

MGT 805: Fixed Income Securities – Bonds, Swaps, and Derivatives**Instructor**Saman Majd (saman.majd@yale.edu)

Office hours by appointment

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Review sessions and office hours to be determined

Course Description

Fixed income markets are among the largest in the world and fixed income products are a key component of any investment strategy. This course covers the valuation and risk management of the key fixed income products – bonds, futures, forwards, swaps, options, and structured products. It combines theory with practical examples and exercises demonstrating the complications that arise when applying theory to realistic situations.

Course Requirements

Course requirements include regular attendance and class participation in lectures, weekly homework assignments, two in-class midterm exams, and a final exam during the end-of-semester exam period. All exams are open-book and open-notes, and you may use any spreadsheets or materials from the class. **The approximate breakdown of the grades is: homework = 15%, midterm 1 = 20%, midterm 2 = 20%, final exam = 45%.**

Topic Outline

Default-free bonds: the US Treasury bond market

Bond pricing fundamentals: spot rates, forward rates, yield curves

Interest rate risk: duration and convexity

Futures and forwards

Interest rate swaps

Swap spreads and financial crises

Foreign exchange and interest rates

Option pricing fundamentals

Options on bonds

Options on interest rates: caps, floors, swap options

Securitization: asset backed securities and mortgage-backed securities

Credit markets and credit derivatives

Textbooks and Lecture Slides

The following texts are required:

- *Fixed Income Markets and Their Derivatives*, Suresh Sundaresan, Academic Press, 3rd edition, 2009.
ISBN: 9780123704719 (eBook ISBN: 9780080919331)
- *Options, Futures and other Derivatives*, John Hull, Pearson, 10th edition, 2018.
ISBN: 9780134472089 (eBook ISBN: 9780134631493)

The following text is for optional background reading and will be on reserve in the library:

- *The Trader's Guide to Key Economic Indicators*, Richard Yamarone, Bloomberg Press, 3rd edition, 2012.
ISBN: 9781118074008

Lecture slides will be available for download from the class website after each lecture.

Background Reading

- Yamarone: p.1-8, 11-23, 30-38

Economic events can have a major impact on interest rates. Yamarone provides a good summary of the key economic indicators that affect markets.

Lecture Schedule

The following schedule is approximate and will be adjusted according to the pace at which we cover the material. Please check the course site on Canvas regularly for updates.

Lectures 1-9

- Introduction
- US Treasury bond market
- Review basic bond analytics
- Spot rates, forward rates, the yield curve
- Explaining the term structure of interest rates
- Interest rate risk – DV01, duration, and convexity
- Money market rates & the Federal Reserve
- Repo and reverse repo
- “Yield Curve Exercise” – review and discussion
- On-the-run versus off-the-run Treasury bonds
- Libor and Libor floating rate note
- Forward rate agreements
- Eurodollar futures
- Futures versus forwards
- Swap basics, swaps versus Treasuries
- Counterparty risk and mark-to-market agreements
- Swap portfolios (Lehman example)
- Swap spreads and financial crises
- “Trade of the century”?

In-class midterm exam #1 will be approximately here

Lectures 10-16

- Inflation adjusted bonds
- Foreign exchange, FX forwards and interest rates
- Currency swaps
- Basics of option pricing
- Black-Scholes-Merton methodology
- Dynamic replication and binomial model
- Black-Scholes formula
- Option risk management – the “greeks”
- Options on interest rates: caps, floors, swap options
- “Options Exercise” – review and discussion
- Volatility skew and smile
- Volatility markets and volatility trades

In-class midterm exam #2 will be approximately here

Lectures 17-24

- Value at Risk
- Risk management case studies (Metallgesellschaft, Orange County, P & G, Allied-Lyons, Showa Shell)
- Guest speaker (tbd)**
- Securitization
- Mortgage-backed securities
- Credit spreads and default risk
- Credit derivatives
- Guest speaker (tbd)**
- Final class – wrap up and discussion

Final exam will be scheduled during the final exam period

Textbook References

Topics	Sundaresan readings	Hull readings
Introduction US Treasury bond market Review basic bond math Spot rates, forward rates, the yield curve	Ch.1 (p.3-23) 2-2.2 (p.25-33) 8-8.1.0 (p.131-134) 8.1.4 (p.138-139) 8.2-8.4 (p.143-157)	4-4.9 (p.77-94) 6.1 (p.135-137)
Explaining the term structure of interest rates Interest rate risk – DV01, duration, and convexity Money market rates & the Federal Reserve Repo and reverse repo	7-7.2.3 (p.105-117) 7.4 (p.119-125) 3-3.3 (p.45-53) 5-5.6 (p.67-84)	4.10-4.11 (p.94-99) 4.12 (p.99-101)
Libor and Libor floating rate note Forward rate agreements Eurodollar futures Futures versus forwards Swap basics, swaps versus Treasuries Swap spreads and financial crises	15-15.2 (p.303-311) 16-16.3 (p.325-345) 16.4-16.5 (p.345-348)	6.3-6.5 (p.143-150) 5.10 (p.120-123) 7-7.4 (p.155-165)
Inflation adjusted bonds (TIPS) Foreign exchange, FX forwards and interest rates Currency swaps	13.1-13.3 (p.269-278)	7.7-7.8 (p.169-174)
Basics of option pricing Black-Scholes-Merton methodology Dynamic replication and binomial model		10-10.2 (p.209-213)
Black-Scholes formula Black Model Option risk management – the “greeks”		15.4 (p.323-327) 15.8-15.9 (p.333-337) 18.7-18.8 (p.388-390) 19.4-19.11 (p.401-418)
Options on interest rates: caps, floors, swap options	15.5-15.6 (p.316-324) 16.6-16.7 (p.348-352)	29.2 (p.675-678) 29.3 (p.681-683)
Volatility skew and smile Volatility markets and volatility trades	8.1.2-8.1.3 (p.136-138)	15.11 (p.339-340) 20.4-20.5 (p.437-438) <i>Optional: 26.16 (p.611-614)</i>
Value at Risk		22.1 (p.493-495)
Securitization and mortgage-backed securities	12-12.4 (p.245-262)	8 (p.184-196)
Credit spreads and default risk Credit derivatives	10-10.3 (p.197-210) 10.5 (p.217-220) 18-18.5 (p.377-386) 19-19.5 (p.397-407)	24-24.3 (p.543-546) 25-25.1 (p.569-573) 25.3 (p.577) 25.7-25.8 (p.579-580)