Building a Stock-Bond Portfolio for Outperformance

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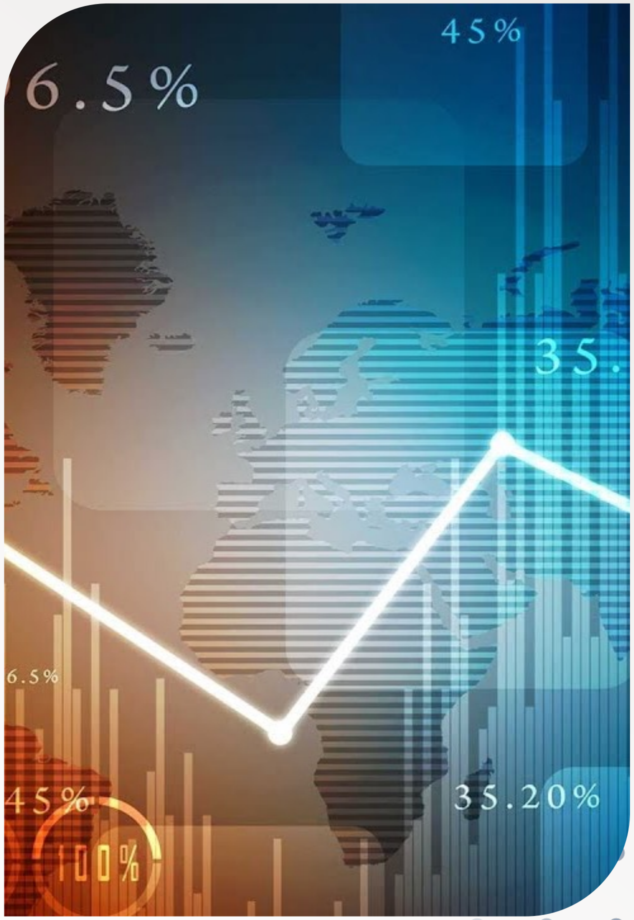
Main Goal

*Optimize the portfolio across different time frames by **maximizing returns** for a **given level of risk**, considering various **market scenarios** and **investor preferences**, including:*

- **Market Outlook**: Expecting different risk environments (e.g., volatility, recessions, or growth)
- **Value vs. Growth**: Adjusting for investors focused on stable, undervalued stocks (value) versus high-growth companies (growth)
- **Large-cap vs. Small-cap**: Analyzing performance of large, stable companies versus smaller, more volatile firms under varying market conditions
- **Liquidity preferences**: Evaluating how liquidity needs influence portfolio adjustments during periods of market instability or calm



Overview

Conduct **general market research** on U.S. Stock and Bond Market to understand the trend

Select **Market-cap weighted index** to track the performance of U.S. Stock and Bond Market

Identify the **risk factors** that will influence portfolio performance

Ran regression model to **analyze the correlation** between risk factors and each index's returns

Define an objective function for the model that **minimizes deviations** from the client's desired risk while maximizing the **Sharpe ratio**

Adjust **factor exposures** and **Sharpe ratio weights** based on market outlook and investor preferences, to find the optimal portfolio

Compare the portfolio's expected return and volatility against those of the benchmark portfolio

Evaluate the optimal portfolio over a **three-year period** based on the market outlook

Portfolio Optimization

Objective Function Overview:

The **objective function** seeks to optimize a portfolio by balancing **factor exposures** and **portfolio performance**. The goal is to minimize the difference between actual factor exposures (like market risk, volatility, etc.) and the client's desired factor exposures while maximizing the **Sharpe ratio**

Influence of Configuration:

- **Factor Weights**: Changing client factor weights (e.g., increasing preference for stability or interest rate sensitivity) directly influences how the portfolio allocates assets to align with these targets
- **Sharpe Weight (sharpe_w):** As the Sharpe weight increases, the optimization places more emphasis on maximizing the Sharpe ratio (risk-adjusted return). Lower Sharpe weights prioritize minimizing factor deviations, while higher weights focus more on improving the overall return

What are the Factors?

Mkt-RF

Higher the coefficient, the more sensitive to market-wide changes

Size (SMB)

Positive values indicating a small-cap bias and negative values indicating large-cap bias

Volatility (VIX)

Higher the coefficient, higher the risk and volatility

Value (HML)

Positive values indicating a value stock bias and negative values indicating growth stock bias

Interest Rate

Higher the coefficient, the more sensitive to interest rate changes

Liquidity

Higher the coefficient, more liquid the market will be

Benchmark Portfolio's Performance

```
                            OLS Regression Results
==============================================================================
Dep. Variable:       Portfolio_Return   R-squared:                       0.854
Model:                            OLS   Adj. R-squared:                  0.854
Method:                 Least Squares   F-statistic:                     2614.
Date:                Thu, 12 Sep 2024   Prob (F-statistic):               0.00
Time:                        19:43:27   Log-Likelihood:                 15338.
No. Observations:                3139   AIC:                        -3.066e+04
Df Residuals:                    3131   BIC:                        -3.061e+04
Df Model:                           7
Covariance Type:            nonrobust
==================================================================================
                     coef    std err          t      P>|t|      [0.025      0.975]
----------------------------------------------------------------------------------
const             -0.0003      0.000     -1.765      0.078      -0.001    3.82e-05
Mkt-RF             0.0042   4.54e-05     92.610      0.000       0.004       0.004
SMB                0.0001   5.55e-05      2.591      0.010    3.49e-05       0.000
HML               -0.0003    4.3e-05     -6.815      0.000      -0.000      -0.000
MOM               -0.0001   3.59e-05     -2.929      0.003      -0.000   -3.48e-05
InterestRate_10y 2.426e-05   3.85e-05      0.631      0.528   -5.11e-05    9.97e-05
VIX                0.0030      0.001      5.118      0.000       0.002       0.004
Liquidity       7.178e-05   3.07e-05      2.339      0.019    1.16e-05       0.000
==============================================================================
Omnibus:                     1300.432   Durbin-Watson:                   1.987
Prob(Omnibus):                  0.000   Jarque-Bera (JB):            52625.011
Skew:                          -1.262   Prob(JB):                         0.00
Kurtosis:                      22.899   Cond. No.                         96.4
==============================================================================
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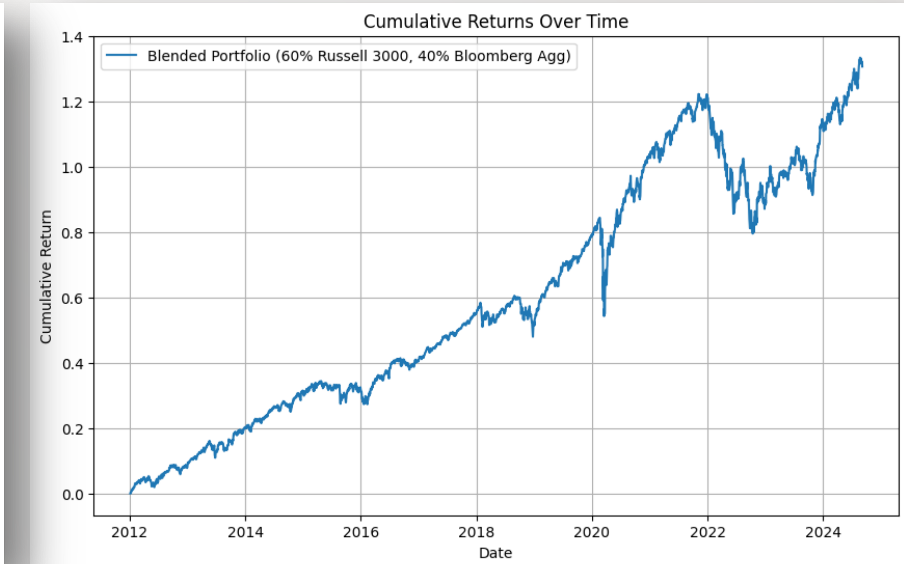


The portfolio's returns are **strongly correlated with overall market performance** and are **sensitive to changes in volatility and interest rates**

Additionally, the portfolio demonstrates a preference for growth stocks over value stocks

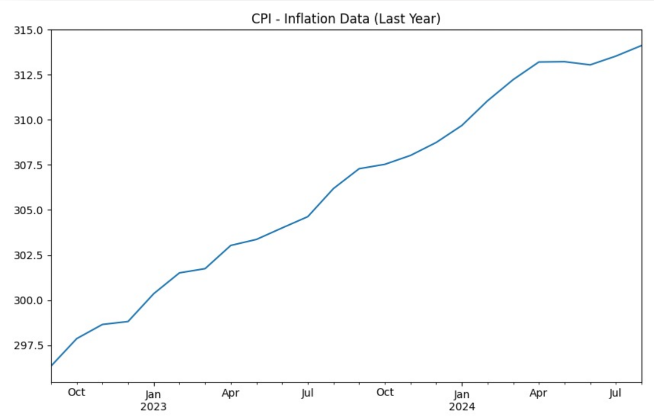
Expected Portfolio Return (Annualized) : 6.89%, moderate return inline with historical averages

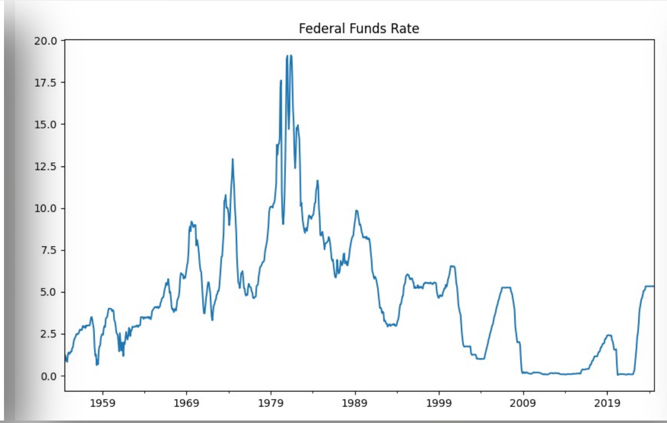
Portfolio Volatility (Annualized): 7.57%, well-diversified risk profile

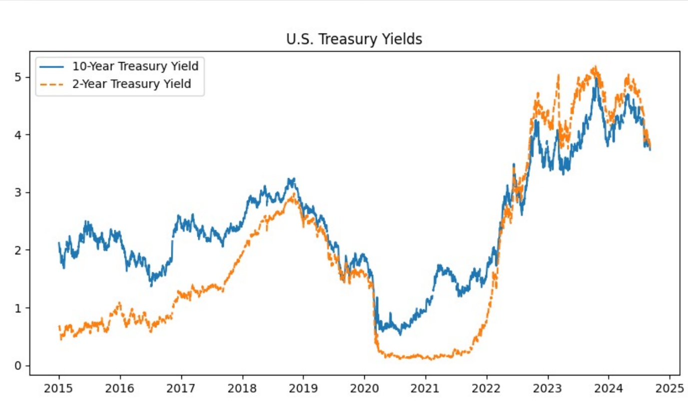
Sharpe Ratio: 0.2435, risk-adjusted return is suboptimal

Market Outlook

Cooling Inflation Ready for Rate Cut?







Inflation continues to rise, with the pace moderated in recent months, down from 2.9% YoY to 2.6%

The jobs data wasn't strong enough to fully support a "soft landing" but not weak enough to prompt a larger-than-expected rate cut from the Federal Reserve. Markets are still betting on a **0.25% rate cut**, with less than a 33% chance of a **0.50% cut**

Fed's rate cut will ***support consumer and corporate spending***, which would further **stabilize the economy**

Rate cut without recessions have been favorable for the stock market

Start of Non-Recession Rate-Cutting Cycle	Stock Market Return: 1 year later	Stock Market Return: 2 years later
Nov. 1966	19%	34%
Aug. 1984	9%	39%
Jul. 1995	19%	73%
Sep. 1998	23%	40%

Source: FRED, Yahoo Finance, U.S. Bureau of Labor Statistics, FactSet as of 09/09/2024.

The yield curve, which had been inverted since mid-2022 (when investors expected low economic growth / recession), has now signaled to turned **positive**, a shift that typically indicates a ***rate cut*** *(easing monetary policy)* and potential ***economic softening***

However, there's concern that the Fed may have tightened too much, the timing risks a **recession**

The initial phase of un-inversion often hints at economic distress before reaching a more stable normalization

Fundamental Analysis

Treasury Bonds

- **Short-Term Protection**: Offer stability and risk mitigation, making them attractive during periods of market volatility
- **Long-Term Capital Preservation**: Ideal for maintaining value over time, especially in uncertain economic climates
- **Yield Considerations**: In low-interest environments, diversify into higher-return assets to enhance income potential.

Large-Cap Stocks

- **P/E Ratio**: Increases from 19.97 (2023 Q3) to 22.49 (2024 Q4) suggest investor optimism about future earnings growth, likely due to expected lower borrowing costs and better economic conditions during rate cuts
- **Operating Margin**: Improvement from 14.53% (2023 Q3) to 16.76% (2024 Q4) indicates better cost management and profitability, important during economic expansions spurred by rate cuts
- **Profit Margin**: An upward trend from 12.27% (2023 Q3) to 13.05% (2024 Q4) highlights increasing efficiency and higher retention of revenue as profit

Small-Cap Stocks

- **P/E Ratio**: Notably higher projections from 24.13 (2023 Q4) to 29.44 (2025 Q4) reflect heightened growth expectations as small-caps can be more agile in capitalizing on economic recoveries
- **Operating Margin**: Marked increase from 6.08% (2023 Q4) to 9.59% (2025 Q4) signals significant operational improvements and potential outperformance in a favorable rate cut environment
- **Profit Margin**: Rises from 5.39% (2023 Q4) to 6.35% (2025 Q4), suggesting profitability and operational leverage amidst changing economic conditions

Source: Bloomberg as of 09/11/2024.

Expected Mean Returns (2012-2023):

SPY 13.8% IWM 11.5% TLT 2.9% LQD 3.2% SHV: 5.4%

Portfolio Performance (1)

Fed's Rate Cut

*Reflected by **higher exposure to InterestRate_10y** in the factor model*

Sharpe Ratio	0.0005	0.005	0.05
Large-Cap	39%	50%	55%
Small-Cap	5%	11%	18%
Treasury Bond	46%	29%	17%
Corporate Bond	5%	5%	5%
Cash	5%	5%	5%
Expected Return (› 6.89%)	7.5%	9.4%	10.4%
Expected Volatility (› 7.57%)	8.9%	10.3%	11.8%

As the focus on risk-adjusted return grows, prioritize large-cap stocks due to their **high expected returns** and **stable, profitable earnings growth**

Though often associated with **higher volatility**, rate cuts generally precede **an economic soft landing**, during which small-cap stocks may **outperform**, thus enhancing overall portfolio performance

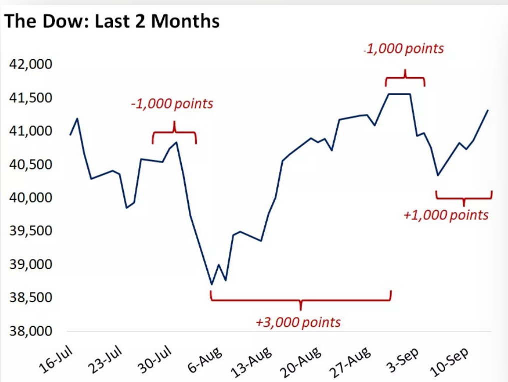
Treasury bonds are favored for their **short-term stability** and **long-term capital preservation**, effectively **balancing the risks** associated with stock holdings in the portfolio

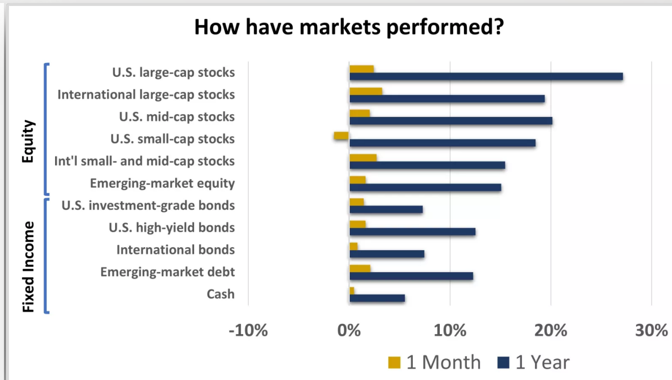
```
Table for InterestRate_10y:
                    SPY       IWM       TLT       LQD       SHV
InterestRate_10y  0.000007  0.000129 -0.000404 -0.000106  0.000009
```

Treasury Bond and Corporate Bond's expected return negatively correlates with interest rate while stocks and cash (short-term bond) positively correlates with interest rate

Market Outlook

Market Volatility: Risk? Opportunity?





Recent stock market activity has shown **notable volatility**, with dramatic swings in the Dow, driven by **economic data impacting labor markets**, **mega-cap tech stocks performance**, and **inflation rates**.

Despite the short-term market uncertainties and political factors influencing volatility, the **underlying strength of the market remains**, as evidenced by its recovery close to all-time highs after each dip

This resilience suggests that the bull market still has momentum, encouraging **continued investment for long-term value and growth**, amidst transient recession fears and economic data responses.

Gains were broad across many sectors, the sectors that have outperformed most are **consumer staples** and **utilities**, both considered defensive sectors that hold up well in a period of economic slowdown

On the other hand, **tech-heavy markets** are **falling behind**

- AI stocks, particularly Nvidia, have recently faced sharp declines due to concerns over hyperscale's' massive capital expenditures and uncertainty about the immediate returns from these investment
- Investors remain optimistic about AI's transformative potential, but near-term volatility and doubts about AI's quick profitability are driving caution. Long-term gains from AI adoption may take years to fully materialize.

Source: FRED, Yahoo Finance, FactSet, Edward Jones as of 09/09/2024.

Fundamental Analysis

Large-Cap Stocks

- **P/E ratio:** Expected to rise from 19.97 (2023 Q3) to 22.49 (2024 Q3), signaling strong investor confidence and potential future earnings growth
- **Gross Margin**: Projected to increase to 36.11%, suggesting operational efficiency
- **Operating Margin**: Expected to rise to 16.76%, reflecting better cost control and profitability
- **Rationale**: In a volatile market, **large caps provide stability**, **efficiency**, and **reliable returns**, appealing to conservative investors seeking lower risk

Small-Cap Stocks

- **P/E ratio**: Expected to rise from 24.13 (2023 Q4) to 29.44 (2025 Q4), indicating higher growth expectations but with added risk
- **Operating Margin**: Expected to grow from 6.08% (2023 Q4) to 9.59% (2025 Q4), signaling improving profitability
- **Return on Equity (ROE)**: Projected at 6.09% by 2025, indicating improving efficiency and potential for high returns
- **Rationale**: **Small caps are volatile but can outperform** in growth scenarios, making them appealing for higher risk tolerance

Treasury Bonds

- **Stability**: Bonds typically offer more stable returns compared to stocks, making them a safer investment during market uncertainty
- **Income**: They provide regular interest payments, which can be a reliable source of income when other investments might be underperforming
- **Diversification**: Adding bonds to a portfolio can help diversify and reduce overall investment risk, as bonds often move inversely to stocks
- **Preservation of Capital**: Bonds are generally less risky, helping to preserve capital during downturns in the stock market.

Expected Mean Returns (2012-2023):

SPY 13.8% IWM 11.5% TLT 2.9% LQD 3.2% SHV: 5.4%

Portfolio Performance (2)

Volatile Market

*Reflected by **higher exposure to VIX** in the factor model*

Sharpe Ratio	0.0005	0.002	0.05
Large-Cap	31%	48%	55%
Small-Cap	5%	5%	15%
Treasury Bond	18%	30%	20%
Corporate Bond	40%	12%	5%
Cash	5%	5%	5%
Expected Return	6.8%	8.5%	10.1%
Expected Volatility	8.2%	9.5%	11.7%

› 6.89% (Expected Return)

~ 7.57% (Expected Volatility)

Large-Cap: Indicate **solid investor confidence** and **potential for earnings growth**, with increasing P/E ratios and **rising operational efficiency**, making them a stable choice for conservative investments in volatile market

Small-Cap: Show potential for high returns with expected growth in operational metrics, appealing to those willing to **accept higher risk for potentially greater rewards**; not the safest choice in volatile market

Treasury Bond: Offer safety and yield stability, providing a **hedge against volatility** and a balanced component in a diversified portfolio, especially beneficial in uncertain economic times

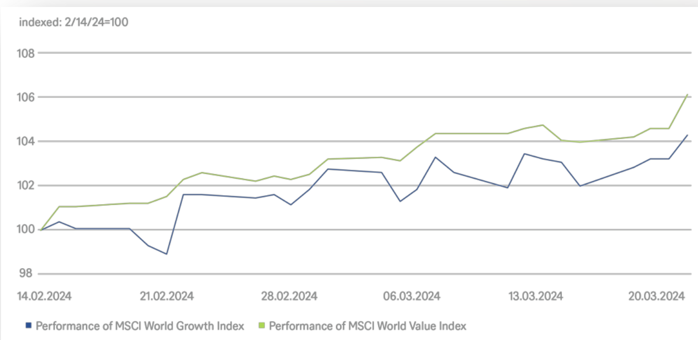
```
Table for VIX:
          SPY       IWM       TLT      LQD       SHV
VIX -0.001686 -0.00193  0.003068  0.00601 -0.000026
```

Large-cap / small-cap stocks and cash negatively correlates with market volatility while Treasury Bond and Corporate Bond's expected return positively correlates with market volatility

Investor Preference

Value Investing vs. Growth Investing

	Growth investing	Value investing
Company features	Growing quickly, hot new product, tech stocks	Growing slowly or not at all, older products
Valuation (P/E ratio)	Higher	Lower
Dividends	Less often	More often
Stereotypical stock	Amazon, Apple, Nvidia	Procter & Gamble, Exxon Mobil
Volatility	Higher	Lower



Value stocks have historically outperformed **growth stocks** when interest rates are high, but that trend **reversed** in 2024 as investors anticipate a Fed pivot to rate cuts in the second half of the year

High market concentration in a few growth stocks suggests potential volatility and risk, which has been proved by recent market as well. The "**Magnificent Seven" tech stocks** now constitute a significant portion of major indices, underscoring their **influence on market trends**

Source: DWS, FRED, Yahoo Finance, FactSet, Edward Jones as of 09/09/2024.

Fundamental Analysis

Large-Cap Stocks

- **Operating Margin**: Expected to reach 16.76%, signaling profitable companies with stable financials
- **Price/Earnings (P/E) Ratio:** Expected to rise from 19.97 (2023 Q3) to 22.49 (2024 Q3), highlighting investor confidence and future earnings growth, preferred by value investor
- **Dividend Yield:** Higher and growing dividend yields, indicating income opportunities
- **Rationale**: Large caps have **stable earnings growth** and **rising margins**, attractive to both value and growth investors

Small-Cap Stocks

- **Return on Equity (ROE)**: Expected to reach 6.09% by 2025, demonstrating growing efficiency
- **Price/Earnings (P/E) Ratio:** Projected to rise from 24.13 (2023 Q4) to 29.44 (2025 Q4), reflecting higher growth expectations, preferred by growth investor
- **Free Cash Flow (FCF)**: While lower than large caps, improving FCF indicates potential for reinvestment and growth
- **Rationale**: Small caps present significant growth potential with **rising profitability** and **efficient use of equity**, making them appealing for growth investors

Treasury Bonds

- **Safety**: Provide a hedge against market volatility
- **Yield Stability**: Treasuries offer consistent, lower-risk returns, particularly attractive during periods of cooling inflation and potential rate cuts
- **Rationale**: Treasuries balance stock-heavy portfolios by providing **stability** and low-risk returns in volatile market conditions

Expected Mean Returns (2012-2023):

SPY 13.8% IWM 11.5% TLT 2.9% LQD 3.2% SHV: 5.4%

Portfolio Performance (3)

Value Investor

*Reflected by **positive exposure to HML** in the factor model*

Sharpe Ratio	0.0005	0.001	0.05
Large-Cap	39%	50%	55%
Small-Cap	5%	7%	18%
Treasury Bond	34%	25%	17%
Corporate Bond	5%	5%	5%
Cash	18%	13%	5%
Expected Return	7.2%	9.3%	10.4%
Expected Volatility	8.0%	8.9%	12.3%

› 6.89% (Expected Return)

› 7.57% (Expected Volatility)

Large-Cap: Offer **stability**, **reliable dividends**, and **established market positions**, ideal for conservative, long-term value investors

Small-Cap: Though riskier, they provide **opportunities for undervalued growth**, which can lead to **higher long-term returns** as market recognition grows (particularly in rate cut environment)

Treasury Bond: Serve as a **safe-haven asset**, preserving capital and generating steady, low-risk income during volatile market periods; will become less preferrable when investor emphasizing returns

Cash: Provides **liquidity** and **flexibility** to seize buying opportunities when undervalued assets arise; will become less preferrable when investor emphasizing returns

```
Table for HML:
          SPY       IWM       TLT       LQD       SHV
HML  0.000214  0.002016 -0.002746 -0.000784 -0.000019
```

*Only Large-cap and Small-cap stocks will be responding to the influence of HML, with Small-cap being more sensitive **Value Investor**. Focuses on undervalued stocks with strong fundamentals, prioritizing safety and dividends*

Expected Mean Returns (2012-2023):

SPY 13.8% IWM 11.5% TLT 2.9% LQD 3.2% SHV: 5.4%

Portfolio Performance (3)

Growth Investor

*Reflected by **negative exposure to HML** in the factor model*

Sharpe Ratio	0.0005	0.001	0.05
Large-Cap	45%	55%	55%
Small-Cap	5%	9%	18%
Treasury Bond	40%	26%	17%
Corporate Bond	5%	5%	5%
Cash	5%	5%	5%
Expected Return (> 6.89%)	8.2%	9.6%	10.5%
Expected Volatility (~ 7.57%)	9.3%	10.7%	12.3%

Mega-cap companies like the "Magnificent Seven" (Apple, Nvidia, Microsoft, etc.) dominate the tech space and **offer strong earnings growth potential**, driven by innovation and market leadership

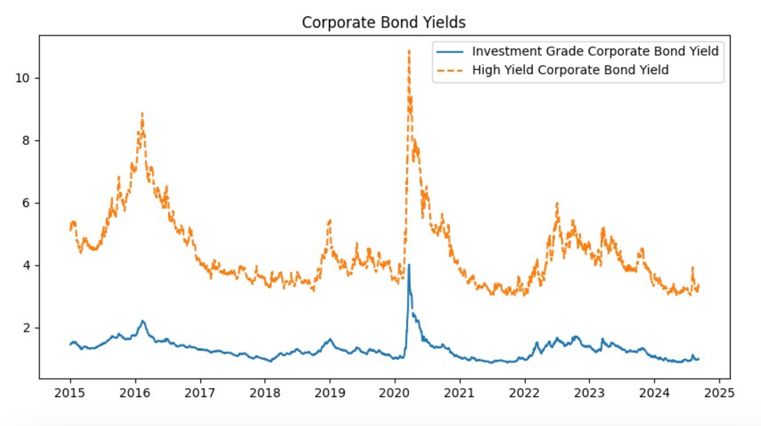
Provide **high-growth opportunities** as smaller, agile companies have **greater room for expansion**, especially in **disruptive sectors**

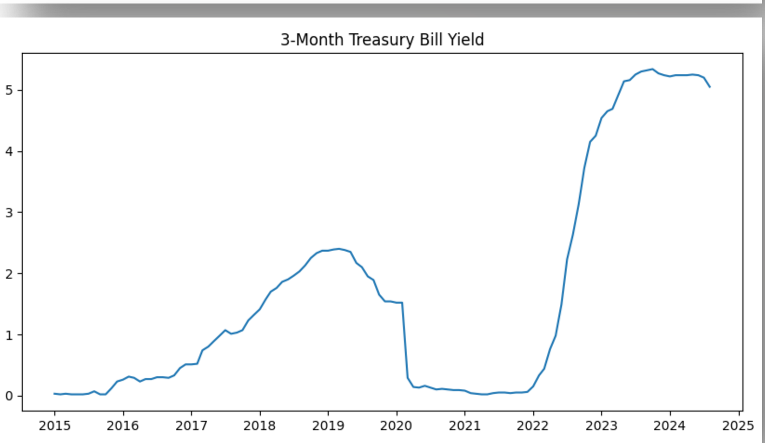
Offer **stability** for growth-heavy portfolios, reducing risk during market downturns while **preserving capital** for future high-growth investments; will become less preferrable when investor emphasizing returns

```
Table for HML:
          SPY       IWM       TLT       LQD       SHV
HML  0.000214  0.002016 -0.002746 -0.000784 -0.000019
```

Only Large-cap and Small-cap stocks will be responding to the influence of HML, with Small-cap being more sensitive
***Growth Investor:** Seeks high-growth companies with potential for substantial future gains*

Less Focus on Corporate Bond / Cash





Risk and Return Considerations

Corporate Bonds - Generally, provide moderate returns with relatively low risk compared to stocks

- **Investment-grade bonds** remain attractive with stable corporate fundamentals, but further gains are limited due to tight valuations
- **High-yield bonds** offer potential but come with heightened volatility concerns

Cash - Holding cash offers liquidity and safety but yields minimal returns. Holding a significant amount of cash might limit the portfolio's growth potential

Focus on Growth

- Maximizing capital appreciation rather than preserving capital or stabilizing income through lower-risk assets like corporate bonds or cash

Long-Term Perspective

- Given investment horizon consideration, equities historically have outperformed other asset classes in terms of total return

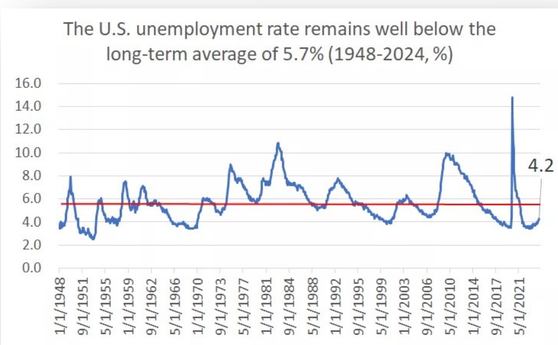
Inflation Considerations

- In an inflationary environment, **real returns on cash** and **bonds** can be **negative**, whereas equities can provide a hedge against inflation due to the ability of businesses to pass on higher costs to consumers, potentially leading to higher profits and stock prices

Market Outlook for the Next 3 Years

Macro Economy

- **Economic Growth**: Despite recent fluctuations, **GDP growth has been resilient.** However, **risks persist** due to geopolitical uncertainty and inflation remaining above central bank targets
- **Federal Reserve**: The Fed's interest rate policy is currently aimed at cooling inflation, though uncertainty remains on when rate cuts will occur

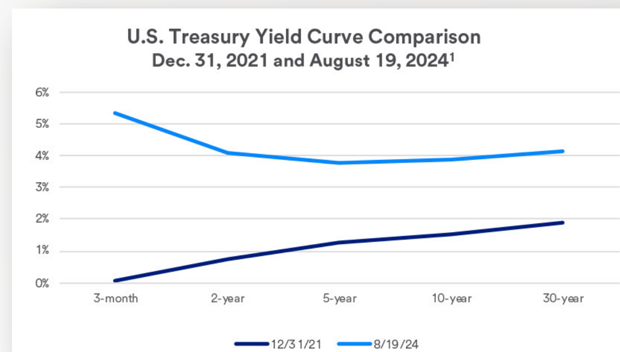


Equity Market

- U.S. presidential election adds **risk**, but historically, the S&P 500 **averages a 7% gain** during election years
- Interest rate cuts are typically considered **good news** for stock prices, but the circumstances vary. Market might not react positively if the Fed is forced to issue emergency rate cuts to stave off a recession
- Despite recent **tech stocks' volatility**, a strong earnings growth will be expected. Tech and consumer discretionary sectors show the highest upside potential
- Possible outcomes range from a continued **bull market** to potential **corrections** or a **bear market** if inflation or interest rates rise unexpectedly. A major technological breakthrough could also change the investment landscape

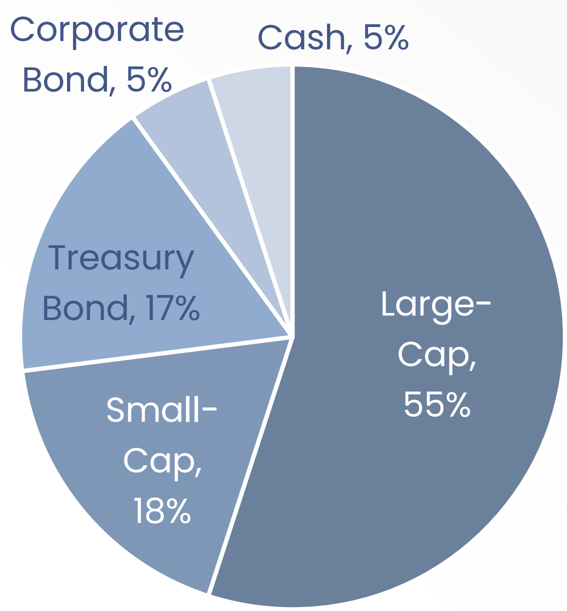
Bond Market

- **Yield Dynamics**: Bond yields might be **volatile**, might be **rising** due to inflation concerns but later **declining** as inflation and growth rates moderated (but currently the yield curve is returning to normal)
- The uncertainty in timing and the unpredictable responses to interest rate environment will potentially influence **bond market's reaction** and the **bond yields**



Source: Charles Schwab Investment Advisory, Inc. and Schwab Asset Management and Morningstar

Bull Market Continues



70 / 30 Stock Bond Portfolio

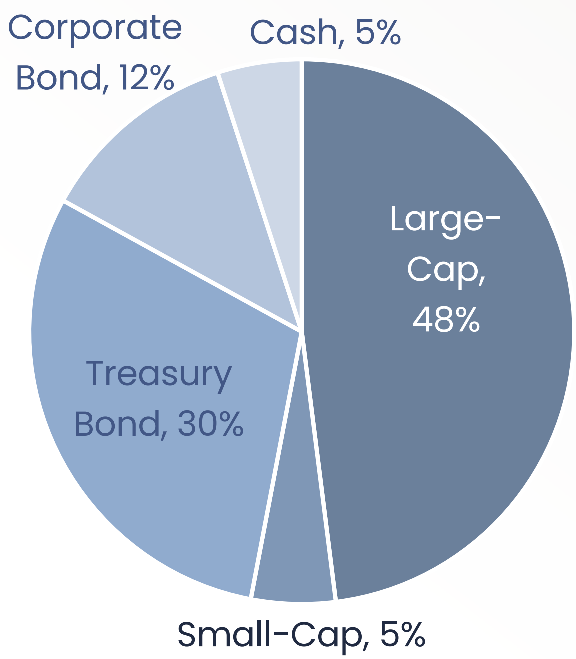
Stability and Growth:

- The portfolio allocation, with its significant allocations to **large-cap stocks** and **treasury bonds**, is well-positioned to capitalize on steady market growth
- Large-cap stocks provide **stability** and **reliable dividends**, while treasury bonds offer safety and low-risk income, reducing overall portfolio volatility

Small-Cap Exposure:

- The smaller allocation to small-cap stocks allows for participation in potential **high-growth opportunities** without significantly increasing risk

Market Correction



50 / 50 Stock Bond Portfolio

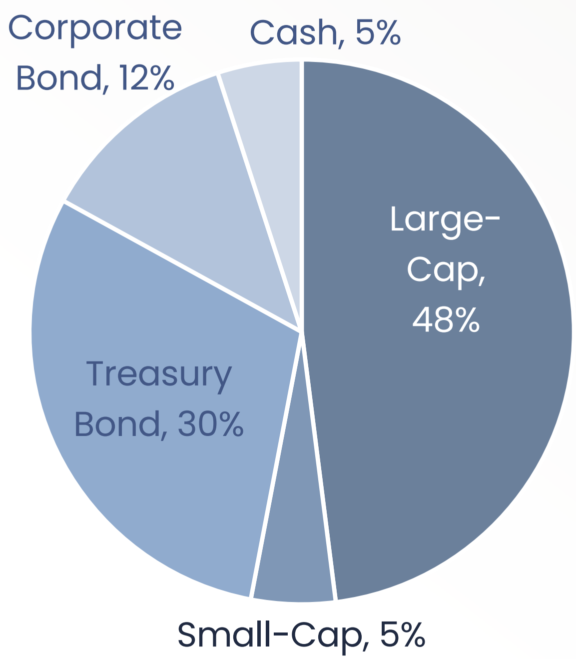
Risk Mitigation:

- **Treasury bonds** and **cash holdings** in the portfolio act as buffers against market downturns, preserving capital. This conservative approach helps mitigate the impact of temporary market declines

Recovery Potential:

- **Large-cap stocks**, with their established market positions and solid dividends, are likely to recover swiftly post-correction, further aided by the generally robust nature of mega-cap companies.

Bear Market



50 / 50 Stock Bond Portfolio

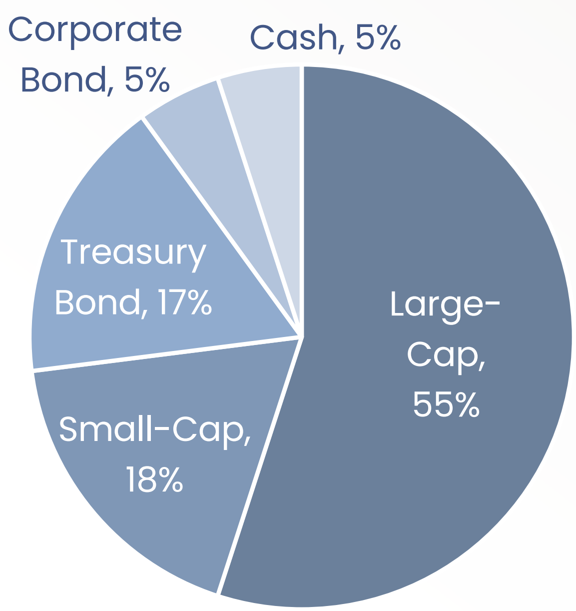
Capital Preservation:

- A heavy allocation to **treasury bonds** and a decent **cash reserve** provide strong capital preservation characteristics, which are crucial during prolonged market downturns

Reduced Volatility:

- The diversification across different asset classes, including corporate bonds, will help lower the portfolio's overall volatility in a bear market, although the equity components may still suffer losses

New Market Paradigm



70 / 30 Stock Bond Portfolio

Adaptability:

- If the market paradigm shifts due to technological breakthroughs or significant economic changes, the portfolio's exposure to **large-cap** and particularly **mega-cap tech companies** positions it well to benefit from new growth sectors

Flexibility:

- **Cash** reserves offer the flexibility to adjust holdings and capitalize on new opportunities as they arise, which is vital in rapidly changing market conditions

Thank you!

Any Questions?