

A MOST (UN)LIKELY CASE SCENARIO

I'm sure that at some time or another in your professional careers you have been asked to create a plan or forecast that represents the most likely case scenario. How do you do that? And how comfortable do you feel after you have completed it? Let's eavesdrop on how a mythical company approached this issue.....

It's Monday, August 15 of some year at the offices of The Osborne Company, a manufacturer of widgets. The company purchases partially assembled product, adds some manufactured components and sells nationally.

Management is having their weekly staff meeting. It is attended by the Chief Executive Officer (CEO); the Chief Marketing Officer (CMO); the Chief Financial Officer (CFO); and the General Manager (GM). At this particular meeting, the subject of next year's plan is the main item on the agenda.

The CEO kicks off the discussion. "It's time to start putting some projections together for next year. The market has established that we can't raise our selling

price from its present level of \$1.00 per widget. Let me hear some thoughts about unit volume that we can start with.”

The CMO says, “With the new production line operating as well as it has over the last six weeks and the positive reaction we have had to the newly-designed widget that we just introduced, I’ve already given some thought to that and I’m guessing that we ought to be able to sell about 989,300 units.”

The GM, looking a little flustered, says, “Hold on there. I think you’re about 40,000 units too high. My foreman and I have looked at this and believe that 950,000 units is about all that we’re going to be able to do.”

The CEO interjects. “You know, I think that we ought to reach for the moon. We’ve got stakeholders that we have to account to and I think that the “street” has high expectations of our bottom line. I’d say that we strive for almost 1,000,000 units, say 995,000.”

The CFO, sitting quietly to the right of the CEO, is deep in thought. He wonders how he is going to be able to create a financial projection with those disparate projections of unit volume. And, he is perplexed that they haven’t even mentioned that to achieve any of those volume levels, while maintaining inventory, they are going to have to purchase anywhere from 685,000 to 700,000 (most likely case, 690,000) assemblies. These assemblies are sourced from several different suppliers whose prices could be anywhere between 37.5 cents to 48 cents each depending upon market conditions and supplier availability.

The GM interrupts his train of thought and says, “There’s something else that we have to consider. There is a possibility that there will be an increase in the minimum wage. Of the 9 people that I have out in the shop, six (6) of them earn at the minimum wage of \$8.25 per hour. I have 1,896 production hours for each of them, without overtime, that I need to put an hourly rate on. What are the odds that there will be an increase and to what amount?”

There is a lot of nodding of heads and a collective “HmMMM.”

The group decides that there is a 30% likelihood of an increase in the minimum wage and, if it occurs, \$10.50 is the likely level.

At this point the CFO is rolling his eyes. Abruptly, the CEO turns to him and says, “Why don’t you take these figures that we have discussed and put together our **most likely case scenario**. We’ll meet again next Monday and go over what you have come up with. Oh, and by the way, don’t forget about the fact that we have that mandatory \$20,000 bank loan repayment that we have to come up with. There should be no problem meeting that requirement based on the numbers that we have discussed today. Right?”

The CFO nods and says, “It appears that way, but let me see what I can come up with based on today’s discussion.”

The meeting breaks up and the CFO heads back to his office. He has a glimmer of an idea that he would like to try. But, his initial task is to create the “**most likely case scenario**.”

He comes up with the following:

THE OSBORNE COMPANY			
FINANCIAL PLAN FOR THE FISCAL YEAR ENDED			
December 31, 20__			
INCOME STATEMENT			
Net Sales	(989,300 @ \$1.00)	\$	989,300
Cost of Goods Sold		\$	666,042
Gross Profit on Sales		\$	323,258
Selling Expenses		\$	178,250
General Expenses		\$	70,710
Operating Profit		\$	74,298
Net Financial Expense		\$	17,215
Income Before Federal Income Tax		\$	57,083
Federal Income Tax		\$	9,271
Net Income		\$	47,812

THE OSBORNE COMPANY				
FINANCIAL PLAN FOR THE FISCAL YEAR ENDED				
December 31, 20__				
STATEMENT OF COST OF GOODS SOLD				
Materials:				
	Inventory - Raw Materials at Beginning of Year			\$ 37,050
	Purchases (690,000 @ \$.40)			\$ 276,000
	Available for Consumption			\$ 313,050
	Inventory - Raw Materials at End of Year			\$ 33,430
	Cost of Materials Used			\$ 279,620
	Direct Labor			\$ 250,272
	Overhead Expense			\$ 149,960
	Total Materials, Labor and Overhead			\$ 679,852
	Inventory - Goods In Process at Beginning of Year			\$ 24,860
	Total			\$ 704,712
	Inventory - Goods In Process at End of Year			\$ 30,260
	Cost of Goods Manufactured			\$ 674,452
	Inventory - Finished Goods at Beginning of Year			\$ 42,300
	Total			\$ 716,752
	Inventory - Finished Goods at End of Year			\$ 50,710
	Cost of Goods Sold			<u>\$ 666,042</u>

THE OSBORNE COMPANY					
FINANCIAL PLAN FOR THE FISCAL YEAR ENDED					
December 31, 20__					
DETAIL OF DIRECT LABOR		Minimum Wage	Hourly Rate	Production Hours	Annual Wages
	Production Employee 1	No	\$ 29.25	1896	\$ 55,458
	Production Employee 2	No	\$ 27.00	1896	\$ 51,192
	Production Employee 3	No	\$ 26.25	1896	\$ 49,770
	Production Employee 4	Yes	\$ 8.25	1896	\$ 15,642
	Production Employee 5	Yes	\$ 8.25	1896	\$ 15,642
	Production Employee 6	Yes	\$ 8.25	1896	\$ 15,642
	Production Employee 7	Yes	\$ 8.25	1896	\$ 15,642
	Production Employee 8	Yes	\$ 8.25	1896	\$ 15,642
	Production Employee 9	Yes	\$ 8.25	1896	\$ 15,642
					<u>\$ 250,272</u>

THE OSBORNE COMPANY	
FINANCIAL PLAN FOR THE FISCAL YEAR ENDED	
December 31, 20__	
CASH FLOW STATEMENT	
Cash Flows From Operating Activities	
Net Income	\$ 47,812
Depreciation	\$ 23,275
Increase In Notes and Accounts Receivable	\$ (43,390)
Increase In Inventories	\$ (11,475)
Increase In Prepaid Expenses	\$ (730)
Increase In Accounts Payable	\$ 2,443
Increase In Accrued Taxes & Expenses	\$ 2,755
Decrease In Deferred Charges	\$ 750
Cash Generated From Operations	\$ 21,440
Cash Flows From Investing Activities	
Additions To Fixed Assets	\$ (165)
Cash Flows From Financing Activities	
Repayment of Bank Loans	\$ (20,000)
Net Change In Cash	\$ 1,275
Cash At Beginning Of Period	\$ 21,085
Cash At End Of Period	\$ 22,360

So, the most likely case scenario results are that the Company will achieve a Net Income of \$47,812 and a Net Change in Cash of \$1,275.

While he is satisfied that these results suggest that the Mandatory Debt Repayment will be covered (albeit barely), he is dissatisfied with the fact that this scenario does not address (a) the wide discrepancy in unit volume forecasts expressed by the CEO and the CMO; (b) the wide discrepancy in raw material unit purchases; (c) the wide range of prices for the raw materials; and (d) the 30% possibility that there might be an increase in the minimum wage.

He remembered learning about a technique called Monte Carlo simulation in grad school. Also known as the Monte Carlo Method, Monte Carlo simulation, through the use of probability distributions, lets you see all the possible outcomes of your decisions and assess the impact of risk, allowing for better decision making under uncertainty.

Starting with the case he just developed, he gives effect to the discrepancies missing from that scenario by assigning probability distributions to the key model drivers. Using commercially available software (@RISK™, the flagship product from Palisade Corporation, which operates as an add-in to Excel), he assigns probability distributions. With better historical data, it would be possible to allow the software to determine the most appropriate probability distribution methods to use. In this case, he is using his own judgement.

Driver	Probability Distribution Method	Parameter 1	Parameter 2	Parameter 3
Unit Volume	Pert	950,000	989,300	995,000
Raw Material Units	Uniform(1)	685,000	700,000	
Raw Material Price	Uniform(1)	\$.375	\$.48	
Minimum Wage	Discrete(2)	No=1=70%	Yes=0=30%	

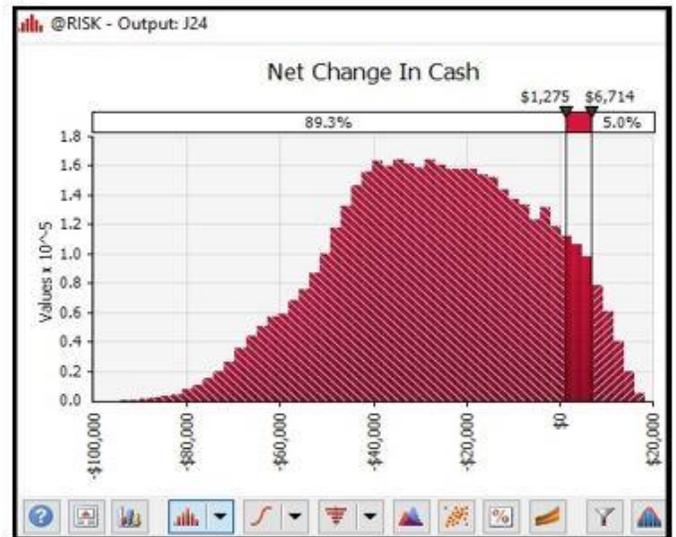
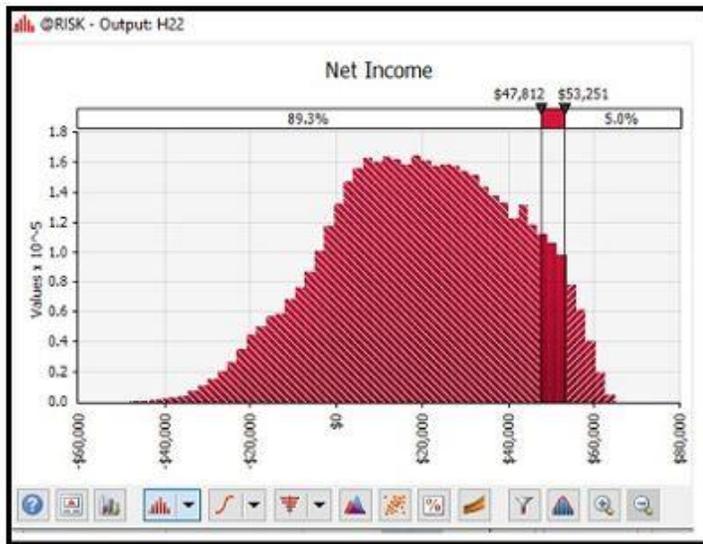
(1) The Uniform Distribution is expressed as a minimum and a maximum. Any value between may be utilized in the simulation.
(2) The Discrete Distribution is expressed as a 0 or 1, with odds assigned to each. An IF statement will direct the appropriate wage rate to be utilized.

The probabilities are entered in the Excel spreadsheet for each of the foregoing drivers.

What he wants to see is the range of results that could occur for Net Income and Net Change in Cash. He decides to run 100,000 iterations of the model to provide greater confidence in the results. Thus, each such iteration is effectively answering the question – what-if this is the result that occurs. All of those answers are collected and put into buckets, allowing the simulation to quantify the probability of any of those results occurring.

The results he came up with after running 100,000 iterations look like this:

Scenario	Net Income	Net Change In Cash (After \$20,000 Mandatory Debt Payment)
Most Likely Case (Single Point Estimate)	\$47,812	\$1,275
Monte Carlo Simulation		
Mean	\$20,016	\$(26,521)
Minimum	\$(45,405)	\$(91,942)
Maximum	\$64,623	\$18,086



The first “aha moment” that he experiences is the realization that there is an 89.3% chance that neither the Net Income forecast or the Net Change in Cash forecast will be achieved.

Insofar as Net Income is concerned, the simulation revealed that the results range between a Net Loss of **\$45,405** and a Net Income of **\$64,623**. Insofar as Net Change in Cash is concerned, the simulation revealed that the mean of this outcome is a deficit of **\$26,521** and the full range of results range from a minimum of **\$91,942** to a maximum of **\$18,086**. Clearly, the mandatory debt payment is in severe jeopardy and might result in the bank foreclosing.

The second “aha moment” that he experiences stems from a review of the tornado charts for both Net Income and Net Change in Cash. These charts display the sensitivity of each of the model’s key drivers on the selected output (the one for Net Income is displayed below). **They reveal that the single most damaging impact to both outputs was the Unit Price of Raw Material Purchases.**



At the meeting on the following Monday, the CFO presented his results and management turned its attention to ways in which to mitigate the risks portrayed in his analysis. They decided to enter into fixed price contracts with their raw material suppliers.

Single point most likely case presentations do not provide you with this in depth picture of risk. It could turn out, as it did in this case, that the most likely case scenario is the most **unlikely** case.



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