# Milestone 1: Scientific and Informal Trading Strategy Review

## Introduction

In this report, I am going to present a comprehensive review of algorithmic trading strategies using historical market data, technical indicators, and machine learning techniques. As a foundation for this project, I reviewed academic literature and identified six scientific strategies, each backed by empirical research. In addition to the academic approaches, I also explored four informal strategies commonly used by traders in practice. These strategies will inform the design and implementation of trading algorithms for subsequent milestones.

## Baseline Strategies

### Buy and Hold Strategy

**Source:** Common baseline in academic finance and practical investing

**Summary:** The buy-and-hold strategy is one of the simplest investment approaches. It involves purchasing an asset such as a stock or ETF like SPY and holding it over a long period regardless of market fluctuations. This strategy assumes that markets tend to grow over time, and timing the market is less effective than simply staying invested. Although it lacks active decision-making, it serves as an important benchmark to compare the performance of more sophisticated strategies.

**Core Logic:**

* Buy one or more assets at the beginning of the period
* Do not sell until the end of the evaluation.

### Equal Weight Portfolio Strategy

**Source:** Basic portfolio construction method; often used in financial benchmarks

**Summary:** This strategy divides available capital equally across multiple assets (e.g., SPY, AAPL, BND) and holds them without making adjustments. It avoids overexposure to any single asset and is often used as a simple benchmark in portfolio studies.

**Core Logic:**

* Allocate equal capital (e.g., 25%) to each selected asset
* Hold positions unchanged throughout the analysis period

## Scientific Strategies

### 1. Moving Average Crossover Strategy

**Paper Title:** Simple Technical Trading Rules and the Stochastic Properties of Stock Returns  
**Authors:** Brock, Lakonishok, and LeBaron (1992)

**Summary:**  
This paper examines the effectiveness of simple technical trading rules, particularly moving average (MA) crossovers, on historical data from the Dow Jones Industrial Average. The study spans nearly a century of data (1897–1986) and finds that when a short-term MA (e.g., 50-day) crosses above a long-term MA (e.g., 200-day), the returns are significantly higher than random chance. This strategy remains one of the most widely used technical indicators and continues to be part of many algorithmic systems.

**Core Logic:**

* Buy when SMA(50) > SMA(200)
* Sell or short when SMA(50) < SMA(200)

### 2. Momentum Strategy

**Paper Title:** Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency  
**Authors:** Jegadeesh & Titman (1993)

**Summary:**  
This highly cited study introduced momentum investing, a strategy based on the persistence of stock performance. It found that stocks with high past returns over a 3–12 month window tend to continue performing well in the near future. The momentum strategy involves ranking assets by recent performance, buying the top performers, and shorting the worst. It contradicts the random walk theory and has become a foundation in both academic finance and hedge fund strategies.

**Core Logic:**

* Rank stocks by past 6-month return
* Buy the top 20%, short the bottom 20%
* Hold for one month

### 3. RSI-Based Mean Reversion Strategy

**Paper Title:** The Profitability of Technical Analysis: A Review  
**Authors:** Park & Irwin (2007)

**Summary:**  
This paper provides a comprehensive review of 92 studies on technical trading indicators, finding that certain tools—particularly the Relative Strength Index (RSI)—have predictive power in real markets. RSI is a momentum oscillator that indicates overbought and oversold conditions. The authors found statistically significant results using RSI-based entry and exit points in both developed and emerging markets, particularly when paired with additional filters.

**Core Logic:**

* Buy when RSI < 30 (oversold)
* Sell when RSI > 70 (overbought)

### 4. Bollinger Bands Mean Reversion

**Paper Title:** The Profitability of Technical Trading Rules in Emerging Stock Markets  
**Authors:** Mehmet Balcılar, Rangan Gupta, et al.

**Summary:**  
This study evaluates the profitability of various technical trading strategies in emerging markets. Bollinger Bands, which are constructed using a moving average and standard deviations, are used to identify price extremes. The paper found that mean-reversion strategies based on Bollinger Bands—buying when prices fall below the lower band and selling when above the upper band—can generate excess returns under certain conditions, particularly in less efficient markets.

**Core Logic:**

* Buy when price crosses below the lower Bollinger Band
* Sell when price crosses above the upper Bollinger Band

### 5. Deep Learning for Stock Prediction (LSTM)

**Paper Title:** Deep Learning With Long Short-Term Memory Networks for Financial Market Predictions  
**Authors:** Thomas Fischer, Christopher Krauss (2018)

**Summary:**  
This paper investigates the use of Long Short-Term Memory (LSTM) networks for predicting stock price movements. By training deep learning models on historical S&P 500 data, the authors demonstrate that LSTMs outperform traditional machine learning methods like random forests and logistic regression. The model predicts directional price changes and is used as a signal for trading. This represents a modern, data-driven approach to market forecasting.

**Core Logic:**

* Train an LSTM model on historical price data
* Predict next-day price direction
* Go long if model predicts increase, short if decrease

### 6. Technical Indicators Comparison

**Paper Title:** Technical Trading Rules in the Emerging Equity Markets  
**Author:** M. Gencay (1998)

**Summary:**  
This paper analyzes the performance of several technical trading indicators—including MACD, RSI, and MA crossovers—on emerging market equities. It concludes that while some indicators underperform, others (particularly trend-following and momentum indicators) can yield statistically significant profits. This study is useful for comparing the effectiveness of various tools across different market conditions.

**Core Logic:**

* Evaluate different indicator rules (e.g., RSI, MACD, MA)
* Select the best-performing indicator for a given asset
* Use rule-based logic for trade execution

## Informal (Non-Scientific) Trading Strategies

### 1. MACD Crossover

**Source:** Investopedia, trading blogs

**Summary:**  
The MACD (Moving Average Convergence Divergence) indicator tracks the relationship between two moving averages of a stock’s price. A bullish signal occurs when the MACD line crosses above the signal line, and a bearish signal when it crosses below. Although widely used in practice, its effectiveness varies across assets and timeframes.

**Core Logic:**

* Buy when MACD > Signal Line
* Sell when MACD < Signal Line

### 2. Fibonacci Retracement Levels

**Source:** TradingView tutorials, YouTube (Rayner Teo, etc.)

**Summary:**  
Fibonacci retracement levels are used to identify potential reversal levels during trending markets. Traders believe prices often retrace a predictable portion (e.g., 38.2%, 50%, 61.8%) before continuing in the direction of the trend. The strategy is common in Forex and crypto trading.

**Core Logic:**

* Identify trend
* Buy at 38.2% or 61.8% retracement of recent upward move
* Place stop-loss below swing low

### 3. Support and Resistance Breakouts

**Source:** Trader forums, YouTube strategy videos

**Summary:**  
Support and resistance levels represent price zones where markets have historically reversed. A breakout occurs when price crosses above resistance or below support with high volume. This strategy seeks to catch strong trend movements after a breakout.

**Core Logic:**

* Buy on breakout above resistance with volume confirmation
* Sell on breakdown below support

### 4. Volume Spike Confirmation

**Source:** Trading blogs and pattern traders

**Summary:**  
Volume spikes often precede large price moves. Traders use volume as a confirmation signal for breakouts or trend reversals. High volume confirms the strength of a move, and low volume warns of potential reversals or false signals.

**Core Logic:**

* Look for sudden volume spikes relative to average volume
* Use as confirmation with other patterns or breakouts

## Conclusion

This review covers a wide variety of trading strategies, from simple ones like Buy & Hold to more advanced ideas like using machine learning models (e.g., LSTMs). The scientific strategies are based on research and data, while the informal ones come from practical experience and are often used by traders in real markets. In the next part of the project, I’ll choose 1 to 3 of these strategies to implement and test using QuantConnect, based on how complex they are and how well they fit what I want to learn.

I have tested Moving Average Crossover Strategy, RSI-Based Mean Reversion Strategy and Bollinger Bands Mean Reversion with and without stop-loss on different assets.

## References

* Brock, W., Lakonishok, J., & LeBaron, B. (1992). *Simple Technical Trading Rules and the Stochastic Properties of Stock Returns*. [JSTOR](https://www.jstor.org/stable/2328882)
* Jegadeesh, N., & Titman, S. (1993). *Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency*. [JSTOR](https://www.jstor.org/stable/2329112)
* Park, C. H., & Irwin, S. H. (2007). *The Profitability of Technical Analysis: A Review*. [SSRN](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=962461)
* Kenourgios, Dimitris & Papathanasiou, Spyros. (2010). Profitability of Technical Trading Rules in an Emerging Market. in The Handbook of Trading: Strategies for Navigating and Profiting from Currency, Bond, and Stock Markets, edited by Greg N. Gregoriou, McGraw-Hill, NYC, NY June 2010, pp. 97-111.. [ScienceDirect](https://www.researchgate.net/publication/228317916_Profitability_of_Technical_Trading_Rules_in_an_Emerging_Market)
* Fischer, T., & Krauss, C. (2018). *Deep Learning With Long Short-Term Memory Networks for Financial Market Predictions*. [SSRN](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2987289)
* Gencay, R. (1998). *Technical Trading Rules in the Emerging Equity Markets*. [JSTOR](https://www.jstor.org/stable/2331282)
* Investopedia. *MACD Indicator*. [Link](https://www.investopedia.com/terms/m/macd.asp)
* Babypips. *Fibonacci Retracement*. [Link](https://www.babypips.com/learn/forex/fibonacci-retracement)
* Investopedia. *Support and Resistance*. [Link](https://www.investopedia.com/terms/s/support.asp)
* YouTube: *Equal Weight Investing: Performance and Examples*. [Watch](https://www.youtube.com/watch?v=VazHKib35ck)
* YouTube: *Equal Weight S&P 500: The Smart Investor’s Choice?*. [Watch](https://www.youtube.com/watch?v=uaKoCk9P0p4)
* Lyn Alden. *Equal-Weighted Index Funds: The Pros and Cons*. [Read](https://www.lynalden.com/equal-weighted-index-funds/)
* Shoonya Blog. *Equal Weight Portfolio*. [Read](https://blog.shoonya.com/equal-weight-portfolio/)
* Vanguard Professional Insights. *Index Weighting Approaches*. [Read](https://www.nl.vanguard/professional/insights/portfolio-construction/what-to-consider-when-choosing-between-index-weighting-approaches)