

INV 201 – Quantitative Finance

Nov 2025/Mar 2026/Jul 2026

Important Course Information:

Exam Registration	Candidates may register online or with an application.
Order Study Notes	Study notes are part of the required syllabus and are not available electronically but may be purchased through the online store.
Syllabus Resources	Resources listed in this syllabus may include study notes, online readings, textbooks, videos and module content. Candidates are responsible for all materials in their entirety, including sections such as Appendices, unless it is stated otherwise in the syllabus.
Topic Weight Ranges	These have been provided to indicate the relative emphasis on each topic. The ranges of weights shown are intended to apply broadly over multiple sittings; however, the weights of topics on any individual exam could fall outside the published range. Candidates should also recognize that some questions will cover multiple learning objectives.
Learning Outcomes	Each resource listed indicates the specific learning outcome(s) it aligns with under that particular topic. Resources are listed in the recommended order of study to best master the overall topic and learning objective. For additional guidance, please see the course strategy guide.
Introductory Study Note	The Introductory Study Note has a complete listing of all study notes as well as errata and other important information.
Case Study	A case study will not be provided for this examination.
Past Exams	Past Exams from Fall 2020-present are available on SOA website.
Updates	Candidates should be sure to check for updates on the course homepage periodically for additional corrections or notices to the current syllabus.
Formula Package	A Formula Package will be provided with the exam. Please see the Introductory Study Note for more information.
Cumulative Table	A Cumulative normal distribution table will be provided with the exam.

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1. Topic: Key Types of Derivatives (5%-15%)	
Learning Objectives	
The candidate will understand key types of derivatives.	
Learning Outcomes	
<p>The Candidate will be able to:</p> <p>a) Understand the payoffs of basic derivative instruments including:</p> <ul style="list-style-type: none"> • Forwards • Futures • Swaps • Calls • Puts • Caps • Floors • Swaption • Currency <p>b) Be able to identify the key differences between forwards and futures</p> <p>c) Be able to compare European, American, Bermudan, Asian options, and various exotic options</p> <p>d) Understand the mechanics of derivatives trading including:</p> <ul style="list-style-type: none"> • Exchange traded vs OTC • Central Clearing • Daily margin variation and daily settle <p>e) Understand basic derivatives strategies including:</p> <ul style="list-style-type: none"> • Call spreads • Put spreads • Collars • Covered calls • Butterfly spreads • Straddles and strangles 	
Resources	Learning Outcomes
<p><i>Options, Futures, and Other Derivatives</i>, Hull, John C., Pearson, 11th Edition, 2021</p> <ul style="list-style-type: none"> • Ch. 1: Introduction (Sections 1.1-1.5) 	1a, 1c, 1d

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• Ch. 2: Futures Markets and Central Counterparties (Sections 2.1-2.8; 2.11)	<i>1b, 1d</i>
• Ch. 7: Swaps (Sections 7.1-7.2)	<i>1a</i>
• Ch. 12: Trading Strategies Involving Options (Sections 12.1-12.5)	<i>1e</i>
• Ch. 17: Options on Stock Indices and Currencies (Sections 17.2)	<i>1a, 1b, 1c</i>
• Ch. 26: Exotic Options (Sections 26.3; 26.8-26.11; 26.13; 26.16)	<i>1c</i>
• Ch. 29: Interest Rate Derivatives: The Standard Market Models (Sections 29.2-29.3)	<i>1a</i>

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2. Topic: Valuation of Derivatives (40%-60%)	
Learning Objectives	
The candidate will understand the principles and techniques for the valuation of derivatives.	
Learning Outcomes	
<p>The Candidate will be able to:</p> <ol style="list-style-type: none"> a) Understand the principles of no-arbitrage and replication in asset pricing. b) Understand Arrow-Debreu security and the distinction between complete and incomplete markets c) Understand put-call parity and price bounds d) Understand Stochastic Calculus theory and technique used in pricing derivatives including: <ul style="list-style-type: none"> • Stochastic differential equations • Ito integral • Ito's Lemma • Martingales, • Change of numeraire • Girsanov's theorem e) Understand and apply the concepts of risk-neutral measure, forward measure, normalization, and the market price of risk f) Understand option pricing techniques including: <ul style="list-style-type: none"> • Calculating an expectation • By solving an PDE g) Understand the limitations of the Black-Scholes-Merton model h) Understand and apply numerical discretization methods to price options including Euler-Maruyama discretization and transition density methods i) Calibrate a model to observed prices of traded securities including fitting to a given yield curve j) Define and explain the concept of volatility smiles and describe several approaches for modeling smiles, including stochastic volatility, local- volatility, jump-diffusions. 	
Resources	Learning Outcomes
<i>Options, Futures, and Other Derivatives</i> , Hull, John C., Pearson, 11 th Edition, 2021 <ul style="list-style-type: none"> • Ch. 5: Determination of Forward and Futures Prices (Sections 5.1-5.14) • Ch. 13: Binomial Trees (Sections 13.1-13.3) 	2a, 2b
INV201-100-25: Chapter 5 of Financial Mathematics – A Comprehensive Treatment, Campolieti	2a, 2b
<i>Options, Futures, and Other Derivatives</i> , Hull, John C., Pearson, 11 th Edition, 2021	

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<ul style="list-style-type: none"> • Ch. 11: Properties of Stock Options (Sections 11.1-11.7) • Ch. 14: Wiener Processes and Ito's Lemma (Sections 14.1-14.8) • Ch. 28: Martingales and Measures (Sections 28.1-28.4; 28:7-28.8) • Ch. 31: Equilibrium Models of the Short Rate (Section 31.3) 	<p>2c</p> <p>2d, 2e</p> <p>2d, 2e</p> <p>2d, 2e</p>
<p>Understanding the Connection Between Real-World and Risk-Neutral Generators, SOA Research, Aug 2022, Sections 1-5, and Appendices A & D</p> <ul style="list-style-type: none"> • Companion Excel Tool 	<p>2d, 2e</p>
<p><i>Options, Futures, and Other Derivatives</i>, Hull, John C., Pearson, 11th Edition, 2021</p> <ul style="list-style-type: none"> • Ch. 15: The Black-Scholes-Merton Model (Sections 15.1-15.12) 	<p>2e, 2f</p>
<p>INV201-101-25: Chapter 6 of Introduction to Stochastic Finance with Market Examples by Privault (Sections 6.1-6.4)</p>	<p>2f</p>
<p>INV201-102-25: How to Use the Holes In Black-Scholes</p>	<p>2g</p>
<p>Calibrating Interest Rate Models (Section 1.1-4.3 excl 4.1.2)</p>	<p>2g-2i</p>
<p><i>The Volatility Smile</i>, Derman, Emanuel and Miller, Michael, 2016</p> <ul style="list-style-type: none"> • Ch. 8: The Smile: Stylized Facts and Their Interpretation • Ch. 10: A Survey of Smile Models 	<p>2j</p>
<p><i>Options, Futures, and Other Derivatives</i>, Hull, John C., Pearson, 11th Edition, 2021</p> <ul style="list-style-type: none"> • Ch. 20: Volatility Smiles and Volatility Surfaces (Sections 20.1-20.8) • Ch. 27: More on Models and Numerical Procedures (Sections 27.1-27.3) 	<p>2j</p>
<p><i>Problems and Solutions in Mathematical Finance: Stochastic Calculus</i>, Chin, Eric, Nel, Dian and Olafsson, Sverrir, 2014</p> <ul style="list-style-type: none"> • Pg. 52: Definitions 2.1 & 2.2; Theorems 2.3 & 2.4 • Pp. 57-58: Question 4 • Pp. 72-73: Question 3 • Pp. 97-98: Theorems 3.3 • Pp. 128-130: Questions 6 & 7 • Pp. 132-137: Questions 10-12 • Pp. 146-147: Question 19 • Pp. 186-188: Definition 4.1(b), Definition 4.1(f) and Theorem 4.2 • Pp. 221-227: Questions 1-5 • Pp. 233-242: Questions 12-17 	<p>2a, 2b, 2d, 2f</p>

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3. Topic: Applications and Risks of Derivatives (30%-50%)	
Learning Objectives	
The candidate will understand various applications and risks of derivatives.	
Learning Outcomes	
<p>The Candidate will be able to:</p> <ul style="list-style-type: none"> a) Understand the Greeks of derivatives b) Understand static and dynamic hedging c) Understand delta hedging, and the interplay between hedging assumptions and hedging outcomes d) Understand the concepts of realized versus implied volatility e) Understand how hedge strategies may fail f) Identify and evaluate embedded options in liabilities (e.g., indexed annuity, structured product based variable annuity, and variable annuity guarantee riders including GMxB, etc.) g) Demonstrate an understanding of hedging for embedded option in liabilities with: <ul style="list-style-type: none"> • Risks that can be hedged, including those of equity, interest rate, volatility, and cross Greeks, • Risks that can only be partially hedged or cannot be hedged, including those of policyholder behavior, mortality, basis, counterparty, correlation, and operational failures h) Demonstrate an understanding of target volatility funds and their effect on fund performance, guarantee cost, and risk control 	
Resources	Learning Outcomes
<p><i>Options, Futures, and Other Derivatives</i>, Hull, John C., Pearson, 11th Edition, 2021</p> <ul style="list-style-type: none"> • Ch. 19: The Greek Letters (Sections 19.1-19.9) • Ch. 26: Exotic Options (Section 26.17) 	<p style="text-align: right;"><i>3a</i></p> <p style="text-align: right;"><i>3b</i></p>
<p><i>The Volatility Smile</i>, Derman, Emanuel and Miller, Michael, 2016</p> <ul style="list-style-type: none"> • Ch. 3: Static and Dynamic Replication • Ch. 5: The P&L of Hedged Option Strategies in a Black-Scholes-Merton World • Ch. 6: The Effect of Discrete Hedging on P&L • Ch. 7: The Effect of Transaction Costs on P&L 	<p style="text-align: right;"><i>3c, 3e</i></p> <p style="text-align: right;"><i>3c, 3d</i></p> <p style="text-align: right;"><i>3c, 3e</i></p> <p style="text-align: right;"><i>3c, 3e</i></p>
INV201-104-25: Which Free Lunch Would You Like Today, Sir?	<i>3e</i>
<p><i>Options, Futures, and Other Derivatives</i>, Hull, John C., Pearson, 11th Edition, 2021</p> <ul style="list-style-type: none"> • Ch. 37: Derivatives Mishaps and What We Can Learn from Them (Sections 37.1-37.3) 	<i>3e</i>
INV201-105-25: An Introduction to Computational Risk Management of Equity-Linked Insurance, Feng, 2018 (sections 1.2-1.3, 4.7 & 6.2-6.3)	<i>3f, 3g</i>

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INV201-106-25: Variable Annuity Volatility Management: An Era of Risk-Control	<i>3f, 3g</i>
INV201-108-25: Mitigating Interest Rate Risk in Variable Annuities: An Analysis of Hedging Effectiveness under Model Risk	<i>3f, 3g</i>
INV201-107-25: It's RILA time: An introduction to registered index- linked annuities (excluding Appendices)	<i>3g</i>
INV201-109-25: Investment Instruments with Volatility Target Mechanism	<i>3h</i>