# QAM Final Project
# Diversified Momentum Strategy

By Rakshay Pawar

## 1. Introduction

A time-series momentum strategy, also known as a trend-following strategy, is a simple extension of the long-only constant-volatility strategy that involves long and short positions defined by each asset's recent performance over some lookback period. It is an absolute momentum strategy that exploits autocorrelation in the time series of securities prices. Analyzing the market for stocks with high velocity and price momentum can be more effective than simply holding a long position.

Momentum strategies have a track record of more than 20 years and have generally demonstrated their effectiveness and profitability. This research specifically focuses on time series momentum strategy. The attractiveness of this strategy lies not only in its potential for outperformance but also in its ability to diversify exposure across different asset classes. This diversification can be advantageous for investors who prefer to avoid excessive volatil-ity associated with a single asset class's momentum factor. Practical implementation of a momentum strategy typically includes considering transaction costs. However, when utilizing futures contracts, these costs can be more e ciently managed. For instance, if trading solely with the S&P 500, transaction fees can accumulate and significantly impact overall returns.

## 2. Why is our strategy choice better than alternative ones

Time series momentum is better than other alternative strategies because:

1. It does not impose constraints on the number of assets in the winner and loser portfolios, which allows it to capture more information from the tails of the return distribution

2. It performs well across different asset classes, markets, and time periods, and has a low correlation with other factors

3. It is simpler and more robust than deep neural networks, which require more data, computational resources, and tuning parameters

## 3. Advantages of the time series Momentum strategy

1. **Capture trending behaviour:** Time-series momentum strategies capitalise on the presence of trending behaviour in financial markets. Empirical studies have consistently shown that asset prices tend to exhibit momentum, wherein assets that have experienced positive returns in the recent past are more likely to continue performing well in the near future. By systematically identifying and following these trends, time-series momentum strategies aim to generate profits from sustained price movements.

2. **Diversification and risk management:** One of the key advantages of a time-series momentum strategy is its potential for diversification and risk management. This strategy has been observed to exhibit low correlation with traditional asset classes, such as stocks and bonds, making it an attractive addition to a well-diversified portfolio. The ability to generate returns that are uncorrelated with other investments can enhance portfolio efficiency and reduce overall risk, particularly during periods of market turbulence.

3. **Enhance risk-adjusted returns:** Numerous academic studies and real-world applications have demonstrated that time-series momentum strategies have the potential to deliver enhanced risk-adjusted returns. By systematically entering and exiting positions based on momentum signals, traders can benefit from both upward and downward price trends, capturing positive returns during bullish periods and potentially mitigating losses during bearish phases. This asymmetrical return profile contributes to improved risk-adjusted performance compared to traditional buy-and-hold strategies.

## 4. Strategy

The implemented strategy is a diversified times series momentum strategy that spans multiple asset classes, including Equities Indices, Commodities, and Currencies. A comprehensive list of the assets included in this strategy can be found in the appendix. In this strategy, momentum is measured by calculating the relative strength or performance of an asset over a specified lookback period. If the asset's price has exhibited positive momentum or upward trend, a long position is taken. Conversely, if the price has shown negative momentum or a downward trend, a short position is initiated. By diversifying across different markets, the strategy aims to reduce the impact of specific asset or market risks and potentially improve risk-adjusted returns. However, there are certain risks associated with this strategy that may hinder its ability to deliver higher returns in exchange for taking on these risks. These

risks are discussed in detail in the subsequent sections of the report.

## 5. Reasons to choose the strategy

1. **Capture trending behaviour:** Time-series momentum strategies capitalise on the presence of trending behaviour in financial markets. Empirical studies have consistently shown that asset prices tend to exhibit momentum, wherein assets that have experienced positive returns in the recent past are more likely to continue performing well in the near future. By systematically identifying and following these trends, time-series momentum strategies aim to generate profits from sustained price movements.

2. **Diversification and risk management:** One of the key advantages of a time-series momentum strategy is its potential for diversification and risk management. This strategy has been observed to exhibit low correlation with traditional asset classes, such as stocks and bonds, making it an attractive addition to a well-diversified portfolio. The ability to generate returns that are uncorrelated with other investments can enhance portfolio efficiency and reduce overall risk, particularly during periods of market turbulence.

3. **Enhance risk-adjusted returns:** Numerous academic studies and real-world applications have demonstrated that time-series momentum strategies have the potential to deliver enhanced risk-adjusted returns. By systematically entering and exiting positions based on momentum signals, traders can benefit from both upward and downward price trends, capturing positive returns during bullish periods and potentially mitigating losses during bearish phases. This asymmetrical return profile contributes to improved risk-adjusted performance compared to traditional buy-and-hold strategies.

4. **Adaptability to different market conditions:** Another advantage of time-series momentum strategies is their adaptability to different market conditions. Unlike strategies that rely on specific market regimes or economic conditions, time-series momentum approaches have shown the ability to generate positive returns across various asset classes and time periods. Whether markets are experiencing bullish or bearish phases, trending or range-bound conditions, a well-executed time-series momentum strategy can dynamically adapt to capture profitable opportunities.

5. **Robustness and empirical evidence:** The robustness and empirical evidence supporting the effectiveness of time-series momentum strategies add credibility to their

appeal as a trading approach. Academic research and empirical studies have consistently shown the existence of momentum across different markets, asset classes, and geographies. The outperformance of time-series momentum strategies has been documented in various timeframes, ranging from short-term horizons to longer-term investment horizons.

## 6. Diversification of the portfolio

A time-series momentum strategy can diversify a portfolio due to its low correlation with traditional asset classes. Diversification is a crucial risk management technique that aims to reduce the overall volatility of a portfolio by investing in assets that have low or negative correlations with each other. By including assets with different risk and return characteristics, investors can potentially enhance the risk-adjusted returns of their portfolios.

Time-series momentum strategies exhibit a unique characteristic that differentiates them from traditional asset classes such as stocks and bonds. While traditional assets are influenced by fundamental factors such as earnings, economic conditions, and interest rates, time-series momentum strategies focus on capturing and capitalising on the persistent price trends exhibited by assets. As a result, the returns generated from time-series momentum strategies tend to have a low correlation with the returns of traditional assets.

When the returns from time-series momentum strategies are uncorrelated or negatively correlated with the returns of other assets in a portfolio, it can lead to diversification benefits. During periods of market turbulence or economic downturns when traditional asset classes may experience significant declines, time-series momentum strategies may be able to generate positive returns by exploiting trends in other markets or asset classes. Moreover, the inclusion of a time-series momentum strategy in a portfolio can potentially reduce the overall portfolio risk. As time-series momentum strategies aim to identify and follow trends, they can dynamically adjust their exposure to different assets based on their momentum signals. This adaptability allows the strategy to potentially avoid or reduce exposure to declining assets, thereby mitigating losses during bearish phases. By diversifying a portfolio with a time-series momentum strategy, investors can potentially achieve a more stable and consistent risk-return profile. The strategy's low correlation with traditional assets can contribute to a reduction in portfolio volatility and provide a potential hedge against market downturns. Furthermore, the potential for positive returns during different market conditions adds an additional dimension of diversification to the overall portfolio.

## 7. Costs and Risks

The momentum strategy, in general, is exposed to the following risks:

Sudden Reversals: Over the past decade, there have been numerous instances of sudden reversals in the market. Sudden reversals occur when the market abruptly changes direction, often driven by turmoil or uncertainty. Such reversals have become more frequent in recent years. Additionally, as markets become more efficient and investors become more sophisticated, the momentum premium tends to diminish. This is because investors exercise caution or skepticism when prices deviate significantly from historical levels. It is worth noting that momentum as a factor has underperformed in the past decade compared to the previous decade.

Systematic Skewness of Winners and Losers: It is intuitive that assets that have recently outperformed carry a higher risk of significant pullbacks, while assets that have underperformed may have a higher probability of positive jumps. This implies that the momentum strategy exhibits negative skewness, meaning the downside risks are greater. The strategy is susceptible to larger deviations on the downside.

Transaction Costs: Implementing a momentum strategy often involves frequent trading, which can result in higher transaction costs, such as brokerage fees and spreads. These costs can erode the overall returns of the strategy, especially when trading in smaller or less liquid markets.

## 8. Strategy Performance

The performance of the momentum strategy was assessed individually for each of the three asset classes: Equities, Commodities and Currencies. The evaluation of performance was conducted based on the following metrics:

1. Cumulative returns

2. Sharpe Ratio

3. Annualized Excess Returns

4. Annualized mean and standard deviation

5. Daily and Max Drawdown

## 9. Exposures to Fama French Factors

The cumulative returns of the Fama French Factors were plotted and used it as a benchmark against the cumulative returns of our portfolio in order to evaluate the performance of the strategy whether the strategy outperforms or underperforms that benchmark. The Fama French Factors capture different sources of risk in the stock market. By comparing the cumulative returns of the diversified momentum strategy with these factors, investors can gain insights into the risk exposures of the strategy.

## 10. Products used for the analysis

1. **Stocks:** Stocks represent ownership in publicly traded companies and are a prominent asset class in financial markets. They are known for their liquidity and the availability of historical price data. Stocks are influenced by a variety of factors, including earnings, company performance, and market sentiment. Time-series momentum strategies applied to stocks aim to capture trends in individual stocks or stock indices. As stock prices can exhibit momentum, these strategies seek to identify and capitalise on upward or downward trends for potential profit.

2. **Commodities:** Commodities include physical goods such as agricultural products (e.g., wheat, corn), energy resources (e.g., oil, natural gas), and metals (e.g., gold, silver). Commodities often exhibit price trends driven by supply and demand dynamics, geopolitical factors, and global economic conditions. Time-series momentum strategies applied to commodities seek to identify and exploit these trends to generate profits. The availability of futures contracts and exchange-traded funds (ETFs) allows investors to gain exposure to commodity price movements and implement time-series momentum strategies in this asset class.

3. **Currencies:** Currencies represent the exchange rates between different countries' monetary units. The foreign exchange (forex) market is the largest and most liquid market globally, providing ample opportunities for time-series momentum strategies. Currency prices are influenced by various factors, including interest rate differentials, economic indicators, political events, and market sentiment. Time-series momentum strategies applied to currencies aim to identify and capitalise on trends in currency pairs' price movements. By following the momentum effect, these strategies seek to profit from trends in currency exchange rates.

## 11. Reasons to used the equally-weighted method

1. **Simplicity:** The equally-weighted method is straightforward and easy to implement. It involves allocating equal amounts of capital to each asset or security in the portfolio. This approach eliminates the need for complex calculations or sophisticated portfolio optimization techniques, making it accessible to a wide range of investors.

2. **Transparency:** The equally-weighted method offers transparency in portfolio construction. Since each asset is assigned an equal weight, it ensures that no single asset dominates the portfolio's performance. This simplicity allows investors to easily understand and monitor the composition of their portfolio.

3. **Broad Diversification:** The equally-weighted method inherently provides broad diversification across the assets included in the portfolio. By allocating equal weights to each asset, it ensures that no particular asset has an outsized impact on the portfolio's overall performance. This diversification helps reduce concentration risk and can enhance the portfolio's stability.

4. **Agnostic to Asset Characteristics:** The equally-weighted method treats all assets equally regardless of their individual characteristics. This approach does not favour or overweight any specific asset based on factors such as market capitalization, volatility, or liquidity. As a result, it avoids potential biases that could arise from using alternative weighting methods, ensuring a more balanced representation of the portfolio.

5. **Bias towards Smaller Assets:** The equally-weighted method has a natural bias towards smaller assets within the portfolio. Since each asset receives the same weight, smaller or lesser-known assets have the same opportunity for inclusion as larger and more widely followed assets. This can potentially lead to opportunities for capturing momentum in assets that might be overlooked by other weighting methods.

6. **Historical Performance:** The equally-weighted method has demonstrated competitive performance in empirical studies and historical analysis. By providing exposure to a diversified set of assets, it has the potential to capture the overall trend and momentum in the portfolio. Additionally, the simplicity of the method may result in lower transaction costs, which can contribute to improved net returns.

## 12. Appendix

List of assets included in the strategy:

**Equity Indices:**

1. **USA:** S&P500

2. **USA:** Dow Jones Industrial Average

3. **UK:** FTSE 100

4. **Italy:** FTSE MIB

5. **Canada:** S&P/TSX Composite Index

6. **France:** CAC 40

7. **Spain:** IBEX 35

8. **Australia:** S&P/ASX 200

**Commodities Indices:**

1. **Aluminum:** BCOMALTR

2. **Brent Oil:** BCOMCOT

3. **Ice Sugar:** BCOMSBTR

4. **Gold:** BCOMGCTR

5. **Coffee:** BCOMKCTR

6. **Wheat:** BCOMWCTR

**Currencies Indices:**

1. **EUR/USD:** BTSFEUUS Index

2. **GBP/USD:** BTSFGBUS Index

3. **CAD/USD:** BTSFCAUS Index

4. **AUD/USD:** BTSFAUUS Index

5. **JPY/USD:** BTSFJPUS Index

Description of the method:

1. For the replication of the paper, we obtained monthly equity data for the required equity indices (S&P500, Dow Jones Industrial Average, FTSE 100, CAC 40, S&P/TSX Composite, S&P/ASX 200, FTSE MIB, IBEX 35) from Bloomberg.

2. Time series momentum, shows persistence in returns for one to 12 months that partially reverses over longer horizons, consistent with sentiment theories of initial under-reaction and delayed over-reaction

3. The past 12-month excess return of each instrument is a positive predictor of its future return. This time series momentum or ''trend'' effect persists for about a year and then partially reverses over longer horizons.

4. Time series momentum is related to, but different from, the phenomenon known as ''momentum'' which is primarily cross-sectional in nature.

5. Rather than focus on the relative returns of securities in the cross-section, time series momentum focuses purely on a security's own past return.

6. Defines a momentum signal function that calculates the sign of the average monthly return over a specified lookback period

7. Calculates the momentum signal for each month, scales the signal by the inverse of its volatility

8. Computes the strategy returns by multiplying the scaled signal by the monthly returns

9. Our final strategy assigns an equal weight to the 3 strategies above.

Performance Statistics of the momentum strategy within each asset class:

Correlation Heat Map of Assets



Performance by Individual Assets



Cumulative Market Return

## Cumulative Returns over Time of Portfolio



## Distribution of Portfolio Returns



Mean: 0.00
Standard Deviation: 0.01

## Cumulative Returns over Time of Portfolio vs. FF Market

Drawdown over Time of Portfolio