1.040 Project Management

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Project Financial Evaluation

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Value Creation

- The main objective of project is creation of value for its stakeholders.

- Value is created

  – financially by creating net cash flow

  – socially by creating social benefit.

- The private sector main objective is value creation for their owners (stock holders). This is in terms of wealth maximization.

- The public sector attempts to maximize social benefits.

- Value creation is the guiding principle through out this discussion. That is any project must be able to create value

Explicit and Implicit Cost

- In accounting all the costs and revenues are explicit, in finance and economics, they are both explicit and implicit.
  - Explicit cost are the accounting costs that are realized. For example, labor cost, energy costs, and material.
  - Implicit costs are those costs that are hidden.
  - One such a cost is the difference between revenue and revenue from best alternative investment . For example if we make A amount of investment and we receive X amount of return but an alternative investment would create Y return, where Y>X, from economic point of view there is a loss equal to $\Delta = Y-X$. In accounting term there is a profit of Y.

Explicit and Implicit, Continued

- Social cost –benefit analysis centers on the difference between explicit and implicit cost.
  - Social cost are costs that are incurred by society. A firm maybe dumping wastes into a river. From firm's point of view there is zero cost associated with waste disposal. However, the social cost of firms operation (from society point of view) is very high since they either have to clean water (a cost for the society) or have polluted water.
  - Social benefits maybe also different that private benefit.

Time Value of Money

- One important implicit cost is the time value of money. Accounting statements such as Balance Sheet and Income Statement do not take this factor into account.
- Time value of money simply suggest that there is a cost associated with holding cash. The cost is the interest rate that one could get from putting the fund in a saving account (time deposit) that has zero risk. This concept plays a central role in our discussion and analysis
- Example:
  - Assume interest rate (risk free) is 8% per year, and that we have $100. If we put the money in interest baring deposited, by the end of the year we would have 100*(1.08)= 108
  - If we do not put the money in interest baring instrument and keep it as cash, while in accounting term we have no cost , we have had $8 as economic cost (opportunity cost)
  - In our example, the Future value of $100 @8% annual interest rate is 108 at the end of the year
  - Alternatively, $108 of one year in future would have a present value of 108/(1.08)= 100 (approximately)
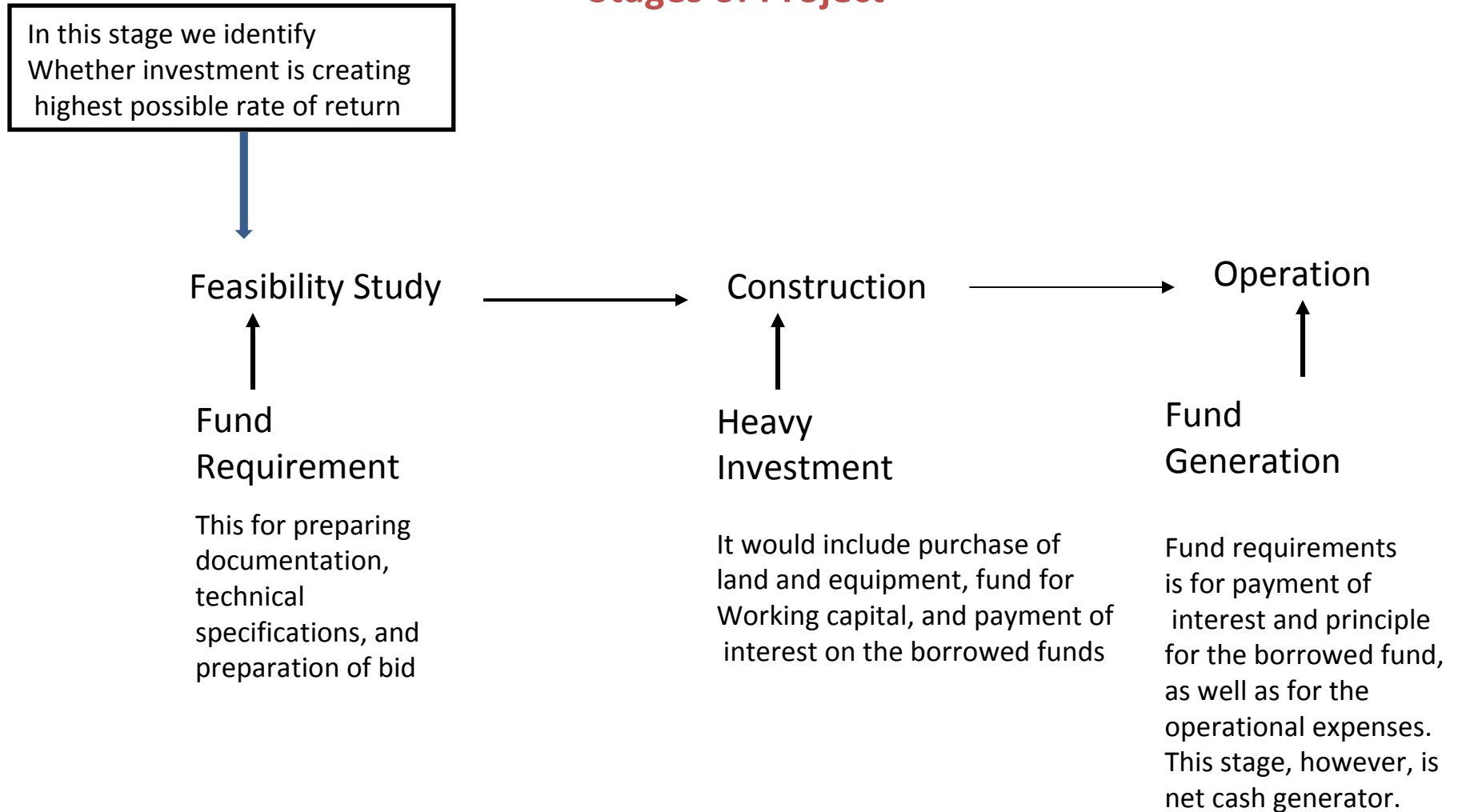 - More generally for a period of one year:

FV= PV *(1+r) FV is Future Value
PV is Present Value
r   is interest rate
(r is in fraction)

Alternatively

PV = FV/(1+r)

How does Construction Relates to Overall Project?

In this stage we identify
Whether investment is creating
 highest possible rate of return

Feasibility Study → Construction → Operation

Fund
Requirement

This for preparing
documentation,
technical
specifications, and
preparation of bid

Heavy
Investment

It would include purchase of
land and equipment, fund for
Working capital, and payment of
 interest on the borrowed funds

Fund
Generation

Fund requirements
is for payment of
 interest and principle
for the borrowed fund,
as well as for the
operational expenses.
This stage, however, is
net cash generator.

Various Types of projects

- Private sector is sponsor of project
  - Financing is from company (corporate finance)
  - Separate financing for project (project finance)
- Government sponsors project but private firm is involved
  - Government financed through various means including issuing of bonds
  - Build Operate and Transfer (Public private partnership)

Private sector uses corporate financing

The **first type** is when sponsor, private sector finances construction through its own resources. Below cash transaction of project is shown
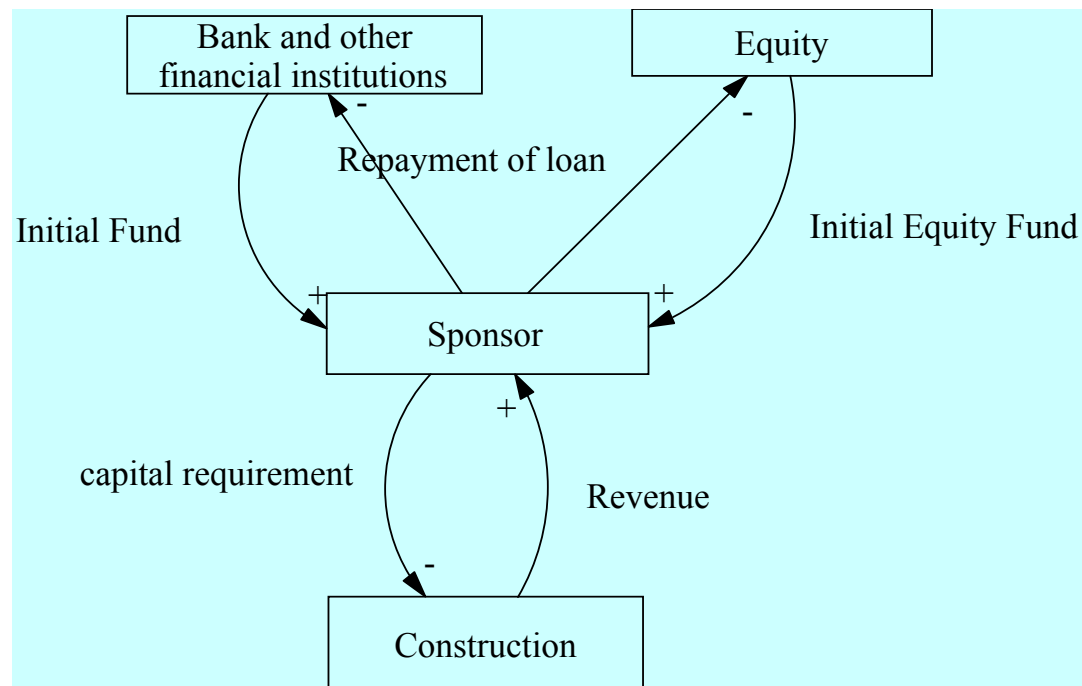
Government Financing of Project

The second type is traditional public sector project finance.
   In these types of projects, public sector entity sponsors the project
   and it funds the project construction. Source of fund is either special
   purpose bond or over all government bond which is supported by
   government ability to pay it off by its future taxes collection.
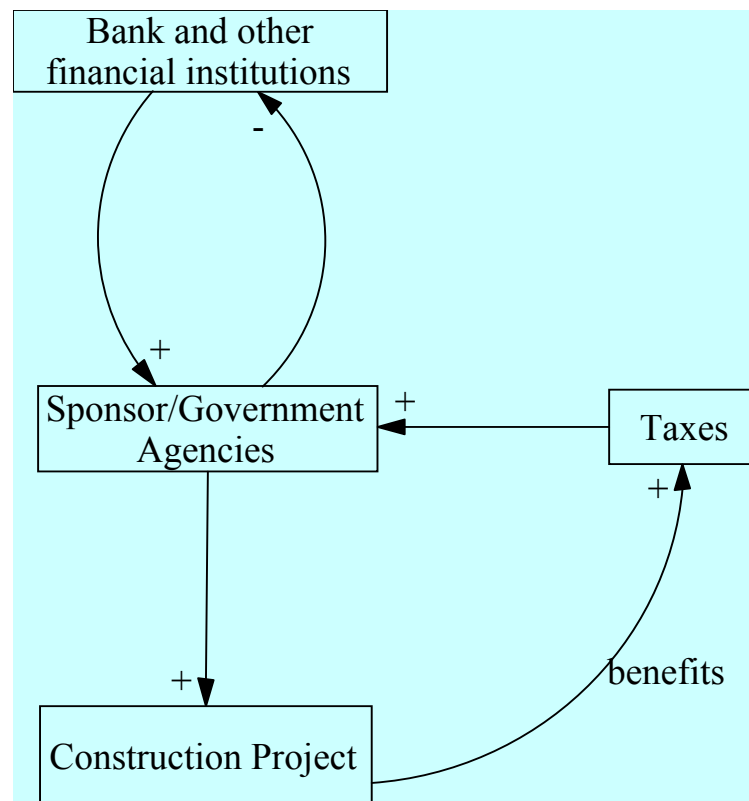
Project Finance

The third type is when the project is directly financed.
This is called "Project Financed". In these type of financing,
a project company is set up and the sponsor provides equity
financing to the "project company". The remaining financial needs
Of the project is raised directly through the project company.
Sponsor could be either public authorities or private firms.
The cash flow of the project pays for the financing cost
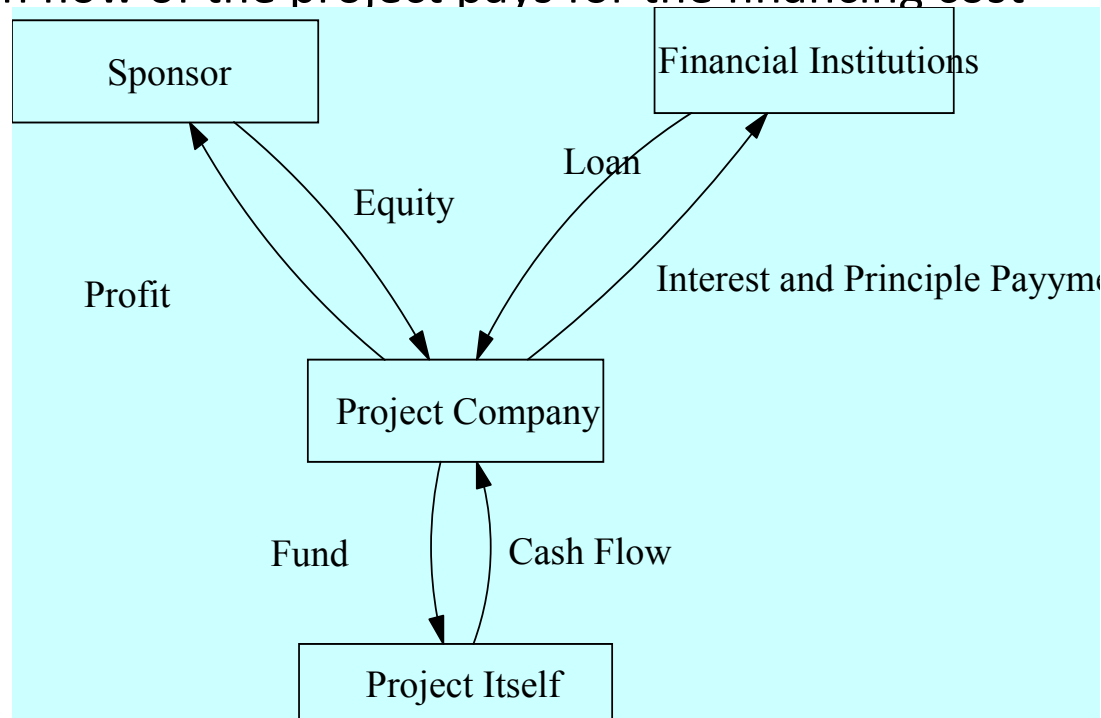
Project Valuation: Cash Flow Analysis

- Cash flow analysis
  - Each period revenue is forecast
  - Each period cost is determined
  - Difference between cost and revenue is gross return
  - Determine taxable income by subtracting depreciation
  - Subtract tax
  - Add back depreciation
  - Discount cash flow to present time take into account proper discount rate

Project Evaluation

- Net Present Value is when we subtract initial investment from present value of cash flow
  - Positive NPV means that the project created value
- Internal rate of return (IRR) is the discount rate that makes NPV zero
  - If the IIR is equal of greater than the company "hurdle rate" then the project creates value
- Payback period is the time it takes to cover the investment

Financial Evaluation

$$NPV = -I + \sum(R - C)(1 - t_a) / (1+r)^t + \sum t_a D/(1+r)^t + S_t / (1+r)^t$$

		accept			accept			accept
	>	accept		>	accept		<	accept
NPV	= 0	indifferent	$r^- = r^*$		indifferent	$t^- = t^*$		indifferent
	<	reject		<			>	reject

reject

NPV	Net Present Value
-I	Initial Investment
R - C	Revenue minus all cost in each period
t_a	Tax Rate
r	Discount Rate
S	Salvage Value of Capital at the End of Project
r^-	Internal Rate of Return
r^*	Hurdle Rate
t^-	Payback Period
t^*	Required Payback time

Role Depreciation

- Tax shield is amount of taxes that a firm is allowed not to pay because of accounting rules relative to its tax base.

  T.S. = ta*D where ta is tax rate (34%)and
  D is dollar value of depreciation

- Deprecation tax shield is important since it provides a free cash flow for the project

Cost Structure

- Over head cost which is fixed for company
  - Over all salaries
  - Energy
  - etc.
- These costs need to be allocated to the project based on some corporate formula

- Variable cost (cost related to the specific operation)
  - Labor
  - Energy used by project
  - Wages related to the project
  - Material
  - Leases
  - etc.
- These are variable and changes with the size of project

What determines the discount rate r

$$r = r_f + r_i + r_r$$

Where:

r   is the discount rate

r_f the risk free interest rate. Normally government bond

r_i Rate of inflation. It is measured by either by consumer price index or GDP deflator.

r_r Risk factor consisting of market risk, industry risk, firm specific risk and project risk

                          Market Risk

      r   =   Industry Risk

                          Firm specific Risk

r   Project Risk

Example: If risk free interest is 5%, inflation 3% then nominal rate of interest is 8%. In addition if we add 5% risk premium then our discount rate is 11%

Later we argue that weighted average cost of capital would make a good indicator for discount rate

Example: Meehan to accept road construction project

Meehan corp. is a civil engineering company with annual revenue of $8 billion per year. The company is a multinational with operation in Latin America and South East Asia. Meehan was established in 1962, and since then it has experienced a high rate of growth. The company is involved in infrastructure development, commercial property development and oil exploration and development. Company is currently considering whether or not to accept a road construction project.

Meehan has collected the following information about the project; which will take four years to complete and Meehan must initially invest about $64 million on equipment and $26 million on buying the necessary property, for a total of $90 million. The annual operation cost is $20 million a year, which include labor cost, and other operational cost. The company uses straight line 8 years depreciation. The salvage value of equipment is calculated at the cost. The tax rate of the Meehan is 34%.

Example: Meehan to accept road construction project

The contract calls for payment of $32 million at the end of first three years and $100 million upon completion at the end of the four year period. The project will commence in January 2007. Therefore all initial expenses such as purchase of land and equipment must take place prior to the start of the project. However, operational revenue and costs are calculated for the end of each subsequent year.
-Should Meehan accept this project, if the discount rate is 10%?
-What if Meehan used 8% discount rate?
-What if Meehan needed a $5 million working capital that it would recapture at the end of the project?

Meehan Construction

	2007	2008	2009	2010	2011
Revenue		32	32	32	100
Operation Cost		20	20	20	20
Depreciation Cost		8	8	8	8
Total Cost		28	28	28	28
Earning Before tax		4	4	4	72
Tax (0.34)		1.36	1.36	1.36	24.48
Profit after Tax		2.64	2.64	2.64	47.52
Add back depreciation		10.64	10.64	10.64	55.52
Salvage Value					32
Initial Investment I	-90				
Working Capital					
Cash Flow	-90	10.64	10.64	10.64	87.52
Discount Factor		0.909	0.826	0.751	0.683
Present Value of Cash Flow		9.673	8.793	7.994	59.777
NPV		-80.327	-71.534	-63.540	-3.763

NPV (10%)	($3.4205)
IRR =	9%
NPV (8%)	$1.62

Meehan Construction

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Add back depreciation		10.64	10.64	10.64	55.52
Salvage Value					32
Initial Investment I	-90				
Working Capital	-5				5
Cash Flow	-95	10.64	10.64	10.64	92.52
Discount Factor		0.909	0.826	0.751	0.683
Present Value of Cash Flow		9.673	8.793	7.994	63.192
NPV		-80.327	-71.534	-63.540	-0.347

NPV (10%)	($4.8614)
IRR =	8%

NPV (8%)	$0.39

Points about NPV

- Timing: Analysis should be on accrued bases
- Working Capital must be taken into account
- Separation of current from capital expense
- Overhead cost should be allocated to the project
- Salvage value of plant and equipment must be considered

NPV

- NPV and Internal rate of return are superior method of calculation of investment relative to payback period, since they recognize the time value of money

- NPV and IRR depend solely on forecasted cash flow and opportunity cost of capital and does rely on management taste and accounting practices

- NPV of independent projects are additive obtain total NPV. That is the NPV of two different independent projects can be summed up to. For two projects A and B

  NPV (A+B) =NPV(A)+NPV(B)

- The additive condition is an important aspect. For two project, A and B, one with positive NPV, A, and the other with negative NVP, B, we do not have to take both because they are packaged together.

NPV

- There are however circumstances that A and B are two different stages of project. In this case, if the second stage depends on the first stage then the additive condition is violated.

- An example is when a construction company may bid for a project with negative NPV in order to be able to get second project which is substantially larger and would have potentially a very high NPV. [for this types of investment there is other analytical instrument called Real Option. Real Option will be discussed subsequently].

- Or that a project opens other opprtunities that have positive NPV

Breakeven Analysis

- Breakeven structure and lumpiness of capacity
  - What is breakeven for a firm? It determine at what level of activities a project can cover all its cost.
  - Breakeven Point: Fixed cost + Variable cost = Revenue
  - Form above we can obtain breakeven quantity:

    Revenue = P*Q

    Variable cost = C *Q [C is a unit cost]

    Total Cost = FC + VC

    Breakeven output is:
    $$Q^* = FC/ (P-C)$$
  - In analysis of cost we must take into account all explicit and implicit costs

Breakeven Analysis, Continued

Oil Exploration

- ## Sunk Cost
  - After investment takes place the only way to recoup the investment is through depreciation. Initial capital investment is a sunk Cost. This also impact negotiation between contractor and sponsor
- ## Why lumpiness of capital important?
  - Once activities increase beyond certain point additional capital investment would be required. If capital is lumpy, then part of it may stay ideal. In this case the total cost would be allocated to the project, which could bring profitability low or negative.
- ## How to deal with lumpiness?
  - lease
  - outsourcing
  - alliances

Impact of Inflation

- Inflation impacts a number of variables in in the NPV equation. Therefore, calculation of NPV, using real value for variables provides different results than if nominal values were used.

NPV = -I + $\sum$(Rc - Cc)(1- ta)(1+i) /(1+r)^t (1+i)^t

Where Rc, Cc, and Rc are constant rates and i is the inflation rate

  - Impact of inflation on different costs parameters maybe different. Therefore, if nominal values were being used each cost components would have to be discounted by its own price index.

Impact of Inflation on Tax Shield

- Impact of inflation on tax shield is another important aspect. Inflation reduces tax shield of depreciation. This is because, based on USA accounting rules, depreciation is a fix value of the cost of capital good. The difference is particularly important in when there is hyper inflation

NPV = -I + $\sum$(Rc - Cc)(1- ta)(1+i) /(1+i)(1+r)t + $\sum$ta D/(1+i)(1+r)^t + SV/(1+i) (1+r)t

Example of Inflation

Company XYZ is considering three different projects, A, B, C. Project A does not need any initial investment, while project B and C require $1,000 and $10,000 investment respectively. All projects have 10 year life span and use straight line depreciation. Annual cash flow of A, B, and C are $361.4, $671.4 and 3460.6. Assuming a discount rate of 20% and tax rate of 34% calculate :

After tax NPV of each project

Determine the impact of 4.17 % inflation rate on the NPV of each project.

Example

		A	B	C	
Initial Investment		0	1000	10000	
Project life		10	10	10	
Depreciaton (D/n)		0	100	1000	
Annual Cash Flow		361.4	671.4	3460.6	
R(1-ta)		238.5	443	2283	
t*D		0	34	340	
After Tax Cash Flow (1-ta)R+T*D (1)		238.5	477	2623	
Sum[(1-ta)+T*D]/(1+R)t		1000	2000	11000	
NPV		1000	1000	1000	

Note: tax Shield is 34*4.19 =140

(1) $1 annuity at 20% interest for t=10 is equal to $4.192

238.5*4.192 = 1000

477.1*4.192 = 2000

2623.9*4.192 =11000

Example Continues

Nominal Discount Rate

Annual Inflation Rate	(1+interest rate)(1+ inflation rate)	
4.17%	(1.0417)(1.2) = 1.25	→ Ten Years annuity at discount
8.33%	(1.0833)(1.2) = 1.3	rate of 25% is 3.57 and not 4.19
12.50%	(1.125)(1.2) = 1.35	Shown in previous case
16.67%	(1.1667)(1.2) =1.4	

Example Continues

With 4.17% Inlfation

	A	B	C
Initial Investment	0	1000	10000
Depreciation	0	100	1000
Cash Flow (CF)	361.4	671.4	3460.6
After tax return	238.5	443.1	2283.6
Annual Depreciation tax shield	0	34	340
PV of cash flow	1000	1857.5	1214.2
PV. Of depreciation tax shield	0	121.4	1214.1
PV of total cash flow	1000	1978.8	10788.1
Net Present Value	1000	978.8	788.1

238.5*4.19=1000
443.1*4.19=1857.5
34*3.57= 121.4
340*3.54= 1214.1