**Derivatives and Risk Management (FIN-3004)**

**Ashoka University (Spring 2024)**

**Instructor:** Sidharth Sinha (sidharth.sinha@ashoka.edu.in)

**Teaching Associates**:

**Office Hours for the Instructor:** Fridays tentatively or by appointment

**About the Course:**

Futures and Options are the two basic derivative securities. Derivative securities get their name from the fact that their value and risk is ‘derived’ from the value and risk of the underlying asset. They enable transfer of risk of the underlying asset without actually transferring the underlying asset.

This course provides the conceptual basis and tools and techniques for pricing derivative securities and using them for risk management of market exposures.

While derivatives are one of the most mathematically sophisticated areas of finance, it is possible to explain the fundamental principles in simple-to-understand and relatively non-mathematical terms. This course, while being formal and rigorous, also builds the accompanying intuition, essential for effective use of derivative securities.

**Prerequisites:**

The course assumes that the student has taken a first course in Finance and a first course in Probability and Statistics.

**Course Text:**

* **"Options, Futures and other Derivatives"**, John Hull, 11th edition, Pearson Education India. This is the ‘standard’ text for derivatives.
* **Class Notes** which will be provided to you at the beginning of the semester.

 It is **necessary** to get hard copies of both the textbook and the notes.

**Evaluation**

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| Take home assignments | 20% |
| Class Participation and Attendance | 10% |
| Mid-term exam  | 35% |
| Final Exam  | 35% |

**10% Class participation and Attendance**

**20% Homework Assignments**:

There will be 5 assignments throughout the course. These will be based on the application of the concepts learnt in class. The grading for these assignments will be binary, i.e. students will receive full marks for attempting **all the questions**. The solutions for these assignments will be discussed in class, post-submission.

**35% Midterm Exam**:

This will be an **open-book, in-class exam** based on the topics covered up until the mid term break. The exam will test applications of the concepts covered. Students are expected to bring a physical copy of the textbook along with the class notes to the classroom for the examination. **Use of the Internet, even to access class materials, is strictly prohibited.** The date for this exam is yet to be decided.

**35% Final Exam**:

This will follow the same pattern as the midterm exam for the course. The syllabus for the exam is yet to be decided.

**Grading**:

This course will be graded absolutely. However, there may be relative grading with respect to other courses.

**Attendance**:

You are expected to attend at least 80% of the lectures. In case of emergencies, you will need to mail the Professor and the TAs with proof for the same in order to be granted an excused absence.

**Course Readings & Material:**

The material that will be covered in the lectures will be as follows. You will be required to complete some pre-reads before attending class.

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| **Session** | **Topics and Readings** |
| 1 | Derivative securities and markets (Ch. 1)Derman, Emanuel. “Models.” *Financial Analysts Journal*, vol. 65, no. 1, 2009, pp. 28–33.[Over-the-Counter Markets: What Are They?](https://www.imf.org/external/pubs/ft/fandd/2008/06/basics.htm), *Randall Dodd*, Finance and Development (Back to Basics), June 2008, Volume 45, Number 2BIS data on Derivatives markets |
| 2 | Review of interest rates and term structure (Ch. 4) |
|  | **Forwards and Futures** |
| 3-4 |  Forward contracts (Ch. 5) |
| 5-6 |  Futures contracts (Ch. 2, 5) |
|  | “The 18 Minutes of Trading Chaos That Broke the Nickel Market”, Business Week“Tycoon Whose Bet Broke the Nickel Market Walks Away a Billionaire” BNN Bloomberg |
| 7 | Commodity Futures |
| 8 | Bond futures |
| 9 | Stock index futures (Ch. 3) |
|  | “Market structures and systemic risks of exchange-traded funds”, Srichander Ramaswamy, BIS Working Papers No 343, April 2011 |
|  | Credit Suisse Group Special Committee of The Board of Directors Report on Archegos Capital Management **,** July 29, 2021 |
| 10 | Hedging with futures and basis risk (Ch. 3) |
|  | **Options** |
| 11-12 | Basic properties of options (Ch. 10, 11) |
|  | Trading Strategies Using Options (Ch. 12)“Box Spreads of Equity Index Options on Futures as a Financing Tool”, CME |
|  | **Mid term exam**  |
|  | **Binomial Option pricing** |
| 13-14 | Binomial Option Pricing (Ch. 13) |
| 15 | Binomial Option Pricing extensions (Ch. 13, 18, Ch.21:Examples 21.1 to 21.6) |
|  | **Black Scholes Option pricing** |
|  | Black-Scholes overview“Trading Volatility”, Emanuel Derman, Inference, vol. 4, no. 4, July 2019 |
| 16 | Black - Scholes Option Pricing (Ch. 15) |
|  | How we came up with the Option Formula, [Black, Fischer](https://www.proquest.com/indexinglinkhandler/sng/author/Black%2C%2BFischer/%24N?accountid=27540), [Journal of Portfolio Management](https://www.proquest.com/docview/195576366/fulltextPDF/199B3182A87448B5PQ/3?accountid=27540); [Vol. 15, Iss. 2,](https://www.proquest.com/indexingvolumeissuelinkhandler/49137/Journal%2Bof%2BPortfolio%2BManagement/01989Y01Y01%2423Winter%2B1989%243b%2B%2BVol.%2B15%2B%24282%2429/15/2?accountid=27540) (Winter 1989): 4 |
| 17-18 | Black - Scholes Option Pricing extensions (Ch. 17, 18) |
|  | “How to Use the Holes in Black-Scholes.”, Black, F., Journal of Applied Corporate Finance 1 (1989), 67-73. |
|  | Option Replication and Hedging (Ch 19) |
| 19 | Volatility forecasting and Implied Volatility (Ch 20, 23) |
|  | “GARCH 101: The Use of ARCH/GARCH models in Applied Econometrics”, Robert Engle, Journal Of Economic Perspectives, Volume 15, Number 4, fall 2001, 157-168 |
|  | **Interest rate forwards and futures** |
| 20 | Interest rate swaps and futures (Ch. 4, 6) |
| 21 | Swaps (Ch. 7,9) |
|  | “Understanding SOFR Futures”, CME, May 2018“Discounting and Derivative Pricing Before and After the Financial Crisis”, Handbook of Fixed Income Securities, Pietro Veronesi (ed), 2016, John Wiley & Sons. |
| 22 |  "Banc One Corp Asset and Liability Management" |
|  | **Risk Management** |
| 23 | “Staff Report on Cotton Futures and Option Market Activity During the Week of March 3, 2008, Commodity Futures Trading Commission, January 4, 2010” |
| 24 | “A Framework for Risk Management, [Kenneth A. Froot](https://onlinelibrary.wiley.com/action/doSearch?ContribAuthorRaw=Froot%2C+Kenneth+A), [David S. Scharfstein](https://onlinelibrary.wiley.com/action/doSearch?ContribAuthorRaw=Scharfstein%2C+David+S), [Jeremy C. Stein](https://onlinelibrary.wiley.com/action/doSearch?ContribAuthorRaw=Stein%2C+Jeremy+C), Journal of Applied Corporate Finance, [Volume 7, Issue 3](https://onlinelibrary.wiley.com/toc/17456622/1994/7/3), Fall 1994 Pages 22-33” |
| 25 | “BHP Limited: Risk Management Strategy” |