**November 17, 2023**

**To**: Mr. Graham Gund

**From**: Kokosing Capital Advisors, L.P.

**Re**: Portfolio Recommendation

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In the words of Warren Buffet, "Someone's sitting in the shade today because someone planted a tree a long time ago." These words resonate profoundly as we find ourselves amidst a time of uncertainty in the financial markets. Today, the Fed's primary lending rate stands at a 22-year high, experts are anticipating a potential uptick in unemployment levels, consumers continue to expect rising inflation levels, and the ongoing presidential race adds another layer of uncertainty as Americans await the outcomes that will shape the trajectory of the next four years.[1] Adding to this unstable climate at home, conflicts in Israel and Ukraine leave the world in limbo, uncertain as to what will happen day after day.

At this crossroads, investors are prompted to navigate with caution and strategic foresight, following Buffett's advice to invest for the long term. All of us here at Kokosing Capital Advisors are honored that you, Mr. Gund, have trusted us with this responsibility.

In the following sections, we will walk you through a more in-depth discussion of our theoretical framework, assumptions, method, and technical analysis we used to create your portfolio, along with our final recommendation, which allocates approximately 81% of your wealth into the optimal risky portfolio, corresponding to an expected return of 11.25%. This leaves around 19% of your wealth to be invested in risk-free assets, leading to the final completed portfolio with a **12.29% expected rate of return** and a **standard deviation of 13.15.**

Theoretical Framework

Here at Kokosing Capital Advisors, our primary goal is **risk control**, which is paramount in a time like today. We ultimately use the Capital Asset Pricing Model (CAPM) as the framework to obtain the Efficient Frontier, on which the optimal portfolio can be found. To accomplish this, we will leverage Modern Portfolio Theory (MPT) – an investment theory that allows investors to assemble an asset portfolio that maximizes expected return for a given level of risk.

Before we begin the discussion, please be advised that there are three CAPM assumptions underlying our analysis:

1) *Investors are all rational and mean-variance optimizers*. This means investors select portfolios that give them the highest returns given a level of risk.
2) *All assets are publicly held and traded on public exchanges*. All assets are traded and can be held in investors' portfolios.

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[1] "The Fed will shift to 'full-on accommodation' mode in 2024 with nearly 3 percentage points of rate cuts as economy slows, UBS says," Business Insider. (https://www.businessinsider.com/fed-rate-cuts-forecast-2024-full-Accommodation-economic-contraction-unemployment-2023-11, viewed on November 13, 2023).

3) *Investors can borrow and lend at a risk-free rate*. This allows investors to select portfolios along the Capital Allocation Line (CAL) – a line that represents all possible combinations of risk-free and risky assets.

Analysis

Our primary goal is to optimize your returns while managing risk by creating a complete portfolio of risky and risk-free assets. Our process begins by choosing the following four risky assets to be included in your portfolio:

1. **American Electric Power (AEP)** – one of the largest electric utility companies in the United States, providing electricity to millions of customers in various states.
2. **DFA US Small Cap Value Portfolio (DFSVX)** – a mutual fund offered by DFA that invests primarily in U.S. small-cap value stocks. DFA is a well-known investment management company that specializes in passive and factor-based investing strategies.
3. **DFA US Large Cap Value Portfolio (DFLVX)** – a mutual fund, also offered by DFA, but designed to provide exposure to U.S. large-cap value stocks.
4. **Fidelity Select Gold Portfolio (FSAGX) –** a mutual fund offered by Fidelity Investments. This mutual fund primarily invests in companies engaged in gold exploration, mining, processing, and related activities, with a secondary focus on silver, platinum, diamonds, and other precious metals and minerals.

A summary of the assets' returns and risk, as well as their correlation with excess returns, can be found in Tables 1 and 2 below.

| | **AEP** | **DFSVX** | **DFLVX** | **FSAGX** |
|---|---|---|---|---|
| **Average excess returns** | 7.7% | 11.0% | 9.0% | 5.29% |
| **Average standard deviation** | 19.98% | 24.36% | 19.44% | 30.84% |

**Table 1:** *Average annual excess returns and standard deviations of the four risky assets (January 1995 - September 2023)*

| | **AEP** | **DFSVX** | **DFLVX** | **FSAGX** |
|---|---|---|---|---|
| **AEP** | 1 | | | |
| **DFSVX** | 0.393 | 1 | | |
| **DFLVX** | 0.560 | 0.903 | 1 | |
| **FSAGX** | - 0.036 | 0.091 | 0.027 | 1 |

**Table 2**: *Correlation matrix of the four risky assets' excess returns*

The rationale behind selecting these assets revolves around the principle of MPT in diversification and managing risk. Our goal is to diversify away firm-specific risks, which are factors unique to individual stocks and firms. For instance, an oil shock might adversely affect petroleum companies while benefiting others like Tesla. Fortunately, as such risks are not universal, they can be largely mitigated through diversification. By incorporating a variety of companies into your portfolio or investing in mutual funds, such as DFSVX and DFLVX, we aim to reduce exposure to firm-specific influences, spreading your investments across a diverse range of seemingly unrelated companies. This is consistent with the small degree of correlations in Table 2 (no perfect correlations), implying that there are diversification benefits from investing in these assets.

Moreover, the strategy of targeting small-cap value stocks is influenced by the "firm size" and "value" factors from the Fama-French Three-Factor Model. Their research suggests that historically, small-cap value stocks have experienced higher than predicted returns. The same logic follows for investing in large-cap value stocks since this aligns with Fama-French's "value" factor, which accounts for the historically higher than predicted returns of high book-to-market value firms (i.e., "value stocks").

However, not all risks can be diversified away. Market risk, influenced by business cycles, inflation, exchange rates, and interest rates, impacts the performance of all companies irrespective of industry or individual characteristics. MPT asserts that eliminating this type of risk is impossible. While market risk cannot be eradicated, a customized portfolio can optimize risk based on your specific tolerance level. This involves combining the optimal risky portfolio with the risk-free asset and tailoring the allocation to match your level of risk aversion (discussed in more detail later).

Given the risky assets, we are now able to construct the Efficient Frontier, which is the set of optimal risky portfolios (combinations of the risky assets) that offer the highest expected return for a given level of risk *or* the lowest risk for a given level of expected return. Figure 1 is a graphical representation of the efficient frontier.

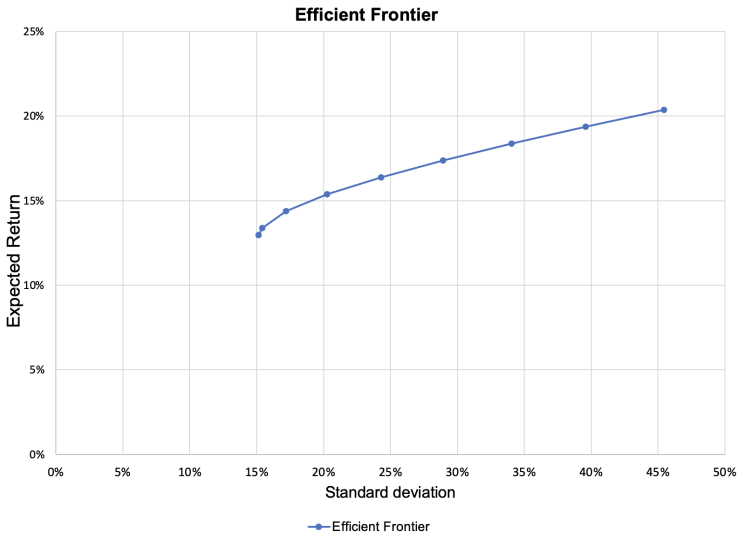


**Figure 1:** *Efficient Frontier*

Next, we find the CAL given the chosen risk-free asset. While there are no assets that are 100% risk-free, T-bills are considered nearly free of default risk.[2] We have used this risk-free asset in developing your portfolio since it plays a crucial role in balancing and reducing the overall risk exposure of the portfolio. The risk-free asset we used here is the 1-Year U.S. Treasury T-bill that has an expected rate of return of 5.37% as of November 1st, 2023. This is represented in the graph below at the y-intercept, showing an expected rate of return of 5.37% and a standard deviation of 0% (risk-free asset).

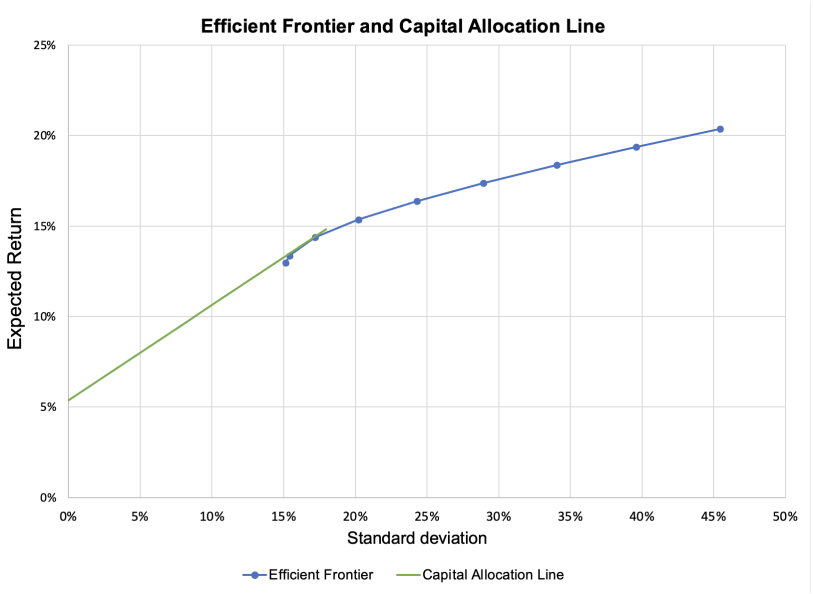


**Figure 2:** *Efficient Frontier and CAL*

Given the CAL, we can now identify the optimal risky portfolio along the Efficient Frontier. This is the portfolio that provides the highest reward per unit of risk (i.e. the highest Sharpe ratio).

Therefore, the ultimate goal is to identify the risky portfolio that yields the maximum Sharpe Ratio. We used the Solver function in Microsoft Excel to complete this task. Our approach utilized the four risky assets' standard deviations and risk premia to first set up a variance–covariance matrix of excess returns as can be seen in Table 3.

| | **AEP** | **DFSVX** | **DFLVX** | **FSAGX** |
|---|---|---|---|---|
| **AEP** | 0.0399 | | | |
| **DFSVX** | 0.0191 | 0.0594 | | |
| **DFLVX** | 0.0217 | 0.0428 | 0.0378 | |

[2] The characterization of T-bills as "nearly free of default risk" is informed by their full backing by the U.S. government, a concept explained by Investopedia. *See* "Why Are T-Bills Used When Determining Risk-Free Rates?" Investopedia. (https://www.investopedia.com/ask/answers/040915/how-riskfree-rate-determined-when-calculating-market-risk- premium.asp, viewed on November 13, 2023).

| | | | | |
|---|---|---|---|---|
| **FSAGX** | -0.0022 | 0.0068 | 0.0016 | 0.0951 |

**Table 3:** *Variance – Covariance matrix of the four risky assets' excess returns*

Next, we identified a weight vector, in which each element denotes the proportion of the risky portfolio made up by each of the four risky assets. We utilized the vector shown in Table 4.

| **Ticker** | **AEP** | **DFSVX** | **DFLVX** | **FSAGX** | **Total** |
|---|---|---|---|---|---|
| **Weights** | 20% | 15%` | 30% | 35% | 100% |

Table 4: *An weight vector denoting each of the four asset's proportion within the risky portfolio*

Then, with vector and matrix multiplications of the weight vector by the variance–covariance matrix, we can identify the risky portfolio's standard deviation and risk premium. This is where we use Excel's Solver to (1) find the Efficient Frontier by finding the risk premia that correspond with different standard deviations; and (2) find the optimal risky portfolio – a weight vector that maximizes the Sharpe Ratio. After the calculations, the optimal risky portfolio and its components (the weight vector) are presented in Tables 5 and 6 below.

| **Standard deviation** | **Risk premium** | **Sharpe Ratio** |
|---|---|---|
| 16.31% | 8.58% | 0.526 |

**Table 5:** *The optimal risky portfolio*

| **Ticker** | **AEP** | **DFSVX** | **DFLVX** | **FSAGX** | **Total** |
|---|---|---|---|---|---|
| **Weights** | 36.66% | 32.68% | 15.17% | 15.49% | 100% |

**Table 6:** *The weights of each asset in the optimal risky portfolio*

As we have the Efficient Frontier and the optimal risky portfolio, we proceed to determine the allocation of your investment between the risk-free asset and the optimal risky portfolio. As observed in Figure 3, the CAL is tangent to the Efficient Frontier at the point that represents the combination of the risk-free asset and the optimal risky portfolio that would maximize your returns - in other words, maximize your Sharpe Ratio.

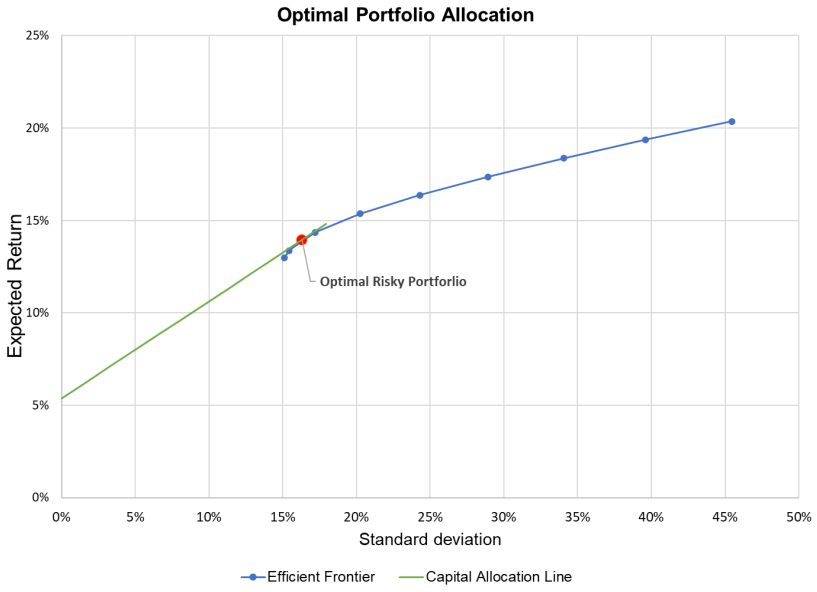


**Figure 3:** *Optimal risky portfolio (located at tangency of Efficient Frontier and CAL)*

Finally, we determine your ultimate portfolio by finding the allocation to the optimal risky portfolio and the risk-free asset based on your degree of risk aversion (A = 4.0). Hence, we allocate approximately 81% of your wealth into the optimal risky portfolio, corresponding to an expected return of 11.25%. This leaves around 19% of your wealth to be invested in risk-free assets, leading to the final completed portfolio with a **12.29% expected rate of return** and a **standard deviation of 13.15%**.

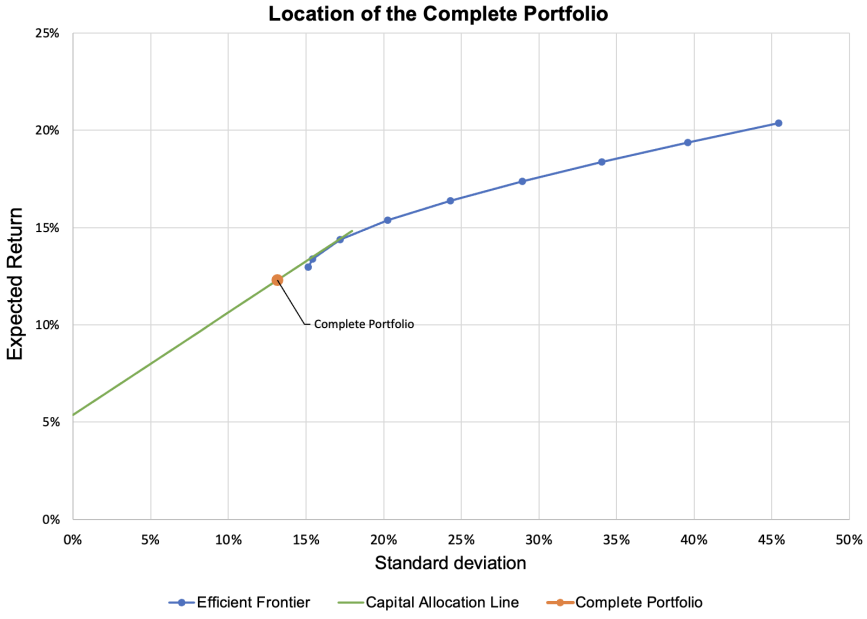


**Figure 4:** *Complete Portfolio (81% optimal risky portfolio; 19% risk-free asset)*

Concluding Remarks

At Kokosing Capital Advisors, we're dedicated to providing investment advice tailored just for you, aiming to maximize returns while respecting your comfort with risk. While our recommendation comprises rigorous and in-depth analyses, please bear in mind that the returns and variance can be affected by the three assumptions of CAPM we made in the beginning. Not all investors are rational - for investors, emotions and social norms often constrain their behaviors, so they might not act rationally and exit from the mean-variance optimization. For the second assumption, it is apparent that there are a plethora of private markets, notably private equity and venture capital, from which investors are unable to buy assets unless they possess adequate resources. Finally, there are no truly risk-free assets - even the T-bills are susceptible to value depreciation when governments default on their debt obligations. Nevertheless, our MPT framework is pivotal in providing you, the investor, and us, the partners, a thorough understanding of portfolio diversification and the relationship between risks and returns.

We maintain that our recommendation is the optimal allocation of your investments, and can confidently assert that the proposed portfolio is well-suited to your needs, keeping in mind the dynamic nature of financial markets. As your risk tolerance evolves and markets change, we'll be here to adapt your strategy. We look forward to discussing this strategy with you and answering any questions you may have to ensure your financial success.

Sincerely,

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