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Chapter VIII

INTERNATIONAL PROJECT APPRAISAL

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PROBLEMS

Problem 1

An Indian firm finds that by investing in a project in East Africa, its borrowing capacity will go up by Rs. 50 million. If the firm's borrowing rate in India is 15% and the risk free rate of interest is 6%, what is the net benefit owing to the increased borrowing capacity ? Assume that the tax rate applicable in India is 40% and the life of the project is 5 years.

Solution

Interest on increased

borrowing capacity = (.15) (50) = Rs. 7.5million

Tax shield generated per year = (.4) (7.5) = Rs. 3.0 million

Present value of tax shields due to increased

borrowing capacity   = 3.0 PVIFA (I-6%, n=5)

$$= 3.0 \, [\, (1.06^5 -1) \, / \, (0.06(1.06)^5$$

= Rs. 12.64 million.

Problem 2

An US multi-national is plannint to invest in Germany. The local Government has agreed to give a loan of DM 100 million at a concessional rate of 5%. The competitive market rate of interest for similar loans in Germany is 10%. If the principal has to be repaid in 5 equal installments, what is the benefit which the US multinational will enjoy? You are given that the exchange rate at the time of investment is DM 1.50/$.

Solution

Year	Loan outstandings (DM)	Principal repayment (DM)	Interest repayment (DM)	Present Value of total repayment (Discount rate = 0.10)
1	100	20	5	$25/(1.10) = 22.72$
2	80	20	4	$24/(1.10)^2 = 19.83$
3	60	20	3	$23/(1.10)^3 = 17.28$
4	40	20	2	$22/(1.10)^4 = 15.03$
5	20	20	1	$21/(1.10)^5 = 13.03$

Present Value of the concessional loan which can be deducted from the cost of the project
= (100 - 87.89) / (1.5) = $ 8.07 million.

Problem 3

A German firm is planning to invest in USA. After detailed calculations, it finds that for the project to break even, the adjusted present value has to increase by DM 5 million. Meanwhile, it has to negotiate with the local Government regarding the interest rate which will be charged for a loan of $20 million. The competitive market rate of interest for similar loans in USA is 8%. If the principal is to be repaid in equal installments over 5 years, what concessional rate of interest must the German firm obtain for the project to break even? You are given that the spot rate at the time of implementation of the project is DM1.50/$.

Solution

Let the concessional rate of interest be i.

Then, the principal repayment will be $4 million each year interest payments will be as follows:

Year 1	:	20 i
Year 2	:	(20-4) i = 16 i
Year 3	:	(16-4) i = 12 i
Year 4	:	(12-4) i = 8 i
Year 5	:	= 4 i

The assumption made in this problem is that the firm generates sufficient profits each year to absorb the tax shield. This means that the risk free rate of interest is adequate to incorporate the degree of risk involved.

The benefit due to the concessional loan must equal DM 5 million or $5/1.5 = $3.33 million.

But benefit due to the concessional loan
$= 20 - \{ [(20i+4) / 1.08] + [(16i+4)] / (1.08)^2] + [(12i + 4) / (1.08)^3] + [(8i+4) / (1.08)^4] + [(4i+4) / (1.08)^5]$

$= [20 - 50.36i - 15.97]$
$= 4.03 - 50.36i$
So, $4.03 - 50.36i > 3.33$ or $i <= .0138 = 1.38\%$

Problem 4

An US corporate is appraising an international project using the Adjusted Present Value method. It has calculated the APV to be $-70 million. The Government of India where the investment will be made has offered a concessional loan of Rs. 1400 crores. The competitive market rate of interest in India is 16% and the spot rate is Rs. 35/$. At what rate should the concessional loan be negotiated so that the project is feasible ? Assume that the principal repayment will be made in five equal installments starting from the second year.

Solution

Let i be the rate of interest charged on the concessional loan.
Then, we can construct the following table.

Year	Interest (Rs crores)	Principal (Rs crores)	Total repayment (Rs crores)
1	1400 i	--	1400 i
2	1400 i	280	1400 i + 280
3	1120 i	280	1120 i + 280
4	840 i	280	840 i + 280
5	560 i	280	560 i + 280
6	280 i	280	280 i + 280

Present Value of repayment

$$= \frac{1400i}{1.16} + \frac{1400i+280}{1.16^2} + \frac{1120i+280}{1.16^3} + \frac{840i+280}{1.16^4}$$
$$+ \frac{560i+280}{1.16^5} + \frac{280i+280}{1.16^6}$$

= Rs (790.16 + 3809.96i) crores

= Rs (7901.6 + 38100i) million

	Year 1	Year 2	Year 3	Year 4	Year 5
Total Sales	60,000	70,000	80,000	90,000	100,000

(Units)

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* In current £ the sales price of a scooter is expected to be £500.
* The variable cost of a scooter is expected to be £300 per scooter, also in current £.

* The economic life of the UK plant is expected to be 5 years and it is expected that no major expenditure for repairs/renovation would be required during the life of the project.

* The salvage value of the UK plant can be assumed to be negligible.

* The depreciation of the plant allowable as per the UK tax laws will be as follows:

	Year 1	Year 2	Year 3	Year 4	Year 5
Depreciation (in £ million)	3	2.6	2.4	1.7	1

The UK plant will incur fixed costs of £1 million per year, exclusive of depreciation.

* The British Government has offered a loan of £5 million at 1% p.a. The principal is to be repaid in 5 equal installments with the first installment due at the end of the first year of production. The competitive market rate of interest for similar loans in UK is 12% p.a.

* All variable and fixed costs are expected to move in line with the UK inflation rate.

* The excess capacity of the Indian plant will remain unutilised. As a result, the loss of contribution each year for Ved Udyog will be Rs. 40 million in current rupees.

* Corporate tax rates in India and Britain are 35% and 20% respectively.

* Ved Udyog Ltd faces a borrowing rate of 17% in India and the risk free rate of interest is 9%.

* The long term inflation rates in India and UK are expected to be 9% and 2% p.a. respectively.

* The current exchange rate is Rs. 59 = £1. It is believed that purchasing power parity is likely to hold.

* The Corporate finance group of Ved Udyog has suggested a discounting rate of

18% for operational cash flows generated by the project.

You are required to examine the feasibility of the project using the APV method.

Solution

Current exports	=	20,000 scooters/annum
Total investment	=	£ 45 million
Sales price	=	£ 500 (current)
Variable cost	=	£ 300
Life of project	=	5 years
Fixed costs	=	£ 1 million
Salvage value	=	nil
Loss of contribution	=	£ 40 million (current)
Tax rate	=	35% (India), 20% (Britain)
India	=	r = 17%, 20% (Britain) (r: market rate, r_f, risk free rate)
UK	=	r = 12% concessional interest rate = 1%
Inflation	=	India - 9% UK - 2%
Current spot rate	=	Rs 59/£ Discount rate = 18%
Increase in borrowing capacity		= Rs 100 million.

Exchange Rate Schedule

We determine the exchange rate schedule by applying the PPP principle.

Year	1	2	3	4	5
Exch rate	63.05	67.38	72.00	76.94	82.22

Initial Investment

This will be Rs (45) (59) million = Rs 2655 million

Cash flows generated from operations

Year	[Sales - Costs] $(1+i_{vk})^t$
1	$[60,000 (500-300) - 1,000,000] (1.02) = £\ 11.22$ million
2	$[70,000 (500-300) - 1,000,000] (1.02)^2 = £\ 13.53$ million
3	$[80,000 (500-300) - 1,000,000] (1.02)^3 = £\ 15.92$ million
4	$[90,000 (500-300) - 1,000,000] (1.02)^4 = £\ 18.40$ million

5             $[100,000 \ (500-300) - 1,000,000] \ (1.02)^5 = £ \ 20.98$ million

The company is now exporting 20,000 scooters per annum. These sales will be lost once the UK plant come into existence. Currently, the contribution is Rs 40 million. this is expected to increase at the rate of inflation in India, which is 9%.

Year	Additional profits (Rs million)	Lost contribution (Rs million)	Net profits before tax (Rs million)	Net profits after tax (Rs million)
1	11.22 (63.05)	40 (1.09)	663.82	431.48
2	13.53 (67.38)	$40 \ (1.09)^2$	864.13	561.68
3	15.92 (72.00)	$40 \ (1.09)^3$	1094.44	711.39
4	18.40 (76.94)	$40 \ (1.09)^4$	1359.23	883.50
5	20.98 (82.22)	$40 \ (1.09)^5$	1663.43	1081.23

PV if operational cash flows

$$= \frac{431.48}{1.18} + \frac{561.68}{(1.18)^2} + \frac{711.39}{(1.18)^3} + \frac{883.50}{(1.18)^4} + \frac{1081.23}{(1.18)^5} = 365.66 + 403.39 + 432.97 + 455.70 + 472.62 = 2130.34$$

Note that the higher tax rate of 35% has been applied.

Tax shield due to Depreciation

Year	Depreciation (£ million)	Depreciation tax shield (Rs million)	
1	3	$(3) \ (63.05) \ (.20) \ / \ (1.09)$	= 34.71
2	2.6	$(2.6) \ (67.38) \ (.20) \ / \ (1.09)^2$	= 29.49
3	2.4	$(2.4) \ (72.00) \ (.20) \ / \ (1.09)^3$	= 26.69
4	1.7	$(1.7) \ (76.94) \ (.20) \ / \ (1.09)^4$	= 18.53
5	1.0	$(1.0) \ (82.22) \ (.20) \ / \ (1.09)^5$	= 10.69
			120.11

Since consolidation of accounts may not take place with the parent company we have calculated the depreciation tax shield as per UK laws. Also, we have discounted the tax shields at the risk free rate of interest in India.

Tax shield due to increased borrowing capacity

Additional borrowing capacity = Rs 100 million
Tax shield on interest   = (100) (.17) (.35) = 5.95

$$\text{PV of tax shields} = \frac{(5.95)\ 1.09^5 - 1}{(.09)\ (1.09)^5} = \text{Rs } 23.14 \text{ million}$$

Benefit due to concessional loan

Year	Outstanding loan	Interest	Principal	Total	PV (k=.12)
1	5	.05	1	1.05	.9375
2	4	.04	1	1.04	.8291
3	3	.03	1	1.03	.7331
4	2	.02	1	1.02	.6482
5	1	.01	1	1.01	.5731

					3.721

PV of concessional loan = 59 (5 - 3.721) = Rs 75.46 million

APV   = - 45 (59) + 2130.34 + 120.11 + 23.14 + 75.46
       = - Rs 305.95 million

Hence, the project cannot be accepted.

Problem 6

The Nepalese government has accepted a proposal from M/s. IRCON, a reputed Indian construction company to operate a Railway project on the following conditions. (In this problem Rs. means Nepalese Rs, NR unless otherwise specifically mentioned.)

  * The initial investment will be Rs. 100 crore.

  * The project will be operated on the basis of Build/Operate/Lease/Transfer. As per the conditions of the offer, the initial investment will be made by IRCON. IRCON will operate the Railway line and other items and in lieu of the operation, the Nepalese government will pay an annual lease rental of Rs. 100 crore.

  * The Nepalese government has also offered to extend a loan of Rs. 50 crore without interest. The competitive market rate for similar loans in Nepal is 20% per year.

* After 5 years the project will be transferred to Nepal Railways for a lump sum amount of Rs. 200 crore.

* The concessional loan provided by the Nepalese government has to be repaid in 5 equal installments starting from the end of year 1.

* As per the Income Tax Laws of Nepal, IRCON is allowed to charge a depreciation of 20% per year.

* The Nepalese government has also agreed to grant a tax holiday of three years.

* The tax rate in India is 35% and in Nepal it is 40%.

* The project will enable IRCON to raise its borrowing capacity by Indian Rs.100 crores.

* The annual operating cost of the project is estimated at Rs 45 crore at the current exchange rate.

* Double Taxation avoidance agreement exists between Nepal and India.

* No major repairs or maintenance work will be required during the tenure of the project.

* All operating costs are expected to move in line with the inflation rate in Nepal. However, the lease rental will remain at the same level of Rs. 100 crore.

* IRCON has been borrowing at 18% interest in India and the riskless rate of borrowing in India can be assumed to be 10% p.a.

* The long term inflation rates in India and Nepal are 10% and 15% respectively.

* The current exchange rate is Indian Rs. 1 = Nepalese Rs. 1.5. It is believed that PPP is likely to hold.

* The Nepal Railways has also agreed to pay a one time technical advisory fee of Rs. 100 crore to Ircon at the end of year 5.

Should IRCON go ahead with the project if the discounting rate for cash flows generated from operating the railway in Nepal is assumed to be 18% p.a. ?

Solution

Exchange Rate Schedule

The exchange rate schedule is determined by using PPP.

Year	1	2	3	4	5
Exch rate (NR/IR)	1.57	1.64	1.71	1.79	1.87

Initial investment

$$= (100) / (1.50) = IR\ 66.67\ crores$$

Cash flows generated from operations

Year	Revenues NR	Costs NR	PBT NR	PBT IR	PAT IR	PV k=.18
1	100 (45)	(1.15)	48.25	30.73	19.97	16.92
2	100 (45)	$(1.15)^2$	40.49	24.69	16.05	11.53
3	100 (45)	$(1.15)^3$	31.56	18.46	12.00	7.30
4	100 (45)	$(1.15)^4$	21.29	11.89	7.13	3.68
5	100 (45)	$(1.15)^5$	9.49	5.07	3.04	1.33

						40.76

Since there is a tax holiday in Nepal for three years, the tax rate for this period is that prevailing in India, i.e. 35%. For the subsequent two years, the higher of the two tax rates, i.e. 40% applies.

Terminal cash flows

$$PV = \frac{(200+100)}{1.87} \quad \frac{(.6)}{(1.18)^5} = 42.07$$

We assume that the terminal cash flows are characterised by the same degree of risk as cash flows from operations. Also, tax at the rate of 40% will have to be paid.

Tax shield due to Depreciation

Year	Depn	Depn	Tax shield	PV
	NR	NR	IR	k = .10
1	20	12.74	5.10	4.63
2	20	12.20	4.88	4.04
3	20	11.70	4.68	3.52
4	20	11.17	4.47	3.06
5	20	10.70	4.28	2.66

		17.91		

Tax shield has been calculated at the higher of the two tax rates, i.e 40%.

Tax shield due to increased borrowing capacity

$$(100)\,(.18)\,(.40)\,\frac{(1.10^5 - 1)}{(.10)\,(1.10)^5} = \text{Rs } 27.29 \text{ crores}$$

Benefit due to concessional loan

$$50 - \frac{(10)\,(1.2^5 - 1)}{(.2)\,(1.2)^5} = \text{Rs. } 27.29 \text{ crores}$$

$$= \text{IR } (20.09) / (1.50) = \text{Rs } 13.39 \text{ crores}$$

APV = - 66.67 + 40.76 + 42.07 +17.91 + 27.29 + 13.39

= Rs 74.75 crores

Since APV is +ve, the project can be taken up for implementation.

Problem 7

Jeanolex, a leading French manufacturer of Denim wear is planning to set up a manufacturing and distributing subsidiary in USA. Presently, Jeanolex is catering to the North American and Latin American markets through two fully owned subsidiaries - one in USA and the other in Mexico. Once its subsidiary is set up in USA both these subsidiaries would be wound up.

The following information regarding the investment has been gathered:

An investment of $40 million would be required to set up the new subsidiary and wind up the existing sales subsidiary.

The investment would increase the borrowing capacity of Jeanolex Ltd to the extent of French Franc 100 million. The actual borrowing would be lower as surplus funds to the extent of $2 million from the existing USA sales subsidiary and Mexican Pesos 30 million from the Mexican subsidiary would be available. The French manufacturer had let the surplus earnings accumulate at the Mexican subsidiary as 50% tax would have to be paid in Mexico for any earnings remitted abroad. Since the tax rate is 45% in France, tax credit could have been availed of only for a portion of the taxes paid. If the investment was not made in USA, the surplus funds in Mexico would have been at some point in time transferred as nothing better could have been done with them. Mexico, being part of the North American Free Trade Area, investment in USA attract the same incentive as those in Mexico.

* The sales projection for the first five years of operation are as follows :

	Year1	Year2	Year3	Year4	Year5
Capacity (%)	60	75	85	100	100
Sales ($ in million)	60	75	85	100	100

(All sales figures given above are in current $.)

* Contribution on sales is expected to be around 50%.

* Fixed costs excluding depreciation are estimated to be as follows. Figures are given in current $.

	Year1	Year2	Year3	Year4	Year5
Fixed cost ($ in million)	10	15	16	20	20

* The existing sales subsidiaries in USA and Mexico are earning a profit of FFr 0.6 million per year and FFr 0.1 million per year respectively. It is expected that the profits of these subsidiaries will keep pace with the rate of inflation in France.

* The economic life of the new plant is 5 years.

* All production and fixed costs are expected to move in line with the rate of inflation in USA.

* Jeanolex will be getting a concessional loan of $5 million at 4% p.a. The principal is to be repaid in 5 equal installments with the first installment due at the end of first year of production. The competitive market interest rate in USA is 10% p.a.

* Depreciation should be charged as per straight line method at 18% p.a. in both France and USA.

* Jeanolex faces a borrowing rate of 12% in France and the riskless rate in that country is 8%.

* The tax rate in France is 45% while that in the US is 40%. The French and the US authorities are vigilant enough to ensure that transfer prices are not manipulated to reduce tax liability.

* The long run inflation rates in the respective countries are expected to be as follows:

France	:	3% p.a.
USA	:	4% p.a.
Mexico	:	8% p.a

* The current exchange rates are

$ 1	=	FF 5.74
$ 1	=	Mex. Peso 3.25

* Jeanolex believes that a 14% discount rate is appropriate for cash flows generated by the project.

Evaluate the investment proposal using the APV method.

Solution

Exchange Rate Schedule

The exchange rate schedule can be determined by using PPP.

Year	1	2	3	4	5
Exch	5.68	5.63	5.58	5.52	5.47

Initial Investment
= $ 40 million = FF (40) (5.74) = FF 229.6 million.

Cash flows from operations

Year	Contribution ($ million)	Fixed costs ($ million)	PBT ($ million)	PAT ($ million)
1	$(60)(1.04)(.5)$	$(10)(1.04)$	20.80	11.44
2	$(75)(1.04)^2(.5)$	$(15)(1.04)^2$	24.34	13.39
3	$(85)(1.04)^3(.5)$	$(16)(1.04)^3$	29.81	16.40
4	$(100)(1.04)^4(.5)$	$(20)(1.04)^4$	35.10	19.31
5	$(100)(1.04)^5(.5)$	$(20)(1.04)^5$	36.50	20.08

Year	PAT (FF million)	Lost profits (FF million)	Net profit (FF million)	PV (k = .14)
1	64.98	.721	64.26	56.37
2	75.39	.743	74.65	57.44
3	91.51	.765	90.75	61.25
4	106.59	.788	105.80	62.64
5	109.84	.811	109.03	56.63

				294.33

Note that the higher tax rate of 45% in France is applicable here.

Tax shields due to increased borrowing capacity

Addition to borrowing capacity = FF 100 million

Applicable interest rate = 12%

Present value of tax shields generated by using a discount rate of 8%, the riskless rate in France.

$$= (100)(.12)(.45) \quad \frac{(1.08^5 - 1)}{(.08)(1.08)^5} = \text{FF } 21.56 \text{ million}$$

Benefit due to concessional loan

Year	Loan outstanding ($ million)	Interest	Principal ($ million)	Total payment ($ million)	PV (k = .10)
1	5	.20	1	1.20	1.09
2	4	.16	1	1.16	0.96
3	3	.12	1	1.12	0.84

4	2	.08	1	1.08	0.74
5	1	.04	1	1.04	0.65

					4.28

Benefit due to concessional loan

   = (5.74) (5 - 4.28) = FF 4.13 million

Tax shield due to depreciation

Since tax rate is higher in France, depreciation will be calculated as per French tax laws.
Investment = (40) (5.74) = FF 229.6 million
Depreciation claimed per year = (.18) (229.6) = FF 41.33 million.

The tax shields are discounted at the risk free rate of interest in France, i.e., 8%.

$$PV = (18.60) \ \frac{1.08^5 - 1}{(.08) (1.08)^5} = 74.26$$

Initial investment = (40) (5.74) = FF 229.6 million

Adjustment for blocked funds

If funds are repatriated, withholding tax of 50% would be charged. Hence, 5% additional tax would have to be paid. So, the necessary adjustment for blocked funds is

Mexican Pesos (0.05) (30) = FF [(0.05) (30) / (3.25)] (5.74)
                        = FF 2.65 million.
This can be deducted from the initial investment.

APV = - 229.6 + 2.65 + 294.33 + 21.56 + 4.13 + 74.26
    = FF 167.33 million.

Since the APV is positive, the project can be accepted.

Problem 8

   In the previous problem, if the US Government increases corporate tax rates to 505, would the adjusted present value differ ?

Solution

The Adjusted Present Value would change as calculations would have to be done on the

basis of the US tax rate. Further, depreciation has to be calculated as per US laws.

Cash flows from operations

Year	PAT (FF million)	Lost profits (FF million)	Net profits (FF million)	PV (FF million)
1	59.07	.721	58.34	51.18
2	68.52	.743	67.78	52.15
3	83.19	.765	82.43	55.64
4	96.90	.788	96.11	56.90
5	99.83	.811	99.02	51.43

				267.30

Tax shield due to depreciation

Depreciation will now be computed as per US rules. The tax rate applicable will be 50%.

Year	Depn ($ million)	Depn tax shield (FF million)	PV (k = .08)
1	7.2	20.45	18.94
2	7.2	20.27	17.38
3	7.2	20.09	15.95
4	7.2	19.87	14.60
5	7.2	19.69	13.40

			80.27

Note that depreciation is calculated as per US tax laws since the tax rate is higher in USA.
PV of tax shields on increased borrowing capacity

$$= \frac{(21.56)\,(.50)}{(.45)}$$

$$= 23.96$$

APV = -229.6 + 2.65 + 267.30 + 80.27 + 23.96 + 4.13
   = FF 148.71 million

Problem 9

M/s. GB Plc. is a leading UK manufacturer of optical fibre cables. The company is

planning to set up a manufacturing unit in Germany to access the European markets. The company has so far tapped only the French market through its sales subsidiary in Paris.

The estimated construction cost of the new plant is DM 50 million and sales from the plant will be realised in one year. The investment will allow the UK company to enhance its borrowing limit by £15 million. The French subsidiary has surplus funds to the tune of FFr. 35 million which can be utilised for the investment in the German factory. The long run inflation rates in the various countries are expected to be as follows:

UK	:	1% p.a.
France	:	2% p.a.
Germany	:	4% p.a

The current exchange rates are £1 = DM 2.74 = FF 9.23 and it is believed that PPP is likely to hold between the three economics. The sales projection for the first five years of operation of the German plant are as follows:

	Year1	Year2	Year3	Year4	Year5
Capacity (%)	60	75	90	100	100
Sales (DM in million)	60	75	90	100	100

The contribution on all sales is expected to be 25%. The economic life of the plant is 5 years. With the establishment of this new unit, the French subsidiary will cease to receive the raw material from UK and the only sales affected by it will be those generated by German production which are included in the projected revenues mentioned above. Currently, the Paris subsidiary is generating a profit of £200,000 for the parent company. had the subsidiary continued to receive goods from UK, the current level of profits would only have grown to keep pace with the UK inflation. The British tax laws allow the historical cost of the plant to be depreciated over 5 years. All other production costs are estimated to move in line with the general price level in Germany.

The German Government has offered a loan of DM 20 million at 5% interest rate, repayable in five equal installments. The first installment is due at the end of the first year. The competitive market rate of borrowing in Germany is 10%. The company faces a borrowing rate of 7% in Britain with the riskless rate being 5%. The tax rate in Britain is 50% while that in Germany is 45%.

You are required to evaluate the proposal using the APV method. Assume that a discount rate of 15% is appropriate for cash flows generated by operations.

Solution

The exchange rate schedule is established by using PPP.

Exchange rate schedule

Year	1	2	3	4	5
Exch rate (DM/£)	2.82	2.91	2.99	3.08	3.17

Initial Investment

= DM 50 million = £ (50/2.74) = £ 18.25 million.

Cash flows from operations

Year	Sales (DM million)	PBT (DM million)	PAT (DM million)	PAT (£million)	Lost profits (£million)
1	60	15	7.500	2.66	.202
2	75	18.75	9.375	3.22	.204
3	90	22.50	11.250	3.76	.206
4	100	25	12.50	4.06	.208
5	100	25	12.50	3.94	.210

Year	Net profits	PV (k = .15)
1	2.458	2.14
2	3.016	2.28
3	3.554	2.34
4	3.852	2.20
5	3.730	1.85

		10.81

Note that the higher tax rate of 50% has been applied here.

Tax shield due to depreciation

Since the UK tax rate is higher, depreciation has to be calculated on the basis of UK laws.

We assume that the entire investment consists of depreciable assets. So, total value of depreciation assets is (50/2.74) = £ 18.25 million. This can be written off over a period of five years. The tax shield can be discounted at the risk free rate of 5% prevailing in Britain.

Year	Depreciation (£ million)
1	3.65
2	3.65
3	3.65
4	3.65
5	3.65

$$\text{PV of depreciation tax shield} = \frac{(3.65)(.5)(1.05^5 - 1)}{(.05)(1.05)^5}$$

$$= 7.90$$

Tax shield due to increased borrowing capacity

Annual tax shield generated = £ (15) (0.07) (0.5)
Present value of tax shields due to increased borrowing capacity can be calculated by using a discount rate of 5%, the risk free rate in Britain.

$$= (15)(.07)(0.5) \frac{(1.05^5 - 1)(.5)}{(.05)(1.05)^5} = 2.28$$

Benefit due to concessional loan

We assume that the principal is repaid in five equal installments.

Year	Loan o/s	Interest	Total payment	PV (k = .10)
1	20	1	5	4.55
2	16	.8	4.8	3.97
3	12	.6	4.6	3.46
4	8	.4	4.4	3.01
5	4	.2	4.2	2.61

				17.60

PV of concessional loan = (20 - 17.6) / 2.74 = .88

APV = - 18.25 + 10.81 + 7.90 + 2.28 + 0.88

   =   + £ 3.62 million

Since the APV is positive, the project can be accepted.

Problem 10

An UK Multi national is planning to set up a chemical manufacturing unit in Australia. Relevant data are given below. For the sake of convenience all (absolute) figures are given in thousands.

Year	1	2	3	4	5
Sales (Units)	100,000	200,000	300,000	300,000	300,000
Price (AD/Unit)	1	1.1	1.2	1.2	1.2
UK Inflation	3%	3%	3%	3%	3%
Australian Inflation	2%	2%	2%	2%	2%

Currently, the exchange rate is AD 2.50 / £.

The total investment in the project will be AD 100,000. The Australian Government is willing to provide a loan of AD 10,000 at 2%.

The company faces a market rate of borrowing of 8% in UK and 6% in Australia.

Depreciation can be calculated using straight line method in UK and on written down value basis at the rate of 25% in Australia.

The tax rate is 50% in UK and 20% in Australia. Double taxation avoidance agreement exists between the UK and Australian Governments.

The total expenses incurred every year, excluding depreciation will be 60% of sales realisation. The company faces a risk free rate of interest of 6% in UK and considers that a discount rate of 10% is adequate to take into account the risk associated with the project.

By taking up the project, the MNC's borrowing capacity will increase by £10,000. Showing relevant calculations, determine whether the project should be accepted or not.

Solution

Exchange rate schedule

We first calculate the exchange rate for each year using PPP.

Year	0	1	2	3	4	5
Exchange rate(£/AD)	0.40	0.404	0.408	0.412	0.416	0.420

Initial Investment

= AD 100,000 = £ (1,00,000) (0.4) = £ 140,000

Cash flows from operations

Year	0	1	2	3	4	5
Sales (units) -		100,000	200,000	300,000	300,000	300,000
Sales(AD) -		100,000	220,000	360,000	360,000	360,000
Expenses(AD)-		60,000	132,000	216,000	216,000	216,000
PBT (AD) -		40,000	88,000	144,000	144,000	144,000
PBT (AD) -		16,000	35,000	59,000	59,000	60,000
PAT () -		8,000	17,000	29,000	29,000	30,000
Present Value(£)						
k = 0.10 -	7,345	14,836	22,287	20,458	18,777	

PV of Cash flows from operation
= 7345 + 14836 + 22287 + 20458 + 1877
= £ 83,703

Tax shields due to depreciation

Depreciation will be calculated as per UK tax laws as the tax rate is higher in UK. If we assume that the life of the project is 5 years, salvage value is zero and that the entire investment is in depreciable plant and equipment, the annual depreciation charge will be (0.4) (100,000) / 5 = £8,000.

The tax shield per year will be (0.5) (8,000) = £4,000.

Additionally, if we assume that the entire tax shield can be absorbed every year, a discount rate of 6% can be used to calculate the present value of tax shields.

Present value of depreciation shields

$$= (4000) \frac{1.06^5 - 1}{0.06 (1.06)^5}$$

= £16,850

Tax shields due to increased borrowing capacity

An additional borrowing capacity of £10,000 is generated by the project. The interest on the additional leverage will be (0.08) (10,000) = £800. Again, if we assume that the tax shield can be absorbed fully, the present value of the tax shields will be

$$(0.5)\,(800)\ \frac{(1.06^5 - 1)}{(0.06)\,(1.06)^5} = £\,1,685$$

Benefit due to concessional loan

A concessional loan of AD 10,000 is available. If we assume that principal is repaid in equal installments over 5 years, the present value of the benefit can be calculated.

Year	1	2	3	4	5
Loan outstandin	10,000	8,000	6,000	4,000	2,000
Interest paid	200	160	120	80	40
Principal repaid	2,000	2,000	2,000	2,000	2,000
Cash outflow	2,200	2,160	2,120	2,080	2,040
Present value (k = .06)	2,075	1,922	1,780	1,648	1,524

Benefit due to concessional laon

= AD [10,000 - (2075 + 1922 + 1780 + 16748 + 1524)]
= AD 1,051
= (0.4) (1051) = £ 420

Adjusted present value
  = -40,000 + 83,703 + 16,850 + 1685 + 420
  = £62,658
Hence, the project can be taken up for implementation.

Problem 11

In the previous problem, if the tax rate is 20% in UK and 50% in Australia, rework the problem.

Solution

Depreciation will now be calculated as per Australian laws. Other calculation will remain

same.

Year	Depreciation (AD)	Depreciation tax Shield (AD)	Depreciation tax shield (AD)	Present Value (£) (k = .06)
1	25,000	12,500	5,050	4,764
2	18,750	9,375	3,825	3,404
3	14,063	7,032	2,897	2,432
4	10,547	5,274	2,194	1,738
5	7,910	3,955	1,661	1,241

				13,579

APV = 40,000 + 83,703 + 13,579 + 1,685 + 420

= £ 59,387