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[Analysis on Capital Budgeting Techniques \(Part III\)](#)

[\(This part covers Net Present Value Technique \(NPV\)\)](#)

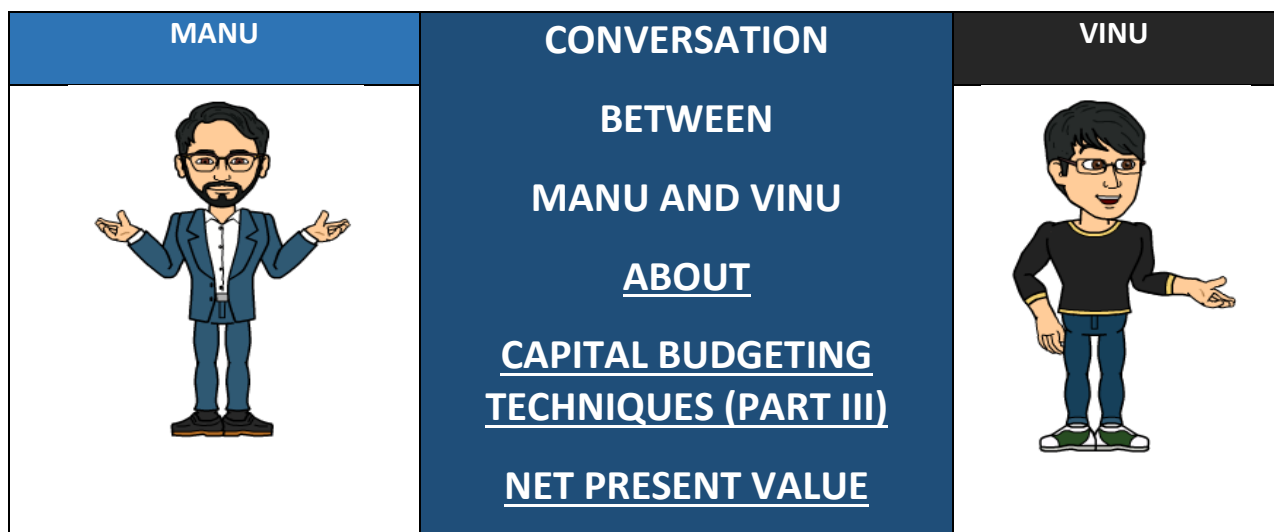
Note: This is a third part of earlier articles “Analysis on Capital Budgeting Techniques”. Start reading this Part III article only after reading the Part I&II article available in the following link:

Part I:

<http://www.caclubindia.com/articles/analysis-on-capital-budgeting-techniques-23668.asp>

Part II:

<http://www.caclubindia.com/articles/analysis-on-capital-budgeting-techniques-part-ii-25294.asp>



[Manu takes Vinu through Future Value, Present Value and Net Present Value \(NPV\) Concepts and teaches him how to take Investment Decision using NPV Technique:](#)

Manu	<p>Good!</p> <p>We have already understood the “Payback period” concept. At that time, I told you, Don’t look merely at cash flows but you should also consider Time Value of Money.</p>						
Vinu	<p>Yes Manu!</p> <p>Our example Project of Rs.100 Crs has cash flows for 8 years and it’s total is Rs.409.40 Crs.</p>						
Manu	<p>Yes! Here total cash flows doesn’t make much sense. You have to find the present value of the cash flows.</p> <p>If you want to find the present value of the cash flows, you should know what is the expected return?</p> <p>If you recollect our Rs.1000 Example in Time Value of Money, we were able to find the present value, because of 10% expected rate of return.</p> <p>So, to proceed further, we should know what is the expected return for our project?</p>						
Vinu	<p>We have already calculated that.</p> <p>We arrived at Weighted Average cost of capital as 20%.</p> <table border="1" data-bbox="331 1585 938 1832"> <tr> <td>Cost (a)</td> <td>20.00</td> </tr> <tr> <td>Total Fund (b)</td> <td>100.00</td> </tr> <tr> <td>Cost of Capital (a / b) x 100</td> <td>20%</td> </tr> </table>	Cost (a)	20.00	Total Fund (b)	100.00	Cost of Capital (a / b) x 100	20%
Cost (a)	20.00						
Total Fund (b)	100.00						
Cost of Capital (a / b) x 100	20%						
Manu	<p>Yes Vinu! Already we have calculated WACC as 20%.</p> <p>But we have not considered effect of tax on Interest while calculating cost of capital!</p>						

Vinu	That confuses me!																				
Manu	Vinu! We know, when we pay interest, we will save tax on interest.																				
Vinu	Yes!																				
Manu	In our example, Debt is Rs.50cr, Interest is 15% on debt.																				
Vinu	Correct!																				
Manu	We also agreed tax benefit on Interest will reduce interest cost.																				
Vinu	Yes!																				
Manu	So please work correct cost of interest.																				
Vinu	It should be $15\% \times 70\% = 10.50\%$																				
Manu	Yes! You have to adjust 30% tax rate and only 70% of interest rate is your cost now. Good! Please tabulate your cost of capital table!																				
Vinu	Let me do that! <table border="1" data-bbox="322 1205 1238 1525"> <thead> <tr> <th>Source</th> <th>Amount</th> <th>Weightage</th> <th>Cost %</th> <th>WACC</th> </tr> </thead> <tbody> <tr> <td>Equity</td> <td>50 Cr</td> <td>50%</td> <td>25%</td> <td>12.50%</td> </tr> <tr> <td>Debt</td> <td>50 Cr</td> <td>50%</td> <td>10.50%</td> <td>5.25%</td> </tr> <tr> <td>Total</td> <td colspan="4">17.75%</td> </tr> </tbody> </table>	Source	Amount	Weightage	Cost %	WACC	Equity	50 Cr	50%	25%	12.50%	Debt	50 Cr	50%	10.50%	5.25%	Total	17.75%			
Source	Amount	Weightage	Cost %	WACC																	
Equity	50 Cr	50%	25%	12.50%																	
Debt	50 Cr	50%	10.50%	5.25%																	
Total	17.75%																				
Manu	Good! Your table now shows your funds are in equal proportion. Weightage will change according to the mix. And your WACC is only 17.75% and not 20%.																				
Vinu	Correct! This makes more sense!																				

	WACC has come down due to tax effect.																																				
Manu	<p>Yes!</p> <p>You have to do this tax adjustment in cost of capital computation, because your cash flows were arrived after considering tax effect on interest.</p>																																				
Vinu	<p>Yes!!!</p> <p>Now I understand the link between the two!</p>																																				
Manu	<p>Good!</p> <p>So now your project should generate a return of 17.75% every year for 8 years. Can you please prepare a table to show what would be the cash that have to be generated for this 8 years?</p>																																				
Vinu	<p>Yes! I'll do that!</p> <table border="1" data-bbox="370 985 1088 1780"> <thead> <tr> <th>Year</th> <th>Investment</th> <th>Return@ 17.75%</th> <th>Total</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>100.00</td> <td>17.75</td> <td>117.75</td> </tr> <tr> <td>2</td> <td>117.75</td> <td>20.90</td> <td>138.65</td> </tr> <tr> <td>3</td> <td>138.65</td> <td>24.61</td> <td>163.26</td> </tr> <tr> <td>4</td> <td>163.26</td> <td>28.98</td> <td>192.24</td> </tr> <tr> <td>5</td> <td>192.24</td> <td>34.12</td> <td>226.36</td> </tr> <tr> <td>6</td> <td>226.36</td> <td>40.18</td> <td>266.54</td> </tr> <tr> <td>7</td> <td>266.54</td> <td>47.31</td> <td>313.85</td> </tr> <tr> <td>8</td> <td>313.85</td> <td>55.71</td> <td>369.56</td> </tr> </tbody> </table>	Year	Investment	Return@ 17.75%	Total	1	100.00	17.75	117.75	2	117.75	20.90	138.65	3	138.65	24.61	163.26	4	163.26	28.98	192.24	5	192.24	34.12	226.36	6	226.36	40.18	266.54	7	266.54	47.31	313.85	8	313.85	55.71	369.56
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Manu	<p>Good!</p> <p>Above table shows, if you invest Rs.100crs @ 17.75%, it should become Rs.369.56 Crs in 8 years.</p>																																				

Vinu	<p>Yes!</p> <p>Rs.369.56 Crs received after 8 years is equivalent to Rs.100 Cr now, if my return expectation is 17.75%</p>																						
Manu	<p>Yes! Now total every year cash flows which you have estimated for the project.</p>																						
Vinu		<table border="1"> <thead> <tr> <th>Year</th> <th>Cash Flow</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>38.75</td> </tr> <tr> <td>2</td> <td>42.25</td> </tr> <tr> <td>3</td> <td>45.05</td> </tr> <tr> <td>4</td> <td>49.25</td> </tr> <tr> <td>5</td> <td>52.75</td> </tr> <tr> <td>6</td> <td>56.25</td> </tr> <tr> <td>7</td> <td>60.45</td> </tr> <tr> <td>8</td> <td>64.65</td> </tr> <tr> <td>Total</td> <td>409.40</td> </tr> </tbody> </table>	Year	Cash Flow	1	38.75	2	42.25	3	45.05	4	49.25	5	52.75	6	56.25	7	60.45	8	64.65	Total	409.40	
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Total	409.40																						
		<p>It is Rs.409.40 Crs which is greater than Future Value of Rs.369.56cr.</p>																					
Manu	<p>Yes! So this answers you that this project will earn more than your expected return of 17.75%.</p>																						
Vinu	<p>Yes Manu!</p>																						
Manu	<p>Now we have made this analysis and derived result by thumb rule only. Let us put it in a more professional way.</p>																						
Vinu	<p>How?</p>																						
Manu	<p>You please tabulate all the cash flows for 8 years</p>																						
Vinu	<p>Ok</p>																						

	Year	Cash Flow
	1	38.75
	2	42.25
	3	45.05
	4	49.25
	5	52.75
	6	56.25
	7	60.45
	8	64.65
Manu	Now you have to find PV of all these year cash flows.	
Vinu	How do we calculate that?	
Manu	How did you calculated FV of an investment?	
Vinu	<p>Future Value is simple.</p> <p>I have to calculate Interest on principal.</p> <p>Then I have to add it with principal.</p> <p>This will give me FV.</p>	
Manu	Can you make it as formula?	
Vinu	<p>I'll try.</p> <p>Future Value = Principal + Interest</p>	
Manu	Break down further.	
Vinu	<p>$FV = \text{Principal} + [\text{Principal} \times \text{Interest Rate}]$</p> <p>$= \text{Principal} [1 + \text{Interest}]$</p>	

Manu	Fine! But this formula will take you for one year only. What will you do if you have to calculate more number of years. Say 2 nd year, 3 rd year and so on?
Vinu	I'll calculate that many times.
Manu	Rather raise the number of times to the power in the formula. It means, if you have to calculate many times or for many period, you take it to the power.
Vinu	So, I should have no. of period in power?
Manu	Yes! Have your formula like this. $FV = PV [1 + i]^n$
Vinu	Here 'PV' Stands for Present Value, 'i' Stands for Interest & 'n' Stands for no. of period. Is that correct?
Manu	Yes! Through 'PV' you can find 'FV' and vice versa.
Vinu	Ok! But why did you started saying all these?
Manu	I wanted to give you the formula for finding 'PV'.
Vinu	Ok!
Manu	Now you know, $FV = PV [1 + i]^n$ So what is the formula for PV?
Vinu	$PV = FV / [(1+i)^n]$
Manu	Good! Now use this formula to find out 'PV' of all the cash flows for 8 years. In this formula, the portion "[1/(1+i) ⁿ]" is called as factor which you will multiply with Cash Flows to derive Present Value.

Vinu I got it!

Manu Now can you find Present Value of our cash flows for 8 years, at expected rate of return of 17.75% ?

Vinu Ok!

Year	Cash Flow	PV Factor
1	38.75	0.849
2	42.25	0.721
3	45.05	0.612
4	49.25	0.520
5	52.75	0.442
6	56.25	0.374
7	60.45	0.318
8	64.65	0.270

Manu You have done it beautifully.

Let me check your PV Factor calculation for year 1

$$\frac{1}{(1+i)^n} = \frac{1}{(1+17.75\%)^1}$$
$$= \frac{1}{(1+0.1775)^1}$$
$$= 0.849.$$

You got that right!

Let me also check on random, say, PV factor for year 5.

$$\frac{1}{(1+i)^n} = \frac{1}{(1+17.75\%)^5}$$

$$= \frac{1}{(1+0.1775)^5}$$

$$= \frac{1}{2.2636}$$

$$= 0.442$$

So you are correct! It matches with your PV factors in your table.

Vinu Yeah.....

Manu Now, multiply this PV Factors with Cash Flows to get Present Value of Cash Flows.

Year	Cash Flow	PV Factor	PV of Cash Flows
1	38.75	0.849	32.89
2	42.25	0.721	30.46
3	45.05	0.612	27.57
4	49.25	0.520	25.61
5	52.75	0.442	23.32
6	56.25	0.374	21.04
7	60.45	0.318	19.22
8	64.65	0.270	17.46
TOTAL	409.40		197.57

Manu Now look at your table.

	You are earning Rs.409.40 Crs cash flows over a period of 8 years but its present value is only Rs.197.57crs
Vinu	True! PV is less than 50% when compared with actual cash flows because of higher expected returns, I believe!
Manu	Yes! You are correct. If you expect high returns, PV of future cash flows will be low. But what is important is you have to compare the PV of future cash inflows with PV of cash outflow.
Vinu	Ok! In our case, PV of cash out flow is Rs.100Crs. I think we need not make any special workings because it is being spent now. PV of cash inflows is Rs.197.57cr
Manu	Look at it! It sounds like great deal. It's like you give Rs.100 Cr now and simultaneously taking back Rs.197.57cr You not only get back your Rs.100crs but also get additional Rs.97.57cr
Vinu	Yes! This creates greater interest in the Project.
Manu	Yes and it would! Because you have brought your 8 years future picture compressed into single value and you can compare that with your investment amount to take a decision.
Vinu	It's really great! Does this methodology or analysis has any technical name?
Manu	Yes! It has. It is called "Net Present Value" method to evaluate an investment decision
Vinu	Great!
Manu	In this method, you will Find 'PV' of cash inflows and compare it with 'PV' of cash out flows.

	If 'PV' of Inflows is greater than or equal to 'PV' of cash out flow then those projects are viable projects.						
Vinu	Viable?						
Manu	Yes! Because those projects not only generates profits, but their profits also matches the expected level. If PV of cash inflow matches PV of out flow, it generates expected return and you know the rest, I believe.						
Vinu	Yes Manu! I understand. Let me tabulate our example. <table border="1" data-bbox="277 745 1107 987"> <tr> <td>PV of Cash inflows</td> <td>= 197.57cr</td> </tr> <tr> <td>Less: PV of Cash outflows</td> <td>= (100.00cr)</td> </tr> <tr> <td>NPV of the Project</td> <td>= 97.57cr</td> </tr> </table>	PV of Cash inflows	= 197.57cr	Less: PV of Cash outflows	= (100.00cr)	NPV of the Project	= 97.57cr
PV of Cash inflows	= 197.57cr						
Less: PV of Cash outflows	= (100.00cr)						
NPV of the Project	= 97.57cr						
Manu	Good! NPV of your project is positive and so it is a viable project.						
Vinu	In case of multiple projects, out of which one has to be selected, how we should approach?						
Manu	In case of multiple projects, select the project with highest NPV. Because highest NPV means, your project earns more than the expected returns. When the project earns more than the expected returns, it will result in creation of wealth for the owners of the company.						
Vinu	Correct! Any Investment Decision should have the objective of creating wealth for the promoters. Thanks for this clarity in NPV concept.						
Manu	So, in this example itself you have understood the concept of <ul style="list-style-type: none"> a) Payback period; b) Cash flows; c) Present Value; d) Future Value; 						

	e) Net Present Value. Good!
Vinu	Thanks Manu!

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