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FM Assignment

1) APR $\approx$ 2 x Flat Rate

Loan amt = 20,000

$\therefore 20000 = (12 \times 427.90)\, a_{\overline{5}|}^{(12)}$

$\therefore 3.8499 = a_{\overline{5}|}^{(12)}$

Flat rate = $\frac{\text{total interest}}{\text{loan} \times \text{total years}} = \frac{[(5 \times 12 \times 427.9) - 20000}{20000 \times 5}$ =

APR $\approx$ 2 x 5.67 $\approx$ 11 %.

OR

$i = 11\%$. $a_{\overline{5}|}^{(12)} = 3.87872$

ii) ~~APR~~ = ~~11~~ $i = 10\%$. $a_{\overline{5}|}^{(12)} = 3.96154$

By interpolation, we get

$i = 10.8\%$

Hence APR is 10.8 %.

ii) APR = 10.8 %

After 1 year capital left to pay = $12 \times a_{\overline{4}|}^{(12)}$ @ 10.8 x 427.9

= 16775.98

Let t denote the term of new loan.

$16775.98 = 12 \times 274.4\, a_{\overline{t}|}^{(P)}$

$\therefore 1.108^{-t} = 0.4754$

$t = 7.25$ years

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iii) The orignal loan had 4 years of payment remaining thus
Total interest = $(4 \times 12 \times 427.9) - 16775.68$
$= 3763.2$

New loan has a term of 7.25 years, hence
Total intrest = $(7.25 \times 12 \times 274.49) - 16775.68$
$= 7104.65$

Hence, they will have to pay 3341.23 more intrest.

2) i) Discounted payback period
→ The discounted payback period is the time t for which the present (or accumulated) value of the amount up to time t exceeds the present (or accumulated value) the cost upto time t.

ii) Payback period
→ The payback period is the same as the DPP, except the present value calculation is carried out using an intrest rate.

ii) Unlike the NPV, neither the DP nor the PP give an indication for how profitable a project is, as they ignore cash flows after the accumulated value reached zero is. These may not be one unique time when the balance in the investors account changes from negative to positive.
The PP can give misleading reasults, as it does not take into account the time value of money.
Hence NPV is supirior as compared to PP or DP.

iii) a) Interal Rate of Return

→ The IRR for Project A is the rate of intrest that satisfies the equation of value.

$\therefore -17000 - 20000v - 10000v^2 + 20000v + 20000v^2 + 20000v^3 = 0$

$\therefore 10v^2 + 200v^3 = 170.$

$\therefore 10v^2 + 200v^3 - 170 = 0$

By trial & error,

we get $i = 0.074229$

$\therefore i = 7.4\%$

$\therefore$ IRR for project B is exactly 7.4%.

b) N.P.V

The NPV are ~~formed~~ found by discounting the payments at 6%.

Project A, $NPV = -170000 + 10000v^2 + 200000v^3 = 6823.82$

Project B, $NPV = -200000 + 14000a_{\overline{7}|} + 200000v^6 = 9834.645$

c) Maximum Intrest Rate beyond which projects are unprofitable

Each project will be profitable if the rate of intrest at which funds can be borrowed is less than IRR so to be profitable project A requires a borrowing rate less than 7.4% & project B requires rate lower than 7%.

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3) ~~Value of~~

Annuity 1 = $200 \cdot v^{0.25} \cdot \ddot{a}_{\overline{22}|}$ @ 8%

= 2161.366

Annuity 2 = $320(1+i)^{1/2} \cdot a^{(4)}_{\overline{16.25}|}$ @ 8%

= 2957.87008

Annuity 3 = $180 \times a^{(12)}_{\overline{18.75}|}$

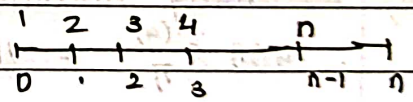
= 1780.66

Let the revised annuity be A

Value of revised annuity is $A(1+i)^{0.25} a^{(2)}_{\overline{21.5}|} (1+i)^{0.25}$

$\therefore A = 656.56$

4) $(I\ddot{a})_{\overline{n}|}$ for $i > 0$



$(I\ddot{a})_{\overline{n}|} = 1 + 2v + 3v^2 + 4v^3 - - - - nv^{n-1}$ ——— (1)

$(I\ddot{a})_{\overline{n}|} = (1+i)(Ia)_{\overline{n}|}$

$= (1+i)\dfrac{\ddot{a}_{\overline{n}|} - nv^n}{i}$

$= \dfrac{\ddot{a}_{\overline{n}|} - nv^n}{i/1+i}$

$\therefore (I\ddot{a})_{\overline{n}|} = \dfrac{\ddot{a}_{\overline{n}|} - nv^n}{d}$

5) TWRR for year 2014

Property fund $= \frac{16.4}{12.4} - 1 = 0.3226$ i.e 32.26%

Equity fund $= \frac{15.5}{12.1} - 1 = 0.281$ OR 28.1%

ii)

a) Assuming the investor bought 100 units per quater in property fund, the eq" value is given by:

$$1240(1+i) + 1310(1+i)^{0.75} + 1480(1+i)^{0.5} + 1580(1+i)^{0.25} = 6560$$

By ~~interpolation~~ & trial & error we get

$$\underline{i \approx 29.32\%}$$

b) Assuming investor purchases 100 INR worth of units per quater

$$\therefore 400\, \ddot{s}^{(4)}_{\overline{1}|} = 100 \times 16.4 \left(\frac{1}{12.4} + \frac{1}{13.1} + \frac{1}{14.8} + \frac{1}{15.8} \right)$$

$$\therefore \ddot{s}^{(4)}_{\overline{1}|} = 1.1801$$

iii) a) $1210(1+i) + 920(1+i)^{0.75} + 1030(1+i)^{0.5} + 1310(1+i)^{0.25} = 4 \times 155$

$\therefore$ By Trial & error. we get

$$i = 67.31\%$$

b) $$400 \times \ddot{s}^{(4)}_{\overline{1}|} = 100 \times 15.5 \left(\frac{1}{12.1} + \frac{1}{9.2} + \frac{1}{10.3} + \frac{1}{13.1} \right)$$

$$\ddot{s}^{(4)}_{\overline{1}|} = \frac{15.5}{4} \left(\frac{1}{12.1} + \frac{1}{9.2} + \frac{1}{10.3} + \frac{1}{13.1} \right)$$

$$\therefore \ddot{s}^{(4)}_{\overline{1}|} = 1.41345$$

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By trial & error we get

$i = 0.7089$ OR 70.89%.

6) i) Let X be initial annual repayment

$160000 = X a_{\overline{10}|} @ 8\%$.

$X = \frac{160000}{a_{\overline{10}|}} = 23844.65$

ii) Loan o/s after 4th payment is

$23844.65\ a_{\overline{6}|} = 110231.442$

Let Y be revised annual installment.

$\therefore Y a_{\overline{6}|} = 110231.442$

$\therefore Y = \underline{25309.72}$

iii) Loan o/s after 7th payment is

$2530972\ a_{\overline{3}|} @ 10\% = 62942.74$

Let Z be revised annual installment

$Z a_{\overline{3}|} = 62942.72 @ 9\%$

$\therefore Z = 24865.77$.

The yeild can be found as :

Doubt

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8) i) The PV of outflow is :

$2.7 + a_{\overline{3}|} @ i$

The expected PV of income is

$1.03v^3 + \bar{a}_{\overline{10}|}(0.25v + 0.2v^2 + 0.1v^3) @ i$

$\therefore$ PV income = PV outflow

$\therefore 2.7 + a_{\overline{3}|} = 1.03v^3 + \bar{a}_{\overline{10}|}(0.25v + 0.2v^2 + 0.1v^3) @ i$

ii) Based on info, PV of company's income is

$= 0.1v^3 + 0.85\,\bar{a}_{\overline{10}|}\,v^3$

= 1.0089

$\therefore$ NPV is positive

$\therefore$ The investment is worth.

9) TWRR :

$$(1+i)^3 = \frac{33}{30.50} \times \frac{41.05 - 4.5}{33 + 6} \times \frac{45.6}{41.05} \times \frac{47}{45.6 - 2.5}$$

$\therefore (1+i)^3 = 1.22813$

$\therefore (1+i) = \sqrt[3]{1.22813}$

$\therefore i = 0.07095$

$\therefore i = 7.095\%$

MWRR

$$30.5(1+i)^3 + 6(1+i)^{2.25} + 4.5(1+i)^{1.5} - 2.5(1+i)^{0.5} - 47 = 0$$

By trial & error

$i = 7.204\%$

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ii) Linked rate of return

Eqn of value

2011 -

$30.5(1+i) + 6(1+i)^{0.25} = 38.5$

∴ By trial & error,

$i = 0.0626$ OR 6.26%.

2012

$88.50(1+i) + 4.50(1+i)^{0.5} = 45$

By trial & error

$i = 0.0493$ OR 4.93%.

2013 -

$45(1+i) - 2.5(1+i)^{0.5} = 47$

By trial & error

$i = 0.10369$ OR 10.369%.

∴ Linked rate of return

$(1+i)^3 = (1.0626) \times (1.0493) \times (1.10369)$

$i = 0.07128$

OR 7.128%.

iii) TWRR eliminates the effect of the cash flow amount and timing & therefore gives a fairer basis for assesing the investment performance for the fund.

MWRR is sensitive to the amount of net cash flows

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10) i) Let loan amt be L

$L = 180000\, a_{\overline{15}|} + 20000\, (Ia)_{\overline{15}|}$ @ 12%

$\therefore L = 1225962 + 814626.7479$

$\therefore L = 2040588$

Total cost of house $= \frac{L}{0.8} = 2550735$

ii) Loan O/s at start of 9th year

$= 340000\, a_{\overline{7}|} + 20000\, (Ia)_{\overline{7}|}$ @ 12%.

$\therefore L(9) = 1875850.33$.

loan schedule

year	loan O/s at start	~~loan~~ Installment	Intrest	capital Repayment
9	1875850.33	360000	225102.04	134897.96
10	1740952.37	360000	208914.28	171085.72
11	1569866.65			

iii) Doubt,

11) i) TWRR

$(1+i)^2 = \frac{500}{460} \times \left(\frac{500+50}{500+40}\right) \times \frac{x}{550}$

$(1+i)^2 = 1.44$ $\quad x = 655.776$

ii) MWRR

$460(1+i)^2 + 40(1+i)^{7/4} - 50(1+i) = 655.776$

By trial & error.

$i = 19.854\%$

iii) The effective rate of return for 2015

↳

$460(1+i) + 40(1+i)^{0.75} = 600$

By trial & error

$i = 0.20438$

OR 20.438%

The ERR for 2016

$(1+i) = \frac{655.78}{550} = 1.92327$

∴ LRR is

$(1+i)^2 = 1.92327 \times 1.202138$

∴ $i = 0.19833$

OR 19.833%

iv) When the sub intervals chosen for calculating LRR coinside with the interval between net cash flow received then the LRR will be identical to TWRR

v) 1) TWRR is a better measure of fund managing performance

2) MWRR is sensitive to amt & time of cash flows

3) Hence TWRR is better measure

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12) i) The DPP of an investment project is the first time when the net PV of cash flow from project is (+)ve

ii) a) Let us work in units of 1000.

$-800(1+i)^t - 50(1+i)^{t-1} + 100 s_{\overline{t-2}|} \text{ @ } 7\% = 0$

By trial & error

$t = 17.767$ years.

b) Accumulated deposit after 22 years =

$100 \bar{s}_{\overline{4.333}|} \text{ @ } 6\% = 100 \times \dfrac{(1.06)^{4.333} - 1}{\ln(1.06)}$

$\therefore$ Acc amt = 480 074 . 3066.

iii) The businessman may accumulate his rental income

$\therefore 100 \bar{s}_{\overline{7}|} = 102.9708$

The DPP is smallest integer.

$\therefore -800(1+i)^t - 50(1+i)^{t-1} + 102.9708 s_{\overline{t-1}|} \text{ @ } 7\%$

By trial & error

$t = 18$ years

The balance in the acc after transitional 18 years is

$-800(1+i)^{18} - 50(1+i)^{17} + 102.971 s_{\overline{16}|}$

$= 9.77896$

Acc value after 22 years $= 9.77896(1+i)^4 + 100 \bar{s}_{\overline{4}|} \text{ @ } 6\%$

$= 462.8081357$

i.e 462801 . 357

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13) i) let $X/12$ be monthly repayment

$\therefore X\, a_{\overline{25}|} = 9880 \quad @\ 7\%$

$\therefore X = 821.766$

$\therefore X/12 = 68.48057$

$\therefore$ Monthly repayment is 6848.057

ii) loan o/s after repayment on 10th march 2029

$$X\, a^{(12)}_{\overline{34/3}|} = 821.7669 \times \frac{\left(1 - \left(\frac{1}{1.07}\right)^{34/3}\right)}{0.067850}$$

$= 6485.745315$

i.e $\underline{648574.5315}$

iii) & iv) $\longrightarrow$ Doubt.