

Group Project

Data-Driven Evaluation of an Equity-Bond Hybrid Strategy

You are part of a quantitative investment team. In recent years, the debate over whether the classic "60/40" equity-bond portfolio is still effective has intensified. Your team leader has tasked you with using historical data to empirically test classical valuation models and, based on this analysis, design, backtest, and evaluate a dynamic equity-bond hybrid strategy to adapt to changing market conditions.

Core Tasks & Guiding Questions

Part 1: Data Collection (From 2000 to Present):

- * Equity: Select a representative broad-market index. Collect its monthly price data to calculate returns.
- * Bond: Select a representative government bond index.
- * Risk-Free Rate: Use the 3-month Treasury bill rate.
- * Other: Collect Earnings Per Share (EPS) and dividend data for the chosen equity index.

Part 2: Model Valuation vs. Market Price

1. The Bond Valuation:

- * Select a specific point in time (e.g., end of 2019). Using the prevailing 10-year government bond yield as the market discount rate, calculate the theoretical price of a hypothetical 10-year bond with a 3% coupon rate.
- * Compare this theoretical price to the market price of a corresponding Bond ETF at that time. Are there discrepancies? What are the potential reasons?

2. The Equity Valuation:

- * Apply the Constant Growth DDM and the CAPM. Use historical average dividend/earnings growth to estimate the long-term growth rate g , and use the CAPM (calculating Beta based on the previous 5 years of data) to estimate the required return r .

- * How does the theoretical stock price calculated using these models compare to the actual index level at the time? What are the main practical limitations of the DDM and CAPM models?

Part 3: Constructing & Backtesting a Dynamic Hybrid Strategy

1. Benchmark Strategy: Construct a traditional static 60/40 rebalanced portfolio as your benchmark.

2. Dynamic Strategy Design (Choose the following one or create your own):

Valuation-Driven Strategy: Overweight equities (e.g., increase allocation to 70%) when the aggregate P/E ratio of the equity market is below its historical median. Underweight equities (e.g., decrease to 50%) when it is above.

3. Backtesting & Evaluation:

- * Calculate the annualized return, volatility, maximum drawdown, and Sharpe ratio for both your dynamic strategy and the benchmark strategy.

- * Key Question: During which market environments did your dynamic strategy outperform the benchmark? Under which conditions did it underperform? Why?

Part 4: Synthesis, Reporting & Model Reflection

1. Recommendation: Based on your backtest results, would you recommend the static strategy or your dynamic strategy to a client? Justify

your recommendation clearly.

2. Critical Model Reflection: This project utilized both theoretical valuation models (DDM, Bond Pricing) and statistically-driven models (Dynamic Strategy). Discuss the respective roles and limitations of these two methodologies in investment practice.

****Submission Requirements****

1. Full Report (PDF): Containing data description, methodology, results analysis, charts, and critical reflection. No more than 10 pages (the reference and the appendix will not be counted).
2. Code File (.py or .ipynb): Containing well-commented code for data processing, calculations, backtesting, and visualization.
3. Dataset (.csv): The cleaned and processed dataset used for the analysis.
4. Presentation Slides (PPT): A 10-minute presentation focusing on the research motivation, key findings, and investment implications.