***Principles of Finance***

A 2 ½ hour exam[[1]](#footnote-1)

**COVERING CHAPTERS 1 - 11**

The exam is in TWO Parts:

**PART A**: 24 multiple choice questions each worth 1½ marks

 = 36 marks

**PART B**: 4 numerical questions, worth 14, 20, 12 and 18 marks, respectively. = 64 marks

You should attempt ALL questions.

A formula sheet is attached.

**SECTION A**

Answer the following multiple choice questions. Each question is worth 2 marks. This section is worth a total of 50 marks.

**QUESTION 1**

The rating agencies faced *a conflict of interest* leading up to the GFC. This refers to the observation that

(a) the credits ratings that might lead to optimal benefits for the rating agency were in

 conflict with the agency’s professional responsibility to provide an honest rating.

(b) different rating agencies might have different assessments as to the credit

 worthiness of mortgaged securities.

(c) at this busy time, the overworked employees of the rating agencies were unable to

 accord to the ratings the level of scrutiny and interest that were required.

(d) None of the above are valid statements.

**QUESTION 2**

Which of the following is most true. Central banks have a prime responsibility

(a) to act as a lender of last resort to the *investment* banking industry.

(b) to seek to influence inflation and economic growth by influencing interest rates.

(c) to issue bonds when interest rates are *high*.

(d) all of the above are true.

**QUESTION 3**

Which of the following are true statements?

(a) The “coupon rate” on the bond is the “interest rate” on the face value of the bond;

(b) The “coupon rate” on the bond is the “yield to maturity” of the bond;

(c) a. but not b. is a true statement;

(d) neither a. nor b. are true statements.

**QUESTION 4**

Which of the following statements is true?

(a) If investors believe inflation will be subsiding in the future, the prevailing yield will be upward sloping.

(b) The real rate of interest varies with the business cycle, with the *lowest* rates seen at the end of a period of *business expansion* and the *highest* at the bottom of a *recession*.

(c) The longer the maturity of a security, the greater its interest rate risk.

(d) The interest risk premium always adds a downward bias to the slope of the yield.

**QUESTION 5**

The bonds of company ABC mature at the end of 7 years, and pay

8% interest (paid annually) on a €100 face value. If an interest payment has just been paid

and the required yield (rate of return) on the bonds is 10%, what is the value of the bond?

(a) €100.26;

(b) €91.26;

(c) €90.26;

(d) €89.26

**QUESTION 6**

The firm ABC has a policy of retaining 40% of its earnings as reinvestment. This policy is expected to continue indefinitely, as is the company’s growth rate of 4%. If investors require a rate of return in the company of 10%, the P/E of the firm ABC should be

(a) 10.0

(b) 10.4

(c) 15.4

(d) 20.4

**QUESTION 7**

Suppose that investors require a real rate of return of 5.0% on equity in the firm XYZ, and that the firm retains 20% of its earnings, which are reinvested at a real rate of return of 10%. The P/E ratio for the firm consistent with the above data would be determined as

(a) 20.0

(b) 27.2

(c) 30.0

(d) 30.2

**QUESTION 8**

In tests of the CAPM,

(a) the outcome returns as a function of beta are generally higher for all portfolios than is predicted by the CAPM.

(b) the outcome returns as a function of beta are generally lower for all portfolios than is predicted by the CAPM.

(c) the outcome returns are generally higher for low beta portfolios and lower for high beta portfolios than is predicted by the CAPM.

(d) the outcome returns are generally lower for low beta portfolios and higher for high beta portfolios than is predicted by the CAPM.

**QUESTION 9**

In the tests of the Fama and French three-factor model,

(a) two additional risk premiums: for high minus low (book market) and small minus big (firm size) portfolios are in addition to the market risk premium, with loadings on the premiums.

(b) the additional risk premiums may be viewed in analogy with the risk premium for the risky market return minus risk-free asset portfolio in the CAPM.

(c) the factor loadings may be viewed in analogy with beta on the market risk premium.

(d) All of the above are reasonably accurate statements.

**QUESTION 10**

In the tests of the Fama and French three-factor model,

(a) A time-series regression identifies the loading factors on the additional high minus low (book market) and small minus big (firm size) risk premiums for each stock.

(b) Fama and French support their FF-3F model on the basis that the intercepts terms in the above regression are (mostly) indistinguishable from zero.

(c) (a) is a valid statement, but (b) is not.

(d) both (a) and (b) are reasonably accurate statements.

**QUESTION 11**

A firm has Net plant and equipment = $100 million in 20x0. The following year it reports Depreciation = $10 million, and expenditure on Net plant and equipment = $15 million. The Net plant and equipment for 20x1 should therefore be

(a) $100 million.

(b) $105 million.

(c) $110 million.

(d) $125 million.

**QUESTION 12**

A firm has Net plant and equipment = $100 million in 20x0. The following year it reports Depreciation = $10 million. It makes zero expenditure on Net plant and equipment, but disposes of assets with book value $1 million. The assets actually sell for $1.5 million. The Net plant and equipment at end 20x1 should therefore be

(a) $89 million.

(b) $90 million.

(c) $90.5 million.

(d) $91 million.

**QUESTION 13**

Which of the following statements is correct assuming that the corporate tax rate is zero?

(a) For a successful firm, leverage can increase dividends per share.

(b) Even when leverage increases dividend per share for the successful firm, the firm’s share value will tend to remain unaffected if investors adjust their cost of equity in accordance with the CAPM.

(c) When leverage increases dividend per share for the successful firm, the firm’s share value will tend to increase if investors maintain their cost of equity in the firm as it was prior to the increase in leverage.

(d) All the above statements are essentially correct.

**QUESTION 14**

Which of the following statements is correct?

(a) The present value of the tax savings due to the corporate tax deductibility of interest rates on the firm’s debt provides the firm with a theoretical “corporate tax shield”.

(b) The above “corporate tax shield” is an argument in favour of debt.

(c) Financial distress is an argument against the use of debt beyond a certain point.

(d) All of the above can be argued as essentially correct statements.

**QUESTION 15**

The spot Euro is quoted $0.96/€. A forward rate of $1.04/€ is closest to a

(a) 8.3% premium on the Euro.

(b) 8.3% discount on the Euro

(c) 7.7% premium on the Euro.

(d) 7.7% discount on the Euro.

**QUESTION 16**

If currency A has appreciated by 30% against currency B, by what percentage has currency B depreciated against currency A?

(a) about 23%

(b) about 33%

(c) about 27%

(d) None of the above

**QUESTION 17**

If the current exchange rate is 124 Japanese yen per US dollar, the price of a Big Mac hamburger in the United States is $2.54, and the price of a Big Mac hamburger in Japan is 250 Yen, then other things equal, the Big Mac hamburger in Japan is \_\_\_\_\_\_\_\_.

(a) correctly priced

(b) inconsistent with purchasing power parity (PPP)

(c) over priced

(d) not enough information to determine if the price is appropriate or not

**QUESTION 18**

One year ago the spot rate of US dollars for Canadian dollars was $1/C$1. Since that time the rate of inflation in the US has been approximately 4% greater than that in Canada. Based on the theory of Relative PPP, the current spot exchange rate of US dollars for Canadian dollars should be approximately \_\_\_\_\_\_\_\_\_\_\_\_.

(a) $0.96/C$

(b) $1/C$1

(c) $1.04/C$1

(d) Relative PPP provides no guide for this type of question.

**QUESTION 19**

If an investor purchases a five-year US bond that has an annual interest rate of 5% rather than a comparable British bond that has an annual interest rate of 6%, then the investor must be expecting the \_\_\_\_\_\_\_\_\_ to \_\_\_\_\_\_\_\_\_\_\_ at a rate of approximately 1% per year over the next 5 years.

(a) British pound; appreciate

(b) British pound; revalue in either direction

(c) US dollar; appreciate

(d) US dollar; depreciate

**USE THE FOLLOWING INFORMATION FOR QUESTIONS 20-24.**

Company ABC in the U.S. has purchased goods from the European firm XYZ for €1,000,000. The contract is made in June with payment from ABC due to XYZ six months later in December.

To help ABC make a hedging decision you have gathered the following information.

• The spot exchange rate is $1.16/€

• The six month forward rate is $1.18/€

• The Euro zone 6-month borrowing rate is 4% per annum (or 2.0% for 6 months)

• The Euro zone 6-month lending rate is 3% per annum (or 1.5% for 6 months)

• The US 6-month borrowing rate is 6% per annum (or 3.0% for 6 months)

• The US 6-month lending rate is 5% per annum (or 2.5% for 6 months)

• ABC’s forecast for 6-month spot rates is $1.19/€.

The following options are available.

|  |  |  |
| --- | --- | --- |
|  | Strike price | Premium |
| December *call* option on the euro | $ 1.16 / € | $ 0.025/€  |
| December *call* option on the euro | $ 1.18 / € | $ 0.010/€  |
|  | Strike price | Premium |
| December *put* option on the euro | $ 1.16 / € | $ 0.010/€  |
| December *put* option on the euro | $ 1.18 / € | $ 0.025/€  |

 Ignore the “carry forward” cost of purchasing the option in all calculations.

**QUESTION 20**

If ABC chooses to hedge its transaction exposure in the forward market, ABC will \_\_\_\_\_\_\_\_\_\_ €1,000,000 forward at a rate of \_\_\_\_\_\_\_\_\_\_\_, leading to a requirement to pay in 6 months: \_\_\_\_\_\_\_\_\_\_\_.

(a) sell; $1.16/€; /$1,160,000

(b) sell; $1.16/€; /€1,160,000

(c) buy; $1.18/€; /$847,458

(d) buy; $1.18/€; /$1,180,000

**QUESTION 21**

If ABC avails of a call option at the strike price of $1.16/€ on €1,000,000 the required payment in 6 months’ time (allowing for the cost of the calls) is

(a) a maximum of $1,185,000

(b) a minimum of $1,185,000

(c) a maximum of €1,185,000

(d) a minimum of €1,185,000

 **QUESTION 22**

If ABC avails of a call option at the strike price of $1.18/€ on 1,000,000€ the required payment in 6 months’ time (allowing for the cost of the calls) is

(a) a maximum of $1,190,000

(b) a minimum of $1,190,000

(c) a maximum of €1,190,000

(d) a minimum of €1,190,000

**QUESTION 23**

If the outcome price of the Euro is 6 months’ time is $1.16/€, and ABC avails of a call option on €1,000,000, the required funds at the end of 6 months will be \_\_\_\_\_\_\_\_\_\_\_ if ABC avails of a call option at the strike price of $1.16/€, and \_\_\_\_\_\_\_\_\_\_\_ if ABC avails of the call option at the strike price of $1.18/€.

(a) $1,185,000; $1,185,000

(b) $1,185,000; $1,170,000

(c) the answer depends on the outcome price of the Euro in 6 months’ time.

(d) €1,185,000 for certain

**QUESTION 24**

What outcome price for the Euro leads to the same outcome for ABC independently of which call option is chosen?

(a) $1.16/€

(b) $1.175/€

(c) $1.18/€

(d) $1,155,000 for certain

**SECTION B**

This section consists of three questions. This section is worth a total of 50 marks.

**QUESTION 1**

Suppose that investors require an annual rate of return of 15.5% on their shares in Company *ABCXYZ*. It is expected that the firm will maintain a policy of retaining ¼ of its earnings for reinvestment into the indefinite futures with the remainder ¾ of its earnings distributed as a dividend. As a result, the firm is expected to grow at an annual rate of 12.2%. Annual inflation is anticipated at 10%.

**REQUIRED:**

**PART A**

(a) Calculate the appropriate P/E ratio for ABCXYZ.

 **(2 marks)**

**PART B**

(b) Convert (i) investors’ required rate of return (15.5%) and (ii) the firm’s growth rate (12.2%) to a real rate of return and growth rate, respectively.

 **(3 marks)**

(c) Using the real values from (b) above, re-calculate the appropriate P/E ratio for ABCXYZ.

 **(2 marks)**

(d) Comment on the comparison of your answers in (a) and (c) for the firm’s P/E ratio.

 **(2 marks)**

(e) Calculate

(i) the real rate of return, and

(ii) the nominal rate of return

that ABCXYZ needs to achieve on its retained earnings so as to sustain the firm’s growth rate (12.2% above).

 **(5 marks)**

**(2 + 3 + 2 + 2 + 5 = 14 marks)**

**QUESTION 2**

Company ***Hendrix*** has earnings *before* tax of $88,800 at the end of the year, which is expected to continue in perpetuity and which will be distributed as dividends. The corporate tax rate is ZERO. Hendrix has 100,000 shares. The firm has NO debt and the cost of equity capital (shareholders’ required rate of return) in the company is 8.88% per annum, consistent with a risk-free rate of 4% and a market risk premium of 4.88%, and an unlevered beta for *Hendrix* = 1.0. (Thus, we have *kU* = 4% + 1.0 *x* 4.88% = 8.88%.)

**REQUIRED:**

**PART A**

(a) Calculate the anticipated dividend per share in Hendrix.

 **(2 marks)**

(b) Calculate the market value of a share in Hendrix.

 **(2 marks)**

**PART B**

Company Hendrix is considering borrowing $400,000 which it can achieve at the risk-free interest rate 4% in perpetuity on account of that its debt would have zero probability of default (the company plans to mortgage its prime real estate to secure the debt). With the debt, it plans to repurchase its own shares (exchanging debt for equity), thereby leveraging the company’s profits to the remaining shareholders. Assume that Hendrix goes ahead with the leveraging of its capital structure under the above conditions.

(c) Calculate:

(i) the leveraged value of the company using Modigliani and Miller’s proposition I and thereby, calculate

 **(2 marks)**

(ii) the leveraged value of the company’s equity, and, hence, the leveraged market value of a share in Hendrix.

**. (2 marks)**

(d) Calculate the leveraged cost of equity for Hendrix with:

$ k\_{E}=k\_{U}+\frac{V\_{D}}{V\_{E}}\left(k\_{U}-k\_{D}\right)$

 **(1 mark)**

 (e) Calculate the leveraged beta for Company Hendrix using:

 $ β\_{E}=β\_{U}+\frac{V\_{D}}{V\_{E}}\left(β\_{U}-β\_{D}\right)$

 **(1 mark)**

 (f) Calculate the leveraged cost of equity for shareholders in Hendrix using the CAPM and the beta calculated in (e) above.

  **(2 marks)**

(g) Comment on the comparison of your calculations for the cost of equity applying the CAPM in part (f) and as derived using Modigliani and Miller’s Proposition II in part (d) above.

 **(1 mark)**

(h) Calculate the new dividend per share to Hendrix in perpetuity. Hence calculate the new equity value of Hendrix.  **(2 marks)**

(i) Comment on the comparison of your calculations for the new equity value of a share in Company Hendrix as calculated in (h) and as calculated using Modigliani and Miller’s Proposition I in (c) above.

 **(2 marks)**

**PART C**

(j) Suppose that due to the increase in dividends per share, investors are sufficiently impressed that they continue to discount the new dividend by the firm’s unlevered cost of equity (8.88%) (in other words, ignoring Modigliani and Miller’s proposition II). How does this affect you estimate of the new levered share price if Hendrix proceeds with the leveraging of its capital structure as described? **(3 marks)**

 **(2 + 2 + 4 + 1 + 1 + 2 + 1 + 2 + 2 + 3 = 20 marks)**

**QUESTION 3**

The Balance Sheet (incomplete) and the Income Statement for Company *ABC* for the end of the accounting year 2016 are as below. (All numbers are in millions.). In the accounting year 2016, the firm invested $6 million on fixed assets. There were no other material changes in the accounting year.

**REQUIRED:**

Determine the missing entries for the firm’s Balance Sheet below. On the ASSETS (left-hand) side of the Balance Sheet:

(a) Cash and equivalents

**(3 marks)**

(b) TOTAL CURRENT ASSETS

**(2 marks)**

(c) Net plant and equipment

**(2 marks)**

(d) TOTAL ASSETS

**(2 marks)**

On the LIABILITIES AND EQUITY (right-hand) side of the Balance Sheet:

(e) Retained earnings

**(3 marks)**

 **(3 + 2 + 2 + 2 + 3 = 12 marks)**

 **BALANCE SHEET for Firm ABC for the end of accounting year 2016**

**ASSETS 2016 2015**

Cash and equivalents $\_\_\_ $12.0

Accounts receivable 18.0 18.0

Inventory 26.0 26.0

**TOTAL CURRENT ASSETS $\_\_\_ $56.0**

Net plant and equipment $ \_\_\_\_ $40.0

**TOTAL FIXED ASSETS $\_\_\_ $40.0**

TOTAL ASSETS $\_\_\_ $96.0

**LIABILITIES AND EQUITY 2016 2015**

Accounts payable $6.0 $6.0

TOTAL CURRENT

 LIABILITIES $6.0 $6.0

Long-term bonds 32.0 32.0

**TOTAL DEBT LIABILITIES $38.0 $38.0**

Ordinary shares 16.0 16.0

Retained earnings \_\_\_\_ 42.0

**BOOK VALUE OF EQUITY $60.0 58.0**

TOTAL LIABILITIES

AND EQUITY $98.0 96.0

**INCOME STATEMENT for Firm ABC for the end of accounting year 2016**

 **2016 2015**

Sales $100.0 $90.0

Variable operating costs (80.0) (72.0)

GROSS PROFIT $20.0 $18.0

Fixed operating costs (8.0) (7.5)

Earnings before interest, taxes, depreciation

and amortization (EBITDA) $12.0 $10.5

Depreciation (and amortization) (4.0) (3.0)

Net operating income (NOI) =

Earnings before interest and tax (EBIT) $8.0 $7.5

Interest (2.0) (2.0)

Earnings before taxes (EBT) $6.0 $5.5

Taxes (here, 30% of EBT) (1.8) (1.65)

**Net income** $4.2 $3.85

Ordinary dividends (2.2) (2.2)

**Addition to retained earnings** $2.0 $1.65

**QUESTION 4**

The company ABCD is considering the production of widgets. The idea is to produce 500,000 units of the widget each year for 5 years.

 The anticipated selling price per widget is $12 and the variable cost per widget is $5.

 The new production operations will also incur a fixed cost of $500,000 per year.

 The initial investment in the plant is $1,000,000 and the expected disposal value of the plant is $500,000 at the end of the project. The plant is fully depreciated during the next five years using straight-line depreciation method.

 Assume the corporate tax rate is 30% and that ABCD wishes to apply a WACC = 12% when discounting its investments in new product lines.

**REQUIRED**

Calculate the NPV of the investment.

**(18 marks)**

***Formula Sheet***

 $ Market bond price=\$PMT\left[\frac{1-(1+r)^{-N}}{r}\right]+\frac{face value of the bond}{(1+r)^{N}}$

 $ PV\_{0}=\sum\_{y=1}^{N}\frac{\$X\_{y}}{(1+i)^{y}} $ .

 $PV\_{0}=\frac{\$X\_{1}}{i-g}$ .

$PV\_{0}=\frac{\$X\_{1}}{i}$ .

 $PV\_{0}=\$X\left[\frac{1-(1+i)^{-N}}{i}\right] $ .

 $PV\_{0}=\$X\left[\frac{1}{i} -\frac{1}{(1+i)^{N}} \frac{1}{i}\right] $ .

$ real rate of interest= \frac{1+nominal interest rate }{1+ inflation rate} - 1$ .

$ Market bond price=\$PMT\left[\frac{1-(1+r)^{-N}}{r}\right]+\frac{face value of the bond}{(1+r)^{N}}$ .

 $P\_{0}^{cum}=DIV\_{0}+\sum\_{i=1}^{\infty }\frac{\$DIV\_{i}}{(1+k)^{i}} $ .

 $P\_{0}^{ex}=share value\_{0}^{ex}=\frac{\$DIV\_{1}}{k-g} $ .

 Real internal growth rate = *b*.*r* .

 $P\_{0}^{ex}=share value\_{0}^{ex}=\frac{\$CFE\_{1}(1-b)}{k-b.r}$ .

$P/E=\frac{(1+g)(1-b)}{k-g}$ .

*kj* = *rf* + *βj* (*MRP*) = *rf* + *βj* [*kM* - *rf* ] .

*kP* - *rf* = *bP*.(*kM* - *rf*) + *sP*.*kSMB* + *hP*.*kHML*  .

 *Vfirm* ≡ *VE* + *VD*  = *VU* .

$ k\_{AV} ≡ \frac{V\_{E}}{V\_{E}+V\_{D}}k\_{E}+\frac{V\_{D}}{V\_{E}+V\_{D}}k\_{D}= k\_{U}$ .

$ k\_{E}=k\_{U}+\frac{V\_{D}}{V\_{E}}\left(k\_{U}-k\_{D}\right)$ .

$β\_{AV}≡ \frac{V\_{E}}{V\_{E}+V\_{D}}β\_{E}+\frac{V\_{D}}{V\_{E}+V\_{D}}β\_{D} $= $β\_{U}$ .

$ β\_{E}=β\_{U}+\frac{V\_{D}}{V\_{E}}\left(β\_{U}-β\_{D}\right)$ .

effective interest rate = nominal interest rate (*iD*) *x* (1 – *Tc*) .

 *free cash flow to equity* (*CFE*) = [*EBIT* - *DEBT*.*iD*](1-*Tc*) + *DEP&A* – *NINV*

 *– repayment of the debt principal*

 $V\_{E}=\sum\_{t=1}^{N}\frac{CFE\_{t}}{(1+k\_{E})^{t}}$

*FCF* = *EBIT*(1–*Tc*) + *DEP&A* – *NINV*

*WACC* ≡$ \frac{V\_{E}}{V\_{D}+V\_{E}}$ *kE* + $\frac{V\_{D}}{V\_{D}+V\_{E}}$ *iD* (1 - *Tc*)

$V\_{project}=\sum\_{t=1}^{N}\frac{FCF\_{t}}{(1+WACC)^{t}}$

$ F^{¥/\$}=S\_{1}^{¥/\$}= S\_{0}^{¥/\$}\frac{1+int^{¥}}{1+int^{\$}}= S\_{0}^{¥/\$}\frac{1+inf^{¥}}{1+inf^{\$}} $ .

Profit for a *Call* option on the Aussie dollar (provided the outcome price of an Aussie dollar is greater than the exercise/strike price) in US dollars (per option on a single Aussie dollar)

= outcome price of an Aussie dollar (US $ per Aussie dollar)

 – exercise price for one Aussie dollar (US $ per Aussie dollar)

 – price (premium, US$) for an option on a single Aussie dollar

Profit for a *Put* option on the Aussie dollar (provided the outcome price of an Aussie dollar is less than the exercise/strike price) in US dollars (per option on a single Aussie dollar) =

 exercise (strike) price for one Aussie dollar (US $ per Aussie dollar)

 – outcome price of an Aussie dollar (US $ per Aussie dollar)

 – price (premium, US$) for an option on a single Aussie dollar

**SOLUTIONS**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **1** | **2** | **3** | **4** | **5** |
| **A** | **B** | **C** | **C** | **C** |
| **6** | **7** | **8** | **9** | **10** |
| **B** | **B** | **C** | **D** | **D** |
| **11** | **12** | **13** | **14** | **15** |
| **B** | **A** | **D** | **D** | **A** |
| **16** | **17** | **18** | **19** | **20** |
| **A** | **B** | **C** | **C** | **D** |
| **21** | **22** | **23** | **24** |  |
| **A** | **A** | **B** | **B** |  |

***Solution notes for multiple choice***

(5) P = $\frac{€8.0 x (1- 1.1^{-7})}{0.1}$ + $\frac{€100}{1.1^{7}}$ = €90.26.

(6) P/E = $\frac{1.04 x 0.60}{0.1-0.04}$ = 10.4.

(7) P/E = $\frac{1.02 x 0.8 }{0 05-0.02}$ = 27.2.

(11) = $100 - $10 + $15 = $105m.

(12) = $100 - $10 - $1.0 = $89m.

(15) premium = (1.04 – 0.96)/0.96 = 8.33.

(16) currency A has appreciated as = $\frac{1.3-1}{1}$ = 0.3 (30%).

Hence, currency B has depreciated as $\frac{\frac{1}{1.3}-1}{1}$ = 0.23 (23%).

(18) Inflation higher in the US implies that the US dollar depreciates by approximately 4% and the Canadian dollar appreciates by approximately 4%.

Hence, we have the Canadian dollar at $1.04/C$1.

(19) A lower interest rate of the US dollar implies that it is expected to appreciate.

(20) The need to purchase Euros implies hedging by buying Euros forward. €1 million x $1.18/€ = $1,180,000.

(21) = €1 million x ($1.16/€ + $0.025/€) = $1,185,000.

(22) = €1 million x ($1.18/€ + $0.01/€) = $1,190,000.

(23) $1.16/€ strike price → 1 million x ($1.16/€ + $0.025/€) = $1,185,000.

 $1.18/€ strike price **not** exercised → 1 million x ($1.16/€ + $0.01/€) = $1,170,000.

(24) Solve: $1.16/€ + $0.025/€ = $/€ + $0.01/€ → $/€ = $1.175/€.

**SOLUTIONS TO NUMERICAL QUESTIONS**

**Question 1**

**PART A**

*Required:*

(*a*) Calculate the appropriate *P/E* ratio for *ABCXYZ*.

 (*a*) With Eqn 5.13, we determine

 *P/E* = $\frac{1.122 x (1-¼)}{0.155-0.122}$ = 25.5.

**PART B**

(*b*) With Eqn 3.13:

$ 1+real required rate of return= \frac{1+nominal required rate of return (k) }{1+ inflation rate} $

we have

 real required rate of return = $\frac{1.155}{1.1} $– 1 = 0.05 (5.0%)

and

 real growth rate = $\frac{1.122}{1.1}$ – 1 = 0.02 (2.0%).

(*c*) We have Eqn 5.13 as

 $P/E =\frac{(1+g)(1-b)}{k-g}$ = $\frac{1.02 x (1-¼)}{0.05-0.02}$ = 25.5,

(*d*) consistent (*a*) and (c) are consistent.

(*e*) With Eqn 5.10, we have

(i) Real internal growth rate = 0.02 = *b.r* = 0.25 x *r*

Hence, *r* = 0.02/0.25 = 0.08 (8.0%). Thus, *ABCXYZ’s* is required to achieve a *real* rate of return of 8.0% on its reinvestments in order to justify a *P/E* ratio of 25.5.

(ii) In nominal terms this is calculated (with Eqn 3.12) as

 1.08 = $\frac{1+nominal rate}{1.10}$

Hence, the nominal required growth rate on the firm’s reinvestments (corresponding to 8.0% real) = 18.8%.

***Question 2***

**PART A**

(*a*) We have the anticipated total dividend = $88,800 per annum in perpetuity.

Hence, the anticipated dividend per share = $\frac{\$88,800}{100,000}$ = $0.888 (88.8 cents).

(*b*) With Eqn 5.9, we can say

 value of company = $\frac{DIV}{k\_{U}}= \frac{\$88,800}{0.0888}$ **= (** $1,000,000. )

where *DIV* = the dividend per annum in perpetuity. And hence the market value of a share in *Hendrix* (with 100,000 shares) is determined as

 $\frac{\$1,000,000}{100,000}$ = $10.0.

Alternatively, we could discount the dividend per share:

 market value of a share in *Hendrix =* $\frac{DIV}{k\_{U}}= \frac{\$0.888}{0.0888}$= $10.0, as above.

**PART B**

(*c*) (*i*) With Modigliani and Miller’s proposition II, the new value of *Hendrix* (market debt plus market equity) remains as $1,000,000.

Hence

 (*ii*) new equity value of *Hendrix* = new value of *Hendrix* – value of debt

 = $1,000,000 - $400,000 = $600,000.

With $400,000, the firm can repurchase $\frac{\$400,000}{\$10.0}$ = 40,000 shares (the shares are valued at $10.0, part (*a*)) which are effectively removed from the market. Thus 100,000 – 40,000 = 60,000 shares remain in the market.

The market value of a share in *Hendrix* (with 600,000 shares) is therefore determined as

 $\frac{\$600,000}{600,000}$ = $10.0,

which is to say, the market value of a share remains unchanged with leverage.

(*d*) With Eqn 8.6:

$ k\_{E}=k\_{U}+\frac{V\_{D}}{V\_{E}}\left(k\_{U}-k\_{D}\right)$

 = 8.88% + $\frac{\$400,000}{\$600,000}\left(8.88\%-4\%\right)$ = 12.133%.

 (*e*) With Eqn 8.8:

 $ β\_{E}=β\_{U}+\frac{V\_{D}}{V\_{E}}\left(β\_{U}-β\_{D}\right)$

 = 1.0 + $\frac{\$400,000}{\$600,000}$ (1.0 - 0) = 1.666.

(*f*) With the CAPM (Eqn 6.2):

 new cost of equity (*kE*) = risk-free rate + *β* [risk premium]

 = 4% + 1.666 (4.88%) = 12.133%,

consistent with the answer in part (*d*) above.

(*g*) They are consistent.

(*h*) We can calculate the new earnings per share in perpetuity, and hence dividends in perpetuity as Eqn 8.9:

 *expectation of dividends* = *EBI* (earnings before interest) – *DEBT x* interest rate

 = $88,800 - $400,000 x 0.04 = $72,800.

Hence, the new dividend per share = $\frac{\$72,800}{60,000}$ = $1.2133, a sharp increase from the 88.8 cents prior to leveraging.

With Eqn 5.9, we then have

 value of equity = $\frac{DIV}{k\_{E}}= \frac{\$72,800}{0.121333}$ = $600,000.

consistent with the answer in part (*c*) above. Thus, we confirm the new equity price for a share in *Hendrix* as $\frac{\$600,000}{60,000}$ = $10.0, as above.

Or, alternatively, we can say

 market value of a share in *Hendrix =* $\frac{DIV}{k\_{U}}= \frac{\$1.21333}{0.121333}$= $10.0, as above.

(*i*) They are consistent.

**PART C**

(*j*) We recalculate the levered value of equity in *Hendrix* as

 value of equity = $\frac{DIV}{k\_{E}}= \frac{\$72,800}{0.0888}$ = ( $819,820)

The market value of a share in *Hendrix* (with 60,000 shares) is therefore determined as

 $\frac{\$819,820}{60,000}$ = $13.66,

which is to say, leverage in this case has increased the market value of the firm’s shares.

***Question 3***

(*a*) Cash and equivalents = $14 million

(*b*) TOTAL CURRENT ASSETS = $58 million

(*c*) Net plant and equipment = $40 million

(*d*) TOTAL ASSETS = $98 million

(*e*) Retained earnings = $44 million

***Question 4***

*Expected price* = $12.

Hence, *Expected Revenue* = 500,000 *x* $12 = $6,000,000

*Operating cost* = 500,000 *x* $5 + $500,000 = $3,000,000

*Annual depreciation* = $10,000,000/5 = $2,000,000.

|  |  |
| --- | --- |
| Expected Annual Revenue:  |  $6,000,000 |
| - Operating cost |  - $3,000,000 |
| *EBITDA (earnings before interest and tax, depreciation and amortization)* |  $3,000,000 |
| - depreciation | - $2,000,000 |
| *EBIT* |  $1,000,000 |
| - tax |  $300,000 ($1,000,000*x*30%) |
| *Net Income* |  $700,000 ($1,000,000 - $300,000) |
| + depreciation | + $2,000,000 |
|  *FCF* | $ 2,700,000 |

Cash Flows year-by-year:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Year 0 | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
| - $10,00,000 |  |  |  |  |  |
|  | $2,700,000 | 2,700,000 | 2,700,000 | 2,700,000 | 2,700,000 |
|  |  |  |  |  | $1,00,000 |
|  |  |  |  |  | -$1,000,000*x*.3 |
|  |  |  |  |  |  |
| -$10,000,000 | 2,700,000 | 2,700,000 | 2,700,000 | 2,700,000 | $3,400,000 |

*NPV* = $-\$10,000,000+ \frac{2,700,000}{1.12} + \frac{2,700,000}{1.12^{2}} + \frac{2,700,000}{1.12^{3}} + \frac{\$2,700,000}{1.12^{4}} + \frac{\$3,400,000}{1.12^{5}}$

 = -$10,00,000 + $2,410,714 + $2,152,423 + $1,921,807 + $1,715,899 + $1,929,251

 = **$130,094.5** (only 1.3% of initial costs)

1. The exam may be considered “do-able” as a 2- hour exam (allowing 10 mins for reading). If a 3-hour exam is required the examiner might consider allocating 1 mark per multiple choice question and allocating the additional 12 marks to an essay question such as: “In the short-run, the market is inefficient, but in the long-run may be regarded as efficient”. Discuss the above. [↑](#footnote-ref-1)