335,834,100	337,941,542	448,487,542	890,484,000	2,012,747,183	-	-	-	-	-

In this example, we use Hyperion Planning to calculate our Cost of Sales for next year. We've calculated our cost of sales for FY10 at \$1,925,227,236. Presenting this to Management, we've been asked two questions:

- 1) How likely is it that cost of sales will exceed this number?
- 2) Which drivers are the most important in this model?

Let's apply two simple risk analysis techniques to answer these questions.

	FY11							FY12				
	Q1	Q2	Q3	Q4	-YearTotal	Q1	Q2	Q3	Q4	-YearTotal		
3 Market Size (billions)	21	22		22	23	25	35	105	-	-	-	-
4 Market Share %	1%	1%		2%	2%	2%	3%	2%	-	-	-	-
5 Hardware	270,900,000	281,600,000	477,140,000	350,000,000	369,600,000	504,000,000	1,074,150,000	2,322,600,000	-	-	-	-
6 Contract Renewals	3,021	3,016		3,000	3,000	4,000	5,000	15,000	-	-	-	-
7 Renewal Rate %	93%	96%		95%	95%	95%	95%	95%	-	-	-	-
8 New Contracts	275	302		300	400	450	500	1,650	-	-	-	-
9 Support Rate	5,072	5,368		5,000	5,000	5,000	5,000	5,000	-	-	-	-
10 Support	15,675,134	17,197,090	18,620,000	750,000	16,250,000	21,250,000	26,250,000	79,500,000	-	-	-	-
11 Consultants	267	295		270	300	350	375	375	-	-	-	-
12 Working Days	62	64		63	64	64	62	253	-	-	-	-
13 Utilization Rate %	83%	85%		85%	85%	90%	90%	88%	-	-	-	-
14 Consulting Rate	378	356		350	350	350	350	350	-	-	-	-
15 Consulting	41,599,752	45,639,393	57,800,000	483,800	45,696,000	56,448,000	58,590,000	201,217,800	-	-	-	-
16 Training % of Sales	22%	24%		20%	20%	20%	20%	20%	-	-	-	-
17 Training	60,708,690	66,851,840	71,500,000	970,000	73,920,000	100,800,000	214,830,000	464,520,000	-	-	-	-
18 Commodity Price Index	43	53		74	85	65	42	42	-	-	-	-
19 Change in Price Index	-57%	24%		24%	24%	24%	-35%	-32%	-	-	-	-
20 Cost of Sale % - Hardware	69%	69%		70%	70%	70%	69%	69%	-	-	-	-
21 Cost of Sale % - Services	45%	43%		50%	50%	50%	50%	50%	-	-	-	-
22 Cost of Sales	242,745,272	256,240,978	411,644,175	1,014,596,812	1,925,227,236	335,000,000	890,484,000	2,012,747,183	-	-	-	-

Context menu for cell D3:

- Cut
- Copy
- Paste
- Paste Special...
- Insert...
- Delete...
- Clear Contents
- Filter
- Sort
- Insert Comment
- Format Cells...
- Pick From Drop-down List...
- Name a Range...
- Hyperlink...
- Crystal Ball
 - Define Assumption...
 - Define Decision...
 - Define Forecast...
 - Copy Data

First, we know that many of the inputs in this model are uncertain. For instance, we don't know for sure, what the market size is, or what the commodity price index will be. Instead of using just a single number, these inputs – assumptions – would be better represented by ranges of numbers.

So let's do that. Let's define assumptions for all the inputs that are uncertain.

CB Test.xlsx - Microsoft Excel

Home Insert Page Layout Formulas Data Review View Developer Add-Ins Hyperion Crystal Ball

POV Manager Adjust Business Rules
Member Selection Cell Text Rules on Form
Function Builder Supporting Details
Task Business

Activate Zoom In Keep Only Select Form Refresh Offline
Reset Zoom Out Remove Only Instructions Sync Back To Server
Connections Ad hoc Analysis Take Offline Lock Forms

D3 24

	A	B	C	D	E	
1				24		
2						
3	Market Size (billions)	21	22	24	33	
4	Market Share %	1%	1%	2%	4%	
5	Hardware	270,900,000	281,600,000	477,148,152	1,243,337,420	2,272
6	Contract Renewals	3,021	3,016	3,500	4,000	
7	Renewal Rate %	93%	96%	95%	95%	
8	New Contracts	275	302	400	500	
9	Support Rate	5,072	5,368	5,000	6,500	
10	Support	15,675,134	17,197,090	18,625,000	27,950,000	79,447
11	Consultants	267	295	340	350	
12	Working Days	62	64	64	63	
13	Utilization Rate %	83%	85%	95%	95%	
14	Consulting Rate	378	356	350	350	
15	Consulting	41,599,752	45,639,393	57,881,600	58,653,000	203,773
16	Training % of Sales	22%	24%	15%	15%	
17	Training	60,708,690	66,851,840	71,572,223	186,500,613	385,633
18	Commodity Price Index	43	53	60	62	
19	Change in Price Index	-57%	24%	12%	4%	
20	Cost of Sale % - Hardware	69%	69%	70%	70%	
21	Cost of Sale % - Services	45%	43%	50%	50%	
22	Cost of Sales	242,745,272	256,240,978	411,644,175	1,014,596,812	1,925,227

Define Assumption: Cell D3

Name: Q3 Market Size

Triangular Distribution

Minimum 23 Likeliest 24 Maximum 26

OK Cancel Enter Gallery Correlate... Help

We've defined our first assumption (Q3 market size) as a triangular distribution with parameters as shown for minimum, likeliest and maximum.

We can define these parameters in two ways: first, if we have historical data for market size, we could use various tools in the software to automatically define the distribution and its parameters. Or, if we have no data, we can use subject matter expertise – our best estimates – to manually enter the parameters in the pop-up.

We define assumptions for:

Market size; Market share; Renewal rate; Number of new contracts; Utilization rate of consultants; Training as a % of sales and Commodity price index.

F22 fx =+B22+C22+D22+E22

	FY10					FY11					FY12				
					-YearTotal					-YearTotal					-YearTotal
	Q1	Q2	Q3	Q4		Q1	Q2	Q3	Q4		Q1	Q2	Q3	Q4	
1															
2															
3	Market Size (billions)	21	22	24	33	100	22	23	25	35	105	-	-	-	-
4	Market Share %	1%	1%	2%	4%	2%	2%	2%	2%	3%	2%	-	-	-	-
5	Hardware	270,900,000	281,600,000	477,148,152	1,243,337,420	2,272,985,572	374,850,000	369,600,000	504,000,000	1,074,150,000	2,322,600,000	-	-	-	-
6	Contract Renewals	3,021	3,016	3,500	4,000	13,537	3,000	3,000	4,000	5,000	15,000	-	-	-	-
7	Renewal Rate %	93%	96%	95%	95%	95%	95%	95%	95%	95%	95%	-	-	-	-
8	New Contracts	275	302	400	500	1,477	300	400	450	500	1,650	-	-	-	-
9	Support Rate	5,072	5,368	5,000	6,500	5,485	5,000	5,000	5,000	5,000	5,000	-	-	-	-
10	Support	15,675,134	17,197,090	18,625,000	27,950,000	79,447,224	15,750,000	16,250,000	21,250,000	26,250,000	79,500,000	-	-	-	-
11	Consultants	267	295	340	350	350	270	300	350	375	375	-	-	-	-
12	Working Days	62	64	64	63	253	63	64	64	62	253	-	-	-	-
13	Utilization Rate %	83%	85%	95%	95%	90%	85%	85%	90%	90%	88%	-	-	-	-
14	Consulting Rate	378	356	350	350	358	350	350	350	350	350	-	-	-	-
15	Consulting	41,599,752	45,639,393	57,881,600	58,653,000	203,773,745	40,483,800	45,696,000	56,448,000	58,590,000	201,217,800	-	-	-	-
16	Training % of Sales	22%	24%	15%	15%	19%	20%	20%	20%	20%	20%	-	-	-	-
17	Training	60,708,690	66,851,840	71,572,223	186,500,613	385,633,366	74,970,000	73,920,000	100,800,000	214,830,000	464,520,000	-	-	-	-
18	Commodity Price Index	43	53	60	62	62	74	85	65	42	42	-	-	-	-
19	Change in Price Index	-57%	24%	12%	4%	4%				-35%	-32%	-	-	-	-
20	Cost of Sale % - Hardware	69%	69%	70%	70%	70%				69%	69%	-	-	-	-
21	Cost of Sale % - Services	45%	43%	50%	50%	50%				50%	50%	-	-	-	-
22	Cost of Sales	242,745,272	256,240,978	411,644,175	1,014,596,812	1,925,227,236	335,834,100	337,941,542	448,487,542	890,484,000	2,012,747,183	-	-	-	-

Context menu for cell F22 (1,925,227,236):

- Cut
- Copy
- Paste
- Paste Special...
- Insert...

Next, we tell the software which output – the forecast – we’re interested in tracking. In this case, we want to analyze the cost of sales. If we can compute the probability of that calculated metric, we can answer our first question – how likely is it that costs will exceed the number?
 In our example, we’re forecasting the FY10 year total cost of sales.

Formula bar: F22 =+B22+C22+D22+E22

	FY10				FY11				FY12			
	-YearTotal				-YearTotal				-YearTotal			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1												
2												
3	Market Size (billions)	21	22	24	33	100	22	23	25	35	105	-
4	Market Share %	1%	1%	2%	4%	2%	2%	2%	2%	3%	2%	-
5	Hardware	270,900,000	281,600,000									
6	Contract Renewals	3,021	3,016									
7	Renewal Rate %	93%	96%									
8	New Contracts	275	302									
9	Support Rate	5,072	5,368									
10	Support	15,675,134	17,197,090									
11	Consultants	267	295									
12	Working Days	62	64									
13	Utilization Rate %	83%	85%									
14	Consulting Rate	378	356									
15	Consulting	41,599,752	45,639,393	57,881,600	58,653,000	203,773,745	40,483,800	45,696,000	56,448,000	58,590,000	201,217,800	-
16	Training % of Sales	22%	24%	15%	15%	19%	20%	20%	20%	20%	20%	-
17	Training	60,708,690	66,851,840	71,572,223	186,500,613	385,633,366	74,970,000	73,920,000	100,800,000	214,830,000	464,520,000	-
18	Commodity Price Index	43	53	60	62	62	74	85	65	42	42	-
19	Change in Price Index	-57%	24%	12%	4%	-39%	20%	14%	-24%	-35%	-32%	-
20	Cost of Sale % - Hardware	69%	69%	70%	70%	70%	71%	72%	70%	69%	69%	-
21	Cost of Sale % - Services	45%	43%	50%	50%	47%	50%	50%	50%	50%	50%	-
22	Cost of Sales	242,745,272	256,240,978	411,644,175	1,014,596,812	1,925,227,236	335,834,100	337,941,542	448,487,542	890,484,000	2,012,747,183	-

Define Forecast: Cell F22

Name: Year Total Cost of Sales

Units: [Empty]

LSL: [Empty] USL: [Empty]

Target: [Empty]

Buttons: OK, Cancel, Help

We define this cell as the Forecast.

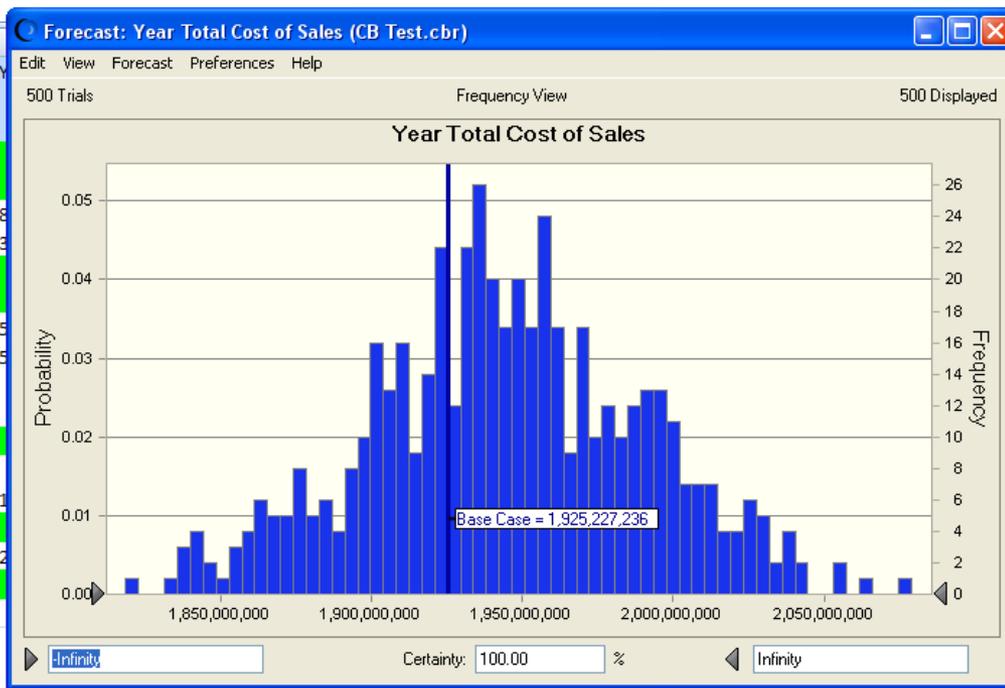
Now we're ready to run our risk analysis. We're going to use a statistical technique called Monte Carlo simulation to calculate hundreds or thousands of trials. Each trial will be a different permutation of the inputs. Sort of like looking at thousands of different possible future results. The software will track all of these trials and from them, compute the probabilities and statistics we need to finish our analysis.

	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Market Size (billions)	21	22	26	33	102	22	23	25	35	105	-	-
Market Share %	1%	1%	2%	4%	2%	2%	2%	2%	3%	2%	-	-
Hardware	270,900,000	281,600,000	526,417,238	1,270,158,660	2,349,075,898	374,850,000	369,600,000	504,000,000	1,074,150,000	2,322,600,000	-	-
Contract Renewals	3,021	3,016	3,500	4,000	13,537	3,000	3,000	4,000	5,000	15,000	-	-
Renewal Rate %	93%	96%	101%	99%	95%	95%	95%	95%	95%	95%	-	-
New Contracts	275	302	413	535	1,525	300	400	450	500	1,650	-	-
Support Rate	5,072	5,368	5,000	6,500	5,485	5,000	5,000	5,000	5,000	5,000	-	-
Support	15,675,134	17,197,090	19,802,118	29,215,536	81,889,878	15,750,000	16,250,000	21,250,000	26,250,000	79,500,000	-	-
Consultants	267	295	340	350	350	270	300	350	375	375	-	-
Working Days	62	64	64	63	253	63	64	64	62	253	-	-
Utilization Rate %	83%	85%	98%	92%	90%	85%	85%	90%	90%	88%	-	-
Consulting Rate	378	356	350	350	358	350	350	350	350	350	-	-
Consulting	41,599,752	45,639,393	59,524,130	56,536,381	203,299,656	49,493,999	45,696,999	56,449,999	59,599,999	203,217,999	-	-
Training % of Sales	22%	24%	11%	11%	19%	-	-	-	-	-	-	-
Training	60,708,690	66,851,840	57,047,362	145,398,933	330,006,826	-	-	-	-	-	-	-
Commodity Price Index	43	53	60	56	62	-	-	-	-	-	-	-
Change in Price Index	-57%	24%	13%	-8%	-39%	-	-	-	-	-	-	-
Cost of Sale % - Hardware	69%	69%	70%	70%	70%	-	-	-	-	-	-	-
Cost of Sale % - Services	45%	43%	50%	50%	47%	-	-	-	-	-	-	-
Cost of Sales	242,745,272	256,240,978	440,800,993	1,005,670,427	1,945,457,670	330,006,826	-	-	-	-	-	-



We can see just from the first 10 trials that there is quite a range of possible outcomes. Let's finish running all 500 trials.

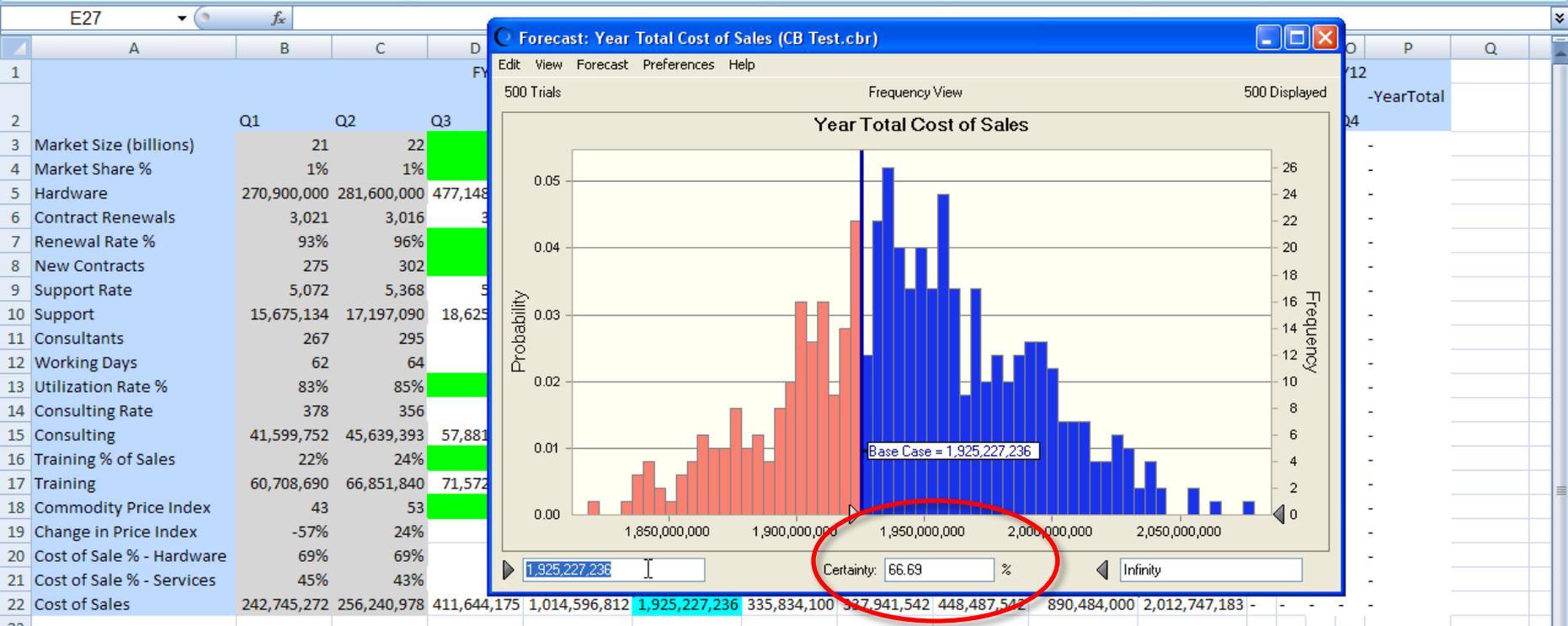
	Q1	Q2	Q3
Market Size (billions)	21	22	
Market Share %	1%	1%	
Hardware	270,900,000	281,600,000	477,148
Contract Renewals	3,021	3,016	
Renewal Rate %	93%	96%	
New Contracts	275	302	
Support Rate	5,072	5,368	
Support	15,675,134	17,197,090	18,625
Consultants	267	295	
Working Days	62	64	
Utilization Rate %	83%	85%	
Consulting Rate	378	356	
Consulting	41,599,752	45,639,393	57,881
Training % of Sales	22%	24%	
Training	60,708,690	66,851,840	71,572
Commodity Price Index	43	53	
Change in Price Index	-57%	24%	
Cost of Sale % - Hardware	69%	69%	
Cost of Sale % - Services	45%	43%	
Cost of Sales	242,745,272	256,240,978	411,644,175



The forecast chart shows the results of all the 500 trials. This is the full range of possible outcomes for Cost of Sales, given the uncertainty inherent in our model inputs.

Now let's answer that first question:

How likely is it that cost of sales will exceed this \$1.925B?

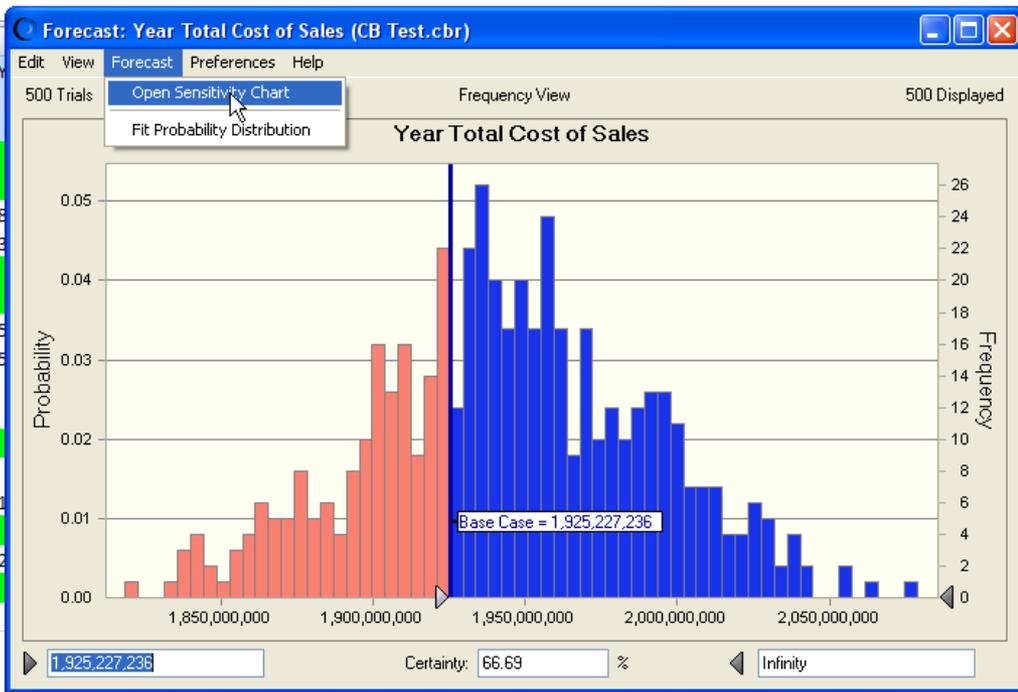


The answer:

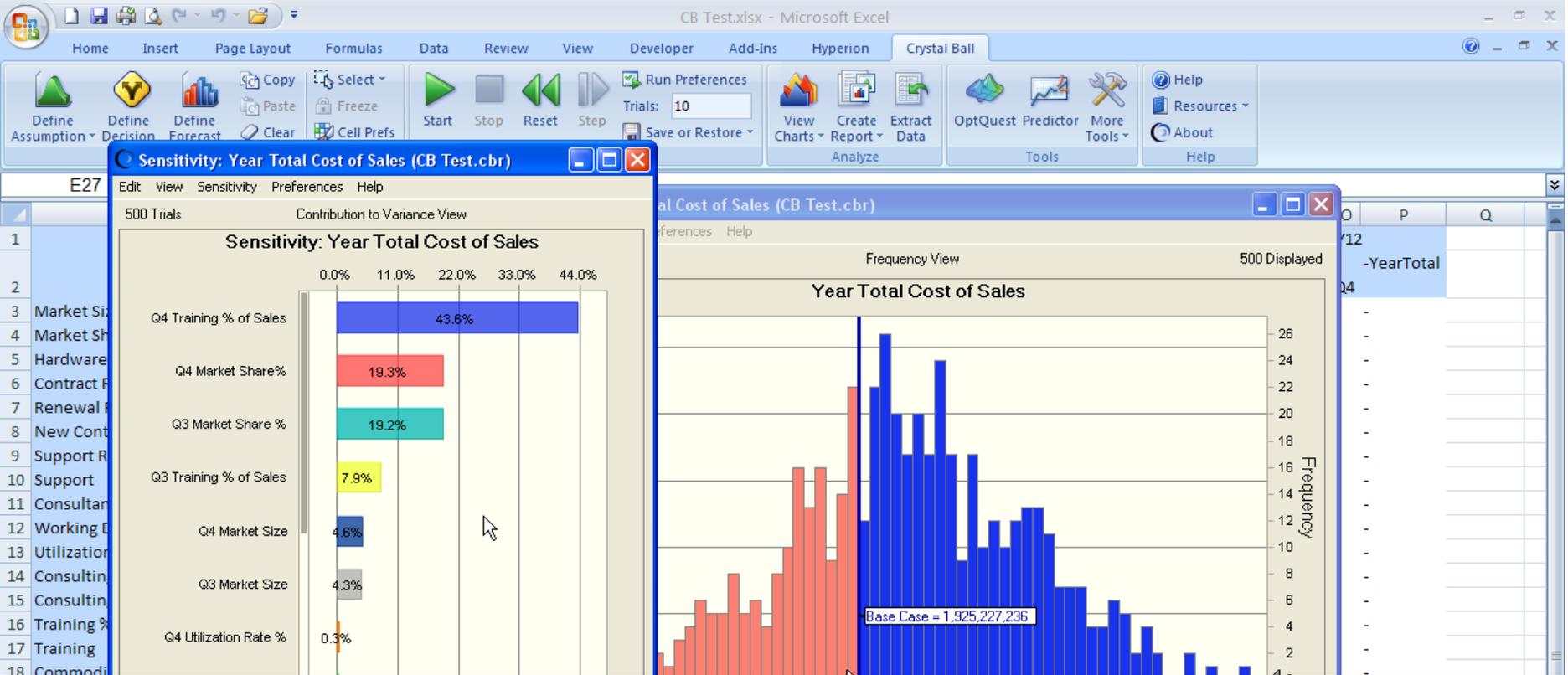
There's a 66% likelihood that our costs will in fact exceed our estimate. This could have a serious impact on the business. We need to understand more.

It's time to answer the second question: Which drivers are the most important in this model? If we can get a better handle on those, we would know where to focus our efforts to reduce the risk.

	A	B	C	D
1				
2		Q1	Q2	Q3
3	Market Size (billions)	21	22	
4	Market Share %	1%	1%	
5	Hardware	270,900,000	281,600,000	477,148
6	Contract Renewals	3,021	3,016	
7	Renewal Rate %	93%	96%	
8	New Contracts	275	302	
9	Support Rate	5,072	5,368	
10	Support	15,675,134	17,197,090	18,625
11	Consultants	267	295	
12	Working Days	62	64	
13	Utilization Rate %	83%	85%	
14	Consulting Rate	378	356	
15	Consulting	41,599,752	45,639,393	57,881
16	Training % of Sales	22%	24%	
17	Training	60,708,690	66,851,840	71,572
18	Commodity Price Index	43	53	
19	Change in Price Index	-57%	24%	
20	Cost of Sale % - Hardware	69%	69%	
21	Cost of Sale % - Services	45%	43%	
22	Cost of Sales	242,745,272	256,240,978	411,644,175
23				1,014,596,812
24				1,925,227,236
25				335,834,100
26				337,941,542
27				448,487,542
28				890,484,000
29				2,012,747,183



Let's open another chart, called a sensitivity chart.

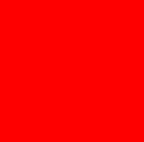


We see that of all our variable assumptions, training and market share account for 90% of the variability – the risk – in the cost of sales.

Now we know that if we can reduce the uncertainty around those factors, we will reduce the risk of exceeding our planned costs.

So in a few short minutes we've substantially enhanced our planning capabilities by adding a measure of risk as well as using the results of the simulation to gain insight into the most important drivers.

Additional elements of the risk analysis software, which we are not showing in this particular demo, can help us optimally choose scenarios – such as exactly how much to spend on advertising to customers to boost those training classes.

- 
- In our demonstration, we've just seen that adding the ability to measure the uncertainty – the risk – around forecasting numbers will improve the accuracy and confidence around those numbers, as well as give insight into which drivers are truly important.
- 



FOR MORE INFORMATION...

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