MGT-482 Principles of Finance
Assignment 2

Prof. Erwan Morellec

Team:
Grégoire Clément - gregoire.clement@epfl.ch
Senri Tatara - senri.tatara@epfl.ch
Timothée-Florian Bronner - timothee-florian.bronner@epfl.ch

February 16, 2019

1 Exercice 1

We transpose the APR into EAR:

$$1 + EAR = (1 + \frac{APR}{k})^k \tag{1}$$

or:

$$EAR = (1 + \frac{APR}{k})^k - 1 \tag{2}$$

resulting in the following rates:

A	B	C	D
5.20%	5.285%	5.292%	5.252%

Hence, the best investment is C.

2 Exercice 2

(a) First we compute the rate per month:

$$r = \frac{0.043}{12} \tag{3}$$

We compute the amount of the original loan:

$$\begin{aligned} P &= \sum_{n=1}^{36} 889.75(\frac{1}{1+r})^n \\ &= \frac{889.75}{r}(1 - \frac{1}{(1+r)^{36}}) \\ &= 30000.72 \end{aligned} \tag{4}$$

(b) The outstanding balance is the present value of the remaining 1 year.

$$\frac{889.75}{r}(1 - \frac{1}{(1+r)^{12}}) = 10432.4 \tag{5}$$

3 Exercice 3

First we compute the rate of the credit card per month:

$$r = \frac{0.12}{12} = 0.01 \tag{6}$$

The payments of each options are as follows:
Option A

$$(30000 - 3000)(1 + r))^{36} = 38630.8 \tag{7}$$

Option B

$$5000(1 + r)^{36} + \sum_{n=1}^{36} \frac{25000}{36}(1 + r))^{n} = 37367.5 \tag{8}$$

Considering above, option B is better because we save \$1263

4 Exercice 4

a) CPN = \$40
b) Find γ with

$$P = \frac{CPN}{\gamma}\left(1 - \frac{1}{(1+\gamma)^{20}}\right) + \frac{FV}{(1+\gamma)^{20}} \tag{9}$$

where CPN = 40
FV = 1000
A solver gives 0.037 or 0.074 APR
c)

$$\begin{aligned} P &= \frac{CPN}{0.045}\left(1 - \frac{1}{(1.045)^{20}}\right) + \frac{1000}{(1.045)^{20}} \\ &= 934.96 \end{aligned} \tag{10}$$

Trade at discount

5 Exercice 5

The bound with face value of \$1000 and coupon rates of 5% is equivalent to 4 zero-coupon bounds:
Three with face value \$25 and maturity 6 months, 12 months and 18 months, and one with face value \$1025 and maturity 24 months.

Maturity	6m	12m	18m	24m
YTM	1.5%	2.1%	2.5%	2.65%
Price per 100\$ face value	98.52	95.93	92.86	90.07

Note that the yield is divided by 2 because it is semi-annual.
We can now easily compute the market price of this bond using the table:

$$\begin{aligned} P &= \frac{98.52}{4} + \frac{95.93}{4} + \frac{92.86}{4} + \frac{41 \cdot 90.07}{4} \\ &= 995.012 \end{aligned} \tag{11}$$

Finally, we can compute the yield for this bound by solve this for y:

$$P = \frac{CPN}{y}\left(1 - \frac{1}{(1+y)^N}\right) + \frac{FV}{(y)^N} \tag{12}$$

where $P = \$995.012$, $CPN = \$25$, $N = 4$ which gives:

$$y = 2.63\% \tag{13}$$

6 Exercice 6

We compute y for 5 notes by using the following formula:

$$P = \frac{CPN}{y}\left(1 - \frac{1}{(1+y)^N}\right) + \frac{FV}{(1+y)^N} \tag{14}$$

Where

$$CPN = \frac{FV \times CouponRate}{2} \tag{15}$$

The value using in this formula is below:

note	9128284Z0	9128284X5	9128284Y3	9128284V9	9128283G3
P	99.407159	99.930401	99.941940	99.268892	100.000000
FV	100	100	100	100	100
Coupon Rate	2.75%	2.75%	2.625%	2.875%	1.750%
N	14	10	4	20	6

A solver gives y as follows:

note	9128284Z0	9128284X5	9128284Y3	9128284V9	9128283G3
y	0.01422	0.01385	0.01327	0.01480	0.00875

7 Exercice 7

a)

$$P_0 = \frac{Div + p_1}{1 + r_E} = 29.73 \tag{16}$$

$$capGain = \frac{p_1 - P_0}{P_0} = 4.264\% \tag{17}$$

b)

$$\frac{Div}{P_0} = \frac{2.3}{29.73} = 7.736\% \tag{18}$$

c)

$$\frac{Div + P_1}{P_0} = \frac{33.3}{29.73} = 12\% \tag{19}$$

12% which is the price of capital.

8 Exercice 8

First let's write down what we know:

$$\begin{aligned} DIV_1 &= \$2 \\ DIV_2 &= \$2.5 \\ P_2 &= \$40 \\ r_E &= 13\% \end{aligned} \tag{20}$$

First we need to compute P_0, the price of stock today. We can do so using this formula:

$$\begin{aligned} P_0 &= \frac{DIV_1}{1+r_E} + \frac{DIV_2 + P_2}{(1+r_E)^2} \\ &= 35.0536 \end{aligned} \tag{21}$$

Now if want to sell the stock only one year (from today to year one), we could expect to sell it at price P_1:

$$\begin{aligned} P_1 &= \frac{DIV_2 + P_2}{1+r_E} \\ &= 37.6106 \end{aligned} \tag{22}$$

Finally, we can go from P_1 to P_0 using the same formula again:

$$\begin{aligned} P_0 &= \frac{DIV_1 + P_1}{1+r_E} \\ &= 35.0536 \end{aligned} \tag{23}$$

Obviously, as expected we obtain the same result whether we go directly from P_2 to P_0 or by going through the step of computing P_1.

9 Exercice 9

a) Price drop by \$6.76
Compute difference between the previous price P_0 and the new price P_0'

$$P_0 = \frac{Div1}{(1+r_E)} + \frac{Div2}{(1+r_E)^2} + \frac{Div3}{(1+r_E)^3} + \frac{P_3}{(1+r_E)^3} \tag{24}$$

$$P_0' = \frac{Div1 - loss_1}{(1+r_E)} + \frac{Div2 - loss_2}{(1+r_E)^2} + \frac{Div3 - loss_3}{(1+r_E)^3} + \frac{P_3}{(1+r_E)^3} \tag{25}$$

Where $r_E = 12\%$
Losses:

- $loss_1 = \frac{200'000'000}{40'000'000} = \$5$
- $loss_2 = \frac{75'000'000}{40'000'000} = \$1.875$
- $loss_3 = \frac{45'000'000}{40'000'000} = \$1.125$

P_3 stays Unchanged

$$P_0 - P_0' = \frac{loss_1}{(1+r_E)} + \frac{loss_2}{(1+r_E)^2} + \frac{loss_3}{(1+r_E)^3} = \$6.75 \tag{26}$$

b) Not if the market is efficient, which mean that the price is due to all information. However if I happen to know this info before everyone else I can short the share and make an nice return.