Additional Exercises Part 1

Exercise A1_1:

A lottery advertises to pay the winner €1 Mio. However, this prize money is paid over 5 years in 5 equal installments at the end of each year. What is the present value of this prize at 10% interest?

Solution:
€758,157.35

Exercise A1_2:

An annuity payment loan with a nominal value of €25,000 has to be amortized over 7 years with an interest rate of 7% p.a. Calculate the yearly debt service amount that will achieve this.

Solution:
€4,638.83

Exercise A1_3:

A 4% bond with 3 years to maturity has a yield to maturity of 5% p.a. What is the price of this bond?

Solution:
97.28

Exercise A1_4:

Find the (i) price and (ii) duration of a 2-year, 4% bond that is trading at a yield to maturity of 3% p.a.

Solution:
(i) 101.91
(ii) 1.962

Exercise A1_5:

Consider the following four bonds and their end of year payments:

	Year 1	Year 2	Year 3
Bond A	10	10	10+100
Bond B	5	5	5+100
Bond C	0	0	100
Bond D	100	0	0

The market interest (spot) rate for all maturities is 2% p.a.

(a) Determine the price of each bond.
(b) Calculate the duration of each bond.
(c) Which bond is most sensitive to changes in the market interest rate?

Solution:
(a) Bond A: 123.0711; Bond B: 108.6516; Bond C: 94.2322; Bond D: 98.0392
(b) Bond A: 2.763 years; Bond B: 2.866 years; Bond C: 3 years; Bond D: 1 year
(c) Bond C

Exercise A1_6:

An investor owns a portfolio of the following fixed income instruments:

100 units (with 5,000 EUR face value each) of a coupon bond (‚Bundesanleihe‘, coupon = 6.625% p.a., price = 104.35), and

300 units (with 1,000 EUR face value each) of a zero bond (price = 83.00).

Calculate the

(a) notional (face) value, and
(b) the market value (clean price)

of this portfolio.

Solution:
(a) €800,000.-
(b) €770,750.-

Exercise A1_7:

Calculate for a coupon bond (‚Bundesanleihe‘, coupon = 6.625%, maturity = 5 Jahre) the present value using the following discount rates (market interest rates): (a) 6.000 %, (b) 6.137 %, and (c) 6.500 %.

Solution:
(a) 102.63
(b) 102.05
(c) 100.52

Exercise A1_8:

Calculate for a zero bond with a current price of 83.00 and a maturity of (exactly) 11 years the present value (theoretical market value), when market interest rates amount to: (a) 6 %, (b) 7 %, and (c) 8 %.

Solution:
(a) 52.68
(b) 47.51
(c) 42.89

Exercise A1_9:

The following table provides information of the terms for a set of coupon bonds (CB) and zero bonds (ZB). The face value per unit is 1,000 EUR in each case.

	Current price	**Maturity**	**Redemption**	**Coupon**
ZB Unilever 97/17	95.24	12 Months	100	0
ZB BBC 00/15	87.34	24 Months	100	0
ZB BP 02/09	79.38	36 Months	100	0
CB Daimler 00/19		3 Years	100	7 3/8
CB DB 99/20	96.00	4 Years	100	7

(a) Calculate the current price of CB Daimler 00/19.
(b) Determine the spot rate for the 4th year.
(c) How large are the forward rates for the 2., 3., and 4. year?

Solution:
(a) 98.70
(b) 8.341%
(c) ${}_1f_2$ = 9.038%, ${}_2f_3$ = 10.028%, ${}_3f_4$ = 9.370%

Exercise A1_10:

A coupon bond has the following terms:
Price = 102.50, coupon = 8 %, notional = 1,000 EUR; redemption = 100, maturity = 3 years. Calculate the exact yield-to-maturity (see e.g. Solver in MS Excel)

Solution:
7.04656%

Exercise A1_11:

(a) A zero bond with a maturity of 4 years and a redemption payment of 100 is quoted on 3.4.2012 at 68.30. On 4.4.2012 a general interest rate drop of 100 basis points takes place. How large is the approximate price change of the zero bond (using the duration)?

(b) A coupon bond has the following terms:
Maturity = 4 years; Redemption = 100; current price (3.4.2012): 100.00; coupon = 10%.
What approximate price change (in using the duration) is caused by a general interest increase of 50 basis points on 4.4.2010?

Solution:
(a) +2.48 (exact: +2.54)
(b) -1.585 (exact: -1.568)

Exercise A1_12:

The spot rates of 1 and 2 years are 6.3% p.a. and 6.9% p.a., respectively. What is the forward rate?

Solution:
7.5%