

MARKET DATA ANALYSIS

Analyzing S&P 500 sector-based ETFs



February
05, 2026

Presented By:
Huadong Liao



DATA COLLECTION

We start the analysis by collecting data.

Analyzed ETFs

- XLE - Energy
- XLF - Financials
- XLI - Industrials
- XLK - Technology
- XLP - Consumer Staples
- XLY - Consumer Discretionary

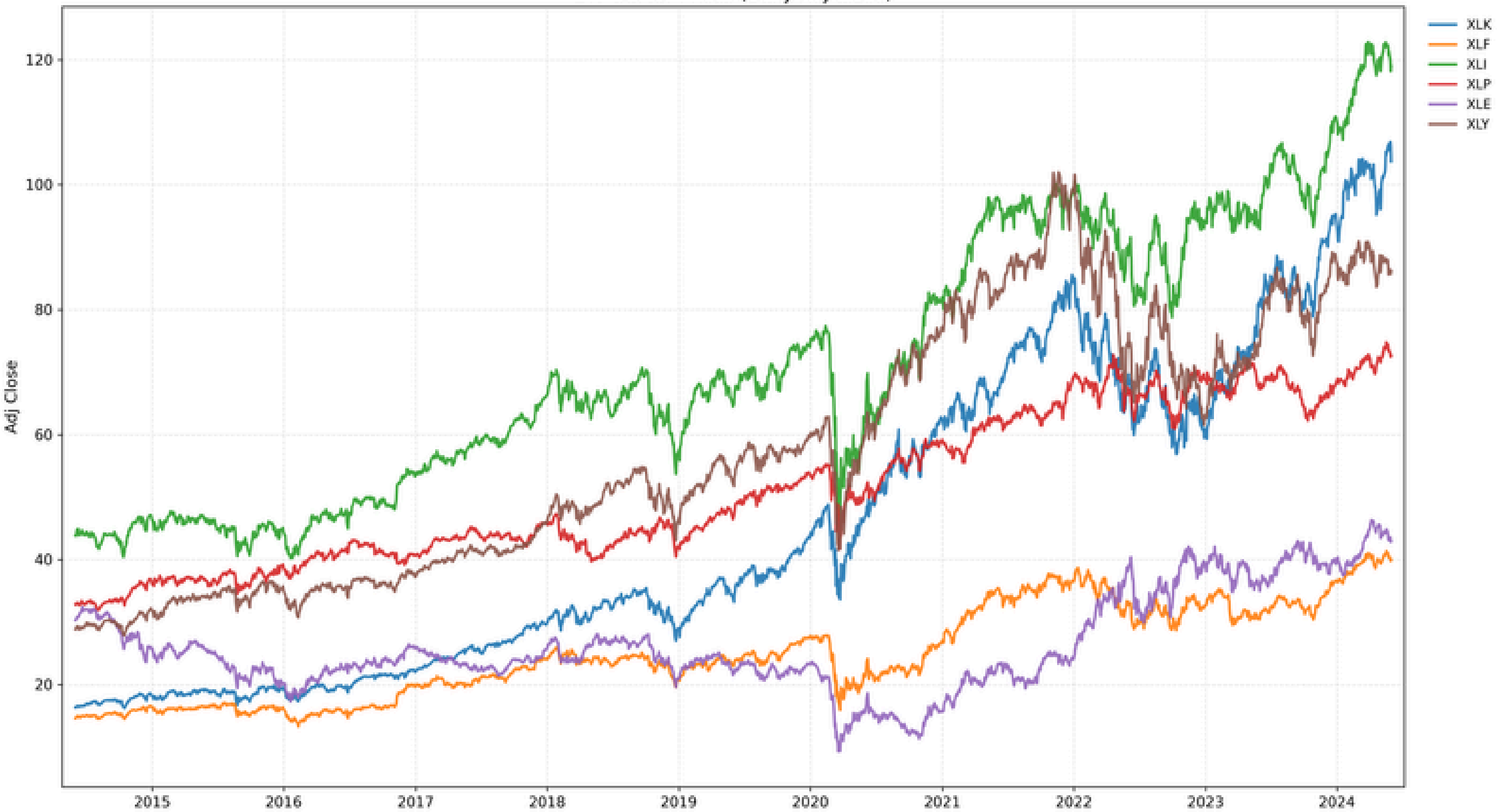
Analyzed period

- Start: May 31, 2014
- End: May 31, 2024

Primary source

- Yahoo Finance

ETF Sector Prices (Daily Adj Close)



Ticker	Start	End	Starting price	Ending price	Cumulative return(%)	CAGR (%)	Years
XLE	2014-06-02	2024-05-30	30.29	42.93	41.73	3.55	10.0
XLF	2014-06-02	2024-05-30	14.59	40.0	174.15	10.62	10.0
XLI	2014-06-02	2024-05-30	43.86	118.98	171.29	10.5	10.0
XLK	2014-06-02	2024-05-30	16.34	103.73	534.99	20.32	10.0
XLP	2014-06-02	2024-05-30	32.84	72.63	121.15	8.27	10.0
XLY	2014-06-02	2024-05-30	28.85	86.22	198.79	11.58	10.0

+534.99% ▲
in 10 years

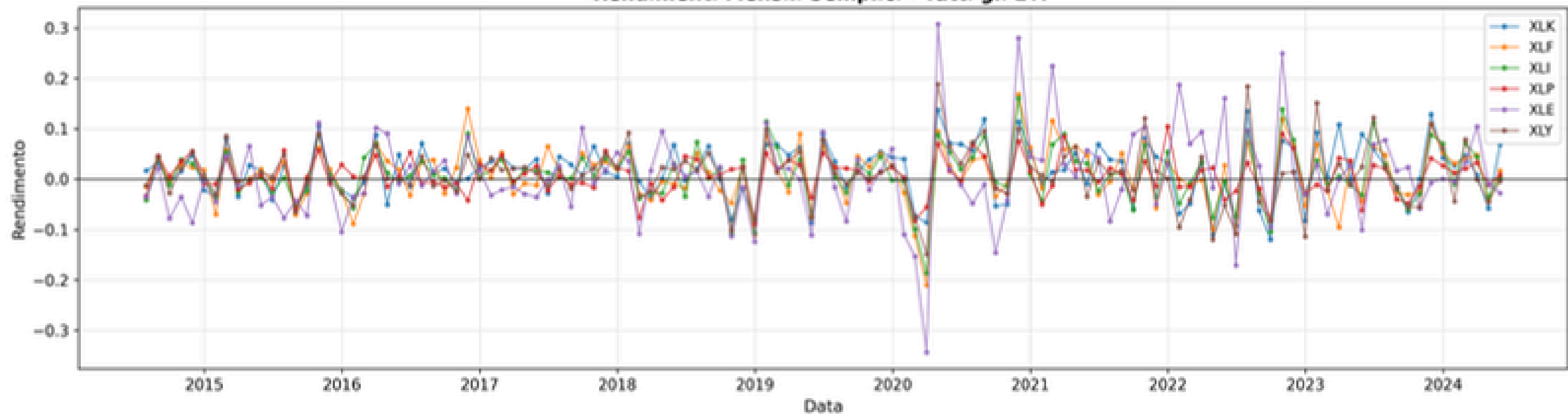


Key Drivers of XLK Growth

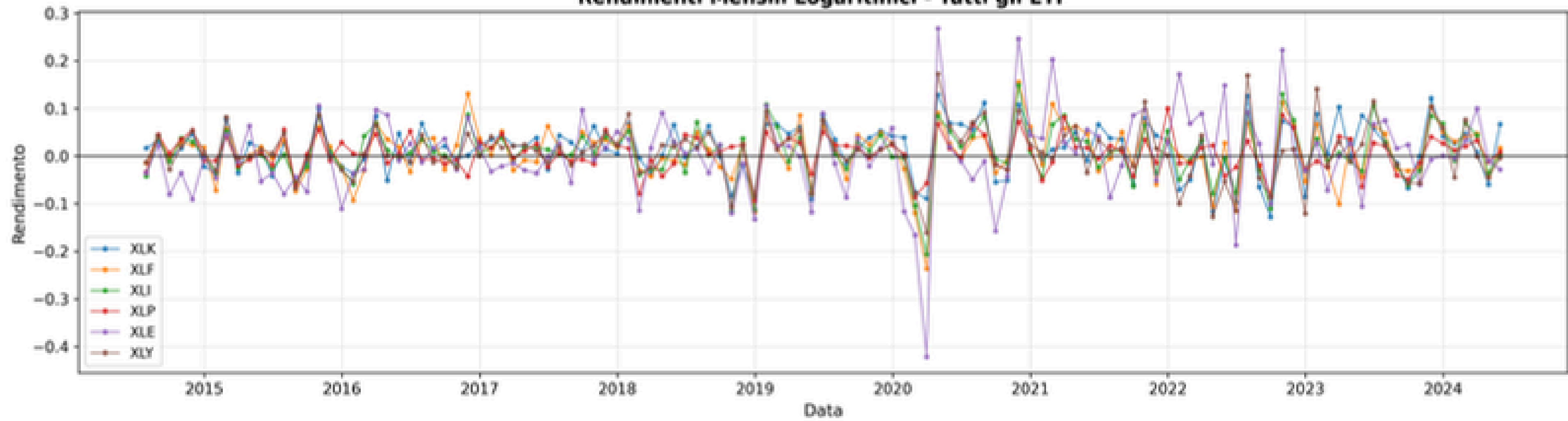
The world has become increasingly technology driven over the last decade, leading to sustained growth in the technology sector:

- Smartphones becoming mainstream
- Major Big Tech product launches
- Shift to SaaS business models
- Adoption of cloud computing
- Rising demand for GPUs and AI accelerators (GPUs/TPUs)
- AI and data center expansion
- Global digitalization of the economy

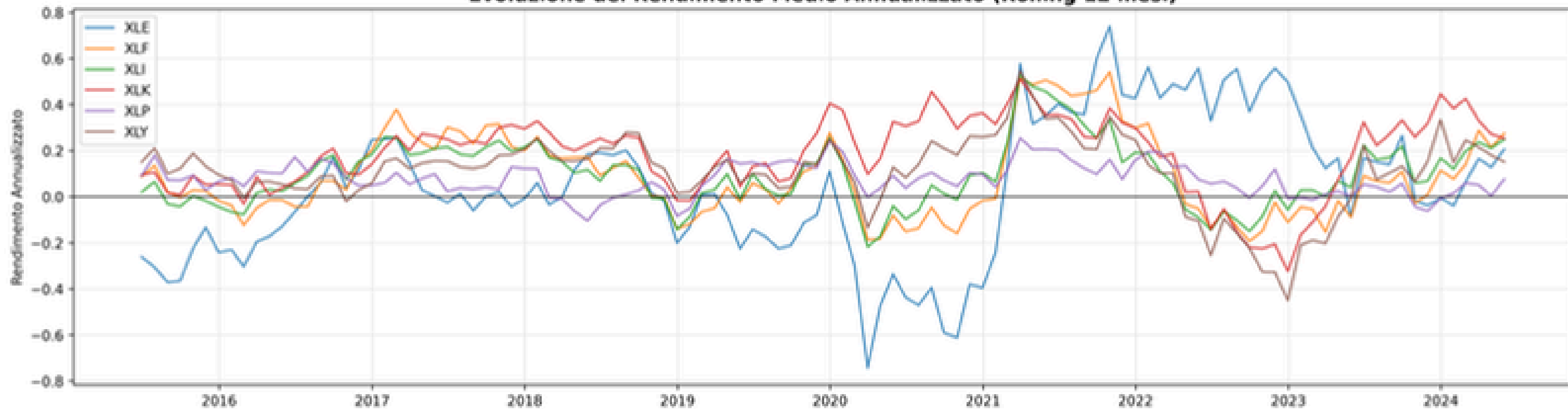
Rendimenti Mensili Semplici - Tutti gli ETF



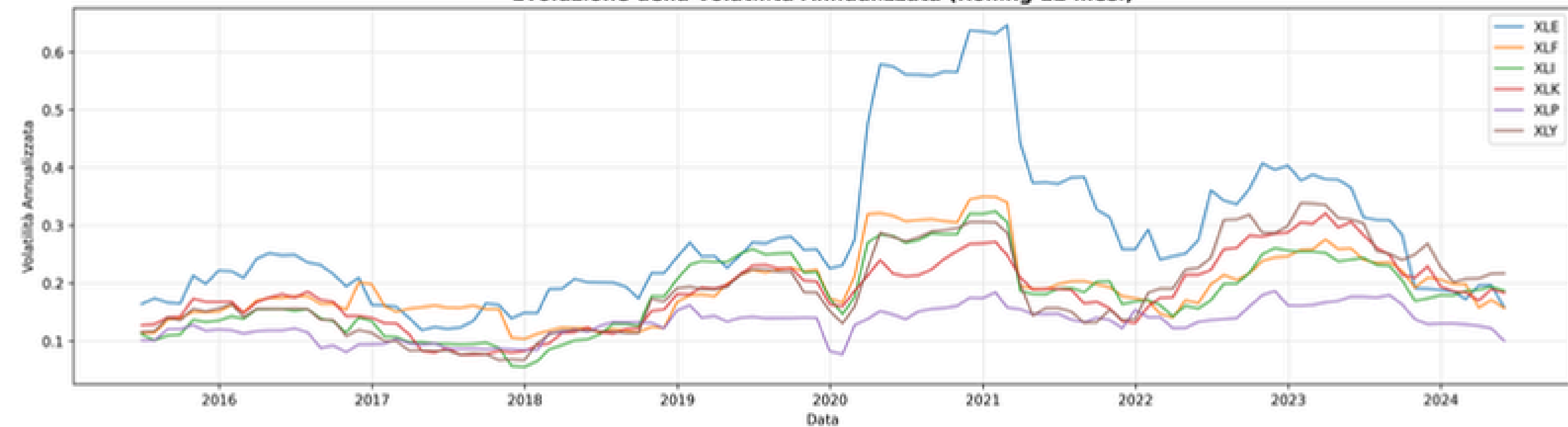
Rendimenti Mensili Logaritmici - Tutti gli ETF



Evoluzione del Rendimento Medio Annualizzato (Rolling 12 mesi)



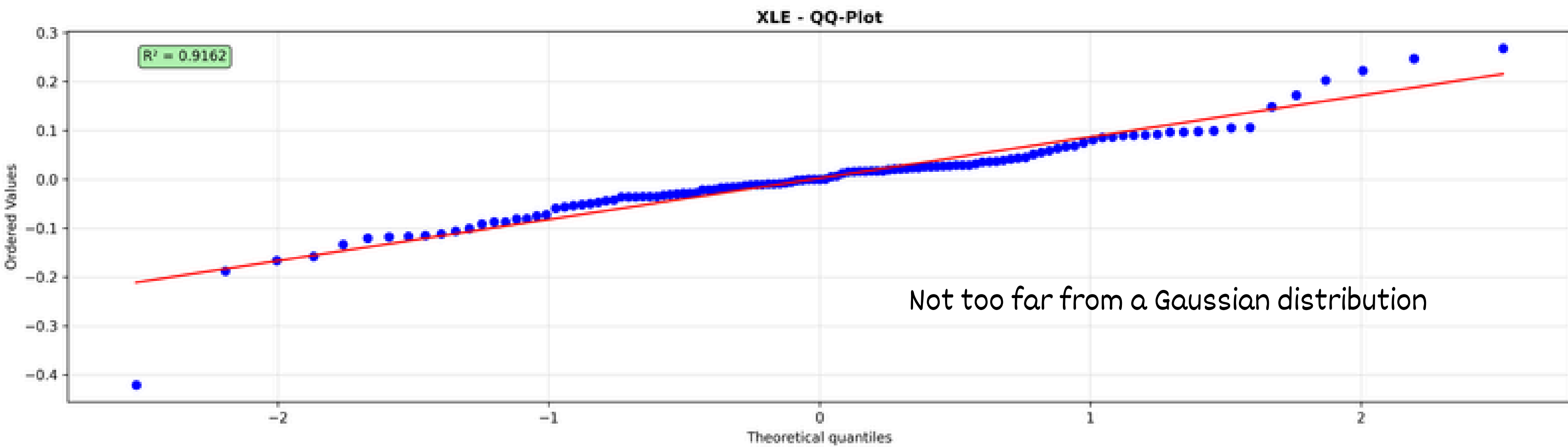
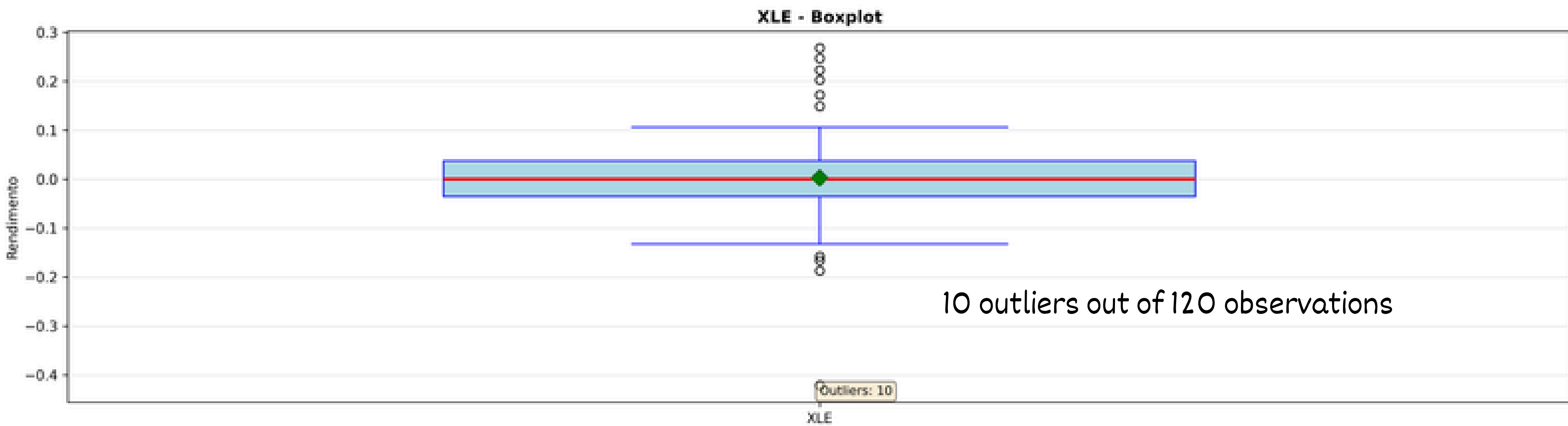
Evoluzione della Volatilità Annualizzata (Rolling 12 mesi)



Behind the scenes...

- High concentration: Exxon Mobil + Chevron
- Highly volatile oil & gas prices
- Wars → supply shocks
- Geopolitics / OPEC





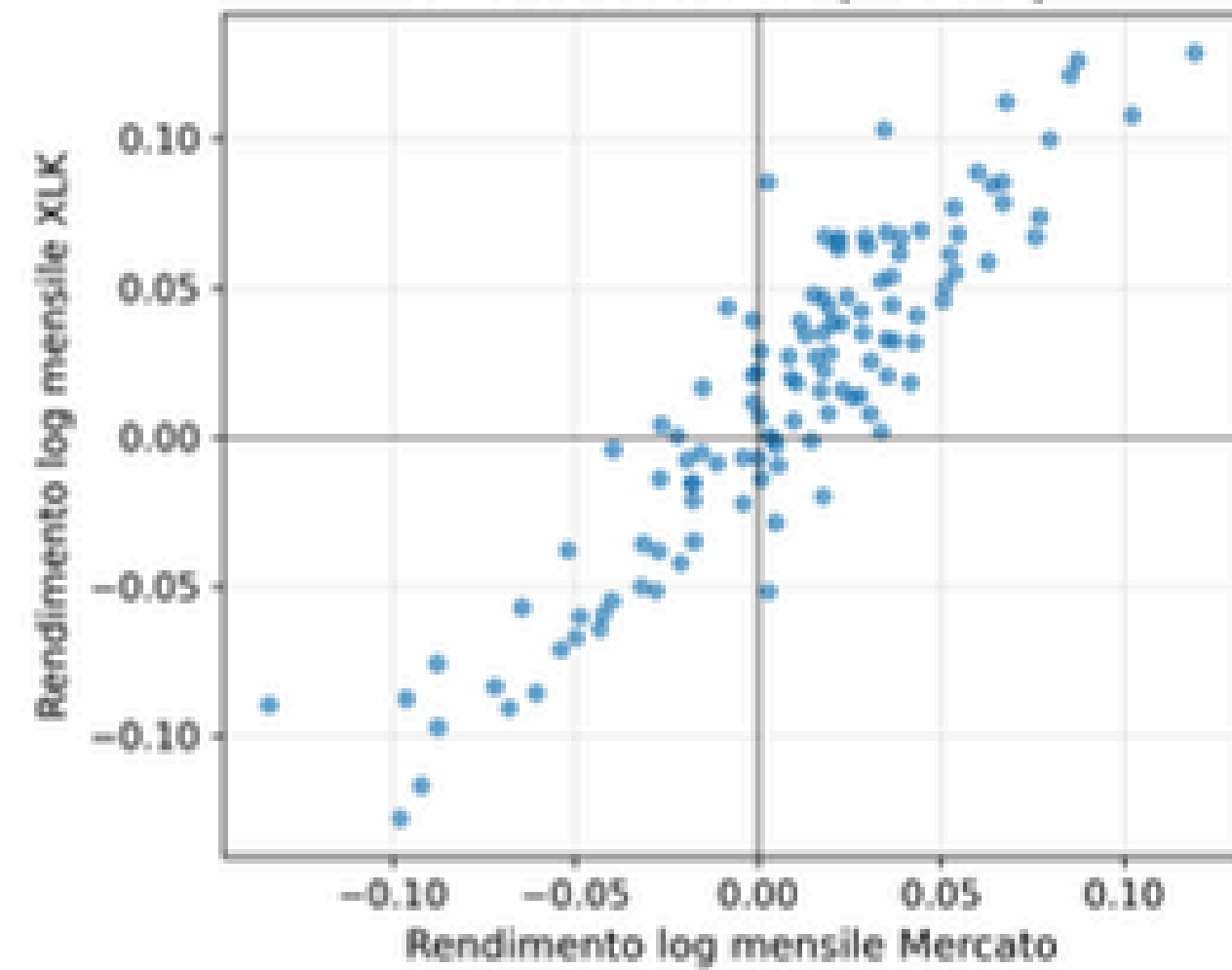
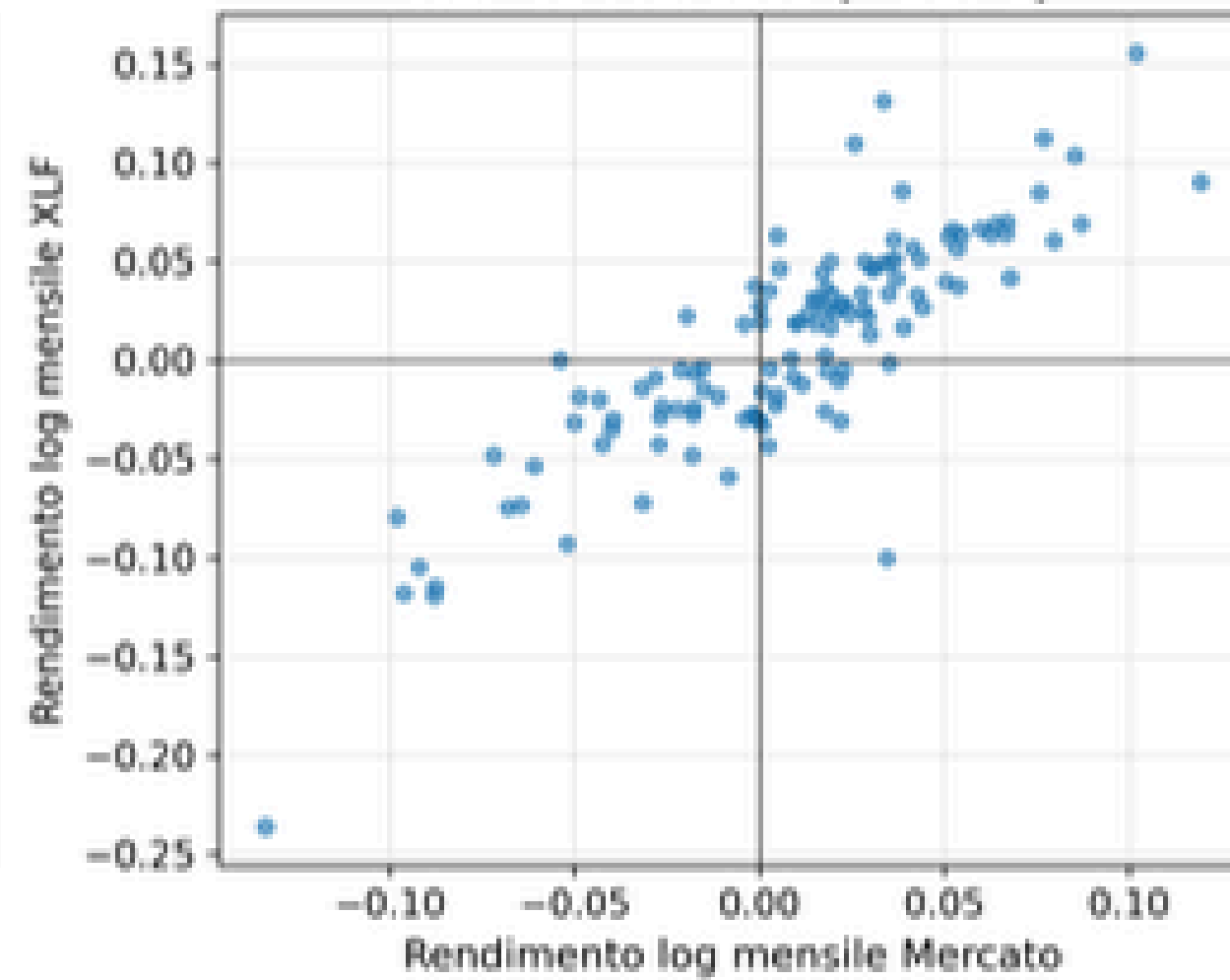
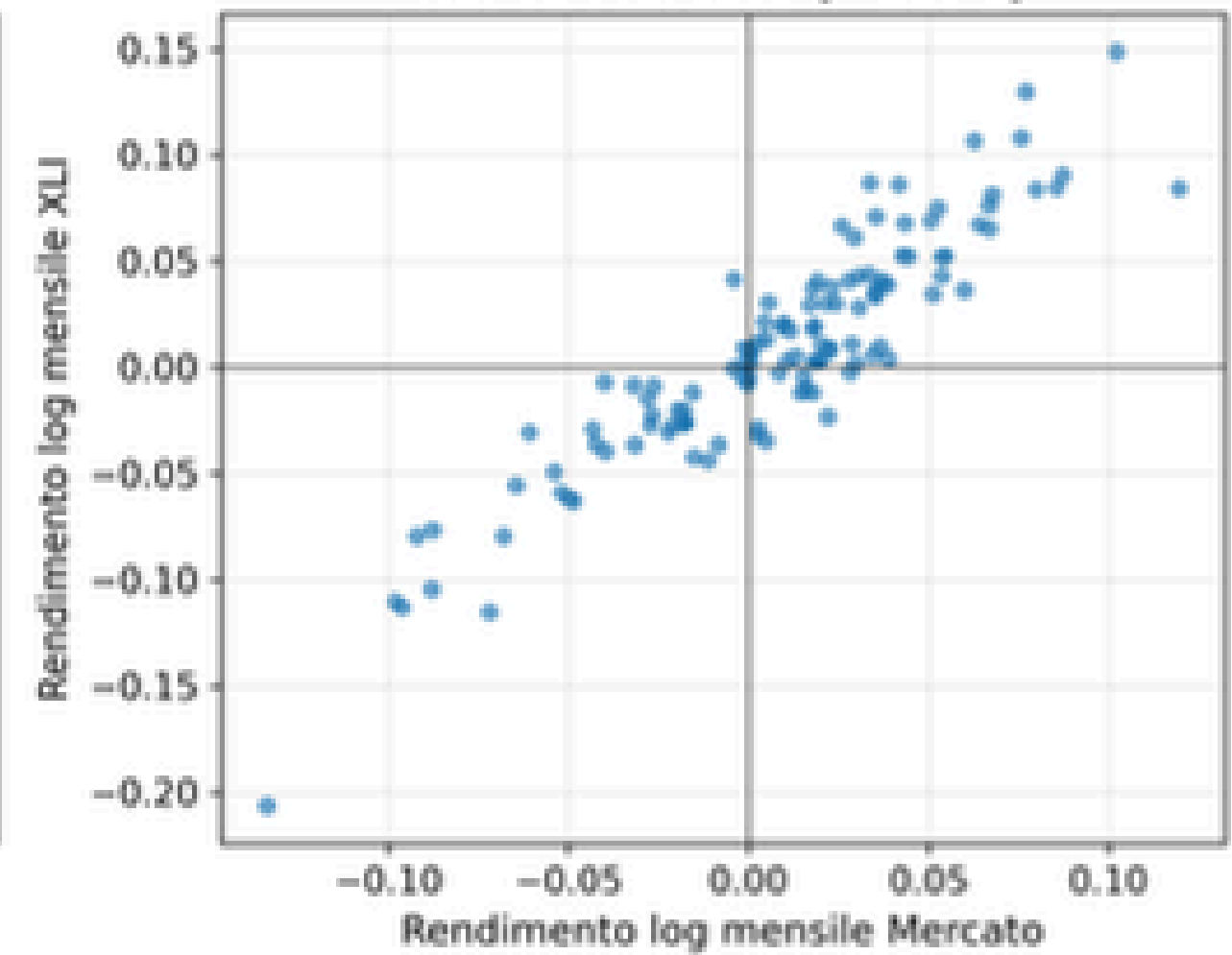
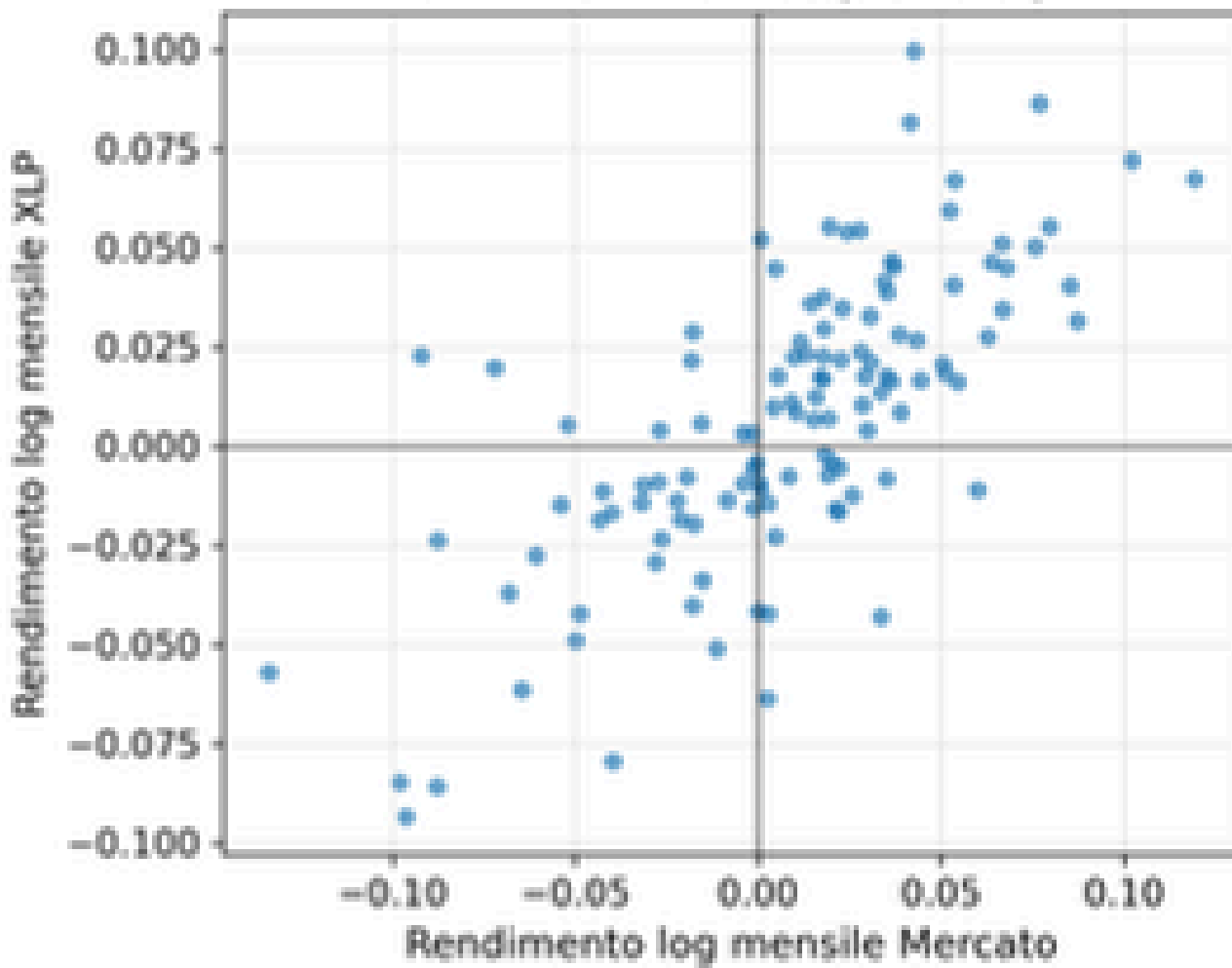
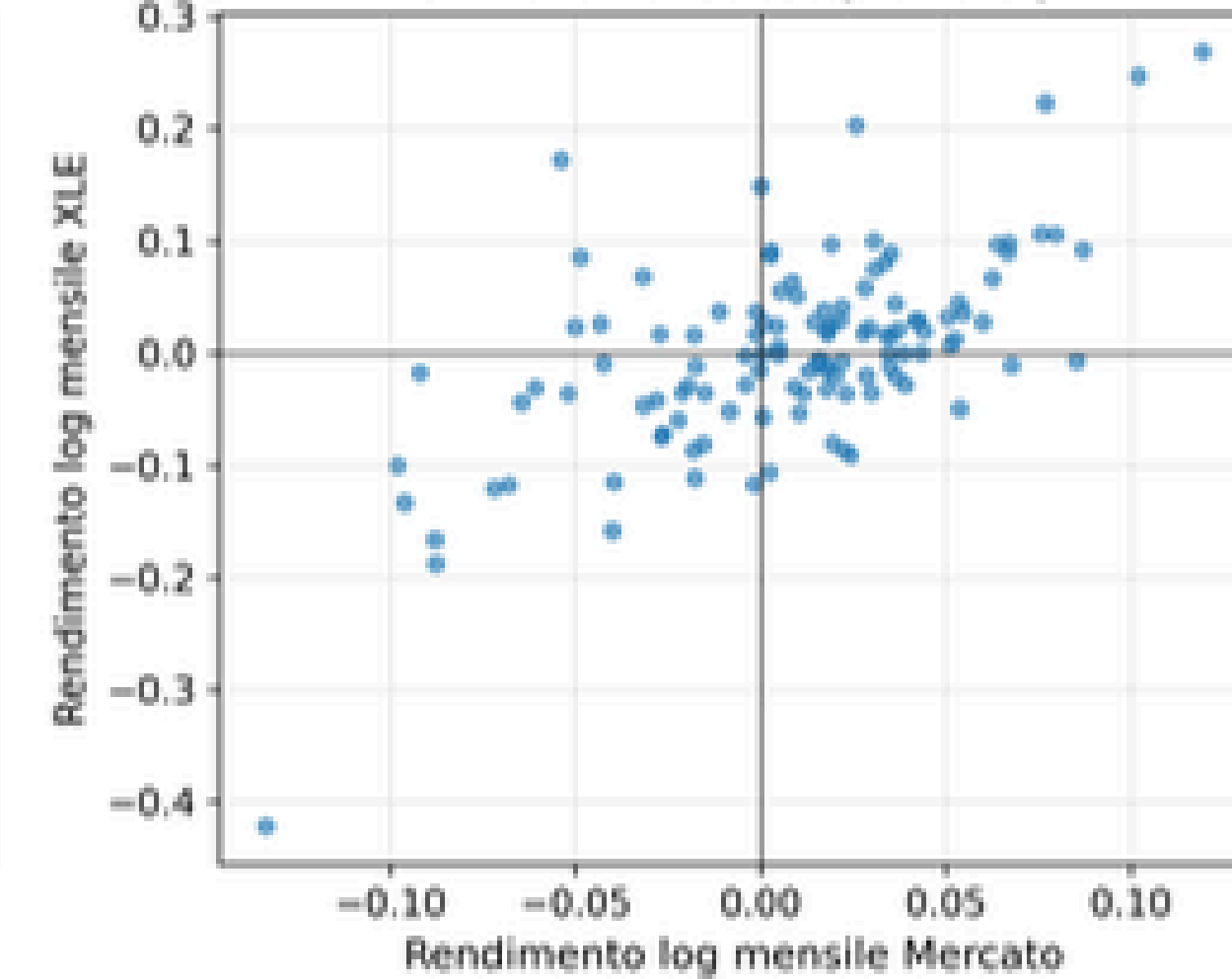
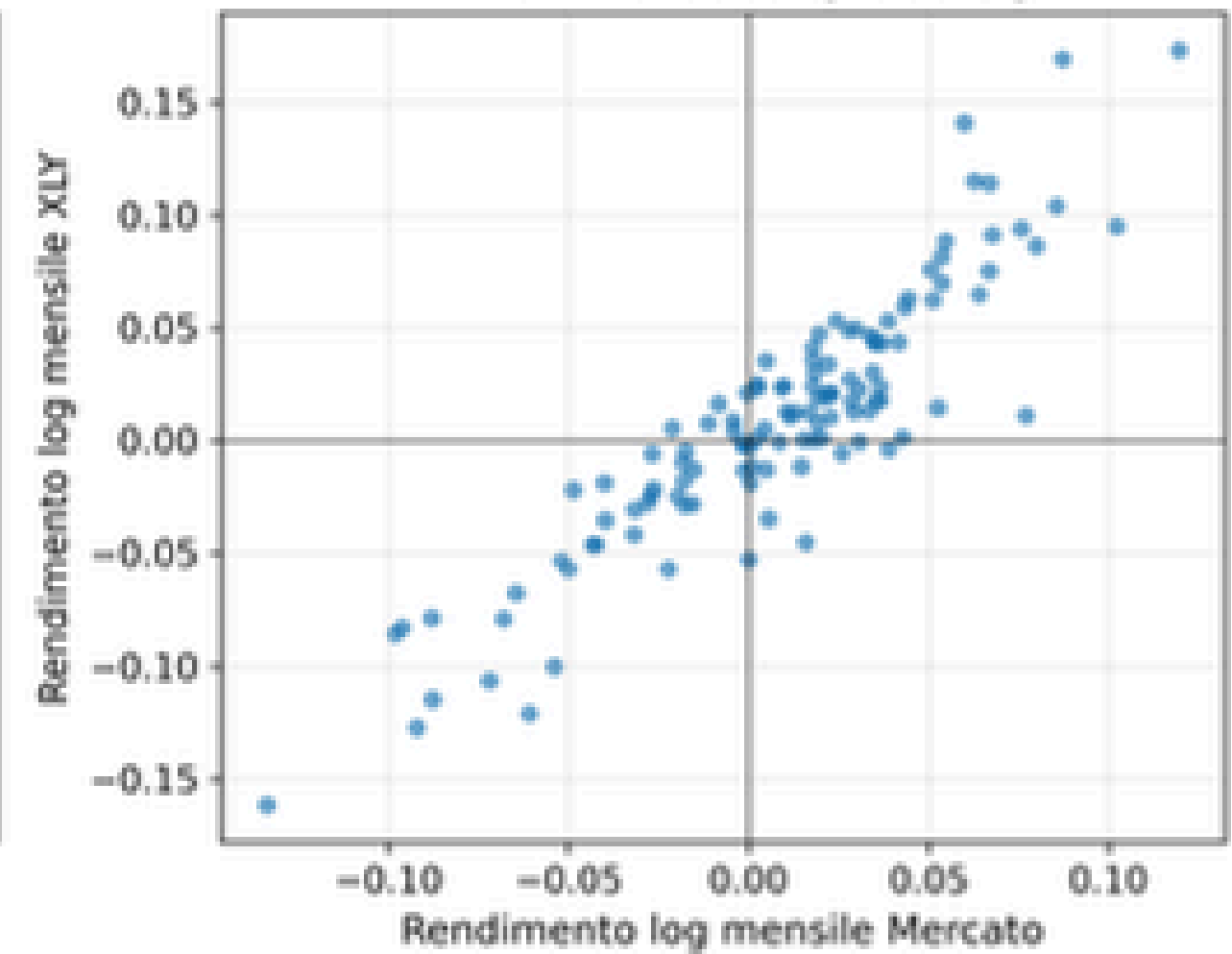
Just a reminder...

- 68% of the data in $[\mu - \sigma, \mu + \sigma]$
- 95% of the data in $[\mu - 2\sigma, \mu + 2\sigma]$
- 99.7% of the data in $[\mu - 3\sigma, \mu + 3\sigma]$

But σ can be any number!



Ticker	Average annual logarithmic return	Annual variance	Annual Std. Dev.	Skewness	Kurtosis
XLE	0.029630	0.091090	0.301812	-0.503220	4.945716
XLF	0.099556	0.038715	0.196762	-0.744394	2.346835
XLI	0.100591	0.034371	0.185394	-0.494754	1.760691
XLK	0.184370	0.035560	0.188574	-0.362401	-0.194357
XLP	0.080042	0.016060	0.126727	-0.280530	0.299075
XLY	0.108779	0.038475	0.196151	-0.040993	1.125391

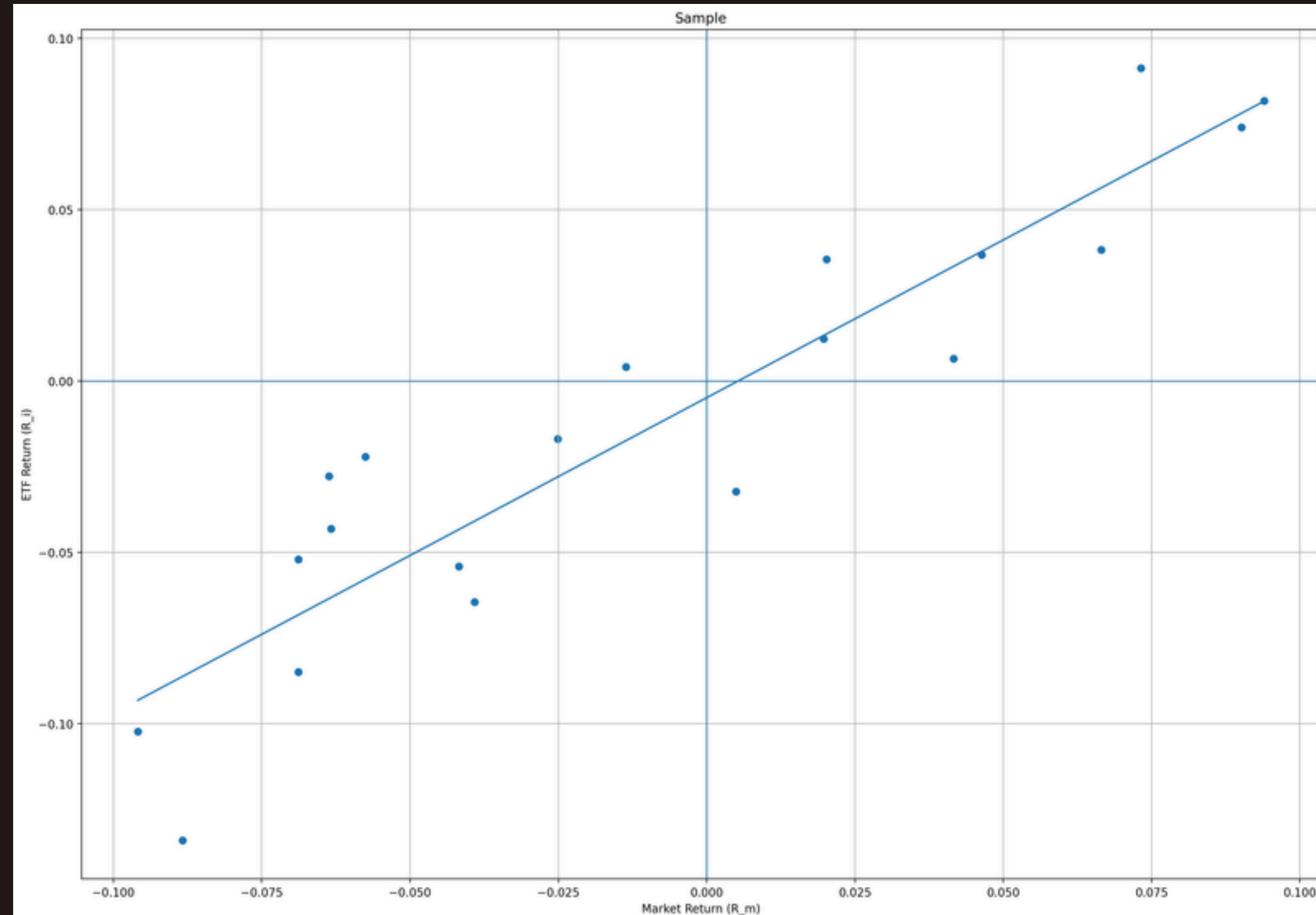
XLK vs Mercato (\hat{GSPC})**XLF vs Mercato (\hat{GSPC})****XLI vs Mercato (\hat{GSPC})****XLP vs Mercato (\hat{GSPC})****XLE vs Mercato (\hat{GSPC})****XLY vs Mercato (\hat{GSPC})**

ETF Betas relative to the market

- XLE : 1.071
- XLF : 1.067
- XLI : 0.987
- XLK : 1.197
- XLP : 0.622
- XLY : 1.061

$$\beta_i = \frac{\text{Cov}(R_i, R_m)}{\text{Var}(R_m)}$$

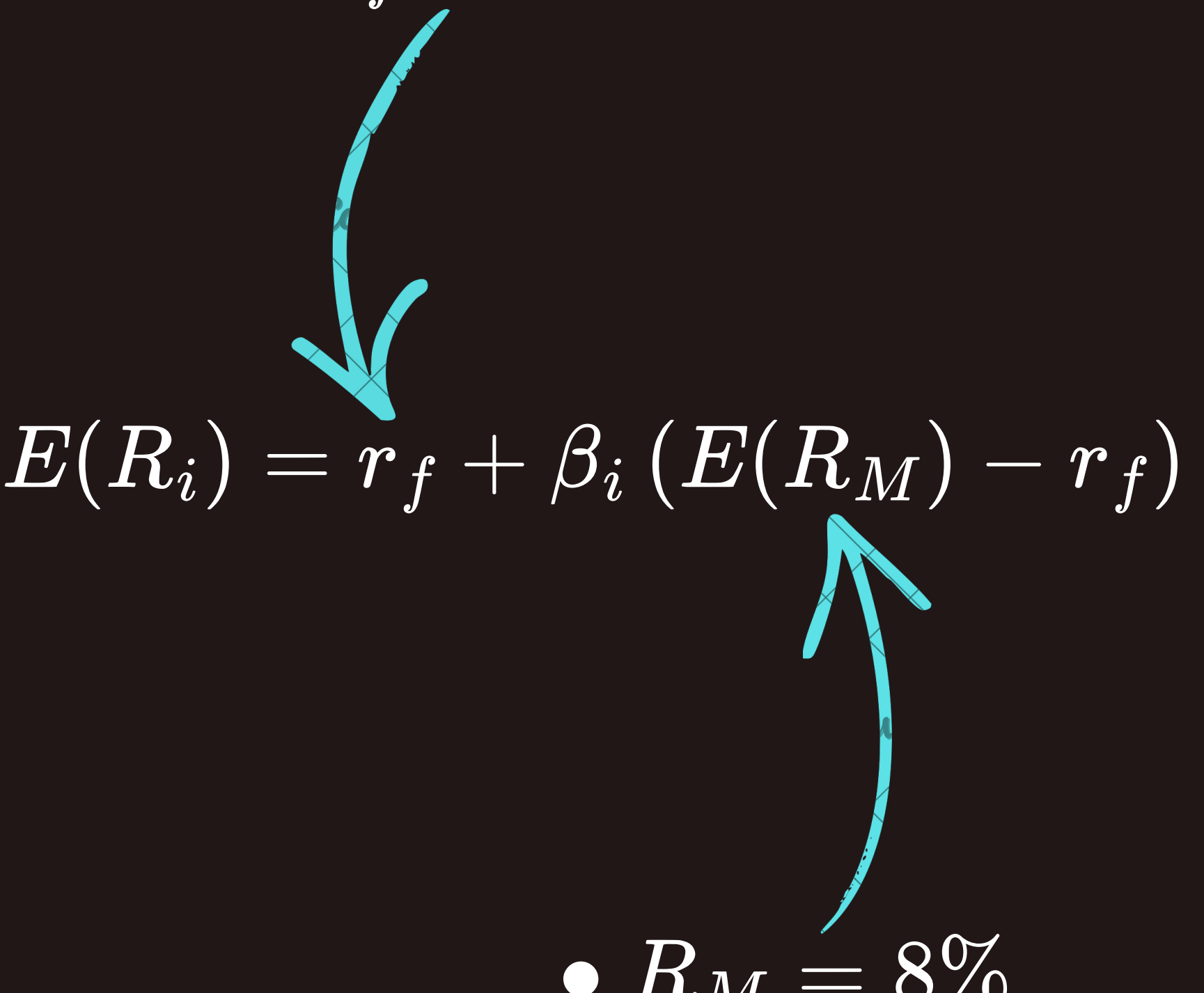
$$R_i = \alpha_i + \beta_i R_m + \varepsilon_i$$



CAPM expected return

- XLK : 8.78%
- XLE : 8.28%
- XLF : 8.27%
- XLY : 8.24%
- XLI : 7.94%
- XLP : 6.49%

• $r_f = 4\%$


$$E(R_i) = r_f + \beta_i (E(R_M) - r_f)$$

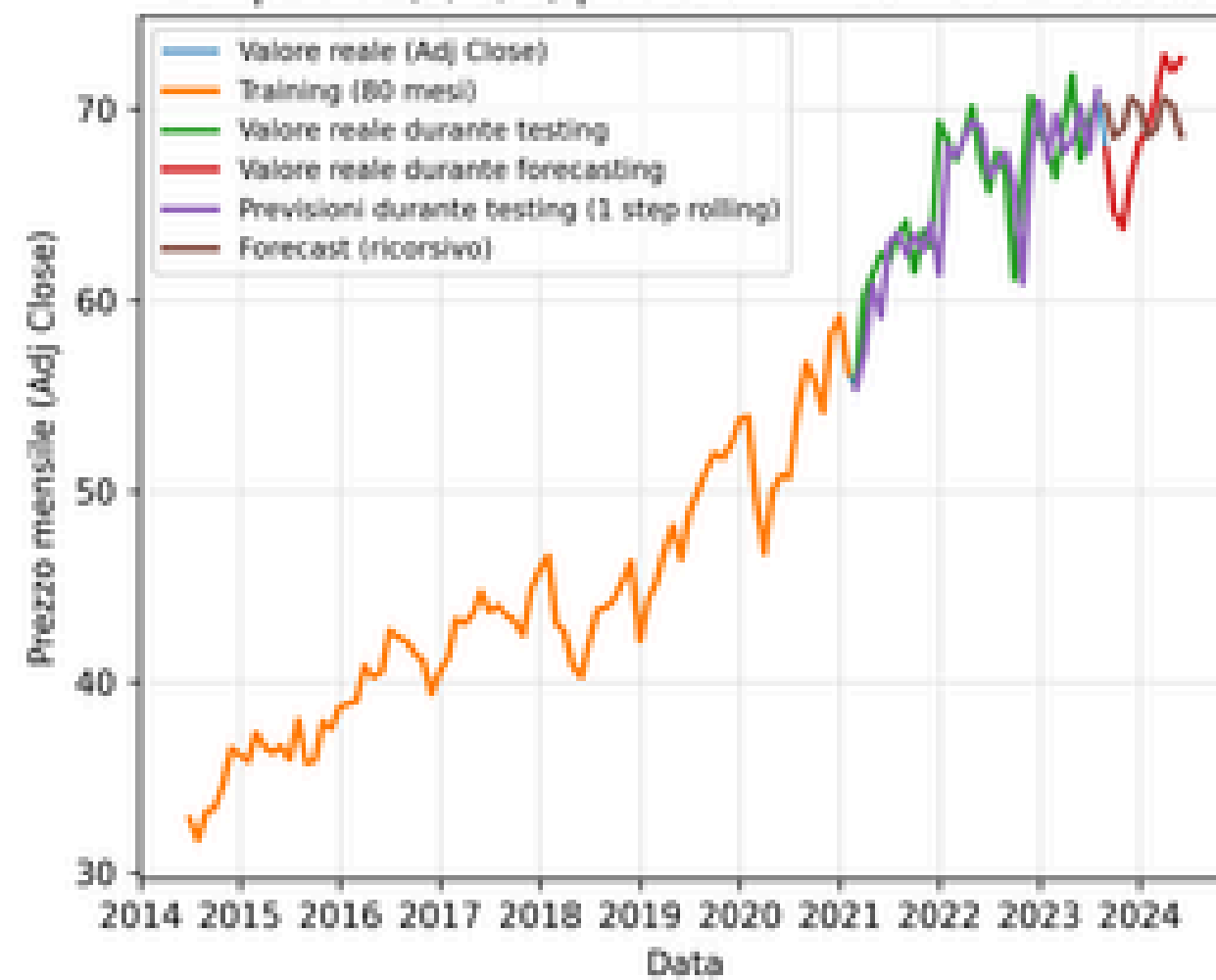
• $R_M = 8\%$

Correlation matrix	XLE	XLF	XLI	XLK	XLP	XLY
XLE	\	0.71	0.663	0.422	0.388	0.501
XLF	0.71	\	0.874	0.647	0.559	0.717
XLI	0.663	0.874	\	0.757	0.688	0.801
XLK	0.422	0.647	0.757	\	0.579	0.856
XLP	0.388	0.559	0.688	0.579	\	0.563
XLY	0.501	0.717	0.801	0.856	0.563	\

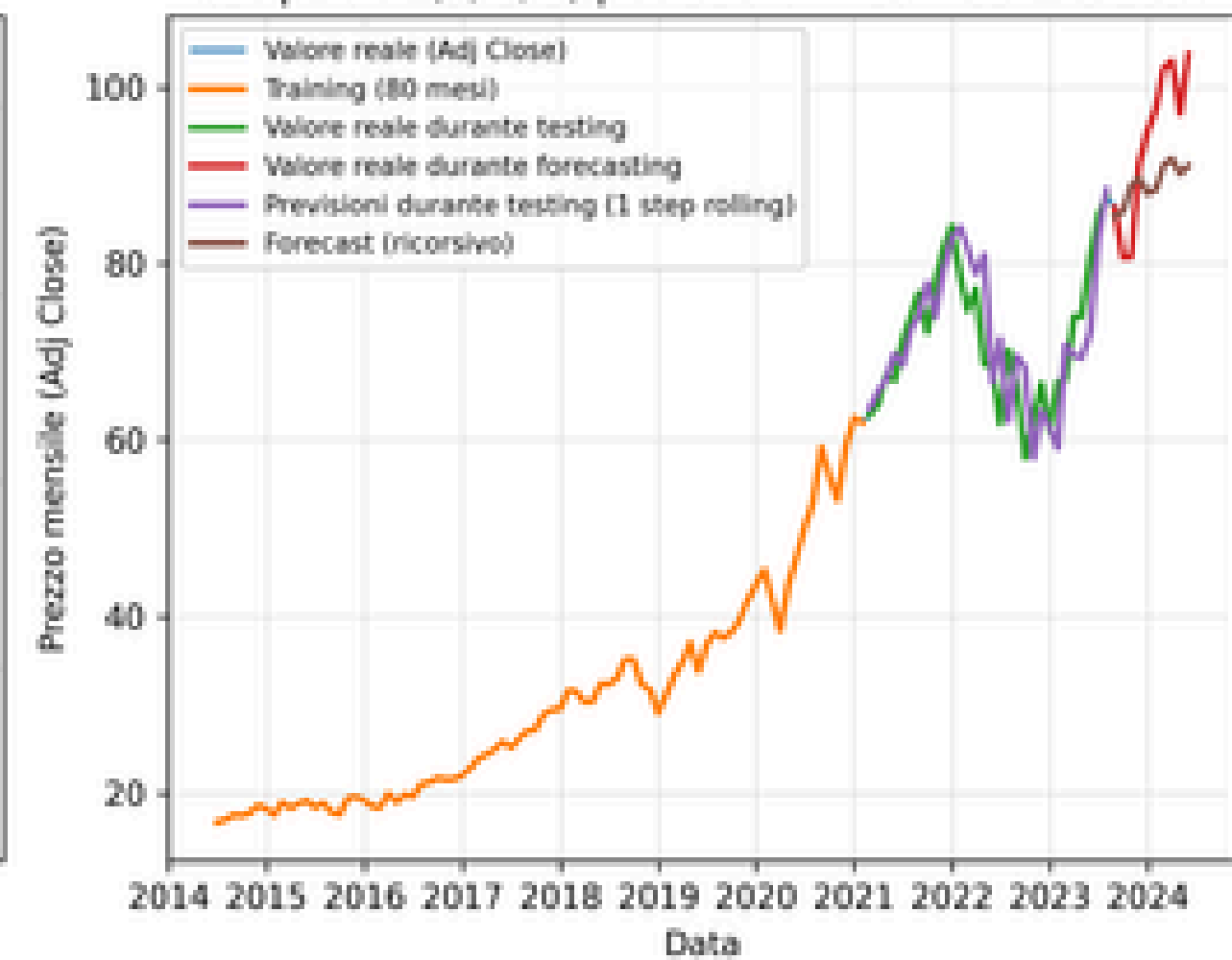
XLY | ARIMA(5, 2, 5) | RMSE ultimi 10 mesi = 5.7642



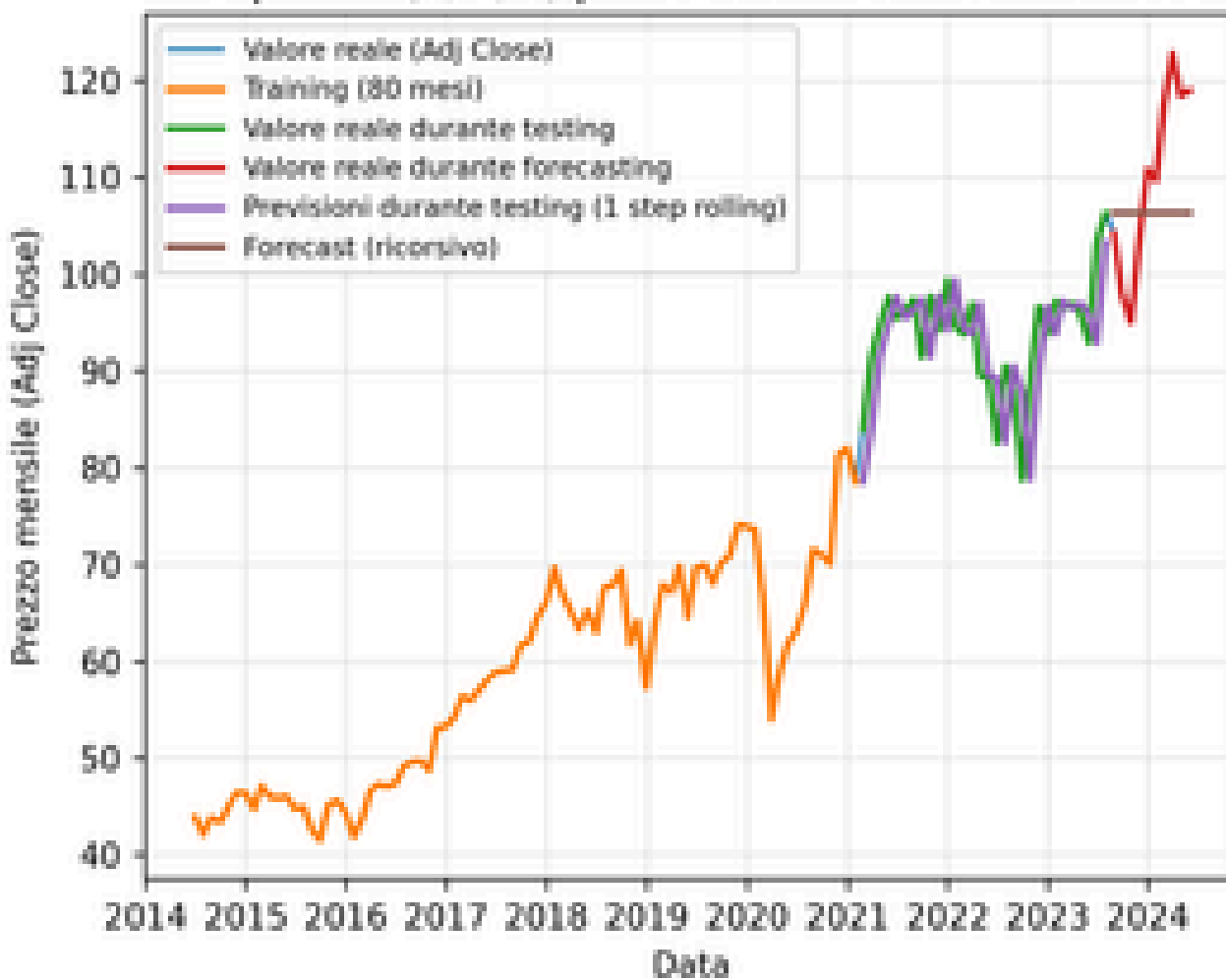
XLP | ARIMA(2, 1, 2) | RMSE ultimi 10 mesi = 3.0996



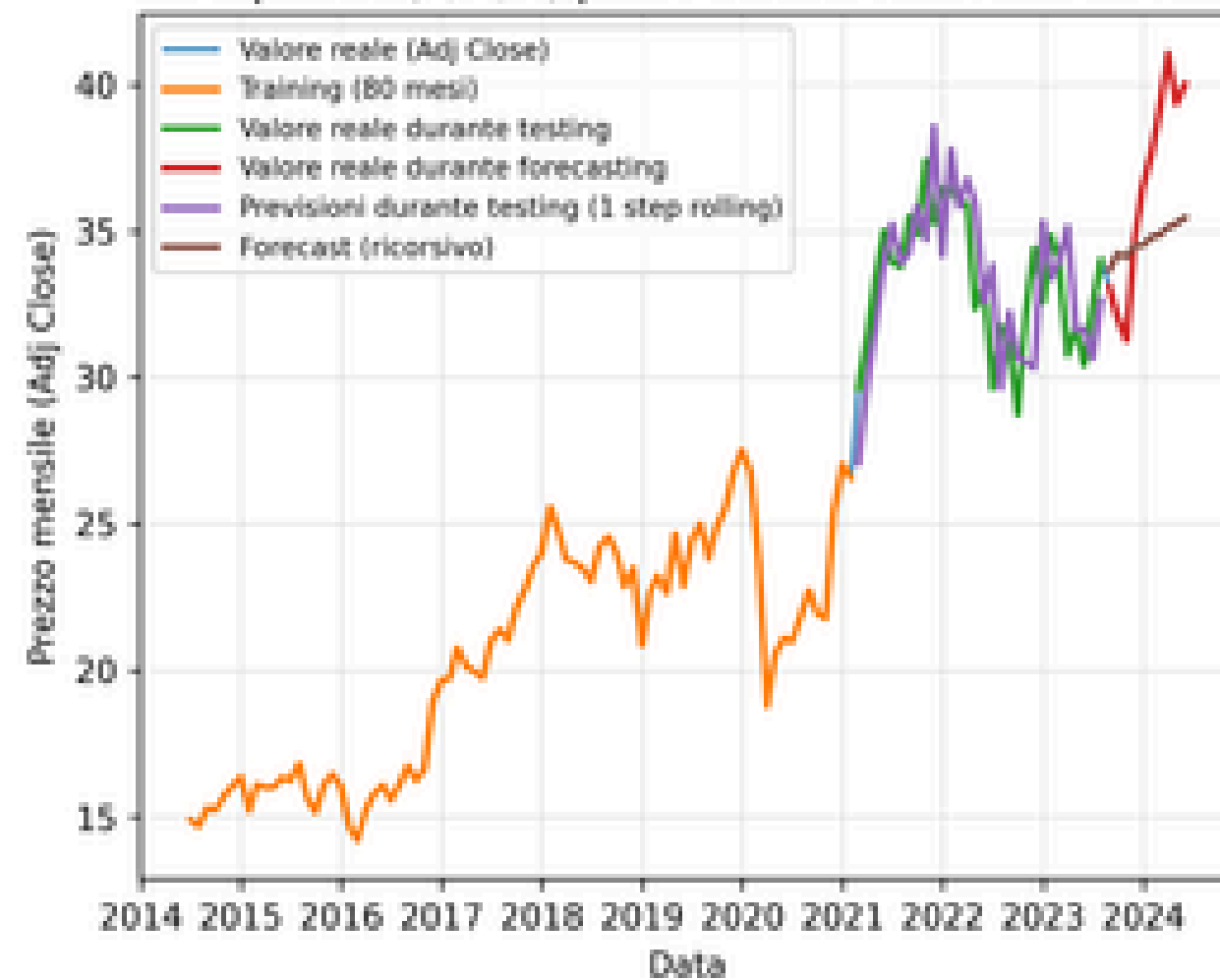
XLK | ARIMA(3, 2, 5) | RMSE ultimi 10 mesi = 8.2597



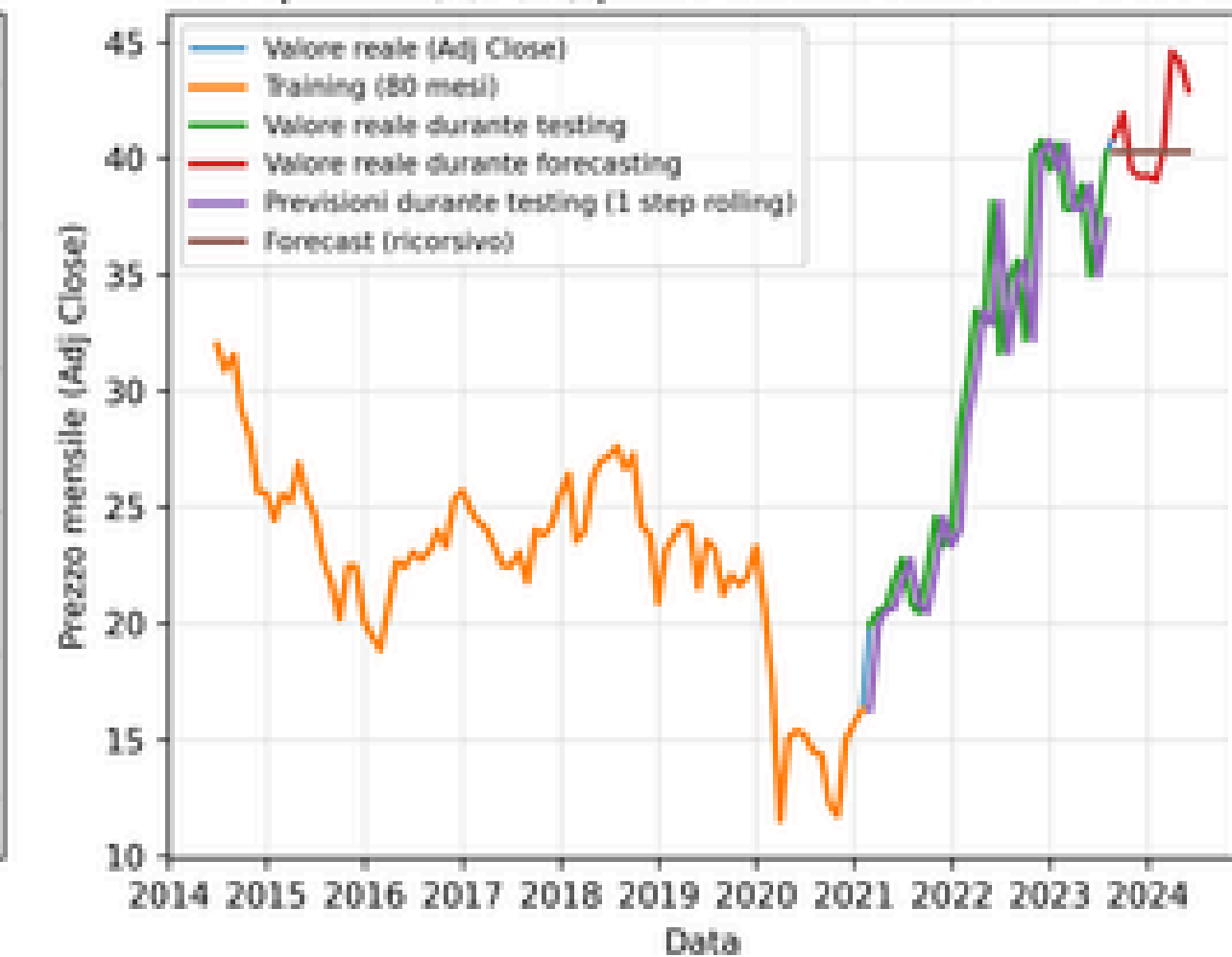
XLI | ARIMA(0, 1, 0) | RMSE ultimi 10 mesi = 9.7355



XLF | ARIMA(2, 2, 3) | RMSE ultimi 10 mesi = 3.4137

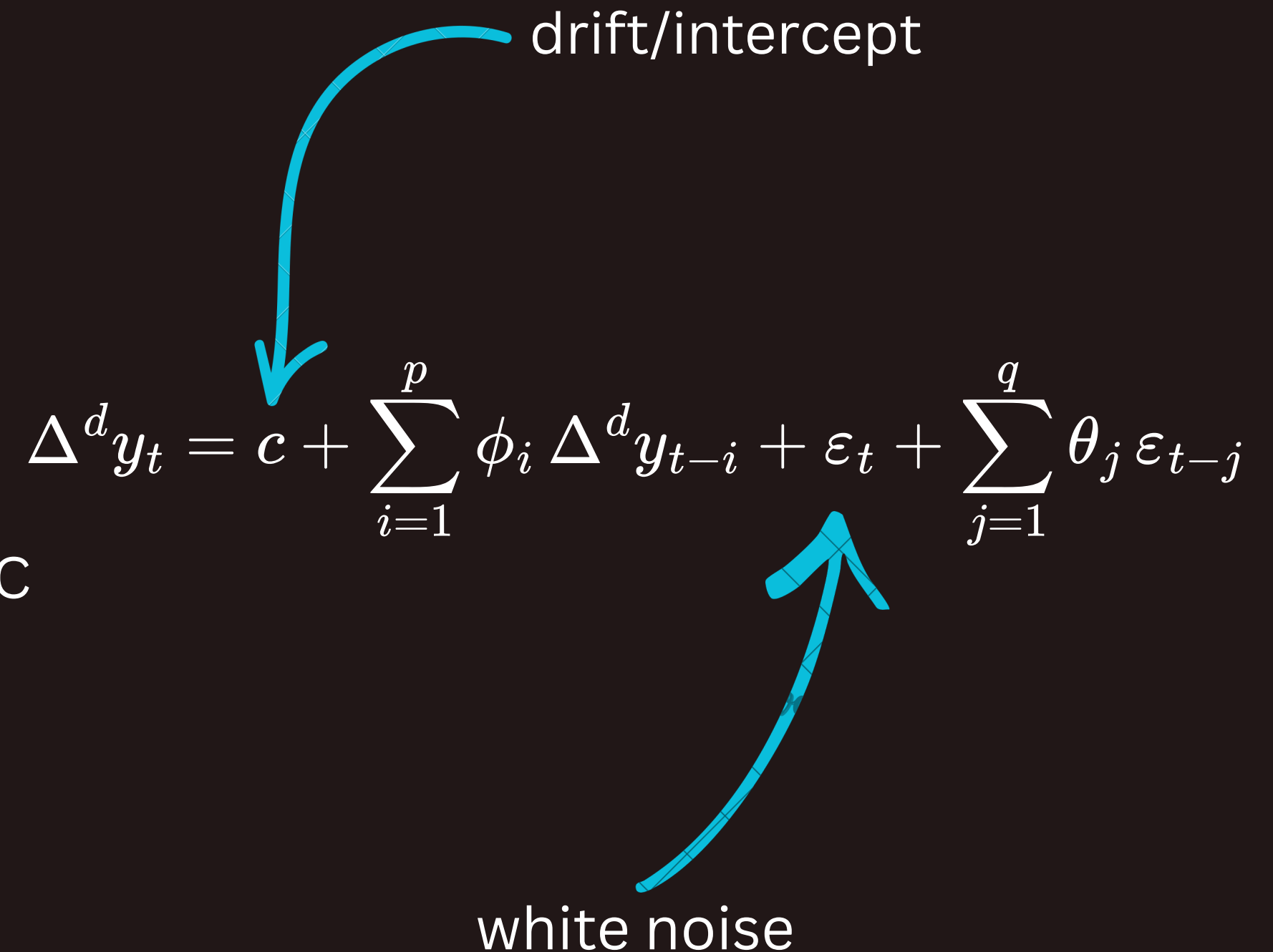


XLE | ARIMA(0, 1, 0) | RMSE ultimi 10 mesi = 2.1855



ARIMA

- AR (AutoRegressive, p)
 - p = how many past steps matter
- I (Integrated, d)
 - d = how many times you difference
- MA (Moving Average, q)
 - q = how many past errors matter
- Optimal (p,d,q): model with minimum AIC
 - Special cases:
 - ARIMA(0,1,0) → random walk
 - ARIMA(p,0,q) → ARMA



The diagram shows the ARIMA equation with two blue arrows pointing to specific terms. One arrow points from the text 'drift/intercept' to the constant term c . The other arrow points from the text 'white noise' to the error term ε_t .

$$\Delta^d y_t = c + \sum_{i=1}^p \phi_i \Delta^d y_{t-i} + \varepsilon_t + \sum_{j=1}^q \theta_j \varepsilon_{t-j}$$

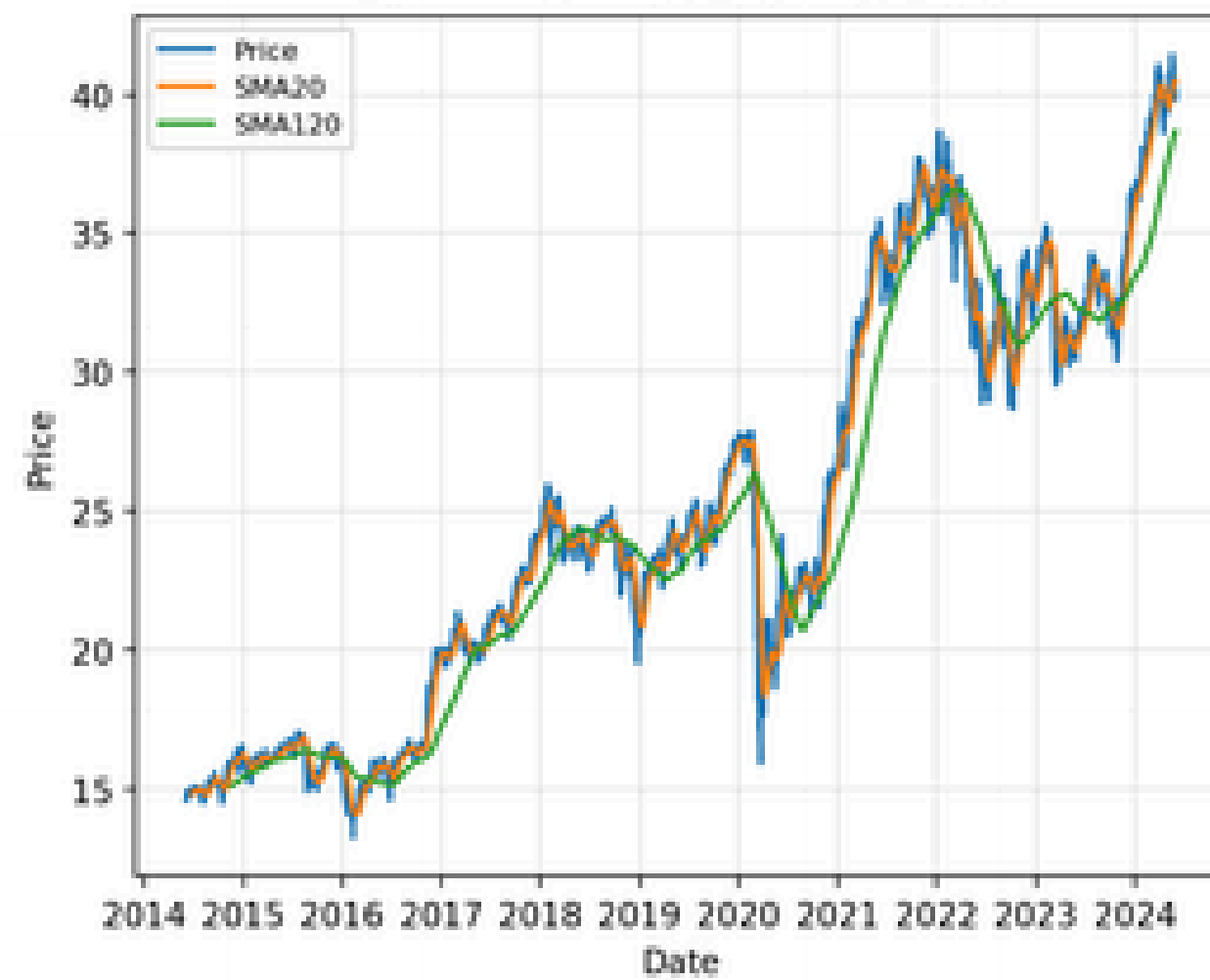
drift/intercept

white noise

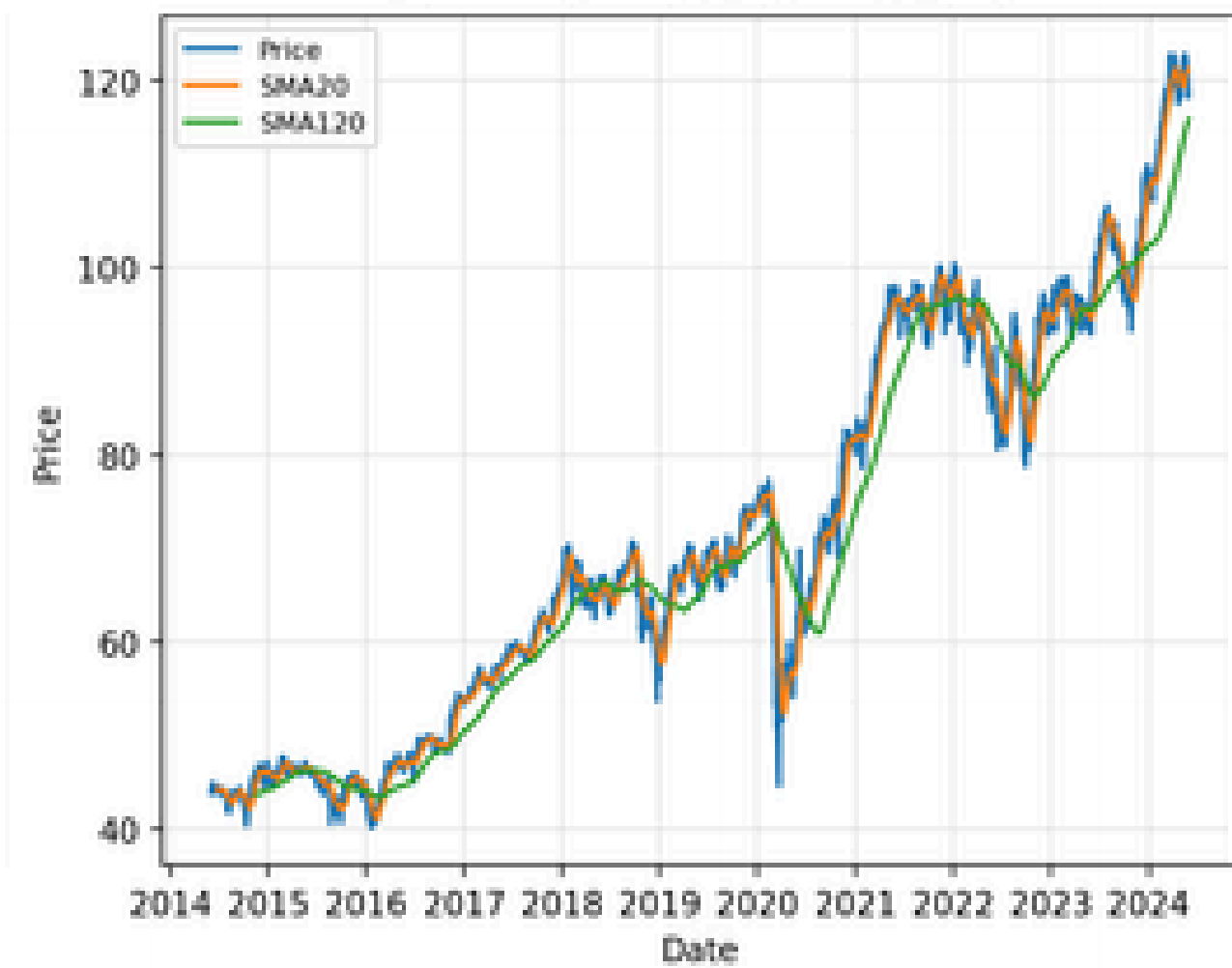
XLE — Price + SMA20 + SMA120



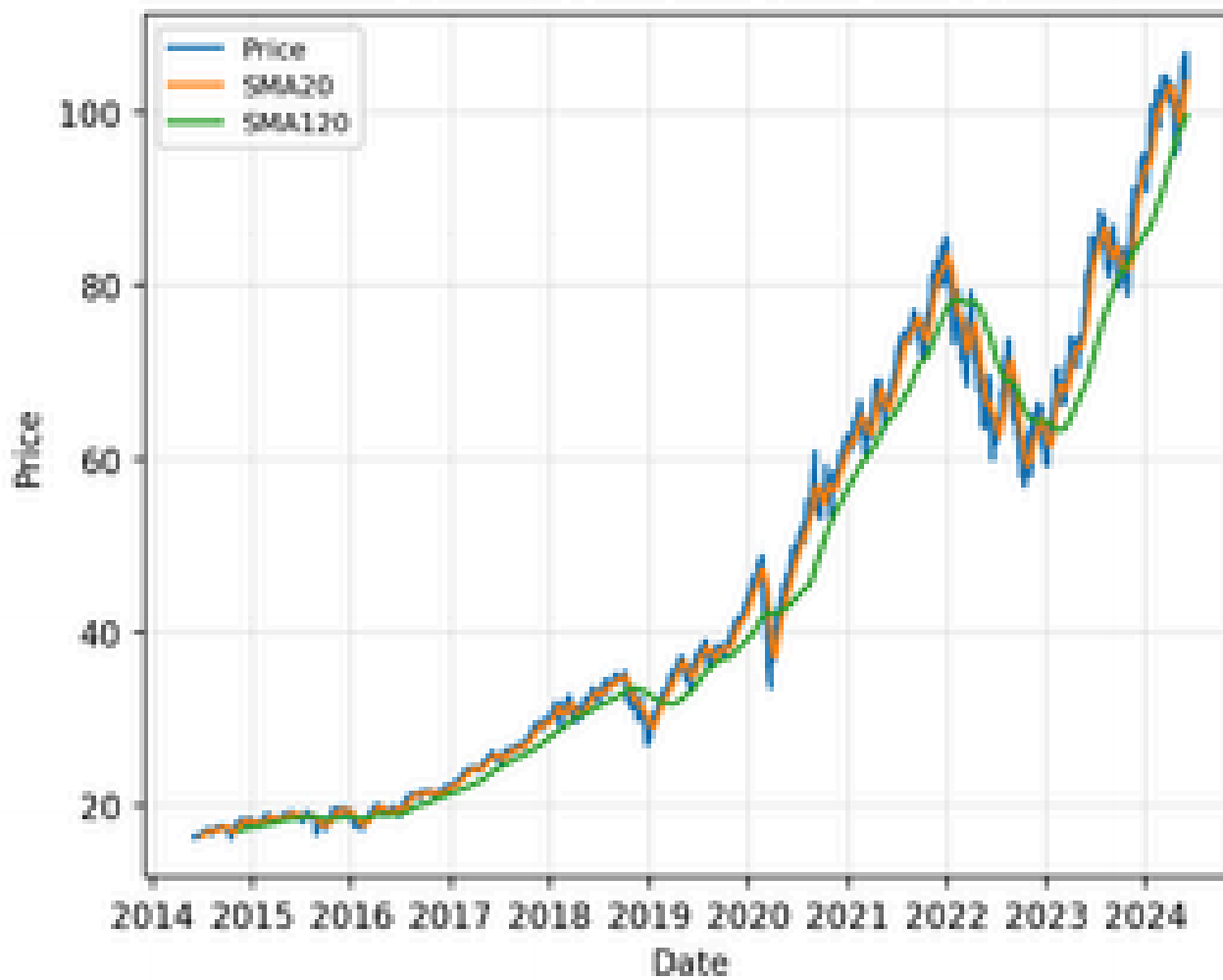
XLF — Price + SMA20 + SMA120



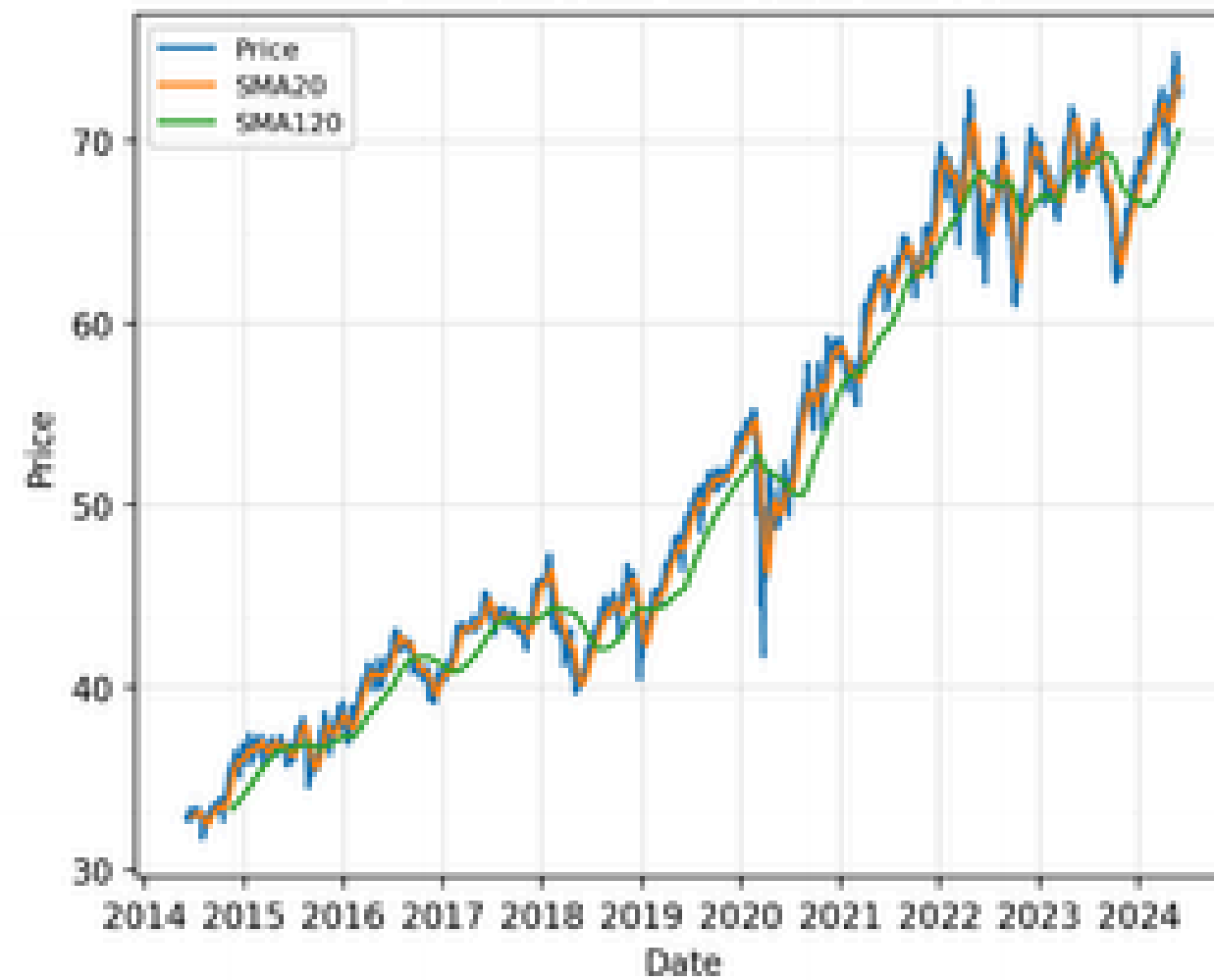
XLI — Price + SMA20 + SMA120



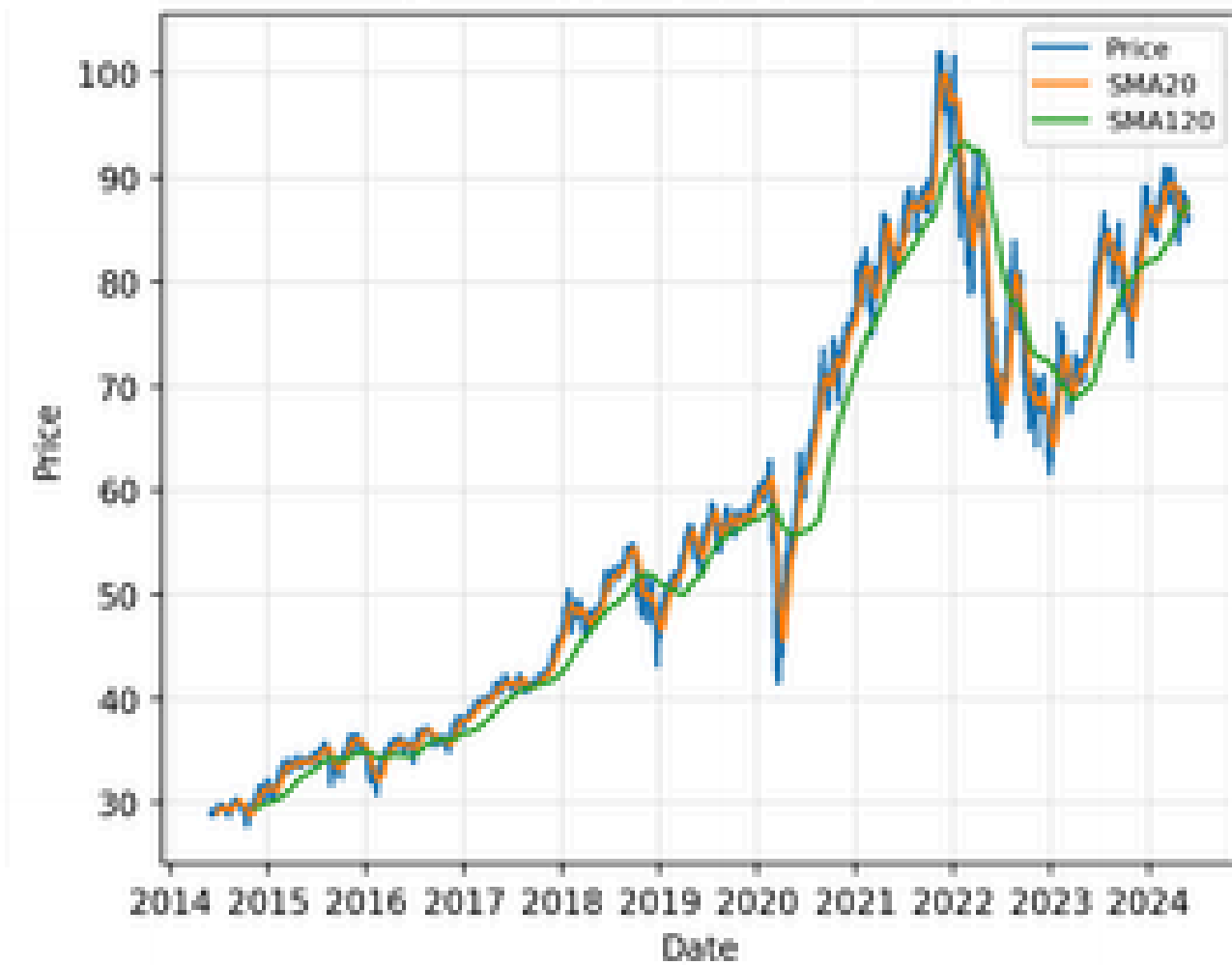
XLK — Price + SMA20 + SMA120



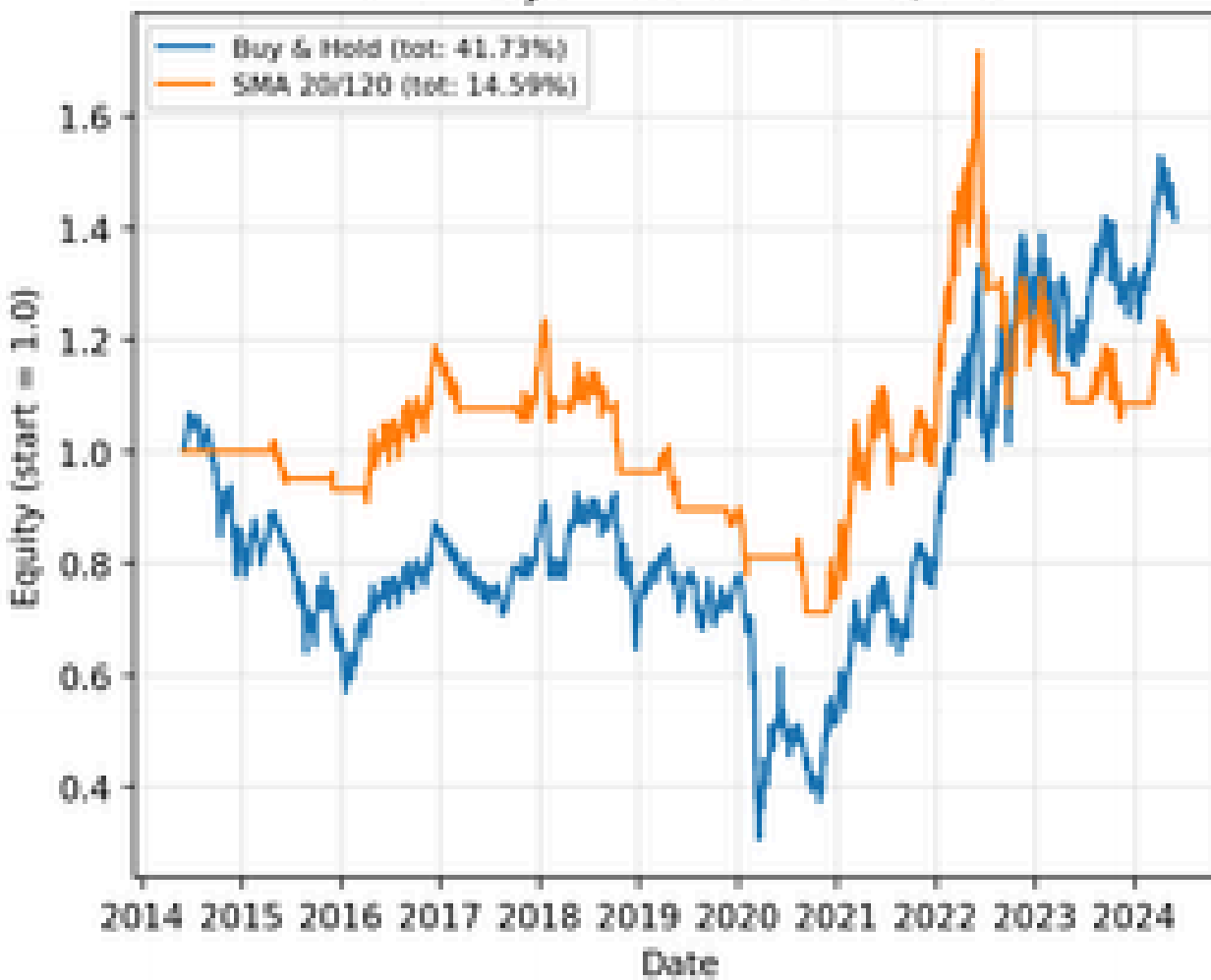
XLP — Price + SMA20 + SMA120



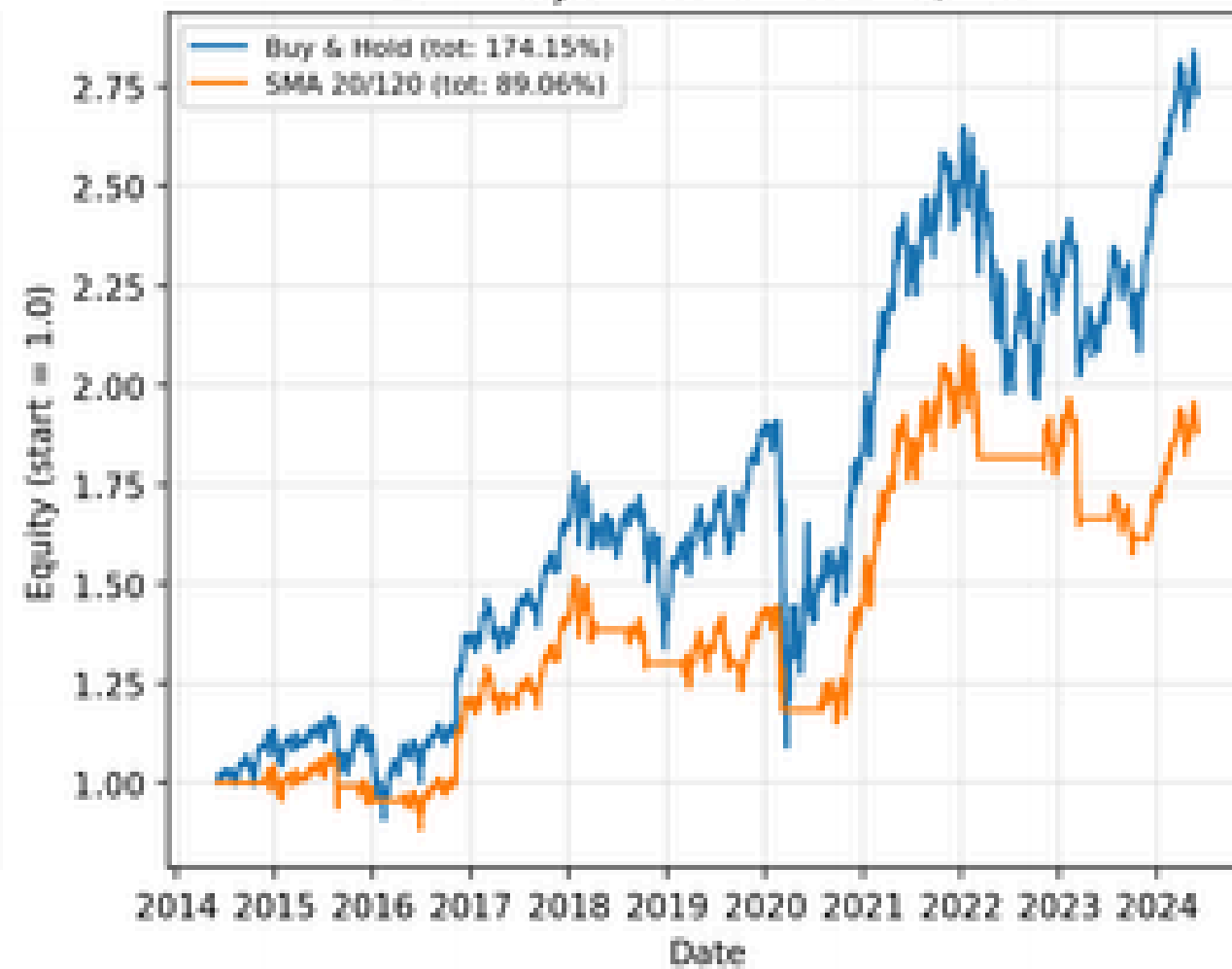
XLY — Price + SMA20 + SMA120



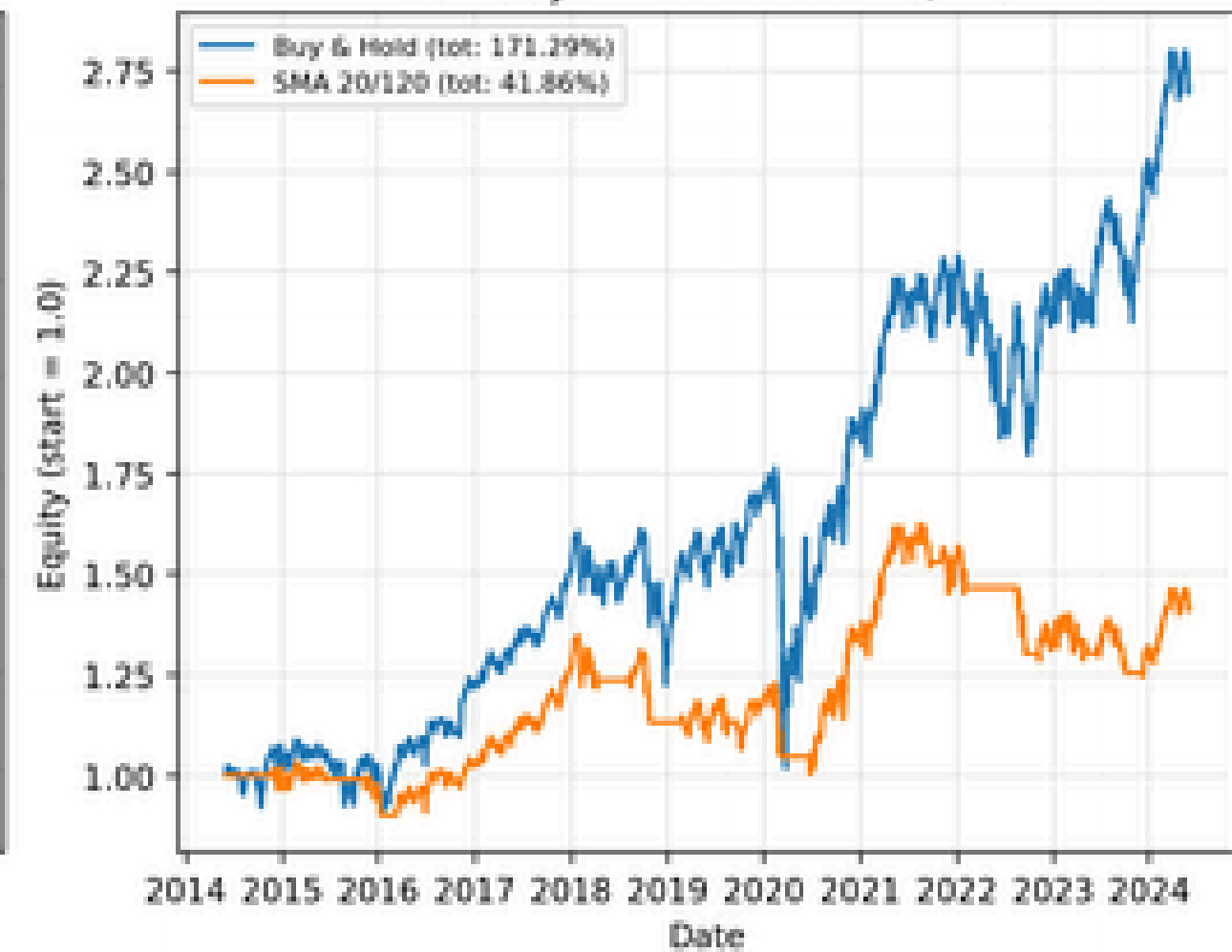
XLE - Buy & Hold vs SMA 20/120



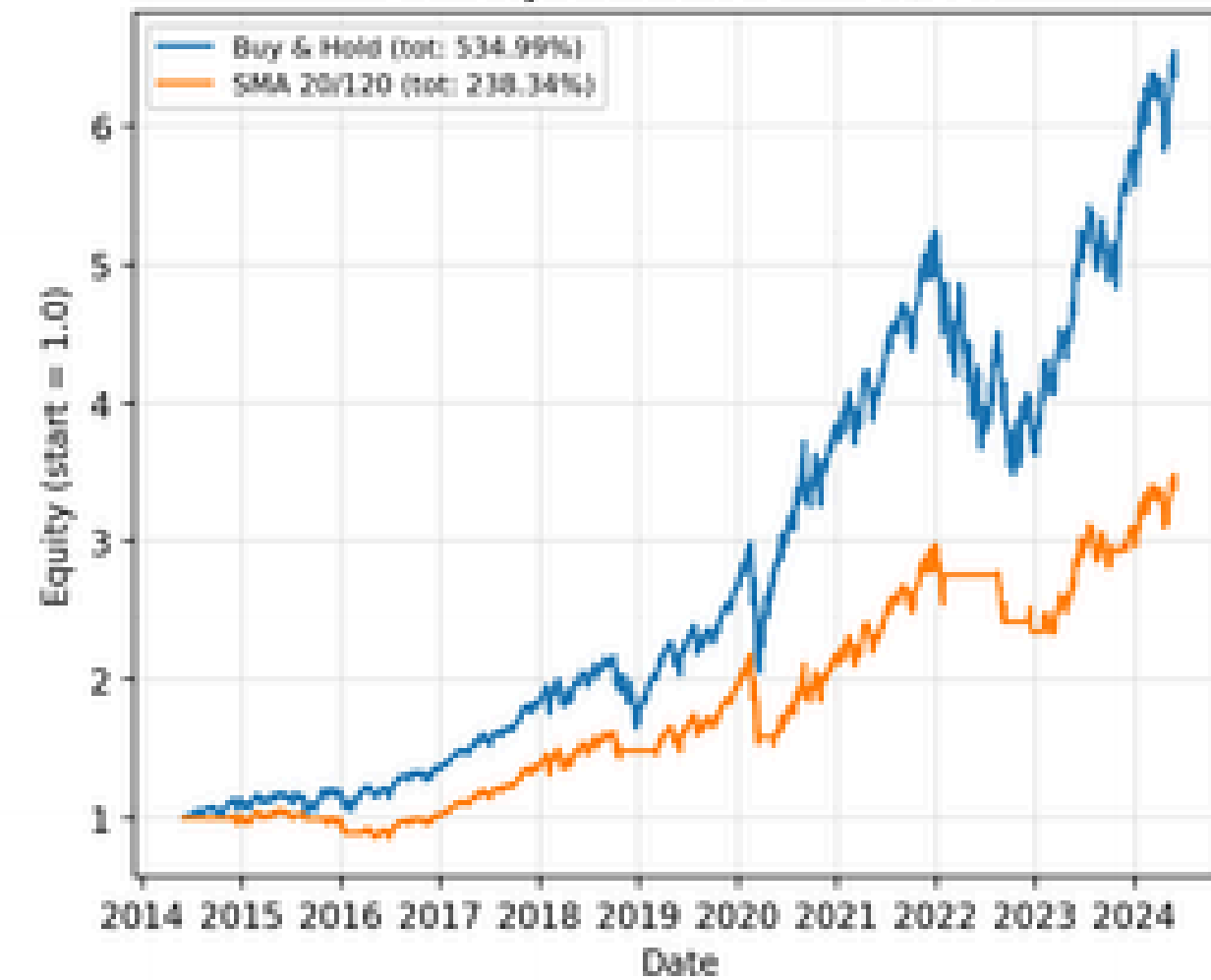
XLF - Buy & Hold vs SMA 20/120



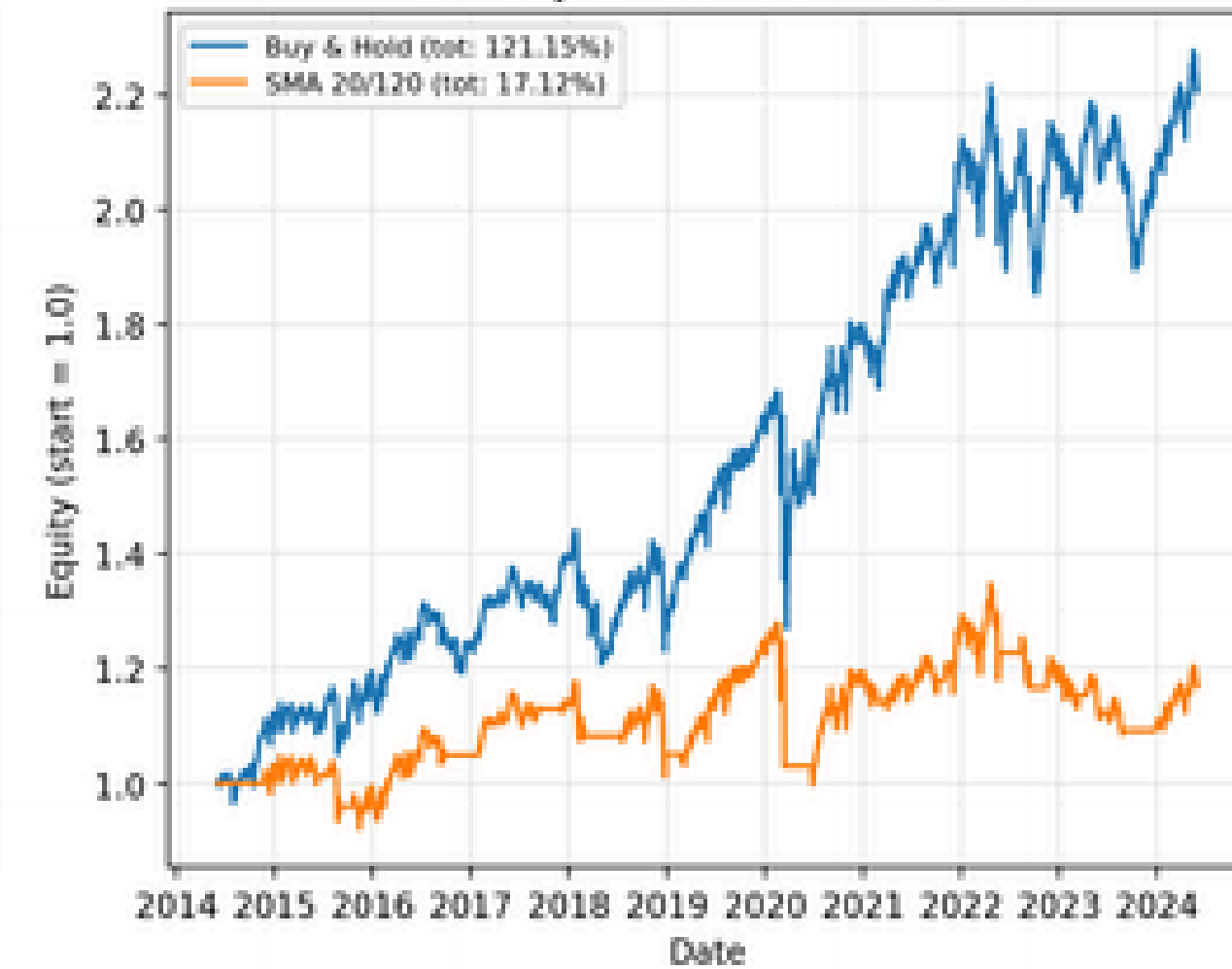
XLI - Buy & Hold vs SMA 20/120



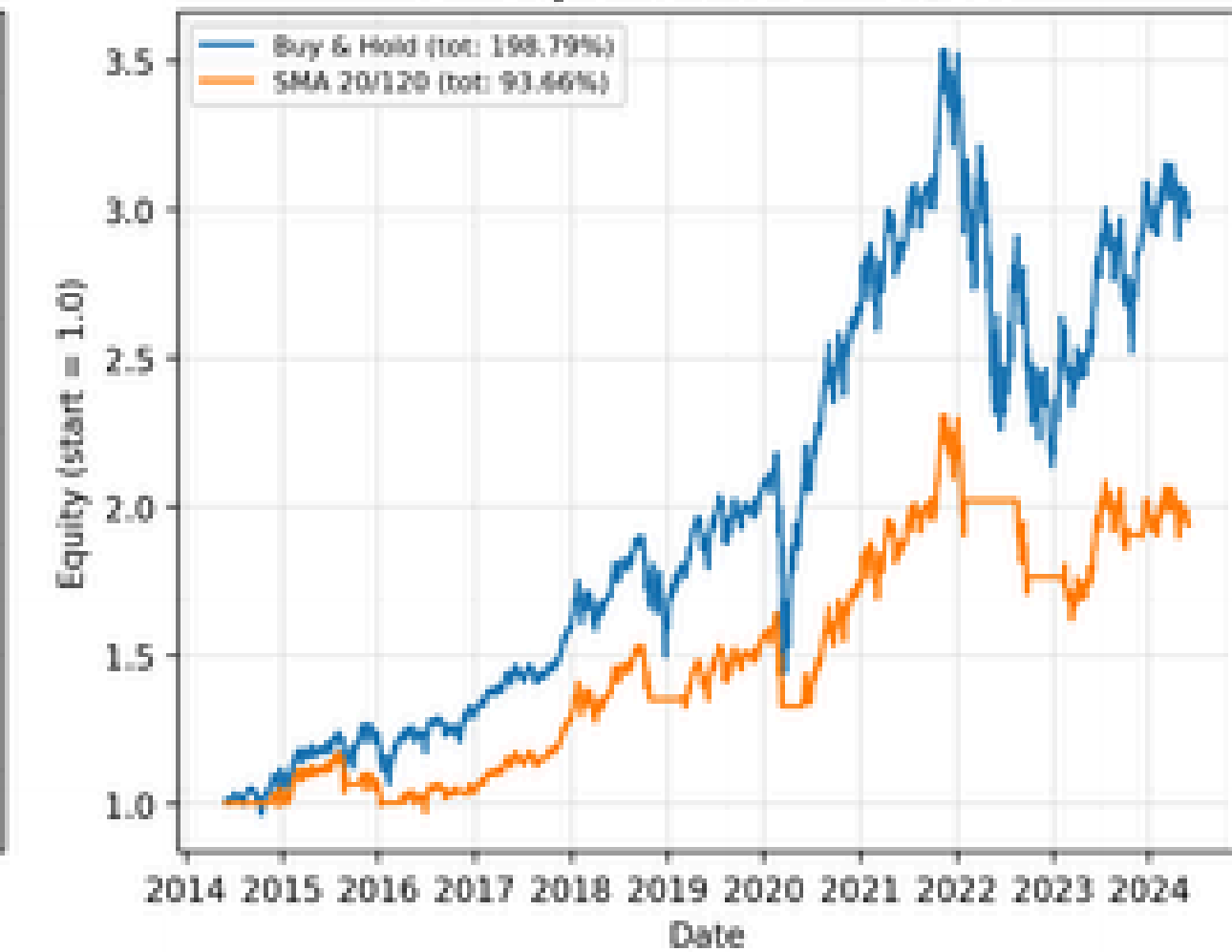
XLK - Buy & Hold vs SMA 20/120

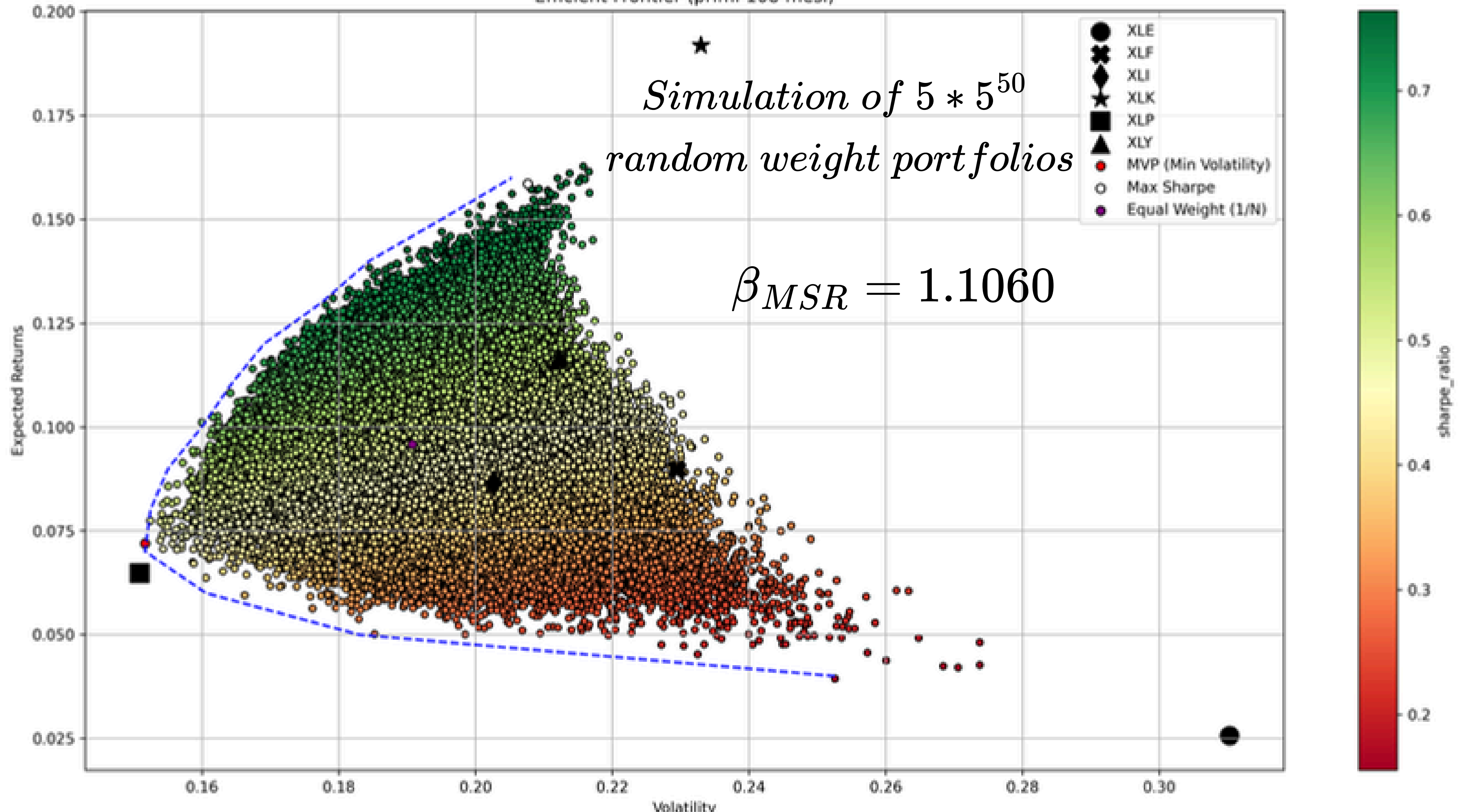


XLP - Buy & Hold vs SMA 20/120

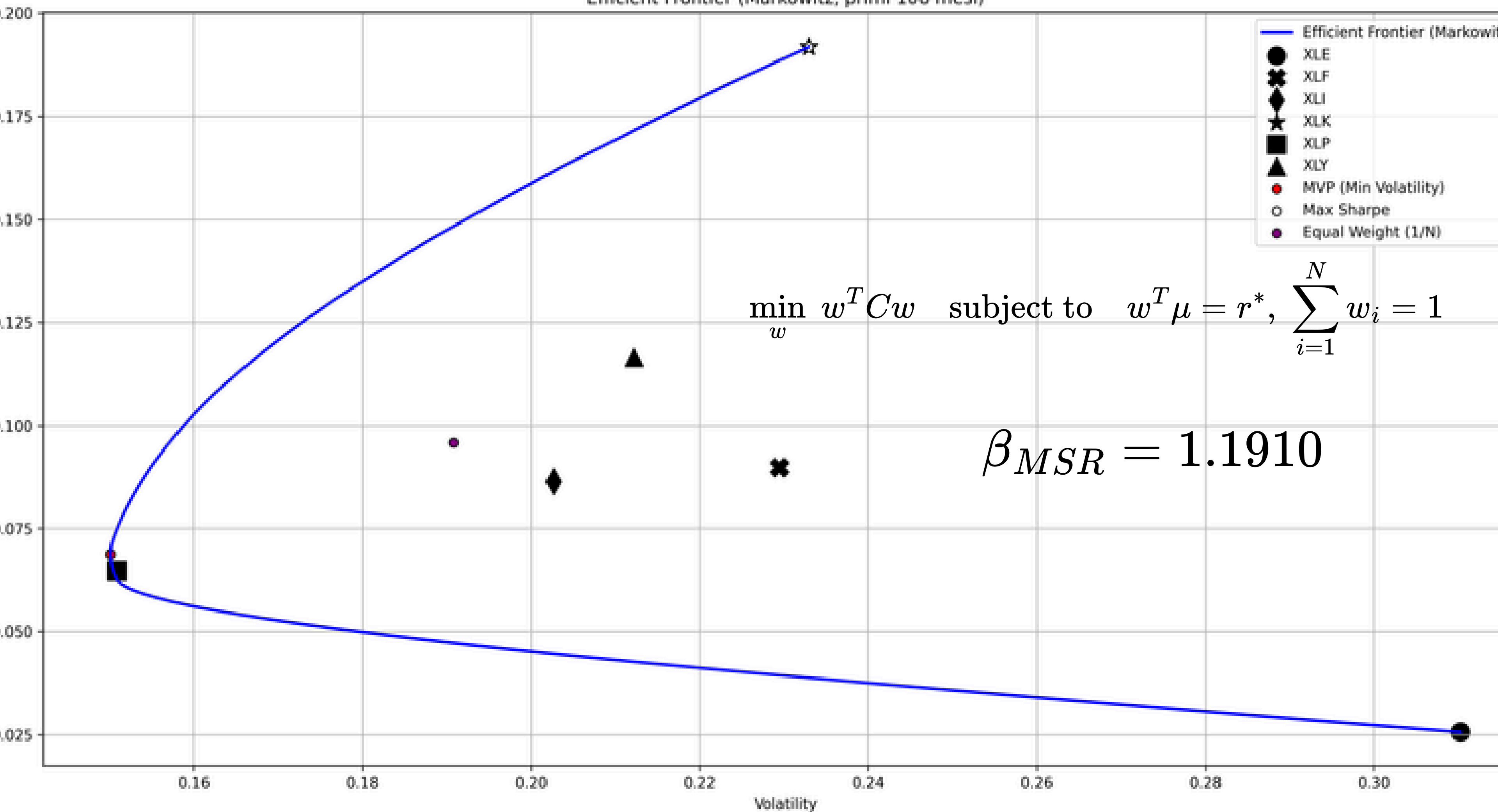


XLY - Buy & Hold vs SMA 20/120

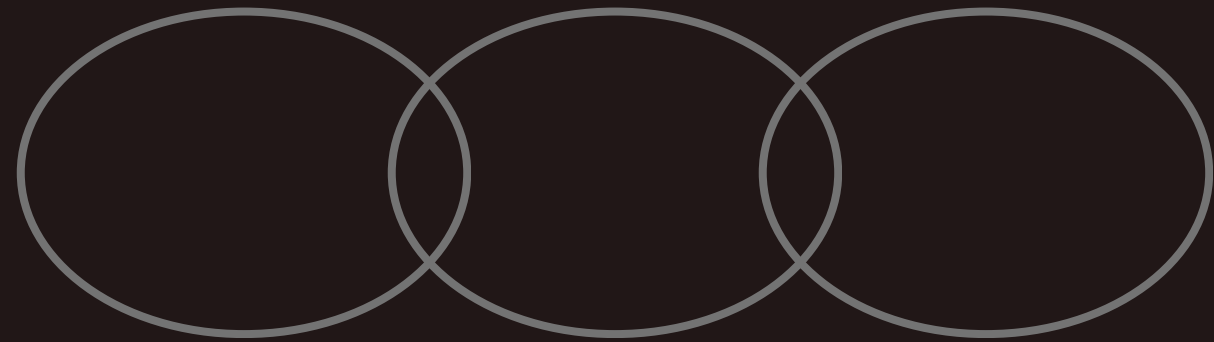




Efficient Frontier (Markowitz, primi 108 mesi)



portfolio	return %	volatility %	sharpe ratio	XLE_w %	XLF_w %	XLI_w %	XLK_w %	XLP_w %	XLY_w %
MVPmw	6.87	15.01	0.4577	1.17	0.0	0.0	0.0	90.4	8.43
MVPmt	7.2	15.17	0.4745	4.88	0.51	3.36	2.27	78.62	10.36
MSRmw	19.19	23.3	0.8237	0.0	0.0	0.0	100.0	0.0	0.0
MSRmt	15.86	20.76	0.7639	0.19	9.85	8.23	69.54	9.78	2.41
Equal Weight (1/N)	9.59	19.08	0.5025	16.67	16.67	16.67	16.67	16.67	16.67



THANK YOU



This concludes the presentation



February
05, 2026

Presented By:
Huadong Liao