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(Deemed to be University under section 3 of UGC Act, 1956)

School of Advanced Sciences (SAS)

Course: Financial Analytics Lab

Course code: PMDS610P

Digital Assignment 1

Q1:

Design a portfolio for a person aged 40 with an initial corpus of 10000000. He has the following goals: at the age of 42 he needs 2000000 and he needs 50,00000 at the age of 48. Also, he has a monthly SIP of 20,000. calculate the retirement corpus at the age of 60 by assuming the debt interest rate of 6% per annum and equity interest rate of 14% per annum. Provide the solution using MS excel sheet. Also generate a python code for the same.

Excel Implementation of Q1

Age	40	At age 42 he needs	
Initial corpus		₹	20,00,000.00
₹	1,00,00,000.00	We invest 50% in debt and the remaining 50% in equity	

For debt	
Principal	₹ 50,00,000.00
rate	0.06
time	2
amount	₹ 56,18,000.00

At age 42 he needs 20 lakhs so remaining amount	
Principal	₹ 36,18,000.00
rate	0.06
time	6
amount	₹ 51,32,202.15

At age 48 he needs 50 lakhs, so remaining amount	
principal	₹ 1,32,202.15
This amount he puts in equity for the next 10 years	
time	10
rate	0.14
amount	₹ 4,90,102.62

For equity	
principal	₹ 50,00,000.00
rate	0.14
time	18
amount	₹ 5,28,75,845.92

At age 58, total amount from debt and equity AND sip	
principal	₹ 7,49,71,931.18
Now he puts this amount in debt for the next 2 years for less volatility	
rate	0.06
time	2
Amount	₹ 8,42,38,461.87

Age			SIP			
	Monthly investment		Total at the end of the year		Interest	Amount
40 ₹	20,000.00	₹	2,40,000.00	₹	0.14	2,73,600.00
41 ₹	20,000.00	₹	5,13,600.00	₹	0.14	5,85,504.00
42 ₹	20,000.00	₹	8,25,504.00	₹	0.14	9,41,074.56
43 ₹	20,000.00	₹	11,81,074.56	₹	0.14	13,46,425.00
44 ₹	20,000.00	₹	15,86,425.00	₹	0.14	18,08,524.50
45 ₹	20,000.00	₹	20,48,524.50	₹	0.14	23,35,317.93
46 ₹	20,000.00	₹	25,75,317.93	₹	0.14	29,35,862.44
47 ₹	20,000.00	₹	31,75,862.44	₹	0.14	36,20,483.18
48 ₹	20,000.00	₹	38,60,483.18	₹	0.14	44,00,950.82
49 ₹	20,000.00	₹	46,40,950.82	₹	0.14	52,90,683.94
50 ₹	20,000.00	₹	55,30,683.94	₹	0.14	63,04,979.69
51 ₹	20,000.00	₹	65,44,979.69	₹	0.14	74,61,276.85
52 ₹	20,000.00	₹	77,01,276.85	₹	0.14	87,79,455.61
53 ₹	20,000.00	₹	90,19,455.61	₹	0.14	1,02,82,179.39
54 ₹	20,000.00	₹	1,05,22,179.39	₹	0.14	1,19,95,284.51
55 ₹	20,000.00	₹	1,22,35,284.51	₹	0.14	1,39,48,224.34
56 ₹	20,000.00	₹	1,41,88,224.34	₹	0.14	1,61,74,575.74
57 ₹	20,000.00	₹	1,64,14,575.74	₹	0.14	1,87,12,616.35
58 ₹	20,000.00	₹	1,89,52,616.35	₹	0.14	2,16,05,982.64

At the age of 60 his retirement corpus is:

₹ 8,42,38,461.87

Python Code for Q1

0.1 Answer 1 python script

0.2 Initial Parameters

```
[13]: initial_corpus = 10000000
p_eq = initial_corpus / 2 # 50% in equity
p_dt = initial_corpus / 2 # 50% in debt
r_eq = 0.14 # Equity return rate
r_dt = 0.06 # Debt return rate
monthly_sip = 20000
retirement_age = 60
initial_age = 40
```

0.3 Function to calculate SIP corpus

```
[14]: def sip_corpus(monthly_investment, rate, years):
    annual_investment = monthly_investment * 12
    amount = 0
    for _ in range(years+1):
        amount = (amount + annual_investment) * (1 + rate)
    return amount
```

0.4 Function to calculate debt/equity returns with compound interest

```
[15]: def future_value(principal, rate, time):
    return principal * (1 + rate) ** time
```

```
[16]: # Computing corpus at age 42 after withdrawal of 20,00,000
amount_42 = future_value(p_dt, r_dt, 2) - 2000000

# Computing corpus at age 48 after withdrawal of 50,00,000
amount_48 = future_value(amount_42, r_dt, 6) - 5000000

# Computing corpus at age 58 from all sources
amount_58 = (
    future_value(amount_48, r_eq, 10) + # Growth of remaining debt corpus by
    ↪ putting in equity
    future_value(p_eq, r_eq, 18) + # Growth of initial equity corpus
```



```

        sip_corpus(monthly_sip, r_eq, 18) # SIP accumulation
    )

    # Putting the entire corpus in debt for 2 years to avoid volatility
    retirement_corpus = future_value(amount_58, r_dt, 2)

    # Display Result in Indian Number Format
    import locale # for Indian number formatting
    # Set locale to Indian format
    locale.setlocale(locale.LC_ALL, 'en_IN')
    # Print the amount in Indian format
    formatted_amount = locale.format_string(" %.2f", retirement_corpus,
        ↪grouping=True)

    print(f"At the age of 60, he can retire with a corpus of:{formatted_amount}")

```

At the age of 60, he can retire with a corpus of: 8,42,38,461.87

Q2.

Design a portfolio for a person aged 40 with an initial corpus of 100000000. He has the following goals: at the age of 42 he needs 2000000 and he needs 50,00000 at the age of 48. The portfolio needs to be created by using investments in Future and index fund. Calculate the retirement corpus at the age of 60 by assuming the index fund interest rate of 14% per annum and the bet on strike price of the Future is 2% per month. Also, it is assumed that the winning bet is 9 times in a year for Future. Provide the solution using MS excel sheet. Also generate a python code for the same.

Excel Implementation of Q2

Initial Corpus	Age
₹ 1,00,00,000.00	40

For future	
Rate/month	principal
0.02	₹ 20,00,000.00
Winning bet	Total interest/year
9	0.18

Age 41	
amount	₹ 23,60,000.00

age 42	
amount	₹ 27,84,800.00

At the age of 42 he needs 2000000	
Amount	₹ 7,84,800.00

This amount he puts in equity for the next 5 years till the age of 47 years

principal	₹ 7,84,800.00
rate	₹ 0.14
time	5
amount	₹ 15,11,065.36

This amount he will put in future for the next 1 year

amount	₹ 17,83,057.13
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For equity

principal	rate	time
₹ 80,00,000.00	0.14	8

At age 48 via equity
amount

₹ 2,28,20,691.38

Total corpus at the age of 48

₹ 2,46,03,748.51

He needs to withdraw 5000000 at age 48, so remaining amount

₹ 1,96,03,748.51

This amount he puts in equity for the next 12 years

principal	₹	1,96,03,748.51
rate		0.14
time		12
amount	₹	9,44,48,994.42

At the age of 60, his retirement corpus is

₹ 9,44,48,994.42

Python Code for Q2

0.1 Answer 2 Python script:

```
[1]: initial_corpus = 10000000 # 1 Crore
p_future = 2000000 # 20L in Future investment
p_eq = initial_corpus - p_future # Remaining in Equity
r_eq = 0.14 # Index Fund return (14% p.a.)
r_future = 0.18 # Effective annual return from Future (18% p.a.) as 9 out of 12 times is winning bet
retirement_age = 60
initial_age = 40
```

0.2 Function to calculate future value with compound interest

```
[5]: def future_value(principal, rate, time):
    return principal * (1 + rate) ** time

[7]: # Computing corpus at age 42 after Future investment
amount_42_future = future_value(p_future, r_future, 2)
amount_42 = amount_42_future - 2000000 # Withdrawal at age 42
amount_47 = future_value(amount_42, r_eq, 5) # Invest in Equity for 5 years

amount_48_future = future_value(amount_47, r_future, 1)

# equity investment for 8 years till age 48
amount_eq_48 = future_value(p_eq, r_eq, 8)

# Total corpus at 48 after taking out 50 lakhs
amount_48_total = amount_48_future + amount_eq_48 - 5000000 # Withdrawal of 50 lakhs at age 48

# Equity investment for 12 years till age 60
amount_60 = future_value(amount_48_total, r_eq, 12)

# Display Result in Indian Number Format
import locale # for Indian number formatting
# Set locale to Indian format
locale.setlocale(locale.LC_ALL, 'en_IN')
# Print the amount in Indian format
```

```
formatted_amount = locale.format_string(" %.2f", amount_60, grouping=True)
print(f"At the age of 60, he can retire with a corpus of:{formatted_amount}")
```

At the age of 60, he can retire with a corpus of: 9,44,48,994.42