Capital Investment Simulatio

Description: As the chief operation officer a manufacturing company, you need to
labor for the next year to meet growing market demand. The sales & marketing d
and price for the next year, your procurement and HR divisions also provided guid
includes three possible scenarios (likely, best case and worst cases) which represe

Forecast of uncertain variables	Simulation Case
Sales demand growth	7%
Unit price growth	4%
Material price growth	3%
Fixed cost price growth	2%

Simulation case

Demand, delivery and revenue	**Current year**
Annual sales demand	700,000
Annual delivery	700,000
Unit price	$ 250.00
Annual revenue	**175,000,000**

Production capacity	
# of machines	70
Capacity per machine	10,000
Total capacity	700,000

Total production	700,000

Variable cost		
Variable cost per unit	$	150.00
Total variable cost	**$**	**105,000,000.00**

Fixed cost		
Machine and operating labor (per machine)	$	720,000.00
Total machine and operating labor cost	$	50,400,000.00
Others	$	4,000,000.00
Total fixed cost	**$**	**54,400,000.00**

Total cost	159,400,000.00
Total profit	**15,600,000.00**

Decision and Impact

Value

Likely-case summary
Investment (machine and operating labor)
Profit change
ROI

Statistics results
Profit change
ROI

Risk

Minimum investment earning ($)
ROI (%)

n Case Study

decide on the investment on additional machines and associated
ivision of the company provided their forecast of sales demand
ance on materials price and labor cost forecast. Their forecast
nt economic and market uncertainty.

Recession	Strong economy	Likely case
2%	8%	6%
1%	4%	2%
1%	4%	2%
1%	4%	2%

Next year (additional machine)	Next year (status quo)
750,126	750,126
720,000	700,000
$ 259	$ 259
186,540,995	**181,359,301**

72	70
10,000	10,000
720,000	700,000

720,000	700,000

$ 154	$ 154
$ 111,234,341	**$ 108,144,498**

$ 737,549	$ 737,549
$ 53,103,518	$ 51,628,420
$ 4,097,494	$ 4,197,364
$ 57,201,012	**$ 55,825,784**

$ 168,435,352	$ 163,970,282
18,105,643	**17,389,019**

		Range of additional machines
Additional machine #	Additional machine #	**1**
2	0	**6**

2 additional machines
$ 1,475,098
$ 716,624
49%

Mean	Stdev
$ 663,798.93	$ 52,366.80
45%	3%

Probability of breaking company guidance	Company guidance	Risk tolerance level
0.1%	$ 250,000	5%
0.2%	20%	5%

Triangle distribution of the key market, economic and operational inputs (variables) based on the three scenarios

Based on demand forecast
The amount of product delivery is bounded by the production capacity and market demand
Based on unit price forecast

There are 70 machines at the end of the current year

The amount of product delivery is bounded by the production capacity and market demand

Based on procurement and HR forecast

Based on procurement and HR forecast

Optimization variable: additional machine #.
Investment constraint : # of machine is within (min, max)

Optimization objective maximize profit (average)

Risk measure: the probability that the minimum investment and ROI are less than the company's guidance set by corporate finance
Risk constraint: probabilty of risk measures breaking company guiance is less than the risk tolerance level

Capital Investment Simulatio

Description: As the chief operation officer a manufacturing company, you need to
labor for the next year to meet growing market demand. The sales & marketing d
and price for the next year, your procurement and HR divisions also provided guid
includes three possible scenarios (likely, best case and worst cases) which represe

Forecast of uncertain variables	Simulation Case
Sales demand growth	5%
Unit price growth	2%
Material price growth	2%
Fixed cost price growth	2%

Simulation case

Demand, delivery and revenue	**Current year**
Annual sales demand	700,000
Annual delivery	700,000
Unit price	$ 250.00
Annual revenue	**175,000,000**

Production capacity	
# of machines	70
Capacity per machine	10,000
Total capacity	700,000

Total production	700,000

Variable cost		
Variable cost per unit	$	150.00
Total variable cost	**$**	**105,000,000.00**

Fixed cost		
Machine and operating labor (per machine)	$	720,000.00
Total machine and operating labor cost	$	50,400,000.00
Others	$	4,000,000.00
Total fixed cost	**$**	**54,400,000.00**

Total cost	159,400,000.00
Total profit	**15,600,000.00**

Decision and Impact

Value

Likely-case summary
Investment (machine and operating labor) ($)
Profit ($)
ROI (%)

Statistics results
Profit ($)
ROI (%)

Risk

Minimum investment earning ($)
ROI (%)

n Case Study

decide on the investment on additional machines and associated
ivision of the company provided their forecast of sales demand
ance on materials price and labor cost forecast. Their forecast
nt economic and market uncertainty.

Recession	Strong economy	Likely case
2%	8%	6%
1%	4%	2%
1%	4%	2%
1%	4%	2%

Next year (additional machine)	Next year (status quo)
737,333	737,333
730,000	700,000
$ 256	$ 256
186,758,333	**179,083,333**

73	70
10,000	10,000
730,000	700,000

730,000	700,000

$ 154	$ 154
$ 112,055,000	**$ 107,450,000**

$ 736,800	$ 736,800
$ 53,786,400	$ 51,576,000
$ 4,093,333	$ 4,188,844
$ 57,879,733	**$ 55,764,844**

$ 169,934,733	$ 163,214,844
16,823,600	**15,868,489**

		Range of additional machines
Additional machine #	Additional machine #	**1**
3	0	**6**

3 additional machines
$ 2,210,400
$ 955,111
43%

Mean	Stdev
$ 830,962.73	$ 303,282.26
38%	14%

Probability of breaking company guidance	Company guidance
8%	$ 250,000
11%	20%

Triangle distribution of the key market, economic and operational inputs (variables) based on the three scenarios

Based on demand forecast
The amount of product delivery is bounded by the production capacity and market demand
Based on unit price forecast

There are 70 machines at the end of the current year

The amount of product delivery is bounded by the production capacity and market demand

Based on procurement and HR forecast

Based on procurement and HR forecast

Optimization variable: additional machine #.
Investment constraint : # of machine is within (min, max)

Optimization objective maximize profit (average)

Risk measure: the probability that the minimum investment and ROI are less than the company's guidance set by corporate finance