



Pilot Questions - 2021

Paper 3.0 (A)

Set 1

Corporate Finance

1. Which one of the following corporate actions results in new funds flowing into a company?
 - A. Bonus issue
 - B. Rights issue
 - C. Share repurchase
 - D. Consolidation
2. A capitalisation issue of shares is another term for a:
 - A. Bonus issue.
 - B. Rights issue.
 - C. Stock split.
 - D. Stock consolidation.
3. Which of the following statements defines the beta coefficient in the Capital Asset Pricing Model (CAPM)?
 - A. The beta value of an asset is a measure of its total risk.
 - B. The beta value of an asset measures the scale of its systematic risk relative to the risk of the market portfolio.
 - C. The beta value of an asset measures how much its return is expected to exceed that of the market portfolio.
 - D. The beta value of an asset measures how much its return is expected to exceed that of a risk free asset.
4. A perpetuity series of cash flows of ₦10,000 each year commences in two years. The relevant rate of interest is 10% each year.

What is the present value, to the nearest ₦1, of the cash flows?

- A. ₦100,000
- B. ₦90,909
- C. ₦82,645
- D. ₦110,000

5. Which of the following statements is most correct?
- A. If a project's internal rate of return (IRR) exceeds the cost of capital, then the project's net present value (NPV) must be positive.
 - B. If project A has a higher IRR than project B, then project A must also have a higher NPV.
 - C. The IRR calculations implicitly assumes that all cash flows are reinvested at a rate of return equal to the cost of capital.
 - D. Answers A and C are correct.
6. Project A has an IRR of 15 percent. Project B has an IRR of 18 percent. Both projects have the same risk. Which of the following statements is most correct?
- A. If the WACC is 10 percent, both projects will have a positive NPV, and the NPV of project B will exceed the NPV of project A.
 - B. If the WACC is 15 percent, the NPV of project B will exceed the NPV of project A.
 - C. If the WACC is less than 18 percent, project B will always have a shorter payback than project A.
 - D. If the WACC is greater than 18 percent, project B will always have a shorter payback than project A.
7. Sanford & Son Ltd. is thinking about expanding their business by opening another shop on property they purchased 10 years ago. Which of the following items should be included in the analysis of this endeavor?
- A. The property was cleared of trees and brush 5 years ago at a cost of ₦5,000.
 - B. The new shop is expected to affect the profitability of the existing shop since some current customers will transfer their business to the new shop. Sanford and Son estimate that profits at the existing shop will decrease by 10 percent.
 - C. Sanford & Son can lease the entire property to another company (that wants to grow flowers on the lot) for ₦5,000 per year.
 - D. Both statements B and C should be included in the analysis.
8. The ordinary share price of NS plc is currently 150k. Dividends are paid once a year, and the dividend for the previous year has very recently been paid. The dividend for the year was 3k and a 15 per cent annual growth rate is expected for dividend payments for the foreseeable future.

Using the dividend growth model, what is the cost of equity for NS plc?

- A. 26.4 per cent
- B. 15.0 per cent
- C. 17.0 per cent
- D. 17.3 per cent

9. The following information relates to the ordinary shares of BC Plc:

Earnings per share	50k
Dividend cover	2.5
Published dividend yield	3.2%

The price of BC Plc's ordinary shares implied by the above data is:

- A. 78k
 - B. 153k
 - C. 625k
 - D. 3,906k
10. If ₦1,700 is invested at an interest rate of 9 per cent per annum, compounded monthly, the sum it will give in three years' time is:
- A. ₦1,738
 - B. ₦2,159
 - C. ₦2,202
 - D. ₦2,225

Equity Valuation & Analysis

11. An investor gathers the following data for a company:

Net profit margin	2%
Total assets	₦200m
Total liabilities	₦120m
PAT	₦10m
Dividends paid	₦2m

The company's estimated dividend growth rate (in %) is closest to:

- A. 8.0
- B. 10.0
- C. 12.5
- D. 17.5

12. A company's ₦100 par perpetual preferred stock has a dividend rate of 7% and required rate of return of 11%. The company's earnings are expected to grow at a constant rate of 3% per year. If the market price per share for the preferred stock is ₦75, the preferred stock is most appropriately described as being:

- A. Undervalued by ₦36.36
- B. Overvalued by ₦11.36
- C. Properly valued
- D. Undervalued by ₦15.13

13. In the year just ended AB Plc reported EPS of ₦140 and paid dividend of ₦40 per share. Earnings and dividends are expected to grow at 5% p.a. to infinity. You buy the company shares at ₦420 per share, ex-dividend. If you require a return of 15% p.a, what will be the required selling price, after holding the stock for five years, that will satisfy your expectations?

- A. ₦845
- B. ₦676
- C. ₦536
- D. ₦620

14. A company earned ₦3 a share last year and just paid a dividend of ₦2 a share. The company's dividends are expected to grow by 8% annually for the next two years. An investor with an 11% required rate of return expects to sell the stock at ₦75 two years from now. The maximum amount the investor should be willing to pay for this company's stock is closest to:

- A. ₦58.68
- B. ₦64.71
- C. ₦66.63
- D. ₦63.45

15. An analyst gathers the following about a company:

Net profit margin	8%
Return on assets	10%
Financial leverage (total assets/equity)	2.5
Beta for the company's stock	1.5
Return on market index	10%
Risk – free rate	5%

The analyst expects the information above to accurately reflect the future. If the company wants to achieve a growth rate of 15% without changing its capital structure or issuing new equity, the company's maximum dividend payout ratio (in %) is closest to:

- A. 25%
 - B. 40%
 - C. 60%
 - D. 75%
16. The issue of differences in accounting conservatism between companies is best addressed when companies are compared using which of the following ratios?
- A. Price –to – earnings
 - B. Price – to – cash flow
 - C. Price – to – book value
 - D. None of the above

17. A company has furnished the following information:

ROE	20%
Earnings retention rate	50%
Current dividend per share	₦2
Required rate of return	15%
Current stock price	₦50
Company's P/E ratio	30x
Industry average P/E ratio	20x
Stock beta	0.7

According to the dividend discount model and the other data given, the company's stock is best described as a:

- A. Growth stock
- B. Cyclical stock
- C. Speculative stock
- D. More information needed

18. An investor who wants to estimate the enterprise value multiple (EV/EBITDA) of a company has gathered the following data:

Market value of debt	₦10m
Market capitalisation	₦45m
Cash and short-term investments	₦2.50m
EBITDA	₦15m
Tax rate	40%

The company's EV/EBITDA multiple is closest to:

- A. 2.5
 - B. 5.8
 - C. 3.5
 - D. 4.5
19. An equity portfolio manager is evaluating her sector allocation strategy for the upcoming year. She expects global economic slowdown for the next two years. Further, she believes that companies will be facing diminishing growth rates with respect to revenues and profits. Owing to these beliefs, the portfolio manager will most likely:
- A. Overweigh construction
 - B. Overweigh consumer staples
 - C. Underweigh telecommunications
 - D. Do nothing
20. A company has initiated the process of selling unproductive land representing 5% of its total assets and using the proceeds to buy back its ordinary shares. Holding other factors constant, these actions by the company will most likely result in a:
- A. higher ROE
 - B. higher operating margin
 - C. lower sustainable growth
 - D. lower financial leverage

Fixed Income Valuation & Analysis

21. Which of the following statements about bonds is true?

- A. A bond with a higher coupon rate must be a better investment than a bond with a lower coupon rate.
- B. A bond that trades at a discount must be a better investment than a bond that trades at a premium.
- C. A bond with a higher yield-to-maturity is a better investment than a bond with a lower yield to maturity.
- D. None of the above statements are true.

22. Which of the following statements about the yield-to-maturity is true?

- A. Discounting all cash flows of a bond with the bond's yield-to-maturity only gives us the correct price if we have a flat term structure of interest rates.
- B. The yield-to-maturity is upwards sloping.
- C. The yield-to-maturity is always a spot rate.
- D. None of the above statements are true.

23. Which of the following statements about bonds is true?

- A. A zero-coupon bond always trades at a discount as long as its yield-to-maturity is positive.
- B. A zero-coupon bond tends to have a higher yield-to-maturity than a coupon bond with the same time to maturity.
- C. In general, zero-coupon bonds have higher interest rate risk than coupon bonds.
- D. Several of the above statements are true.

24. Which of the following statements about yield-to-maturity are true?

- A. A bond with a yield-to-maturity of 7% is never more sensitive to changes in the yield than a bond with a yield to maturity of 5%.
- B. A bond with a yield-to-maturity of 7% is always more sensitive to changes in the yield than a bond with a yield to maturity of 5%.
- C. A bond with a yield-to-maturity of 5% is never more sensitive to changes in the yield than a bond with a yield to maturity of 7%.
- D. None of the above statements are true.

25. If all spot rates decreased by 1%, the duration of a 10-year 5%-coupon bond would...
- A. Increase
 - B. Decrease
 - C. Be unaffected
 - D. Change in a direction that depends on its convexity
26. The convexity of a bond...
- A. Leads to an undesirable asymmetry in the price response to yield changes
 - B. Leads to a desirable asymmetry in the price response yield changes
 - C. Is a measure of the bond's time to maturity
 - D. A and C
27. The shape of the term structure of interest rates is influenced by...
- A. Expectations on future spot rates
 - B. The risk aversion of investors
 - C. Mismatches between the investment horizon of investors in bonds and issuers of bonds
 - D. All of the above
28. Bondholders are concerned about how price inflation in the future will affect real rates of return in their investments. Which of the following types of bond offers the best protection against inflation?
- A. Plain vanilla bonds
 - B. Floating rate notes
 - C. Index-linked bonds
 - D. Convertible bonds
29. The interest component of a monthly payment for a fixed-rate mortgage is:
- A. Highest during the first year of the mortgage
 - B. Highest during the middle year of the mortgage
 - C. Highest during the last year of the mortgage
 - D. Constant throughout the life of the mortgage
30. Which of the following statements about mortgage pass-through securities is are correct?
- I. Pass-through offer better call protection than most
 - II. Interest and principal payments are made on a monthly basis

III. It is common practice to use the weighted-average maturity on a pass-through in place of its duration.

IV. Pass-through are relatively immune from reinvestment risk.

- A. I and only
- B. II and III only
- C. II only
- D. IV only



Pilot Solutions - 2021

Paper 3.0 (A) Set 1

Corporate Finance

1. B.
2. B.
3. B.
4. B.

$$\frac{10,000}{(0.1 \times 1.1)} = 90.909$$

5. A.

Statement A is correct, the other statements are false. If the projects are mutually exclusive, then project B may have a higher NPV even though project A has a higher IRR. IRR is calculated assuming cash flows are reinvested at the IRR, not the cost of capital.

6. B.

The correct statement is B; the other statements are false. Since Project A's IRR is 15%, at a WACC of 15% $NPV_A = 0$; however, Project B would still have a positive NPV. Given the information in A, we can't conclude which project's NPV is going to be greater. Since we are given no details about each project's cash flows we cannot conclude anything about payback. Finally, IRR is independent of the discount rate, i.e. IRR stays the same no matter what the WACC is.

7. D.

Statements B and C are correct; therefore, statement D is the correct answer. The cost of clearing the land is a sunk cost and should not be considered in the analysis. The expected impact of the new store on the existing store should be considered. In addition, the opportunity to lease the land represents an opportunity cost of opening a new store on the land and should be considered.

8. D.

$$k_e = \frac{D_1}{P_0} + g = \frac{3(1.15)}{150} + 0.15 = 0.173, \text{ or } 17.3\%$$

9. C.

$$\text{Dividend cover} = \frac{\text{EPS}}{\text{DPS}} \therefore \text{DPS} = \frac{50}{2.5} = 20\text{k}$$

$$\text{Dividend yield} = \frac{\text{DPS}}{\text{MPS}} \therefore \text{MPS} = \frac{20}{0.032} = 625\text{k}$$

10. D.

$$S = X(1 + r)^n = 1,700(1 + 0.0075)^{36} = \text{R}2,225$$

Equity Valuation & Analysis

11. B.

$$\text{ROE} = \text{ROA} \times \text{Financial Leverage}$$

$$= \frac{10}{200} \times \frac{200}{80} = 12.5\%$$

$$\text{Retention rate} = b = \frac{8}{10} = 0.80$$

$$g = (\text{ROE})(b) = (12.5)(0.80) = 10\%$$

$\text{ROA} = \text{PAT} / \text{Total assets}$

$\text{Financial leverage (FL)} = \frac{\text{Total assets}}{\text{Equity}}$
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12. B.

$$V_p = \frac{\text{Dividend}}{\text{Required return}} = \frac{\text{R}7}{0.11} = \text{R}63.64$$

The stock is overvalued by $\text{R}75 - 63.64 = \text{R}11.36$

Note: Information on earnings growth is irrelevant when valuing preferred stock. Also ignore any information on tax.

13. C.

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

$$P_5 = \text{R}420(1.05)^5 = \text{R}536$$

14. B.

$$P_0 = \frac{2(1.08)}{(1.11)} + \frac{2(1.08)^2}{(1.11)^2} + \frac{75}{(1.11)^2} = \text{N}64.71$$

15. B.

$$g = (\text{ROE}) (b)$$

b = retention rate

$$\text{ROE} = \text{ROA} \times \text{Leverage}$$

$$= 10 \times 2.5 = 25\%$$

$$15 = (25) (b)$$

$$b = \frac{15}{25} = 0.60$$

$$1 - b = 1 - 0.6 = 40\%$$

16. B.

Quality of earnings affects 'earnings' in P/E ratio and 'book value' in price – to – book value ratio. Hence the correct answer is B.

17. C.

A speculative stock is (1) substantially overvalued and (2) it sells at an extremely high P/E ratio. The computations for intrinsic value are:

$$g = 20 \times 0.5 = 10\%$$

Intrinsic value: $\text{N}2.20 / (0.15 - 0.10) = \text{N}44$ compared to the market price of $\text{N}50$. The stock's P/E is 30x versus the industry average of 20x.

18. C.

EV = Market capitalisation + market value of debt + market value of preferred stock – cash and short-term investments.

$$= 45 + 10 - 2.5 = 52.5;$$

$$\text{EV/EBITDA} = 52.5/15 = 3.5$$

19. B.

Non-cyclical companies produce goods or services for which demand remains relatively stable throughout the business cycle. The consumer staples sector exhibits relatively less sensitivity and thus tends to be over-weighted during economic slowdowns and when revenues and profits are expected to be under pressure.

20. A.

Selling unproductive land and using the proceeds from the sale to buy back shares reduces total assets. Holding sales constant the decrease in assets would improve the asset turnover. Buying back shares increases the firm's financial leverage. Both the increases in asset turnover and financial leverage will lead to a higher ROE.

Fixed Income Valuation & Analysis

21. D.

In order to properly compare different bond alternatives we need to know both the term structure and the price.

22. D.

The yield-to-maturity is the constant hypothetical interest rate that solves the bond pricing equation linking its future cash flow. It is a summary of the term structure rather than a part of it per se.

23. D.

The face value of a zero coupon is discounted in the price and there are no coupons to balance the effect out. It also has a higher duration than a comparable coupon paying bond and so is associated with higher interest rate risk, which would tend to see it trade with the higher yield to maturity as well.

24. D.

The statements are not true, since the sensitivity depends on duration for which we need information on cash flows and maturities.

25.A.

If all spot rates decreased, the yield to maturity of the bond would decrease also. The present value of cash flows further away in time would increase relatively more, giving them higher weight in the duration calculation. A is correct.

26.B.

Convexity means that duration (i.e. interest rate sensitivity) is higher when yields decrease (prices rise) than when they increase (prices fall). B is correct.

27. D.

Without risk aversion the uncertainties brought by reinvestment and liquidity risk need not necessarily be compensated. Expectations tie in closely with forward rates.

28.C.

29.A.

Since interest is computed on outstanding principal and the outstanding principal is highest in the first year, the interest component of repayment in the first year

30. C.



Pilot Questions - 2021

Paper 3.0 (B)

Set 1

Derivatives & Financial Engineering

- Which one of the following statements correctly describes derivatives markets:
 - Options allow to pursue both hedging and speculation whereas futures only allow to pursue hedging
 - Hedgers always close out their futures or options positions with a loss: the loss is the premium they have to pay in order to get price insurance
 - A short futures position incurs a loss when the underlying asset price increases
 - A long option position always incurs a loss when the underlying asset price increases.
- As of April 11, 2020 the dividend yield on the S&P500 index is 1.75% p.a., the riskless US interest rate is 1% p.a. for all maturities. Then, unless arbitrage opportunities arise:
 - The S&P500 spot level is lower than the June 2020 futures price
 - Longer maturity futures contracts have higher prices than shorter maturity futures contracts
 - The S&P500 spot level is higher than the June 2020 futures price
 - The S&P500 spot level equals the June 2020 futures price
- You sold short two index futures contract at the opening price of 452.25 on July 1. The multiplier on the contract is ₦500. The initial margin requirements is ₦9,000 per contract and the maintenance margin is ₦6,000 per contract. The settlement price for July 1 is 453.95. What is the balance of your margin account at the end of the day on July 1?
 - ₦19,700
 - ₦16,300
 - ₦9,850
 - ₦8,150
- The price of a stock is ₦64. A trader buys 1 put option contract on the stock with a strike price of ₦60 when the option price is ₦10. When does the trader make a profit?
 - When the stock price is below ₦60
 - When the stock price is below ₦64

- C. When the stock price is below ₦54
D. When the stock price is below ₦50
5. The price of a stock, which pays no dividends, is ₦30 and the strike price of a one year European call option on the stock is ₦25. The risk-free rate is 4% per annum (continuously compounded). Which of the following option price quotes for the call does NOT represent an arbitrage opportunity?
- A. ₦6.00
B. ₦5.01
C. ₦4.98
D. ₦31
6. An investor is bearish on a stock he does not own and that is currently trading at ₦40. What strategy is NOT consistent with the investor's view on the stock, among the following ones:
- A. Buy a ₦60 strike price put and sell a ₦20 strike price put
B. Buy a ₦20 strike price put and sell a ₦60 strike price put
C. Write a naked call with a strike price of ₦50
D. Go long on an at-the-money put.
7. Which of the following is true of a box spread with European options?
- A. It is a package consisting of a bull spread and a bear spread
B. It involves two call options and two put options
C. It has a payoff at maturity which is known at the time it is set up
D. All of the above
8. An investor has an asset that is currently worth \$800, and the continuously compounded rate at all risk-free maturities is 4 percent. If the asset pays a continuous dividend of 2 percent, which of the following is the closest to the no-arbitrage price of a 3-month forward contract?
- A. \$797.99.
B. \$800.00.
C. \$802.01.
D. \$804.01.

Portfolio Management

Use the following data to answer questions 9 to 11

Assume that there is some risky portfolio Q, which has an expected return of 15%, and a standard deviation of 12%. The risk-free rate is 5%. There is also some asset P that is not part of Q, which has an expected return of 10%, and a standard deviation of 7%.

9. What is the Sharpe ratio of Q?
- A. 0.71
 - B. 1
 - C. 1.34
 - D. 0.83
10. What is the Sharpe ratio of the market portfolio?
- A. Between 0.71 and 1.34
 - B. Larger than or equal to 0.83
 - C. Exactly 1
 - D. Lower than or equal to 0.83
11. You want to invest in some combination of the Q and the risk-free asset to achieve an expected return of 40%. What is the standard deviation of your returns?
- A. 42%
 - B. 32%
 - C. 16%
 - D. 40%
12. Which of the following statements about the efficient frontier is true?
- A. In practice, only the market portfolio is on the efficient frontier.
 - B. The portfolios on the efficient frontier are only dominated by other portfolios on the efficient frontier.
 - C. The efficient frontier is the set of risky portfolios which are not dominated by anything else
 - D. None of the above statements are true.
13. Which of the following statements about investors are true?
- A. A mean-variance investor will always choose the asset with the highest return.
 - B. A mean-variance investor will always choose the asset with the lowest risk.
 - C. A mean-variance investor will trade off expected returns and risk.
 - D. Several of the above statements are true.

14. Which of the following statements about diversification are true?
- A. The diversification benefits in a portfolio of two assets are smaller when the correlation between the returns of the assets is larger.
 - B. The diversification benefits in a portfolio of two assets are larger when the correlation between the returns of the assets is larger.
 - C. The diversification benefit of combining three perfectly correlated assets is typically larger than the diversification benefits of combining two perfectly correlated assets.
 - D. Several of the above statements are true.
15. Which statement is true regarding the market portfolio?
- A. It includes all publicly traded financial assets.
 - B. It lies on the efficient frontier.
 - C. On the basis of unanimous risk and return perceptions it is the risky portfolio that will be held by all investors.
 - D. All of the above statements are true
16. Which of the following statements is false about the capital allocation line (CAL)?
- A. It contains portfolios that can dominate those on the Efficient Frontier
 - B. Investors prefer assets further to the right on the CAL to assets further to the left on the CAL.
 - C. The risk-free asset plots on the CAL.
 - D. Assets plotting below the CAL generally carry unsystematic risk
17. The risk free rate is 4% and the expected return of the market portfolio is 12%. If a stock has a CAPM β of 1.5, a standard deviation of returns of 20% and a current price of ₦100, what is the expected price one year from now?
- A. ₦100
 - B. ₦116
 - C. ₦120
 - D. There's not enough information to say.
18. If the standard deviation of a stock's return increases, what happens to its required return under CAPM?
- A. It decreases.
 - B. It increases.
 - C. It stays the same.
 - D. There's not enough information to tell.
19. According to the CAPM a well-diversified portfolio's rate of return is a function of
- A. market risk.
 - B. unsystematic risk.

- C. unique risk.
- D. reinvestment risk.

20. Which of the following statements is true about the security market line, SML?

- A. It is a different name for the CAL.
- B. It contains all efficient portfolios.
- C. It is convex for risk averse investors.
- D. More than one of the above statements are true.

21. A passively managed investment fund is considered to be well-managed if its tracking error is consistently:

- A. Close to zero.
- B. Between minus 5% and plus 5%.
- C. 100%.
- D. More than the average tracking error for actively managed funds.

22. Which of the following correlation coefficients associated with the expected returns on pairs of assets offers investors the lowest prospective reduction of risk from asset diversification?

- A. 1.0
- B. -0.5
- C. 0.5
- D. 0

Commodity Trading & Futures

23. On March 1 the spot price of a commodity is ₦1,000 and the December futures price is ₦1,015. A producer of the commodity entered into a December futures contracts on March 1 to hedge the sale of the commodity, which will occur on November 1. The producer closed out its position on November 1. On November 1 the spot price is ₦980 and the December futures price is ₦981. What is the effective price (after taking account of hedging) received by the company for the commodity?

- A. ₦1,016
- B. ₦1,001
- C. ₦981
- D. ₦1,014

24. A forward contract that was negotiated some time ago will expire in three months and has a delivery price of ₦40. The current forward price for three-month forward contract is ₦42. The three month risk-free interest rate (with continuous compounding) is 8%. What is the current value of the short position in the forward contract?

- A. +~~N~~2.00
- B. -~~N~~2.00
- C. +~~N~~1.96
- D. -~~N~~1.96

25. A silver mining company has used futures markets to hedge the price it will receive for everything it will produce over the next 5 years. Which of the following is true about the company?

- A. It is liable to experience liquidity problems if the price of silver falls dramatically
- B. It is liable to experience liquidity problems if the price of silver rises dramatically
- C. It is liable to experience liquidity problems if the price of silver rises dramatically or falls dramatically
- D. The reliance on futures markets protects it from liquidity problems.

26. Which of the following is NOT true about forward and futures contracts?

- A. The futures contracts are traded on exchanges while forward contracts are traded in the over-the-counter market
- B. In theory forward prices and futures prices are equal when there is no uncertainty about future interest rates
- C. Forward contracts are typically more liquid than futures contracts
- D. Taxes and transaction costs can lead to forward and futures prices being different.

27. As inventories of a commodity decline, which of the following is true, all else equal?

- A. The one-year futures price as a percentage of the spot price increases
- B. The one-year futures price as a percentage of the spot price decreases
- C. The one-year futures price as a percentage of the spot price stays the same
- D. The one-year futures and spot prices move in the same direction

28. On March 1 the spot price of a commodity is \$1,000 and the December futures price is \$1,015. A producer of the commodity entered into a December futures contracts on March 1 to hedge the sale of the commodity, which will occur on November 1. The producer closed out its position on November 1. On November 1 the spot price is \$980 and the December futures price is \$981. What is the effective price (after taking account of hedging) received by the company for the commodity?

- A. \$1,016
- B. \$1,001
- C. \$981
- D. \$1,014

29. Which of the following statements about basis risk is correct?

- A. The larger the difference between the futures prices when the hedge is put in place and when it is closed out the higher is basis risk

- B. The higher the difference between spot and futures price when the hedge is put in place the higher is basis risk
- C. The shorter the time between the date when the futures contract is closed and its delivery month the higher is basis risk
- D. The higher the correlation between spot price and futures price the lower is basis risk.

30. Margin accounts in futures markets have the objective of

- A. Reducing the risk of one party regretting the deal and backing out
- B. Ensuring funds are available to pay traders when they make a profit
- C. Reducing systemic risk due to collapse of futures markets
- D. Accomplishing all of the above



Pilot Solutions - 2021

Paper 3.0 (B) Set 1

Derivatives & Financial Engineering

1. C.

2. C.

From $F_0 = S_0 e^{(r-q)T}$, since $r < q$ it follows that $F < S$. And the longer the maturity the lower is F .

3. B.

The price has increased by 1.70. Because you have a short position you lose $1.7 \times \text{N}500$ or $\text{N}850$ per contract. The balance in the margin account therefore goes down.

4. D.

The payoff must be more than the $\text{N}10$ paid for the option. The stock price must therefore be below $\text{N}50$.

5. A.

The lower bound is $S_0 - Ke^{-rT}$. In this case it is $30 - 25e^{-0.04 \times 1} = \text{N}5.98$. The upper bound is $S = \text{N}30$. A is the only case that does not violate either bound.

6. B.

Creates a bull spread with puts, which is contrary to the bearish view.

7. D.

A, B, and C are all true.

8. D.

Use $F_0 = S_0 e^{(r-q)T}$, where $S = 800$; $T = 0.25$; $q = 0.02$; and $r = 0.04$:

$$F_0 = 800 \times e^{(0.04 - 0.02) \times 0.25}$$

$$F_0 = \$804.01$$

Portfolio Management

9. D is correct. From the definition of the Sharpe ratio:

$$S_Q = \frac{0.15 - 0.05}{0.12} \approx 0.83$$

10. We are not told what the market portfolio is here. Hence we cannot calculate its Sharpe Ratio. But we know that it must be the best possible Sharpe ratio in the investment universe. Therefore since

$$S_P = \frac{0.1 - 0.05}{0.07} \approx 0.71$$

$$S_Q = \frac{0.15 - 0.05}{0.12} \approx 0.83$$

The market portfolio must have a Sharpe ratio that is larger or equal to 0.83. B is correct.

11. A.

Let w_Q be your investment in Q. It must be chosen so that

$$(1 - w_Q) 0.05 + w_Q 0.15 = 0.4$$

$$\Rightarrow 0.05 + (0.15 - 0.05) w_Q = 0.4$$

$$w_Q = \frac{0.4 - 0.05}{0.15 - 0.05} \approx 3.5$$

It follows that the standard deviation is:

$$\sigma = w_Q \sigma_Q = 3.5 \times 0.12 = 0.42. \text{ A is correct.}$$

12. C.

The efficient frontier is a set of portfolios that minimize the standard deviation for their respective expected returns. C is correct.

13. C is correct.

The investor will balance expected returns and risk against each other.

14. A is correct.

The less correlated two assets are, the more of their risk will "cancel out".

Meanwhile there are no diversification benefits of combining perfectly correlated assets.

15. D. All of the above statements are true. D is correct.

16. B is correct. Investor choice comes down to maximizing utility amongst the alternatives on the CAL which will depend on preferences for risk.

17. B. First we work out the expected return through the CAPM equation:

$$E(r) = 0.04 + 1.5(0.12 - 0.04) = 0.16$$

Since the price today is ₦100, the expected price in one year is $100(1 + 0.16) = 116$. B is correct.

18. D is correct, because the standard deviation has a systematic and an unsystematic component. If the standard deviation increases as a result of an increase in unsystematic risk alone, the required return is not affected.

19. A is correct. Market/covariance risk is all that matters.

20. B is correct. For efficient portfolios risks are defined entirely by β .

21. A.

22. A.

A correlation coefficient of 1.0 is perfect positive correlation. If two assets are perfectly positively correlated it means that, from an investor return perspective, they performed exactly alike. The implication is that a portfolio of the two assets offers no risk reduction relative to the expected returns. It would be as though they were one and the same asset. Perfect negative correlation offers the maximum possible risk reduction from asset pairings.

Commodity Trading & Futures

23. D.

The producer of the commodity takes a short futures position. The gain on the futures is $1015 - 981$ or ₦34. The effective price realized is therefore $980 + 34$ or ₦1014. This can also be calculated as the March 1 futures price ($=1015$) plus the November 1 basis ($=-1$).

24. D.

The contract gives one the obligation to sell for ₦40 when a forward price negotiated today would give one the obligation to sell for ₦42. The value of the contract is the present value of $-\text{₦}2$ or $-2e^{-0.08 \times 0.25} = -\text{₦}1.96$.

25. B.

The mining company shorts futures. It gains on the futures when the price decreases and loses when the price increases. It may get margin calls which leads

to liquidity problems when the price rises even though the silver on the ground is worth more.

26.C.

Futures contracts are more liquid than forward contracts. To unwind a futures position it is simply necessary to take an offsetting position. The statements in B, C and D are corrects.

27.B.

When inventories decline, the convenience yield increases and the futures price as a percentage of the spot price declines.

28.D.

The producer of the commodity takes a short futures position. The gain on the futures is $1015 - 981$ or \$34. The effective price realized is therefore $980 + 34$ or \$1014. This can also be calculated as the March 1 futures price ($=1015$) plus the November 1 basis ($=-1$).

29.D.

30.A.

Initial margin requirements dramatically reduce the risk that a party will walk away from a futures contract. As a result they reduce the risk that the exchange clearing house will not have enough funds to pay profits to traders. Furthermore, if traders are less likely to suffer losses because of counterparty defaults, there is less systemic risk.



Pilot Questions - 2021

Paper 3.0 (B)

Set 2

Derivatives & Financial Engineering

1. You manage an equity portfolio with a beta of 1.5 currently valued at ₦100,000,000. You aim to minimise the risk of the portfolio over the next 2 weeks. Index futures contracts are trading at 10,000 points. Each contract size is ₦10 times the index. Your portfolio return variance is 2.50, the futures return variance is 3 and the correlation between the index and futures returns is 0.90. You should:
 - A. Short 1500 contracts
 - B. Short 1232 contracts
 - C. Short 822 contracts
 - D. Long 1500 contracts
2. The price of a stock is ₦67. Sheldon has written 5 put option contracts on the stock with a strike price of ₦70 when the option premium is ₦4. The options are exercised when the stock price is ₦69. What is Sheldon's net profit or loss?
 - A. Loss of ₦1,500
 - B. Loss of ₦500
 - C. Gain of ₦1,500
 - D. Loss of ₦1,000
 - E. Gain of ₦2,000
3. Assume interest rates are zero. A European call with a strike price of ₦50 and a maturity of one year is worth ₦6. A European put with a strike price of ₦50 and a maturity of one year is worth ₦7. The current stock price is ₦49. Which of the following is true?
 - A. The call price is too high relative to the put price
 - B. The put price is too high relative to the call price
 - C. Both the call and put must be mispriced
 - D. None of the above
4. Which of following statements about put-call parity is NOT correct:
 - A. It is a non-arbitrage condition. i.e., if it is violated it gives rise to an arbitrage opportunity
 - B. It shows that a long position in a European put option has the same dollar payoff as a long position in the corresponding (i.e., same S , K and T) European call combined with a short position in the underlying asset

- C. It shows that European call options can be synthetically replicated by combining the underlying asset, the corresponding (i.e., same S , K and T) put options and risk-free borrowing
- D. It relates prices in the option markets with prices in the underlying assets spot market and with risk-free interest rates
5. A trader buys a call and sells a put with the same strike price and maturity date. What is the position equivalent to?
- A long forward
 - A short forward
 - Buying the asset
 - Shorting the asset
6. Which one of the following statements is NOT true:
- An out-of-the money put option sells for a non-negative premium because of its time value
 - The time value of a call option is positively related to the probability that the underlying asset price will rise relatively to the strike price
 - Intrinsic value is always a larger portion of the option premium than time value is
 - Deep out-of-the-money options have higher time value than intrinsic value
7. The S&P 500 index is standing at 1127 and the futures price for an index futures contract deliverable in three months is 1131. The current risk-free rate is 5% per annum with continuous compounding and the dividend yield on the S&P 500 index is 2% per annum with continuous compounding. An arbitrageur could lock in arbitrage profit by
- Short selling the index and entering a long position in index futures
 - Short selling the index and entering a short position in index futures
 - Borrow to buy the index and entering a long position in index futures
 - Borrow to buy the index and entering a short position in index futures
8. The one-year interest rates in UK and USA are 6% and 4% per annum with continuous compounding, respectively. The spot exchange rate between British pounds and US dollars is 1.6479 USD per GBP. A financial institution offers a currency forward contract with an one-year forward exchange rate at 1.571 USD per GBP.
- An arbitrageur can make risk-free profits by following the strategy:
- Borrow British pounds, convert them to US dollars, invest them at 4% pa and enter a short position in the forward contract
 - Borrow British pounds, convert them to US dollars, invest them at 4% pa and enter a long position in the forward contract
 - Borrow US dollars, convert them to British pounds, invest them at 6% pa and enter a short position in the forward contract

- D. Borrow US dollars, convert them to British pounds, invest them at 6% pa and enter a long position in the forward contract.

Portfolio Management

9. If you expect the price of Security A will be 5 times the current price in 5 years and Security B will be 10 times the current price in 10 years, then:
- A. Security A provides a higher annual return than security B.
 - B. Security B provides a higher annual return than security A.
 - C. Security A provides the same annual return as Security B.
 - D. Additional information needed.
10. The Sharpe ratio measures the:
- A. Total portfolio return as a ratio of the portfolio's total risk.
 - B. Portfolio risk premium as a ratio of the portfolio's total risk.
 - C. Portfolio risk premium as a ratio of the portfolio beta.
 - D. Portfolio risk premium as a ratio of the risk-free return.
11. Assuming that all the conditions for the CAPM are met and we only accept the fact that an investor will not be able to borrow at exactly the same rate as he lends, we can say that,
- A. The efficient frontier will be unaffected.
 - B. The efficient frontier will shift to the left.
 - C. The efficient frontier will not be a straight line, but will have two segments.
 - D. The efficient frontier will not be a straight line, but will have three segments.
12. There are only two stocks available in an economy where the risk free rate is 3%. The risk-return characteristics of these stocks are: $E(R_A) = 5\%$, $\sigma(R_A) = 7\%$, $E(R_B) = 8\%$, $\sigma(R_B) = 9\%$. The correlation between the two stocks is 0.40. What will be the optimal portfolio of a risk-neutral investor?
- A. 100% of its initial wealth invested in stock A.
 - B. 100% of its initial wealth invested in stock B.
 - C. 100% of its initial wealth invested in the risk-free rate.
 - D. 70% of its initial wealth invested in stock A and 30% in stock B.
13. Analysts forecasts the stock price of company K to be ₦100 in a year. The risk-free rate is 5% and the market risk premium is 10%. According to the CAPM what is the maximum price you agree to pay for this stock knowing that its beta is equal to 2?
- A. ₦750
 - B. ₦800
 - C. ₦869.50
 - D. ₦1,000

14. What is the monthly average return for a stock whose yearly simple return has been 47%?
- 3.26%
 - 3.92%
 - 10.11%
 - 47.00%
15. Which statement is not true regarding the Capital Market Line (CML)?
- The CML is the line from the risk-free rate through the market portfolio.
 - The CML is the best attainable capital allocation line.
 - The CML is also called the security market line.
 - The CML always has a positive slope.
16. Consider a portfolio that has generated the following returns over three consecutive periods: 15%, 5% and -10%. What is the total return of the portfolio for all three periods?
- 3.33%
 - 8.68
 - 10.00%
 - Cannot conclude as period lengths are not known.
17. Suppose two portfolios A and B have the same average return, the same standard deviation of returns, but portfolio A has a lower beta than portfolio B. According to the Sharpe ratio, the performance of portfolio A:
- Is poorer than the performance of portfolio B.
 - Is the same as the performance of portfolio B.
 - Is better than the performance of portfolio B.
 - We don't have enough information to answer.
18. Given the following two stocks A and B

Security	Expected rate of return	Beta
A	0.12	1.2
B	0.14	1.8

If the expected market rate of return is 0.09 and the risk-free rate is 0.05, which security would be considered the better buy and why?

- A because it offers an expected excess return of 1.2%.
- B because it offers an expected excess return of 1.8%.
- A because it offers an expected excess return of 2.2%.
- B because it offers an expected return of 14%.

19. Proponents of the EMH typically advocate

- A. an active trading strategy.
- B. investing in an index fund.
- C. a passive investment strategy.
- D. investing in an index fund and a passive investment strategy

20. In an efficient market, _____.

- A. security prices react quickly to new information
- B. security prices are seldom far above or below their justified levels
- C. security prices react quickly to new information, are seldom far above or below their justified levels, and security analysis will not enable investors to realize superior returns consistently
- D. one cannot make money

21. Which of the following portfolios **cannot lie** on the efficient frontier as described by Markowitz?

Portfolio	Expected Return	Standard Deviation
W	9%	21%
X	5%	7%
Y	15%	36%
Z	12%	15%

- A. Only portfolio W cannot lie on the efficient frontier.
- B. Only portfolio X cannot lie on the efficient frontier.
- C. Only portfolio Y cannot lie on the efficient frontier.
- D. Only portfolio Z cannot lie on the efficient frontier.

22. The individual investor's optimal portfolio is designated by:

- A. The point of tangency with the indifference curve and the capital allocation line.
- B. The point of highest reward to variability ratio in the opportunity set.
- C. The point of tangency with the opportunity set and the capital allocation line.
- D. The point of the highest reward to variability ratio in the indifference curve.

Commodity Trading & Futures

23. A cereal producer has used futures markets to hedge the price it will pay for every amount of wheat it will purchase over the next 3 years. Which of the following is true about the company?
- A. It is liable to experience liquidity problems if the price of wheat falls dramatically
 - B. It is liable to experience liquidity problems if the price of wheat rises dramatically
 - C. It is liable to experience liquidity problems if the price of silver either rises dramatically or falls dramatically
 - D. The reliance on futures markets protects it from liquidity problems
24. A silver mining company has used futures markets to hedge the price it will receive for everything it will produce over the next 5 years. Which of the following is true about the company?
- A. It is liable to experience liquidity problems if the price of silver falls dramatically
 - B. It is liable to experience liquidity problems if the price of silver rises dramatically
 - C. It is liable to experience liquidity problems if the price of silver rises dramatically or falls dramatically
 - D. The reliance on futures markets protects it from liquidity problems
25. A cereal producer has used futures markets to hedge the price it will pay for every amount of wheat it will purchase over the next 3 years. Which of the following is true about the company?
- A. It is liable to experience liquidity problems if the price of wheat falls dramatically
 - B. It is liable to experience liquidity problems if the price of wheat rises dramatically
 - C. It is liable to experience liquidity problems if the price of silver either rises dramatically or falls dramatically
 - D. The reliance on futures markets protects it from liquidity problems
26. Which of the following is NOT true:
- A. Futures contracts are standardized; forward contracts are not.
 - B. Delivery or final cash settlement usually takes place with forward contracts; the same is not true of futures contracts.
 - C. Forward contracts usually have one specified delivery date; futures contract often have a range of delivery dates.
 - D. Futures contracts nearly always last longer than forward contracts.
27. Which of the following is NOT true?
- A. Cross hedging refers to the situation where the asset underlying the futures contract is not the same as the asset whose price is being hedged.
 - B. When the commodity futures prices trade lower than the commodity spot prices then the convenience yield of the commodity is relatively high.

- C. When long-term interest rates increase more than short-term interest rates then the loss on the bond portfolio is more than the gains made on the short futures position used to hedge the bond portfolio.
- D. The effective price received in a short hedge is equal to the futures price at hedge initiation plus the basis when the hedge is closed out.
28. An investor has just entered into three short oil futures contracts traded on the NYME and the futures price is \$87.30 per barrel. The size of each contract is 1000 barrels. The initial margin is \$9,000 and the maintenance margin is \$6,500 per contract. Which of the following futures prices represents the smallest change that will lead to a margin call?
- A. \$79.80
 B. \$84.80
 C. \$87.30
 D. \$89.80
29. A company has a ₦14 million portfolio with an average estimated beta of 1.30. The S&P500 index is currently standing at 1128 and the index futures price for a contract maturing in six months is trading at 1081. Futures contracts for ₦250 times the index can be traded. What trades are necessary to eliminate exposure to the general level of the market over the next four months?
- A. Take a short position in 65 six-month futures contracts and close out the position in six months
 B. Take a long position in 65 six-month futures contracts and close out the position in four months
 C. Take a short position in 67 six-month futures contracts and close out the position in four months
 D. Take a long position in 67 six-month futures contracts and close out the position in four months
30. The current spot price of crude oil is \$81.24 per barrel and the ten-month crude oil futures price is \$74.65 per barrel. The proportional storage cost of crude oil is 1.4% per annum with continuous compounding. The interest rate is 4.7% per annum for all maturities with continuous compounding. The current cost of carry and the convenience yield are respectively.
- A. 3.30% and 0%
 B. 3.30% and 13.45%
 C. 6.10% and 0%
 D. 6.10% and 16.25%



Pilot Solutions - 2021

Paper 3.0(B)

Set 2

Derivatives & Financial Engineering

1. A.

$$N^* = \beta \frac{V_A}{V_F} = 1.5 \times 100,000,000 / (10,000 \times 10) = 1,500 \text{ Short}$$

2. C.

The option payoff is $70 - 69 = \text{N}1$. The amount received for the option is ~~N4~~. The gain is ~~N3~~ per option. In total $5 \times 100 = 500$ options are sold. The total gain is therefore

$$\text{N}3 \times 500 = \text{N}1,500.$$

3. D.

In this case because interest rates are zero $c + K = p + S_0$. The left side of this Put-Call Parity equation is $50 + 6 = 56$. The right side is $49 + 7 = 56$. There is no mispricing and hence, no arbitrage opportunity.

4. B.

5. A.

From adding up the two payoffs we see that A is true:

$$\max(S_T - K, 0) - \max(K - S_T, 0) = S_T - K.$$

6. C.

7. A.

$$F_t = S_t e^{(r-q)(t)} = 1127 e^{(0.05-0.02)3/12} = 1135.48 > F_{\text{market}} = 1131.$$

The index futures contract is under priced relatively to the underlying asset thus Long the futures contract and short sell the shares underlying the index.

8. B.

$$F_0 = S_0 e^{(r-f)T} = 1.6479 e^{(0.04-0.06)1} = 1.615 > F_{\text{market}} = 1.571.$$

The forward contract is underpriced relatively to the underlying asset thus

Take a long position in the forward contract and Borrow the foreign currency (pounds) and convert it to USD and invest at domestic risk-free rate $r = 4\%$.

Portfolio Management

9. A.

Annualised return

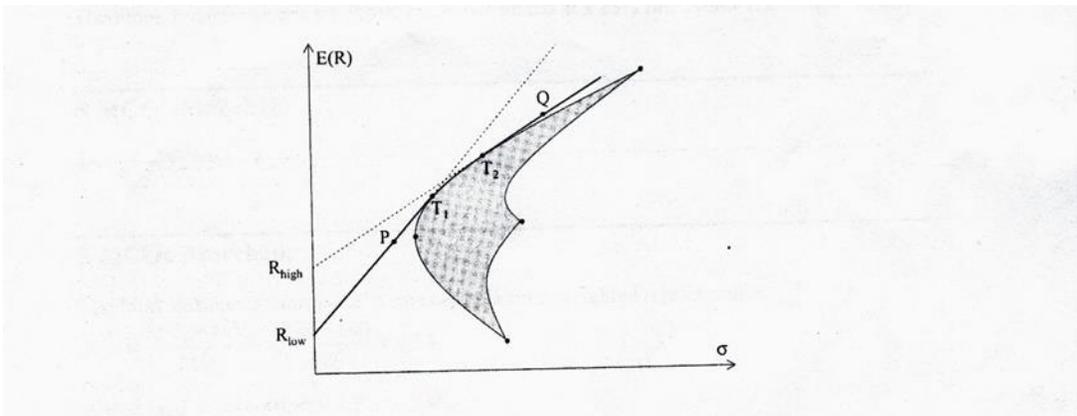
$$\left(\frac{EV}{BV}\right)^{1/n} - 1$$

$$A \left(\frac{5}{1}\right)^{1/5} - 1 = 38\%$$

$$B \left(\frac{10}{1}\right)^{1/10} - 1 = 26\%$$

10. B.

11. D. The investor will have to borrow the money at a higher rate (R_{high}) than he is able to lend (R_{low}). In this case the efficient frontier will not be a straight line but will have three segments. As shown in the graph below, the efficient frontier will be formed by the straight line from R_{low} to T_1 , the curve from T_1 to T_2 and the straight line through Q from T_2 .



12. B.

The risk-neutral investor chooses the stock that maximizes his utility. Since he does not care of risks, he will choose the stock with the maximum expected value, therefore stock B.

Another way to see this is that his indifference curves are parallel to the x-axis (risk), therefore the optimal choice is the one that maximizes his utility, i.e. stock B.

13. B.

$$\text{Required return} = 5 + 2(10) = 25\%$$

$P_0 = \text{PV of the stock}$

$$= \frac{1,000}{1.25} = 800$$

14. A.

$$\text{Monthly return} = (1.47)^{1/12} = 3.26\%$$

15. C.

Both the Capital Market Line and the Security Market Line depict risk/return relationships. However, the risk measure for the CML is standard deviation and the risk measure for the SML is beta (thus C is not true; the other statements are true).

16. B.

$$= (1.15)(1.05)(0.90) - 1 = 8.68\%$$

This is not annualized return but total return.

17. B.

The sharpe ratio uses the standard deviation, not the beta, as a measure of risk. Therefore both measures are equal.

18. C.

A's excess return is expected to be $12\% - [5\% + 1.2(9\% - 5\%)] = 2.2\%$. B's excess return is expected to be $14\% - [5\% + 1.8(9\% - 5\%)] = 1.8\%$.

19. D.

Believers of market efficiency advocate passive investment strategies, and an investment in an index fund is one of the most practical passive investment strategies, especially for small investors.

20. C.

Security prices react quickly to new information, security prices are seldom far above or below their justified levels, and security analysis will not enable investors to realize superior returns consistently; however, even in an efficient market one should be able to earn the appropriate risk-adjusted rate of return.

21. A.

When plotting the above portfolios, only W lies below the efficient frontier as described by Markowitz. It has a higher standard deviation than Z with a lower expected return.

22. A.

The indifference curve represents what is acceptable to the investor; the capital allocation line represents what is available in the market. The point of tangency represents where the investor can obtain the greatest utility from what is available.

Commodity Trading & Futures

23.A.

The company hedges by going long futures. It gains on the futures when the price increases and loses when the price decreases. It may get margin calls which lead to liquidity problems when the price drops.

24.B.

The mining company shorts futures. It gains on the futures when the price decreases and loses when the price increases. It may get margin calls which lead to liquidity problems when the price rises even though the silver in the ground is worth more.

25.A.

The company hedges by going long futures. It gains on the futures when the price increases and loses when the price decreases. It may get margin calls which lead to liquidity problems when the price drops.

26.D.

Forward contracts typically last longer than futures contracts. A, B, and C are true.

27.C.

28. D.

Margin call when $\$9,000 - \$6,500 = \$2,500$ loss per contract is made in the margin account; Given that a short position is held this will happen when the futures price increases by $(\$2,500/1,000) \2.50 per ounce, from $\$87.30$ to $\$89.80$.

29. C

To eliminate the exposure over the next four months, a short position in

$$N = \beta \frac{P}{F} = 1.30 \frac{14,000,000}{1081 \times \text{€}250} = 67.35 = 67$$

6-month index futures contracts is required and to close out the position in four months.

30.D.

$$C = r + u - q = 4.7\% + 1.4\% - 0\% = 6.10\%$$

$$\text{and } F_0 = S_0 e^{(c-y)T}$$

$$y = c - \frac{1}{T} \ln \frac{F_0}{S_0} = 6.10\% - \frac{12}{10} \ln \frac{74.65}{81.24} = 0.1625 = 16.25\%$$

$$N = \beta \frac{P}{F} = 1.30 \frac{14,000,000}{1081 \times \text{¥}250} = 67.35 = 67$$

6-month index futures contracts is required and to close out the position in four months.



Pilot Questions - 2021

Paper 3.0 (A) Set 2

Corporate Finance

1. TKQ Co has just paid a dividend of 21 kobo per share and its share price one year ago was ₦3.10 per share. The total shareholder return for the year was 19.7%.

What is the current share price?

- A. ₦3.50
 - B. ₦3.71
 - C. ₦3.31
 - D. ₦3.35
2. Which of the following statements are correct?
- 1. Maximising market share is an example of a financial objective
 - 2. Shareholder wealth maximisation is the primary financial objective for a company listed on a stock exchange
 - 3. Financial objectives should be quantitative so that their achievement can be measured
- A. 1 and 2 only
 - B. 1 and 3 only
 - C. 2 and 3 only
 - D. 1, 2 and 3
3. A company has 7% loan notes in issue which are redeemable in seven years' time at a 5% premium to their nominal value of ₦100 per loan note. The before-tax cost of debt of the company is 9% and the after-tax cost of debt of the company is 6%.

What is the current market value of each loan note?

- A. ₦92.67
- B. ₦108.90
- C. ₦89.93
- D. ₦103.14

4. Which of the following statements is/are correct?
1. An increase in the cost of equity leads to a fall in share price
 2. Investors faced with increased risk will expect increased return as compensation
 3. The cost of debt is usually lower than the cost of preference shares
- A. 2 only
 B. 1 and 3 only
 C. 2 and 3 only
 D. 1, 2 and 3
5. Which of the following statements is most correct?
- A. The IRR method is appealing to some managers because it produces a rate of return upon which to base decisions rather than a naira amount like the NPV method.
 - B. The discounted payback method solves all the problems associated with the payback method.
 - C. For independent projects, the decision to accept or reject will always be the same using either the IRR method or the NPV method.
 - D. Statements A and C are correct.
6. The following are extracts from the statement of financial position of a company:

	N000	N000
Equity		
Ordinary shares	8,000	
Reserves	<u>20,000</u>	
		28,000
Non-current liabilities		
Bonds	4,000	
Bank loans	6,200	
Preference shares	<u>2,000</u>	
		12,200
Current liabilities		
Overdraft	1,000	
Trade payables	<u>1,500</u>	
		<u>2,500</u>
Total equity and liabilities		<u>42,700</u>

The ordinary shares have a nominal value of 50 kobo per share and are trading at ₦5.00 per share. The preference shares have a nominal value of ₦1.00 per share and are trading at 80 kobo per share. The bonds have a nominal value of ₦100 and are trading at ₦105 per bond.

What is the market value based gearing of the company, defined as prior charge capital/equity?

- A. 15.0%
- B. 13.0%
- C. 11.8%
- D. 7.3%

7. Which of the following statements is correct?

- A. Governments can keep interest rates low by buying short-dated government bills in the money market
- B. The normal yield curve slopes upward to reflect increasing compensation to investors for being unable to use their cash now
- C. The yield on long-term loan notes is lower than the yield on short-term loan notes because long-term debt is less risky for a company than short-term debt
- D. Expectations theory states that future interest rates reflect expectations of future inflation rate movements.

8. The following information relates to a company:

Year	0	1	2	3
Earnings per share (kobo)	30.0	31.8	33.9	35.7
Dividends per share (kobo)	13.0	13.2	13.3	15.0
Share price at start of year (₦)	1.95	1.98	2.01	2.25

Which of the following statements is correct?

- A. The dividend payout ratio is greater than 40% in every year in the period
 - B. Mean growth in dividends per share over the period is 4%
 - C. Total shareholder return for the third year is 26%
 - D. Mean growth in earnings per share over the period is 6% per year
9. Pickles Ltd. is a company which sells bottled iced tea. The company is thinking about expanding its operations into the bottled lemonade business. Which of the following factors should the company incorporate into its capital budgeting decision as it decides whether or not to enter the lemonade business?
- A. If the company enters the lemonade business, its iced tea sales are expected to fall 5 percent as some consumers switch from iced tea to lemonade.

- B. Two years ago the company spent ₦3 million to renovate a building for a proposed project which was never undertaken. If the project is adopted, the plan is to have the lemonade produced in this building.
- C. If the company doesn't produce lemonade, it can lease the building to another company and receive after-tax cash flows of ₦500,000 a year.
- D. Answers A and C are correct.

10. Which of the following statements are correct?

1. The sensitivity of a project variable can be calculated by dividing the project net present value by the present value of the cash flows relating to that project variable
 2. The expected net present value is the value expected to occur if an investment project with several possible outcomes is undertaken once
 3. The discounted payback period is the time taken for the cumulative net present value to change from negative to positive
- A. 1 and 2 only
 - B. 1 and 3 only
 - C. 2 and 3 only
 - D. 1, 2 and 3

Equity Valuation & Analysis

11. Which of the following is the most appropriate reason for using a free-cash-flow-to-equity (FCFE) model to value equity of a company?
- A. FCFE is a measure of the firm's dividend paying capacity
 - B. FCFE models provide more accurate valuation than the dividend discount models
 - C. A firm's borrowing activities could influence dividend decisions but they would not impact FCFE
 - D. None of the above
12. A stock is currently priced ₦40. In the next one year the stock will pay dividend of ₦2. You require a return of 10% p.a. What is the target price that is most consistent with the stock being fairly valued, with a holding period of 1 year?
- A. ₦42
 - B. ₦44
 - C. ₦38
 - D. ₦50

13. If the expected return of the market portfolio is 18% and a stock with a beta of 1.00 pays a dividend yield of 6%, what must the market believe is the expected rate of price appreciation (capital gain yield) of the stock?
- A. 18%
 - B. 24%
 - C. 15%
 - D. 12%
14. Vinto buys a stock at ₦72.08 and plans to hold it for one year. The stock pays annual dividend of ₦2.11. The required return on equity is 7.5%. Given that the stock is fairly priced, calculate the price appreciation return (capital gains yield)
- A. 4.57%
 - B. 2.93%
 - C. 7.50%
 - D. 5.45%
15. Koko Plc generates annual ROE of 24%. If the required return is 12% and annual growth rate is 6%, what is the current P/B?
- A. 2
 - B. 3
 - C. 4
 - D. 6
16. A high level of debt can be acceptable when:
- A. The probability of the differential between ROA and average interest rate being negative
 - B. The probability of the differential between ROA and the average interest rate being positive is high
 - C. The probability of the differential between ROA and the average interest rate being non-existent is high
 - D. All the above are incorrect
17. The Lewis Ltd, had revenue per share of ₦300 in 2020, earnings per share of ₦4.50, and paid out 60 percent of its earnings as dividends. If the return on earnings (ROE) and required rate of return of Lewis are 20 percent and 13 percent respectively, what is the appropriate price/sales (P/S) multiple for Lewis?

A. 0.90

B. 0.19

C. 0.18

D. 0.12

18. A firm has a payout ratio of 35 percent, a return on equity (ROE) of 18 percent, an estimated growth rate of 13 percent, and its shareholders require a return of 17 percent on their investment. Based on these fundamentals, a reasonable estimate of the appropriate price-to-book value ratio for the firm is:

A. 1.58

B. 2.42

C. 1.25

D. 5.09

19. Alpha Software (AS) recently reported a representative annual earnings per share (EPS) of ₦1.75, which included an extraordinary loss of ₦0.19 and an expense of ₦0.10 related to acquisition costs during the accounting period, neither of which are expected to recur. Given that the most recent share price is ₦65.00. What is a useful AS's trailing price to earnings (P/E) for valuation purposes?

A. 37.14

B. 44.52

C. 31.86

D. 33.50

20. Assuming all other factors remain unchanged, which of the following would decrease the market P/E ratio?

A. A rise in the stock risk premium

B. A decline in the risk-free rate

C. A decline in the rate of inflation

D. An increase in the dividend payout ratio.

Fixed Income Valuation & Analysis

21. The concept of 'duration' provides a framework for estimating:

A. By how much the expected return on equity is affected by alterations in the risk-free rate of return.

B. By how much the price of a bond changes in response to a change in the yield on the bond.

C. The extent to which the yield on a bond is expected to change with the decline in its term to maturity.

D. The average term to maturity of the coupon payments on a bond.

22. A callable bond entitles:

- A. A lender to demand repayment prior to the bond's redemption date.
- B. A lender to convert the bond into shares.
- C. A borrower to repay the debt sooner than the specified redemption date.
- D. A borrower to extend the redemption date.

23. A corporate bond has a duration of 8.73 years and a convexity of 61.33. This implies that if market yields:

- A. Increase significantly, the price of the bond will fall by less than the amount indicated by duration alone.
- B. Increase significantly, the price of the bond will fall by more than the amount indicated by duration alone.
- C. Decrease significantly, the price of the bond will increase by less than the amount indicated by the convexity measure alone.
- D. Decrease significantly; the price of the bond will increase by less than the amount indicated by duration alone.

24. A yield curve shows the relationship between the yield and term to maturity for a number of financial assets, e.g. government stocks. In theory, the yield curve will normally be upward sloping so that long-term financial assets offer a higher yield than short-term financial assets.

Which of the following best explains the reason for this?

- A. Interest rates are expected to fall in the future
- B. Interest rates have been increased on a number of occasions in the past year in an attempt to combat high inflation
- C. The investor must be compensated for the additional risk of tying up money in the asset for a longer period of time
- D. The market prices of long-term financial assets will tend to be lower than for short-term financial assets.

25. The average life of an MBS is more relevant than a security's stated maturity. It represents the average time to the receipt of:

- A. All interest payments
- B. scheduled principal payments
- C. expected prepayments
- D. Both expected prepayments and scheduled principal payments.

26. Suppose the yield curve becomes steeper. Which of the following is a consequence of the statement?

- A. Long-term bonds become less sensitive to interest rate changes
 - B. Long-term bonds become more sensitive to interest rate changes
 - C. The convexity of long-term bonds increases relative to short-term instruments
 - D. The yield spread between long and short-term securities increases.
27. Which one of the following statements with respect to the immunization of a bond portfolio for interest rate variation is wrong?
- A. For a short time-horizons, the investor would like to avoid the negative impact of an interest rate increase.
 - B. For longer time-horizons, the investor would like to avoid the negative impact of an interest rate decrease.
 - C. There cannot be any time horizon at which the wealth of the bond portfolio will be constant (i.e. portfolio is immunized) when there is an interest rate variation.
 - D. Once the portfolio is immunized for any interest rate variation, immunization needs to be recalculated for any further interest rate variations.
28. A zero coupon bond with YIM of 10% matures in 5 years. What is the convexity of the bond?
- A. 24.79
 - B. 27.27
 - C. 20.66
 - D. 4.55
29. You want to immunise a liability occurring in 10 years with two bonds: bond K has a maturity of 5 years and duration of 4 years; bond P has a maturity for 15 years and duration of 12 years. The weight of the portfolio invested in bond K, respectively P are:
- | K | P |
|--------|-----|
| A. 75% | 25% |
| B. 50% | 50% |
| C. 25% | 75% |
| D. 40% | 60% |
30. You manage a bond portfolio. Your client wants to reduce the re-investment risk over time. If he does not have any definite forecast over the future movements of interest rates, what strategy will you apply?
- A. Barbell strategy
 - B. Bullet strategy
 - C. Butterfly strategy
 - D. Ladder strategy



Pilot Solutions - 2021

Paper 3.0 (A) Set 2

Corporate Finance

1. A.

$$\text{Monetary value of return} = \text{N}3.10 \times 1.197 = \text{N}3.71$$

$$\text{Current share price} = \text{N}3.71 - \text{N}0.21 = \text{N}3.50$$

2. C.

3. A.

$$\text{MV} = (7 \times 5.033) + (105 \times 0.547) = \text{N}92.67$$

4. D.

5. D.

Statements A and C is correct; therefore, statement D is the correct choice. The discounted payback method still ignores cash flows after the payback period.

6. A.

$$\begin{aligned} \text{Gearing} &= [(4,000 \times 1.05) + 6,200 + (2,000 \times 0.8)] / (8,000 \times 2 \times 5) \\ &= 12,000 / 80,000 = 15\%. \end{aligned}$$

7. B.

8. D.

$$\text{Mean growth in earnings per share} = 100 \times [(35.7/30.0)^{1/3} - 1] = 5.97\% \text{ or } 6\%.$$

9. D.

Statements A and C are correct; therefore, statement D is the correct answer. Externalities and opportunity costs should be considered, while sunk costs should not be included in the analysis.

10. B.

Equity Valuation & Analysis

11. A.

FCFE is a measure of the firm's dividend paying capacity

12. A.

$$ER = \frac{P_1 + D_1}{P_0} - 1$$

$$1.10 = \frac{P_1 + 2}{40}$$

$$44 = P_1 + 2 \text{ or } P_1 = 42$$

Thus A is correct.

13. D.

Since beta = 1, required return is the same as market return = 18%. If the stock is fairly priced:

18% = Dividend Yield + Capital gain yield

$$(6\%) + (x)$$

$$x = 12\%$$

14. A.

$$\text{Dividend Yield} = \frac{2.11}{72.08} = 2.93\%$$

$$\text{Capital gain yield} = 7.5 - 2.93 = 4.57\%$$

Alternatively:

Let P_1 = Expected price in Year 1

$$1.075 = \frac{P_1 + 2.11}{72.08}$$

$$P_1 = 75.376$$

$$\% \Delta P = \frac{75.376}{72.08} - 1 = 4.57\%$$

15. B.

$$\frac{P}{B} = 1 + \frac{ROE - r}{r - g} = 1 + \frac{0.24 - 0.12}{0.12 - 0.06} = 3$$

$$\text{OR: } \frac{P}{B} = \frac{ROE - g}{r - g} = \frac{0.24 - 0.06}{0.12 - 0.06} = 3$$

16. B.

When $ROA > i$, $ROE > ROA$

When $ROA = i$, $ROE = ROA$

When $ROA < i$, $ROE < ROA$

17. B.

$$\frac{P}{S} = \frac{E_0}{S_0} \left(\frac{1 - b}{1 - g} \right) (1 + g)$$

Profit Margin = $\text{EPS}/\text{Sales per share} = 4.50/300 = 0.015$ or 1.5% percent

Expected growth in dividends and earnings $ROE \times (1 - \text{payout ratio}) = 0.20 \times 0.40 = 0.08$ or 8%.

$$\frac{P_0}{S_0} = \frac{[\text{profit margin} \times \text{payout ratio} \times (1 + g)]}{(r - g)} = \frac{[0.015 \times 0.60 \times (1.08)]}{(0.13 - 0.08)} = 0.1944$$

18. C.

$$\frac{P}{BV} = \frac{ROE - g}{r - g} = \frac{18 - 13}{17 - 13} = 1.25$$

19. C.

Using an underlying earnings concept, an analyst would add back the temporary charges against earnings: $\text{N}1.75 + \text{N}0.19 + \text{N}0.10 = \text{N}2.04$. The resulting trailing $P/E = 65.00/2.04 = 31.86$.

20. A.

$$P/E = (1 - b)/(k - g)$$

To lower P/E: b increases, g decreases and or k increases. Both a decline in the RF rate and a decline in the rate of inflation will reduce k. An increase in the stock's risk premium will increase k.

Fixed Income Valuation & Analysis

21. B.

22. C.

23. A.

Convexity is the curvature of the price-yield curve, for non-callable bonds, it is always positive. Duration shows the gross movement of a bond's price due to interest-rate changes. Convexity adjusts these measures up to the level of the price-yield curve. Another way to think about the concept is the convexity corrects for the errors in duration. If duration overestimates the fall in price, and underestimates the rise in price, choice A must be correct.

24. C.

25. D.

Because of prepayments, the stated maturity of a mortgage pass-through security is unlikely to equal its true life. The average life is a more accurate measure because it represents the average time to receipt of both principal payments and expected prepayments.

26. D.

A steepening yield curve means that the slope of the yield curve increases. The slope is the difference (i.e. the term spread) between the yields of two maturities. Consequently, as the yield curve steepens this spread increases.

27.C.

Statement A is correct. On short time-horizons, the effect on the bond price is higher than the effect on the reinvestment of the coupons, and the investor would like to avoid an interest rate increase.

Statement B is correct. For longer time-horizons, the reinvestment of coupons takes a higher part of the final wealth, and the investor would like to avoid an interest rate decrease.

Statement C is wrong. There is a time horizon equal the duration of the bond portfolio under consideration for which the wealth of the portfolio will be identical (i.e. portfolio is immunized) when there is an interest rate variation. So if an investor selects a portfolio wherein its duration is equal to the time horizon, the portfolio will be immunised for interest rate variation.

Statement D is correct. As soon as there is further interest rate modification, an immunised portfolio is not immunised anymore, as its duration is modified. Hence, a portfolio should theoretically be rebalanced after each change in interest rates.

28.A.

For zero coupon bond, convexity is given by:

$$\frac{n(n+1)}{(1+y)^2} = \frac{5(5+1)}{(1.10)^2} = 24.79$$

29.C.

Let x = % invested in bond K.

$$4x + 12(1 - x) = 10$$

$$x = 0.25 = 25\%$$

$$1 - x = 0.75 = 75\%$$

30.D.

With a ladder strategy, the bonds are well distributed over the maturities and the effect of re-investment risk (when bonds arrive to maturity) is minimized, given the relative small amount that has to be re-invested in any period. Moreover, since the manager does not have any definite forecast over the future movements of interest rates, a diversified and 'neutral' position like the "ladder strategy" one is to recommend.



Pilot Questions - 2021

Paper 3.0 (A) Set 3

Corporate Finance

1. Which of the following statements are problems in using the price/earnings ratio method to value a company?

1. It is the reciprocal of the earnings yield
2. It combines stock market information and corporate information
3. It is difficult to select a suitable price/earnings ratio
4. The ratio is more suited to valuing the shares of listed companies

- A. 1 and 2 only
- B. 3 and 4 only
- C. 1, 3 and 4 only
- D. 1, 2, 3 and 4

2. A perpetuity series of cash flows of ₦10,000 each year commences in two years. The relevant rate of interest is 10% each year.

What is the present value, to the nearest ₦1, of the cash flows?

- A. ₦100,000
- B. ₦90,909
- C. ₦82,645
- D. ₦110,000

3. A company has in issue loan notes with a nominal value of ₦100 each. Interest on the loan notes is 6% per year, payable annually. The loan notes will be redeemed in eight years' time at a 5% premium to nominal value. The before-tax cost of debt of the company is 7% per year.

What is the ex interest market value of each loan note?

- A. ₦94.03
- B. ₦96.94
- C. ₦102.91
- D. ₦103.10

4. Increases and decreases in the level of sales are due to business risk. The business risk of a particular company is characterised by

- A. the ratio of debt to equity in the capital structure.

- B. the level of risk assumed by the debt providers.
 - C. operating leverage and uncertainty about demand, output prices, and competition.
 - D. uncertainty about credit ratings, government debt, interest rates, and the demand for the domestic currency.
5. Which of the following is *most* likely to signal negative information concerning a firm?
- A. Share repurchase.
 - B. Increase in the payout ratio.
 - C. Decrease in the quarterly dividend rate.
 - D. A two-for-one stock split.
6. On a market value basis, GFV Co is financed 70% by equity and 30% by debt. The company has an after-tax cost of debt of 6% and an equity beta of 1.2. The risk-free rate of return is 4% and the equity risk premium is 5%.

What is the after-tax weighted average cost of capital of GFV Co?

- A. 5.4%
 - B. 7.2%
 - C. 8.3%
 - D. 8.8%
7. The following financial information relates to QK Co, whose ordinary shares have a nominal value of ₦0.50 per share:

	₦m	₦m
Non-current assets		120
Current assets		
Inventory	8	
Trade receivables	<u>12</u>	<u>20</u>
Total assets		<u>140</u>
Equity		
Ordinary shares	25	
Reserves	<u>80</u>	105
Non-current liabilities		20
Current liabilities		<u>15</u>
Total equity and liabilities		<u>140</u>

On an historic basis, what is the net asset value per share of QK Co?

- A. ₦2.10 per share
- B. ₦2.50 per share
- C. ₦2.80 per share
- D. ₦4.20 per share

8. The following financial information relates to an investment project:

	₦'000
Present value of sales revenue	50,025
Present value of variable costs	<u>25,475</u>
Present value of contribution	24,550
Present value of fixed costs	<u>18,250</u>
Present value of operating income	6,300
Initial investment	<u>5,000</u>
Net present value	<u>1,300</u>

What is the sensitivity of the net present value of the investment project to a change in sales volume?

- A. 7.1%
- B. 2.6%
- C. 5.1%
- D. 5.3%

9. Which of the following statements concerning capital structure theory is correct?

- A. In the traditional view, there is a linear relationship between the cost of equity and financial risk
- B. Modigliani and Miller said that, in the absence of tax, the cost of equity would remain constant
- C. Pecking order theory indicates that preference shares are preferred to convertible debt as a source of finance
- D. Business risk is assumed to be constant as the capital structure changes

10. Which of the following actions is LEAST likely to increase shareholder wealth?

- A. The weighted average cost of capital is decreased by a recent financing decision
- B. The financial rewards of directors are linked to increasing earnings per share
- C. The board of directors decides to invest in a project with a positive NPV
- D. The annual report declares full compliance with the corporate governance code

Equity Valuation & Analysis

11. Which of the following multiples is most useful when comparing companies with significant differences in capital structure?

- A. EV/EBITDA
- B. Price – to – book ratio
- C. Price – to – cash flow ratio
- D. Price – to – earnings

12. Coombeshead plc has ordinary shares in issue that pay a constant dividend per share of 25 kobo and have a beta of 1.2. The current market rate of return is 8% and the risk-free rate of return is 2%.

What is the predicted market value of each share of the company (to the nearest kobo)?

- A. 179 kobo
- B. 216 kobo
- C. 272 kobo
- D. 347 kobo

13. SKV Co has paid the following dividends per share in recent years:

	2020	2019	2018	2017
Dividend (kobo per share)	36.0	33.8	32.8	31.1

The dividend for 2020 has just paid and SKV Co has a cost of equity of 12%.

Using the geometric average historical dividend growth rate and the dividend growth model, what is the market price of SKV Co shares to the nearest kobo on an ex dividend basis?

- A. ₦4.67
- B. ₦5.14
- C. ₦5.40
- D. ₦6.97

14. Thom worthy plc, which is financed entirely by equity, earns a constant return of 10% on its investments. The company has a constant dividend payout ratio of 40% and the earnings per share of the company is expected to be 50 kobo at the end of the forthcoming year.

What is the predicted market value of each share of the company?

- A. 200 kobo

- B. 206 kobo
- C. 333 kobo
- D. 500 kobo

15. QT Plc pays an annual dividend of 30 kobo per share to shareholders, which is expected to continue in perpetuity. The average rate of return for the market is 9% and the company has a beta coefficient of 1.5. The risk-free rate of return is 4%.

What is the expected rate of return for the shareholders of the company and the predicted value of the shares in the company?

Expected rate of return (%) Predicted value (kobo)

- | | | |
|----|------|-----|
| A. | 23.5 | 705 |
| B. | 17.5 | 171 |
| C. | 16.5 | 182 |
| D. | 11.5 | 261 |

16. An analyst choosing between the free cash flow to the firm (FCFF) and free cash flow to equity (FCFE) valuation approaches recognizes that an increase in leverage:

- A. Reduces FCFE by the amount of the debt.
- B. Increases FCFE by the amount of after-tax interest.
- C. Increases FCFE by the amount of the debt.
- D. Does not change FCFF.

17. Free cash flow to the firm (FCFF) adjusts earnings before interest and taxes (EBIT) by:

- A. Adding taxes, deducting depreciation, and adding back the investments in fixed capital and working capital.
- B. Subtracting investments in fixed capital and working capital.
- C. Subtracting capital expenditures.
- D. Deducting taxes, adding back depreciation, and deducting the investments in fixed capital and working capital.

18. Industrial Light currently has:

- Free cash flow to equity = ₦4.0 million.
- Cost of equity = 12 percent.
- Weighted average cost of capital = 10 percent
- Total debt = ₦30.0 million.
- Long-term expected growth rate = 5 percent.

What is the value of equity?

- A. ₦60,000,000
- B. ₦27,142,857
- C. ₦57,142,857

D. ₦44,440,000

19. A biotech firm is currently experiencing high growth and pays no dividends. One of their product patents is scheduled to expire in 5 years. This firm would be a good candidate for which of the following valuation models?

- A. Two-stage free cash flow to equity.
- B. Single-stage free cash flow to equity.
- C. Two-stage dividend discount model.
- D. Single-stage dividend discount model.

20. Which of the following free cash flow to equity (FCFE) models is most suited to analyze firms in an industry with significant barriers to entry?

- A. FCFE Perpetuity Model.
- B. Two-stage FCFE Model.
- C. E Model (Three-Stage FCFE Model).
- D. Stable Growth FCFE Model.

Fixed Income Valuation & Analysis

21. A callable bond can be thought of as a combination of a long non-callable (bullet) bond and a short position in a call option. The presence of the position in a call option results in drawbacks for the investor related to:

- A. Reinvestment risk
- B. Price compression
- C. Both of the above
- D. None of the above

The following is a list of prices of zero coupon bonds with different maturities and par value of ₦1,000.

Maturity (Years)	Price
1	₦917.43
2	₦826.51
3	₦737.96

Use the above data to answer questions 2 and 3.

22. According to the expectations theory, what is the expected forward rate in the third year?

- A. 10%
- B. 11%
- C. 13%

D. 12%

23. What is the YTM on a 3-year zero coupon bond?

- A. 10.00%
- B. 12.00%
- C. 10.66%
- D. 12.66%

24. When of the following statements regarding mortgage pass-through securities is FALSE?

- A. Pass-through coupon rates tend to be greater than the underlying average interest rate of mortgages in the pool.
- B. Pass-through securities covert illiquid mortgages into liquid securities
- C. Any number of mortgages can form a Pass-through pool.
- D. The average maturity of the underlying mortgages will be different from the average life of the mortgages pool

Use the data in the following table to answer questions 4 and 5

The following table shows a mortgage pool that consists of five mortgages

Mortgage	Outstanding balance	Mortgage rate	Remaining payment
1	N280,00	5.26%	247
2	N325,000	5,60%	86
3	N462,000	6.10%	323
4	N291,000	6.32%	331
5	N305,000	6.40%	342

25. Holding all other factors constant, an increase in expected yield volatility will cause the price of a:

- A. Putable bond to increase.
- B. Callable bond to increase.
- C. Putable bond to decrease.
- D. Callable bond to decrease.

26. You have 2 bonds of the same issuer in your portfolio. Market rates suddenly decrease by 1% along the curve. In this context, which one of the 2 bonds is more volatile?

Coupon	4%	3%
Time to maturity	8 years	8 years
Yield to maturity	4%	4%

- A. Price of bond A is more volatile
 B. Price of bond B is more volatile
 C. Prices of bond A and bond B have the same volatility
 D. More information is needed to answer.
27. An 8 percent coupon bond with a par value of ₦100 matures in 2 years and is selling at ₦98.24 to yield 9 percent. Exactly one year ago this bond sold at a price of ₦95.03 to yield 10 percent. The bond pays annual interest. The change in price attributable to the change in maturity is closest to:
- A. ₦1.47
 B. ₦3.21
 C. ₦4.97
 D. ₦1.50
28. Which one of the following statements is true concerning the duration of a perpetuity?
- A. The duration of 15% yield perpetuity that pays ₦100 annually is longer than that of a 15% yield perpetuity that pays ₦200 annually.
 B. The duration of a 15% yield perpetuity that pays ₦100 annually is shorter than that of a 15% yield perpetuity that pays ₦200 annually.
 C. The duration of a 15% yield perpetuity that pays ₦100 annually is equal to that of 15% yield perpetuity that pays ₦200 annually.
 D. The duration of a perpetuity cannot be calculated.
29. The curvature of the price-yield curve for a given bond is referred to as the bond's
- A. modified duration.
 B. immunization.
 C. sensitivity.
 D. convexity.
30. Consider a bond selling at par with modified duration of 10.6 years and convexity of 210. A 2 percent decrease in yield would cause the price to increase by 21.2%, according to the duration rule. What would be the percentage price change according to the duration-with-convexity rule?
- A. 21.2%
 B. 25.4%
 C. 17.0%
 D. 10.6%



Pilot Solutions - 2021

Paper 3.0 (A)

Set 3

Corporate Finance

1. A.

2. B.

$$\frac{10,000}{(0.1 \times 1.1)} = 90,909$$

3. B.

It is correct that the price/earnings ratio is more suited to valuing the shares of listed companies, and it is also true that it is difficult to find a suitable price earnings ratio for the valuation.

4. C.

Business risk results from economic factors and operating leverage.

5. C.

Decreases send negative signals regarding future prospects.

6. D.

$$\text{Cost of equity} = 4 + (1.2 \times 5) = 4 + 6 = 10\%$$

$$\text{WACC} = (10 \times 0.7) + (6 \times 0.3) = 7 + 1.8 = 8.8\%$$

7. A.

$$\text{Net asset value (NAV)} = 140\text{m} - 15\text{m} - 20\text{m} = \text{N}105\text{m}$$

$$\text{Number of ordinary shares} = 25\text{m}/0.5 = 50\text{m shares}$$

$$\text{NAV per share} = 105\text{m}/50\text{m} = \text{N}2.10 \text{ per share}$$

8. D.

$$\text{Sensitivity to a change in sales volume} = 100 \times 1,300/24,550 = 5.3\%$$

9. D.

The statement about business risk is correct.

10. B.

Increase in shareholder wealth will depend on increases in cash flow, rather than increases in earnings per share, i.e. increases in profit. If the financial rewards of directors are linked to increasing earnings per share, for example, through a performance-related reward scheme, there is an incentive to increasing short-term profit at the expense of longer growth in cash flows and hence shareholder wealth.

Equity Valuations & Analysis

11. A.

The EV/EBITDA approach is most useful when comparing companies with significant differences in capital structure. EBITDA is computed prior to payment to any of the company's financial stakeholders and is not impacted by the amount of debt leverage.

12. C

$$K_E = 2 + 1.2(8 - 2) = 9.2\%$$

$$P_0 = \frac{25}{0.092} = 272 \text{ k}$$

13. C.

$$g = \left[\left(\frac{32.8}{31.1} \right) \left(\frac{33.8}{32.8} \right) \left(\frac{36}{33.8} \right) \right]^{1/3} - 1 = 5\%$$

$$P_0 = \frac{D_1}{r - g} = \frac{36(1.05)}{0.12 - 0.05} = \text{R}5.40$$

14. D.

$$g = 10 \times 0.6 = 6\%$$

$$K_E = 10\%$$

$$P_0 = \frac{50 \times 0.40}{0.10 - 0.06} = 500\text{k}$$

15. D.

$$K_E = 4 \times 1.5(9 - 4) = 11.5\%$$

$$P_0 = \frac{30}{0.115} = 261\text{k}$$

16.D.

$$\text{FCFF} = \text{EBIT}(1 - \text{Tax rate}) + \text{DEP} - \text{FCInv} - \text{WCInv}$$

$$\text{FCFE} = \text{FCFF} - \text{Int}(1 - \text{Tax rate}) + \text{Net borrowing}$$

FCFF is not changed by leverage. However, FCFE is increased by the amount of the debt and is decreased by the amount of after-tax interest.

17.D.

$$\text{FCFF} = \text{EBIT} (1 - \text{tax rate}) + \text{Dep} - \text{FCInv} - \text{WCInv}.$$

18.A.

$$\text{The value of equity is } \frac{(\text{N}4,000,000)(1.05)}{(0.12 - 0.05)} = \text{N}60,000,000$$

19.A.

The two-stage free cash flow to equity model is well suited to value a firm that is currently experiencing high growth and will likely see this growth drop to a lower, more stable rate in the future.

20.B.

The two-stage FCFE model is most suitable for analyzing firms in high growth that will maintain that growth for a specific period, such as firms with patents or firms in an industry with significant barriers to entry.

Fixed Income Valuations & Analysis

21. C.

The presence of the short position in a call option results in the following drawbacks:

- Reinvestment risk: as the market yield decrease below the issue's coupon rate, the issuer will call the bond as it is possible for him to borrow at a lower yield. The investor will have to reinvest at a lower rate.
- Price compression: as interest rate falls, the price of option-free bonds increases. In the case of callable bonds, the price appreciation is limited by the call price.

22. D.

What is required here is $F_{2,3}$.

$$F_{2,3} = \frac{dF_2}{dF_3} - 1 = \left[\frac{856.51}{737.96} \right]^{\frac{1}{3}} - 1 = 12\%$$

23. C.

$$YTM = \left[\frac{1000}{737.96} \right]^{\frac{1}{3}} - 1 = 10.66\%$$

24. A.

Investors in a mortgage Pass-through security receive the monthly cash flows generated by the underlying pool of mortgages, less any servicing fees. The fees account for the fact that the Pass-through coupon rates are less than the average coupon rate of mortgages in the pool. The other answer choices are true. Note that the average maturity of the underlying mortgages will be different from the average life of the pool due to prepayment

25. A.

Increasing yield volatility increases as the value of both put options and call options, which increases the value of a puttable bond (which is long the put option) but decreases the value of a callable bond (which is short the call option).

26. B.

Bond B has the lower coupon, so bond B has the higher duration. The higher the duration, the higher the price sensitivity to a curve move. So bond B has the higher price volatility.

27. D.

The price of the bond one year ago was ₦95.03 to yield 10%. If the yield stays at 10%, the price of the bond today is:

$$\frac{8}{1.10^1} + \frac{108}{1.10^2} = 96.53$$

The change in price attributable to moving to maturity = ₦96.53 – ₦95.03 = ₦1.50.

28. C.

Duration of a perpetuity = $(1 + y)/y$; thus, the duration of a perpetuity is determined by the yield and is independent of the cash flow.

29. C.

Convexity measures the rate of change of the slope of the price-yield curve, expressed as a fraction of the bond's price.

30. B.

$$\frac{\Delta P}{P} = -MD \times \Delta y + \frac{1}{2} \times C \times (\Delta y)^2 = -10.6 \times (-0.02) + \frac{1}{2} \times 210 \times (0.02)^2 = 25.4\%$$



Pilot Questions - 2021

Paper 3.0(B)

Set 3

Derivatives & Financial Engineering

- Which of the following statement about forward contracts is **FALSE**?
 - Both parties to a forward contract have potential default risk.
 - The short promises to sell the asset.
 - A forward contract can be exercised at any time.
 - The long promises to purchase the asset.
- Which of the following statements regarding currency forward contracts is **FALSE**?
 - Currency forward contracts can be settled in cash or by delivery.
 - A currency forward contract can be used to hedge the exchange rate risk of an expected payment in foreign currency at a future date.
 - If the domestic currency appreciates over the term of the contract, the party that is long the foreign currency will have losses on the contract.
 - A long position in a currency that appreciates more than expected over the term of the contract will have a positive value at contract expiration.
- You have the following facts.

Spot exchange rate ₦150 = \$1

Risk-free rate in Nigeria 8%

Risk-free rate in USA 2%

Assume simple rate.

The 9-month forward exchange rate is close to:

 - 144
 - 159
 - 142
 - 157
- A bond pays a semiannual coupon of N40. The current spot price is N888. The next payment is due in 4 months and the interest rate is 10%. Using the continuous-time model, the price of a 6-month forward contract on this asset is:

- a. N889.37
 - b. N892.86
 - c. N933.53
 - d. N1,037.35
5. If an investor expects that the price of a stock is going to rise dramatically, which of the following actions would be most appropriate?
- A. Buying a put option
 - B. Buying a call option
 - C. Writing a put option
 - D. Writing a call option
6. Which of the following variables would NOT result in an increase in the value of a call option?
- A. The passage of time
 - B. An increase in the risk-free rate.
 - C. An increase in the stock price.
 - D. Greater volatility of the price of the underlying shares.
7. A put option with an exercise price of ~~N45~~ is trading for ~~N3.50~~. The current stock price is ~~N45~~. What is the **most likely** effect on the options delta and gamma if the stock price increases to ~~N50~~?
- A. Both delta and gamma will increase
 - B. Both delta and gamma will decrease
 - C. One will increase and the other will decrease
 - D. None of the above answers is correct
8. George Carons holds 47,000 shares of JTE common stock. If the call option for the JTE has a delta of 0.90 in order to construct a delta-neutral hedge, he needs to:
- A. buy 42,300 call options
 - B. sell 42,300 put options
 - C. sell 52,222 call options
 - D. buy 52,222 call options

Portfolio Management

9. A non dividend paying stock, with a beta value of 0.9 with respect to a market with 15% expected returns, is currently quoted at 48 EUR. You expect the stock to be valued at 52 EUR after one year. Assuming a risk free rate of 5%, calculate the alpha for the stock and choose the correct answer.
- A. The stock is undervalued.
 - B. The stock is correctly priced.
 - C. The stock is overvalued.
 - D. The stock cannot be valued with available data.

10. Which of the following statements is false regarding diversification?
- A. Addition of another asset to an existing portfolio increases diversification.
 - B. Additional diversification moves the efficient frontier to the right.
 - C. The more assets there are in an equally weighted portfolio, the less each asset will add to the diversification benefits.
 - D. Diversification reduces only the unsystematic risk.
11. When defining the strategic asset allocation, one should essentially take into account:
- I. The level of risk aversion decided by the client.
 - II. The variances and covariances between all asset classes.
 - III. The short term risk considerations.
- A. Statements I, II and III are true.
 - B. Only statements I & II are true.
 - C. Only statements II & III are true.
 - D. Only statements I & III are true.
12. In the case of an international portfolio, diversification is possible due to:
- I. Imperfect correlation between the various international stock markets.
 - II. Imperfect correlation between the various currencies.
 - III. Imperfect correlation between the currencies and international stock markets.
- A. I, II and III.
 - B. Only I & II.
 - C. Only II & III.
 - D. Only III.
13. A stock has gradually gone from being a growth stock to a value stock to a cheap value stock. We can safely assume that in the case of this stock.
- A. The P/E ratio has been constant, but high.
 - B. The P/E ratio has been decreasing.
 - C. The P/E ratio has been increasing.
 - D. The P/E ratio has been constant, but low.
14. Using the SML, you calculate the expected returns of two stocks A and B in your portfolio as $R_A = 6.5\%$ and $R_B = 14\%$ respectively. (You have used the risk free return, $R_F = 4\%$ and the expected market return, $R_M = 9\%$). Assume that risk is measured by the beta (i.e. only the market risk is considered). Using the CAPM model, we can say that

- A. Stock A is twice as risky as Stock B.
- B. Stock B is twice as risky as Stock A.
- C. Stock A is 4 times as risky as Stock B.
- D. Stock B is 4 times as risky as Stock A.

15. An investment is made in stock 1 for two periods and then the amount is moved to stock 2 for another 2 periods. The applicable returns for each stock are given below. Ignoring, transaction costs, what is the total holding period return to the investor?

	Period 1	Period 2	Period 3	Period 4
Stock 1	+ 10%	-10%		
Stock 2			-10%	+10%

- A. -2.01%
 - B. -1.99%
 - C. -1%
 - D. 0%
16. The only risk-adjusted performance measure that does not require the identification of a "Market Portfolio" is:
- A. Sharpe's measure.
 - B. Treynor's measure.
 - C. Jensen's alpha.
 - D. Appraisal ratio.
17. Based on their relative degrees of risk tolerance
- A. investors will hold varying amounts of the risky asset in their portfolios.
 - B. all investors will have the same portfolio asset allocations.
 - C. investors will hold varying amounts of the risk-free asset in their portfolios.
 - D. investors will hold varying amounts of the risky asset and the risk-free asset in their portfolios.
18. An investor can choose to invest in T-bills paying 5% or a risky portfolio with end-of-year cash flow of ₦132,000. If the investor requires a risk premium of 5%, what would she be willing to pay for the risky portfolio?
- A. ₦100,000
 - B. ₦108,000
 - C. ₦120,000
 - D. ₦145,000
19. The standard deviation of a portfolio that has 20% of its value invested in a risk-free asset and 80% of its value invested in a risky asset with a standard deviation of 20% is
- A. 18%
 - B. 14%

- C. 12%
- D. 16%

20. If the standard deviation of stock 'A' is 40, the standard deviation of stock 'B' is 32, and the correlation between stocks 'A' and 'B' is 0.75, what is the covariance between stocks 'A' and 'B'?
- A. 1,280
 - B. 40
 - C. 960
 - D. 32
21. According to the mean-variance criterion, which one of the following investments dominates all others?
- A. $E(r) = 0.15$; Variance = 0.20
 - B. $E(r) = 0.10$; Variance = 0.20
 - C. $E(r) = 0.10$; Variance = 0.25
 - D. $E(r) = 0.15$; Variance = 0.25
22. Consider a risky portfolio, A, with an expected rate of return of 0.15 and a standard deviation of 0.15, that lies on a given indifference curve. Which one of the following portfolios might lie on the same indifference curve?
- A. $E(r) = 0.15$; Standard deviation = 0.20
 - B. $E(r) = 0.15$; Standard deviation = 0.10
 - C. $E(r) = 0.10$; Standard deviation = 0.10
 - D. $E(r) = 0.20$; Standard deviation = 0.15

Commodity Trading & Futures

23. On a given day, the spot price of silver is ~~N~~43.125 per ounce. The futures prices for 3-, 6-, 9- and 12-month contracts are ~~N~~43.635, ~~N~~43.945, ~~N~~44.175 and ~~N~~44.325 per ounce, respectively. This is an example of a market.
- A. with high volatility
 - B. with low volatility
 - C. in contango
 - D. in backwardation
24. You sold short two index futures contract at the opening price of 452.25 on July 1. The multiplier on the contract is ~~N~~500. The initial margin requirements is \$9,000 per contract and the maintenance margin is ~~N~~6,000 per contract. The settlement price for July 1 is 453.95. What is the balance of your margin account at the end of the day on July 1?
- A. ~~N~~19,700

- B. ₦16,300
- C. ₦9,850
- D. ₦8,150

25. In futures markets, the 'basis' refers to the:

- A. Standard size of a derivative contract.
- B. Minimum amount of cash that a dealer must maintain in a trading account.
- C. Price used in contract settlement.
- D. Difference between the spot price and futures contract price.

26. The theoretical price of a forward contract:

- A. Equals the long's expectation of the future price of the underlying asset.
- B. Includes accrued interest on a bond forward contract.
- C. Is always greater than the current price of the underlying asset.
- D. Is the no-arbitrage price.

27. At expiration, the value of a forward contract is:

- A. The difference between the contract price and the market value of the underlying asset.
- B. Always greater than or equal to zero.
- C. Equal to the market price of the underlying asset.
- D. The difference between the buy price for the long and the sell price for the short.

28. The long pays a premium of ₦10,000 to enter into a forward contract with dealer. This is an example of a(n):

- A. Premium contract.
- B. Mispriced or out-of-equilibrium contract.
- C. Off-market contract.
- D. Positive-value contract.

29. The distinguishing figures of an off-market forward contract is that:

- A. Its value at contract initiation is not equal to zero.
- B. The contract price is not equal to the spot price at contract initiation.
- C. It is priced based on market prices, rather than expectations.
- D. It is priced off the yield curve for spot rates, not the yield to maturity curve.

30. Which of the following is NOT true about forward and futures contracts?

- A. The futures contracts are traded on exchanges while forward contracts are traded in the over-the-counter market
- B. In theory forward prices and futures prices are equal when there is no uncertainty about future interest rates
- C. Forward contracts are typically more liquid than futures contracts
- D. Taxes and transaction costs can lead to forward and futures prices being different



Pilot Solutions - 2021

Paper 3.0 (B)

Set 3

Derivatives & Financial Engineering

1. C.

Delivery must be at expiration of the contract.

2. C.

The forward exchange rate in the contract will reflect the expected appreciation or depreciation of the currency. If a currency appreciated by more than the expected appreciation implicit in the forward exchange rate, the party that is long that currency will have gains. An appreciation of one does not equate to gains to the party that is long that currency; if it appreciates by less than the appreciation reflected in the forward exchange rate, the long will have losses.

3. D.

$$\begin{aligned}\text{Using } F &= S_0(I+r/I+q)^T \\ &= 150 (1.08/1.02)^{0.75} = 157.\end{aligned}$$

4. B.

$$\begin{aligned}\text{Using: } F &= S_0e^{rT} - FV (\text{ Future CFs}) \\ &= 888e^{0.10 \times 0.5} - 40e^{0.10 \times 2/12} = 892.86\end{aligned}$$

Note: You could also use:

$$F = (S_0 - I) e^{rT}, \text{ Where}$$

$$I = 40e^{-0.10 \times 4/12} = 38.687$$

$$F = (888 - 38.687)e^{0.10 \times 0.5} = \text{\textcancel{N}892.86}$$

5. B.

The position with the largest payoff from a dramatic increase in market price would be to the holder of a long call. He or she could exercise the call and sell the stock at the higher market price.

6. A.

For three of the variables cited—an increase in the risk-free rate, an increase in the stock price, and greater volatility of the stock price—the value of a call option would increase. As the time to maturity decreases, the value of an option decreases.

7. D.

The put is currently in-the-money. As stock price increases, the put delta will increase to zero, becoming less negative. The put's gamma is at a maximum when the option is at-the-money. Therefore, out-of-the-money, its gamma will fall.

8. C.

In order to determine the number of call options, we divide the number of shares held by the delta of the options

$$\# \text{ option} = \frac{47,000}{0.90} = 52,222$$

Portfolio Management

9. C.

The predicted return on the stock based on the SML

$$E_{\text{CAPM}}(R) = R_F + \beta \cdot (R_M - R_F) = 0.05 + 0.9 (0.15 - 0.05) = 0.14 = 14\%$$

While the expected return on the stock is

$$E(R) = \frac{52 - 48}{48} = 0.0833 = 8.33\%$$

The stock alpha is $\sigma = 8.33\% - 14\% = -5.67\%$. The CAPM predicts a return of 14%, which is not consistent with your expectations of 8.33%. The stock is overvalued. Hence option c) is correct.

10. B.

The increase in diversification will make the efficient frontier shift to the left. Hence option b) is the correct answer.

11. B.

Strategic asset allocation involves long term risk considerations only. Short terms considerations affect the tactical asset allocation.

Hence option B) is correct.

12.A.

The diversification in the case of international investment is due to the imperfect correlation between the various international stock markets, between the currency changes and also between the various international stock markets and currencies.

Hence option A) is correct.

13.B.

Value stocks are usually defined as companies with **low** valuation multiples (P/B, P/E ratios) and high dividend yield while **growth stocks** are defined as companies with **high valuation multiples** (P/B, P/E) and low dividend yield.

Hence option B) is correct.

14.D.

We have the SML equation: $E(R_i) = R_F + [E(R_M) - R_F] \cdot \beta_i$

Given other parameters, we can calculate the beta values for A and B.

$$\beta_A = \frac{E(R_A) - R_F}{E(R_M) - R_F} = \frac{6.5 - 4}{9 - 4} = \frac{2.5}{5} = 0.5$$

$$\beta_B = \frac{E(R_B) - R_F}{E(R_M) - R_F} = \frac{14 - 4}{9 - 4} = \frac{10}{5} = 2$$

Since the beta of Stock B is 4 times beta of Stock A, we can say that Stock B is 4 times as risky as stock A.

Hence option D) is the correct.

15. B.

Total holding period return $= (1.10) (1 - 0.10) (1 - 0.10) (1.1) - 1 = - 1.99\%$

16.A.

17.D.

By determining levels of risk tolerance, investors can select the optimum portfolio for their own needs; these asset allocations will vary between amounts of risk-free and risky assets based on risk tolerance.

18. C.

$$(5\% + 5\%) = \frac{132,000}{P} - 1$$

$$1.10 = \frac{132,000}{P}$$

$$1.10P = 132,000$$

$$P = \text{₦}120,000$$

19. D.

$$0.8 \times 20\% = 16\%$$

20. C.

$$\text{COV} = (0.75) (40) (32)$$

$$= 960$$

21. A.

A gives the highest return with the least risk; return per unit of risk is 75, which dominates the reward-risk ratio for the other choices.

22. C.

Portfolio A has a reward to risk ratio of 1.0; portfolio C is the only choice with the same risk-return tradeoff.

Commodity Trading & Futures

23. C.

24. B.

The price has increased by 1.70. Because you have a short position you lose $1.7 \times \text{₦}500$ or $\text{₦}850$ per contract. The balance in the margin account therefore goes down from $\text{₦}18,000$ to $\text{₦}16,300$.

25. D.

26. D.

The theoretical price of a forward contract is the future price of the underlying asset imposed by the no-arbitrage conditions. It can be less than the current price of the asset if the cost-of-carry is negative. Accrued interest is paid by the long at delivery under a bond forward, but is not included in the price quote, which is usually in terms of yield to maturity at the settlement date.

27.A.

In a forward contract, the long is obligated to buy, and the short is obligated to sell, the underlying asset at the contract price. The difference between the contract price and the market price of the asset is what gives the contract value. The contract has a positive value at expiration to the long/short only if the contract price is below/above the market price.

28.C.

According to the no-arbitrage principle, the value of a forward contract at initiation is zero. When the contract price in a forward contract is set so that the contract has value at initiation, it is termed an off-market contract.

29.A.

A forward contract priced based on the market price of the underlying asset has zero value at initiation. When a different price is used, so that the contract value is different from zero at initiation, it is called an off-market contract.

30.C.

Futures contracts are more liquid than forward contracts. To unwind a futures position it is simply necessary to take an offsetting position. The statements in B, C, D are correct.