

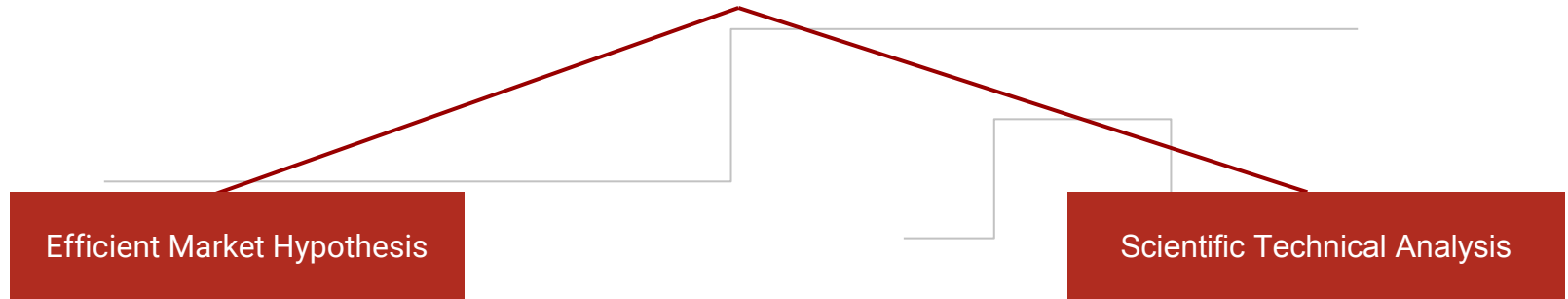
MS&E 448 Presentation

| ALFA RESEARCH GROUP |  |

Introduction to Technical Analysis

Technical Analysis: Is defined as an *Analysis* methodology for forecasting the direction of *prices* through the study of past market data, primarily price and volume.

- Technical Analysis (Charting) was the tool of choice and evolved a fairly advanced methodology before quantitative and algebraic techniques became the primary mechanism behind financial decision making.
- There are two main schools of thought with regards to modern use of technical analysis as a tool for optimized decision making about financial markets.

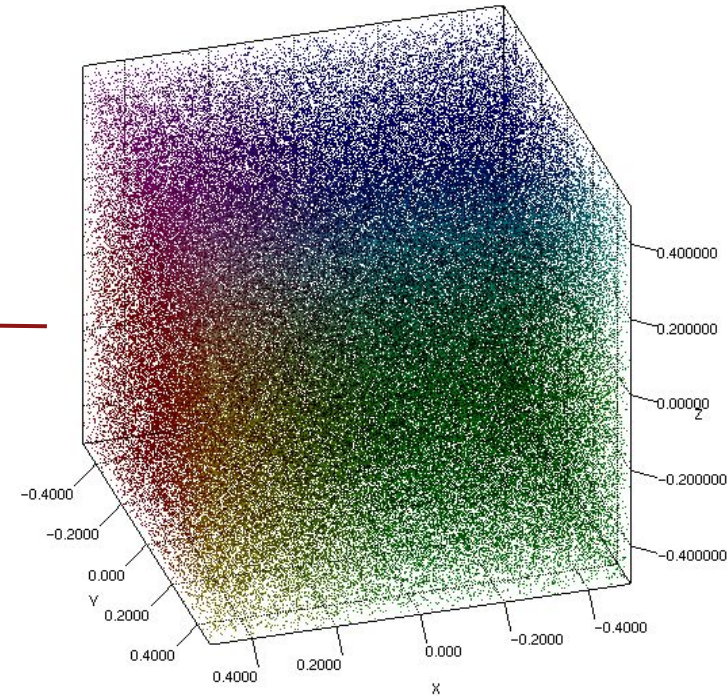


Efficient Market Hypothesis

A market theory that evolved from a 1960's Ph.D. dissertation by Eugene Fama, the efficient market hypothesis states that at any given time and in a liquid market, security prices fully reflect all available information.

The Efficient Market Hypothesis contradicts the useful predictive value of Technical Analysis as a tool for profitably predicting future Prices.

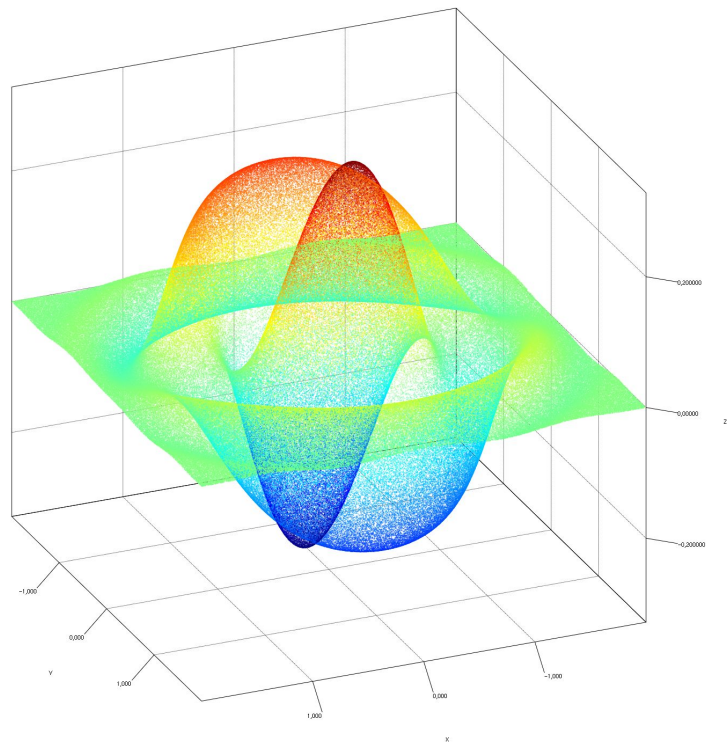
| Sample Clustering |
Market Data
Chaotic Output



Scientific Technical Analysis

Scientific Technical Analysis takes the opposite approach, asserting that the overarching diverse data can be stratified and studied to produce generate predictive patterns, that carry in them significant Powers of prediction.

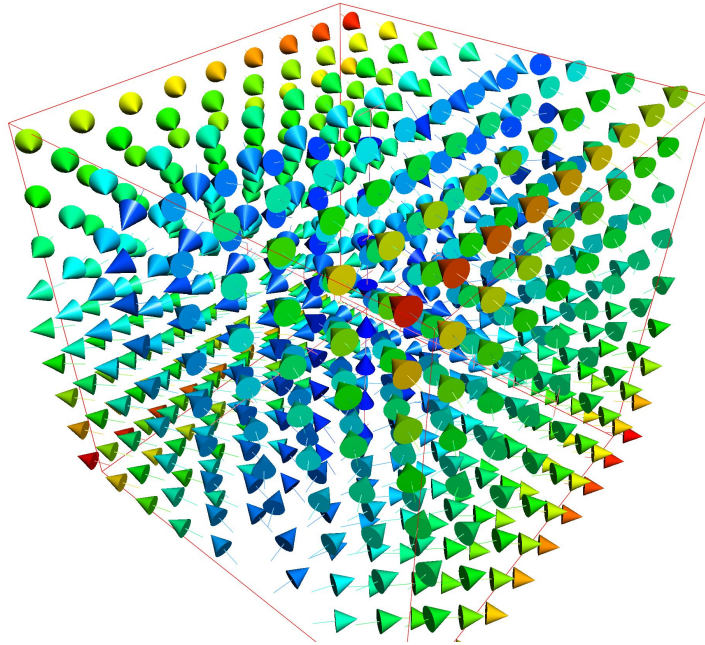
| Sample Clustering |
Market Data
Attractor Function
Core Approach



Our Approach With Technical Analysis



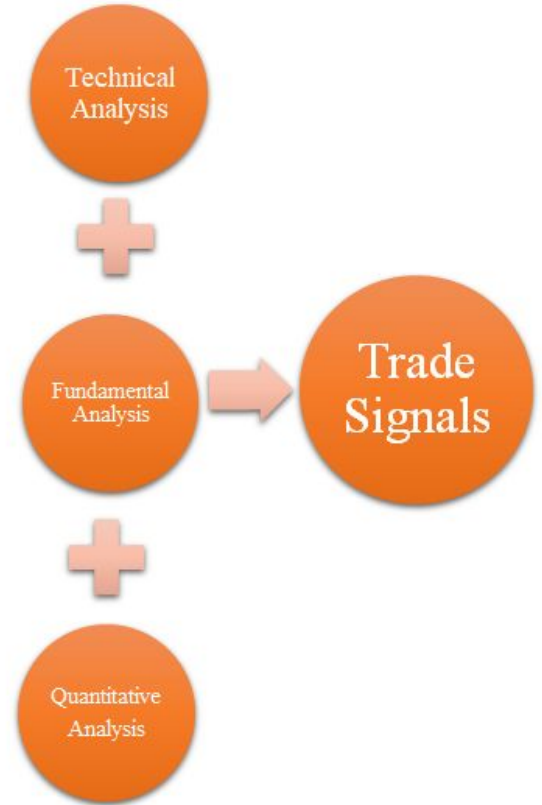
Our Approach With Technical Analysis



Creating a Trade Signal

Trade signals

- A trigger for action, either to buy or sell a security or other asset, generated by analysis.
- Technical analysis, fundamental analysis and quantitative analysis can all be inputs. The goal is to give investors and trader a method, devoid of emotion, to buy or sell a security or other asset.
- A handful of inputs tend to perform better. For practical purposes, it is far easier to manage a simple signal generator and periodically test it to see what components need adjusting or replacing. Too many inputs could be rendered obsolete before testing is even finished



Project Goals and Outlooks

Build a suite of predictors that are predictable of 1 month - 3 month returns

- Technical Patterns are major inputs to trade signals for our project
- Include triangles, rectangles, head-and-shoulders and trendlines



Head and Shoulders Pattern

Apply technical analysis on different types of assets and comparison, help with asset class allocation such as shifting money among stocks, bonds, and gold finally.

Goals Continued

Build a neural network-based Stock Trading System using technical signals

- Traditional decision support models are mostly based on static rules and analyses, hence can easily be outdated. Computational intelligence models on the other hand, such as neural networks demonstrated good performance achievements
- Converts the financial time series data into a series of buy-sell-hold trigger signals using the technical analysis indicators
- Use technical analysis indicators as features for the neural network model

Future Goals: Phase of Neural Network Algorithm

The peak points are marked as “Sell”,
the valley points are marked as “Buy”
and the remaining points are marked
as “Hold”

Calculate technical values for each
daily stock price

Feed training and test data into neural
network

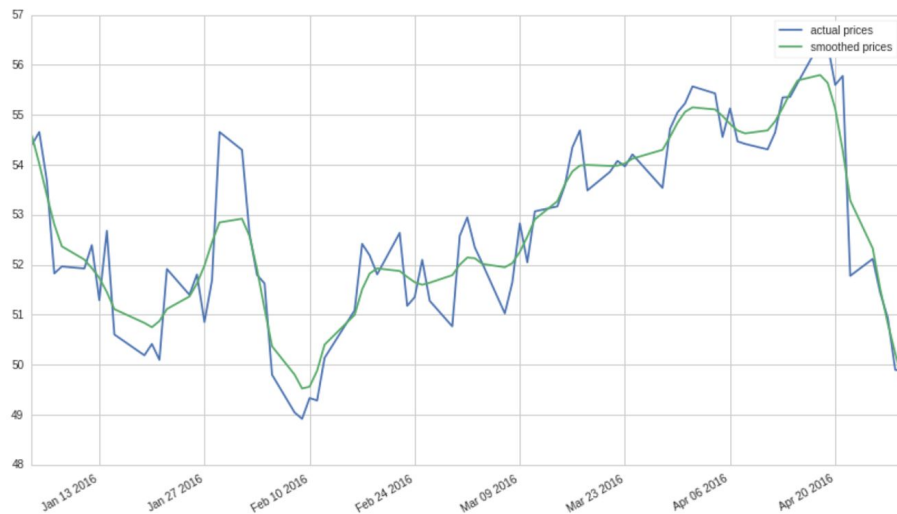


Empirical Evaluation of Technical Patterns

Kernel Regression Estimator

$$\hat{m}_h(x) = \frac{1}{T} \sum_{t=1}^T \omega_{t,h}(x) Y_t = \frac{\sum_{t=1}^T K_h(x - X_t) Y_t}{\sum_{t=1}^T K_h(x - X_t)}.$$

Microsoft (MSFT) smoothing
from January 1st 2016
through May 1st 2016



Define Technical Patterns

Head and Shoulders (HS)

Inverse Head and Shoulders (IHS)

Broadening Top (BTOP)

Broadening Bottom (BBOT)

Triangle Top (TTOP)

Triangle Bottom (TBOT)

Rectangle Top (RTOP)

Rectangle Bottom (RBOT)

$$\text{BTOP} \equiv \begin{cases} E_1 \text{ is a maximum} \\ E_1 < E_3 < E_5 \\ E_2 > E_4 \end{cases}$$

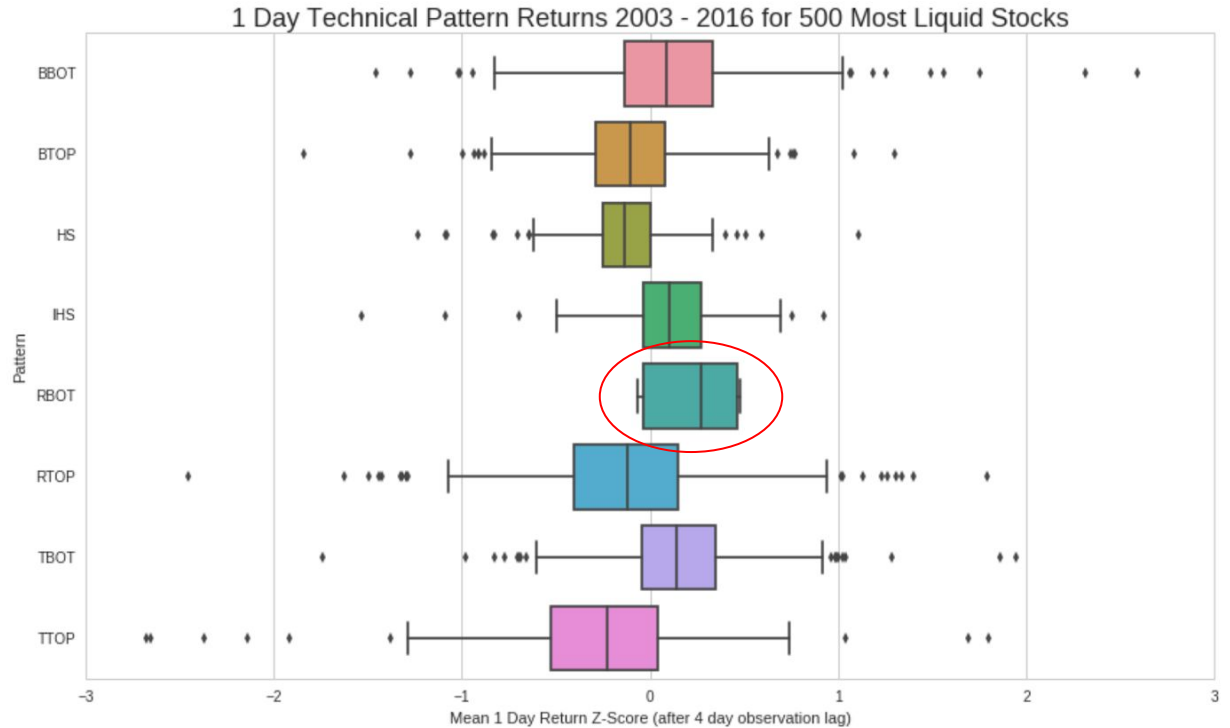
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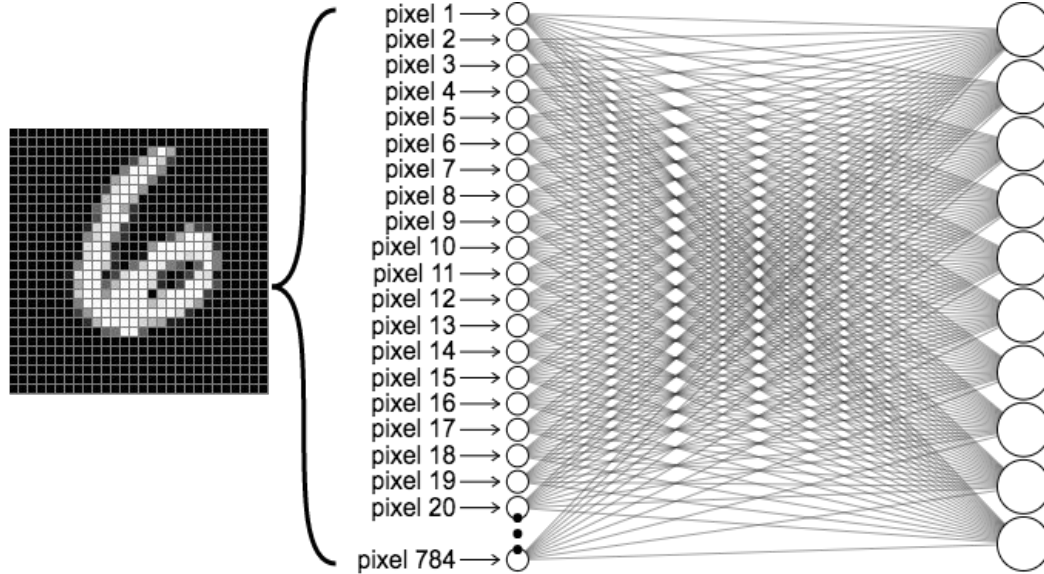
Returns Distributions

- Daily data taken from 500 most liquid stocks over a 13 period from 2003 and 2016
- Recognizes technical patterns from time series
- Mean returns 1 day after the patterns were identified



Complementary Approach

(To get an A+)



References

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Campbell A (2016). An Empirical Algorithmic Evaluation of Technical Analysis. Retrieved from quantopian.com.