Valuation The Art and Science of Corporate Investment Decisions 3rd edition Titman Solutions Manual

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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

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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	

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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

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$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)

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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

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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

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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

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Problem 3-3

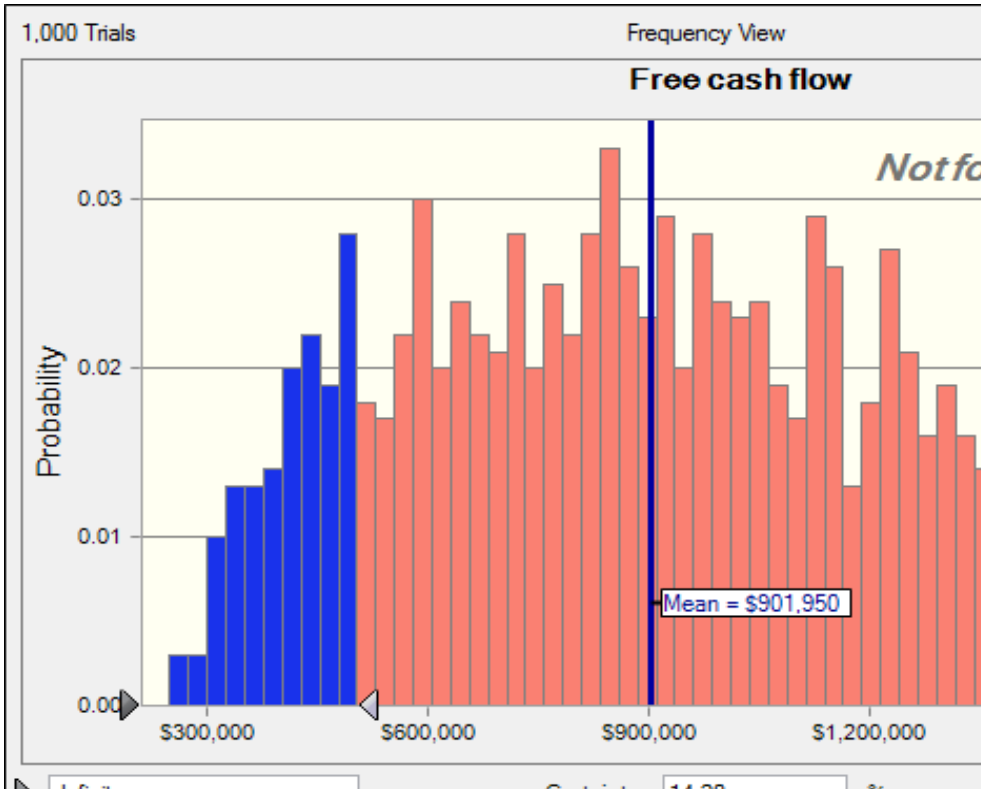
Given:

	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.



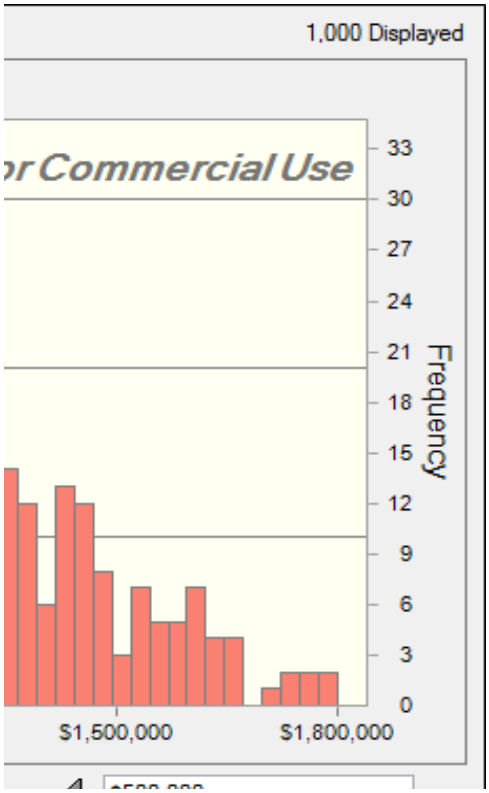
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Parameter Estimates
max = 150,000; Min = 50,000
Meam = $50, standard deviation = $10
NA
min = $30;most likely = $35; max = $40
NA
NA
min = $60,000; max = $90,000
min = $18,000; most likely = $20,000; max = $22,000

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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

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Solution Legend	
	= Value given in problem
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	= 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**

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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**	

	0	1	2	Yea
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

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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!).

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y Analysis

RENUMBER

	= Value given in p
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	= 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	
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	= Crystal Ball Output

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Solution Legend
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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.

Cash flow estimation	0	1	2	Y
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)	To answer part **b.** simply subs sale of reclaimed waste in C1
Critical B-E for sale of waste materials	$ 104,695	
Critical B-E Price decline in salvage materials	47.65%	Solver has been used to find t Details given in text box above

c. See next worksheet

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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.

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cals

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

Year 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.

his answer.
e.

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Solution Legend
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analysis or Short answer required
or Solver cell
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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

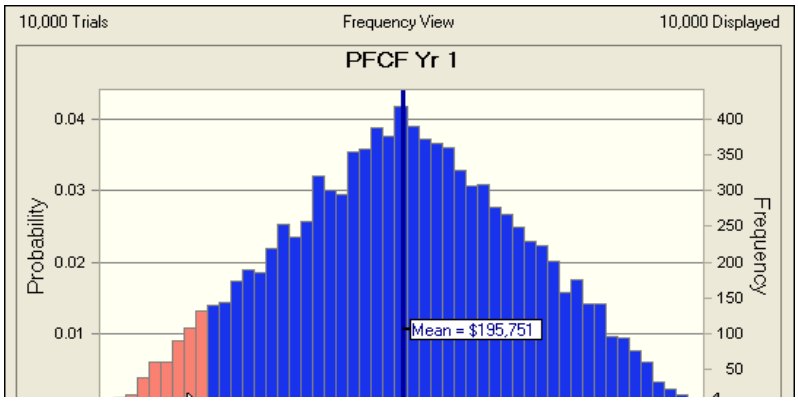
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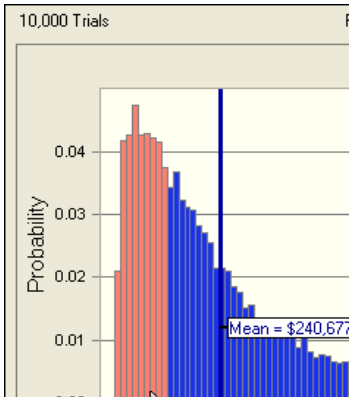
Cash flow estimation	**0**	**1**
Investment	$ (400,000)	
Waste disposal cost savings per year		$ 18,000
Labor cost savings per year		40,000
Proceeds from sale of reclaimed waste		200,000
EBITDA		$ 258,000
Less: Depreciation		(80,000)
Additional EBIT		$ 178,000
Less: Taxes		(62,300)
NOPAT		$ 115,700
Plus: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

NPV	$ 185,263
IRR	39.74%

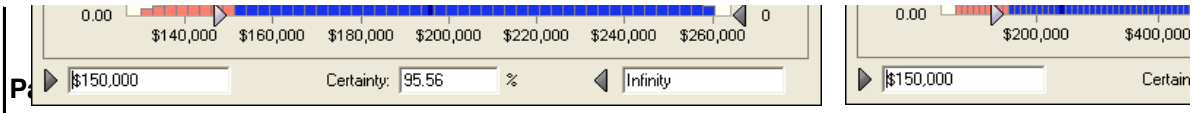
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Part i.

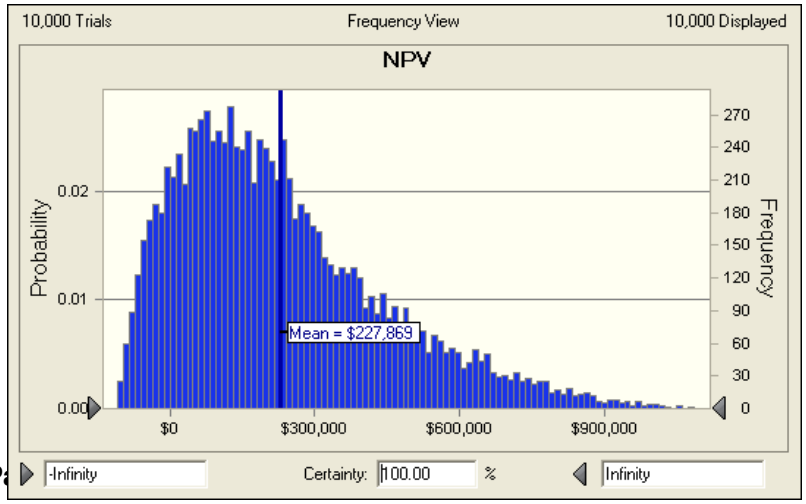


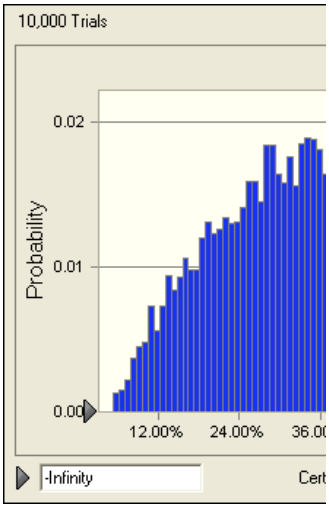


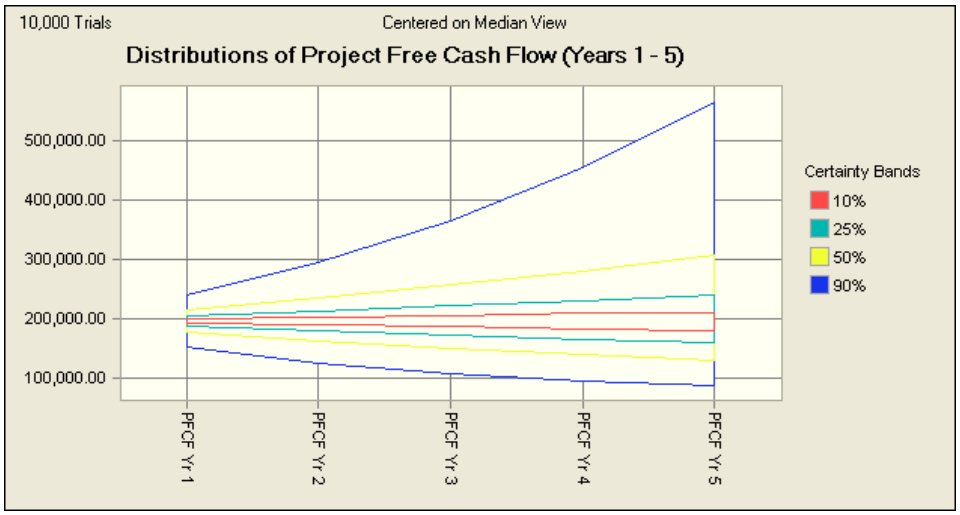
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0.00
$140,000
$160,000
$180,000
$200,000
$220,000
$240,000
$260,000
0
$150,000
Certainty: 95.56 %
Infinity

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


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


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

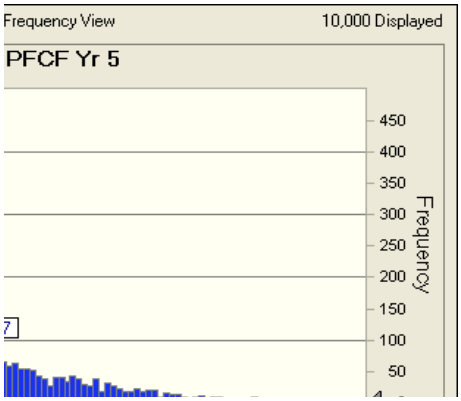

10,000 Trials
Centered on Median View
Distributions of Project Free Cash Flow (Years 1 - 5)
500,000.00
400,000.00
300,000.00
200,000.00
100,000.00
PFCF Yr 1
PFCF Yr 2
PFCF Yr 3
PFCF Yr 4
PFCF Yr 5
Certainty Bands
10%
25%
50%
90%

Pharmaceuticals

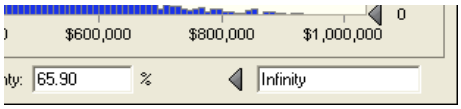
Solution Legend	
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	= Formula/Calculation/Analysis required
	= Qualitative analysis or Short answer required
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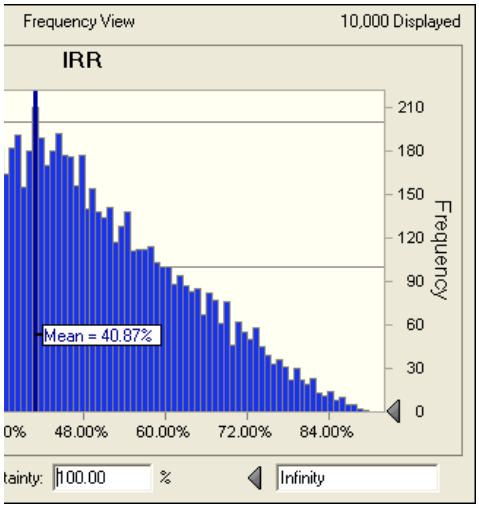
	Year			
	2	3	4	5
$	18,000	$ 18,000	$ 18,000	$ 18,000
	40,000	40,000	40,000	40,000
	200,000	200,000	200,000	200,000
$	258,000	$ 258,000	$ 258,000	$ 258,000
	(80,000)	(80,000)	(80,000)	(80,000)
$	178,000	$ 178,000	$ 178,000	$ 178,000
	(62,300)	(62,300)	(62,300)	(62,300)
$	115,700	$ 115,700	$ 115,700	$ 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).



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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%
0%
48.00%
60.00%
72.00%
84.00%
100.00
%
Infinity



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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**

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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)

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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

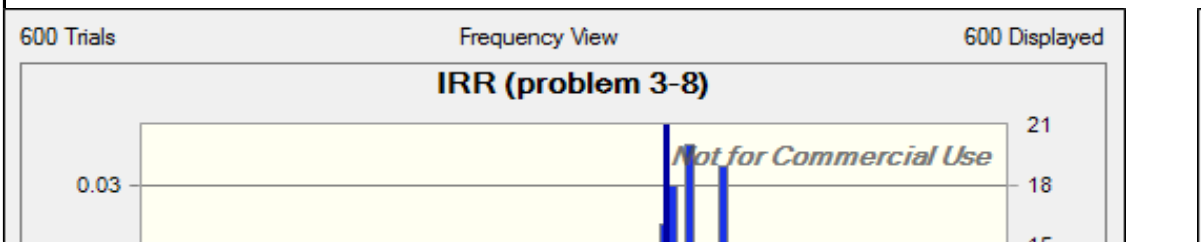
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PROBLEM 3

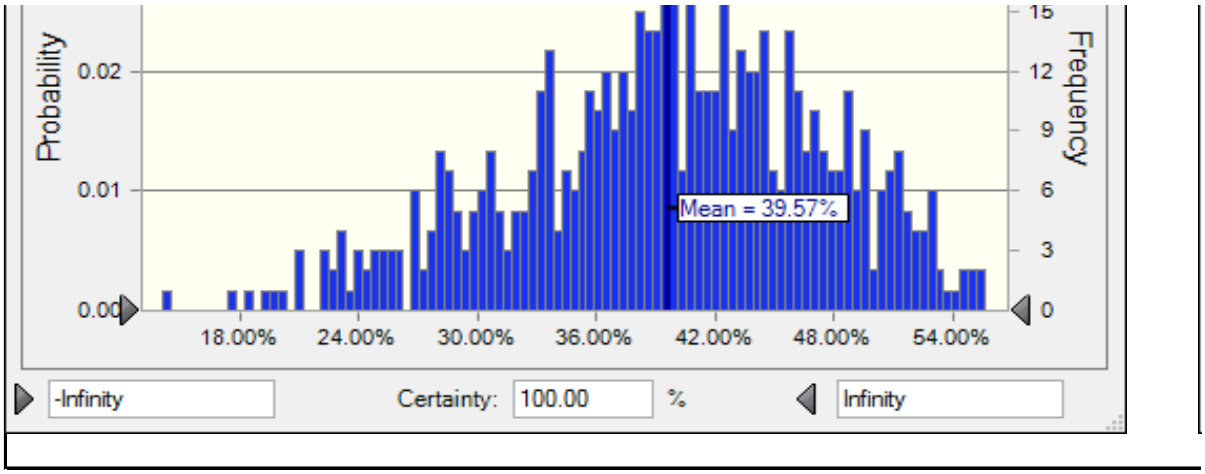
Given		
Assumptions and Predictions	**Estimates**	
Price per unit	$ 4,895	
Market share (%)	15.00%	
Market size (Year 1)	200,000	
Growth rate in market size beginning in Year 2	5.00%	
Unit variable cost	$ 4,250	
Fixed cost	$ 9,000,000	
Tax rate	50.0%	
Cost of capital	18.00%	
Investment in NWC	5.00%	of 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%



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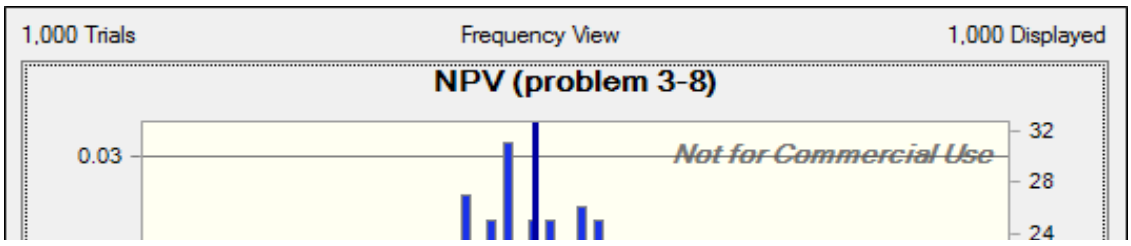
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-8: TitMar Motor Company

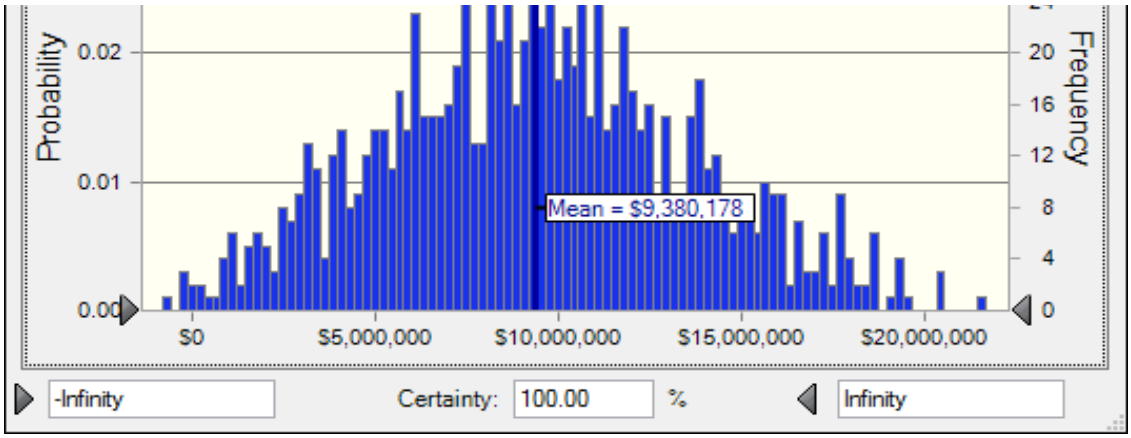
Solution Legend	
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	= Qualitative analysis or Short answer required
	= Goal Seek or Solver cell
	= Crystal Ball Input
	= Crystal Ball Output

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



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Probability
0.02
0.01
0.00
Frequency
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

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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

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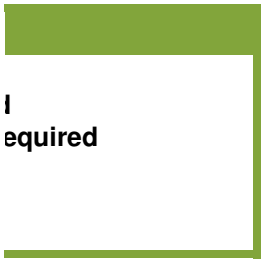
	2011	2012
	$ 109,710	$ 658,770
	$ 29,710	$ 578,770
	$ 93,710	$ 642,770

	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

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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

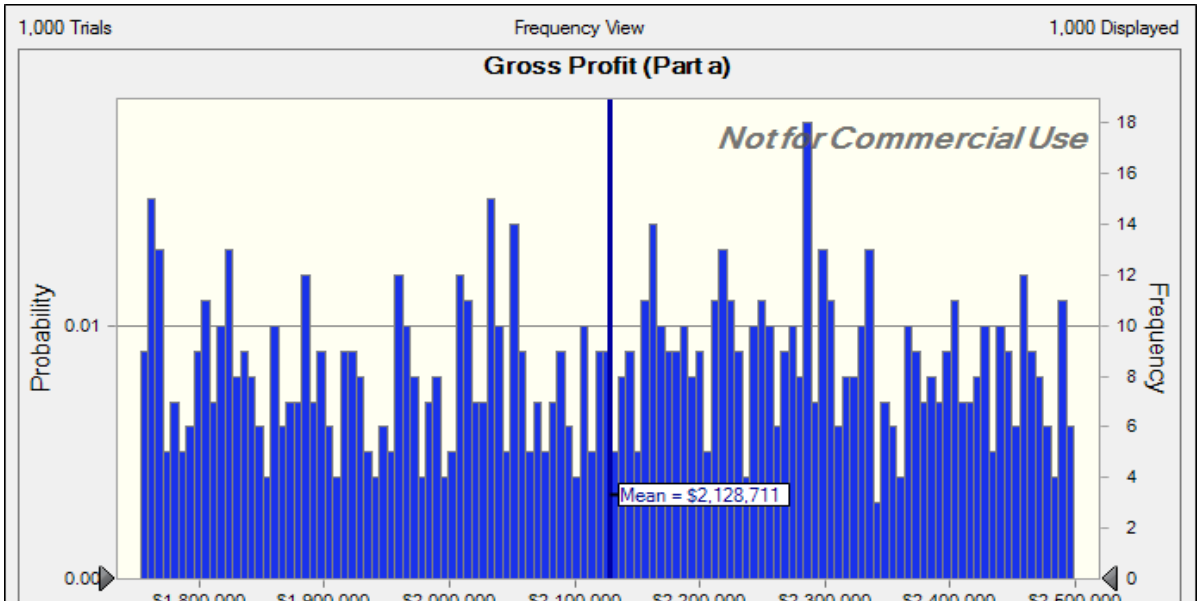
Solution		
Forecasted Sales	$	8,500,000
Gross profits	$	2,125,000

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

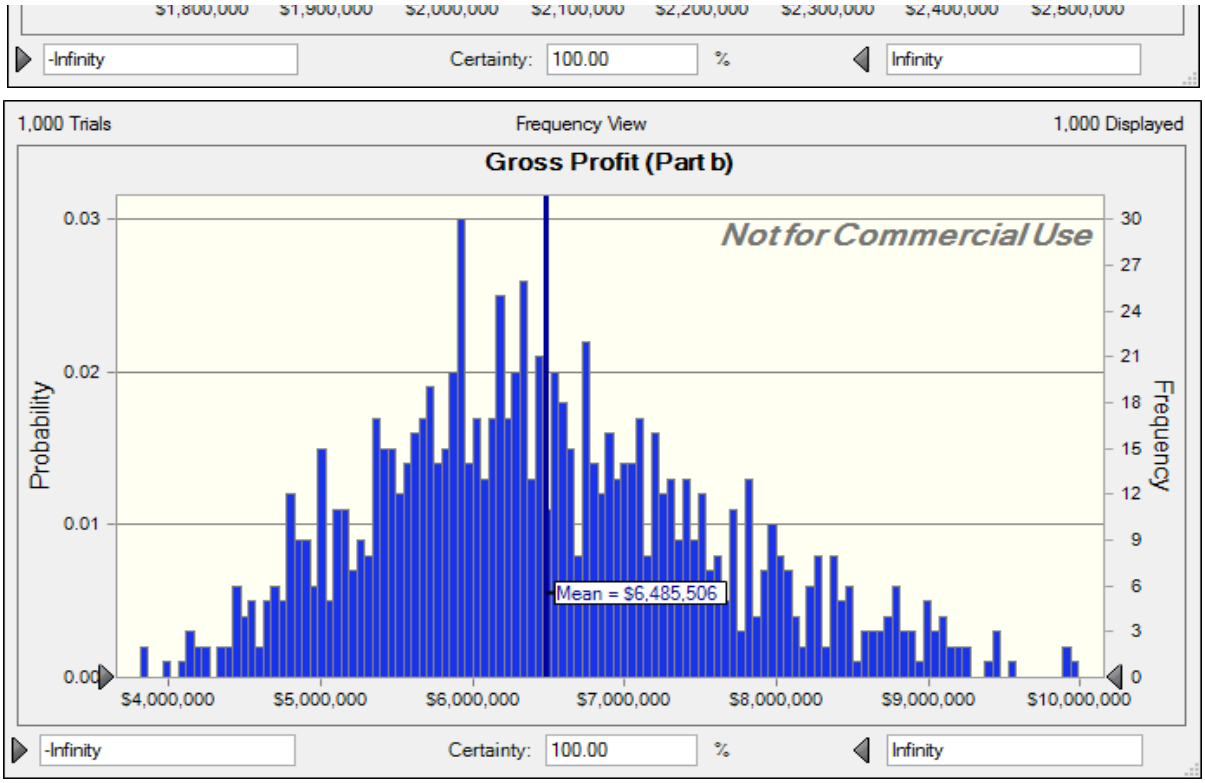
b. Aggiebear Dog Snacks, Inc.

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



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Solution Legend
in problem
culation/Analysis required
nalysis or Short answer required
r Solver cell
Input
Output

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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
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	= 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

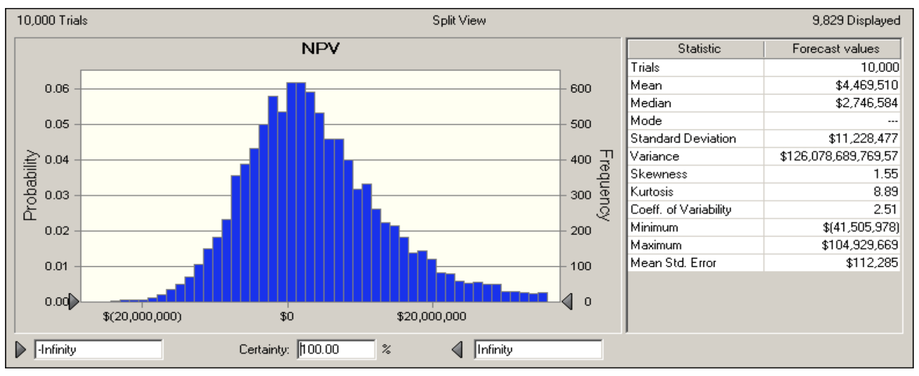
Annual Growth Rates		Triangular Distrbution		
Year		Most likely	Minimum	Maximum
2	46.67%	40.00%	20.00%	80.00%
3	54.44%	40.00%	10.00%	160.00%
4	63.52%	40.00%	5.00%	320.00%
5	74.10%	40.00%	2.50%	640.00%

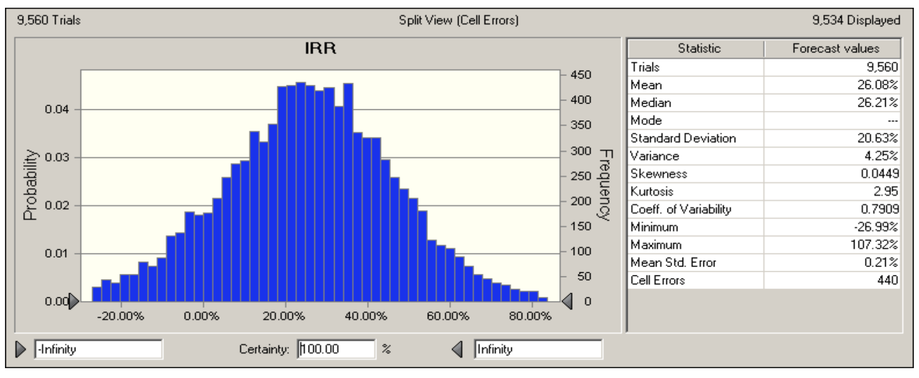
Year	Growth Rate	Cash Flows
0		$ (12,500,000)
1	0	2,000,000
2	46.67%	2,933,333
3	54.44%	4,530,370
4	63.52%	7,407,995
5	74.10%	12,897,684

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





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

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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.

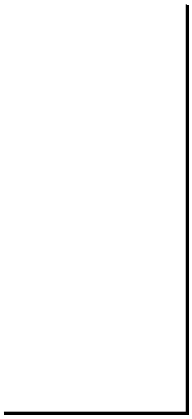
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volatile. We
is
natural gas

	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
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PROBLEM 3-13: Blended Profile Applied, per A

Given					
Purchase Cost (pre-installed) $00(	$ (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 50.00%	Year 1(a) Additional 50.00%	valid til 9/11/04 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
(a) Job Creation and Worker Assistance Act of 2002				100.00%	

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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, 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

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Aircraft B737-700

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

$
= Value give
= Formula/C
= Qualitative
= 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

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