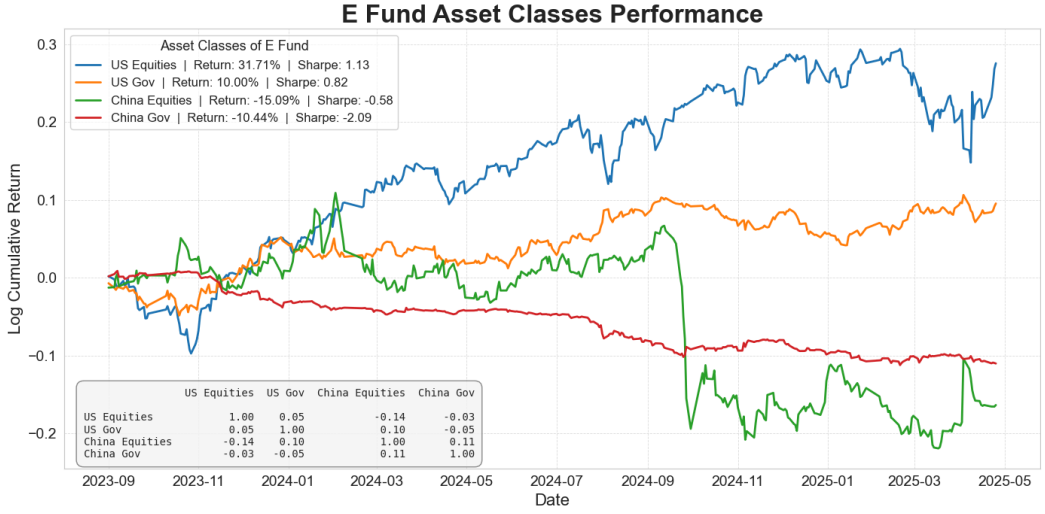
Macro Finance – Final Project Write-Up

The fund we found to be lacking in their macroeconomic asset exposure is E Fund Global Allocation Hybrid Securities Investment Fund (E Fund). They are a Chinese global multi-asset manager, who have currently limited their investments to 51% in equities and 44% in bonds across two different countries (US & China). This leaves them incredibly exposed to actively worsening relations between the two nations, which was reflected in their recent performance, where within the span of a week their returns tanked -5.87% during the announcement of the tariffs. As a Qualified Domestic Institutional Investor (QDII), they are legally allowed to invest in a much larger universe than they are currently considering, which we believe is a large part of their tumultuous performance. We seek to further diversify their assets under management to more asset classes, and consider investments in European markets as well.

E Fund invests in four major asset classes: US equities, US government bonds, Chinese equities, and Chinese government bonds. To illustrate the performance of these four asset classes since the inception of the fund, we used four indexes as proxies (SPX, BBG US 10-Year Bond Index, SSE Composite, S&P China government bond index). As shown in the graph below, the Chinese assets severely underperformed since the establishment, while the US assets exhibited much higher returns and Sharpe ratios. The correlations among these four asset classes are relatively low, but further geographical diversification can still lower the risk of the portfolio.

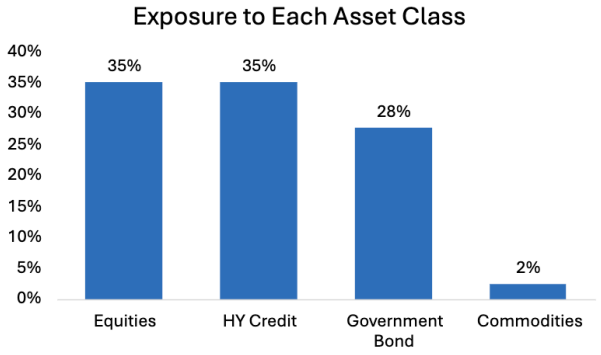


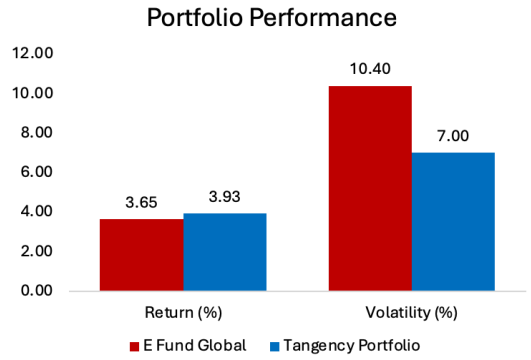
For our portfolio optimization effort, we used Mean-Variance (MV) Optimization., which maximizes the Sharpe Ratio, or risk-adjusted return. The Tangency Portfolio (the portfolio that assigns weight or risk exposure for each asset) also considers the covariance matrix, meaning it examines the covariance between assets. If a certain asset has a considerably high return compared to other assets, but also an extremely high correlation with another asset in the portfolio, the Tangency Portfolio will not assign a significantly high weight towards that asset.

Our training data for the MV Optimization process is from January 2016 until September 2023. As discussed in class, high-yield credit does show high returns and

low volatility, but performs poorly during the financial crisis. To diversify our allocation and avoid getting over-exposed to one sector / asset class, we put a cap of 35% for each asset class and region, and only used long positions (no negative weights). The number comes from the 35% fixed-income exposure in AQR Capital Management's Multi-Asset Fund.

The first MV-Optimization was for a global portfolio and to see how much risk should be allocated for an asset class. The portfolio contains measures of global equities, high-yield corporate bonds, commodities, and government bonds for all over the world. This exercise results in a Sharpe Ratio of 0.56 (E Fund's Sharpe is 0.35). Comparing this with E Fund's performance, we have a higher annualized return: 3.93% (vs 3.65%) and a lower volatility of 7% (vs 10.4%).





From the first optimization, we should allocate 35% each towards high-yield corporate bonds and equities, 28% to government bonds, and 2% for commodities, to maximize risk-adjusted returns.

For the second optimization, we are determining the best allocation strategies within each asset class if we categorize by geographical regions. The purpose is to avoid being over-exposed to one region. For equities, government bonds, and HY credit, we are looking at measures (ETFs) from the US, Europe, Emerging Markets, and China. For commodities, we are breaking it down to oil, agriculture & livestock, and industrial metals. Here, we also put a 35% cap on each category to avoid over-concentration on a single asset. Below is a summary of our results:

Asset Class	US	Europe	Emerging Markets	China
Equities	35%	0%	35%	30%
Government Bond	35%	30%	35%	0%
High-Yield Credit	35%	2%	35%	28%

Asset Class	Oil	Industrial Metals	Agricultural & Livestock
Commodities	35%	30%	35%

For equities, we see EU stocks are eliminated. We attribute this to the low growth and FX drag in European countries. For government bonds, the optimizer excludes

China. One possible reason is that China has strict foreign capital controls, which results in the underperformance of China investable government bond indices.

For our out-of-sample testing, we utilized the weights from our tangency portfolio in the period of (2023 – present). We multiplied the weights given for each asset class to the weights given for each region within the asset class. We also used regularization to shrink the relationship between assets and stabilize the covariance matrix inversion. This reduces overfitting and should improve the out-of-sample performance of our strategy.

We compared our OOS results with E Fund's performance in the same period. Our tangency portfolio has a higher return of 7.1% and a lower volatility of 5.9%, compared to E Fund's 3.65% return and 10.4% volatility. This results in a higher Sharpe ratio of 1.2. We have managed to avoid being over-exposed to a specific region and asset class, whilst also maximizing risk-adjusted return.