Initial cost of equipment
Project and equipment life
Salvage value of equipment
Working capital requirement
Depreciation method
Depreciation expense
Discount rate
Tax rate

	Base case
Unit sales	10,000
Price per unit	$ 125.00
Variable cost per unit	$ 75.00
Fixed costs	$ 250,000.00

Best Case

	Solution
Revenues	$1,512,500
Variable cost	742,500
Fixed Expenses	225,000
Gross profit	$545,000
Depreciation	100,000
Net operating income	$445,000
Income tax expense	151,300
Net income	$293,700
Cash flow	$393,700

NPV	

Expected Case

	Solution
Revenues	$1,250,000
Variable cost	750,000
Fixed Expenses	250,000
Gross profit	$250,000
Depreciation	100,000
Net operating income	$150,000
Income tax expense	51,000
NOPAT	$99,000
plus: Depreciation	100,000
less: CAPEX	-
less: Working capital investment	-
Free cash flow	$199,000

NPV	

Worst Case — Assuming the negative tax credit

	Solution
Revenues	$1,012,500.00
Variable cost	$742,500.00
Fixed Expenses	$275,000.00
Gross profit	-$5,000.00
Depreciation	$100,000.00
Net operating income	-$105,000.00
Income tax expense	-$35,700.00
Net income	-$69,300.00
Cash flow	$30,700.00

NPV=PV(E12,E7,D50)-E6	
NPV	

Problem 3-1

Given
$1,000,000.00
10
0
0
Straight-Line
$100,000.00
10.00%
34.00%

Worst case	Best Case
9000	11000
$112.50	$137.50
$82.50	$67.50
$275,000.00	$225,000.00

Excel formula in previous column
F17*F18
F17*F19
F20
D25-D26-D27
E11
D28-D29
D30* E13
D30-D31
D32+D29

$1,419,116.07

Excel formula
d17*d18
d17*d19
d20
D25-D26-D27
E11
D28-D29
D46* e13
D30-D31
D32+D29

$222,768.85

obtained here can used somewhere else or carried forward

Excel formula in previous column
E17*E18
E17*E19
E20
D42-D43-D44
E11
D45-D46
D47*E13
D47-D48
D32+D29

($811,361.79)

Solution Legend	
	= Value given in problem
	= Formula/Calculation/Analysis required
	= Qualitative analysis or Short answer required
	= Goal Seek or Solver cell
	= Crystal Ball Input
	= Crystal Ball Output

Problem 3-2

Initial cost of equipment
Project and equipment life
Salvage value of equipment
Working capital requirement
Depreciation method
Depreciation expense
Discount rate
Tax rate

	Base case
Unit sales	11,000
Price per unit	$ 125.00
Variable cost per unit	$ 75.00
Fixed costs	$ 250,000.00

Part a. Expected Case

	Solution
Revenues	$1,375,000
Variable cost	825,000
Fixed Expenses	250,000
Gross profit	$300,000
Depreciation	100,000
Net operating income	$200,000
Income tax expense	68,000
NOPAT	$132,000
plus: Depreciation	100,000
less: CAPEX	-
less: Working capital investment	-
Free cash flow	$232,000

NPV	

Part b.	Breakeven unit annual sales	8,901
Part c.	Breakeven unit price (unit sales +15%)	$ 113.70

Given
$1,000,000.00
10
0
0
Straight-Line
$100,000.00
10.00%
34.00%

Worst case	Best Case
9900	
$112.50	$137.50
$82.50	$67.50
$275,000.00	$225,000.00

Excel formula
d17*d18
d17*d19
d20
D25-D26-D27
E11
D28-D29
D46* e13
D30-D31
D32+D29

$425,539.57

Solution Legend	
	= Value given in problem
	= Formula/Calculation/Analysis required
	= Qualitative analysis or Short answer required
	= Goal Seek or Solver cell
	= Crystal Ball Input
	= Crystal Ball Output

Problem 3-3

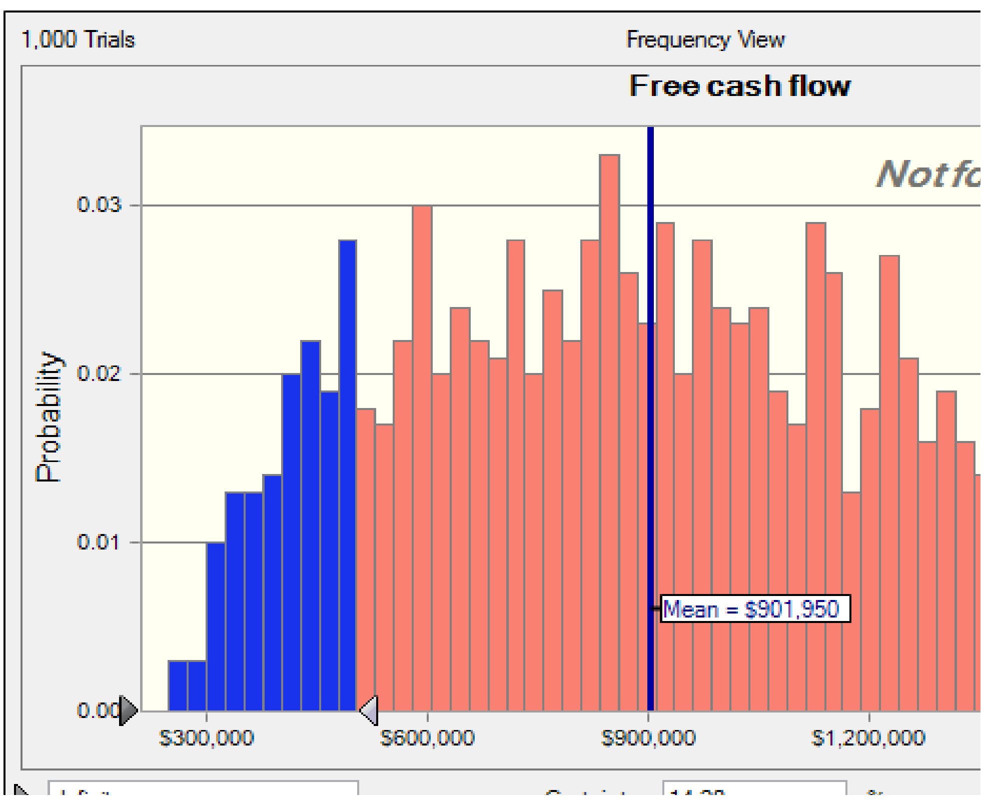
Given:

		Expected Values	Distributional Assumptions
Sales units		100,000	Uniform
Unit price	$	50	Normal
Fixed operating costs		120,000	NA
Variable operating costs per unit		35	Triangular
Tax rate		30%	NA
Depreciation expense	$	60,000	NA
CAPEX		75,000	Uniform
Working capital investment		20,000	Triangular

a.

Sales	$	5,000,000
less: Variable operating costs		(3,500,000)
less:		(60,000)
less: Fixed operating costs		(120,000)
Net Operating Profit	$	1,320,000
less: Taxes		(396,000)
NOPAT	$	924,000
plus: Depreciation expense		60,000
less: CAPEX		(75,000)
less: Working capital investment		(20,000)
Free cash flow	$	889,000

b.




-Infinity
Certainty:
14.20
%

Parameter Estimates
max = 150,000; Min = 50,000
Meam = $50, standard deviation = $10
NA
min = $30;most likely = $35; max = $40
NA
NA
min = $60,000; max = $90,000
min = $18,000; most likely = $20,000; max = $22,000

	= Value giv
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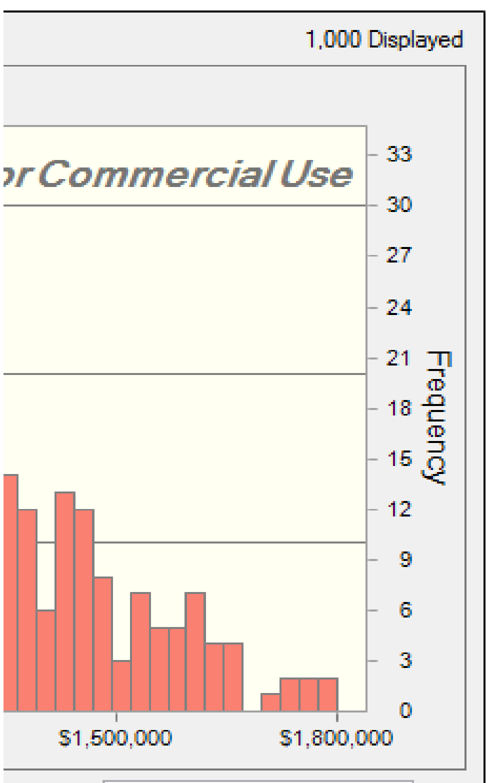

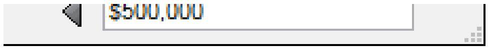
$500,000

Solution Legend
ven in problem
/Calculation/Analysis required
ve analysis or Short answer required
ek or Solver cell
Ball Input
Ball Output

PROBLEM 3-4: Clayton Manufact

Given		
EBITDA (Year 1)	$ 200,000	
Growth Rate in EBITDA	5%	
Initial investment	$ 800,000	
Depreciation (Straight line) over	5	years
Estimated salvage value	$ -	
Tax rate	35%	
Cost of capital	12%	

Solution

a.	**0**	**1**	**2**
EBITDA		$ 200,000	$ 210,000
Less: Depreciation Expense		(160,000)	(160,000)
EBIT		$ 40,000	$ 50,000
Less: Taxes		(14,000)	(17,500)
NOPAT		$ 26,000	$ 32,500
Plus: Depreciation Expense		160,000	160,000
Less: CAPEX	(800,000)	-	-
Less: Change in Working Capital	-	-	-
Project FCF	**$ (800,000)**	**$ 186,000**	**$ 192,500**

b.

NPV	$ (85,926)

c.

Using "Goal Seek" to solve for the EBITDA in year 1 (C5) that yields a NPV of 0 (C28).

Breakeven Year 1 EBITDA	$ 233,551

turing Company

Solution Legend	
	= Value given in problem
	= Formula/Calculation/Analysis required
	= Qualitative analysis or Short answer required
	= Goal Seek or Solver cell
	= Crystal Ball Input
	= Crystal Ball Output

Years		
3	4	5
$ 220,500	$ 231,525	$ 243,101
(160,000)	(160,000)	(160,000)
$ 60,500	$ 71,525	$ 83,101
(21,175)	(25,034)	(29,085)
$ 39,325	$ 46,491	$ 54,016
160,000	160,000	160,000
-	-	-
-	-	-
$ 199,325	**$ 206,491**	**$ 214,016**

PROBLEM 3-5: Breakeven Sensitivity

Given					
Investment (enter with "-" sign)	$ (4,000,000)				
Plant life	5	Years			
Salvage value	$ 400,000				
Variable Cost %	45%				
Fixed operating cost	$ 1,000,000				
Tax rate	38%				
Working capital	10%	(Percent of the expected change in revenues for the year)			
Required Rate of Return	15%				
Sales volume multiple	**1.00**				

			Yea
	0	**1**	**2**
Sales volume		$ 1,000,000	$ 1,500,000
Unit price		2.00	2.00
Revenues		2,000,000	3,000,000
Variable Operating Costs		(900,000)	(1,350,000)
Fixed Operating Costs		(1,000,000)	(1,000,000)
Depreciation Expense		(800,000)	(800,000)
Net Operating Income		$ (700,000)	$ (150,000)
Less: Taxes		266,000	57,000
NOPAT		$ (434,000)	$ (93,000)
Plus: Depreciation		800,000	800,000
Less: CAPEX	(4,000,000)	-	-
Less: Working Capital	(200,000)	(100,000)	(450,000)
Free Cash Flow	$ (4,200,000)	$ 266,000	$ 257,000

NPV	$ 419,435
IRR	18%
Equivalent Annual Cost	$ 125,124

Solution

a. What are the key sources of risk that you see in this project?

The "given" data or parameters capture the variables that are uncertain in the analysis. However, the sensitivity analysis is designed to identify the key sources of uncertainty that are most crucial.

b. Breakeven sensitivity analysis

Variable	**Estimated Value**	**Breakeven Value**	**Percent Difference**

Initial Capex	$ (4,000,000)	$ (4,419,435)	10%
Variable Cost as a % of Sales	45%	49%	9%
Working Capital % of new Sales	10%	27%	170%
Sales volume multiplier	1	0.92	-8%

c. Discuss results of part b.

The initial capital cost, variable cost as a percent of sales and the sales volume are all roughly equally important in terms of their significance in driving the results of the investment. The kinds of things that can be done to control these costs entail careful cost contracting for the initial capital cost, and closely monitoring both the variable cost % and sales volume. It would also be helpful to know what "options" the firm might have with regard to reducing output or shutting down should the forecasts of sales volume or variable costs prove to be

d. Should you always seek to reduce project risk?

This should provide an interesting discussion since most students are taught that risk is bad. In fact, firms "choose" to assume risks for which they feel particularly well suited to manage. For example, most traditional E&P firms do not attempt to hedge the price risk of their oil and gas reserves but choose to assume this risk as a risk of doing business in an industry where their specialized knowledge and skills make the cost of bearing this risk less than for outsiders that might wish to assume this risk (for a price!).

/ Analysis

RENUMBER

	= Value given in p
	= Formula/Calcula
	= Qualitative anal
	= Goal Seek or So
	= Crystal Ball Inp
	= Crystal Ball Out

ar

3	4	5
$ 3,000,000	$ 3,500,000	$ 2,000,000
2.50	2.50	2.50
7,500,000	8,750,000	5,000,000
(3,375,000)	(3,937,500)	(2,250,000)
(1,000,000)	(1,000,000)	(1,000,000)
(800,000)	(800,000)	(800,000)
$ 2,325,000	$ 3,012,500	$ 950,000
(883,500)	(1,144,750)	(361,000)
$ 1,441,500	$ 1,867,750	$ 589,000
800,000	800,000	800,000
-	-	248,000
(125,000)	375,000	500,000
$ 2,116,500	$ 3,042,750	$ 2,137,000

Solution Legend

	= Value given in problem
	= Formula/Calculation/Analysis required
	= Qualitative analysis or Short answer required
	= Goal Seek or Solver cell
	= Crystal Ball Input
	= Crystal Ball Output

Solution Legend
problem
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PROBLEM 3-6ab: Bridgeway Pharmaceutic

Given		
Investment cost (today)	$ (400,000)	
Project life	5	years
Depreciation expense	$ 80,000	
Waste disposal cost savings per year	$ 18,000	
Labor cost savings per year	$ 40,000	
Sale of reclaimed waste	$ 200,000	
Required rate of return	20%	
Tax rate	35%	

Solution

Part a.			Y
Cash flow estimation	**0**	**1**	**2**
Investment	$ (400,000)		
Waste disposal cost savings per year		18,000	18,000
Labor cost savings per year		40,000	40,000
Proceeds from sale of reclaimed waste materials		200,000	200,000
EBITDA		$ 258,000	$ 258,000
Less: Depreciation		(80,000)	(80,000)
Additional EBIT		$ 178,000	$ 178,000
Less: Taxes		(62,300)	(62,300)
NOPAT		$ 115,700	$ 115,700
Plus: Depreciation		80,000	80,000
Less: Capex		-	-
Less: Additional working capital		-	-
FCF	$ (400,000)	$ 195,700	$ 195,700

NPV	$ 185,263
IRR	39.74%
Analysis	The project appears to be a good one with an expected N

b.

If sale of reclaimed waste drops in half, NPV	$ (9,127)
Critical B-E for sale of waste materials	$ 104,695
Critical B-E Price decline in salvage materials	47.65%

To answer part **b.** simply subs
sale of reclaimed waste in C1

Solver has been used to find t
Details given in text box above

c. See next worksheet

The terminal period growth rates were estimated such that the intrinsic valuation of the firm's equity would equal the current market capitalization of the firm using the "Goal Seek" function.

cals

= Value giver
= Formula/Ca
= Qualitative
= Goal Seek c
= Crystal Ball
= Crystal Ball

'ear

3		4		5
18,000		18,000		18,000
40,000		40,000		40,000
200,000		200,000		200,000
$ 258,000	$	258,000	$	258,000
(80,000)		(80,000)		(80,000)
$ 178,000	$	178,000	$	178,000
(62,300)		(62,300)		(62,300)
$ 115,700	$	115,700	$	115,700
80,000		80,000		80,000
-		-		-
-		-		-
$ 195,700	$	195,700	$	195,700

NPV of over $185,000.

stitute $100,000 for the
0.

this answer.
e.

Solution Legend
n in problem
alculation/Analysis required
analysis or Short answer required
or Solver cell
l Input
l Output

PROBLEM 3-6c: Bridgeway

Given		
Investment cost (today)	$ (400,000)	
Project life	5	years
Depreciation expense	$ 80,000	
Waste disposal cost savings per year	$ 18,000	
Labor cost savings per year	$ 40,000	
Sale of reclaimed waste	$ 200,000	
Required rate of return	20%	
Tax rate	35%	
Correlation (Year to year) in Proceeds from reclaimed waste	0.90	

Solution

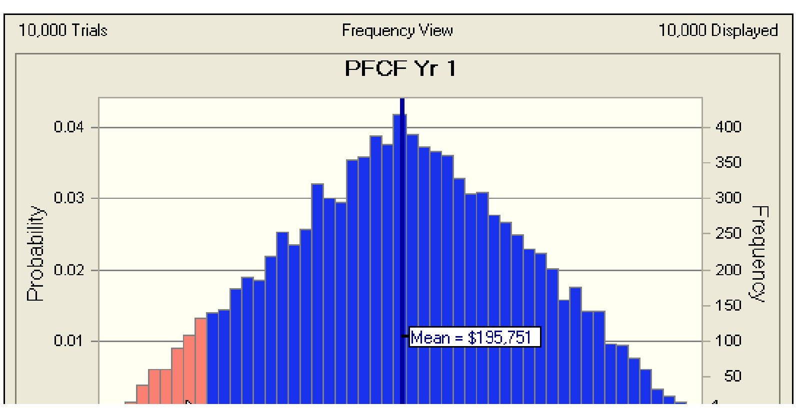
c.

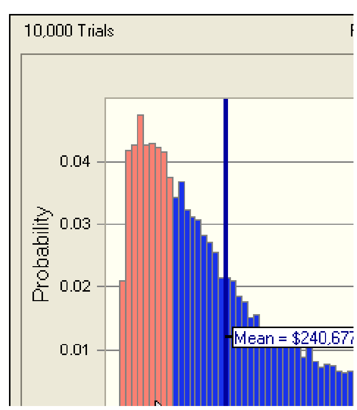
Cash flow estimation	**0**	**1**
Investment	$ (400,000)	
Waste disposal cost savings per year		$ 18,000
Labor cost savings per year		40,000
Proceeds from sale of reclaimed waste		200,000
EBITDA		$ 258,000
Less: Depreciation		(80,000)
Additional EBIT		$ 178,000
Less: Taxes		(62,300)
NOPAT		$ 115,700
Plus: Depreciation		80,000
Less: Capex		-
Less: Additional working capital		-
FCF	(400,000)	$ 195,700

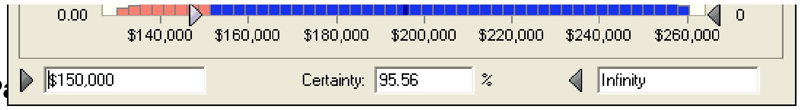
NPV	$ 185,263
IRR	39.74%

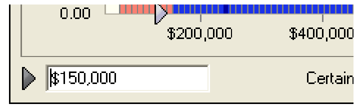
Note: Your res
here where yo
fact, if you do
slightly from o
Preferences/S

Part i.

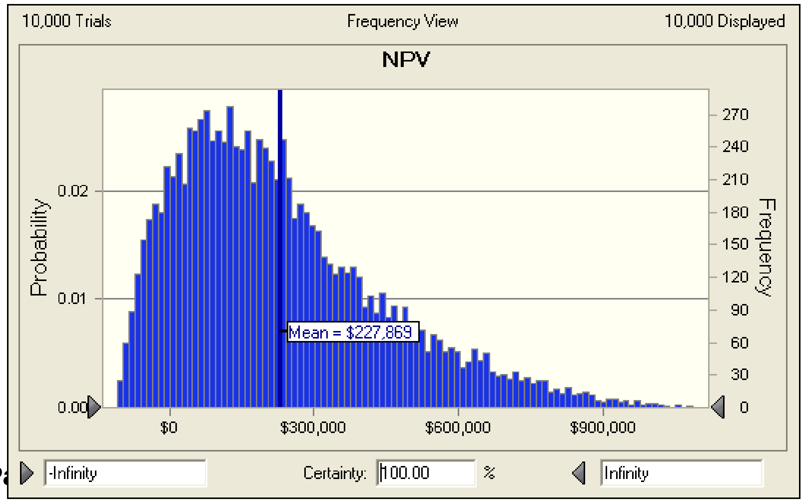


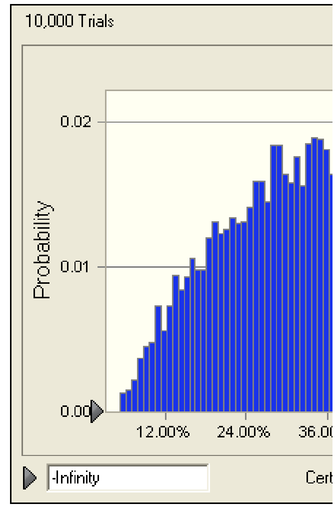



0.00
$140,000 $160,000 $180,000 $200,000 $220,000 $240,000 $260,000
0
$150,000
Certainty: 95.56 %
Infinity

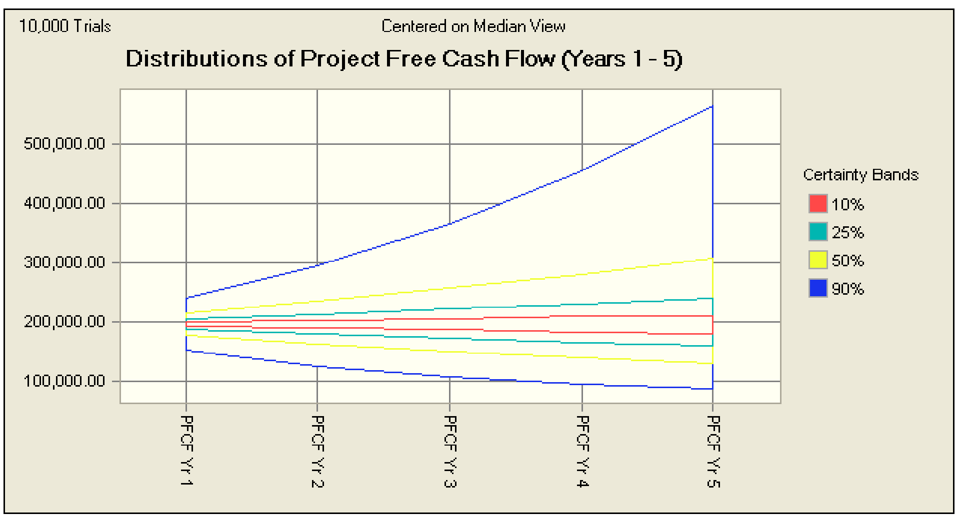

0.00
$200,000 $400,000
$150,000
Certain

Pa


10,000 Trials
Frequency View
10,000 Displayed
NPV
Probability
Frequency
0.02
0.01
0.00
270
240
210
180
150
120
90
60
30
0
Mean = $227,869
$0 $300,000 $600,000 $900,000
-Infinity
Certainty: 100.00 %
Infinity


10,000 Trials
Probability
0.02
0.01
0.00
12.00% 24.00% 36.00
-Infinity
Cert

Pa

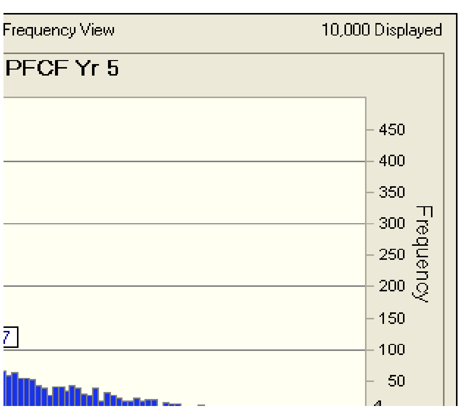

10,000 Trials
Centered on Median View
Distributions of Project Free Cash Flow (Years 1 - 5)
500,000.00
400,000.00
300,000.00
200,000.00
100,000.00
PFCF Yr 1
PFCF Yr 2
PFCF Yr 3
PFCF Yr 4
PFCF Yr 5
Certainty Bands
10%
25%
50%
90%

Pharmaceuticals

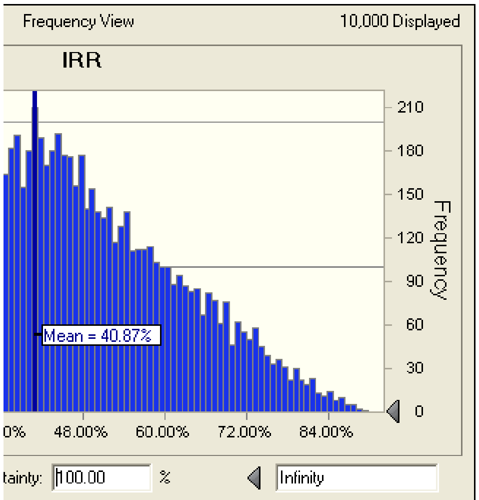
Solution Legend	
(light green)	= Value given in problem
(orange)	= Formula/Calculation/Analysis required
(pink)	= Qualitative analysis or Short answer required
(yellow)	= Goal Seek or Solver cell
(bright green)	= Crystal Ball Input
(blue)	= Crystal Ball Output

Year 2	Year 3	Year 4	Year 5
$ 18,000	$ 18,000	$ 18,000	$ 18,000
40,000	40,000	40,000	40,000
200,000	200,000	200,000	200,000
$ 258,000	$ 258,000	$ 258,000	$ 258,000
(80,000)	(80,000)	(80,000)	(80,000)
$ 178,000	$ 178,000	$ 178,000	$ 178,000
(62,300)	(62,300)	(62,300)	(62,300)
$ 115,700	$ 115,700	$ 115,700	$ 115,700
80,000	80,000	80,000	80,000
-	-	-	-
-	-	-	-
$ 195,700	$ 195,700	$ 195,700	$ 195,700

sults from the simulation experiment will differ slightly from those reported
u did not use the same "seed" value for the random number generator. In
not "fix" the same seed value for each simulation your results will differ
ne simulation of the same problem to another (see Run
ampling).




0
$600,000
$800,000
$1,000,000
65.90
%
Infinity


Frequency View
10,000 Displayed
IRR
210
180
150
120
90
60
30
0
Frequency
Mean = 40.87%
48.00%
60.00%
72.00%
84.00%
100.00
%
Infinity

PROBLEM 3-4: TitMar M

Given

Assumptions and Predictions	**Estimates**	
Price per unit	**$ 4,895**	
Market share (%)	**15.00%**	
Market size (Year 1)	$ 200,000	units
Growth rate in market size beginning in Year 2	5.00%	
Unit variable cost	$ 4,250	
Fixed cost	$ 9,000,000	
Tax rate	50.00%	
Cost of capital	18.00%	
Investment in NWC	5.00%	of the predicted change in firm revenues.
Initial investment in PP&E	$ 7,000,000	
Depreciation (5 year life w/no salvage)	$ 1,400,000	

Solution

	0	**1**
Investment	$ (7,000,000)	
Revenue		146,850,000
Variable Cost		(127,500,000)
Fixed cost		(9,000,000)
Depreciation		(1,400,000)
EBT(Net Operating Income)		$ 8,950,000
Tax		(4,475,000)
Net Operating Profit after Tax (NOPAT)		$ 4,475,000
Plus: Depreciation expense		1,400,000
Less: Capex	(7,000,000)	-
Less: Change in NWC	(7,342,500)	(367,125)
Free Cash Flow	$ (14,342,500)	$ 5,507,875
Net Present Value	$ 9,526,209	
Internal Rate of Return	39.82%	
Units Sold		30,000

a. If the market share is only 5% then the project's NPV =

b. If market share = 15% and the price of the PTV falls to $4,500 the NPV =

Breakeven Sensitivity Analysis	**Critical % Change**	**Critical Value**
Price per unit	**-3.88%**	**$ 4,705**
Market share (%)	-33.53%	9.97%
Market size (Year 1)	-33.53%	$ 132,936
Growth rate in market size beginning in Year 2	-496.00%	-19.80%
Unit variable cost	**4.40%**	**$ 4,437**

Fixed cost	67.69%	$ 15,092,541
Tax rate	57.20%	78.60%
Cost of capital	121.22%	39.82%
Investment in NWC	212.00%	15.60%

Analysis: The above analysis suggests that the two k otor Company

Part b. Substitute $4,500 for the price per unit.
Part a. Substitute 5% for market share (%) .

Year							
	2		3		4		5
	154,192,500		161,902,125		169,997,231		178,497,093
	(133,875,000)		(140,568,750)		(147,597,188)		(154,977,047)
	(9,000,000)		(9,000,000)		(9,000,000)		(9,000,000)
	(1,400,000)		(1,400,000)		(1,400,000)		(1,400,000)
$	9,917,500	$	10,933,375	$	12,000,044	$	13,120,046
	(4,958,750)		(5,466,688)		(6,000,022)		(6,560,023)
$	4,958,750	$	5,466,688	$	6,000,022	$	6,560,023
	1,400,000		1,400,000		1,400,000		1,400,000
	-		-		-		-
	(385,481)		(404,755)		(424,993)		8,924,855
$	5,973,269	$	6,461,932	$	6,975,029	$	16,884,878

31,500	33,075	34,729	36,465

$	(9,413,430)
$	(10,261,801)

ey value drivers are price per unit and unit variable cost!

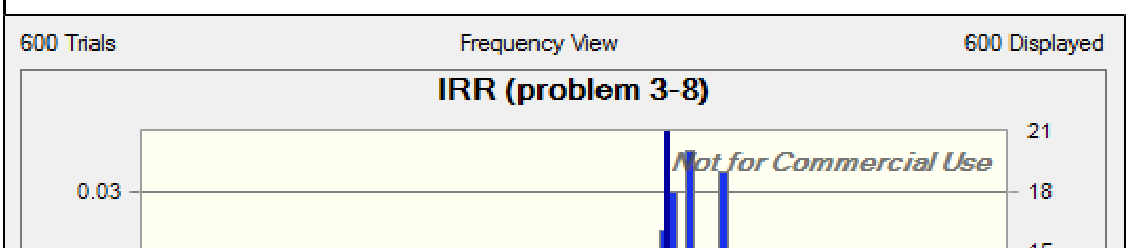
Solution Legend	
	= Value given in problem
	= Formula/Calculation/Analysis required
	= Qualitative analysis or Short answer required
	= Goal Seek or Solver cell
	= Crystal Ball Input
	= Crystal Ball Output

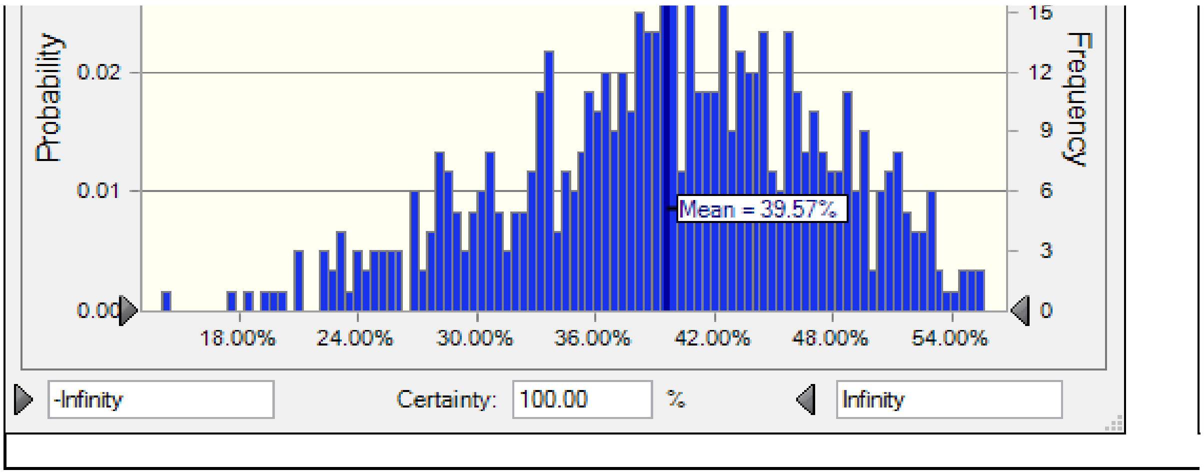
PROBLEM 3

Given		
Assumptions and Predictions	**Estimates**	
Price per unit	$ 4,895	
Market share (%)	15.00%	
Market size (Year 1)	200,000	
Growth rate in market size beginning in Year 2	5.00%	
Unit variable cost	$ 4,250	
Fixed cost	$ 9,000,000	
Tax rate	50.0%	
Cost of capital	18.00%	
Investment in NWC	5.00%	of the predicted change in firm revenues.
Initial investment in pp&e	$ 7,000,000	
Depreciation (5 year life w/no salvage)	$ 1,400,000	

	0	1
Investment	$ (7,000,000)	-
Growth rate in market size		5.0%
Market Size (total PTV sold)		200,000
Market Share (units sold by Titmar)		30,000
Revenue		146,850,000
Variable Cost		(127,500,000)
Fixed cost		(9,000,000)
Depreciation		(1,400,000)
EBT(Net Operating Income)		$ 8,950,000
Tax		(4,475,000)
Net Operating Profit after Tax (NOPAT)		$ 4,475,000
Plus: Depreciation expense		1,400,000
Less: Capex	(7,000,000)	-
Less: Change in NWC	(7,342,500)	(367,125)
Free Cash Flow	$ (14,342,500)	$ 5,507,875

Net Present Value	$ 9,526,209
Internal Rate of Return	39.82%



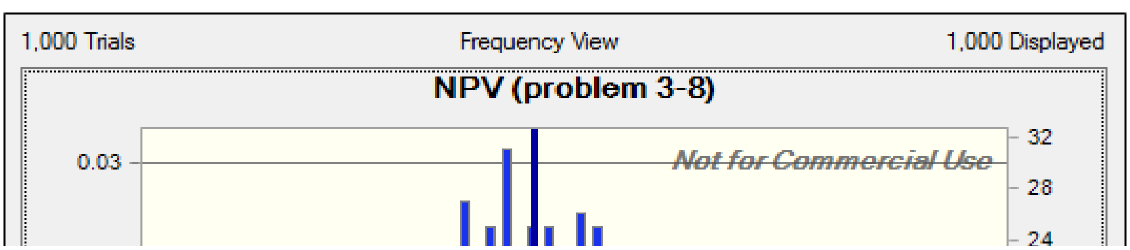

Probability
Frequency
0.02
0.01
0.00
15
12
9
6
3
0
Mean = 39.57%
18.00%
24.00%
30.00%
36.00%
42.00%
48.00%
54.00%
-Infinity
Certainty:
100.00
%
Infinity

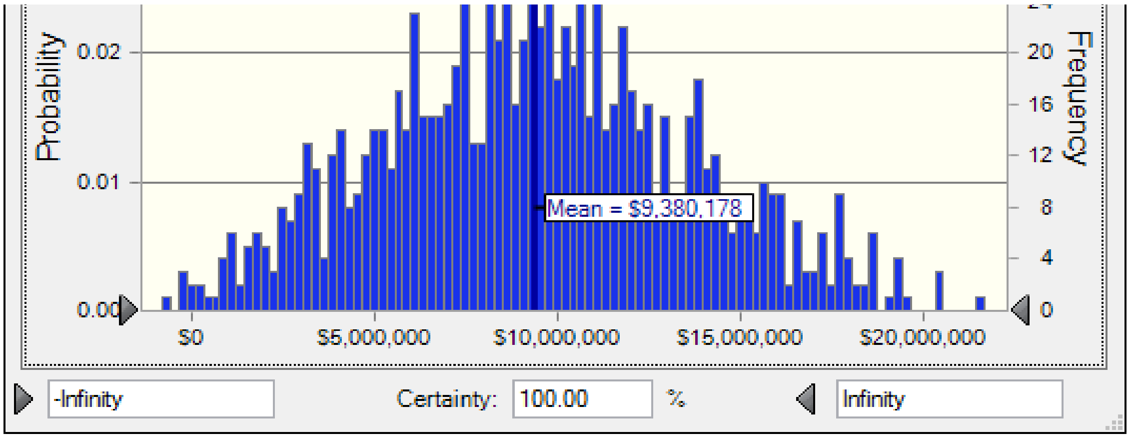
-8: TitMar Motor Company

Solution Legend
= Value given in problem
= Formula/Calculation/Analysis required
= Qualitative analysis or Short answer required
= Goal Seek or Solver cell
= Crystal Ball Input
= Crystal Ball Output

Solution

Year			
2	3	4	5
-	-	-	-
5.0%	5.0%	5.0%	5.0%
210,000	220,500	231,525	243,101
31,500	33,075	34,729	36,465
154,192,500	161,902,125	169,997,231	178,497,093
(133,875,000)	(140,568,750)	(147,597,188)	(154,977,047)
(9,000,000)	(9,000,000)	(9,000,000)	(9,000,000)
(1,400,000)	(1,400,000)	(1,400,000)	(1,400,000)
$ 9,917,500	$ 10,933,375	$ 12,000,044	$ 13,120,046
(4,958,750)	(5,466,688)	(6,000,022)	(6,560,023)
$ 4,958,750	$ 5,466,688	$ 6,000,022	$ 6,560,023
1,400,000	1,400,000	1,400,000	1,400,000
-	-	-	-
(385,481)	(404,755)	(424,993)	8,924,855
$ 5,973,269	$ 6,461,932	$ 6,975,029	$ 16,884,878




Probability
Frequency
0.02
0.01
0.00
20
16
12
8
4
0
Mean = $9,380,178
$0
$5,000,000
$10,000,000
$15,000,000
$20,000,000
-Infinity
Certainty:
100.00
%
Infinity

PROBLEM 3-9: Earthilizer Problem--Decision Tree

Given		
EPA after-tax cost	$	80,000
Abandonment Value	**$**	**350,000**
Probability of Good EPA Ruling		80%

Solution

Panel a. No Option to Abandon

	2007		2008		2009		2010	
Favorable EPA Ruling--Expected Project FCFs	$	(580,000)	$	87,600	$	78,420	$	93,320
NPV (Favorable EPA Ruling) =	$	43,062						
Unfavorable EPA Ruling--Expected FCFs	$	(580,000)	$	7,600	$	(1,580)	$	13,320
NPV (Unfavorable EPA Ruling)	$	(236,608)						
Revised Expected Project FCFs	$	(580,000)	$	71,600	$	62,420	$	77,320
E[NPV] with No Option to Abandon	$	(12,872)						

Panel b. Option to Abandon

	2007		2008		2009		2010	
Project Not Abandoned (Favorable EPA)	$	(580,000)	$	87,600	$	78,420	$	93,320
NPV (Favorable EPA Ruling) =	$	43,062						
Project Abandoned (Unfavorable EPA)	$	(580,000)	$	437,600	$	-	$	-
NPV (Unfavorable EPA Ruling)	$	(193,598)						
Revised Expected Project FCFs	$	(580,000)	$	157,600	$	62,736	$	74,656
E[NPV] with the Option to Abandon	**$**	**(4,270)**						

Analysis:

Reducing the abandonment value to $350,000 reduces the
with the abandonment option to $(4,270). The break-even a
makes the expected NPV of the proposed investment zero

	2011	2012
	$ 109,710	$ 658,770
	$ 29,710	$ 578,770
	$ 93,710	$ 642,770

	2011	2012
	$ 109,710	$ 658,770
	$ -	$ -
	$ 87,768	$ 527,016

expected NPV of the project
abandonment value that
is $374,177.

	Solution Legend
	= Value given in problem
	= Formula/Calculation/Analysis required
	= Qualitative analysis or Short answer r
	= Goal Seek or Solver cell
	= Crystal Ball Input
	= Crystal Ball Output

l
equired

PROBLEM 3-10: Introductory Simulation Analysis Exercises

a. Jason Enterprises

Given		
Gross Profit/Sales		25%
Sales (upper limit)	$	10,000,000
Sales (lower limit)	$	7,000,000

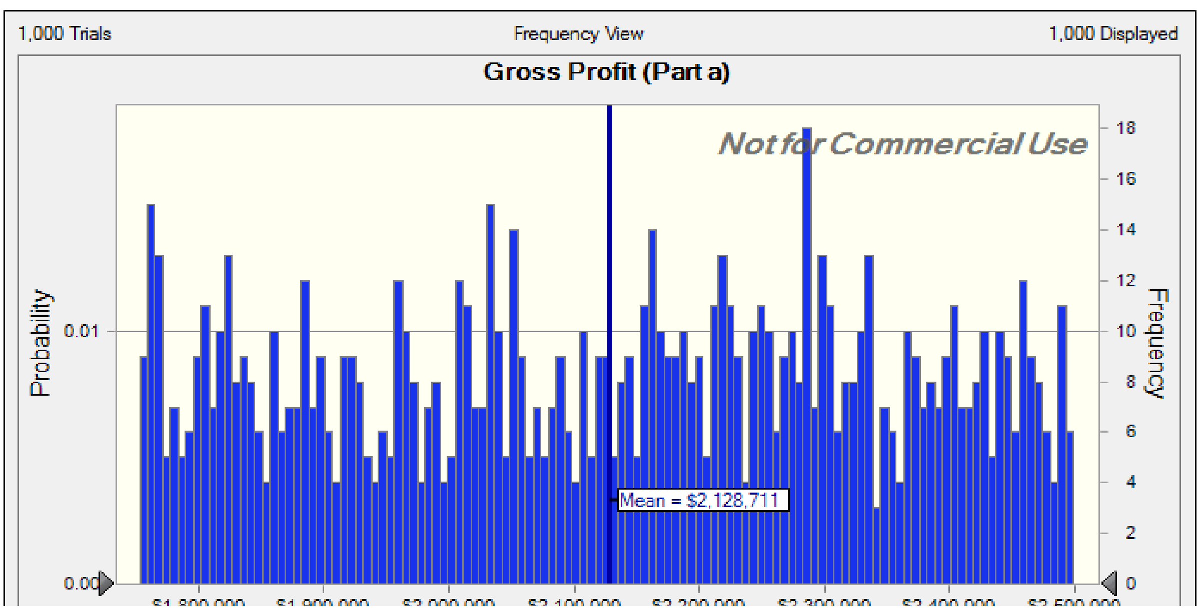
Solution		
Forecasted Sales	$	8,500,000
Gross profits	$	2,125,000

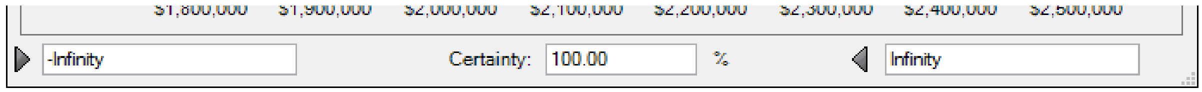
	= Value given
	= Formula/Cal
	= Qualitative a
	= Goal Seek o
	= Crystal Ball
	= Crystal Ball

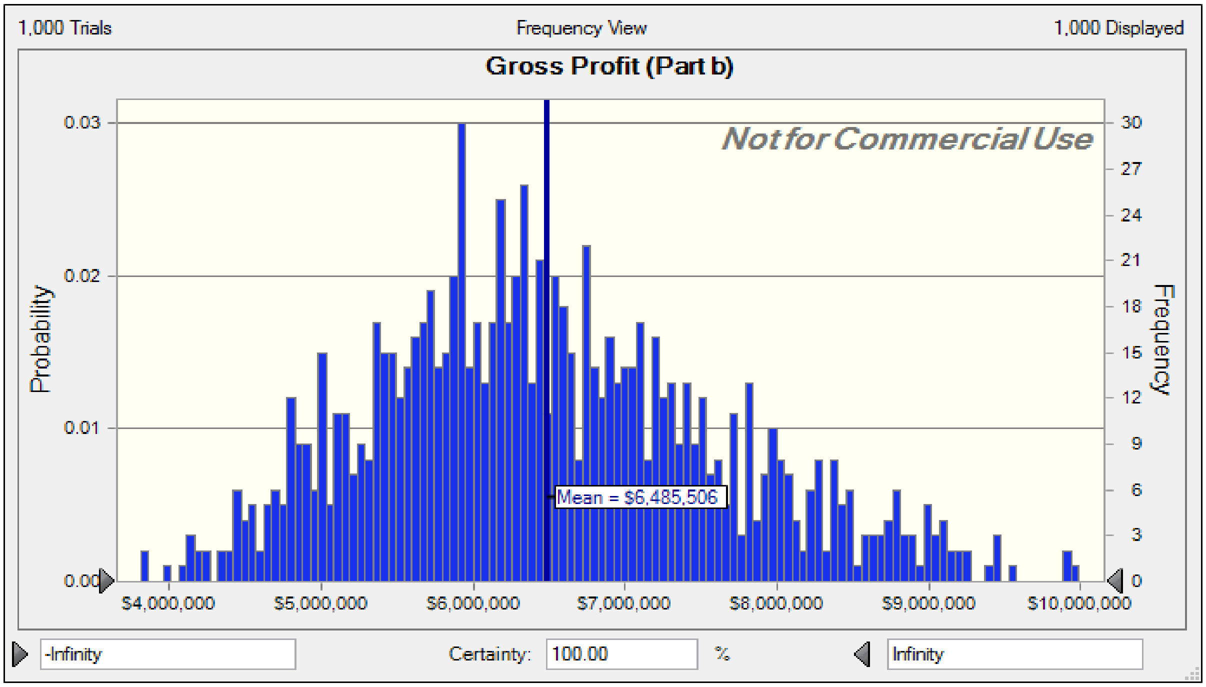
b. Aggiebear Dog Snacks, Inc.

Given			
Revenues	Minimum	$	18,000,000
	Most likely	$	25,000,000
	Maximum	$	35,000,000
Cost of Goods sold/Revenues	Minimum		70%
	Maximum		80%

Solution		
Forecasted Sales	$	26,000,000
Cost of Goods Sold/Sales		0.75
Part i-iii.		
Sales	$	26,000,000
Less: Cost of Goods Sold		(19,500,000)
Gross Profit	$	6,500,000




$1,800,000
$1,900,000
$2,000,000
$2,100,000
$2,200,000
$2,300,000
$2,400,000
$2,500,000
-Infinity
Certainty: 100.00 %
Infinity


1,000 Trials
Frequency View
1,000 Displayed
Gross Profit (Part b)
Not for Commercial Use
Probability
0.03
0.02
0.01
0.00
Frequency
30
27
24
21
18
15
12
9
6
3
0
Mean = $6,485,506
$4,000,000
$5,000,000
$6,000,000
$7,000,000
$8,000,000
$9,000,000
$10,000,000
-Infinity
Certainty: 100.00 %
Infinity

Solution Legend

in problem
culation/Analysis required
nalysis or Short answer required
r Solver cell

Input
Output

PROBLEM 3-11: Rayner Aeronautics

Given		
Investment Outlay (Year 0)	$	12,500,000
Year 1 Expected Cash Flow	$	2,000,000
Required Rate of Return		18%

Solution Legend	
	= Value given in problem
	= Formula/Calculation/Analysis required
	= Qualitative analysis or Short answer required
	= Goal Seek or Solver cell
	= Crystal Ball Input
	= Crystal Ball Output

Solution

a.

Break-Even Growth Rate in Cash flows **41.06%**

Year	Growth Rate	Cash Flows		
0		$ (12,500,000)	NPV =	(0.00)
1	0	2,000,000		
2	41.06%	2,821,214		
3	41.06%	3,979,623		
4	41.06%	5,613,683		
5	41.06%	7,918,699		

b.

Simulation Model

	Variable		Mean	Std. Deviation
Year 1 cash flow	$ 2,000,000	**Normal distribution**	$ 2,000,000	$ 1,000,000

Annual Growth Rates		Triangular Distrbution		
Year		**Most likely**	**Minimum**	**Maximum**
2	46.67%	40.00%	20.00%	80.00%
3	54.44%	40.00%	10.00%	160.00%
4	63.52%	40.00%	5.00%	320.00%
5	74.10%	40.00%	2.50%	640.00%

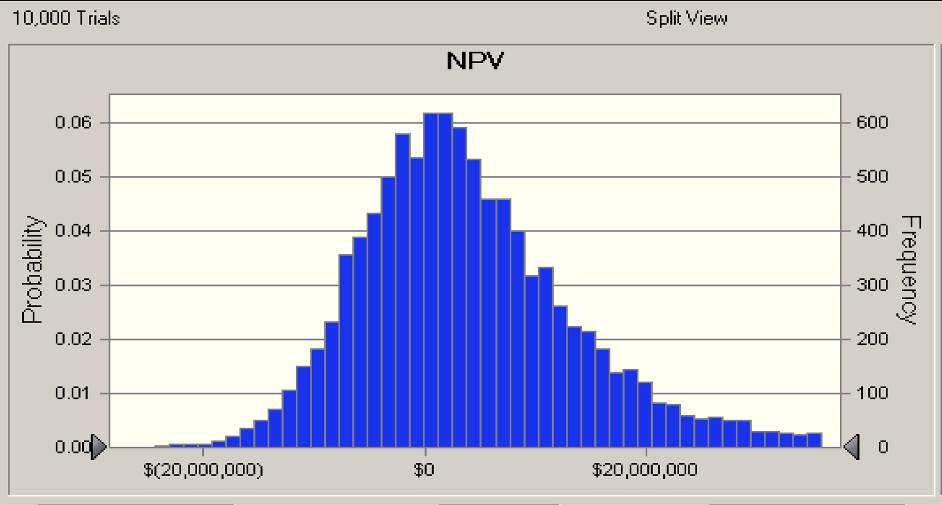
Year	Growth Rate	Cash Flows
0		$ (12,500,000)
1	0	2,000,000
2	46.67%	2,933,333
3	54.44%	4,530,370
4	63.52%	7,407,995
5	74.10%	12,897,684

c.

Results of Simulation

NPV	$ 3,517,571	
IRR	26.58%	
Expected NPV	$ 4,469,510	see mean value in chart below
Expected IRR	26.08%	see mean value in chart below

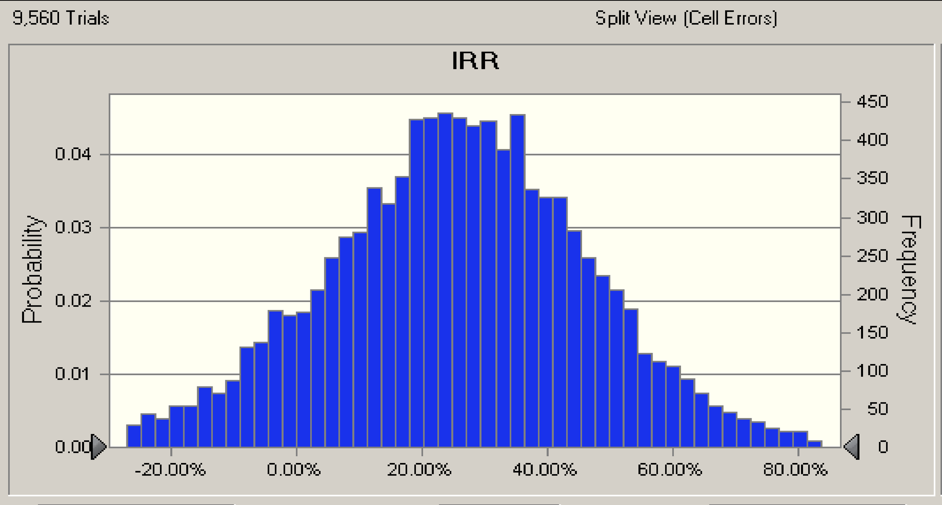
10,000 Trials — Split View — 9,829 Displayed



Statistic	Forecast values
Trials	10,000
Mean	$4,469,510
Median	$2,746,584
Mode	---
Standard Deviation	$11,228,477
Variance	$126,078,689,769,57
Skewness	1.55
Kurtosis	8.89
Coeff. of Variability	2.51
Minimum	$(41,505,978)
Maximum	$104,929,669
Mean Std. Error	$112,285

-Infinity Certainty: 100.00 % Infinity

9,560 Trials — Split View (Cell Errors) — 9,534 Displayed



Statistic	Forecast values
Trials	9,560
Mean	26.08%
Median	26.21%
Mode	---
Standard Deviation	20.63%
Variance	4.25%
Skewness	0.0449
Kurtosis	2.95
Coeff. of Variability	0.7909
Minimum	-26.99%
Maximum	107.32%
Mean Std. Error	0.21%
Cell Errors	440

-Infinity Certainty: 100.00 % Infinity

PROBLEM 3-12: Con

Given	
ConocoPhillips's Cost of Capital for project	15.00%
Project life	10 years

1.

	0	1	2
Investment	$ 1,200,000		
Increase in NWC	145,000		
MACRS Depr Rate (7 year)		0.1429	0.2449
Natural Gas Wellhead Price (per MCF)		6	6
Volume (MCF/day)		900	720
Days per year		365	
Fee to Producer of Natural Gas		$3.00	$3.00
Compression & processing costs (per MCF)		0.65	0.65
Cash Flow Calculations			
Natural Gas Wellhead Price Revenue		$ 1,971,000	$ 1,576,800
Lease fee expense		985,500	788,400
Compression & processing costs		213,525	170,820
Depreciation expense		171,480	293,880
Net operating Profit		$ 600,495	$ 323,700
Less: Taxes (40%)		(240,198)	(129,480)
Net operating profit after tax (NOPAT)		$ 360,297	$ 194,220
Plus: Depreciation expense		171,480	293,880
Return of net working capital			
Project Free Cash Flow	$ (1,345,000)	$ 531,777	$ 488,100

NPV	$ 280,051
IRR	22.43%

2a-c. Scenario Summary

	Current Values	Best Case	Most Likely Case
Changing Cells			
NG Price	6	8	6
Production Rate	900	1200	900
Result Cells			
NPV	$ 280,051	$ 1,440,400	$ 280,051
IRR	22.43%	53.11%	22.43%

Notes: Current Values column represents values of changing cells at time Scenario Summary Repor

3. Breakeven Sensitivity Analsyis

Students should use Goal Seek in Excel to answer this question.

a.

Breakeven nautral gas price for an NPV = 0	$ 4.98

b.

Breakeven natural gas volume in Year 1 for an NPV = 0	704

c.

Breakeven investment for an NPV = 0	$ 1,573,795

4. Student answers will vary but most will probably recommend the project.

The problem is intentionally set up to illustrate the risk of natural gas prices because the price is very suggest students go to the internet and look at current natural gas prices. A good website to suggest http://www.wtrg.com. On November 29, 2007, the NYMEX price for natural gas was $7.56. At higher prices, this project is very profitable. However, in subsequent years the price fell to below $3.00.

ocoPhillips Natural Gas Wellhead Project

Solution

			Years										
	3		**4**		**5**		**6**		**7**		**8**		**9**
	0.1749		0.1249		0.0893		0.0893		0.0893		0.0445		
	6		6		6		6		6		6		6
	576		461		369		295		236		189		151
	$3.00		$3.00		$3.00		$3.00		$3.00		$3.00		$3.00
	0.65		0.65		0.65		0.65		0.65		0.65		0.65
$	1,261,440	$	1,009,152	$	807,322	$	645,857	$	516,686	$	413,349	$	330,679
	630,720		504,576		403,661		322,929		258,343		206,674		165,339
	136,656		109,325		87,460		69,968		55,974		44,779		35,824
	209,880		149,880		107,160		107,160		107,160		53,400		-
$	284,184	$	245,371	$	209,041	$	145,801	$	95,209	$	108,495	$	129,516
	(113,674)		(98,148)		(83,616)		(58,320)		(38,083)		(43,398)		(51,806)
$	170,510	$	147,223	$	125,425	$	87,480	$	57,125	$	65,097	$	77,710
	209,880		149,880		107,160		107,160		107,160		53,400		-
$	380,390	$	297,103	$	232,585	$	194,640	$	164,285	$	118,497	$	77,710

Worst Case

	3
	700
$	(645,791)
	-2.34%

t was created.

volatile. We
: is
natural gas

10
6
121
$3.00
0.65
$ 264,543
132,272
28,659
-
$ 103,613
(41,445)
$ 62,168
-
145,000
$ 207,168

Solution Legend

	= Value given in problem
	= Formula/Calculation/Analysis required
	= Qualitative analysis or Short answer required
	= Goal Seek or Solver cell
	= Crystal Ball Input
	= Crystal Ball Output

PROBLEM 3-13: Blended Profile Applied, per

Given			
Purchase Cost (pre-installed) $000	$ (700,000)	Airframe Maintenance Cost	$ (2,100)
Installation $000	$ (56,000)	Useful Life (yrs) Average	20
Downtime Days (installation)	1	Runway Savings	$ 500
Downtime Cost/Day $000	$ (5,000)	Facility cost	$ 1,200
Salvage %	15.00%	Depreciation	MACRS (see
Gen. Escalation	3.00%	Fuel Price (all-in)	$ 0.80
Marginal Tax Rate	39.00%	Fuel (gallons saved)	178,500
Discount Rate	9.28%		

	0	1	2	3	4
Winglet Purchase	$ (700,000)				
Winglet Installation	$ (56,000)				
Install. Downtime costs	$ (5,000)				
Airport Reconfiguration	$ (1,200)				
Fuel Savings		$ 142,800	$ 142,800	$ 142,800	$ 142,800
Airframe Maint. Costs		(2,100)	(2,163)	(2,228)	(2,295)
Reduced restrictions (inflated 3%/yr)		500	515	530	546
Less: depreciation		(432,016)	(92,572)	(66,112)	(47,212)
EBIT		$ (290,816)	$ 48,580	$ 74,990	$ 93,839
Less: Income Tax		(113,418)	18,946	29,246	36,597
Net Income		$ (177,398)	$ 29,634	$ 45,744	$ 57,242
Plus: Depreciation		432,016	92,572	66,112	47,212
Operating Cash Flow		$ 254,618	$ 122,206	$ 111,856	$ 104,454
Salvage Value					
Tax on Salvage Value					
Total Project Cash Flow	$ (762,200)	$ 254,618	$ 122,206	$ 111,856	$ 104,454

b.

NPV	$ 260,980
IRR	15.0%
MIRR	10.9%

DEPRECIATION DETAILS

MACRS Table	**Normal Table**	**Normal Table x**	**Year 1(a) Additional**	**valid til 9/11/04**	
		50.00%	50.00%	**Total (modified table)**	
1	14.29%	7.15%	50.00%	**57.15%**	$ 756,000
2	24.49%	12.25%		**12.25%**	756,000
3	17.49%	8.75%		**8.75%**	756,000
4	12.49%	6.25%		**6.25%**	756,000
5	8.93%	4.47%		**4.47%**	756,000
6	8.92%	4.46%		**4.46%**	756,000
7	8.93%	4.47%		**4.47%**	756,000
8	4.46%	2.23%		**2.23%**	756,000
				100.00%	

(a) Job Creation and Worker Assistance Act of 2002

c.

Breakeven fuel cost	$ 0.53	per gallon
Breakeven fuel savings	118,742	gallons

d.

	Current Values	Best Case	Worst Case
Changing Cells			
Fuel Price	$ 0.80	$ 1.10	$ 0.50
Gallons Saved	178,500	214,000	142,000
Result Cells			
NPV	$ 260,980	$ 766,489	$ (130,981)
IRR	15.00%	24.70%	6.00%
MIRR	10.90%	13.10%	8.30%

Notes: Current Values column represents values of changing cells at time Scenario Summary Report was created.

e. Students should try to think of all possible qualitative and quantitative aspects of the project not already options excluded from the project: Southwest Airlines may be able to enter into new markets since the jets refueling. The jets can also carry more cargo with the greater fuel savings. It will make the airline more pr prices are high, especially when compared to their competitors with less fuel efficient jets. Potential risks, a increased accidents because the jets handle differently and the wingspan is wider. There are other potenti students are encouraged to "brainstorm" these.

f. Impact on NPV and IRR if winglets have no salvage value.

NPV	$ 250,123
IRR	$ 14.89

Aircraft B737-700

per year

per year
per aricraft
 below)
includes delivery, taxes and into plane charges

= Value give
= Formula/C
= Qualitativ
= Goal Seek
= Crystal Ba
= Crystal Ba

Solution

				Year			
5	**6**	**7**	**8**	**9**	**10**	**11**	**12**
$ 142,800	$ 142,800	$ 142,800	$ 142,800	$ 142,800	$ 142,800	$ 142,800	$ 142,800
(2,364)	(2,434)	(2,508)	(2,583)	(2,660)	(2,740)	(2,822)	(2,907)
563	580	597	615	633	652	672	692
(33,755)	(33,718)	(33,755)	(16,859)				
$ 107,244	$ 107,228	$ 107,134	$ 123,973	$ 140,773	$ 140,712	$ 140,650	$ 140,585
41,825	41,819	41,782	48,350	54,902	54,878	54,853	54,828
$ 65,419	$ 65,409	$ 65,352	$ 75,624	$ 85,872	$ 85,835	$ 85,796	$ 85,757
33,755	33,718	33,755	16,859				
$ 99,174	$ 99,126	$ 99,107	$ 92,483	$ 85,872	$ 85,835	$ 85,796	$ 85,757
$ 99,174	$ 99,126	$ 99,107	$ 92,483	$ 85,872	$ 85,835	$ 85,796	$ 85,757

Tax Depr
$ 432,016
92,572
66,112
47,212
33,755
33,718
33,755
16,859
$ 756,000

included. The are real
s can fly further without
ice competitive when jet fuel
although remote, would be
al risks and benefits, and

Solution Legend
en in problem
Calculation/Analysis required
e analysis or Short answer required
: or Solver cell
ll Input
ll Output

13	14	15	16	17	18	19	20
$ 142,800	$ 142,800	$ 142,800	$ 142,800	$ 142,800	$ 142,800	$ 142,800	$ 142,800
(2,994)	(3,084)	(3,176)	(3,272)	(3,370)	(3,471)	(3,575)	(3,682)
713	734	756	779	802	826	851	877
$ 140,519	$ 140,450	$ 140,380	$ 140,307	$ 140,232	$ 140,155	$ 140,076	$ 139,994
54,802	54,776	54,748	54,720	54,691	54,661	54,630	54,598
$ 85,716	$ 85,675	$ 85,632	$ 85,587	$ 85,542	$ 85,495	$ 85,446	$ 85,397
$ 85,716	$ 85,675	$ 85,632	$ 85,587	$ 85,542	$ 85,495	$ 85,446	$ 85,397
							$ 105,000
							(40,950)
$ 85,716	$ 85,675	$ 85,632	$ 85,587	$ 85,542	$ 85,495	$ 85,446	$ 149,447