CHARTERED INSTITUTE OF STOCKBROKERS

QUESTIONS & ANSWERS

Examination Paper 2.2

Corporate Finance
Equity Valuation and Analysis
Fixed Income Valuation and Analysis

Professional Examination
March 2021

Level 2

Question 2 - Corporate Finance

Explain why many small companies that are not in financial difficulties may pay small dividends or no dividends at all. (3 marks)

Solution to Question 2

Many small companies were recently established, having been set up to exploit promising new business opportunities. Companies in sectors where growth is rapid, or where product or business process innovation is critical to competitive success, often need to invest heavily.

One of the sources of capital for investment is retained funds, and the decision about which sources of capital to use will depend on the costs and risks of different forms of capital.

Companies of the kind described may not have steady cash flows (which minimise the risks associated with interest and capital payments on loans) or substantial tangible fixed assets (which can provide security for loans).

Equity tends to be more appropriate for such companies, since rapid growth that is difficult to predict or uncertainties associated with technological and other innovation means higher levels of business risk.

A high level of investment and a preference for equity capital means that such a company is more likely to use retained earnings for investment and consequently pay out a smaller proportion (or even none) of its earnings as dividends.

This approach is often acceptable to shareholders, who may be more prepared to wait for a return in the form of capital growth rather than dividends, than they would be with an investment in a larger, better established company.

(1 mark each for any 3)

Question 5 - Corporate Finance

Eko plc is considering investing ₦5 million in a new machine with an expected life of five years. The machine will have no scrap value at the end of five years. Details of the investment include:

Annual sales in units	20,000
Unit selling price	₦300
Unit variable costs	₦165
Incremental annual cash	
Fixed cost	₦1 million
Cost of apital	12%

The company expects invest projects to recover their initial investment within two years.

Required:

5a)
5ai).   Estimate the annual net cash flows associated with the project   (4 marks)
5aii). Calculate and comment on the payback period of the project   (2 marks)
5aiii). Estimate and comment on the NPV of the project   (2 marks)
5aiv). Now assume that the new project will lead to an immediate **reduction** in working capital of ₦500,000. What will be the revised NPV of the project?   (2 marks)

5b)   Ignoring requirement (a)(iv), estimate the sensitivity of the project's NPV to

changes in:

5bi) the sales volume

5bii) the sales price (3 marks)

5c) Upon further investigation it is found that there is a significant chance that the expected sales volume of 20,000 units per year will not be achieved. The sales manager of Eko plc suggests that sales volumes could depend on expected economic states that could be assigned the following probabilities.

Economic state	Poor	Normal	Good
Probability	0.3	0.6	0.1
Annual sales volume (units)	17,500	20,000	22,500

Calculate the expected net present value of project. (3 marks)

(Total: 16 marks)

Solution to Question 5

5a) **₦000**

5ai) Annual contribution:

20,000 (₦300 − 165) (1 mark)   2,700   (1 mark)

Cash fixed cost   (1,000)   (1 mark)

Annual NCF   1,700   (1 mark)

5aii) Payback period = ₦5m/1.70m = 2.94 years (1 mark)

Using the payback period method, the project will be rejected because it does not meet management target of 2 years payback period. (1 mark)

5aiii) With constant annual CF, the NPV can easily be calculated as followings:

₦000

NPV = − ₦5000 + 1,700 × (3.605)   1,128.50   ($1^{1/2}$ marks)

The NPV is positive and the project can be accepted. (½ mark)

5aiv) It **must** be assumed that at the end of the project in year 5, the level of working capital will be restored to its normal level (i.e. an increase of ₦500,000).

(1 mark)

Change in NPV = + 500 − ₦ (500 × 0.567) = + 216.50

(1 mark)

Revised NPV = ₦1,128.50 + 216.50 = ₦1,345   (₦ '000)

5b) **Sensitivity**

5bi)   Sales volume

$$= \frac{NPV}{PV \text{ of contribution}} \times 100$$

$$= \frac{₦1,128.50}{₦2,700 \times ₦3.605} \times 100 = 11.59\%$$

($1^{1/2}$ marks)

5bii)   Sales price

$$= \frac{NPV}{PV \text{ of sales revenue}} \times 100$$

$$= \frac{\text{₦}1,128,500}{\text{₦}20,000 \times \text{₦}300 \times \text{₦}3.605} \times 100 = 5.22\%$$

(1^{1/2} marks)

5c) Expected sales in units =
(17,500 × 0.30) + (20,000 × 0.60) + 22,500 (0.10) = 19,500 units   (^{1/2} mark)

		₦ 000	
Annual NCF:			
19.50 × (₦300 − 165) − 1,000	=	1,632.50	(1^{1/2} marks)

Expected NPV:
- ₦5,000 + (1,632.50 × 3.605)   =   ₦885. 8   (1 mark)

Question 3 - Equity Valuation and Analysis

Consider two firms producing DVD recorders. One uses a highly automated robotics process, whereas the other uses workers on an assembly line and pays overtime when there is heavy production demand.

3a)   which firm will have higher profits in a recession? In a boom?
3b)   which firm's stock will have a higher beta?   (3 marks)

Solution to Question 3
3a)   The robotics process entails higher fixed costs and lower variable (labour) costs. Therefore, this firm will perform better in a boom and worse in a recession. For example, costs will rise less rapidly than revenue when sales volume expands during a boom.
                                                                            ($1^{1/2}$ marks)

3b)   Because its profits are more sensitive to the business cycle, the robotics firm will have the higher beta.
                                                                            ($1^{1/2}$ marks)

Question 6 - Equity Valuation and Analysis

KT plc is in the information technology (IT) sector. The main business of KT is assembly of personal computer from components that are imported from abroad. Recently, it expanded its business activities to include the assembly of smartphones. Its shares are actively traded on the stock market.

The beta of KT's equity is 20% higher than the beta of the whole market. The company's current debt-to-equity ratio is 50%. KT's management has projected income statements for the next four fiscal years. These projections are given in Table 1. Furthermore, KT's management plans to have capital expenditures and changes of net working capital in the coming four fiscal years as stated in Table 2. KT's outstanding debt is risk free.

Risk free rate of return is 3% p.a. and the stock market is expected to earn a 12% return p.a. corporate tax is 30%.

Table 1

Income statement	2020	2021	2022	2023
	₦	₦	₦	₦
Revenues	3,000,000	3,300,000	3,600,000	4,000,000
Cost of goods sold	1,800,000	1,900,000	2,000,000	2,200,000
Depreciation	300,000	360,000	390,000	420,000
EBIT	900,000	1,040,000	1,210,000	1,380,000
Interest	300,000	300,000	300,000	300,000
EBT	600,000	740,000	910,000	1,080,000
Taxes	180,000	222,000	273,000	324,000
Net income (NI)	420,000	518,000	637,000	756,000

Table 2

	2020	**2021**	**2022**	**2023**
Capital expenditures (CE)	200,000	328,000	350,000	430,000
Changes in net working capital (ΔNWC)	220,000	200,000	277,000	326,000

6a) The management assumes that KT's business will increase only at a 2% compound growth rate after 2023 as the extraordinary growth in the market for smartphones is not expected to be sustainable after 2023.

6a1) Determine KT's expected free cash flow to the firm (FCFF) in the fiscal years 2020 to 2023. (4 marks)

6a2) Determine KT's weighted average cost of capital. (1 mark)

6a3) Determine KT's total value using discounted cash flows (DCF) as of January 1, 2020. (4 marks)

6b) KT has some investment opportunities in an innovative strategic business segment: smart mobility technologies. In order to finance this investment, KT's management is considering increasing leverage to a debt-to-total asset ratio equal to 50% without affecting its credit rating adversely. KT can issue a convertible bond in order to finance this investment. The convertible bond has a face value of ₦500,000, features an annual coupon rate of 5%, and a maturity of eight years. The convertible bond could be sold at a price of 118.04%.

6b1) Determine KT's equity cost of capital under the new proposed capital structure (4 marks)

6b2) Determine the extra financing which KT can raise by issuing the convertible bond compared to a straight coupon bond with the same terms except for the conversion feature and provide an economic reason for this extra financing. (3 marks)

(Total: 16 marks)

Solution to Question 6
6a)
6a1) FCFF = EBIT – Taxes + Depreciation – ΔNWC – CE

	2020	**2021**	**2022**	**2023**
	₦	₦	₦	₦
EBIT	900,000	1,040,000	1,210,000	1,380,000
Taxes	(270,000)	(312,000)	(363,000)	(414,000)
Depreciation	300,000	360,000	390,000	420,000
ΔNWC	(220,000)	(200,000)	277,000	326,000
CE	(200,000)	(328,000)	(350,000)	(430,000)
FCFF	510,000	560,000	610,000	630,000

($^{1/6}$ mark for each)

Note: Alternative methods are available and allowed – for example, candidates can start from net income.

6a2) Cost of equity = KE = 3 + 1.2(12 – 3) = 13.8%
Cost of debt = K_D = 3%
WACC

Debt/Equity = 0.5
If debt = 5, equity = 10 or any other figures in similar proportion.
WACC = (10/15)(13.8) + (5/15)(3) = 9.9% or (say) 10%.

(1 mark)

6a3)   Valuation of KT (₦'000)
- **First 4 years**

$$PV = 510\left(\frac{1}{1.10}\right) + 560\left(\frac{1}{1.10}\right)^2 + 610\left(\frac{1}{1.10}\right)^3 + 630\left(\frac{1}{1.10}\right)^4 = 1,815$$

(2 marks)

- **Years 5 – infinity**

$$PV = \frac{630(1.02)}{0.10 - 0.02} \times \left(\frac{1}{1.10}\right)^4 = 5,540$$

(1½ marks)

Total value = 1,815 + 5,540 = 7,355

(½ mark)

6b)

6b1) The existing equity beta of 1.2 of KT reflects the business risk of IT sector and current financial risk of KT (imposed by its current D/E ratio of 50%). With the change in D/E ratio, we need to recompute a revised equity beta that reflects the new D/E ratio.

Step 1: Ungear the current equity beta – to remove the impact of the current D/E ratio. This means converting the existing equity beta to asset beta. When debt is risk free.

$$\beta_A = \frac{E \cdot \beta_E}{E + D(1 - t)} = \frac{10 \times 1.2}{10 + 5(1 - 0.3)} = 0.89$$

(1½ marks)

(Note that the calculation uses the current D/E ratio of 0.5)

This asset beta of 0.89 reflects only the business risk of IT sector.

Step 2: To incorporate the revised financial risk of KT (represented by the revised D/E of 1 **or** debt/asset = 50%), we regear the above asset beta, using:

$$\beta_E = \beta_A + (\beta_A - \beta_D)\left(\frac{D}{E}\right)(1 - t) = 0.89 + (0.89 - 0) (1) (1 - 0.3) = 1.5$$

This reflects the business risk of the IT sector and the revised financial risk of TK Plc.

(1½ marks)

Note
Debt/Total asset = Debt/Debt + Equity
For D/D + E of 0.5

If total asset = 10, for example, D = 5 and E = 5, or any similar proportion.
$K_E = 3 + 1.5 (12 - 3) = 16.50\%$

(1 mark)

6b2)   The fair value of a straight coupon bond per ₦000 in nominal (face) value is given by:

$$₦5\left(\frac{1 - 1.03^{-8}}{0.03}\right) + 100\left(\frac{1}{1.03}\right)^8 = 114.04\%$$

(1½ marks)

This means that if straight (option - free) bond is issued rather than a convertible, it would have been priced at 114.04% rather than 118.04%.

(½ mark)

Hence, the additional financing raised by issuing the convertible bond is:
(118.04% - 114.04%) × ₦500,000 = ₦20,000.

(½ mark)

The extra financing raised by KT reflects the economic value of the conversion feature. It is the conversion premium and represents the value of the equity leg of the convertible bond.

(½ mark)

Question 4 - Fixed Income Valuation and Analysis

Identify 3 key uses of yield curve in an economy   (4 marks)

Solution to Question 4

Uses of Yield Curve
Any three

- The yield curve has an impressive record as a leading indicator of economic conditions, alerting investors to an imminent recession or signaling an economic upturn.

- The yield curve can be used as a benchmark for pricing many other fixed income securities. Because most government Treasury bonds have no perceived credit risk, most fixed-income securities, which do entail credit risk, are priced to yield more than Treasury bonds.

- By anticipating movements in yield curve, fixed-income managers can attempt to earn above-average returns on their bond portfolio – by engaging in yield curve strategies (barbell, bullet or ladder).

- Using the yield curve, investors may also attempt to identify bonds that appear cheap or expensive at any given time.

- Fixed-income managers can also seek extra return with a bond investment strategy known as riding the yield curve, or rolling down the yield curve. When the yield curve slopes upward, as a bond approaches maturity or "rolls down the yield curve," it is valued at successively lower yields and higher prices. Using this strategy, a bond is held for a period of time as it appreciates in price and is sold before maturity to realise the gain. As long as the yield curve remains normal, or in an upward slope, this strategy can continuously add to total return on a bond.

$(1^{1/3}$ mark per point, Max 3 Points)

You have the following bonds (A and B) in your portfolio as well as Bond C which is a callable bond. All the bonds have a par value of fixed income ₦100 and have just paid their annual coupon.

Bond	Coupon	Price	YTM	Term to maturity (years)	Macaulay's duration (years)	Nominal bought (in million)
A	5.00%			3	2.86	1
B	5.75%	103.25	5.00%	5	4.49	2
C	5.50%		4.84%	4	3.70	1

YTM, Term to maturity and Macaulay's duration of bond C are computed as if the bond is not called.

7a) If the one-year risk-free rate ($R_{0,1}$) is 5.00% and the two-year forward risk-free rate at the end of the first year ($F_{1,3}$) is 5.50%, calculate the values for YTM and Price of bond A in the table above knowing that the YTM of bond A is 0.40% higher than the risk-free spot rate. (5 marks)

7b) Bond C can be called at par in 2 years. Your quant desk has computed that the price of the call option is 4%. Knowing that a call-free equivalent bond price is quoted at 106.35%. What is the price of Bond C? (1 mark)

7c) Is a callable bond price higher or lower than a plain vanilla (normal bond)? What is the financial justification for the price difference between a callable bond and a plain vanilla bond? (2 marks)

7d) You expect a massive increase of interest rates 2 years from now with the risk-free rate increasing by 3% along the curve, but you expect the bond spread with respect to the risk-free rate to stay stable at 0.40%, from a financial point of view, do you think the chances that the bond will be called are high or low? Explain (1 marks)

7e) If the bond were not called, what would be the modified duration of your portfolio? (6 marks)

7f) If interest rates suddenly increase by 0.75%, what will be the result in % terms on your portfolio? Will it be a gain or a loss? (You can use the duration approximation for your computation). (2 marks)

(Total: 18 marks)

Solution to 7

7a) First, we need to determine the 3-Year spot rate (R_3)

$$F_{1,3} = \left[\frac{(1 + R_3)^3}{1 + R_1}\right]^{\frac{1}{3-1}} - 1$$

$$0.055 = \left[\frac{(1 + R_3)^3}{1.05}\right]^{\frac{1}{2}} - 1$$

$$(1.055)^2 = \frac{(1 + R_3)^3}{1.05}$$

$$(1.055)^2 \times 1.05 = (1 + R_3)^3$$

(2 marks)

$$R_3 = [(1.055)^2 \times 1.05]^{1/3} - 1 = 5.333\%$$

(1 mark)

$$YTM_A = 5.333 + 0.40\% = 5.733\%$$

$$P_A = \frac{5}{(1+0.05733)^1} + \frac{5}{(1+0.05733)^2} + \frac{105}{(1+0.05733)^3} = 98.03$$

(1¹ᐟ² mark)

7b) We have Callable Bond Price = Call Free – Call Option = 106.35 – 4 = 102.35

(1 mark)

7c) The callable bond price is lower than the price of a normal bond. The call premium is somewhat of a penalty paid by the issuer to the bond holders for the early redemption. In order to receive the rights associated with a call option, the premium must be paid to the seller, and therefore the callable bond price is lower.

(2 marks)

7d) Low. The main cause to call a bond is a decline in interest rates. If interest rates have declined since a company first issued the bonds, it will likely want to refinance this debt at a lower rate of interest. In this case, company will call its current bonds and reissue them at a lower rate of interest. Inversely, if interest rates increase, the company will have no incentives to call back the bond. Hence the probability of the bond to be called is pretty low when interest rates increase.

(2 marks)

7e)

- First, compute the modified duration (MD) of each bond
  Bond A: MD = 2.86/1.05333 = 2.7152 (½ mark)
      B: MD = 4.49/1.05 = 4.2762 (½ mark)
      C: MD = 3.70/1.0484 = 3.5292 (½ mark)

(1¹ᐟ² marks)

- Determine the total market value of each bond

                                ₦m

Bond A $\frac{98.03}{100} \times ₦1m$ = 0.9803 (½ mark)

     B $\frac{103.25}{100} \times ₦2m$ = 2.0650 (½ mark)

     C $\frac{102.35}{100} \times ₦1m$ = 1.02350 (½ mark)

                          4.0688

(1¹ᐟ² marks)

- Next, compute the modified duration of the portfolio

The modified duration of the bond portfolio is the weighted average of the modified duration of the individual bonds in the portfolio.

Bond	MD	Total value		Hash total
A	2.7152 ×	0.9803	=	2.6617
B	4.2762 ×	2.0650	=	8.83035
C	3.5292 ×	1.0235	=	3.61214
		4.0688 (1 mark)		15.10419

(1 mark)

$$MD_p = \frac{15.10419}{4.0688} = 3.7122$$

(1 mark)

7f) We have:

$$\frac{\Delta P}{P} = -MD.\Delta Y = (-3.7122)(0.75) = -2.78\%.$$

(1½ mark)

The portfolio will lose about 2.78% of its total value.

(½ mark)