



ECONOMIC ANALYSIS FOR A CONSTRUCTION CORPORATION

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OBJECTIVE

What should be made by a construction corporation on a plot of land in the city of Boston, Massachusetts to maximize their earnings?

The three alternatives that the managers came up with are:

- Residential Buildings
- Mall
- Hotel



CASH FLOWS

- The cost of land is a cash flow that will occur in all the alternatives. Thus, we will ignore it for our economic analysis.
- The costs for constructing a building are the same. These costs are:
 - Plumbing
 - Flooring
 - Foundation
 - Roofing
 - Wiring
 - Carpentry
 - Heating & Cooling Systems



ALTERNATIVE-A: Residential Buildings

Initial Investment:

- It comprise of four 20-story high buildings.
- The construction cost per apartment includes the cost of materials, labor, machines, and contractor which amounts to \$635,000.
- Thus, the total cost for building 4 such buildings amounts to \$711.2 million.

ALTERNATIVE-A: Residential Buildings

Annual Cost:

	Monthly Costs (per building)	Annual Cost (per building)
Salaries & Personnel	= \$20 (/hr) * 8 hrs * 3 shifts * 30 days = \$14,400	\$172,800
Repair & Maintenance	\$2000	\$48,000
Utilities	= \$4000 (per floor) * 20 = \$80,000	\$960,000
Insurance	\$10,000	\$120,000
Management Fees	= \$35 (per hr) * 8 hrs * 10 * 30 days = \$84,000	\$1,008,000



ALTERNATIVE-A: Residential Buildings

Annual Cost:

- For Marketing: The initial cost is assumed to be \$8,000 per month.
- Assuming that for the first 2 years, marketing is going to be 100% of the initial cost.
- The marketing cost would decrease in the future.
- The marketing rate is assumed to be fixed at 70% of the initial cost from year-3 onwards. The Annual cost (per building) for marketing = $\$8,000 * 12 = \$96,000$.



ALTERNATIVE-A: Residential Buildings

Annual Revenue:

- All the apartments are leased on a yearly basis.
- The rent for each apartment is \$5600 per month. Thus the ideal total Annual revenue amounts to:
 - $\$5600 * 14 \text{ apartments (per floor)} * 20 \text{ floors} * 4 \text{ buildings} * 12 \text{ months}$
= \$ 75,264,000.
- We take the occupancy rate into account to calculate the total annual revenue.
- Assume that for the first 2 years, the occupancy rate is 50% and 70% respectively, and for the subsequent years, the occupancy rate is assumed to be 100%



ALTERNATIVE-B: Mall Construction

Mall

90,000 sqft. X 3 Floor → 270,000 sqft Mall Area

33.33% Public Area → 180,000 sqft. Pure Store Area

Garage

90,000 sqft Basement Garage



ALTERNATIVE-B: Mall

Initial Investment:

Mall

$$27,000 \text{ sqft.} \times (\$200(\text{M}) + \$250(\text{L})) = \$121,500,000$$

Garage

$$90,000 \text{ sqft.} \times (\$30(\text{M}) + \$30(\text{L})) = \$5,400,000$$

Total Initial Investment of Mall Project: $\$121,500,000 + \$5,400,000 = \$126,900,000$

ALTERNATIVE-B: Mall

Regulation: Area of Store

Unit Store Area: 2000 SF

1 Unit: GameStop, Fossil

2 Unit: Tiffany & Co., Foot Locker

3+ Unit : Under Armour, Victoria's Secret

West Marine 10,200	Pier 1 Imports 9,800	Dollar Tree 9,700	Dollar General 9,100
Dollarama 10,000	Victoria's Secret 8,100	Famous Footwear 6,600	Under Armour 6,400
Dressbarn 8,100	Hollister 6,100	Skechers 4,500	Foot Locker 4,000
Gap 9,900	Five Below 7,600	Men's Wearhouse 5,300	Lululemon Athletica 3,100
Coach 3,000	Tiffany & Co. 4,200	Journeys 1,900	Genesco 1,700
Signet Jewelers 2,100	Fossil 1,700	GameStop 1,600	Claire's Stores 1,000



ALTERNATIVE-B: Mall

Revenue

Number of Unit Stores:

$$18,000 \text{ sqft.} / 2000 = 90 \text{ Unit Stores}$$

Revenue from Mall:

$$\$2,000 \text{ sqft.} \times \$50/\text{sqft/month} \times 90 \text{ Unit Stores} = \$108,000,000$$

Revenue from Garage:

$$\$100,000 * 12 = \$1,200,000$$

Total Annual Revenue: $\$9,000,000 + \$1,200,000 = \$109,200,000$



ALTERNATIVE-B: Mall

Cost & BTCF

Utility: $(270,000 * 33.33\%) * \$80 + 90,000 * \$1.6 =$
\$7,344,000

Salary of Personnel: $[(4 + 1) * 3 + 2] * \$5000 = \$85,000$

Repair & Maintenance: \$10,000

Management Fee: $3 * \$7000 = \$21,000$

Insurance: \$30,000

Annual Cost : $\$7,490,000 * 12 = \$89,880,000$

TOTAL Mall Project BTCF: $\$109,200,000 - \$89,880,000 = \$19,320,000$



ALTERNATIVE-C: HOTEL

The hotel is a 20-story building, 200 rooms in total with a pool, restaurant, and 4 conference halls. The building occupies about 70% of the land, which is 70,000 square feet. The rest of the area is assigned for parking and garden.



ALTERNATIVE-C: HOTEL

Initial costs

- The total initial cost for construction is \$114,600,000.00 considering the following factors (amount per floor):
 - Cost of Materials = \$1,900,000
 - Cost of Labor = \$1,600,000
 - Cost of Machines = \$970,000
 - Cost for Contractor = \$1,260,000
 - Thus, initial cost (per floor) = \$5,730,000



ALTERNATIVE-C: HOTEL O&M / REVENUE

- Monthly wages totals to \$250,650
- O&M cost on average \$200,000/month (considering peak and off seasons)
- Total expenses including insurance, marketing \$7,207,800 Annually
- Total revenue per year reach up to \$22,500,000 and a net revenue of \$15,292,200



PLANNING HORIZON

- The initial investment is very high for the project.
- The discounted payback period would be around 20 years.
- So for the corporation to make profits, the planning horizon should be greater than 20 years.
- Thus, the planning horizon is assumed to be 30 years.



REGRESSION MODEL

- The two types of regression model we have used are Linear & Exponential Regression.

For Residential Buildings

- Exponential Regression:

$$\text{Rent: } Y = a * b^X,$$

where $X = t - 1$

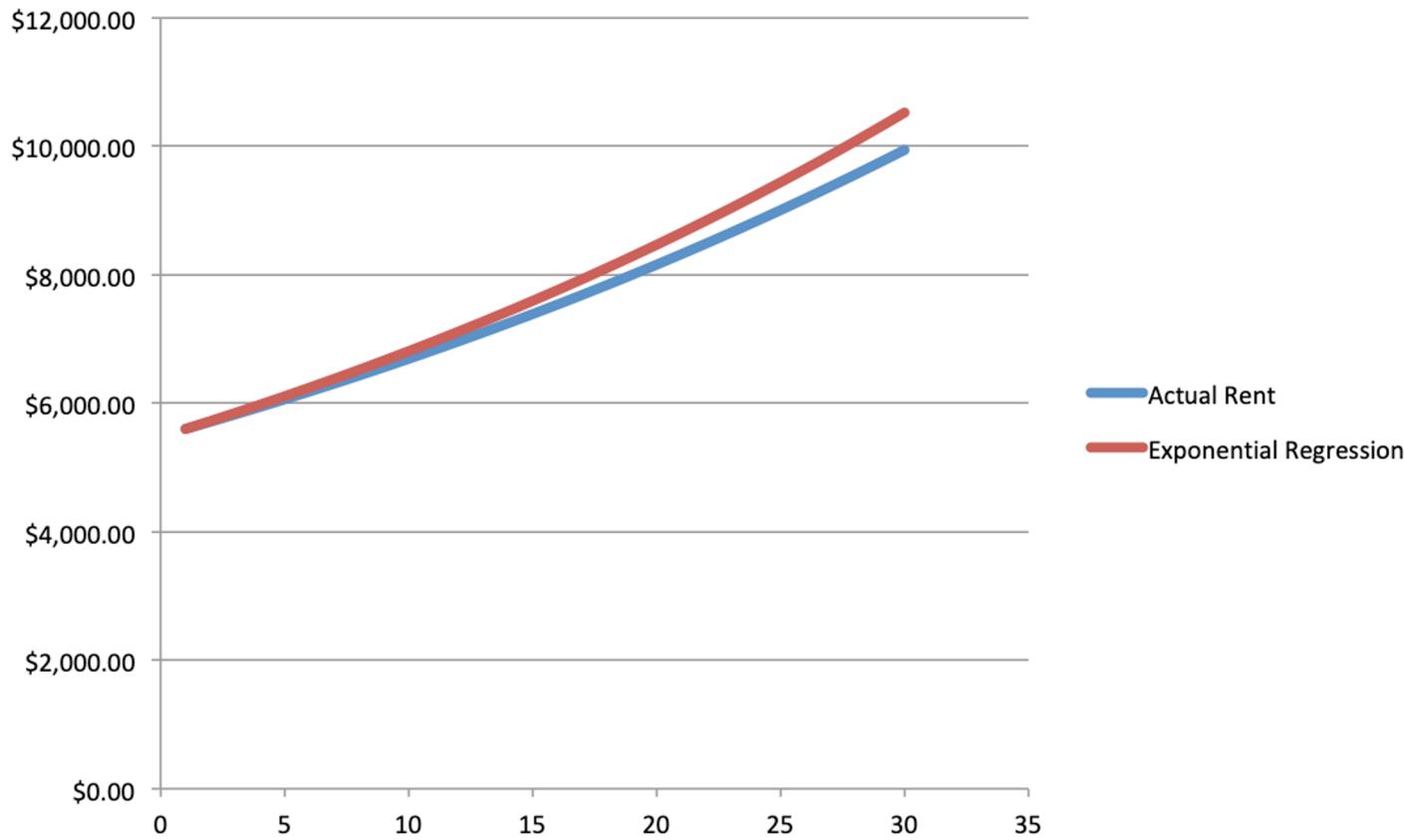
Y

= rent for next year

a

= rent for year-1

Exponential Regression: Rent





REGRESSION MODEL

- Linear regression:

Rent: $Y = a + b \cdot X$,

where $X = t -$

1

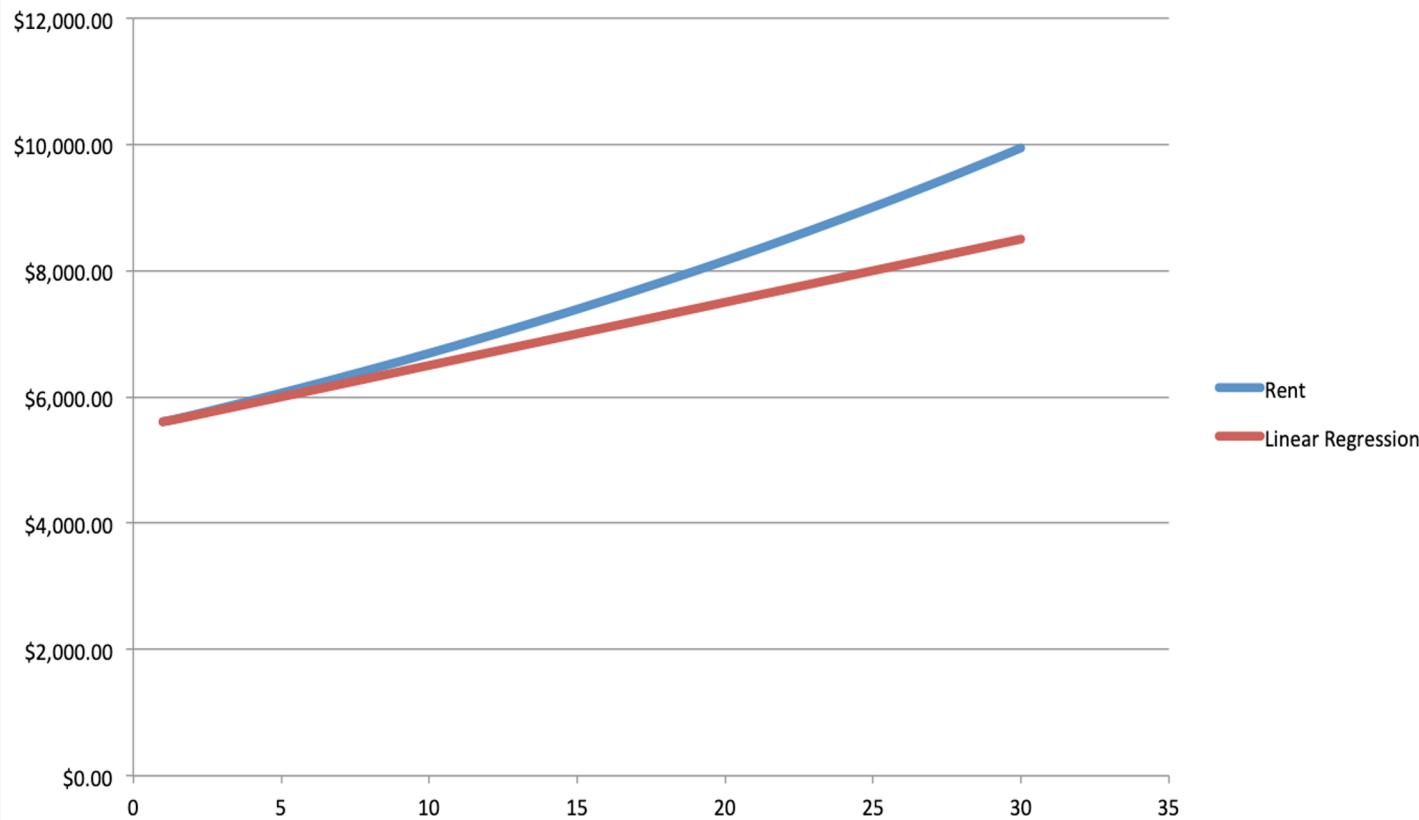
Y = rent for next year

a = rent for year-1

b = Increase per year

$= \$100$

Linear Regression: Rent





WACC Percentage

The different resources used are:

- Loan 30%
- Common Stock 40%
- Preferred Stock 20%
- Retained Earnings 10%



WACC

Cost of Capital

- **Loan:** The interest rate is assumed to be 5% compounded annually from the bank. So, the effective rate is 5.00%
- **Common Stock:** The dividend per share (CSD) is \$5, the current trading price per share (PCs) is \$100, & the growth rate is assumed to be 4%.
- **Preferred Stock:** the dividend per share (PSD) is \$7, the current trading price per share (PPs) is \$100, & the Cps is \$1.

WACC & MARR

	Percentage	Cost of Capital
Loan	30.00%	3.0000%
Common Stock	40.00%	9.0000%
Preferred Stock	20.00%	7.0707%
Retained Earnings	10.00%	9.0000%

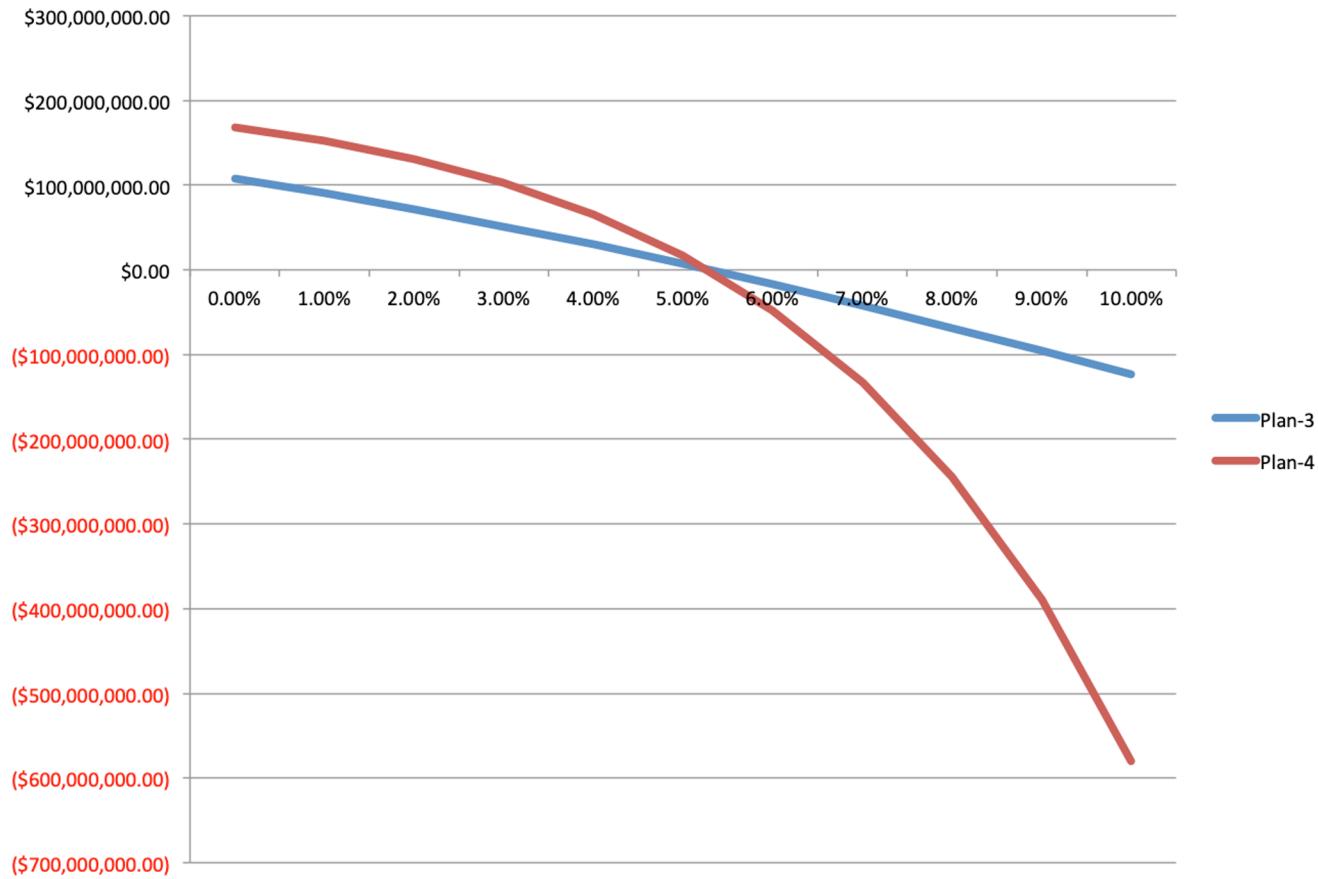
- WACC = $30\% * 3\% + 40\% * 9\% + 20\% * 7.0707\% + 10\% * 9\% = 6.81414\%$
- Profit margin = 2%
- BTMARR is $6.81414\% + 2\% = 8.81414\%$
- ATMARR = BTMARR * (1 - itr) = 5.28848%



PAYBACK METHOD

- We have used Plan-3 & Plan-4 for paying back the loan.
- The Lender's rate is 5% compounded annually and the ATMARR is 5.28848%, which is equal to TVOM for us.
- Thus:
 - if the lender's rate < TVOM, use plan-4 for borrowing.
 - if the lender's rate > TVOM, use plan-3 for borrowing.

Lender's Rate vs PW





PAYBACK METHOD

- Since the lender's rate (5%) is less than the TVOM (5.29%), thus it is better for us to use Plan-4 for paying back the loan.
- It means that the present worth would be greater if we use Plan-4 for paying back the loan rather than using Plan-3.



DEPRECIATION

- Two depreciation methods used in the project are Straight Line Depreciation (SLN) & MACRS-GDS.
- The residential building is considered to be a 27.5-year residential rental property with mid-month convention and the mall & hotel are considered to be 39-year nonresidential property with mid-month convention.
- We are assuming that the salvage value is a constant value and is equal to 30% of the initial investment.

DEPRECIATION

a. MACRS-GDS percentages for 27.5-year residential rental property using mid-month convention.

Year	Month in Tax Year Property Placed in Service											
	1	2	3	4	5	6	7	8	9	10	11	12
1	3.485%	3.182%	2.879%	2.576%	2.273%	1.970%	1.667%	1.364%	1.061%	0.758%	0.455%	0.152%
2-9	3.636%	3.636%	3.636%	3.636%	3.636%	3.636%	3.636%	3.636%	3.636%	3.636%	3.636%	3.636%
10-26*	3.637%	3.637%	3.637%	3.637%	3.637%	3.637%	3.637%	3.637%	3.637%	3.637%	3.637%	3.637%
11-27**	3.636%	3.636%	3.636%	3.636%	3.636%	3.636%	3.636%	3.636%	3.636%	3.636%	3.636%	3.636%
28	1.970%	2.273%	2.258%	2.879%	3.182%	3.485%	3.636%	3.636%	3.636%	3.636%	3.636%	3.636%
29						0.152%	0.455%	0.758%	1.061%	1.364%	1.667%	

*even-numbered year

** odd-numbered year

DEPRECIATION

b. MACRS-GDS percentages for 39-year nonresidential real property using mid-month convention.

Year	Month in Tax Year Property Placed in Service											
	1	2	3	4	5	6	7	8	9	10	11	12
1	2.461%	2.247%	2.033%	1.819%	1.605%	1.391%	1.177%	0.963%	0.749%	0.535%	0.321%	0.107%
2-39	2.564%	2.564%	2.564%	2.564%	2.564%	2.564%	2.564%	2.564%	2.564%	2.564%	2.564%	2.564%
40	0.107%	0.321%	0.535%	0.749%	0.963%	1.177%	1.391%	1.605%	1.819%	2.033%	2.247%	2.461%



ECONOMIC PERFORMANCE

- We use Present worth (PW) & Internal Rate of Revenue (IRR) as evaluation methods for after-tax analysis.

Table: After-Tax Present Worth for Residential Buildings

	SLN		MACRS	
	Plan-3	Plan-4	Plan-3	Plan-4
Uniform	\$43,832,485.57	\$66,840,102.43	\$74,745,204.21	\$97,752,821.07
Geometric	\$199,985,696.03	\$222,993,312.89	\$230,898,414.67	\$253,906,031.53

ECONOMIC PERFORMANCE

Table: After-Tax Present Worth for Mall

	SLN		MACRS	
	Plan-3	Plan-4	Plan-3	Plan-4
Uniform	\$32,693,923.38	\$36,799,191.34	\$33,649,088.73	\$53,923,981.43
Geometric	\$242,715,360.07	\$284,890,628.04	\$281,740,525.42	\$302,015,418.13

Table: After-Tax Present Worth for Hotel

	SLN		MACRS	
	Plan-3	Plan-4	Plan-3	Plan-4
Uniform	\$61,409,790.65	\$65,117,148.48	\$62,272,374.96	\$65,979,732.79
Geometric	\$98,112,342.04	\$101,819,699.87	\$98,974,926.35	\$102,682,284.18



ECONOMIC PERFORMANCE

We observe the following:

- Since lender's rate < MARR, thus we prefer to use Plan-4. Thus, the Present Worth calculated for Plan-4 is greater than the one for Plan-3.
- The Present Worth for Geometric CF is greater than the Uniform CF. This is expected since the revenues are greater in geometric CF.



SENSITIVITY ANALYSIS

- The sensitivity analysis is done for only Residential Buildings.
- The 4 inputs taken into consideration are:
 - the initial investment
 - the marketing rate
 - the geometric increase rate
 - the rent (per apartment per month) in year-1

SENSITIVITY ANALYSIS

Table: Distribution fitting for the different inputs

	Distribution	Parameter-1	Parameter-2	Parameter-3
Initial Investment	Normal	\$683,510,526.32	\$55,530,421.04	
Marketing Rate	Triangular	44.00%	70.00%	85.00%
Geometric Increase Rate	Triangular	2.00%	8.00%	10.00%
Rent	Normal	\$5,761.90	\$677.11	

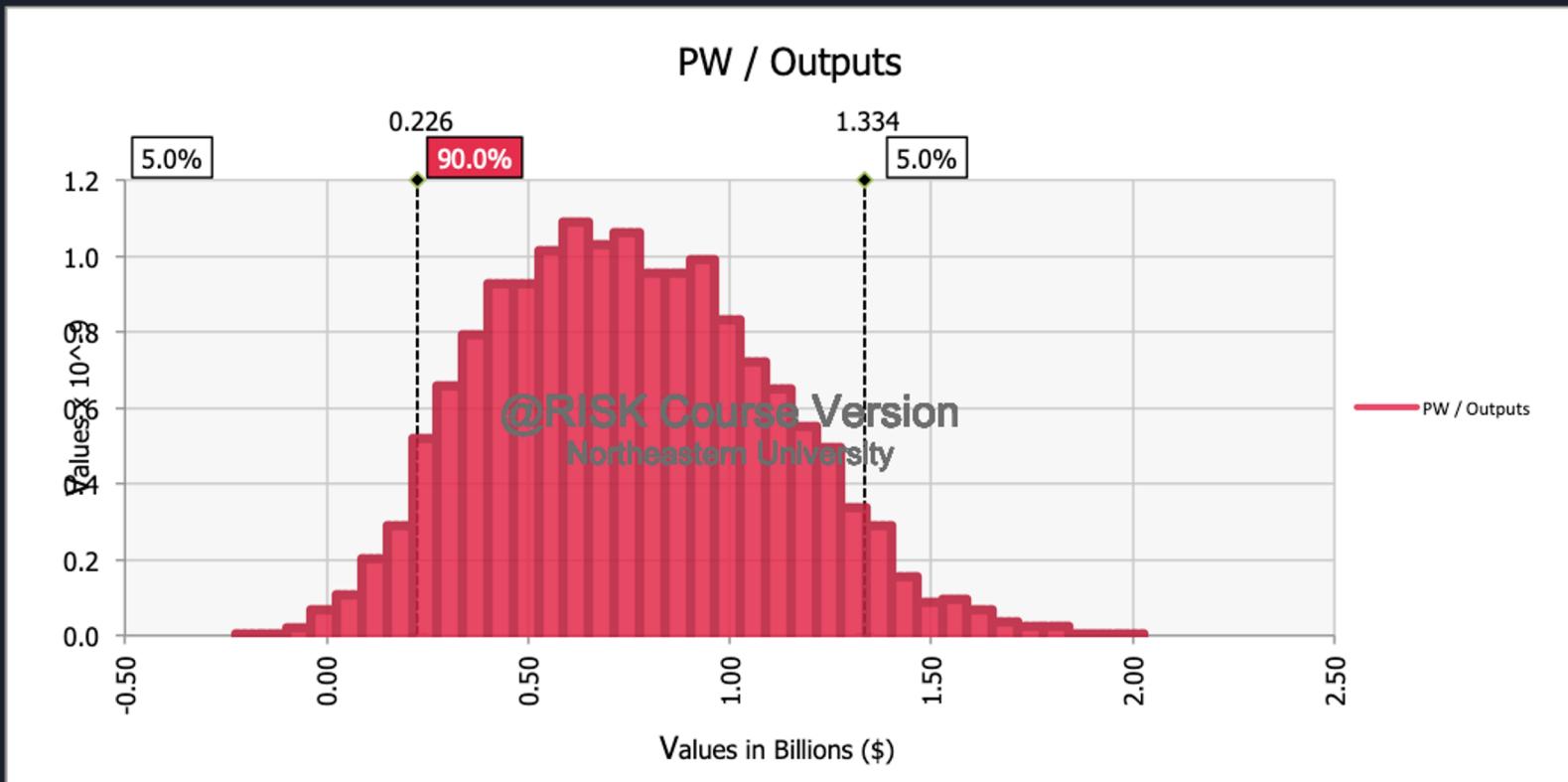


SENSITIVITY ANALYSIS

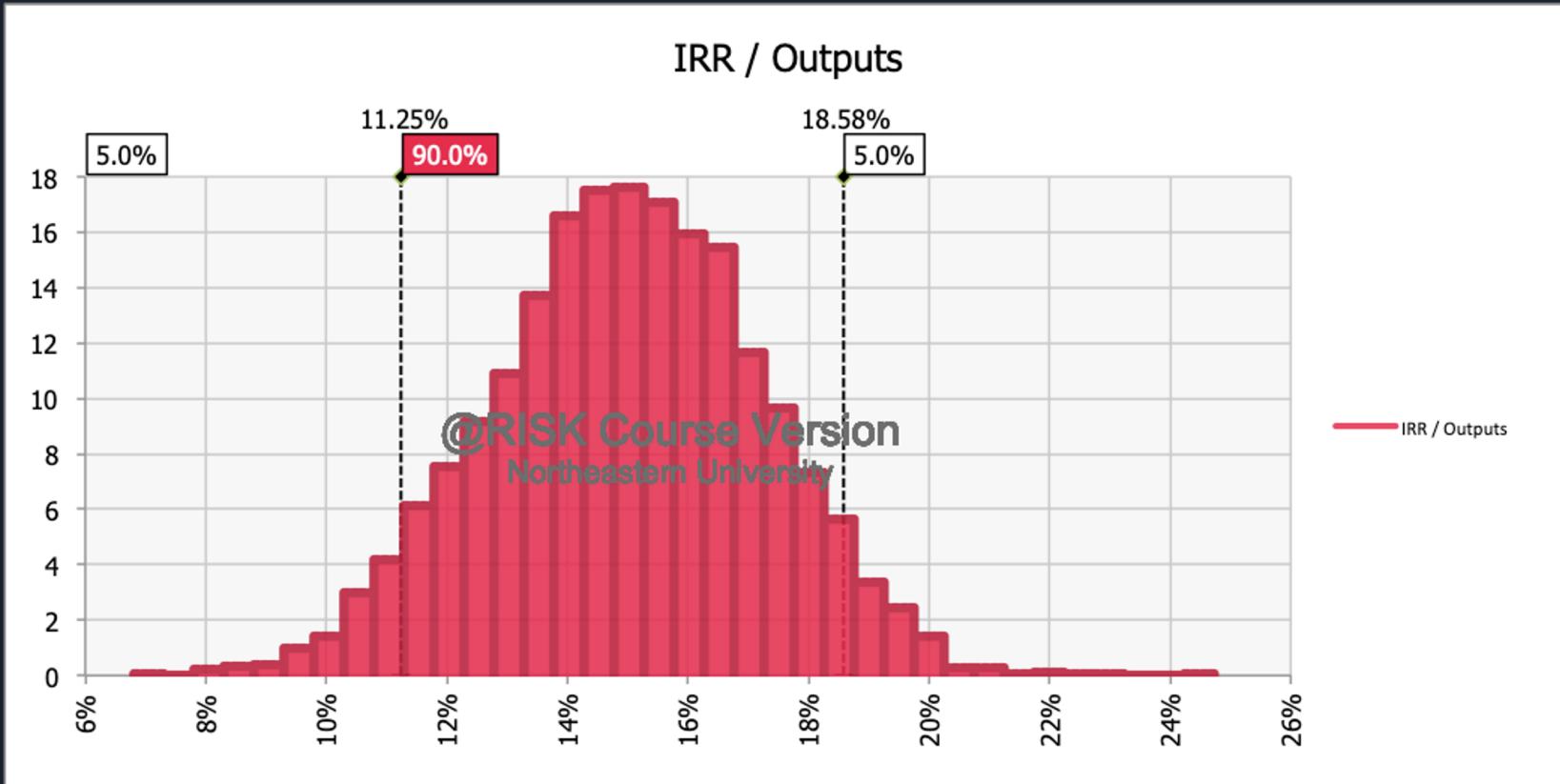
Risk Analysis:

The outputs for the risk analysis are PW, IRR & Bonus. The simulation is run for 5000 iterations.

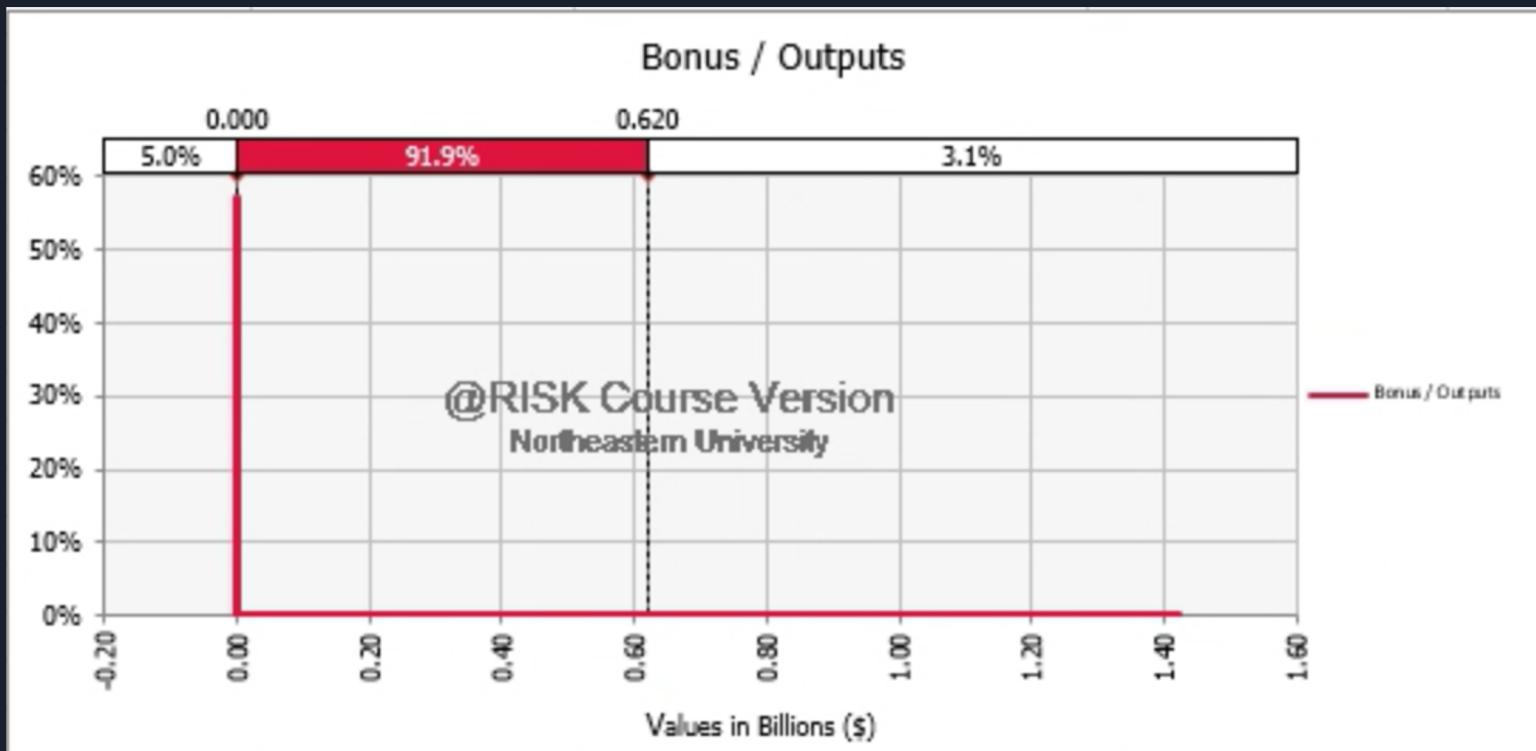
SENSITIVITY ANALYSIS



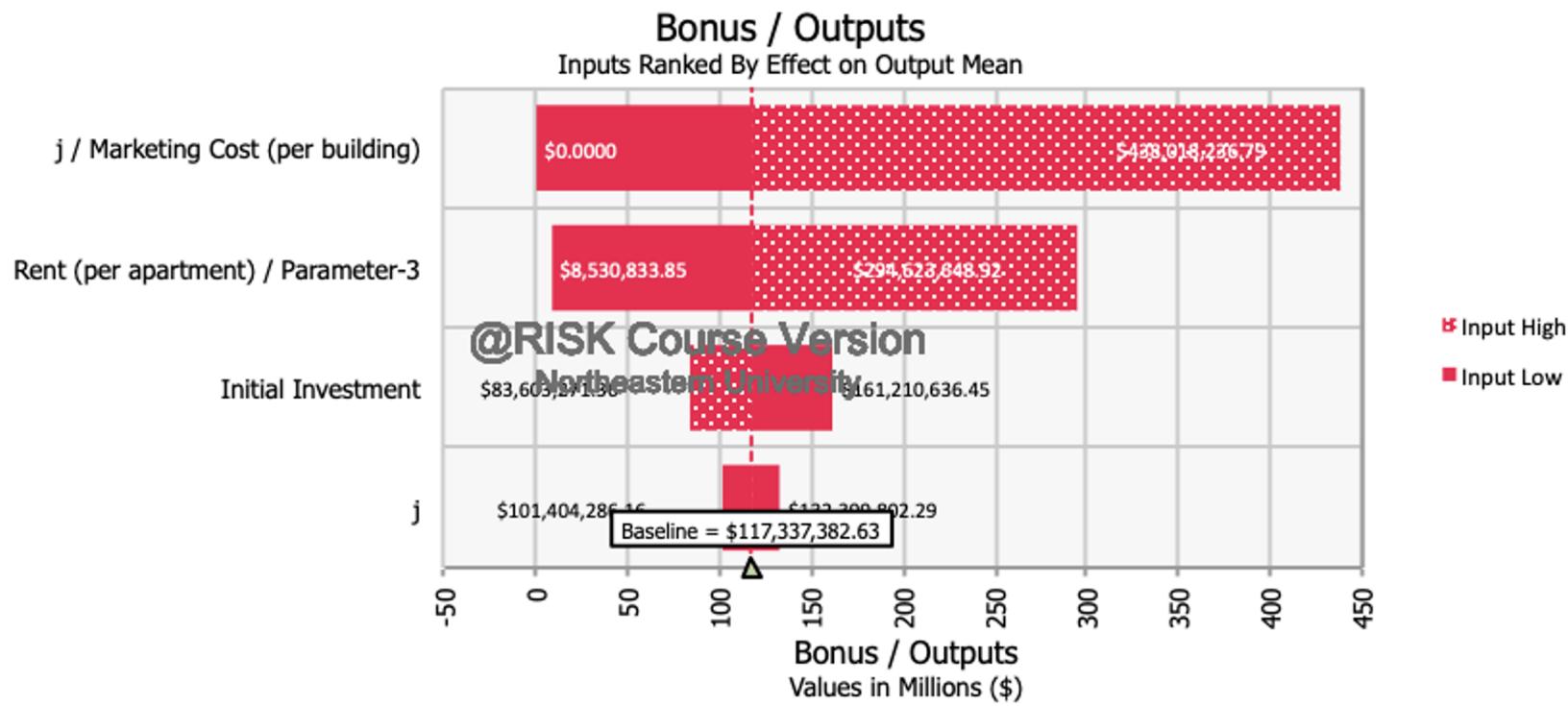
SENSITIVITY ANALYSIS



SENSITIVITY ANALYSIS



SENSITIVITY ANALYSIS





AHP ANALYSIS

- We have taken four factors into consideration to compare the three alternatives.
- **In AHP Analysis:** for each row, Priority Vector = Average of the individual cells in the row divided by the sum of each column.

AHP ANALYSIS

Table: Legend of the different alternatives & factors

Legend	Alternatives
A	Residential Buildings
B	Mall
C	Hotel

Legend	Factor
1	Present Worth
2	Maintenance Fees
3	Customer Satisfaction
4	Waste Disposal

WEIGHTED FACTOR COMPARISON

Weighted Factor Comparison							
Factor	Weight	A		B		C	
		Rate	Score	Rate	Score	Rate	Score
1	0.5582	0.2316	0.1293	0.6965	0.3888	0.0719	0.0401
2	0.1100	0.2431	0.0267	0.1181	0.0130	0.6389	0.0703
3	0.2885	0.1973	0.0569	0.0648	0.0187	0.7379	0.2129
4	0.0433	0.0819	0.0035	0.5750	0.0249	0.3431	0.0148
100.000%			0.2165		0.4454		0.3381
RANK			3		1		2
Best Alternative				=	Alternative-B: Mall		

Rate (i) = the priority vector of each alternative wrt the factor (i)

$$\text{Score (i)} = \text{Weight (i)} * \text{Rate (i)}$$

Total Score = summation of all score (i)

WEIGHTED FACTOR COMPARISON

Table : Total score for the alternatives

Alternative	Total Score
Residential Buildings	0.2165
Mall	0.4454
Hotel	0.3381

Highest total score is for Mall.



CONCLUSION

It is the most beneficial for the corporation to construct a Mall, followed by a Hotel, & then Residential Building.



THANK YOU

Any Questions?

How would you rate the presenter?

When poll is active, respond at **PollEv.com/uditshah148**  Text **UDITSHAH148** to **37607** once to join

- 1 - Poor
- 2 - Fair
- 3 - Average
- 4 - Good
- 5 - Excellent