Jiacheng Han AEM 4060

jh995

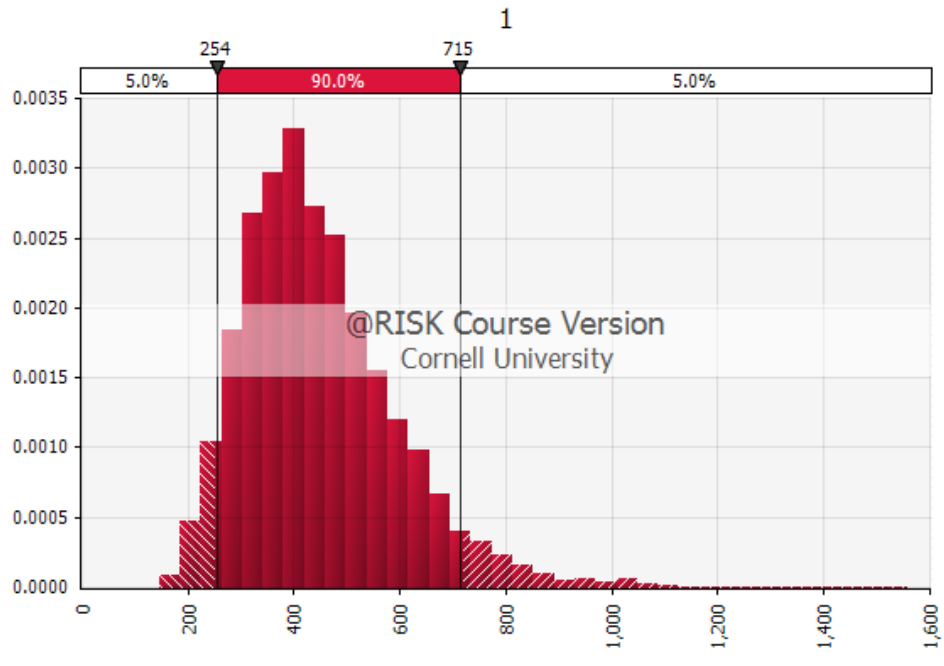
Assignment 3

Part A

1.

$PV_{10} = \frac{A_{10}}{(1+r)^{10}} = \frac{100(1.15)^{10}}{(1.068)^{10}} =$ **$209.54**

2. a)

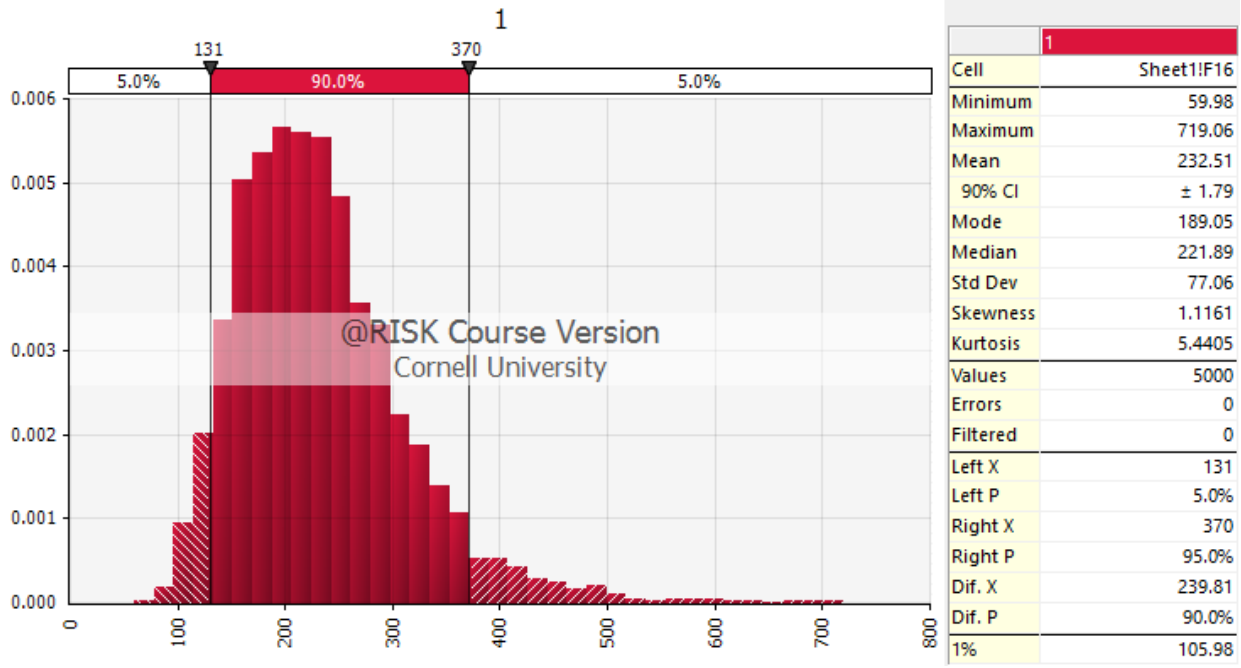


	1
Cell	Sheet1!D16
Minimum	145.19
Maximum	1,558.35
Mean	448.08
90% CI	± 3.39
Mode	401.54
Median	423.78
Std Dev	145.52
Skewness	1.0478
Kurtosis	5.0676
Values	5000
Errors	0
Filtered	0
Left X	254
Left P	5.0%
Right X	715
Right P	95.0%
Dif. X	460.97
Dif. P	90.0%
1%	206.28

Mean: $488.08

Standard Deviation: $145.52

b)

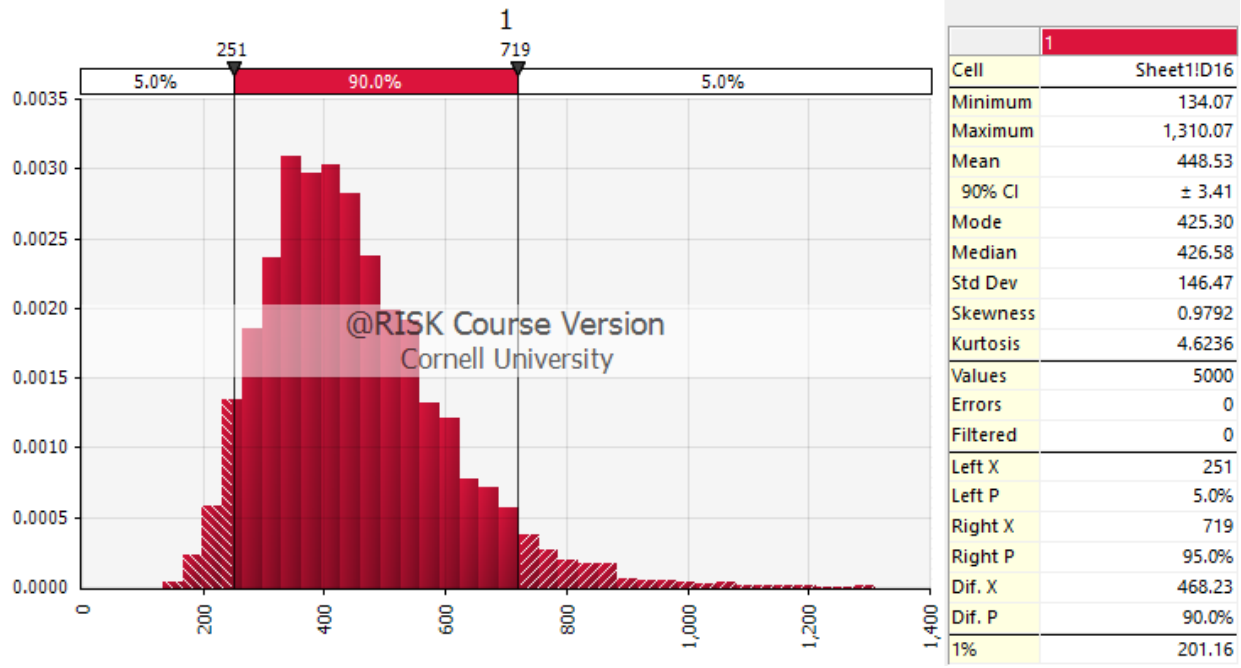


	1
Cell	Sheet1!F16
Minimum	59.98
Maximum	719.06
Mean	232.51
90% CI	± 1.79
Mode	189.05
Median	221.89
Std Dev	77.06
Skewness	1.1161
Kurtosis	5.4405
Values	5000
Errors	0
Filtered	0
Left X	131
Left P	5.0%
Right X	370
Right P	95.0%
Dif. X	239.81
Dif. P	90.0%
1%	105.98

Mean: $232.51

Standard Deviation: $77.06

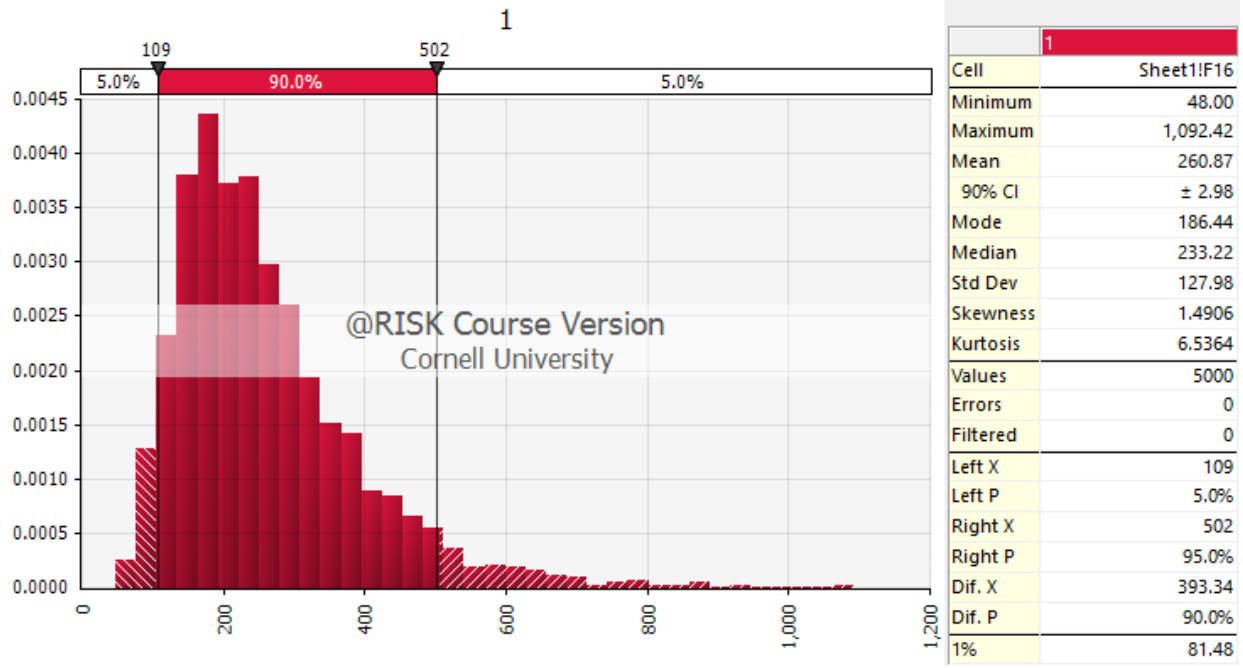
3. c)



	1
Cell	Sheet1!D16
Minimum	134.07
Maximum	1,310.07
Mean	448.53
90% CI	± 3.41
Mode	425.30
Median	426.58
Std Dev	146.47
Skewness	0.9792
Kurtosis	4.6236
Values	5000
Errors	0
Filtered	0
Left X	251
Left P	5.0%
Right X	719
Right P	95.0%
Dif. X	468.23
Dif. P	90.0%
1%	201.16

Mean: $488.53, Standard Deviation: $146.47

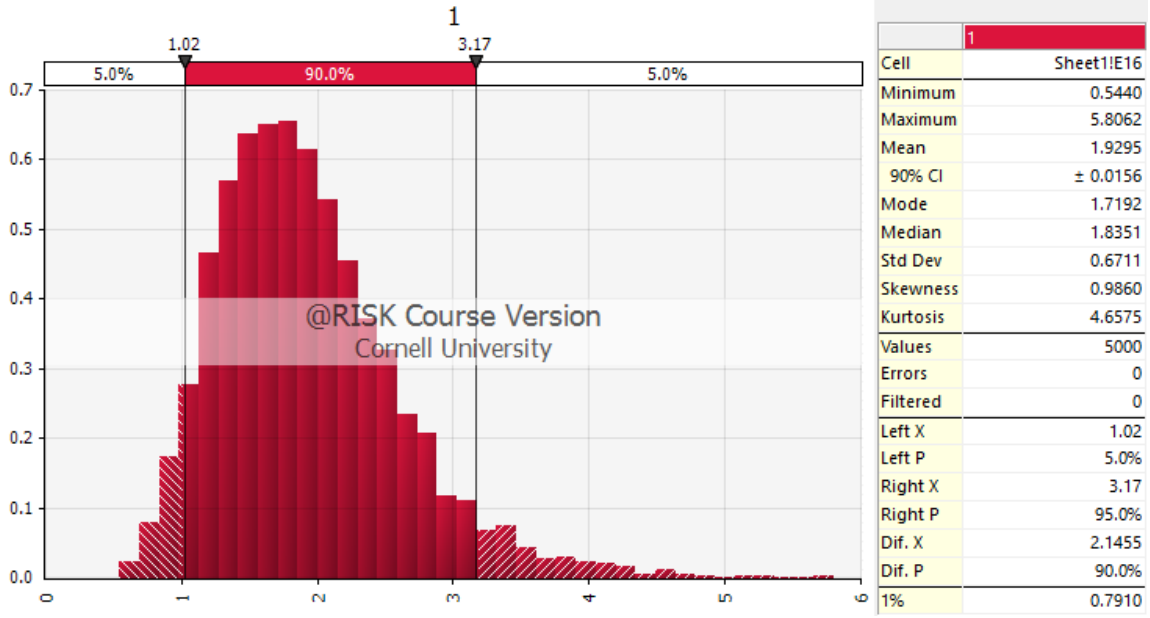
d)



	1
Cell	Sheet1!F16
Minimum	48.00
Maximum	1,092.42
Mean	260.87
90% CI	± 2.98
Mode	186.44
Median	233.22
Std Dev	127.98
Skewness	1.4906
Kurtosis	6.5364
Values	5000
Errors	0
Filtered	0
Left X	109
Left P	5.0%
Right X	502
Right P	95.0%
Dif. X	393.34
Dif. P	90.0%
1%	81.48

Mean: $260.87, Standard Deviation: $127.98

e)

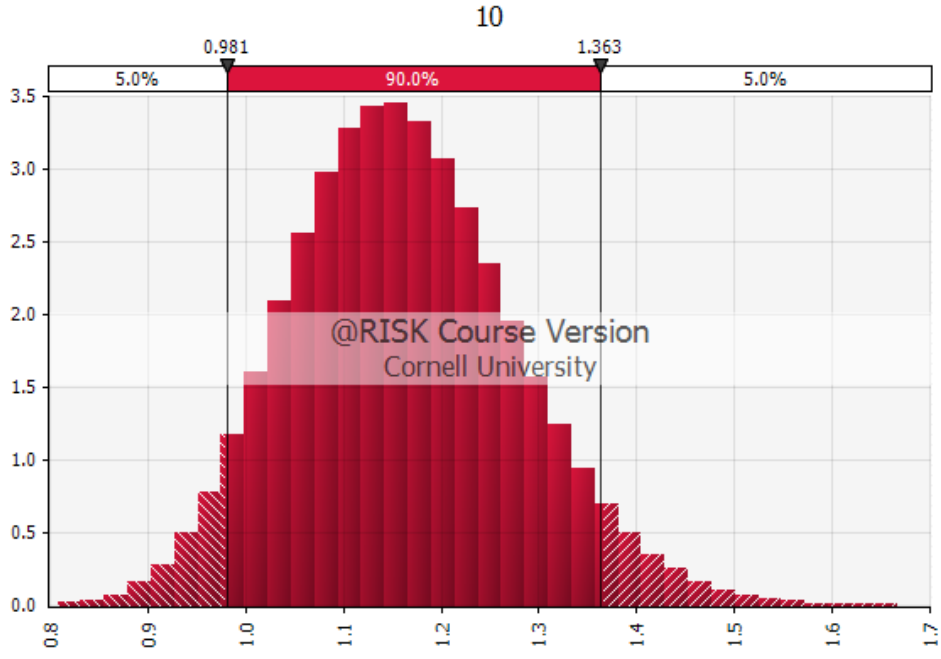


	1
Cell	Sheet1!E16
Minimum	0.5440
Maximum	5.8062
Mean	1.9295
90% CI	± 0.0156
Mode	1.7192
Median	1.8351
Std Dev	0.6711
Skewness	0.9860
Kurtosis	4.6575
Values	5000
Errors	0
Filtered	0
Left X	1.02
Left P	5.0%
Right X	3.17
Right P	95.0%
Dif. X	2.1455
Dif. P	90.0%
1%	0.7910

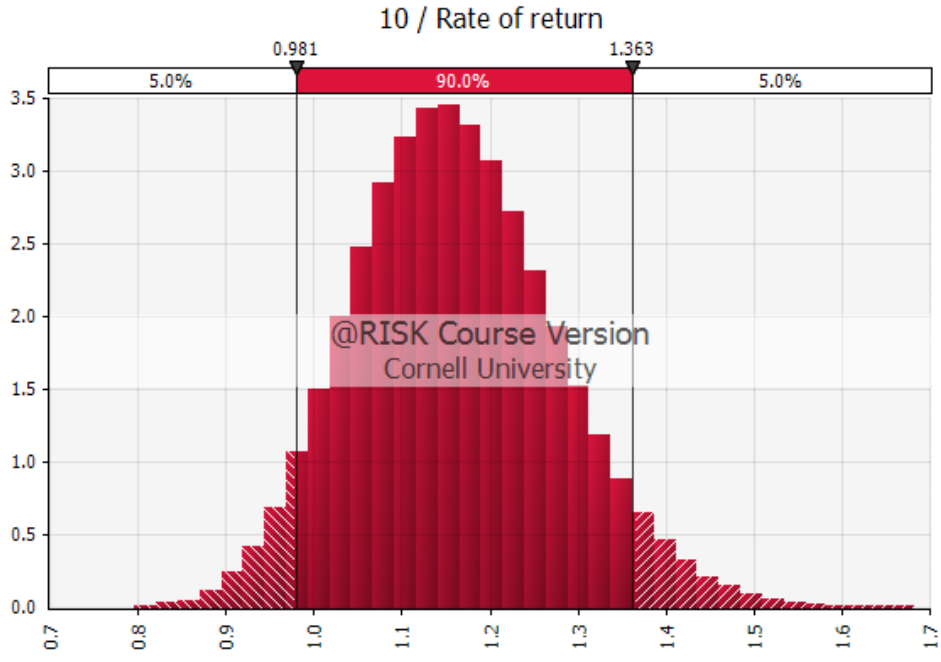
Mean: 1.9295, Standard Deviation: 0.6711

The discount rate has a large standard deviation by year 10, which makes sense with respect to the "yearly" standard deviation of 11.47%. As in, as time passes a non-constant discount rate will a higher standard deviation

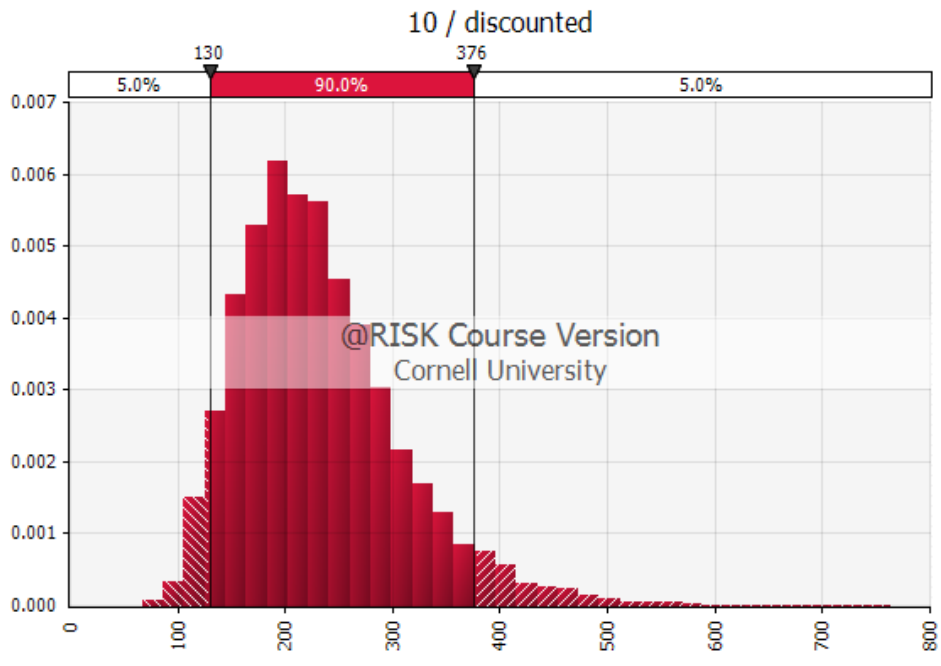
4.



	10
Cell	Sheet1!I16
Minimum	0.80801
Maximum	1.66801
Mean	1.16184
90% CI	± 0.00271
Mode	1.14305
Median	1.15600
Std Dev	0.11646
Skewness	0.3012
Kurtosis	3.1492
Values	5000
Errors	0
Filtered	0
Left X	0.981
Left P	5.0%
Right X	1.363
Right P	95.0%
Dif. X	0.38209
Dif. P	90.0%
1%	0.91543



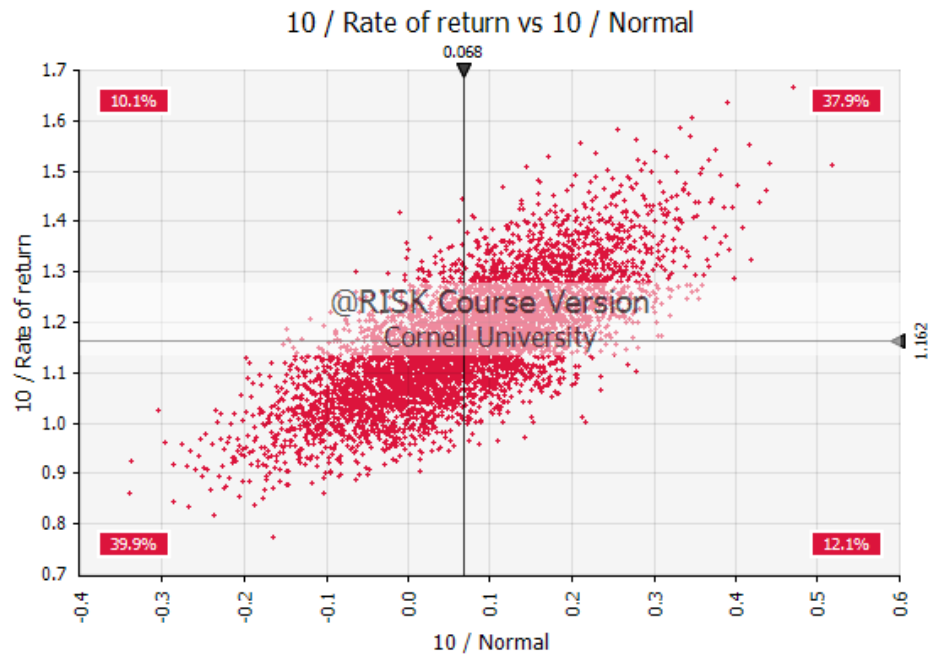
	10 / Rate of return
Cell	Sheet1!C25
Minimum	0.79647
Maximum	1.68204
Mean	1.16184
90% CI	± 0.00271
Mode	1.15170
Median	1.15603
Std Dev	0.11648
Skewness	0.3022
Kurtosis	3.1583
Values	5000
Errors	0
Filtered	0
Left X	0.981
Left P	5.0%
Right X	1.363
Right P	95.0%
Dif. X	0.38203
Dif. P	90.0%
1%	0.91567



	10 / discounted
Cell	Sheet1!E25
Minimum	67.13
Maximum	763.45
Mean	232.17
90% CI	± 1.76
Mode	194.56
Median	220.86
Std Dev	75.77
Skewness	1.0660
Kurtosis	5.0682
Values	5000
Errors	0
Filtered	0
Left X	130
Left P	5.0%
Right X	376
Right P	95.0%
Dif. X	245.58
Dif. P	90.0%
1%	107.66

The first two graphs of this problem show that the rate of return is not noticeably affected by the correlation. The standard deviation of PV is similar to that of parts 1 and 2, where the discount rate were not random. Part 3 has a larger standard deviation due to randomness.

5.



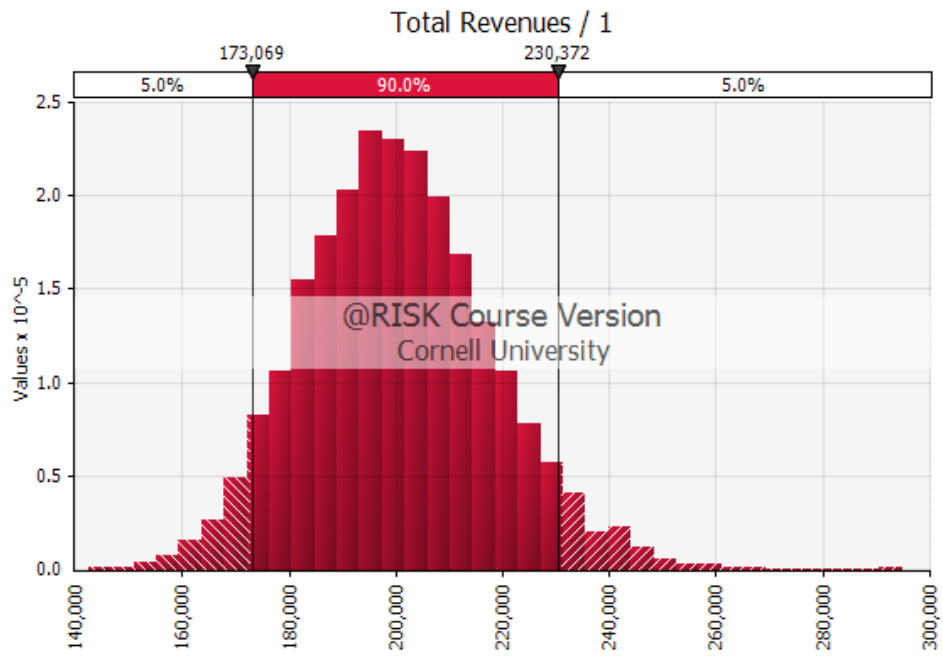
	10 / Rate of return vs 10 / Normal
Cell	Sheet1!C25
X Mean	0.06801
X Std Dev	0.11471
Y Mean	1.16183
Y Std Dev	0.11648
Corr. (Pearson)	0.7456
Corr. (Rank)	0.7341
Delimiter X	0.06801
Delimiter Y	1.16183
Quadrant I	37.9%
Quadrant II	10.1%
Quadrant III	39.9%
Quadrant IV	12.1%

From the graph and table above, the correlation is around 75%. This is true for every year.

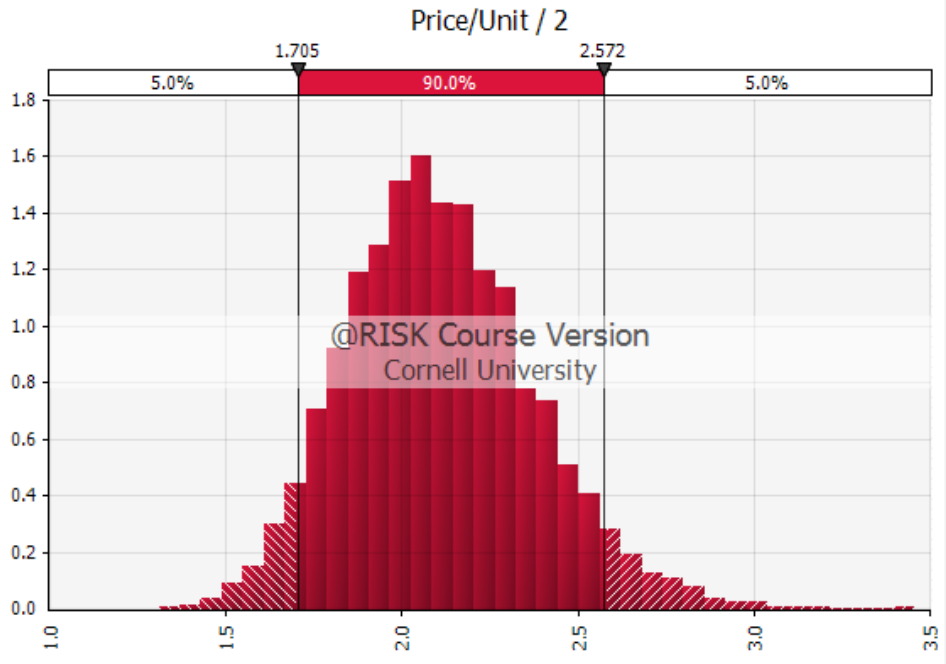
Part B

A)

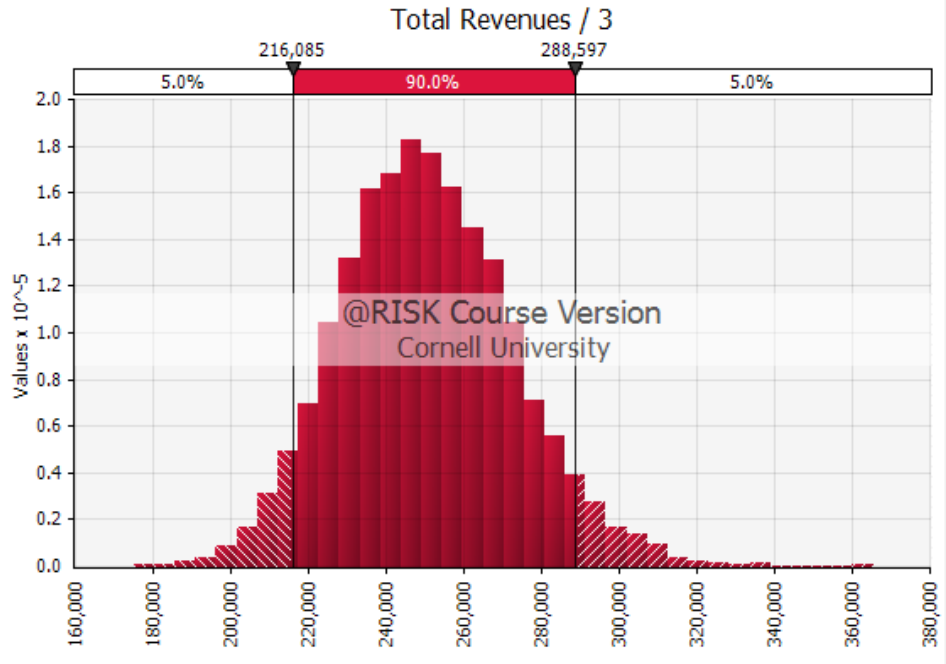
	Mean	Standard Deviation
Year 1 Sales Revenue	$200,444.44	$ 17,533.02
Year 2 Sales Price	$ 2.11	$ 0.27
Year 3 Sales Revenue	$250,588.62	$ 22,347.70
Year 4 Operating Costs	$165,782.09	$ 16,034.53
Terminal Cash Flows	$ 90,014.99	$ 8,867.25
Year 4 Terminal Cash Flows	$ 36,874.90	$ 6,549.24
Net Present Value	$ 39,933.50	$ 19,486.99
IRR	17.042%	3.345%
Payback	2.8773	0.1946



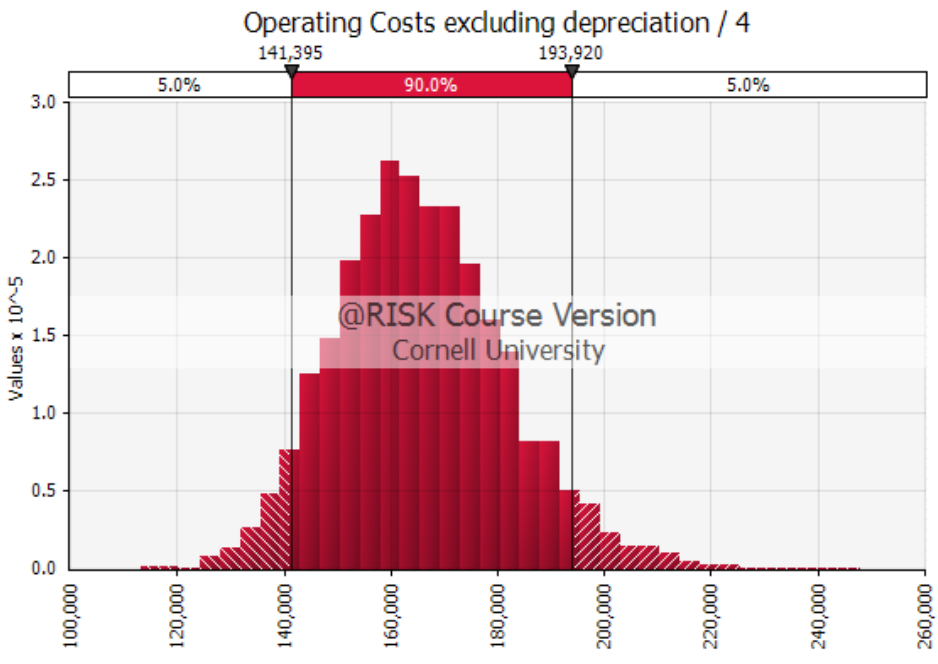
	Total Revenues / 1
Cell	Sheet1!C11
Minimum	142,468.23
Maximum	294,889.18
Mean	200,438.38
90% CI	± 406.17
Mode	199,440.67
Median	199,567.06
Std Dev	17,457.73
Skewness	0.2751
Kurtosis	3.2181
Values	5000
Errors	0
Filtered	0
Left X	173,069
Left P	5.0%
Right X	230,372
Right P	95.0%
Dif. X	57,302.52
Dif. P	90.0%
1%	162,395.51



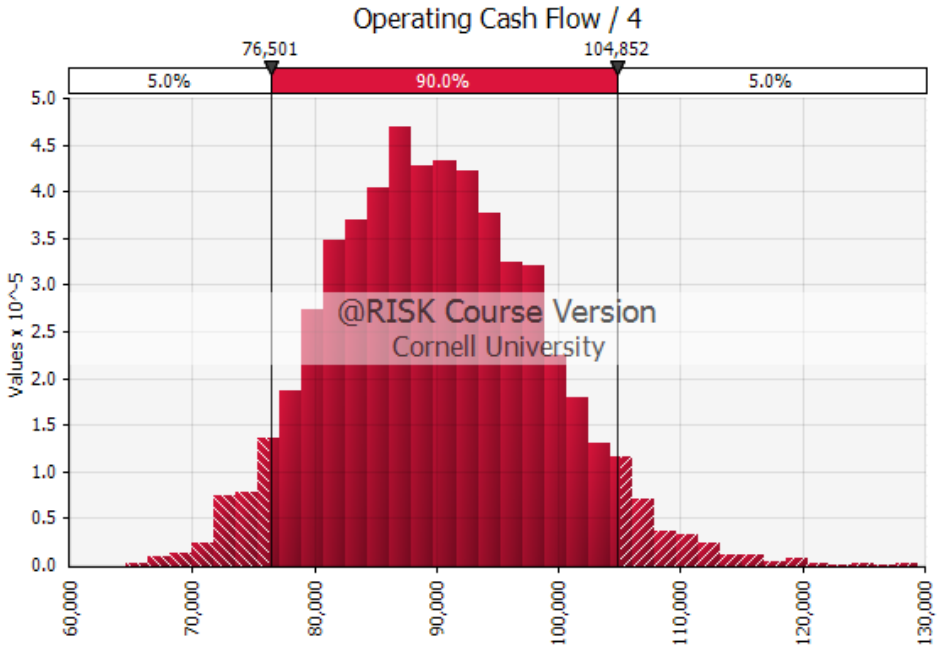
	Price/Unit / 2
Cell	Sheet1!D10
Minimum	1.3101
Maximum	3.4579
Mean	2.1101
90% CI	± 0.00618
Mode	2.0629
Median	2.0906
Std Dev	0.2658
Skewness	0.3865
Kurtosis	3.2679
Values	5000
Errors	0
Filtered	0
Left X	1.705
Left P	5.0%
Right X	2.572
Right P	95.0%
Dif. X	0.8671
Dif. P	90.0%
1%	1.5619



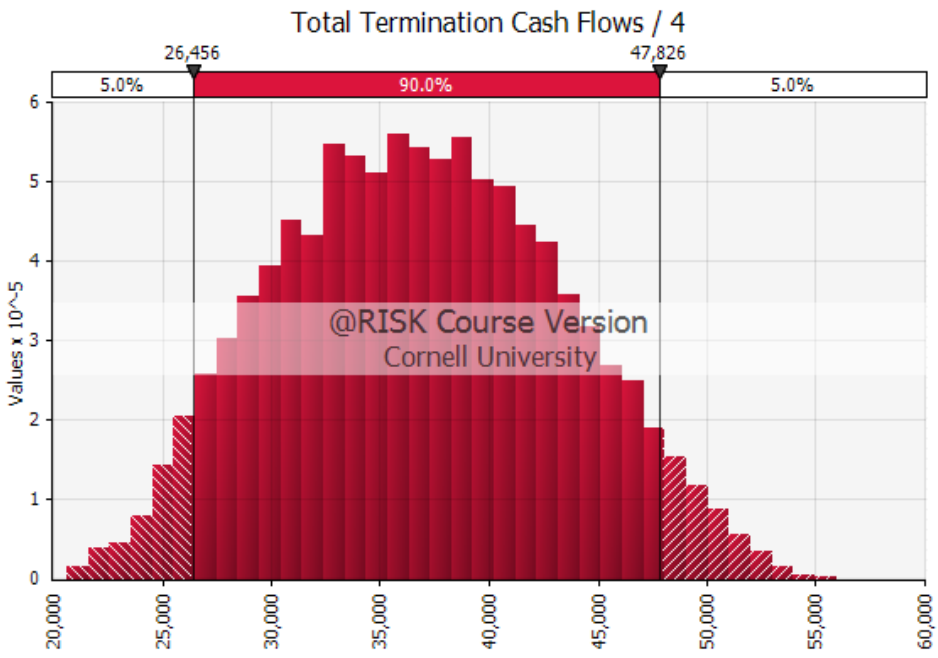
	Total Revenues / 3
Cell	Sheet1!E11
Minimum	175,110.46
Maximum	365,474.24
Mean	250,577.99
90% CI	± 517.04
Mode	251,368.40
Median	249,593.18
Std Dev	22,222.76
Skewness	0.2779
Kurtosis	3.2265
Values	5000
Errors	0
Filtered	0
Left X	216,085
Left P	5.0%
Right X	288,597
Right P	95.0%
Dif. X	72,512.23
Dif. P	90.0%
1%	202,465.56



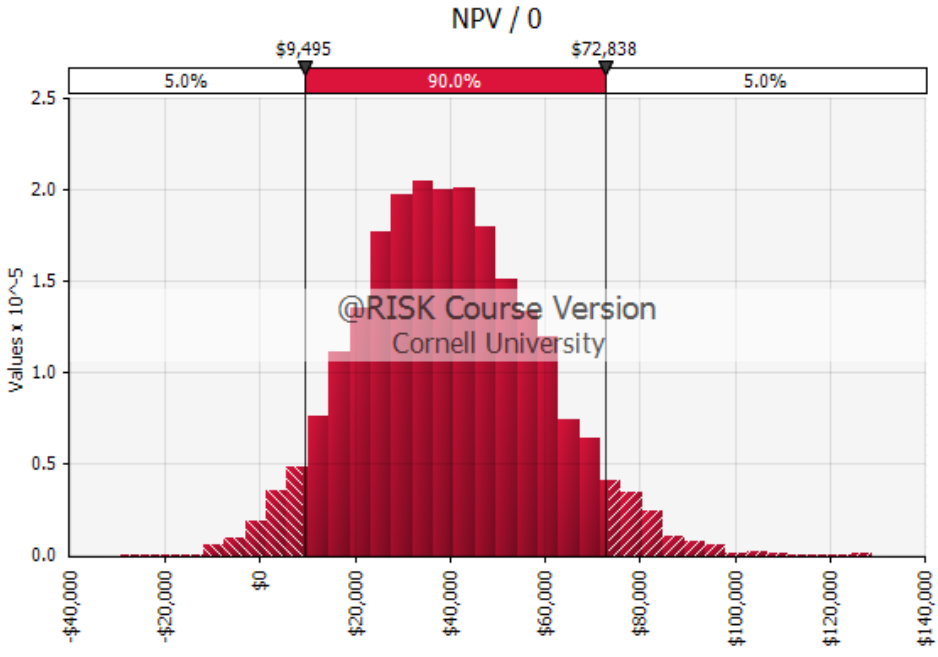
	Operating Costs excluding depreciation / 4
Cell	Sheet1!F12
Minimum	113,138.86
Maximum	247,882.19
Mean	165,782.09
90% CI	± 373.06
Mode	165,421.26
Median	164,911.19
Std Dev	16,034.53
Skewness	0.3575
Kurtosis	3.3176
Values	5000
Errors	0
Filtered	0
Left X	141,395
Left P	5.0%
Right X	193,920
Right P	95.0%
Dif. X	52,524.77
Dif. P	90.0%



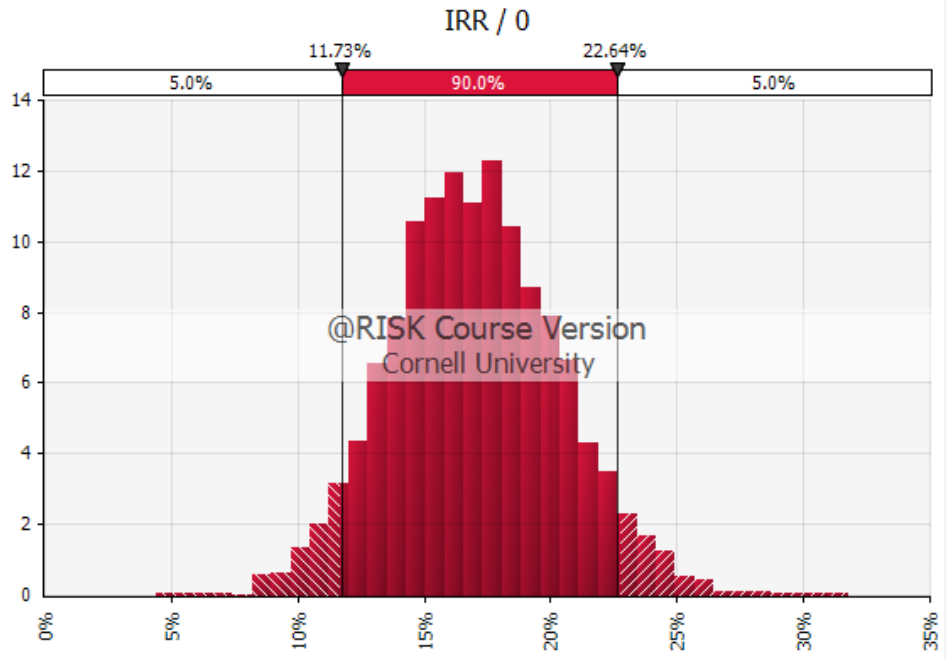
	Operating Cash Flow / 4
Cell	Sheet1!F19
Minimum	64,559.27
Maximum	129,493.36
Mean	89,997.72
90% CI	± 201.88
Mode	90,650.14
Median	89,614.54
Std Dev	8,676.90
Skewness	0.2824
Kurtosis	3.0993
Values	5000
Errors	0
Filtered	0
Left X	76,501
Left P	5.0%
Right X	104,852
Right P	95.0%
Dif. X	28,351.51
Dif. P	90.0%



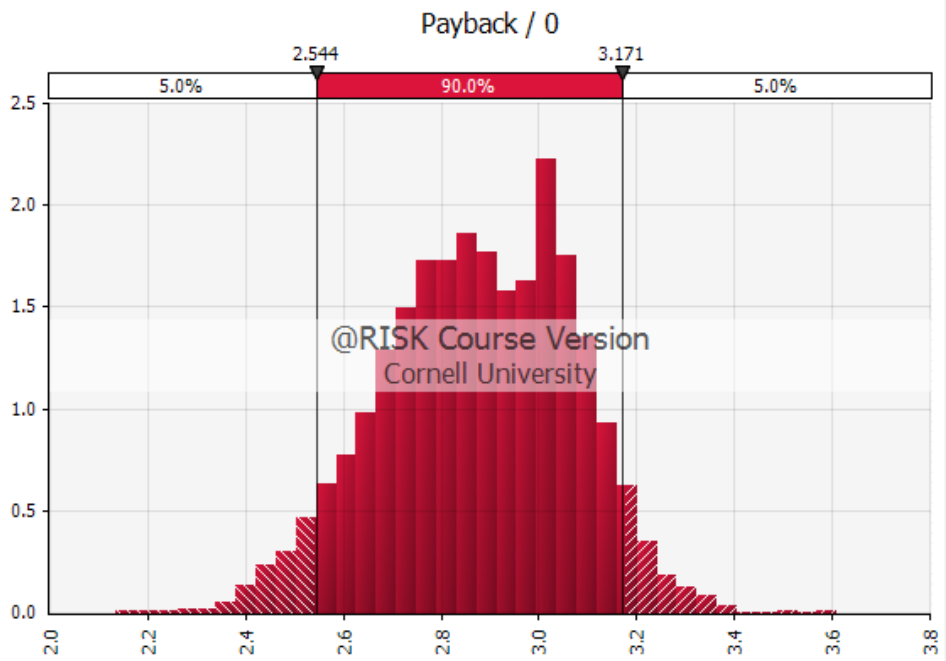
	Total Termination Cash Flows / 4
Cell	Sheet1!F24
Minimum	20,630.64
Maximum	55,931.54
Mean	36,875.05
90% CI	± 151.52
Mode	35,206.93
Median	36,712.79
Std Dev	6,512.53
Skewness	0.0946
Kurtosis	2.4050
Values	5000
Errors	0
Filtered	0
Left X	26,456
Left P	5.0%
Right X	47,826
Right P	95.0%
Dif. X	21,370.43
Dif. P	90.0%



	NPV / 0
Cell	Sheet1!B30
Minimum	-$29,511.03
Maximum	$128,954.90
Mean	$39,923.52
90% CI	± $449.59
Mode	$44,865.75
Median	$38,870.53
Std Dev	$19,324.04
Skewness	0.2500
Kurtosis	3.1432
Values	5000
Errors	0
Filtered	0
Left X	$9,495
Left P	5.0%
Right X	$72,838
Right P	95.0%
Dif. X	$63,343.57
Dif. P	90.0%
1%	-$1,395.71

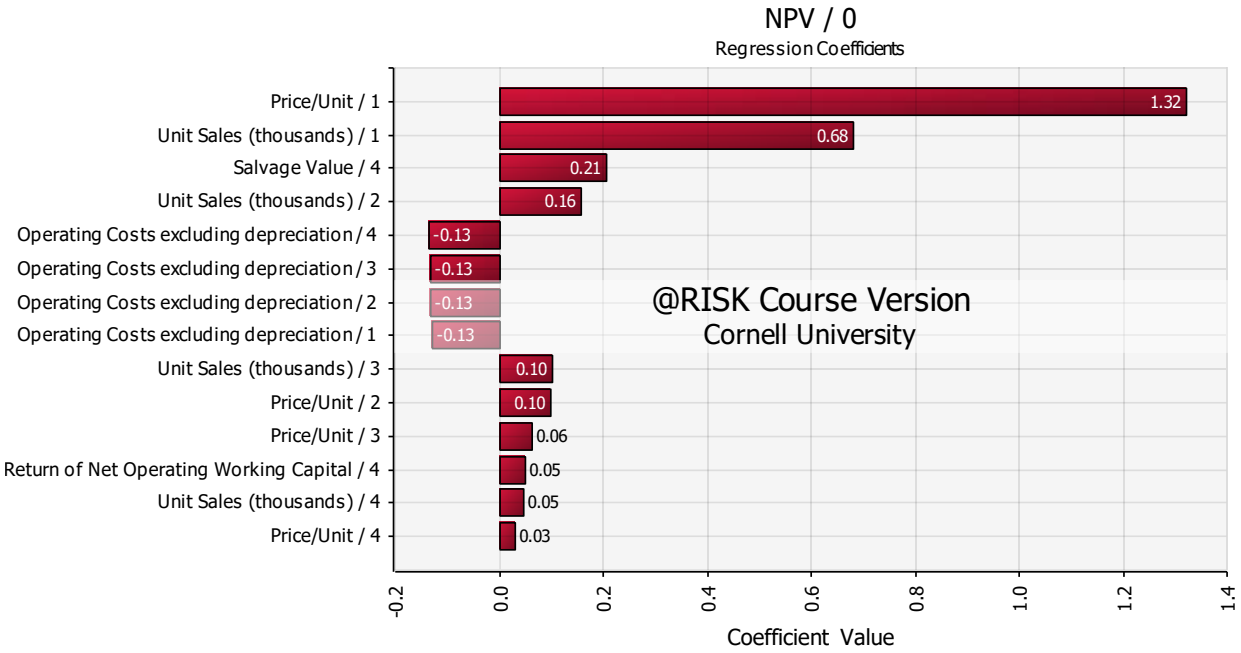


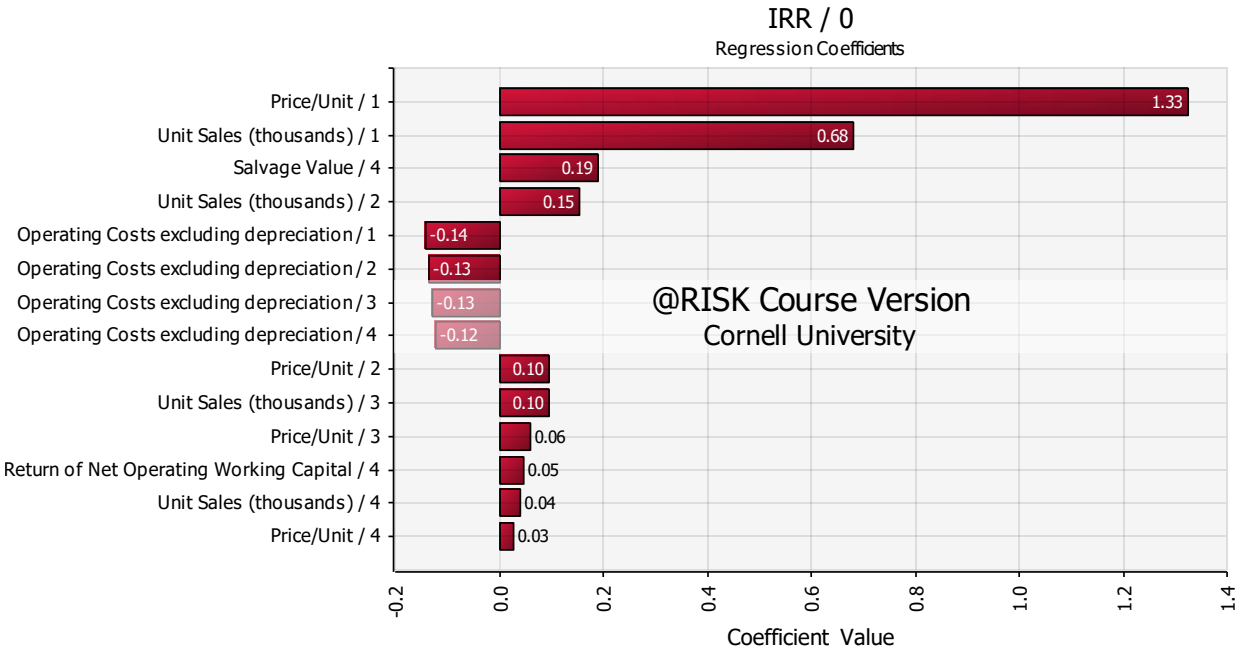
	IRR / 0
Cell	Sheet1!B31
Minimum	4.403%
Maximum	31.777%
Mean	17.042%
90% CI	± 0.0772%
Mode	16.392%
Median	16.930%
Std Dev	3.319%
Skewness	0.1661
Kurtosis	3.0859
Values	5000
Errors	0
Filtered	0
Left X	11.73%
Left P	5.0%
Right X	22.64%
Right P	95.0%
Dif. X	10.908%
Dif. P	90.0%
1%	9.740%

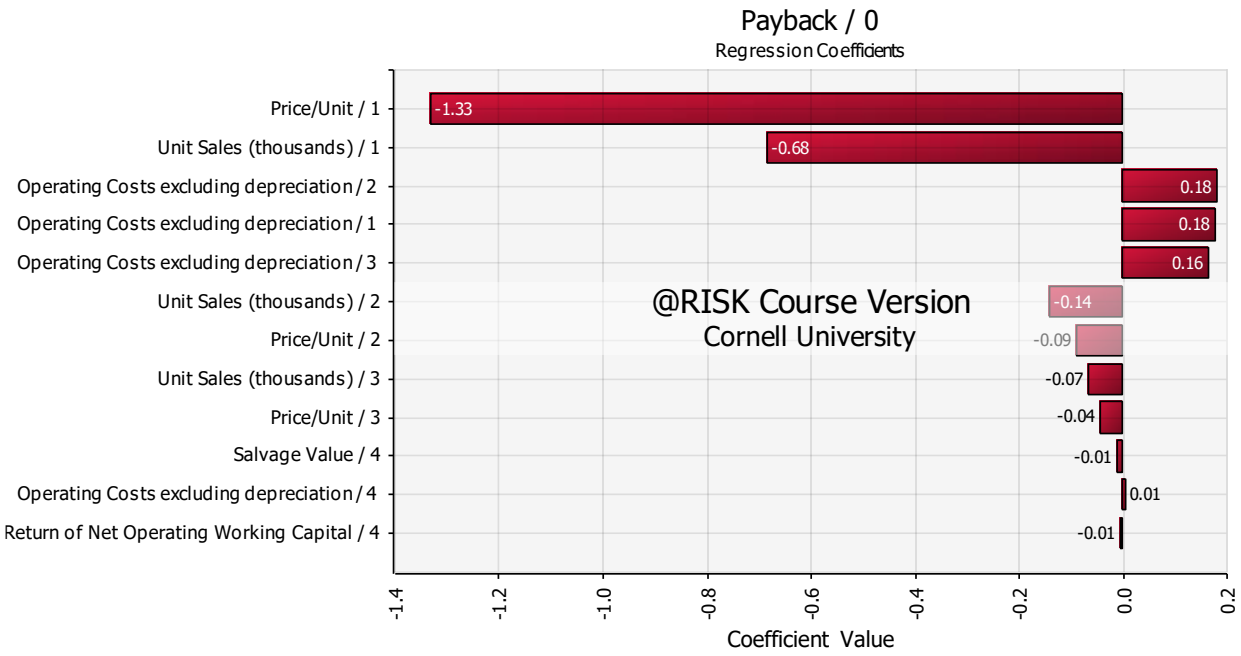


	Payback / 0
Cell	Sheet1!B32
Minimum	2.1350
Maximum	3.6112
Mean	2.8774
90% CI	± 0.00452
Mode	3.0094
Median	2.8835
Std Dev	0.1942
Skewness	-0.2039
Kurtosis	2.7259
Values	5000
Errors	0
Filtered	0
Left X	2.544
Left P	5.0%
Right X	3.171
Right P	95.0%
Dif. X	0.6271
Dif. P	90.0%
1%	2.4227

B)

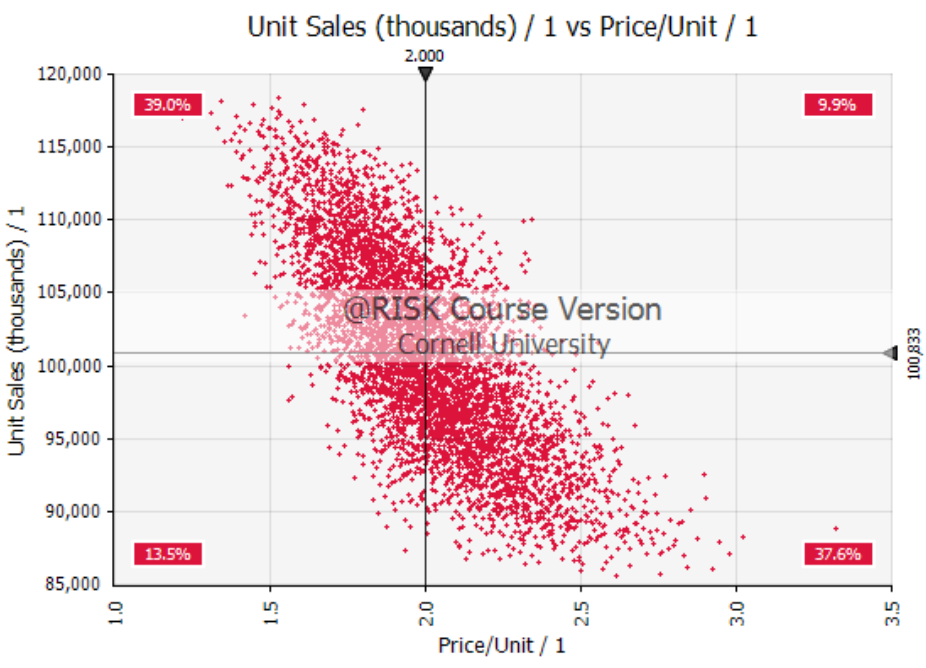

NPV / 0
Regression Coefficients
Price/Unit / 1
Unit Sales (thousands) / 1
Salvage Value / 4
Unit Sales (thousands) / 2
Operating Costs excluding depreciation / 4
Operating Costs excluding depreciation / 3
Operating Costs excluding depreciation / 2
Operating Costs excluding depreciation / 1
Unit Sales (thousands) / 3
Price/Unit / 2
Price/Unit / 3
Return of Net Operating Working Capital / 4
Unit Sales (thousands) / 4
Price/Unit / 4
1.32
0.68
0.21
0.16
-0.13
-0.13
-0.13
-0.13
0.10
0.10
0.06
0.05
0.05
0.03
@RISK Course Version
Cornell University
-0.2
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
Coefficient Value


IRR / 0
Regression Coefficients
Price/Unit / 1
Unit Sales (thousands) / 1
Salvage Value / 4
Unit Sales (thousands) / 2
Operating Costs excluding depreciation / 1
Operating Costs excluding depreciation / 2
Operating Costs excluding depreciation / 3
Operating Costs excluding depreciation / 4
Price/Unit / 2
Unit Sales (thousands) / 3
Price/Unit / 3
Return of Net Operating Working Capital / 4
Unit Sales (thousands) / 4
Price/Unit / 4
1.33
0.68
0.19
0.15
-0.14
-0.13
-0.13
-0.12
0.10
0.10
0.06
0.05
0.04
0.03
@RISK Course Version
Cornell University
-0.2
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
Coefficient Value

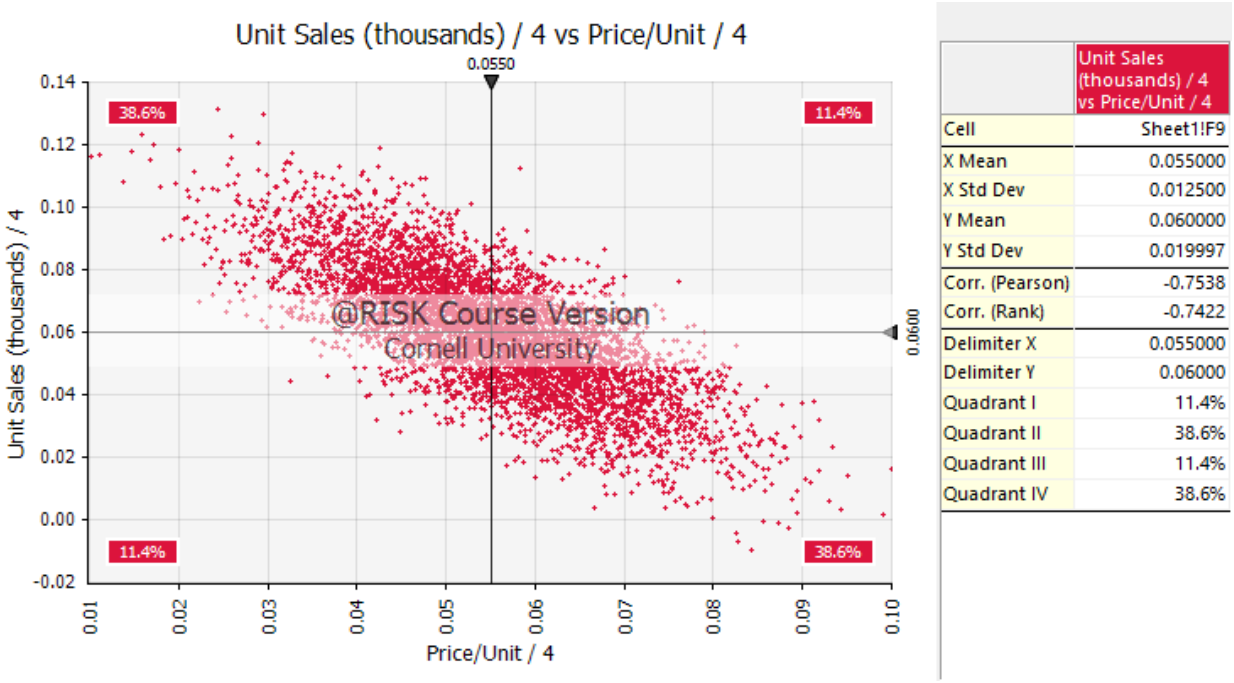


Tornado Graphs show how much the output changes if an input is changed by one standard deviation. With all 3 graphs, Price/Unit and Unit Sales inputs contribute most to the variability of the outcome. However, NPV and IRR have a positive correlation with those inputs, while payback has a negative correlation. The other inputs are not as influential as Price/Unit and Unit Sales inputs.

C)



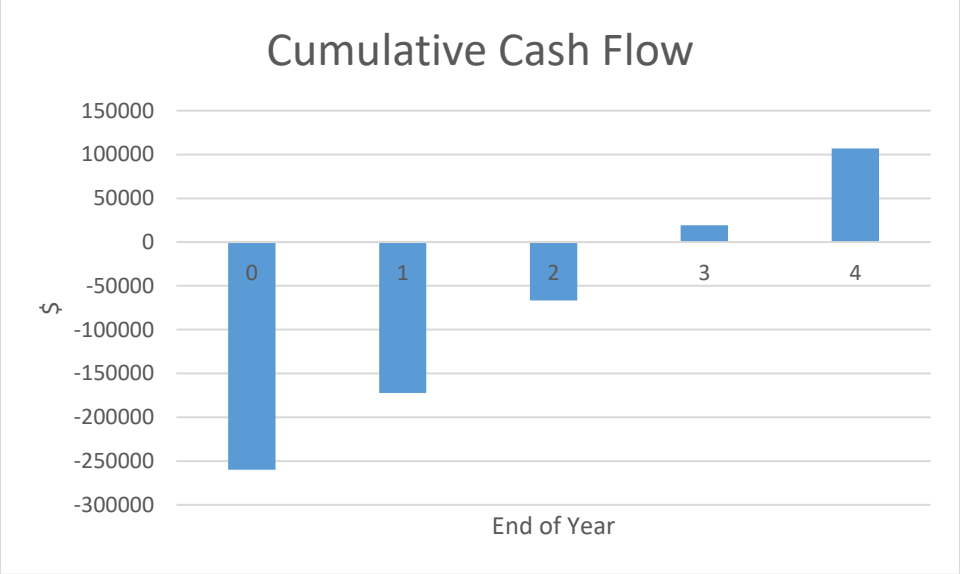
	Unit Sales (thousands) / 1 vs Price/Unit / 1
Cell	Sheet1!C9
X Mean	2.00001
X Std Dev	0.25014
Y Mean	100,833.23
Y Std Dev	6,584.80
Corr. (Pearson)	-0.7463
Corr. (Rank)	-0.7377
Delimiter X	2.0000
Delimiter Y	100,833.23
Quadrant I	9.9%
Quadrant II	39.0%
Quadrant III	13.5%
Quadrant IV	37.6%



	Unit Sales (thousands) / 4 vs Price/Unit / 4
Cell	Sheet1!F9
X Mean	0.055000
X Std Dev	0.012500
Y Mean	0.060000
Y Std Dev	0.019997
Corr. (Pearson)	-0.7538
Corr. (Rank)	-0.7422
Delimiter X	0.055000
Delimiter Y	0.06000
Quadrant I	11.4%
Quadrant II	38.6%
Quadrant III	11.4%
Quadrant IV	38.6%

The above scatterplots do match correlation (-0.75) between the two model inputs. The scatterplots indicate that as price per unit increases, unit sales decrease, thus having a negative correlation.

D)



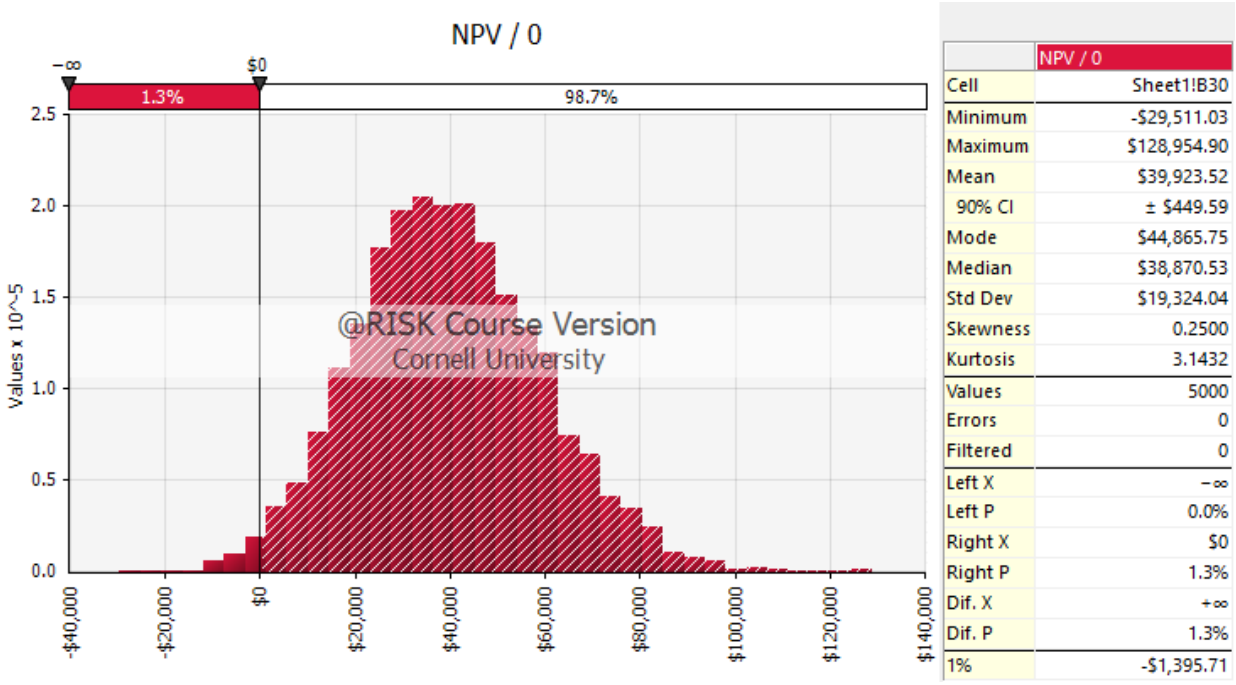
This graph shows that the payback rate is somewhere between 2 and 3 years on average, which is consistent to the payback distribution we calculated earlier.

E)

Based on the CV, I would say the project should be classified as average to low risk, since you do get above a dollar of return per dollar. The type of risk being measured is how likely you will get a positive return on investment from the project.

F)

NPV is the PV of future revenues minus the PV of future costs. Thus, having a higher NPV would mean the project is worth investing. IRR is similar in that a higher IRR means a greater net cash flow. Generally an IRR percentage higher than the cost of capital would signify a promising project. For payback time, the shorter time the better. In the case of Allied's, the NPV between 1.25 and 1.75 means the project has positive returns. The IRR mean of 17% is higher than the WACC of 10%. The payback time is also less than 3 years. Keeping in mind the nature of probabilities and the possibility that NPV<0, where the discount rate is greater than NPV, there is risk involved. But from the NPV distribution, the likelihood of a negative NPV is low (around 1.3%).



	NPV / 0
Cell	Sheet1!B30
Minimum	-$29,511.03
Maximum	$128,954.90
Mean	$39,923.52
90% CI	± $449.59
Mode	$44,865.75
Median	$38,870.53
Std Dev	$19,324.04
Skewness	0.2500
Kurtosis	3.1432
Values	5000
Errors	0
Filtered	0
Left X	−∞
Left P	0.0%
Right X	$0
Right P	1.3%
Dif. X	+∞
Dif. P	1.3%
1%	-$1,395.71