

# Title: Momentum-Based Multi-Asset Algorithmic Trading Strategy

## Vrishani Shah 451-DL-Assignment 3

### 1. Introduction

- Purpose of automated systematic trading
- Idea: time-series momentum across diversified ETF assets
- Reference Clenow (2019) – trend-following with volatility targeting

### 2. Data and Portfolio Construction

- Data: Adjusted daily close prices from Yahoo Finance (2014–2025)
- Universe: SPY, QQQ, IWM, EFA, EEM, TLT, LQD
- Rebalance frequency: Monthly

### 3. Strategy Design

- **Signal:** 126-day positive return → long exposure; otherwise no exposure
- **Position sizing:** Inverse-volatility weighting with 10% target annualized vol
- **Costs:** 3 bps slippage assumed per rebalance
- **Benchmarks:** SPY, QQQ, TLT buy-and-hold

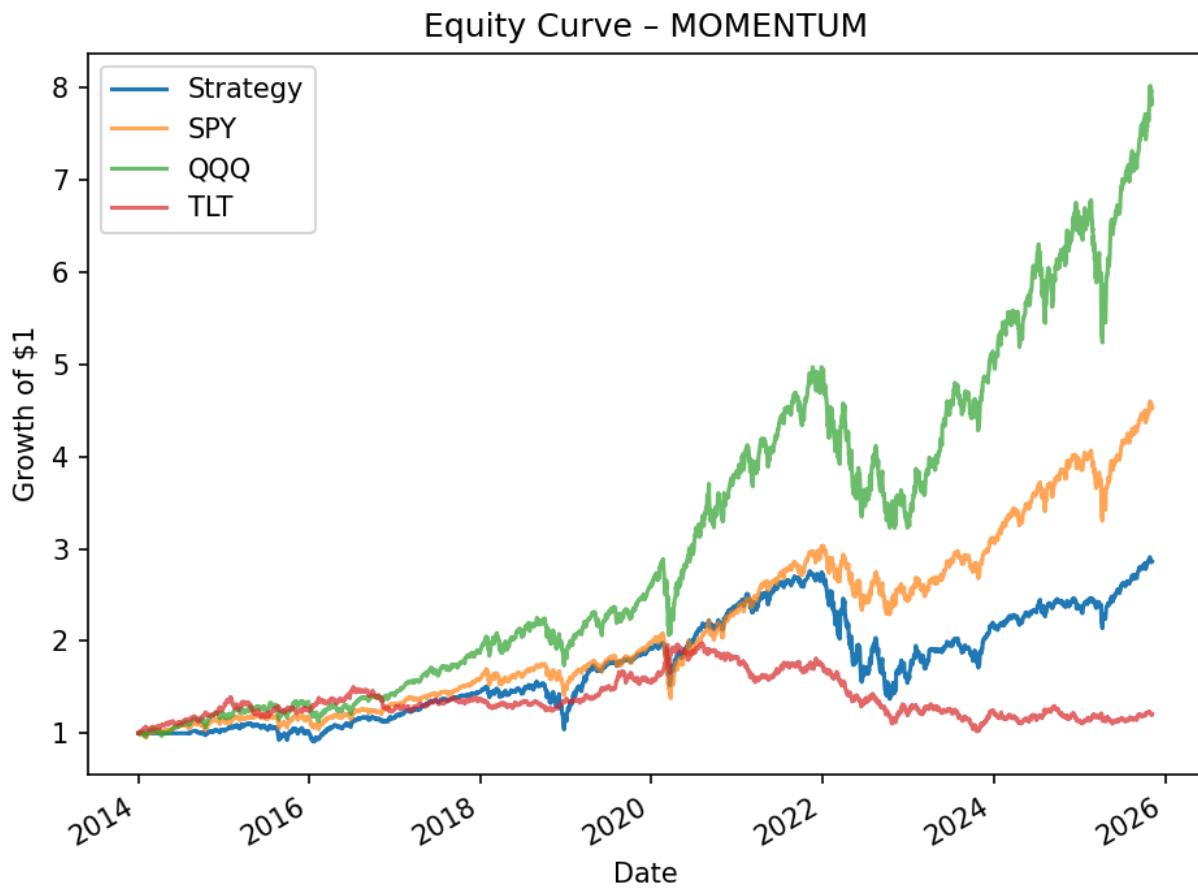
### 4. Backtesting Framework

- In-sample period: 2015–2021
- Out-of-sample period: 2022–2025
- Evaluation metrics: Sharpe ratio, CAGR, MaxDD, Annualized volatility

### 5. Results

#### Performance Summary

Period	CAGR	Sharpe	MaxDrawdown	AnnualizedVolatility
In-Sample (2015–2021)	0.1487	0.9515	-0.3337	0.1591
Out-of-Sample (2022–2025)	0.0134	0.1775	-0.495	0.259
Full Period	0.0928	0.5585	-0.5023	0.1922



- **Interpretation**

The momentum strategy performed well during the in-sample period (2015–2021), achieving a Sharpe ratio of 0.95 and a CAGR of 14.9% with moderate volatility. However, out-of-sample performance deteriorated substantially (Sharpe = 0.18, CAGR = 1.3%), indicating that the strategy did not generalize robustly to market conditions after 2022. In particular, the strategy experienced a large drawdown of nearly 50% during 2022–2023, a period characterized by regime change: rising interest rates, inflation shocks, and rotation away from growth equities. Because the strategy allocates dynamically toward assets with recent positive momentum, it was systematically overweight high-beta tech and international equities, which underperformed significantly during the post-2022 environment. Despite risk targeting, the portfolio's exposure to correlated momentum crashes increased realized volatility. Overall, this strategy is effective in trending bull markets but vulnerable during sharp regime reversals and sideways markets.

## 6. Discussion

- Strength: performs well in stable/trending bull market regimes
- Weakness: momentum crash behavior after macro regime shift (rate hiking cycle)
- Possible improvements:
  - Include trend filter (e.g., SMA(200) > SMA(400))
  - Reduce leverage after volatility spikes
  - Add bonds as defensive overlay factor

## 7. Conclusion

- The momentum effect is real but **not regime-stable**
- Robust trading systems require regime awareness or diversification of signals