



QuantStrats LLC

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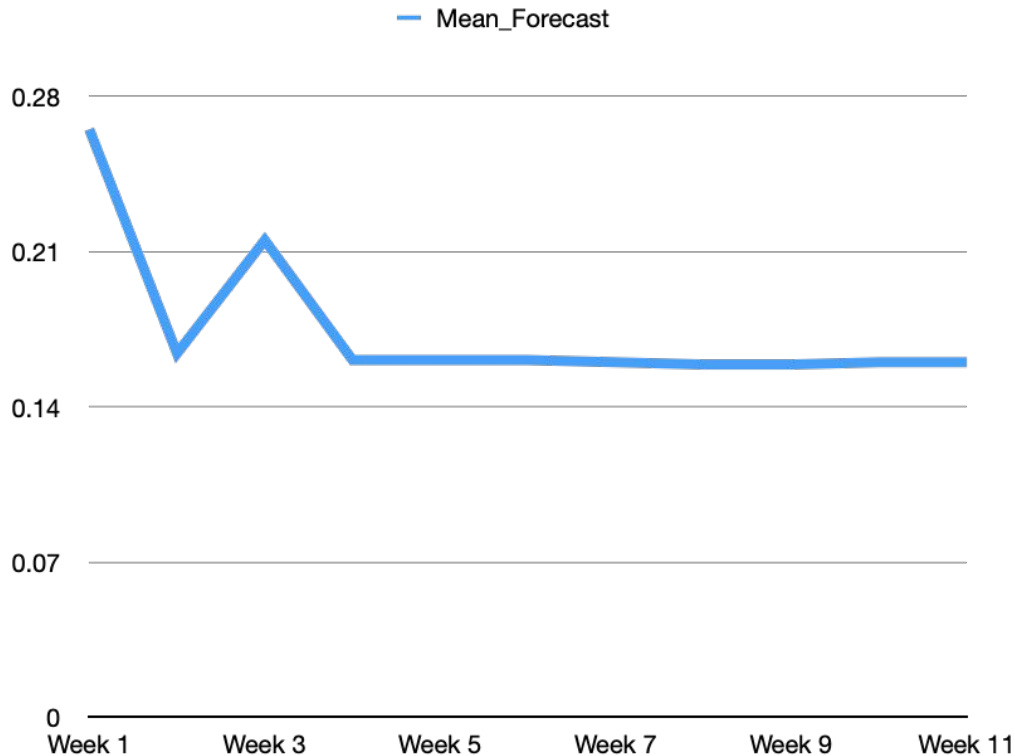
Semester Overview

- Utilize a well established strategy (EMA) consistently throughout the semester
 - Concurrently, implementing our in-class experiences and external findings to research a better performing strategy or implementations in different market regimes & using 1/n as our base strategy
 - Perfect Scenario: Discretionary + Systematic (Data Driven) strategies and approaches
- First Half of Competition
 - Working code for scraping and analyzing Google News on different underlyings and names (Appendix)
 - Recaptcha when scraping for too long
 - Did not pursue due to too much noise in the news articles (irrelevant articles, etc.)
- Second Half of Competition
 - Regression Analysis
 - Factor Analysis
 - Backtesting

Performance Summary

Weeks	Strategy Overview	Mean_Forecast	Mean_Decision	Rank_forecast	Rank_decision	Uncorrupted Mean_Decision
Week 1	Earnings Outlook	0.265	1.43	8	3	1.43
Week 2	Exponential Moving Average (Daily)	0.164	5.63	3	3	5.63
Week 3	EMA + RSI + MACD (Weekly)	0.215	3.53	5.5	3	3.53
Week 4	EMA + RSI + MACD (Weekly)	0.161	-9.49	5	8	-9.49
Week 5	EMA + RSI + MACD (Weekly)	0.161	-10.77	4	10	-10.77
Week 6	EMA + RSI + MACD + BB (Weekly)	0.161	11.92	4	1	11.92
Week 7	VXX 100% (Corrupted)	0.16	-14.69	5	10	7.11
Week 8	Addition to Strat: Factors Analysis	0.159	1.05	4	8	1.05
Week 9	Addition to Strat: Factors Analysis	0.159	11.83	3	1	11.83
Week 10	Addition to Strat: Market Neutral	0.16	-2.1	5	10	-2.1
Week 11	Addition to Strat: Backtesting	0.16	3.17	5	1	3.17

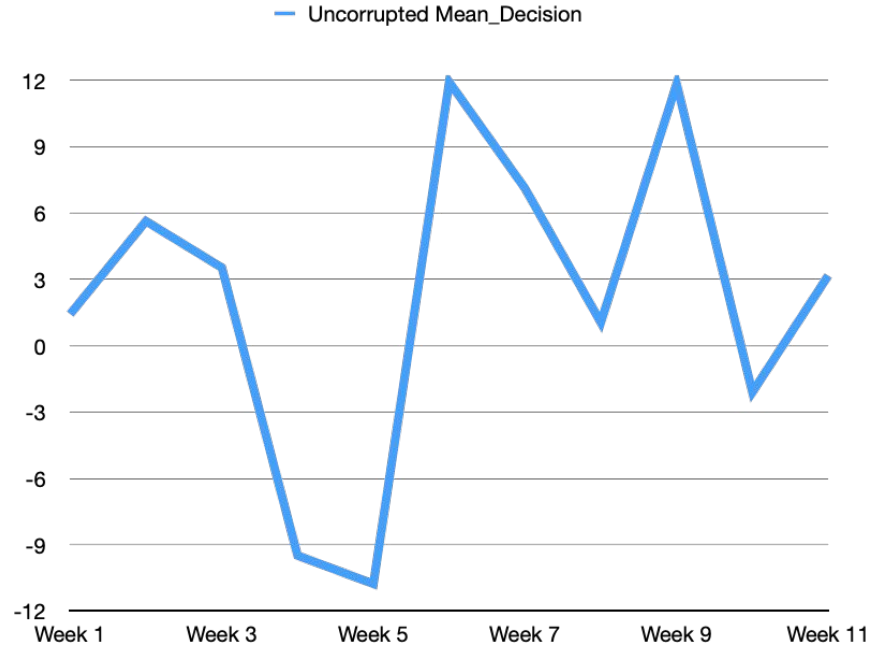
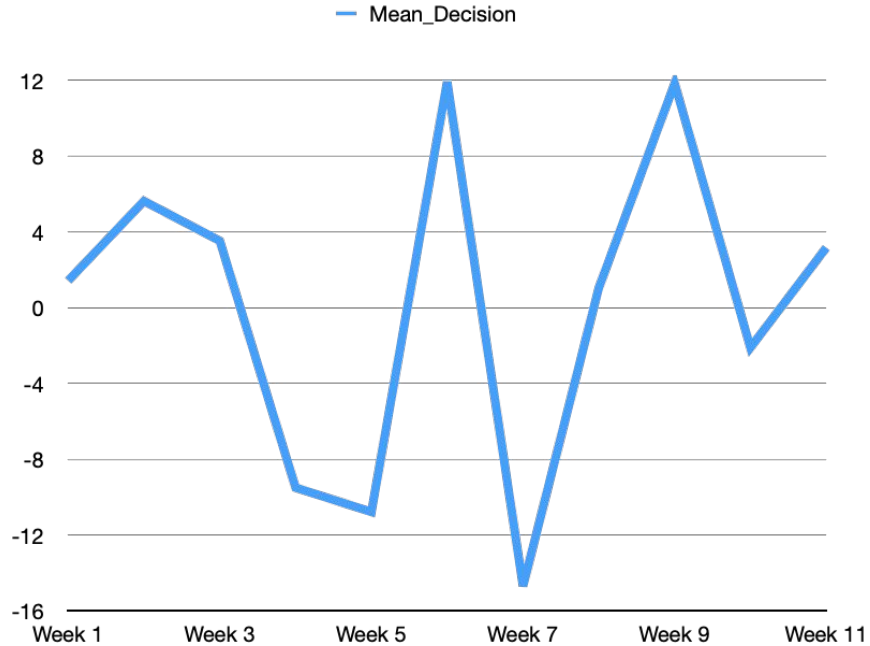
Deep dive into forecast



Weeks one to three:
Fitting a Student t-
distribution to the decisions

After week three:
 $ew * 0.99 + \text{fitting} * 0.01$

Decision Performance



Week 1

Discretionary Earnings Outlook

Company Financials
Analyst Ratings
Yahoo Finance Data
Banks Analytics

- Positive but low Sharpe
- Analyst ratings have 51% of being true
- Not Systematic at all

Week 2

Exponential Moving Average

Implementation of an EMA strategy using a combination of short term and long term

- Increase in Sharpe
- Simple strategy
- Needs additional indicators to be combat false signals

Week 3

Exponential Moving Average w/ RSI + MACD

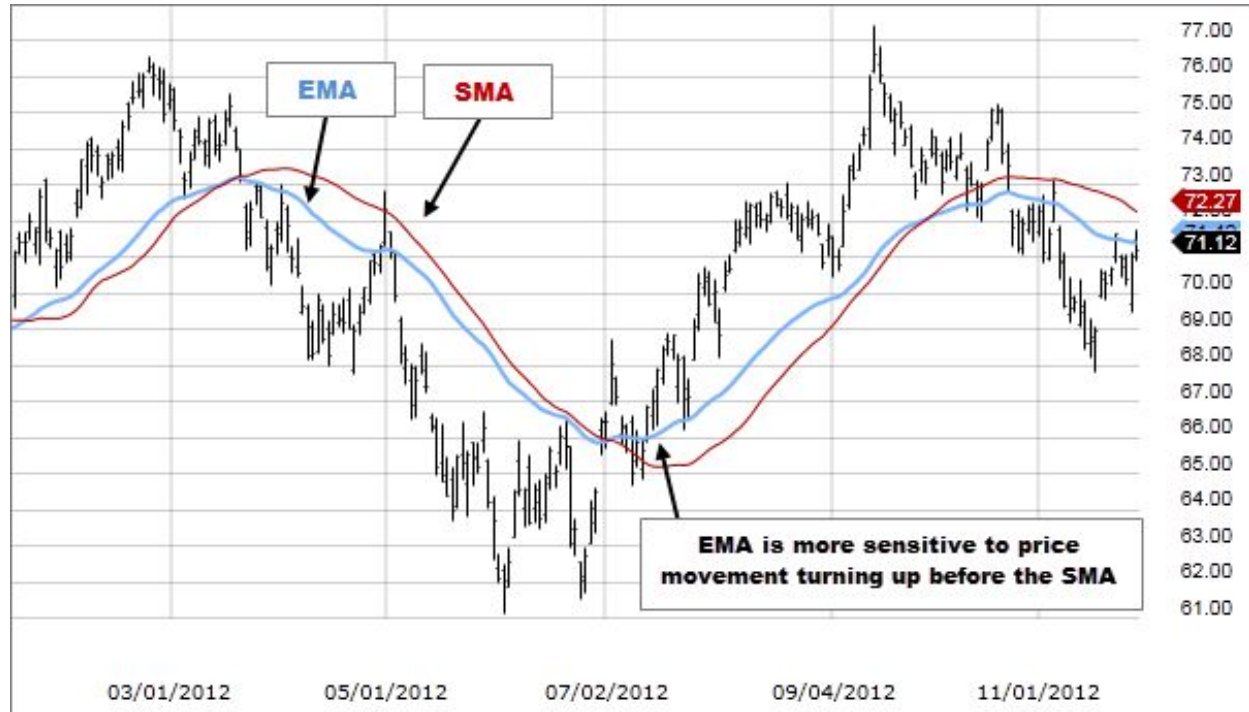
Implementation of previous strategy but added RSI and MACD indicators

- RSI to capture momentum
- MACD to capture trends
- Sharpe falls slightly but still positive

Exponential Moving Average

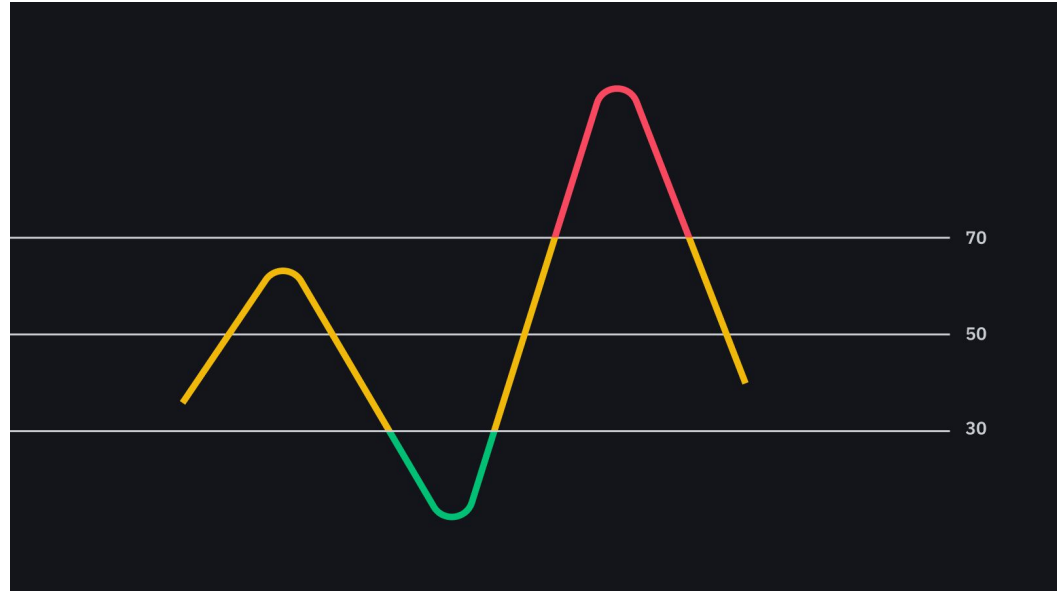
Why EMA?

- We believed that *trends* are the best *current* way to capture recent market activity and sentiment
- More responsive to recent price action
- Helps reduce noise by giving more weight to recent price action
- More weight on the longer-term trend
- Our short term window was 1 week and our long term window was 3 weeks
 - If Short term larger than long term -> Long Position and vice versa



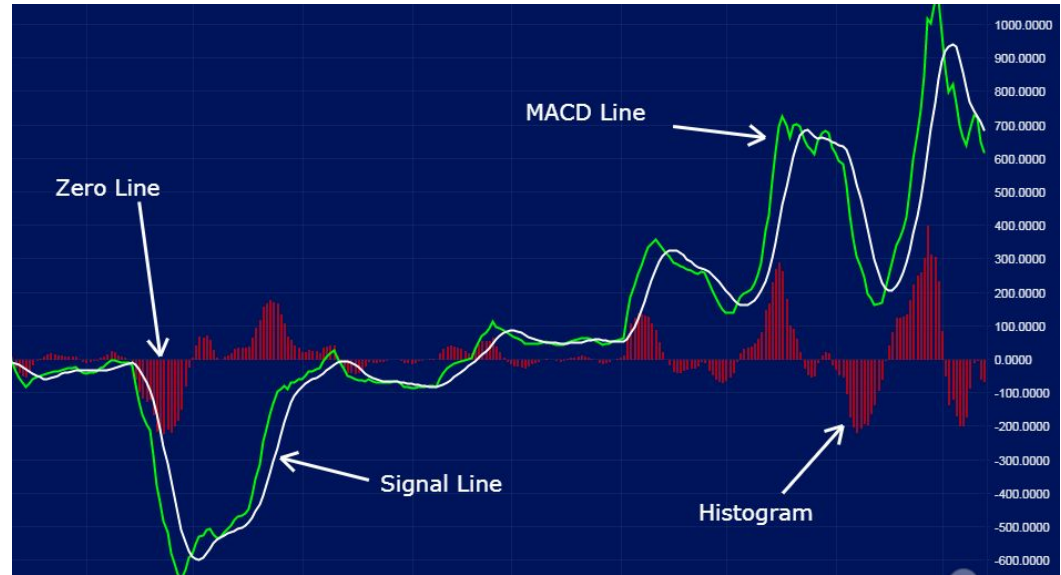
Relative Strength Index (RSI)

- Momentum indicator that measures the speed and change of price movements.
 - Comparing the average gains of the underlying asset with the average losses over a set period of time
- An RSI above 70 indicates that the underlying asset has been oversold and needs to be shorted
- An RSI below 30 indicates that the underlying asset is undervalued and needs to be bought



Moving Average Convergence Divergence (MACD)

- Trend-following indicator that signals whether shorter-term price momentum is in the same direction as longer-term price momentum, and if not, whether a trend change is close.
- We did not utilize the signal line but generally just used the zero line as our differentiation.
 - MACD Line below zero signifies bearish trend
 - MACD Line above zero signifies bullish trend



Week 4

Exponential Moving Average
w/ RSI + MACD

Recreate success of Week 3 with
higher Sharpe and better forecasting

- Sharpe fell off a cliff
- Assumption that just a "bad week"
- Conduct further research on the side

Week 5

Exponential Moving Average
w/ RSI + MACD

Belief that Week 4 was a one time
scenario so replicate the strategy while
researching other implementation
techniques

- Sharpe continued to decline
- Strategy does not seem to react
well in times of uncertainty

Week 6

Exponential Moving Average
w/ RSI + MACD + BB

EMA + RSI + MACD is not good enough
on its own so we need to add Bollinger
Bands to the strategy to account for
volatility

- Market Uncertainty
- Implement Volatility Indicator

Bollinger Bands (BB)

- Volatility of asset's price by plotting two standard deviations above and below a Moving Average
- When the price of the asset moves closer to the upper band, it *may* indicate that the asset is overbought
 - Short the underlying asset
- When the price of the asset moves closer to the lower band, it *may* indicate that the asset is oversold
 - Long the underlying asset



Week 7 'Submission'

	Submitted IR			Real IR		
Week 7	0.16	-14.69	5	10	7.11	One position Long VIX

- Poor Submission
- Any trend or momentum strategy would fail during this outlier week
- This was after SVB announced its crash and regional banks crashed into close on Friday, March 10th.
- Original Plan: 100% VXX (VIX Short-Term Futures ETN)
 - The week of March 13th had a lot of economic prints
 - Uncertainty around Regional Banks (Bailouts, bankruptcy, etc.)
- Good case for where systematic strategies might suffer losses but discretionary strategies can succeed

Week 8

Factors Implementation

Refining weeks 1-3 inputs into factors to produce Factor model.

- Industry Momentum
- Mean lower partial moment CAPM beta
- Revision ratio

Week 9

Factors Implementation

Refining weeks 1-3 inputs into factors to produce Factor model.

- Industry Momentum
- Mean lower partial moment CAPM beta
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Week 10

Market Neutral

Achieved market neutrality given signals from other strategies.

- SPY as a proxy for global market
- Conditioned on the given positions
- Last signals in the pipeline

Industry Momentum

Industry Momentum

INDMOM

Industry momentum

This descriptor measures stock relative strength as compared to the GICS sub-industry. Stock relative strength is calculated as:

$$RS_s(t) = \sum_{\tau \in I(t)} w_{\tau-t} [\ln(1 + r_s(\tau)) - \ln(1 + f(\tau))]$$

We have used 18 month of weekly returns, half life is 21 days, weekly risk-free rate is 0.1%

Sub-industry $I(t)$ relative strength is calculated using square

Where $c_i(t)$ is market capitalization weighting of the equity

root cap-weighting c:

$$RS_I(t) = \sum_{i \in I(t)} c_i(t) RS_i(t)$$

Finally the descriptor is calculated as:

$$INDMOM_s(t) = -(c_s(t) RS_s(t) - RS_I(t))$$

or simplifying, the descriptor is relative strength of GICS sub-industry net of the stock in question:

$$INDMOM_s(t) = RS_{I(t) \setminus \{s\}}(t)$$

Mean Lower partial moment CAPM beta

ELCAPM

Mean lower partial moment CAPM beta

The hybrid tail covariance risk a stock return r covariance with the market return m conditional on lower quintile of stock return sample:

$$ELCAPM(t) = \frac{\sum_{i \in I} (r(i) - m_q)(m(i) - m_q)}{\sum_{i \in I} (m(i) - m_q)^2}$$

and

m_q is a market return corresponding to the quintile $q = 0.1$

$$P[m(t - \tau + 1) < m_q] \leq q, \tau = 378$$

and $I = \{i \mid m(i) < m_q\}$

Revision ratio

Sentiment

RRIBS

Revision ratio

The monthly change of analyst revision ratios. It is defined as the number of up revisions minus the number of down revisions, divided by the total number of revisions:

$$RRIBS(t) = \sum_{L=0}^8 w_L \frac{UP(t - L*5) - DOWN(t - L*5)}{TOTAL(t - L*5)}$$

where, $L = \{0, 1, 2, 3, 4, 5, 6, 7, 8\}$

- Taking data directly from Yahoo Finance
- When L is 0 then the report was published this month, and $L=1$ return was published last month.
- In our strategy we adjust it by weeks, so $L = \{0, 1, \dots, 7, 8\}$. And we scale it by five days in week.

Week 11 - Backtesting

Performed backtesting to develop the most optimal way to combine multiple signal generations.

Previously all the signals were combined into one and investment decisions were made.

New approach:

1. If multiple strategies produce opposite direction signals -> go default value.
2. If multiple strategies produce same direction signals -> take the supremum.

What could have been done differently?

- More backtesting between submission of each strategy
- More regression and factor analysis
- Different sources for Sentiment Analysis
 - Stocktwits, Twitter, Reddit, etc.
- Applying time series analysis to returns to have better forecasting techniques
- Finding better and alternative data



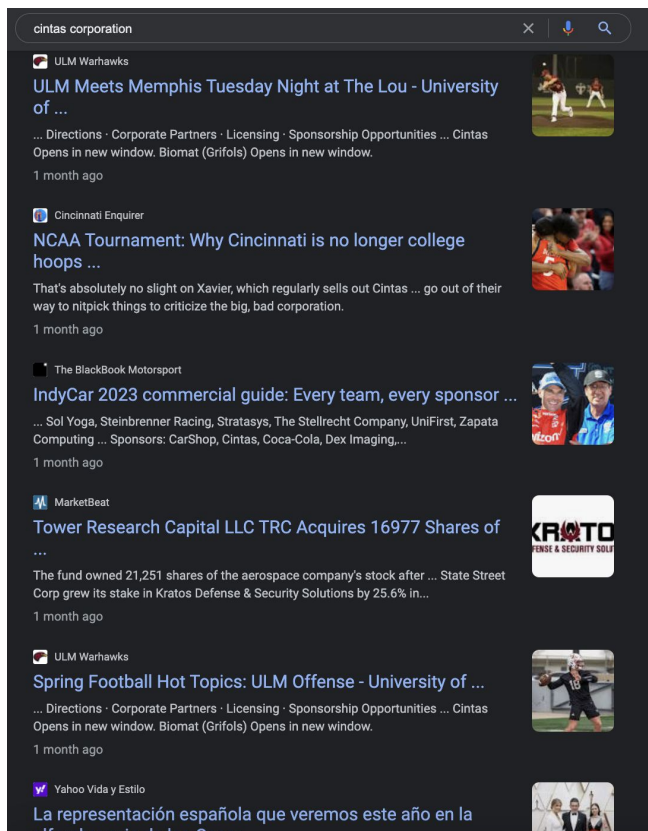
APPENDIX - NLP

Core Ideas - Sentiment Analysis & NLP

- The best way to capture an asset's movement week by week is through sentiment.
- The whole semester we have argued that an asset in our universe will be trend and momentum following due to the current market regimes (FOMC meetings, inflation, high volatility, etc.)
- After Bloomberg, Google News is the first stop for retail and institutional investors.
 - Scraping Historical Google News data would give us an edge in predicting what is the investors sentiment for the upcoming week.

Strategy Draft - Sentiment Analysis & NLP

- Outline
 - Per week, each underlying name would have 50 articles (10 per day)
 - Exponentially weight the sentiment more heavily towards end of the week
 - Friday news has a greater impact on one's investing decision than Monday's news does
 - Long or short the stock depending on the average sentiment of the name for the given week
 - Very hard to backtest
- Scraping Python Libraries
 - Selenium because just using beautifulsoup would not work
- Sentiment Analysis Python Libraries
 - Flair, textblob, nltk, nltk.sentiment.vader (SentimentIntensityAnalyzer), re



Too Much Noise - Google News

- We were collecting and aggregating the first 10 most relevant news that showed up on a given date for a given underlying name
- As you can see, there are irrelevant news articles such as the NCAA tournament article, which mentions the word *Cintas* but nothing relevant to our sentiment analysis
- This is apparent for multiple “not in the spotlight” names.