

# High-Risk vs Low-Risk Portfolio Analysis

## Erdős Quantitative Finance – Mini Project 1

Guoqin Liu

June 25, 2025

# Methodology & Risk Metrics

- **Data:** Daily adjusted closes (Jan 2023 – today) via `yfinance`.
- **Risk proxy:** 5-year beta vs. S&P 500.
- **Momentum proxy:** 52-week percentage price change.
- **Portfolios:** Two equal-weight baskets (20 % each name).

# Beta: Definition & Calculation

- Beta measures sensitivity of a security's returns to market moves.

$$\beta = \frac{\text{Cov}(R_{\text{asset}}, R_{\text{market}})}{\text{Var}(R_{\text{market}})}$$

- Interpretation

- $\beta = 1$ : moves one-for-one with the market.
- $\beta < 1$ : less volatile than the market.
- $\beta > 1$ : more volatile (amplifies moves).

- Implementation (Python):

- 1 Download daily returns for each ticker and GSPC.
- 2 Compute log returns.
- 3 Use `numpy.cov` to get covariance; divide by market variance.

# Low-Risk Portfolio

Ticker	Company / ETF	$\beta$	52-week $\Delta$ (%)
JNJ	Johnson & Johnson	0.41	2.84
PG	Procter & Gamble	0.43	-5.62
KO	Coca-Cola	0.46	9.92
BRK.B	Berkshire Hathaway B	0.84	18.44
BND	Vanguard Total Bond ETF	0.24	0.39
<b>Equal-weight avg.</b>		<b>0.23</b>	<b>7.30</b>

- Defensive sectors plus bond ETF sleeve.
- About half the market's volatility yet still a positive trailing return.

# High-Risk Portfolio

Ticker	Company	$\beta$	52-week $\Delta$ (%)
TSLA	Tesla	2.46	74.27
NVDA	NVIDIA	2.12	6.10
PLTR	Palantir Tech	2.64	431.76
COIN	Coinbase Global	3.62	30.70
MRNA	Moderna	1.86	-80.96
<b>Equal-weight avg.</b>		<b>2.11</b>	<b>117.71</b>

- Concentrated exposure to AI, EV, crypto, biotech themes.
- Very high upside—but expect wide drawdowns.

# Comparison at a Glance

- **Average Beta**

Low-Risk = 0.23    High-Risk = 2.11

- **Weighted 52-week Return**

Low-Risk = 7.30 %    High-Risk = 117.71 %

- Low-risk basket dampens volatility via defensive sectors and bonds.
- High-risk basket amplifies market swings and theme rotations.

# Key Takeaways from the Project

- **Systematic-risk quantification:** used the 5-year beta to gauge how much each asset amplifies or dampens market moves.
- **Momentum snapshot:** 52-week price change provided a quick proxy for recent performance.
- **Equal-weight construction:** showed how simple 20 % weights translate directly into portfolio-level beta and return.
- **Risk–return trade-off:** contrasted a defensive basket ( $\beta < 1$ ) with a growth basket ( $\beta \gg 1$ ) to illustrate volatility vs. potential upside.
- **Importance of diversification & rebalancing:** highlighted how sector mix and periodic reweighting keep the intended risk profile intact.