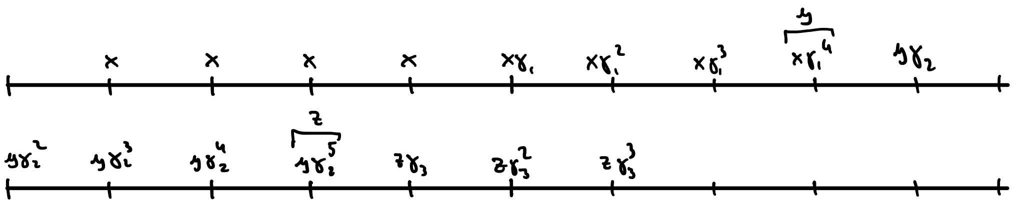
Class 12

1. Today's date is January 1, 2015 and Sanjana needs some advice. Suppose Project A has cash flows of $32 starting at the end of this year, and continuing on for three more years (thus 4 years total). The cash flows then decrease by 2% each year after that, for 4 years. After that, cash flows increase by 8% for 5 years, and then decrease by 3% for 3 years. Assume the discount rate is 12%.

a) What is the NPV for Project A?



$x = 32\,\$$ $\quad \gamma_1 = 0.98 \quad \gamma_2 = 1.08 \quad \gamma_3 = 1.03 \quad r = 0.12$

```
import matplotlib.pyplot as plt
import numpy as np
```

```
def NPV(r, C):
    #Calculate the Net Present Value of a sequence (array) C of cash flows
    #with discount rate r.
    NPV = 0
    for i in range(len(C)):
        NPV += C[i]/((1+r)**i)
    return NPV
```

```
r=0.12
x = 32
C_1=[x]*4
g_1 = 0.98
C_2=[x*g_1**i for i in range(1,5)]
y = x*g_1**4
g_2 = 1.08
C_3 = [y*g_2**i for i in range(1,6)]
z = y*g_2**5
g_3 = 1.03
C_4 = [z*g_3**i for i in range(1,4)]
print(NPV(0.12, [0]+C_1+C_2+C_3+C_4))
```

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234.89554574632731
```

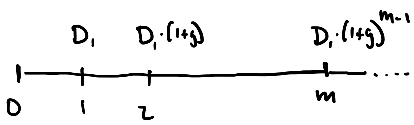
2. Today's date is January 1, 2015 and Wei needs some advice. Project A has cash flows of $89 starting at the beginning of this year (i.e. today), and continuing on for three more years (thus 4 years total). The cash flows then increase by 3% each year after that, for 5 years. After that, cash flows decrease by 8% for 6 years. Assume the discount rate is 12%.

a) What is the NPV for Project A?

a) Same as above. Note

$$\sum_{i=0}^{\infty} \frac{C_i}{(1+r)^i} = \sum_{i=0}^{K} \frac{C_i}{(1+r)^i} + \frac{1}{(1+r)^{K+1}} \sum_{i=0}^{\infty} \frac{C_{K+i+1}}{(1+r)^i}$$

Therefore in the GGM we have:



$$NPV(C_1,\dots,C_m) = \frac{D_1}{r-g} - \frac{D_1\cdot(1+g)^m}{(r-g)(1+r)^m}$$

(A) 89\$ for years 0, ..., 3

$$NPV(C_1,\dots,C_4) = \frac{D_1}{r} - \frac{D_1}{r\cdot(1+r)^4} = 270.32 \cdot 1.12$$

(B) 3% increase for 5 years, starting at $89\cdot 1.03$

$$NPV = \frac{89\cdot 1.03}{0.12-0.03} - \frac{89\cdot 1.03^6}{0.12-0.03}\cdot\frac{1}{1.12^5} = 348.54$$

which has to be discounted by 4

$$\frac{348.54}{(1+r)^3} = 248.08$$

(C) -8% for 6 years, starting from $89\cdot 1.03^5\cdot 0.92 = x$

$$NPV = \frac{x}{0.12+0.08} - \frac{x\cdot 0.92^7}{(0.12+0.08)}\cdot\frac{1}{1.12^6} = 368.26$$

discounted by 8 years $\Rightarrow$ 148.73

(A) + (B) + (C) = 683.6

Cash Flows

3. The current date is January 1, 2015. You are thinking about building a plant for a project run by Sager Enterprises that will cost $40K today. The plant will start producing immediately, and will generate revenues for 3 years, starting at the end of this year (December 31, 2015). Each year, the revenue will be $80K. The material costs for the project each year will be $40K, also starting at the end of this year. Labor costs will start at $10K at the end of this year, and stay constant. The plant has a 4 year depreciation schedule, as prescribed by the IRS; assume the depreciation schedule is based on a 0 salvage value at the end of 4 years. Assume a tax rate of 40%, and that all taxes are paid at the end of the year. Assume a discount rate of 9%. At the end of the project, you expect to sell the plant for $2K (i.e. on December 31, 2017), but this value is not used for calculating depreciation. You need to maintain working capital levels of $15K at the end of this year and the end of next year; assume new working capital is fully recovered by December 31, 2017. The current level of working capital on January 1, 2015 is 0.

a) Should you invest in this plant?
b) Suppose that the tax rate is now 50%. By how much will your NPV decrease?

	1/1/2015	12/31/2015	12/31/2016	12/31/2017			
						Tax rate	0.40
Revenues		80	80	80		Depreciation Schedule	4
COGS		40	40	40		Discount Rate	0.09
Labor		10	10	10			
EBITDA		30	30	30			
Taxes on EBITDA		12	12	12			

Taxes on EBITDA		12	12	12
After-tax EBITDA		18	18	18
Depreciation Tax Shield		4	4	4
Capex	40			
Salvage				2
Book Value				10
Tax on Salvage				3.2
NWC Level		15	15	0
NWC Change		15	0	-15
Opp Costs				
Cash Flow	-40	7	22	42.2
NPV	$17.53	at tax = .4		
NPV	$13.08	at tax = .5		