

Project Overview

The aim of this project is to compare the traditional financial Capital Asset Pricing Model (CAPM) and its extensions with machine learning models for equity valuation. The focus is on assessing the predictive accuracy of both approaches using identical variables, with additional analysis segmented by industry sectors to account for differing variances and relationships.

Progress Made This Week

1. Academic Paper Review

I have read the following academic papers to establish a foundational understanding of CAPM, its extensions, and their methods of analysis: The list is longer than provided but these are the main papers.

- **"Capital Asset Prices: A Theory of Market Equilibrium Under Conditions of Risk" (1964) by William F. Sharpe**
Introduces the CAPM and its relationship between risk and return.
- **"The Cross-Section of Expected Stock Returns" (1992) by Eugene F. Fama and Kenneth R. French**
Proposes the Three-Factor Model by adding size (SMB) and value (HML) factors.
- **"A Five-Factor Asset Pricing Model" (2015) by Eugene F. Fama and Kenneth R. French**
Extends the Three-Factor Model with profitability (RMW) and investment (CMA) factors.
- **"Capital Market Equilibrium with Restricted Borrowing" (1972) by Fischer Black**
Introduces the Black CAPM, relaxing the risk-free rate assumption.
- **"Machine Learning in Asset Pricing" (2020) by Stefan Nagel**
Highlights trade-offs between predictive accuracy and interpretability in ML models.
- **"Neural Networks for Financial Time Series Prediction" (2019) by Yoav Freund, Robert E. Schapire**
Examines the use of deep learning models, particularly recurrent neural networks, RNNs, in financial time-series prediction.

2. Traditional Models to Be Used

The following traditional models will form the basis of comparison with ML approaches:

- **CAPM:** Focuses on market risk as the sole determinant of returns.
- **Fama-French Three-Factor Model:** Adds size (SMB) and value (HML) factors.
- **Fama-French Five-Factor Model:** Further includes profitability (RMW) and investment (CMA) factors.
- **Black CAPM:** Removes the risk-free rate assumption.
- **Carhart Four-Factor Model:** Adds a momentum (MOM) factor.
- **CCAPM (Consumption-Based CAPM):** Relates returns to consumption growth.
- **SDF (Stochastic Discount Factor) CAPM:** Reformulates CAPM using stochastic discount factors.

3. WRDS Account

I have emailed WRDS to unfreeze my account to begin the data collection process.

Plan for Next Week

1. Complete Literature Review:

- Finish processing and note-taking on academic papers.

2. Determine Sample Set:

- Select frequency, etc. for data collection
- Determine how systematic risk will be calculated and the risk free rate
- Define criteria for company inclusion

3. Data Collection:

- Start gathering data from WRDS