CHARTERED INSTITUTE OF STOCKBROKERS

QUESTIONS & ANSWERS

Examination Paper 3.0A

**Corporate Finance
Equity Valuation and Analysis
Fixed Income Valuation and Analysis**

Professional Examination
March 2021

Level 2

Question 2 - Corporate Finance

ZK Plc is a listed company that owns and operates a large number of farms throughout the country. A variety of crops are grown.

Financing structure

The following is an extract from the statement of financial position of ZK Plc at 30 September 2020.

	₦million
Ordinary shares of ₦1 each	200
Reserves	100
9% irredeemable ₦1 preference shares	50
8% loan stock 2021	250
	600

The ordinary shares were quoted at ₦3 per share ex div on 30 September 2020. The beta of ZK Plc's equity shares is 0.8; the annual yield on treasury bills is 5%, and financial markets expect an average annual return of 15% on the market index.

The market price per preference share was ₦0.90 ex div on 30 September 2020. Loan stock interest is paid annually in arrears and is allowable for tax at 2020 30%. The loan stock was priced at ₦100.57 ex interest per ₦100 nominal on 30 September 2020. Loan stock is redeemable on 30 September 2021.
Assume that taxation is payable at the end of the year in which taxable profits arise.

A new project

Difficult trading conditions have caused ZK Plc to decide to convert a number of its farms into camping sites with effect from the 2021 holiday season. Providing the necessary facilities for campers will require major investment, and this will be financed by a new issue of loan stock. The returns on the new campsite business are likely to have a very low correlation with those of the existing farming business.

Required:

2a) Using the capital asset pricing model, calculate the required rate of return on equity of ZK Plc at 30 September 2020. Ignore any impact from the new campsite project. Briefly explain the implications of a beta of less than 1, such as that for ZK Plc.

(4 marks)

2b) Calculate the weighted average cost of capital of ZK Plc at 30 September 2020 (use your calculation in answer to requirement (a) above for the cost of equity). Ignore any impact from the new campsite project. (5 marks)

2c) Without further calculations, identify and explain the factors that may change ZK Plc's equity beta during the year ending 30 September 2021. (7 Marks)

2d) Discuss whether or not an increase in dividends is likely to benefit the shareholders of a publicly quoted company. (6 marks)

(Total: 22 marks)

Solution to Question 2

2a) Required return on equity = 5% + 0.8(15% - 5%) = 13% (2 marks)
The beta is a measure of the extent to which historic movements in ZK's share price have correlated with average market returns. A beta of less than 1 means that the share price is less volatile than the market. Thus, at 0.8, it means that if the market index rises by 10% then on average the share price of ZK would be expected to increase by 8%.

(1½ marks)

This argument does not however mean that the required rate of return on ZK's shares also moves in direct proportion to the required return on the market as this is also affected by the risk free rate. (½ marks)

2b) Cost of preference shares = $\frac{9}{90} = 10\%$ (½ mark)

Total value = ₦50m × 0.9 = ₦45m (½ mark)

Cost of debt
Working with face value of ₦100 nominal

With 1 year to redemption, the following formula can be used to calculate the cost of debt:

$$K_D = \frac{EV}{BV} - 1, \quad \text{where:}$$

EV = total cash flow expected in year 1
= redemption value (₦100) + year 1's interest, net of tax (₦5.60) = ₦105.60
BV = current market value = ₦100.57

∴ K_D = (105.60/100.57) – 1 = 5% (1 mark)

Total value = ₦250m × (100.57/100) = ₦251.43m (½ mark)

Calculation of WACC

Capital	Total value ₦m	Cost %	Hash total ₦m
Equity	600.00	13	78.00
Pref shares	45.00	10	4.50
Loan stock	251.43	5	12.57
	896.42		95.07

WACC = 95.07/896.43 = 10.61%

(2½ marks)

2c) There are three major factors occurring during 2021 which may impact upon the beta of ZK Plc.
- The opening of a new business venture in campsites;
- The financing of the new venture with a new issue of bonds;
- The refinancing of the existing debt which is redeemable in 2021.

The new business venture

The new business venture is significantly different from the existing business. This is indicated by the low correlation of the returns of the two businesses.

The low correlation may diversify the unsystematic risk of the business, but its impact on the beta of the company is uncertain. This will depend on the correlation of the returns on the campsite project with the market portfolio - not their correlation with existing company returns.

Ignoring the impact of debt financing, this new equity beta will be the weighted average of the existing beta and the beta of the new project.

(1½ marks)

Financing for the new project

The new debt finance will increase financial gearing and thus increase the variability of equity returns on the project and for the company as a whole. If the equity returns become more variable in relation to the market index, then this will increase the equity beta, although the total risk to debt and equity will be unaffected.

(1½ marks)

Refinancing existing debt

The impact of refinancing on the beta will depend on the type of financing used to redeem the existing debt - if any. If there is like-for-like replacement with new debt, then there will be a minimal impact on the beta, although the terms of the replacement debt instruments may differ.

If however, the debt is redeemed - totally or partially - with new equity then this will reduce gearing, reduce the volatility of equity returns and thus lower the beta.

(1¹ᐟ² marks)

Other factors

Betas are based on historic returns and may not be stable over time. Past betas are, thus, not necessarily a good guide to the future, as they are affected by random events in relation to the company and the market. Even without the significant operational and financial changes in ZK plc in 2021, the beta would thus be likely to change anyway through normal ongoing events in the farming industry. The direction of change would, however, be in determinant.   (1¹ᐟ² marks)

Summary

The new beta will be the weighted average of the beta on the existing farming business and the beta of the new leisure business. Both of these may change over time.

(1 mark)

2d) Differing views exist about the effect of dividends on a company's share price. Several authors, including Modigliani and Miller (M & M) have argued that dividend policy is irrelevant to the value of a company. Such arguments are formulated under very restrictive assumptions. If such conditions existed then shareholders would not value an increase in dividend payments. However, there are several real world factors that are likely to influence the preference of shareholders towards dividends or retentions (and hence expected capital gains). These include: (2 marks)

i) Taxation. In some countries dividends and capital gains are subject to different marginal rates of taxation, usually with capital gains being subject to a lower level of taxation than dividends.

ii) Brokerage fees. If shareholders have a preference for some current income and are paid no or low dividends their wealth will be reduced if they have to sell some of their shares and incur brokerage fees in order to create current income. Shareholders, especially institutional shareholders, often rely on dividends to meet   their cash flow needs.

iii) The corporate tax treatment of dividends may favour a higher level of retention.

iv) If the company needs to finance new investment it is usually cheaper to use retained earnings. This is because most forms of external finance involve issue costs, which, in the case of equity finance can be three percent or more of the funds raised.

v) Information asymmetry may exist between shareholders and directors. If the market is not strong form efficient shareholders may have less complete knowledge of the likely future prospects of the company than directors, which may influence the shareholders' desire for dividends or capital gains.

(4 marks)

The implications of an increase in dividends need to be considered by the company. Dividends are often regarded as an unbiased signal of a company's future prospects, an increase in dividends signalling higher expected earnings. A company should be careful to inform its shareholders of the reason for any increase in dividends.

(1 mark for any 4 points)

A further factor is the use that the company can make of funds. If the company has a number of possible positive NPV investments then shareholders will normally favour undertaking these investments (at least on financial grounds), as they will lead to an increase in shareholder wealth. As previously mentioned, internal finance is cheaper than external finance and, ceteris paribus, would lead to a preference for retentions. If, however, the company has relatively few projects and can only invest surplus cash in money market or other financial investments at an expected zero NPV, relative high dividends or share repurchase might be preferred.

Question 3 - Equity Valuation & Analysis

3a) Kasco Plc has a current stock price of ₦49.86. It also has a P/B of 3.57 and book value per share of ₦13.97. Assume that the single-stage growth model is appropriate for valuing the company. Kasco's beta is 0.80, the risk-free rate is 5%, and the equity risk premium is 5.50%.

   3a1)   If the growth rate is 6% and the ROE is 20%, what is the justified P/B for Kasco?
                  (3 marks)

   3a2)   if the growth rate is 6%, what ROE is required to yield Kasco's current P/B?
                  (3 marks)

   3a3)   If the ROE is 20%, what growth rate is required for Kasco to have its current P/B?
                  (3 marks)

 3b) You are currently following Ifeoluwa. The stock has a current dividend of ₦6 per share. Investors are currently demanding a return of 12.5% on the stock.

3b) Calculate the intrinsic value Per Share (VPS) of the stock under the following independent assumptions:

3b1) the dividend is expected to grow at a constant rate of 2.5% to infinity.
                  (1 mark)

3b2) the growth rate in dividend will be 17.5% p.a. for the next four years, after which the growth rate decline to 5% for the indefinite future.   (4 marks)

3b3) If the stock is currently trading at ₦73.412, what is the implied perpetual growth rate in dividend?   (3 marks)

3b4) If the assumption in 4b1) above holds, how much can you sell the stock in 10 years' time?   (2 marks)

3b5) Explain the difference between a value-oriented investment outlook and a growth-oriented investment outlook.   (3 marks)

3c) 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.

   3c1)   Which firm will have higher profits in a recession? In a boom?

   3c2)   Which firm's stock will have a higher beta?   (4 marks)

                  (Total: 26 marks)

Solution to Question 3
3 a)

   3a1)   The justified P/B can be found with the following formula:

$$P_0/B_0 = 1 + \frac{ROE - r}{r - g}$$

ROE = 20%
  g = 6%
  r = 5 + (0.80 × 5.5) = 9.4% $(1^{1/2}$ marks)

$$\text{Thus: } P_0/B_0 = \frac{0.20 - 0.04}{0.094 - 0.06} = 4.12$$

The assumed parameters give a justified P/B of 4.12, slightly above the current P/B of 3.57.

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

   3a2)   To find the ROE that would result in a P/B of 3.57, we substitute 3.57, r, and g into the following equation:

$$P_0/B_0 = 1 + \frac{ROE - r}{r - g}$$

This yields

$$3.57 = 1 + \frac{ROE - 0.094}{0.094 - 0.06}$$

$$2.57 = \frac{ROE - 0.094}{0.034}$$

ROE − 0.094 = 0.0874

ROE = 18.1%   (1 mark)

This value of ROE is consistent with P/B of 3.57.

3a3) To find the growth rate that would result with a P/B of 3.57, we make use of the same expression:

$$P_0/B_0 = 1 + \frac{ROE - r}{r - g}$$

(½ mark)

$$3.57 = 1 + \frac{0.20 - 0.094}{0.094 - g}$$

$$2.57 = \frac{0.106}{0.094 - g}$$

2.57 (0.094 − g) = 0.106

0.094 − g = 0.106/2.57

g = 5.28%

(2½ marks)

3b)

3b1

i)

$$P_0 = \frac{D_1}{r - g} = \frac{6(1.025)}{0.125 - 0.025} = ₦51.25$$

(1 mark)

3b2)   **First 4 years, when g = 17.5%**

We use growing annuity:

$$PV = \frac{D_1}{r - g}\left[1 - \left(\frac{1 + g}{1 + r}\right)^n\right]$$

$$= \frac{6(1.175)}{0.125 - 0.175}\left[1 - \left(\frac{1.175}{1.125}\right)^4\right] = ₦26.79$$

(2 marks)

Years 5 − Infinity, when g = 5%

We make use of delayed growth:

$$PV = \frac{D_n}{r - g}(1 + r)^{-n+1}$$

$D_n = D_5 = 6(1.175)^4(1.05) = ₦12$ (1^{1/2} marks)

g = 5%

$$PV = \frac{12}{0.125 - 0.05}(1.125)^{-5+1} = ₦99.89$$

Total = ₦12 + ₦99.89 = ₦111.89   (½ mark)

3b3)   Here, we use:

$$P_0 = \frac{D_1}{r - g}$$

(½ mark)

$$73.412 = \frac{6(1+g)}{0.125-g}$$

(2½ marks)

$6(1 + g) = 73.412(0.125 - g)$

$6 + 6g = 9.1765 - 73.412g$

$79.412g = 3.1765$

$g = 4\%$

3b4) With constant growth model:

$P_n = P_0(1 + g)^n$

$P_{10} = 51.25(1.025)^{10} = ₦65.6$ (2 marks)

3b5) Value-oriented asset managers seek to acquire assets that they deem to be cheap relative to current earnings. Typically, they regard low price/earnings ratios (PERs) and price/book values (PBVs) as powerful indicators of 'cheapness'. There is a clear intuitive sense to this perspective. A dollar of earnings is a dollar of earnings irrespective of which company it comes from. The lower the price of buying earnings, the better. Value investors are well aware that low PER companies are often higher-risk companies, but contend that there is still excess return even after accounting for additional risk. In other words, low PER investments really are, or at least tend to be, cheap.

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

Growth-oriented investors are less interested in current asset prices relative to current earnings; and focus more on prospects for future earnings. Growth-oriented investors are more willing to trade at higher PERs if they believe that earnings potential justifies the cost.   ($1^{1/2}$ marks)

 3c)

3c1) 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.

(2 marks)

3c2) Because its profits are more sensitive to the business cycle, the robotics firm will have the higher beta.

(2 marks)

Question 4 - Fixed Income Valuation & Analysis

4a. Consider the following 3 default free bonds.

BONDS	PRICE ₦	COUPON %	REDEMPTION VALUE ₦	MATURITY YEARS
A	105	10	100	1
B	96	4	100	2
C	98	6	100	3

4a) Estimate the two-year forward rate at the end of year 1 and the one-year forward rate at the end of year 2. (5 marks)

4b) You are considering buying a three - year 9% annual-coupon paying bond with face value of ₦1,000. The bond is default free bond.

4b1) Calculate the price of the bond and its yield to maturity. Clearly explain why you may not realise the calculated yield. (5 marks)

4b2) One-year after purchasing the bond at the price you have calculated and if there are no changes in market interest rates, do you expect the price of the bond to increase, fall or remain constant. Explain. (2 marks)

4b3) Estimate and interpret the modified duration of the bond. Identify the key limitations of modified duration in bond analysis. (6 marks)

4c) Explain the components of interest rate risk and how you can be exposed to it as an investor. (4 marks)

(Total: 18 marks)

Solution to Question 4

4a)   **Step 1**. Compute the spot rates for 1, 2 and 3 years

1-year spot rate (r_1): This is calculated from bond A.

$$105 = \frac{110}{1+r_1}$$

$r_1 = 4.76\%$ (This is the YTM of bond A)

(½ mark)

2-year spot rate (r_2): This is computed from bond B.

$$96 = \frac{4}{1+r_1} + \frac{104}{(1+r_2)^2}$$

$$96 = \frac{4}{1.0476} + \frac{104}{(1+r_2)^2}$$

$$92.18 = \frac{104}{(1+r_2)^2}$$

$$92.18(1+r_2)^2 = 104$$

$$r_2 = \left(\frac{104}{92.18}\right)^{\frac{1}{2}} - 1 = 6.22\%$$

(1 mark)

3-year spot rate (r_3): This is computed from the information on bond C.

$$98 = \frac{6}{1+r_1} + \frac{6}{(1+r_2)^2} + \frac{106}{(1+r_3)^3}$$

$$98 = \frac{6}{1.0476} + \frac{6}{(1.0622)^2} + \frac{106}{(1+r_3)^3}$$

$$86.95 = \frac{106}{(1 + r_3)^3}$$

$$86.95(1 + r_3)^3 = 106$$

$$r_3 = \left(\frac{106}{86.95}\right)^{\frac{1}{3}} - 1 = 6.83\%$$

(1½ marks)

Step 2. Compute the forward rates

$$F_{1,3} = \left(\frac{(1 + r_3{}^3)}{1 + r_1}\right)^{\frac{1}{3-1}} - 1$$

$$= \left(\frac{(1.0683)^3}{1.0476}\right)^{\frac{1}{3-1}} - 1 = 7.88\%$$

(1 mark)

$$F_{2,3} = \left(\frac{(1 + r_3)^3}{(1 + r_2)^2}\right)^{\frac{1}{3-2}} - 1$$

$$= \left(\frac{(1.0683)^3}{(1.0622)^2}\right) - 1 = 8.06\%$$

(1 mark)

4b

4b1) The price (P) of the bond is computed. Using the computed spot rates.

$$P = \frac{90}{1.0476} + \frac{90}{(1.0622)^2} + \frac{1090}{(1.0683)^3} = ₦1096.70$$

(1½ marks)

Calculation of YTM
We try 4% and 6%

YEAR	CASH FLOW ₦	PV AT 4% ₦	PV AT 6% ₦
0	-1096.70	-1096.7	-1096.7
1-3	90	249.98	240.57
3	1,000	889.00	839.62
NPV		42.28	-16.51

$$\text{YTM} = 4 + \left(\frac{42.28}{42.28 + 16.51}\right) \times (6 - 4)$$

$$= 4 + 1.44\% = 5.44\%$$

(1½ marks)

The YTM of 5.44% may not be realised for the following reasons:
- **Timely receipt of the association cash flows**. If the coupons and the redemption value are received as and when due, the realised yield will be less than 5.44% (because of the time value of money)

- **Reinvestment risk**. If the coupon received at the end of year 1 and at the end of year 2 are reinvested at a rate lower than 5.44%, the realised yield will be less than 5.44% and if they are reinvested at a higher rate, the realised yield will be higher than 5.44%.

(2 marks)

- **Price risk**. If the bond is not held to maturity (Year 3 in this cases, 1 may realise a capital gain/loss when the bond is sold prior to maturity. This is called price risk.

(1 mark for any 2)

4b2) The bond is a premium bond. Generally, the price of a premium bond falls with passage of time (holding interest rate constant). This reason for this is that at maturity the market value and the face value must be the same – since the face

value will be paid at maturity. Thus the market value of at the end of Year 1 will be less than the current market value. (2 marks)

4b3) First, we need to compute the duration of the bond.

YEAR (N)	CF ₦	PV (AT 5.44%) ₦	PV × N
1	90	85.36	85.36
2	90	80.95	161.90
3	1090	929.84	2,789.52
		1096.15	3036.78

Duration (D) = 3036.78/1096.15 = 2.77 Years.
Next, we compute the modified duration (MD)
MD = D/1 × YTM =2.77/1.0544 =2.63 (3 marks)

Modified duration measures the change in the value of a bond in response to a change in 100-basis point (1%) change in interest rates. In this example, if interest rate increases by 1%, the price of the bond is expected to fall by approximately 5.44%. Alternatively, if interest rate drops by 1%, the price of the bond is expected to increase by approximately 5.44%. (1 mark)

The modified duration is only a linear approximation of the full price change due to a change in the interest rates. It doesn't consider the convexity of the bond that is dependent on the particular features of the specific bond in terms of expiry date, amount of coupons, payment dates of the coupons, redemption price of the bond, amortizing of the nominal redemption value if any, call/put options if any. (½ mark)

In addition, the modified duration is a good approximation of bond's price change only if:
- it's assumed that the yield curve is "flat".
- a limited (small) interest rate change is considered.
- a parallel shift of the interest rate curve is considered.
- an instantaneous interest rate change is considered. ($^{1/2}$ for any 3)
($1^{1/2}$ marks)

4c)
Interest rate risk is the uncertainty regarding the ending-wealth value of a bond portfolio due to changes in market interest rates between the time of purchase and the investor's horizon date. Notably, interest rate risk involves two component risks: **price risk** and **reinvest risk**. (1 mark)

- **Price Risk**. Price risk occurs because if interest rates change before the horizon date and the bond is sold before maturity, the realised market price for the bond will differ from the expected price, assuming there had been no change in rates. If rates increased after the time of purchase, the realised price for the bond in the secondary market would be below expectations, whereas if rates declined, the realised price for the bond would be above expectations. Because you do not know whether interest rates will increase or decrease, you are uncertain about the bonds future price. ($1^{1/2}$ marks)

- **Reinvestment Risk.** Reinvestment risk arises because the YTM computation implicitly assumes that all coupon cash flows will be reinvested at the promised YTM. If, after the purchase of the bond, interest rates decline, the coupon cash flows will be reinvested at rates below the promised YTM and the ending wealth will be below expectations. In contrast, if interest flows will be reinvested at rates above expectations, the ending wealth will be above expectations. Again, because you are uncertain about future rates, you are uncertain about these reinvestment rates.
Thus, holder of the bond will be exposed to price risk if the bond is sold prior to maturity and to reinvestment risk if the coupons cannot be reinvested at the YTM. ($1^{1/2}$ marks)