Factor Investing and Momentum

An Applied Study in Portfolio Management and Factor Models

April 17, 2025 BAFI3178 - Portfolio Management



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AGENDA Performance MTUM vs. NYSE COMPOSITE MTUM during COVID-19 Is Momentum Statistically Profitable? Harvey Tortured Data Confidential

Overview of MTUM



The **iShares MSCI USA Momentum Factor ETF (MTUM)** is an exchange-traded fund (ETF) issued by BlackRock. It seeks to offer exposure to **U.S. large and mid-cap stocks** that demonstrate strong momentum characteristics.



Portfolio Characteristics

- Benchmark Index:MSCI USA Momentum SR Variant Index
 The index contains U.S. stocks that demonstrate the highest momentum based on their relative stock performance.
- Exposure: U.S. Stocks
 The ETF concentrates only on U.S. stocks which make up a substantial portion of worldwide market capitalization.
- Management Type: Passive Management
 The ETF makes a passive replication of the index which results in lower management costs than active investments.

Sectors of the fund's holdings

Sector	% of market value
Financials	24.22%
Industrials	17.97%
Information Technology	14.84%
Consumer Discretionary	7.81%
Communication	7.03%
Utilities	5.47%
Health Care	5.47%
Real Estate	4.69%
Consumer Staples	3.91%
Energy	3.13%
Cash and/or Derivatives	3.13%
Materials	2.34%



Overview of MTUM

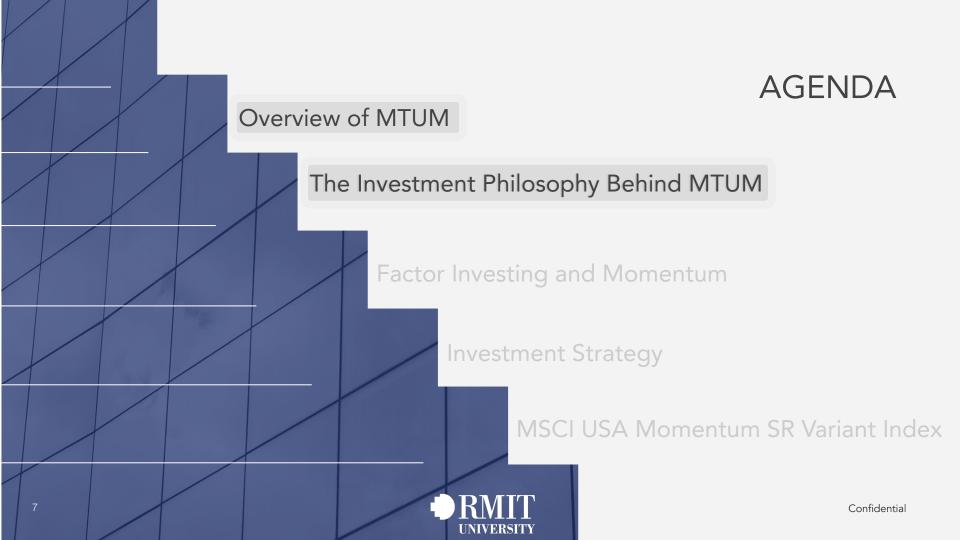
Top 10 Holdings

Ticker	Name	Weight (%)
WMT	WALMART INC	5.36
JPM	JPMORGAN CHASE & CO	4.94
AVGO	BROADCOM INC	4.59
NVDA	NVIDIA CORP	4.21
V	VISA INC CLASS A	4.01
META	META PLATFORMS	3.92
TSLA	TESLA INC	3.77
COST	COSTCO WHOLESALE CORP	3.34
NFLX	NETFLIX INC	2.99
PLTR	PALANTIR TECHNOLOGIES	2.86

Key Features

- 1 April 16, 2013
- 2 0,15% Expense Ratio
- 3 \$13,739,124,505 Net Assets of Fund, as of Apr 15, 2025
- 4 124 Number of Holdings, as of Apr 14, 2025
- 5 15.66% Annualized Return





The Investment Philosophy Behind MTUM

IShares Factor ETFs seek to track indexes that active managers have used for generations, but can now be accessed with ease using ETFs, like MTUM.

The Fund, seeks to track the investment results of the MSCI USA Momentum SR Variant Index.



A price momentum strategy exploits divergences in relative returns, and consists of **buying winners**, and **selling losers** over the past **6–12 months**,

Designed to **outperform** broad indices (e.g. MSCI USA Index) in upward-trending markets.



Why It Matters

At the heart of MTUM lies one of the most researched factors in asset pricing: momentum. It offers an Index-based access to a specific factor which has historically driven a significant part of companies' risk and return. From a behavioral finance perspective, these patterns may result from a delayed reaction to new information.





Factor Investing and Momentum



Factors are persistent and well-documented characteristics that can help investors understand differences in expected return.

Using these characteristics to create efficient and cost-effective portfolios is an investment style known as Factor Investing.



Momentum Investing

A strategy that invests in outperforming stocks and reduces exposure to underperforming ones.

The momentum factor is one of the

The momentum factor is one of the most studied anomalies in asset pricing



Empirical Evidence

Stocks with positive trends tend to continue rising in the short to medium term.

Stocks that are declining often keep underperforming



Key Study

Asness, Moskowitz, Pedersen (2014), "Value and Momentum Everywhere" – Journal of Finance.

The strategy is effective even for individual equity stocks in the U.S. market.





Investment Strategy

Indexing Strategy

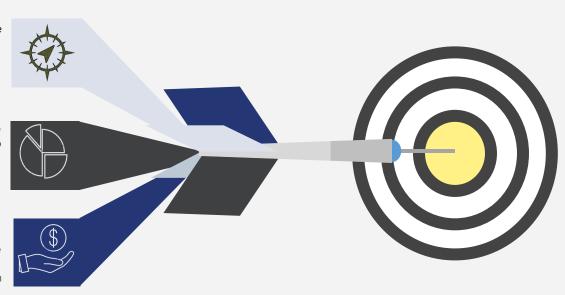
The Fund uses an indexing approach to try to achieve the investment objective. It screens for **6- and 12-month risk adjusted price momentum**.

Portfolio Construction

Blackrock uses **representative sampling** to replicate the index, investing at least **80%** in index securities. Up to **20%** can be in different liquid assets.

Cost & Tax Efficiency

MTUM's **expense ratio** is lower than **99%** of its peers, **0.61%** less than comparable active mutual funds since inception. It's **tax-efficient**, with no capital gains distributions, making it cost-effective for long-term investors.



This kind of indexing may eliminate the chance that the Fund will substantially outperform the Underlying Index.





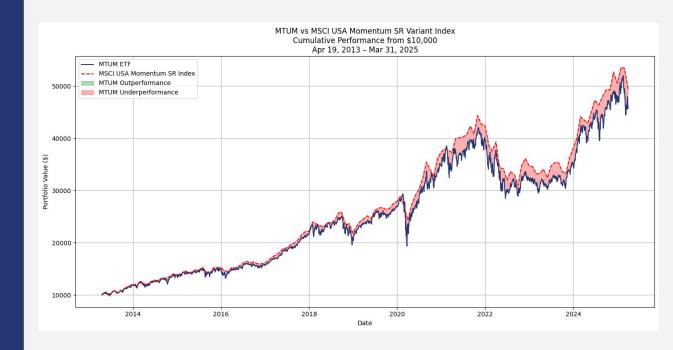
MSCI USA Momentum SR Variant Index

Underlying Index is based on an equity momentum strategy.
MSCI uses an algorithm to determine the components from the parent Index.

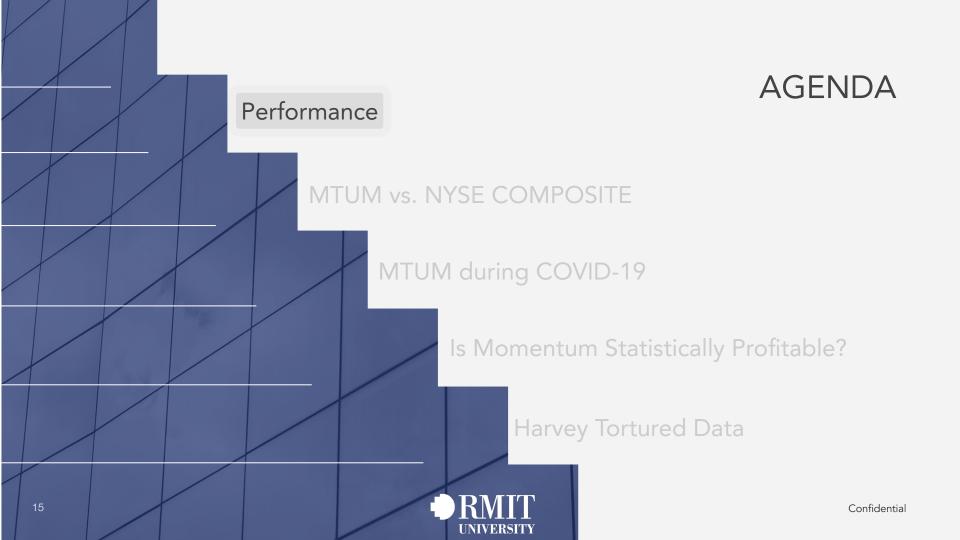
It selects the top 125 securities from the MSCI USA Index based on their momentum scores, weighting them by multiplying these scores with their market capitalization weights.

To ensure diversification, a capping methodology is applied to limit individual issuer weights and aggregate positions.

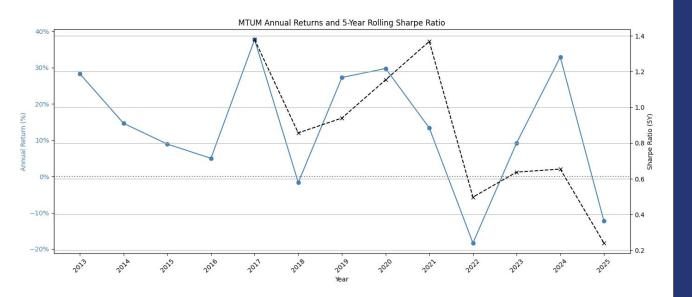
The index is reconstituted quarterly to maintain its focus on recent outperformers.







Performance

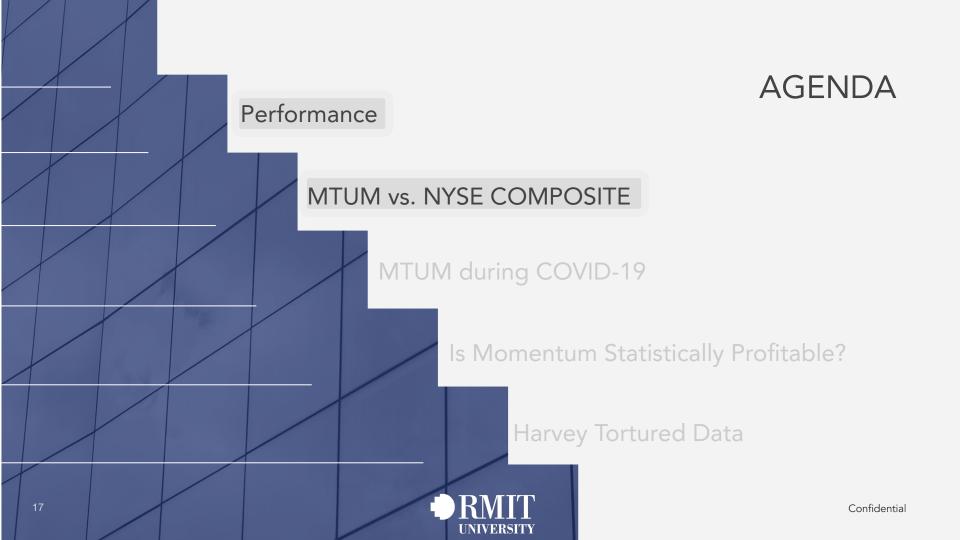




Return & Risk Statistics						
Metric	Value					
Annualized Return (Simple)	15.66%					
Annualized Volatility	19.7%					
Sharpe Ratio (Annualized, Rf=0)	0.74%					
Skewness	-0.3%					
Kurtosis	10.99%					
Performance Metrics						
Metric	Value					
Maximum Drawdown	-34.08%					
Maximum Run-up	428.58%					
Total Return (Since Injection)	352.11%					
Risk Metrics						
Metric	Value					
VaR(1%) - Daily	-3.71%					
CVaR - Daily	-4.94%					
Momentum Statistics						
Metric	Value					
Average Momentum 6M	7.13%					
Std Dev Momentum 6M	10.76%					
Positive Momentum 6M (%)	81.19%					
Maximum Momentum 6M	60.00%					

Minimum Momentum 6M

-27.64%



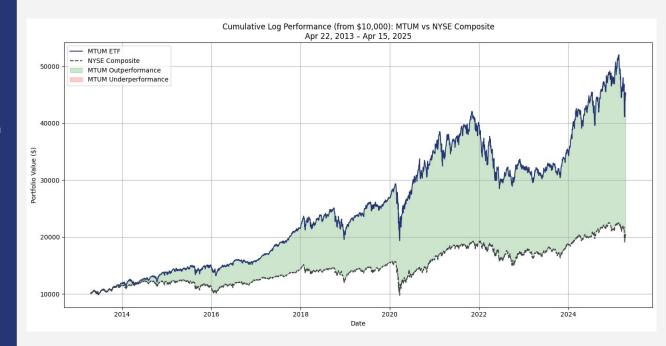
The NYSE Composite tracks all common stock listed on the New York Stock Exchange which includes more than 2000 U.S. and international stocks for wide diversification and relatively low volatility.

The MTUM ETF delivers specific exposure to high-momentum U.S. equities by maintaining a stock selection of approximately 125 securities.

MTUM generates superior long-term returns than the NYSE Composite because it produces annual returns of 15.66% while the NYSE Composite returns approximately 7.06%.

The increased investment returns of MTUM come at the expense of certain trade-offs. The investment has limited diversification while showing higher volatility and facing increased sector concentration risk.

MTUM vs. NYSE COMPOSITE





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MTUM during COVID-19

Has momentum lost its strength since COVID?

A Pre/Post performance comparison

Test 1 - MTUM vs NYSE (Pre vs Post COVID)

The purpose of this study is to determine if the COVID-19 pandemic caused a significant shift in the performance gap between MTUM and the NYSE Composite.

The high p-value indicates that we should not reject the null hypothesis.

→ The analysis shows that MTUM's relative performance against the NYSE did not experience a statistically significant change during the post-COVID period.

Test 2 - MTUM Return Persistency.

The purpose of this test is to establish if MTUM generated annual returns at significantly different levels between the two time periods.

The p-value exceeds 0.05 which leads to the failure of rejecting the null hypothesis.

→ The return levels of MTUM remain consistent between

the pre-COVID and post-COVID periods.



T-Test: Pre vs Post COVID

Test1 MTUM vs NYSE

T-Statistic: 0.3292 P-Value: 0.7536 No significant difference

Test2 **MTUM Return Persistency**

T-Statistic: 0.2327 P-Value: 0.8232 No significant difference



MTUM during COVID-19

Has momentum lost its strength since COVID?

A Pre/Post performance comparison

The horizontal dashed lines show the decline in average alpha and the black dashed vertical line marks a clear regime break in performance dynamics.

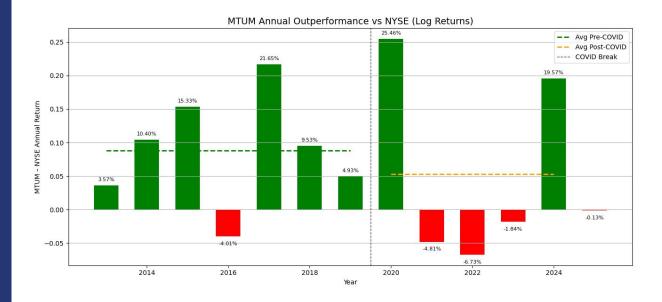
Although MTUM continues to outperform the NYSE on average, its post-COVID alpha generation has become <u>less reliable</u> and <u>more volatile</u>.

The statistical tests confirm that there is <u>no</u> <u>significant change</u> in either <u>absolute</u> or <u>relative</u> <u>performance</u>.

However, the visual and metric-based evidence suggests a <u>qualitative shift</u>:

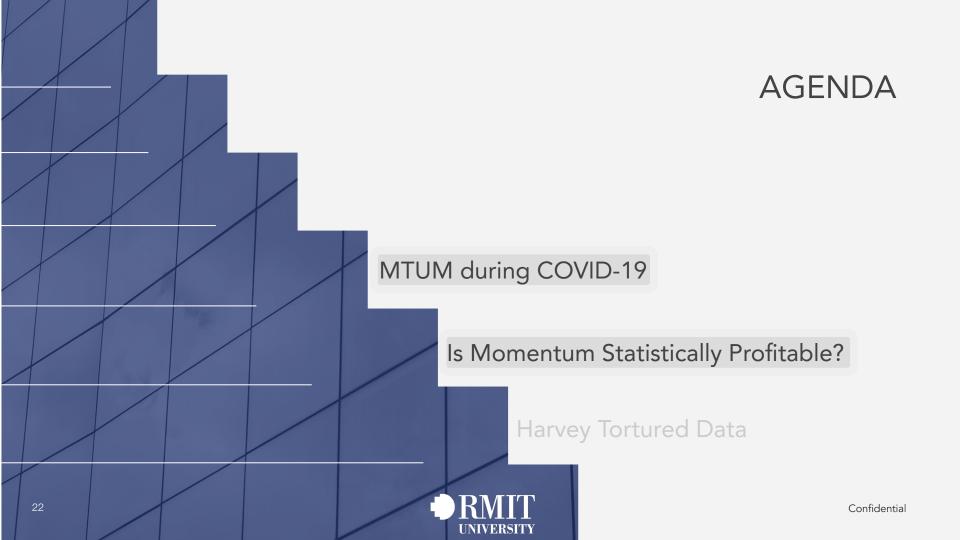
Momentum's post-COVID efficiency has weakened, drawdowns are more frequent, and alpha is more concentrated in fewer years.

The MTUM strategy remains valid, but investors should consider dynamic risk management, possibly shorter holding periods or adaptive weighting, to preserve performance in a post-COVID regime.



_	Strategy	Average Return	Std Dev	Sharpe Ratio (Rf=0)	Positive Years
	MTUM Pre	15.83%	13.44%	117.76%	85.71%
-	MTUM Post	13.40%	20.44%	65.54%	80.00%
_	NYSE Pre	7.06%	12.32%	57.30%	71.43%
_	NYSE Post	7.07%	11.52%	61.35%	80.00%
_					





Is Momentum Statistically Profitable?

A one-sided t-test was used to determine if the MTUM momentum strategy has historically generated significant positive annual returns.

Conclusion

The null hypothesis (H_0 : mean annual return \leq 0) is **rejected** at the 1% significance level. There is strong statistical evidence that the momentum strategy represented by MTUM has consistently produced positive returns on an annual basis.

Interpretation

The MTUM **momentum strategy has been profitable** both statistically and economically across different market conditions including the post-COVID regime. The evidence indicates momentum remains a valid factor which produces excess returns.

Historical performance does not predict future investment outcomes yet the data indicates momentum investing remains robust.



Hypothesis Test: Is Momentum Still Profitable?

Time Period: 2013-2025
Mean Annual Return: 13.40%

Standard Deviation: 16.04%

T-statistic: 3.01

One-sided P-value: 0.0054

• Reject H_0 : The strategy has a statistically

positive expected return.



Is Momentum Statistically Profitable?

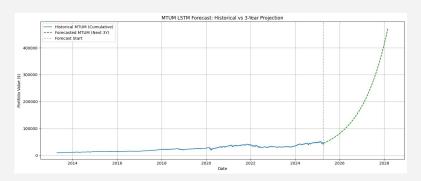


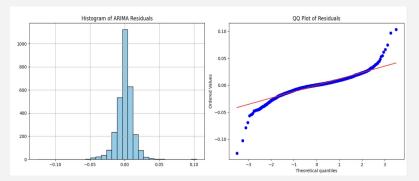


Would you still think the same?

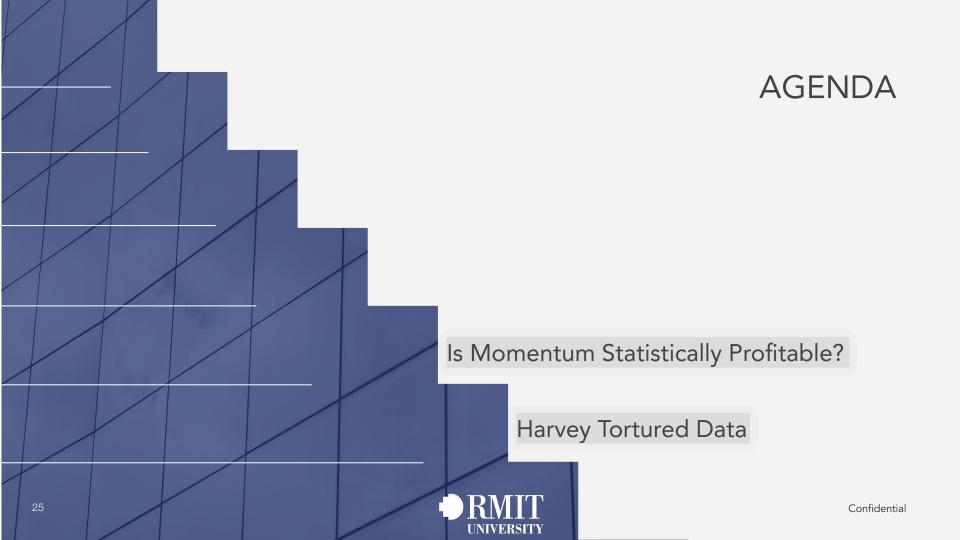












Harvey Tortured Data



Implications for Factor Investing and ETFs

- The requirement to publish statistically significant results in academic finance creates incentives that drive researchers toward data mining activities.
- The process of overfitting factor strategies leads to models which demonstrate academic robustness but demonstrate market failure.
- These strategies get packaged into ETFs by asset managers who present them as scientifically validated products even though they could demonstrate weak real-world performance.

01

Strategic Data Selection

Researchers either purposefully or unintentionally choose data which confirms their preferred outcomes by excluding evidence that contradicts their findings.





Multiplicity of Methods

The availability of multiple tools and models allows researchers to discover statistically significant results through various combinations which raises the possibility of false discoveries.





Delegation of Responsibility

Researchers who adopt standard methods such as simple regression may end up working with preprocessed or biased datasets that others have generated thus producing incorrect results.



04

Fake Out-of-Sample Testing

The practice of reserving historical data for out-of-sample testing frequently breaks down because researchers tend to modify their results after knowing the outcomes. ones demonstrate limited ability to predict future performance.





