FINANCIAL MANAGEMENT - MIDTERM EXAM – 23/10/2024

Dr. Andrea Rigamonti

EXERCISE 1

In a perfectly competitive market where the interest rate r remains constant over time, security A pays 1200 euro after three years and it costs 1000 euro.

Security B pays 100 euro after one year and 1100 euro after two years. How much does the investor who buys B earn after two years?

The interest rate is:

$$1000 = \frac{1200}{(1+r)^3}$$

$$(1+r)^3 = \frac{1200}{1000}$$

$$1 + r = 1.2^{1/3}$$

$$r = 1.2^{1/3} - 1 \approx 0.0627 = 6.27\%$$

Since the interest rate is 6.27% and we are in a perfect market, the price of B has to be:

$$P_B = \frac{100}{1+\mathrm{r}} + \frac{1100}{(1+r)^2} = \frac{100}{1+0.0627} + \frac{1100}{(1+0.0627)^2} = 1068.128$$

The investor earned $1200 - 1068.128 = 131.872$ euro.

EXERCISE 2

Security A pays a single 10% interest after 2 years.

Security B pays a 2% interest after 6 months, another 2% after 12 months, and a final 2% after 18 months.

Which of the two securities pays the highest interest rate?

We compute the EAR for both:

Security A:

$$(1+0.1)^{1/2} - 1 \approx 0.0488 = 4.88\%$$

Security B:

$$(1+0.02)^2 - 1 \approx 0.0404 = 4.04\%$$

Security A pays the highest rate.

EXERCISE 3

A zero-coupon bond with a face value of 1000 euro expires 15 months from now and costs 950 euro.

What would the price of the bond be if the interest rates increase by 2%?

To answer the question we need to compute the Modified duration.

The formula for the Modified duration is:

$$ModifiedD = \frac{MacaulayD}{1 + \frac{YTM}{k}}$$

Since this is a zero-coupon bond, the Macaulay duration is simply equal to its maturity expressed in years, i.e.:

$$MacaulayD = \frac{15}{12} = 1.25$$

The yield to maturity is:

$$YTM = \left(\frac{FV}{P}\right)^{1/n} - 1 = \left(\frac{1000}{950}\right)^{\frac{1}{1.25}} - 1 \approx 0.0419$$

We also have $k = 1$ because it is a zero-coupon bond, so the Modified duration is:

$$ModifiedD = \frac{MacaulayD}{1 + \frac{YTM}{k}} = \frac{1.25}{1 + \frac{0.0419}{1}} = \frac{1.25}{1.0419} \approx 1.2$$

This means that a 1% increase in the interest rates would lead to a 1.2% decrease in the price of the bond. Therefore, if the interest rates increase by 2%, the price is:

$$950 - 950 * 0.024 = 927.2$$

EXERCISE 4

A corporation has 1 million euro in cash, 2 million euro of debt, and has 1 million shares outstanding. Its weighted average cost of capital is 5% and its latest free cash flow is equal to 1 million euro.

If we expect that the future cash flows will grow at a constant rate of 2% per period forever starting from next period, what is the share price according to the discounted free cash flow model?

First we compute the current value of the enterprise, which is given by the present value of all its future cash flows. Given that the free cash flows will grow forever at a constant rate, we can compute it using the formula of the present value of a growing perpetuity:

$$V_0 = \frac{FCF_1}{R_{wacc} - g} = \frac{FCF_0 + gFCF_0}{R_{wacc} - g} = \frac{1000000 + 0.02 * 1000000}{0.05 - 0.02} = \frac{1020000}{0.03} = 34000000$$

Therefore, the current share price should be:

$$P_0 = \frac{V_0 + Cash_0 - Debt_0}{Shares\ Outstanding_0} = \frac{34000000 + 1000000 - 2000000}{1000000} = 33$$

EXERCISE 5

Answer (shortly) to the following questions:

1. *What happens to the bid-ask spread if the market becomes more efficient?*
2. *How should you interpret a market-to-book ratio greater than 1?*
3. *How should you record depreciation in the balance sheet and in the statement of cash flow?*
4. *What is the internal rate of return (IRR)?*
5. *What happens to the price of a bond traded on the secondary market when the credit rating of its issuer decreases?*
6. *In the dividend-discount model, how is the price of a certain stock determined?*

1. The bid-ask spread gets smaller
2. It indicates that the value of the firm's assets when put to use exceeds their historical cost.
3. We should record it as a negative value in the balance sheet, but add it back in the statement of cash flow.
4. The IRR is the discount rate that sets the net present value equal to zero.
5. The price of the bond decreases.
6. It is assumed to be equal to the present value of the expected future dividends that the stock will pay.