

SOA Official Source Readings and PAK subsections mapping (Part I and II)

Derivatives Markets (Third Edition), 2013, by McDonald, R.L., Pearson Education:

- **Chapter 1, Sections 1, 2, 4, 5:** PAK-section-6 from subsections 1 to 6.
- **Chapter 2, Sections 1-4:** PAK-section-6 from subsections 7 to 8 and PAK-section-6 from subsections 14 to 21.
- **Chapter 3, Sections 1-4:** PAK-section-6 subsection 22; PAK-section-7 subsection 1 and PAK-section-7 from subsections 15 to 20.
- **Chapter 5, Sections 1, 2, 3 (through the middle of p. 136), 4 (through the top of p. 143):** PAK-section-6 from subsections 9 to 13; PAK-section-6 from subsections 23 to 26; PAK-section-6 from subsections 7 to 8
- **Chapter 9, Sections 1 (through the bottom of p.269), 3:** PAK-section-7 from subsections 2 to 14; PAK-section-7 subsection 21;
- **Chapter 10, Sections 1-5, 6 (through the middle of p. 315):** PAK-section-8 from subsections 1 to 10
- **Chapter 11, Section 1:** PAK-section-8 subsection 11
- **Chapter 12, Sections 1-3, Appendices A, B:** PAK-section-9 from subsections 9 to 13; PAK-section-10 from subsections 3 to 10; PAK-section-10 from subsections 12 to 16
- **Chapter 13, Sections 1-4, 5 (beginning at the bottom of p.398), 6:** PAK-section-10 from subsections 17 to 26
- **Chapter 14, Sections 1, 2 (through the bottom of p.413), 3 (through the bottom of p.416), 4 (through the bottom of p. 419), 5 (through Figure 14.4 on p.423), 6, Exercises 14.20 and 14.21 on p.429:** PAK-section-9 from subsections 14 to 15; PAK-section-10 from subsections 17 to 26; PAK-section-7 from subsections 22 to 28
- **Chapter 18, Sections 1-4, Appendix A, Appendices B.1, C:** PAK-section-9 from subsections 1 to 8

Corporate Finance (Fourth Edition), 2017, by Berk, J. and DeMarzo, P., Pearson:

- **Chapter 8, Section 5:** PAK-section-4 subsection 2
- **Chapter 9, Section 5:** PAK-section-3 from subsections 1 to 3.
- **Chapter 10 (all sections):** PAK-section-1 from subsections 1 to 13
- **Chapter 11 (all sections):** PAK-section-1 from subsections 14 to 20 and PAK-section-2 from subsections 2 to 3
- **Chapter 12 (all sections):** PAK-section-2 subsection 1 and PAK-section-2 from subsections 4 to 9.
- **Chapter 13 (all sections):** PAK-section-3 from subsections 4 to 15 and PAK-section-2 subsection 10.
- **Chapter 14, Sections 1-3:** PAK-sections-5 from subsections 0 to 7.
- **Chapter 15, Sections 1-2:** PAK-sections-5 from subsections 8 to 11.
- **Chapter 16 (all sections):** PAK-sections-5 from subsections 13 to 25.
- **Chapter 22, Sections 1-4:** PAK-sections-4 from subsections 4 to 11.
- **Chapter 23, Sections 1-3:** PAK-sections-5 from subsections 26 to 33.

- Chapter 24, Sections 1-2: PAK-sections-5 from subsections 34 to 36.

SOA-approved Study Notes:

- **IFM-21-18: Measures of Investment Risk, Monte Carlo Simulation, and Empirical Evidence on the Efficient Market Hypothesis:** PAK-section-4 subsection 1; PAK-section-4 subsection 3 and PAK-section-3 subsection 16.
- **IFM-22-18: Actuarial Applications of Options and Other Financial Derivatives:** PAK-section-6 subsection 4; PAK-section-6 subsection 19; PAK-section-6 subsections 27 to 29; PAK-section-7 subsection 3; PAK-section-9 subsection 16; PAK-section-10 subsection 27.

CONTENTS OF PAK-PART I- Corporate Finance

PAK-section-1: Mean Variance Portfolio theory (10%-15%)

1. Common measures of risk and return
2. Calculating realized returns
3. The empirical distribution of the returns
4. The historical volatility of returns and the standard error of estimate
5. The historical trade-off between risk and return
6. Individual risk versus portfolio risk: An insurer's perspective
7. The role of diversification in a large portfolio of insurable risk
8. Idiosyncratic risk versus systematic risk
9. The risk premium: Individual stock and portfolio
10. Is long run diversification a fallacy?
11. Identifying systemic risk: The market portfolio
12. Measuring the systemic risk of a security
13. The cost of capital of a security
14. The expected return of a portfolio
15. The two-assets portfolio: expected return and volatility
16. The volatility of a large portfolio
17. Efficient portfolios with two stocks
18. Efficient portfolios with short sales and many assets
19. Including the risk-free asset to a portfolio of risky assets
20. Required return for an asset given a portfolio
21. *MOCK problems and solutions for SOA-section-1 (next release)*

PAK-section-2: Asset pricing models (5%-10%)

1. The Market Portfolio
2. The CAPM Assumptions and the Capital Market Line (CML)
3. The Security Market Line (SML) and the CAPM Model
4. Determining the risk-free rate and the risk premium
5. Determining a security's Beta
6. Models for approximating the debt cost of capital
7. The cost of capital of a project- An All-equity as comparable
8. The cost of capital of a project- A levered firm as comparable
9. The Weighted Average Cost of Capital and the unlevered cost of capital
10. The Fama-French-Carhart (FFC) multifactor model
11. *MOCK problems and solutions for SOA-section-2 (next release)*

PAK-section-3: Market efficiency and Behavioral finance (5%-10%)

1. Information in stock prices
2. Competition and efficient markets

3. The efficient market hypothesis versus no-arbitrage
4. Market competition and the CAPM equilibrium model
5. Information and rational expectations
6. Under-diversification and portfolio biases
7. Excessive trading and overconfidence
8. The disposition effect
9. Investor attention, mood and experience
10. The herd behavior
11. Trading on news or recommendations
12. Size effects
13. Momentum
14. The Efficient Market hypothesis, the efficiency of the market portfolio and the CAPM
15. Implications of positive-alpha trading strategies
16. Empirical evidence for/against the EMH
17. *MOCK problems and solutions for SOA-section-3 (next release)*

PAK-section-4: Investment risk and project analysis (10%-15%)

1. Risk Measures
2. Tools for investment analysis (Breakeven analysis, sensitivity and scenario analysis)
3. Monte Carlo Simulation
4. Definition of real option and comparison to financial option
5. Decision Tree analysis (DTA) versus NPV analysis
6. Decision Tree Analysis and Real Option Analysis (ROA)
7. BSM valuation of the option to delay investment
8. Replicating portfolio approach to value the option to defer an investment
9. Risk-neutral binomial tree approach to value a growth option
10. Option to expand
11. Option to abandon
12. *MOCK problems and solutions for SOA-section-4 (next release)*

PAK-section-5: Capital structure (10%-15%)

0. Introduction to capital structure
1. Financing a firm with equity
2. MM1 proposition
3. Financing a firm with debt and equity
4. Homemade Leverage financing
5. MM1 and the Market Value Balance Sheet
6. MM2 and the cost of capital of a levered firm
7. Computing the WACC using multiple securities
8. The interest tax deduction of a corporate entity
9. The value of the levered firm
10. The Interest tax shield with permanent debt
11. The Weighted Average Cost of Capital with taxes
12. **CAPM and MM: The Beta of a levered firm in a world with taxes**
13. Risky debt in MM's perfect capital markets
14. Optimal capital structure-1: The trade-off theory

15. The agency costs of leverage
16. The asset substitution problem
17. The debt overhang and the under-investment problem
18. Agency costs and the value of leverage
19. The leverage Ratchet Effects
20. Debt maturity and covenants
21. Leverage and management entrenchment
22. Optimal capital structure-2: Agency costs/benefits and the trade-off theory
23. The signaling theory of debt
24. The adverse selection problem and the issuance of equity
25. The adverse selection problem and the implications for capital structure
26. The sources of funding of a private company
27. Venture capital investing: Preferred stocks and funding rounds
28. Venture capital financing terms- Features of convertible preferred stocks
29. Exiting an investment in a private company
30. Initial Public Offering (IPO): Advantages and disadvantages
31. Types of offerings
32. The mechanics of an IPO
33. The four IPO puzzles
34. Public corporate bond
35. Private Debt
36. Other types of Debt
37. *MOCK problems and solutions for SOA-section-5 (next release)*

CONTENTS OF PAK-PART II- DERIVATIVES PRICING

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22. Definition of a derivative
23. Overview of financial markets
24. The role of financial markets
25. The uses of derivatives
26. Perspectives on derivatives
27. Buying and short selling financial assets
28. Definition of forward contracts
29. Payoff of a forward contract
30. Comparing a forward contract to an outright purchase
31. Comparing a forward contract to a fully leveraged purchase
32. Comparing an outright purchase to a fully leverage purchase
33. Prepaid forward contracts: Finding the prepaid forward price
34. Dividend paying stocks: Forward contracts and outright purchase
35. Zero Coupon Bond (ZCB) in payoff and profit diagrams
36. Settlement of a forward contract
37. Credit risk
38. Introduction to call options
39. Introduction to put options
40. *Life insurance applications: Equity Index Based Insurance products*
41. Moneyness of an option
42. Summary of forward and option positions
43. Introduction to put call parity and the synthetic forward contract
44. Creating a synthetic forward contract
45. *Derivatives written on a dividend-paying stock*
46. The forward price as predictor of the Future spot price
47. Futures Contract
48. Options and guarantees in mortgage loans
49. Guarantee in a property insurance contract: Guaranteed replacement cost coverage
50. Option in a DB pension benefit: Inflation indexing
51. *35 MOCK problems and solutions for SOA-section-6*

PAK-section-7: General properties of options (10%-15%)

1. Basic insurance strategies
2. Put-Call parity
3. Put-call parity with applications: Synthetic purchase of stock
4. Put-call parity with applications: Synthetic Treasury Bill
5. Put-call parity with applications: Forward price and pre-paid forward price
6. Put-call parity with applications: Options on currencies

7. Put-call parity with applications: Options on Bonds
8. Put-call parity with applications: Stock paying uncertain dividend
9. European versus American Options
10. Maximum and Minimum option prices
11. Early exercise for American options on a non-dividend paying asset
12. Early exercise for American options on a dividend paying stock
13. Comparing options with respect to maturity
14. Comparing options with respect to strike
15. Bull and Bear spreads
16. Box spreads
17. Ratio spreads
18. Collars
19. Straddles and strangles
20. Butterfly spreads
21. Arbitrage opportunities with spread options
22. Asian options
23. Asian options in a currency exchange hedge
24. Barrier Options
25. Barrier options in a currency exchange hedge
26. Compound options
27. Gap options
28. Exchange options
29. *An option theory's perspective of a firm's equity and debt*
30. Guarantees and options associated with a variable annuity product
31. Other exotic options: Chooser option, forward start option and others
32. *35 MOCK problems and solutions for SOA-section-7*

PAK-section-8: Binomial option pricing models (10%)

0. *Introduction to Binomial option pricing models*
1. One-period binomial tree: Illustrative example
2. The Binomial Solution: Two approaches for pricing derivatives
3. Arbitrage opportunities in the Binomial model
4. Risk neutral pricing
5. The continuously compounded return of an asset
6. The volatility of an asset
7. Example of pricing a put option: Two period Binomial tree
8. Two period binomial tree for an American option
9. Binomial option models and other assets
10. Numerical example of European and American options
11. Understanding early exercise
12. *Applying Binomial models to life insurance derivatives*
13. *Applying binomial models to price a Gap option*
14. *Non-recombining binomial tree for asset prices*
15. *Options in pension plans.*
16. *30 MOCK problems and solutions for SOA-section-8*

PAK-section-9: Black Scholes option pricing models (10%-15%)

1. Why consider the lognormal distribution for asset prices?
2. The lognormal model for asset prices
3. Lognormal probabilities and expectations calculations
4. Value at Risk (VAR) under the lognormal model
5. The conditional expected price under the binomial model
6. *Option prices as conditional expected payoffs under any model for asset prices*
7. The conditional expected price under the lognormal model
8. Pricing options under the lognormal mode for asset prices
9. The Black Scholes formula
10. The assumptions of the Black Scholes formula
11. The Black Scholes formula for stock paying discrete dividends
12. The Black Scholes formula for currencies options
13. The Black Scholes formula for option on Futures
14. The Black Scholes formula for gap options
15. The Black Scholes formula for exchange options
16. *The Black Scholes formula for equity based life insurance liabilities*
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PAK-section-10: Option Greeks and risk management (5%-10%)

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2. Delta neutral portfolio under the BSM model
3. Delta of a portfolio of derivatives
4. Gamma of a portfolio of derivatives
5. Vega of a portfolio of derivatives
6. Theta of a portfolio of derivatives
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8. Psi of an option
9. Greeks measure for portfolios
10. Relationship between Delta, Gamma and Theta
11. *Extension of the Greeks: Dividend paying assets, currency options*
12. Option elasticity
13. The volatility of an option
14. The risk premium and beta of an option
15. The Sharpe ratio of an option
16. The elasticity and risk premium for a portfolio
17. Market-makers
18. Delta hedging for two days
19. Delta hedging for several days
20. Using Gamma to better approximate the change in an option price
21. Accounting for the passage of time in the Delta-Gamma approximation
22. Understanding the Market-maker's profit
23. Frequency of delta hedging: Daily or hourly?
24. Delta-hedging in practice
25. Gamma neutrality
26. Is market-making an insurance business?
27. Hedging techniques for variable annuities and other insurance products
28. *Black Scholes model, CAPM and Modigliani and Miller*

29. 30 MOCK problems and solutions for SOA-section-10