

## Complexities of Investment Decisions In Real Estate Development

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### **Abstract**

*The research paper is an attempt to emphasize the importance of sensitivity analysis and scenario analysis while making the strategic investment decision particularly in a real estate firm. The complexities involved in computing the after tax cash flows have been illustrated by introduction of various variables such as price, operating expenses, rent, vacancy percentage, depreciation, salvage value, interest on debt, tax rates etc. The hypothetical example uses the popular Net Present Value technique of capital budgeting to help in decision making. The two options of cent percent equity financing vis-à-vis use of debt in capital structure have been discussed. In all, 243 scenarios with different values for determinants of cash flows have been considered.*

*Although NPV is negative for most of the scenarios, it is more sensitive to changes in purchase price, vacancy percentages and rent received. The forecasting risk involved and sources of value creation are thus important for capital appraisal. The paralysis of analysis with discounted cash flow techniques of capital budgeting may be overcome by the use of sensitivity analysis. Future market expectations of the decision maker also play a key role; the best scenario may not be probable but still be possible.*

**Keywords:** Capital Budgeting, Real Estate, Net Present Value

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### **I. Introduction**

Capital Appraisal an irreversible strategic decision of the top management of an organisation involves commitment of finances yielding returns in the future. Although, the capital expenditure is incurred at present (with increments/withdrawals in future as well), the cash inflows occur in future time periods and are uncertain. The problem of capital budgeting becomes even more complex for real estate firms. One because the amount involved is fairly large and two because both the cash inflows as well as the outflows are not fixed and determined by a host of factors. The variables involved in computing the after tax cash flows could be the price negotiated, operating expenses, rent received, vacancy percentages, rate of depreciation and salvage value; interest rate on debt, tax rates etc. The decision to invest/ not to invest may be taken only after an analysis of different present values of project considering all these factors and the future market expectations.

There is an increasing trend towards the use of discounting cash flow methods of capital budgeting over the last 25 years. The Net Present Value technique of capital budgeting is the

most used investment criteria, with about eighty percent businesses in United Kingdom using this technique (Atrill and Mc Laney, 2002). It evaluates the investment decision by adjusting for time value of money and accounting for the risks involved. Information on whether the investment decision would create value of the firm is provided by this technique. The positive NPV decisions add value and increases the wealth of owners. Thus, NPV is a direct measure of how well project will meet its targets. However, to make a prudent investment decision it is important to consider the forecasting risk i.e. the sensitivity of NPV to the changes in cash flow estimates, sources of value created and any improbable events. Scenario analysis and sensitivity analysis further analyse the NPV in this respect.

The hypothetical case developed here deals with the capital budgeting decision of investing in an office building in central London with cash flows spread over a period of ten years. The best, likely and worst possible values of seven determinants of cash flows are considered to create a model for finding NPV in the 243 possible scenarios. Sensitivity analysis and scenario analysis has been conducted also taking into consideration two types of capital structure for the project either fully equity financed or through a mix of equity and debt. The case study has been divided into seven sections as follows 1.Introduction, 2.The Capital Budgeting Model, 3.Market Scenarios, 4. Selection of Hurdle Rate, 5.Estimation and Modelling, 6.Results and Analysis and 7. Business Recommendations.

The strategic decision to purchase the office building available for sale in the real estate market in Central London is a problem of capital budgeting. The primary objective of an investment decision is to increase the **value of the firm**. A project with a positive Net Present Value (NPV) would generate wealth for its shareholders. It would result in a higher present value of its cash inflows than the present value of its cash outflows, thereby increasing the value of a firm.

The problem involves estimation of future cash inflows as well as outflows, and their discounting at the appropriate rate to find out the Net Present Value. The cash outflows include the purchase price of the building, operating expenses, interest on debt (if any) and tax expenses. If the purchase is financed by a debt, it will also become payable at the end of tenth year. The major cash inflows are from rental income from office spaces in the building. Also, the residual value of the building would be realised in cash at the end of tenth year.

The computations of after tax cash flows are determined by the following factors:

1. Price per square foot;
2. Operating Expenses;
3. Rent Received per square foot;
4. Vacancy percentages;
5. Depreciation rates and salvage value;
6. Interest rate on debt;
7. Tax rates.

These determinants of cash flows are not certain and can vary between estimated ranges. The exact value of these variables depends upon the volatility in the property market, negotiations

with local maintenance companies, economic volatility and market conditions. Their best, average and worst possible values for these variables are exhibited in Table 1.

Table 1: The best, average and worst possible values for Determinants of Cash Flows

	Best	Average (Likely)	Worst
Price/sq.ft	250	270	300
Op. Expense/sq.ft	8	10	11
Rent/sq.ft	100	90	70
Vacancy percent	10%	30%	50%
Depreciation	30%	50%	70%
Tax Rates	As per slab rates		
	0 - 6000 0		
	6000-	15000	20%
	15000-	30000	40%
	30000	or more 50%	
Interest on debt	As per credit rating of the firm (Baa1 by Moody's)		

## II. The Capital Budgeting Model

The determination of after-tax cash flows resulting from purchasing the project and operating it for the next ten years has been attempted using the following base model.

Table 2: Model for Cash Flow Estimation

Present Value of Cash Outflows	Initial Investment	180000*price/sq ft (1)	
	Redemption of debt at par	$\frac{P}{(1+r)^{10}}$ (2)	
	Total	(1)+ (2)	(3)
Present Value of Cash Inflows	Rental Income	180000*(1-vacancy percent)* rent/sq.ft (4)	
	Less: Operating Expenses	180000*operating expense/sq. ft (5)	
	EBITDA	(4) - (5)	(6)
	Less: Depreciation	(Initial Investment*Depreciation Rate)/10 (7)	
	EBIT	(6) - (7)	(8)
	Less: Interest	Amount Borrowed*Interest Rate (9)	
	Profit Before Taxes	(8) - (9)	(10)
	Less: Taxes	As per slab rates (11)	
	Profit After Taxes	(10) - (11)	(12)
Add: Depreciation	(Initial Investment*Depreciation Rate/10) (7)		

Operating Cash Flows	(12) + (7)	(13)
Present Value of Operating Cash Flows	(13)*PVAF <sub>(hurdle rate%,10)</sub>	(14)
Residual Value	Initial Investment*(1- Depreciation Rate)	(15)
Present Value of residual	(15)*PVF <sub>(hurdle rate%,10)</sub>	(16)
Present Value of Cash Inflows	(14) +(16)	(17)
Net Present Value	(17) – (3)	

### III. Market Scenarios

There are five uncertain variables namely price; operating expenses; rent; vacancy percentage; and rate of depreciation determining the net present value of the project. Each one of these can take three possible values (Kindly see Table 1) or any value other value in that range. This would result in a total of 243 ( $3^5$ ) scenarios for the project. The best scenario would be the one with lowest price, operating expenses, depreciation rate, vacancy percentage and highest rent. The most likely scenario is the one with variables taking the average (middle) values. The worst scenario for office streamer would be the one with highest price, operating expenses, depreciation rate, vacancy percentage and lowest rent. The Net Present Value (NPV) has been computed for each of the 243 scenarios highlighting the best, most likely and worst scenario for **ten percent** required rate of return on equity.

When the company has a capital structure of 70% equity and 30% debt, another 243 scenarios are created. The NPV has been calculated for all the scenarios for the weighted average cost of capital computed from rate of debt and required rate of return on equity.

### IV. Selection of Hurdle Rate

- Case I** The hurdle rate for computation of the NPV would be ten percent when the capital structure of the firm has no debt. This is the required rate of return by the equity shareholders.
- Case II** The hurdle rate when office streamer is 30% levered would be computed as the weighted average cost of capital calculated from the rate of debt and the increased rate of equity. The cost of debt for a corporate bond is the addition of the government's bond interest rate (risk-free rate) and default spread.

$$K_d = R_f + \text{Default Spread}$$

The risk-free rate has been taken as 1.74% which is the UK Gilt 10 year yield. The yield spread accounting for default risk, liquidity risk and other embedded risk is dependent upon the company's credit rating from independent rating agencies. The professional credit rating agency Moody's has rated Office Streamer's debt as Baa1. The ratings are done on the basis of company's most recent financial ratios, its operating and competitive environment and its senior management. Companies in this category have moderate rate of risk, they are considered between safe and speculative investments. The spread for office streamer has been derived as 288 basis points (every 100 points make one percent). This is the spread which corresponds to 10 year maturity and rating of Baa1 by Moody's. Hence, the cost of debt/yield to maturity is derived as 4.62% (1.74%+2.88%).

The market condition for Office Streamer would be similar to other real estate firms with a credit rating of Baa1 in the market issuing debt. Another real estate company in retail and office spaces, Corio NV very recently raised finances through issuing debt. The •150 million issue was done at par. Assuming the same market conditions, Office streamer would be able to issue debt at par. This assumption leads to the equality of yield to maturity (calculated above) and coupon rate of interest. Thus, the interest rate is taken to be 4.62% as well.

Since we are considering the after tax cash flows, we must consider the effect of taxes on the cost of debt. The interest payables on corporate bonds are tax deductible. The after tax cost of debt would be  $K_d (1-T_c)$ . The tax shield applicable to Office Streamer would work out to be 50% as in all the scenarios the Profit before Taxes are above ₹30,000 (except for the first two worst scenarios). In this case the after tax cost of debt would work out to 2.31%.

The cost of equity for 30% levered firm would be higher than the cost of equity for an unlevered firm. The formula for calculation of the increased cost of equity has been adopted from the MM Hypothesis with corporate taxes Proposition II.

$$R_e = R_u + (R_u - R_d) D/E (1-T_c)$$

where,

$R_u$  = Required rate of return for unlevered firm (10%),

$R_d$  = Cost of debt (4.62%),

$D/E$  =Debt to Equity ratio (30/70),

$T_c$  = Tax shield (50%).

The cost of equity is computed as 11.15% using the above formula.

The weighted average cost of capital is calculated as 8.49% using the following formula:

$$WACC = W_e R_e + W_d R_d (1-T_c)$$

where,  $W_e$  and  $W_d$  are the weights of equity and debt respectively (70% and 30%) in the capital structure of the company.

The hurdle rate for Office streamer's project would be 8.49% when it is 30% levered.

## V. Estimation and Modelling

The capital budgeting model for determining the after tax cash flows and net present value as developed in Section II has been applied to the 243 scenarios emerging from five uncertain variables each taking three possible values as discussed in Section III. This procedure has been followed for both the cases – unlevered firm and 30% levered firm. The hurdle rate for computing the NPV of unlevered firm is 10% and that of levered firm is 8.49% as computed in Section IV. The discount rate for levered firm is lesser than the unlevered firm due to the presence of tax shield on interest payments. The resulting NPV's from the investment in all scenarios for both the capital structure cases are tabulated and presented in the attached appendices.

## VI. Analysis of Results

### 1. Case I: 100% Equity

The Net Present Value calculated for the 243 market scenarios fluctuates from a maximum of ? 16,683,504 to a minimum of negative ? 22,824,381 (Figure 1). The NPV is negative in 160 out of 243 scenarios. The NPV in the best scenario, most likely scenario and the worst scenario (as identified in Table 1) are presented in Table 3. The NPV is ?16,683,504 for the best scenario, thereby indicating generation of wealth and increasing value of the firm. For the most likely scenario where all the five uncertain variables assume the average (middle) values, the NPV is negative. This is also true for the worst scenarios. Here erosion of wealth is indicated, thereby reducing the value of the firm.

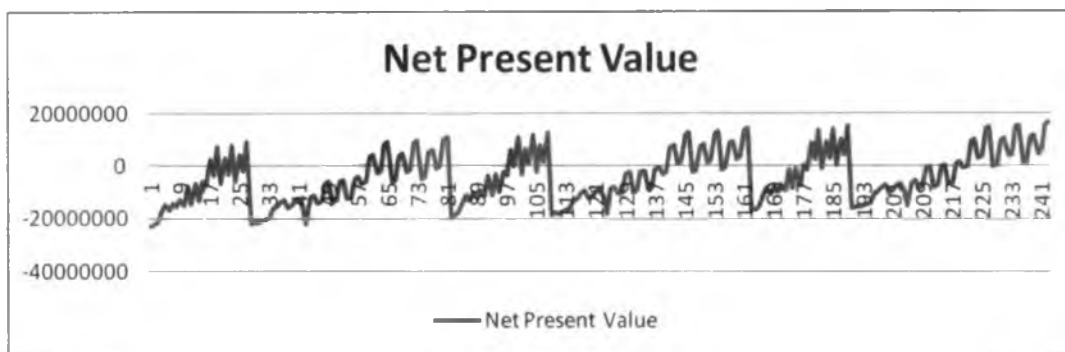


Figure 1: NPV of Office Streamer with 100% Equity Financing

A **sensitivity analysis** for the variables having a significant impact on NPV's is done through a graphical analysis of behaviour of NPV in the 243 identified scenarios with respect to changes in only one uncertain variable. The graphical analysis is presented in Figure 2.

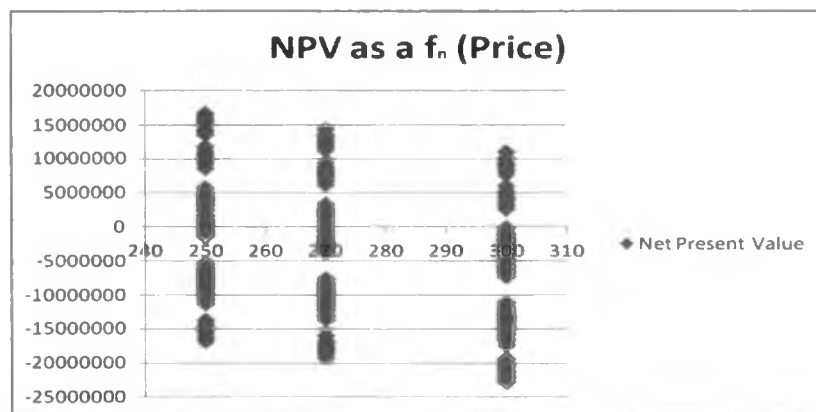
Table 3: NPV for Best, Likely and Worst Scenario

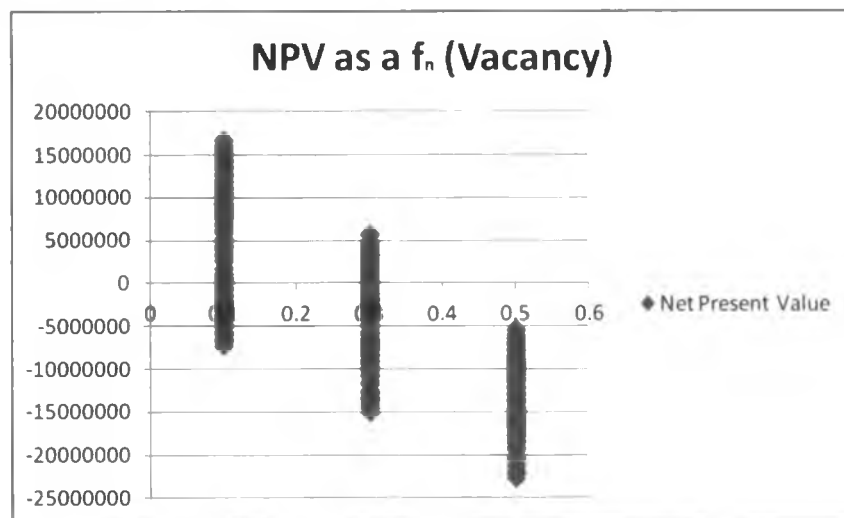
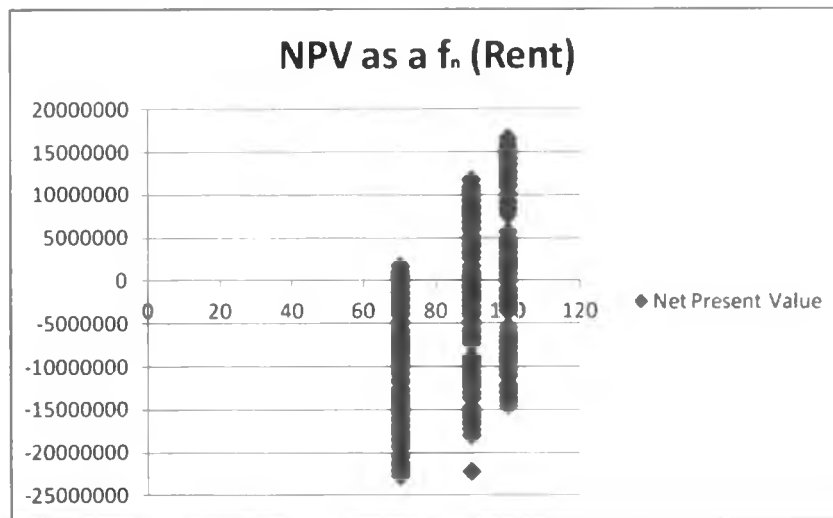
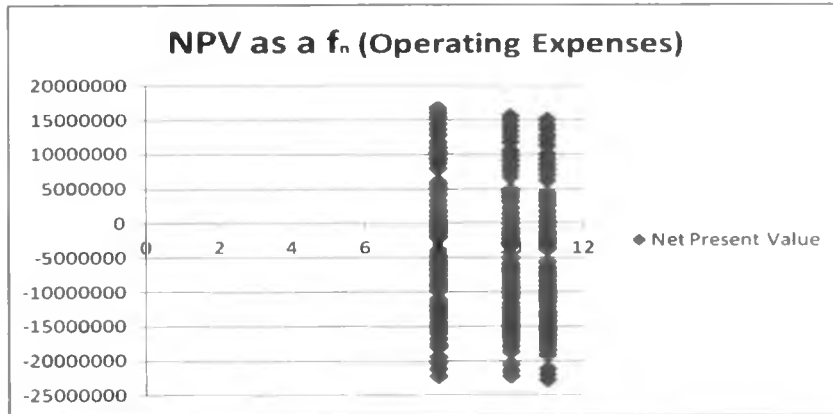
<i>Cash Outflows</i>	<i>Worst Scenario</i>	<i>Likely Scenario</i>	<i>Best Scenario</i>
Initial Investment	54000000	48600000	45000000
<b>Cash Inflows</b>			
Income	6300000	11340000	16200000
Operating Expenses	1980000	1800000	1440000
EBITDA	4320000	9540000	14760000
Less: Depreciation	3780000	2430000	1350000
EBIT	540000	7110000	13410000
Less: Interest	0	0	0
Profit Before Taxes	540000	7110000	13410000
Less: Taxes	262800	3547800	6697800
Profit After Taxes	277200	3562200	6712200

<i>Cash Outflows</i>	<i>Worst Scenario</i>	<i>Likely Scenario</i>	<i>Best Scenario</i>
Add: Depreciation	3780000	2430000	1350000
Operating Cash Flows	4057200	5992200	8062200
Salvage Value	16200000	24300000	31500000
Hurdle Rate	0.1	0.1	0.1
Present Value of Cash Inflows	31175619	46188294	61683504
Present Value of Cash Outflows	54000000	48600000	45000000
Net Present Value	-22824381	-2411706	16683504

As the price increases from ?270 to ?300 the number of negative NPV's increase drastically. **Price of the building** becomes an important variable with significant impact on NPV. The behaviour of NPV's do not much change as we move from the operating cost of ?8 to ?11. For the rent of ?70 per square feet almost all of NPV's are negative. As the office rent is increased to ?90 and then to ?100 the number of negative NPV's gets reduced and more than half of NPV's become positive. **Rent** becomes an important variable while taking this capital budgeting decision. The **percentage of vacancy** has an important bearing on the decision. This is because as the vacancy percentage is increased from 10% to 30% the NPV's which were positive start becoming negative. As the vacancy percentage increases to 50% all the NPV's become negative. Vacancy becomes the most important variable for the decision. With fluctuations in depreciation rate, the NPV does not fluctuate much. The rate of depreciation does not assume priority while taking the decision to purchase this office building.

Thus, while making the decision to buy the office building office streamer should be more cautious about the predictions for the price, rent and vacancy rate.







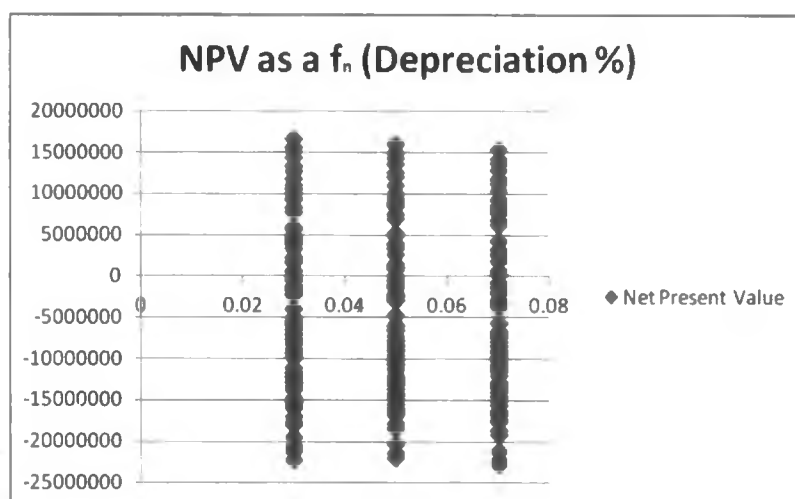


Figure 2: Sensitivity of NPV's with each uncertain variable

## 2. Case II : 70% Equity and 30% Debt

A similar analysis is conducted for the levered firm as well. The NPV value fluctuates between £13762296 £-30570566.

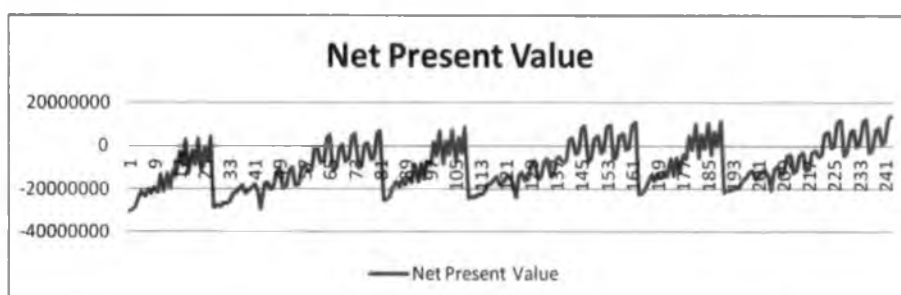


Figure 3: Net Present Value for 243 scenarios when Office Streamer is 30% Levered

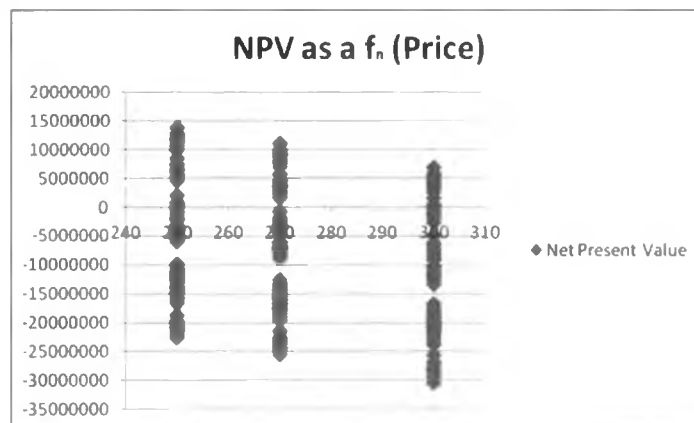
Table 2: NPV for Worst, Likely and Best scenario with Leverage

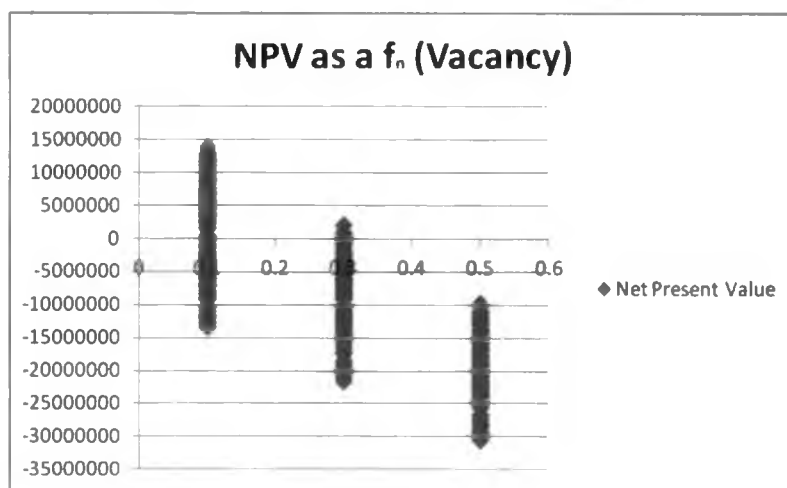
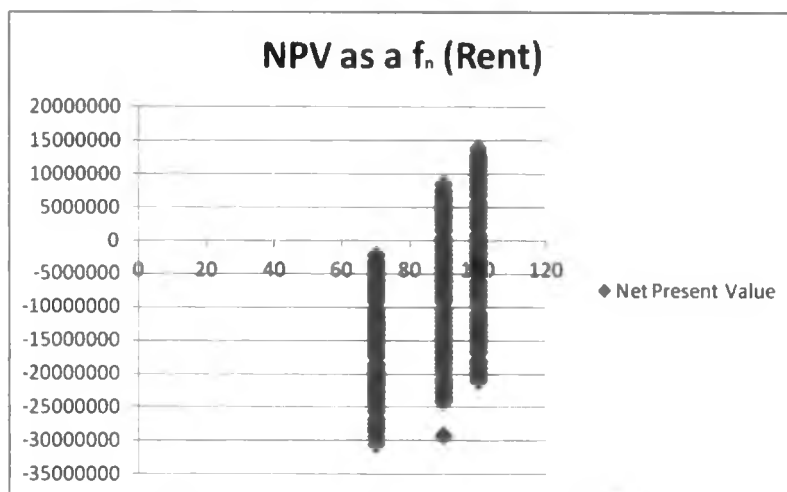
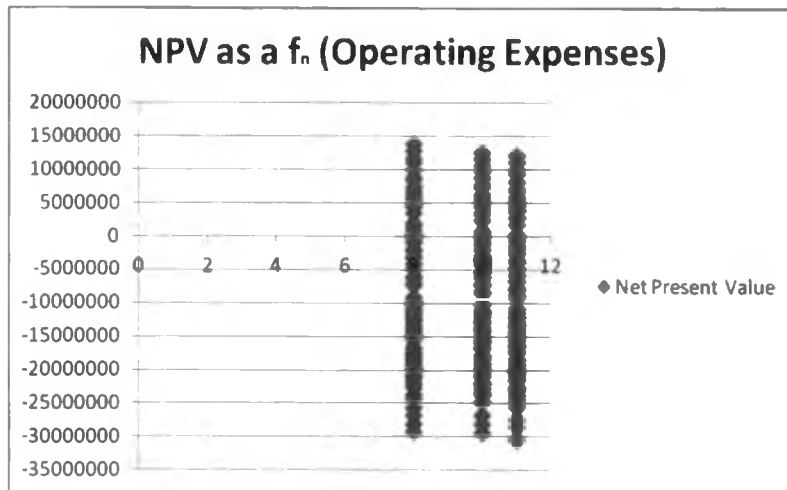
Cash Outflows	Worst Scenario	Likely Scenario	Best Scenario
Initial Investment	54000000	48600000	45000000
Equity (70%)	37800000	34020000	31500000
Debt (30%)	16200000	14580000	13500000
Cash Inflows			
Income	6300000	11340000	16200000
Operating Expenses	1980000	1800000	1440000
EBITDA	4320000	9540000	14760000

<i>Cash Outflows</i>	<i>Worst Scenario</i>	<i>Likely Scenario</i>	<i>Best Scenario</i>
Less: Depreciation	3780000	2430000	1350000
EBIT	540000	7110000	13410000
Less: Interest	748440	673596	623700
Profit Before Taxes	-208440	6436404	12786300
Less: Taxes	0	3211002	6385950
Profit After Taxes	-208440	3225402	6400350
Add: Depreciation	3780000	2430000	1350000
<b>After Tax Cash Flows</b>	<b>3571560</b>	<b>5655402</b>	<b>7750350</b>
Salvage Value	16200000	24300000	31500000
Redemption of Debt (year10)	16200000	14580000	13500000
Hurdle Rate	0.0850	0.0850	0.0850
Present Value of Cash Inflows	30557433.6	47791437	64702296
Present Value of Cash Outflows	61128000	55015200	50940000
Net Present Value	-30570566.4	-7223763	13762296

The NPV is positive only in 49 of the 243 possible scenarios. Even for the most likely scenario (with average values) the NPV is negative.

The sensitivity analysis for the five uncertain variables is attempted through mapping the behaviour of NPV with changes in one variable at a time. The graphical analysis indicated that the purchase price, rent for office and vacancy percentage were the most important variables to be considered while making the investment decision. This is because the all the NPV's were negative when vacancy percentage was 50%, they all were also negative for a rent of £70. Most of the NPV's were negative for a price of £300. The operating expenses and rate of depreciation are not very significant while taking up a decision. This is due to the fact that almost same proportion of NPV's was negative for all three values of operating expenses and depreciation.





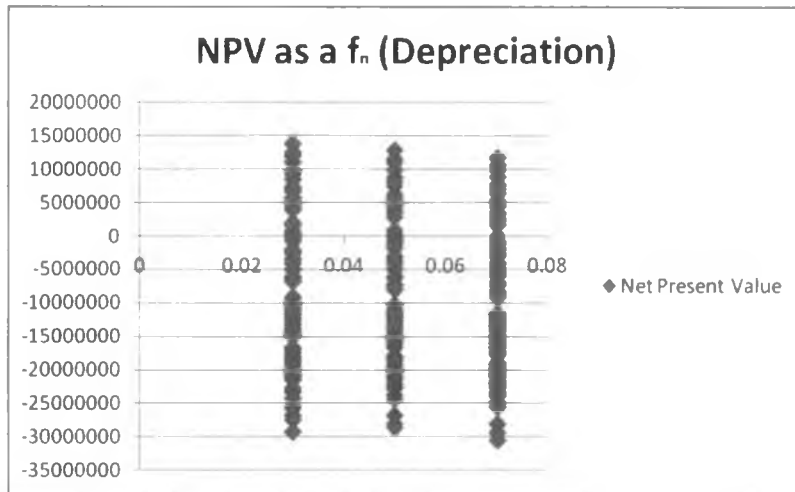


Figure 4 : Sensitivity Analysis of NPV with respect to each uncertain variable

## VII. Business Recommendations

Most of the Net Present Values calculated for 243 scenarios in both the cases (unlevered firm & 30% levered firm) are negative. The number of negative NPV's increased for capital structure with leverage. A negative Net Present Value implies erosion of wealth and decrease in value for the company. However, running the sensitivity analysis of the uncertain variables, purchase price, rent and vacancy percentage emerge out to have a bearing on the value of NPV. NPV fluctuates drastically with changes in these variables.

Although with negative NPV's in most of the cases the company should not purchase the office building. For example, if purchase price is £300, or rent expected is £70, or expected vacancy percentage is 50% the NPV would always be negative (Kindly see Figure 2 & Figure 4). In any of the above scenarios Office streamer should not buy the office building.

Also relating NPV to the capital structure of the firm, if there are not enough available finances with the firm and it would need to borrow to purchase the building, it is advisable not to purchase the office building. This is because the number of scenarios with positive NPV's decreased from 83 under 100% equity financing to only 49 under leverage conditions. Even

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One of the most important caveats of discounted cash flow techniques is the determination of cost of capital and estimation of cash flows. The assumptions made to calculate these forecasts may not always hold and hence there would be forecasting risk involved. It is important to consider the source of value creation. The effect of specific variables on NPV elaborating on the forecasting error as attempted in this case would be helpful in taking the decision. The greater the volatility in NPV in relation to a specific variable more is the forecasting error associated.

This paralysis of analysis has to be overcome to make an optimal investment decision. The best and worst cases are not necessarily probable but they may be possible. Hence, if office streamer has extremely optimistic predictions about the future market conditions, i.e. it feels that management will be able to negotiate a lower purchase price, or generate enough demand for office spaces at a higher rent and at the office rent set the building would have lower percentage of vacancy, then it may consider purchasing the office building.

- 1 It is assumed that any debt taken for financing the project would be redeemed at par at the end of tenth year.
- 2 The cash flows are estimated for a period of ten years, after which the total capital investment would depreciate to its salvage value. Studying the scenario in the real estate markets it is implicitly assumed that the salvage value will be completely realized in the market without any losses or gains.
- 3 Earnings Before Interest Taxes Depreciation and Amortization.
- 4 Depreciation is charged as per the straight line method over ten years of project life.
- 5 Earnings Before Interest and taxes.
- 6 It would be zero for the 100% equity scenario. Thirty percent of initial investment would be through raising debt when the equity-debt mix would be 70:30.
- 7 Present Value Annuity Factor at the hurdle rate for ten years since the operating cash flows would repeat for the next ten years under the assumption of no inflation.

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