

# AFP Proposal: Advanced Term Structure Models

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**Reference Paper:** [https://link.springer.com/content/pdf/10.1007%2F11758501\\_9.pdf](https://link.springer.com/content/pdf/10.1007%2F11758501_9.pdf)

**Background and Problem Setting:** In MFE 230I, we explored various term-structure and pricing models for fixed income securities. In particular we studied standard frameworks such as CIR, HJM, and Vasicek. Our team would like to continue on this path and investigate extensions of these standard frameworks as well as new methods to evaluate them faster/more accurately. In particular, we are interested in models with Jump processes and using Monte-Carlo and tree methods to evaluate them.

**Data:** Bloomberg (through Berkeley MFE subscription) to obtain data on rates and yield curves for US Treasury bonds.

## Project Objectives:

1. Review existing literature on more advanced term-structures particularly focusing on models incorporating jump diffusion processes.
2. Replicate results of the Park et. al. paper (link above) using real data on Zero-Coupon and Coupon yielding US Treasury bonds.
3. Investigate improvements arising from alternative Monte-Carlo approaches such as Control Variates and Antithetic Variates methods.
4. Investigate and implement tree-based and/or finite-difference techniques for models with jump diffusion terms.
5. Price common fixed income products like floorlets, caplets, swaptions, etc. and compare with prices using classical models.

## Project Timeline:

1. Week of January 18, Complete advisor and MFE approval process.
2. Week of January 25, Prepare and present material for mini-presentations.
3. Week of February 1, Explore existing literature and (simultaneously) prepare a skeletal draft of the final paper (due on Feb 10).
4. Week of February 8, Focus on replicating and commenting on the approach by Park et. al. using real data.
5. Week of February 15, Complete development of advanced MC methods as described in the objectives. Start exploration/initial implementation of tree-based models.
6. Week of February 22, Complete tree-based models and finalize paper.
7. Week of March 1, Submit and prepare for presentation.

**Project Logistics:** Weekly check-ins and updates with Professor Stanton. Frequent meetings between team members to coordinate ongoing tasks.

**Risk Management:** We do not anticipate any difficulties with the data as it is pretty standard data on Treasuries obtained from the Bloomberg Terminal. If we encounter difficulties implementing the MC approach for the different models, we will focus on the extended Cox-Ingersoll-Ross (CIR) model and only expand to other models if time permits.