ADVANCED CAPITAL BUDGETING DECISIONS

CLASS 7

Topic Utility Approach to Capital Budgeting

Question 1:

Jumble Consultancy Group has determined relative utilities of cash flows of two forthcoming projects of its client company as follows:

Cash Flow in ₹	-15000	-10000	-4000	0	15000	10000	5000	1000
Utilities	-100	-60	-3	0	40	30	20	10

The distribution of cash flows of project A and Project B are as follows:

Project A

Cash Flow (₹)	-15000	- 10000	15000	10000	5000
Probability	0.10	0.20	0.40	0.20	0.10

Project B

Cash Flow (₹)	- 10000	-4000	15000	5000	10000
Probability	0.10	0.15	0.40	0.25	0.10

Which project should be selected and why ?

(Source: ICAI)

ANSWER:

Evaluation of project utilizes of Project A and Project B

Cash flow (in ₹)	**Project A**		
	Probability	**Utility**	**Utility value**
-15,000	0.10	-100	-10
-10,000	0.20	-60	-12
15,000	0.40	40	16
10,000	0.20	30	6
5,000	0.10	20	2
			2

Cash flow (in ₹)	**Project B**		
	Probability	**Utility**	**Utility value**
-10,000	0.10	-60	-6
-4,000	0.15	-3	-0.45
15,000	0.40	40	16
5,000	0.25	20	5
10,000	0.10	30	3
			17.55

Project B should be selected as its expected utility is more.

Topic Certainty Equivalent

Question 2:

The Textile Manufacturing Company Ltd., is considering one of two mutually exclusive proposals, Projects M and N, which require cash outlays of ₹ 8,50,000 and ₹ 8,25,000 respectively. The certainty-equivalent (C.E) approach is used in incorporating risk in capital budgeting decisions. The current yield on government bonds is 6% and this is used as the risk free rate. The expected net cash flows and their certainty equivalents are as follows:

	Project M		Project N	
Year-end	**Cash Flow ₹**	**C.E.**	**Cash Flow ₹**	**C.E.**
1	4,50,000	0.8	4,50,000	0.9
2	5,00,000	0.7	4,50,000	0.8
3	5,00,000	0.5	5,00,000	0.7

Present value factors of ₹ 1 discounted at 6% at the end of year 1, 2 and 3 are 0.943, 0.890 and 0.840 respectively.

Required:

i. Which project should be accepted?
ii. If risk adjusted discount rate method is used, which project would be appraised with a higher rate and why?

(Source: ICAI)

ANSWER:

i. Statement Showing the Net Present Value of Project M

Year end	Cash Flow (₹) (a)	C.E. (b)	Adjusted Cash flow (₹)(c) = (a) × (b)	Present value factor at 6% (d)	Total Present value (₹)(e) = (c) × (d)
1	4,50,000	0.8	3,60,000	0.943	3,39,480
2	5,00,000	0.7	3,50,000	0.890	3,11,500
3	5,00,000	0.5	2,50,000	0.840	2,10,000
					8,60,980
Less: Initial Investment					8,50,000
Net Present Value					10,980

Statement Showing the Net Present Value of Project N

Year end	Cash Flow (₹) (a)	C.E. (b)	Adjusted Cash flow (₹) (c) = (a) × (b)	Present value factor (d)	Total Present value (₹) (e) = (c) × (d)
1	4,50,000	0.9	4,05,000	0.943	3,81,915
2	4,50,000	0.8	3,60,000	0.890	3,20,400

3	5,00,000	0.7	3,50,000	0.840	2,94,000
					9,96,315
Less: Initial Investment					8,25,000
Net Present Value					1,71,315

Decision: Since the net present value of Project N is higher, so the project N should be accepted.

Question 3:

Col. Rao, after retirement from the Indian army, is planning to start up an automobile service centre. Initial outlay for this project is Rs.60 lakhs. The expected cash-inflows of the project are as given below:

Year	1	2	3	4	5	6	7
Cash inflow (Rs. in Lakhs)	10	15	16	16	12	8	5

Risk free rate is 8%. A management consultant says that certainty equivalent factor in this business behaves as per the following equation

$$\alpha_{t+1} = \frac{\alpha_t\,(1.01+i)}{(1+k)}$$

where

i = risk free rate,

k = cost of capital,

α_t = certainty equivalent factor for year t

$\alpha_t + 1$ = certainty equivalent factor for year (t + 1)

$\alpha_0 = 1$

You are required to find the maximum value of cost of capital for this project's financing at which the promoter is indifferent between acceptance and rejection of this project.

(Source: FOD)

ANSWER:

$\alpha_0 = 1$ as the cash flow in o^{th} year is certain

$\therefore$ NPV as per certainty equivalent method would be

$$-60+\frac{(1.09)\times10\times\text{PVIF}(8\%,1)}{(1+k)}+\frac{15\times(1.09)^2\times\text{PVIF}(8\%,2)}{(1+k)^2}+\frac{16\times(1.09)^3\times\text{PVIF}(8\%,3)}{(1+k)^3}+$$

$$\frac{16\times(1.09)^4\times\text{PVIF}(8\%,4)}{(1+k)^4}+\frac{12\times(1.09)^5\times\text{PVIF}(8\%,5)}{(1+k)^5}+\frac{8\times(1.09)^6\times\text{PVIF}(8\%,6)}{(1+k)^6}$$

$$\frac{5\times(1.09)^7\times\text{PVIF}(8\%,7)}{(1+k)^7}$$

$$= -60+\frac{10.09}{(1+k)}+\frac{15.28}{(1+k)^2}+\frac{16.45}{(1+k)^3}+\frac{16.60}{(1+k)^4}+\frac{12.57}{(1+k)^5}+\frac{8.45}{(1+k)^6}+\frac{5.33}{(1+k)^7}$$

For maximum value of cost of capital the NPV should be zero when the promoter becomes indifferent between acceptance and rejection of the project.

at k = 10% R. H. S. = 0.80

k = 11% R. H. S. = –1.00

$\therefore$ by interpolating, we get

$$k = 11 - \frac{(0+1.00)}{(0.80+1.80)} = 10.44\%.$$

Topic Risk Adjusted Discount Rate (RADR)

Question 4:

Determine the risk adjusted net present value of the following projects:

	X	Y	Z
Net cash outlays (₹)	2,10,000	1,20,000	1,00,000
Project life	5 years	5 years	5 years
Annual Cash inflow (₹)	70,000	42,000	30,000
Coefficient of variation	1.2	0.8	0.4

The Company selects the risk-adjusted rate of discount on the basis of the coefficient of variation:

Coefficient of Variation	Risk-Adjusted Rate of Return	P.V. Factor 1 to 5 years At risk adjusted rate of discount
0.0	10%	3.791
0.4	12%	3.605
0.8	14%	3.433

1.2	16%	3.274
1.6	18%	3.127
2.0	22%	2.864
More than 2.0	25%	2.689

(Source: ICAI)

ANSWER:

Projects	**Net cash outlays**	**Coefficient of variation**	**Risk adjusted discount rate**	**Annual cash inflow**	**PV factor 1-5 years**	**Discounted cash inflow**	**Net present value**
	₹			₹		₹	₹
(i)	**(ii)**	**(iii)**	**(iv)**	**(v)**	**(vi)**	**(vii) = (v) × (vi)**	**(viii) = (vii) – (ii)**
X	2,10,000	1.20	16%	70,000	3.274	2,29,180	19,180
Y	1,20,000	0.80	14%	42,000	3.433	1,44,186	24,186
Z	1,00,000	0.40	12%	30,000	3.605	1,08,150	8,150

Question 5:

New Projects Ltd. is evaluating 3 projects, P-I, P-II, P-III. Following information is available in respect of these projects:

	P-I	**P-II**	**P-III**
Cost	₹ 15,00,000	₹ 11,00,000	₹ 19,00,000
Inflows-Year 1	6,00,000	6,00,000	4,00,000
Year 2	6,00,000	4,00,000	6,00,000
Year 3	6,00,000	5,00,000	8,00,000
Year 4	6,00,000	2,00,000	12,00,000
Risk Index	1.80	1.00	0.60

Minimum required rate of return of the firm is 15% and applicable tax rate is 40%. The risk free interest rate is 10%.

Required:

i. Find out the risk-adjusted discount rate (RADR) for these projects.
ii. Which project is the best?

(Source: ICAI)

ANSWER:

i. The risk free rate of interest and risk factor for each of the projects are given. The risk adjusted discount rate (RADR) for different projects can be found on the basis of CAPM as follows:

Required Rate of Return $= I_{Rf} + (k_o - I_{RF})$ Risk Factor

For P-I : RADR = 0.10 + (0.15 – 0.10) 1.80 = 19%
For P-II : RADR = 0.10 + (0.15 – 0.10) 1.00 = 15 %
For P-III : RADR = 0.10 + (0.15 – 0.10) 0.60 = 13 %

ii. The three projects can now be evaluated at 19%, 15% and 13% discount rate as follows:

Project P-I

Annual Inflows	₹ 6,00,000
PVAF (19 %, 4)	2.639
PV of Inflows (₹ 6,00,000 x 2.639)	₹ 15,83,400
Less: Cost of Investment	₹ 15,00,000
Net Present Value	**₹ 83,400**

Project P-II

Year	Cash Inflow (₹)	PVF (15%,n)	PV (₹)
1	6,00,000	0.870	5,22,000
2	4,00,000	0.756	3,02,400
3	5,00,000	0.658	3,29,000
4	2,00,000	0.572	1,14,400
Total Present Value			12,67,800
Less: Cost of Investment			11,00,000
Net Present Value			**1,67,800**

Project P-III

Year	Cash Inflow (₹)	PVF (13%,n)	PV (₹)
1	4,00,000	0.885	3,54,000
2	6,00,000	0.783	4,69,800
3	8,00,000	0.693	5,54,400
4	12,00,000	0.613	7,35,600
Total Present Value			21,13,800
Less: Cost of Investment			19,00,000
Net Present Value			**2,13,800**

Project P-III has highest NPV. So, it should be accepted by the firm

Question 6:

A company engaged in manufacturing of toys is considering a line of stationary items with an expected life of five years. From past experience the company has a conservative view in its investment in new products. Accordingly company considers the stationary items an abnormally risky project. The company's management is of view that normally required rate of return of 10% will not be sufficient and hence minimum required rate of return should be 15%. The initial investment in the project will be of ₹ 1,10,00,000 and expected free cash flows

to be generated from the project is ₹ 30,00,000 for 5 years. Determine whether project should be accepted or not.

(Source: ICAI)

ANSWER:

PV of cash inflows = ₹ 30,00,000 x PVIAF (15%, 5)
= ₹ 30,00,000 x 3.352
= ₹ 1,00,56,000

NPV = PV of Cash Inflow – Initial Investment
= ₹ 1,00,56,000 – ₹1,10,00,000
= ₹ 9,44,000

Thus project should not be accepted.

Had the required rate of return be 10%.

The position would have been as follows.

Present value of Cash Inflows = ₹ 30,00,000 x PVIAF (10%, 5)
= 30,00,000 x 3.791 = ₹ 1,13, 73,000

NPV = ₹ 1,13,73,000 – ₹ 1,10,00,000
= ₹ 3,73,000

Question 7:

One of the largest FMCG producer is planning to take a venture in retail business of consumer goods through their discount stores. Average cost of capital of this company is 12%. As the company is taking up a new project they decided to appraise the project with risk adjusted discount rate method. They also found that the premium for the normal risk of the firm is twice the premium for the extra risk of the project. Risk free rate prevailing in the market is 7%. Estimated initial investment for this project is Rs.100 crores. Cash flows related to this project are expected to be as follows:

	(Rs. in Crores)
Year	**Cash Flow**
0	(100)
1	60
2	55

Find out the risk adjusted NPV of the project.

(Source: FOD)

Q.7

$k_c = 12\%$

$R_f = 7\%$

$\therefore n = 5\%$

$d_k = 1/2 \text{ of } n = 1/2 \text{ of } 5 = 2.5\%$

$\therefore RADR = k_c + d_k = 12 + 2.5 = 14.5\%$

$$NPV = \frac{60}{(1.145)} + \frac{55}{(1.145)^2} - 100 = -5.65$$

$\therefore$ The project is rejected.