Regime Switching Momentum Strategy

Regime Switching Momentum Strategy

Time series Momentum

- A simple time series momentum strategy involves calculating returns over a fixed horizon and then taking a position in the underlying based on the sign of the past returns
- If the returns over a particular horizon is positive we take a long position in the underlying and if the returns are negative we take a short position in underlying
- According to paper "Time series momentum" by Tobais Mosktwitz a significant time series momentum effect was found to be consistent across for several asset classes over past 25 years
- Time series momentum exhibits strong and consistent performance across many diverse asset classes and performs well in extreme periods, all of which present a challenge to the random walk hypothesis and to standard rational pricing models
- In such a momentum strategy most common look back periods for computing returns are 12 month, 6 month, 3 month and 1 month

Market Regimes

- Financial securities undergo changes in their behavior due to some permanent or temporary change in economy's structure and hence we observe different market regimes at different intervals
- Markets generally evolve through two different regimes, a high risk state and low risk state and differ only in terms of volatility
- Hence in this strategy we identify the regimes of market existing over the entire horizon under consideration
- To split the Equity markets into high and low volatility regimes we use a two state Markov Switching model
- A 2 state markov switching model is represented as
  - $Yt = U1 + \epsilon t$ where $\epsilon t \sim (0, \sigma_1^2)$ for state 1 i.e. Low volatility regime
  - $Yt = U2 + \epsilon t$ where $\epsilon t \sim (0, \sigma_2^2)$ for state 2 i.e. High Volatility regime
- Markov Switching model will not identify the low and high volatility regimes but instead indicate regime switching probabilities. That is probability of switching from high volatility regime to low volatility regime and viceversa

Regime Switching Momentum Strategy

Motivation

- We aim to develop an optimized version of a simple momentum strategy by using different signal generation techniques for different market regimes
- As discussed earlier for a simple time series momentum strategy we can use different look back periods to compute the returns for signal generation
- Using a static look back period for the entire horizon is not optimal as certain look back horizons may not perform well in both high and low volatility regimes
- We therefore switch between different look back horizons for high and low volatility regimes.
- For Low volatility regimes we use lookback period with a longer horizon for signal generation as they seem to have better predictive power than lookback periods with shorter horizons,(as described n paper by Mosktwitz) however for high volatility regimes we switch to shorter horizons as they provide a better picture of the current market trend.
- Using a look back period with longer horizons during high volatility regimes can provide distorted signals as the Equity markets could have performed very well during the initial part of the lookback horizon compared to the more recent performance

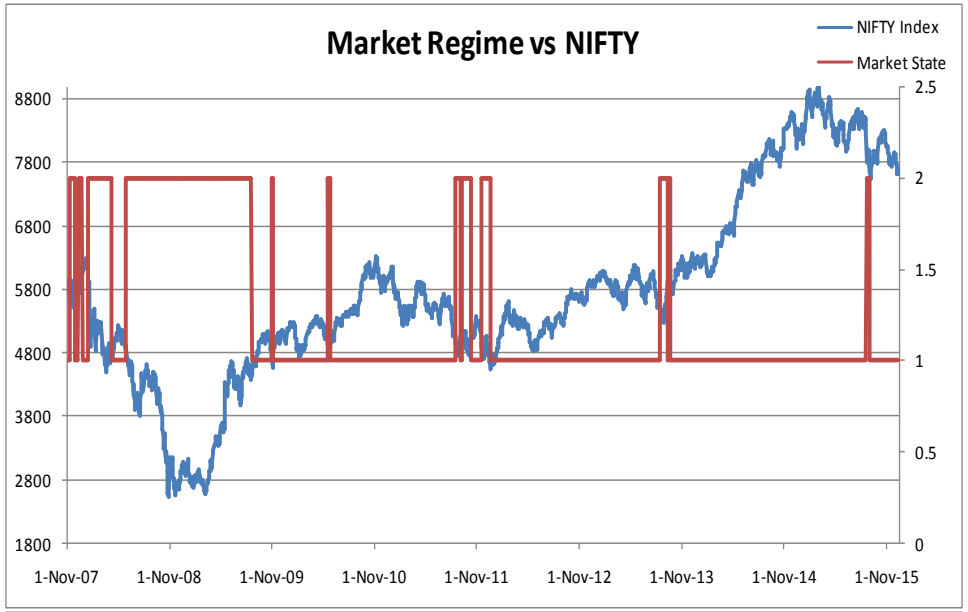
Strategy Description

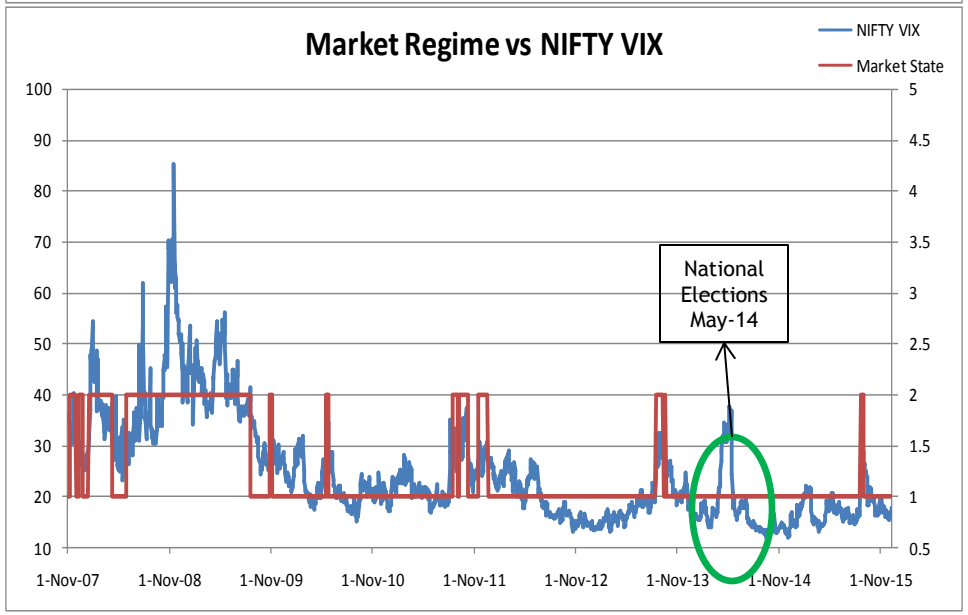
- The strategy is applied to 5 sectoral Indices within NSE(National Stock Exchange India) namely Pharmaceutical Index, Information Technology Index, Private Sector Bank Index, Automobile Index, and Fast Moving Consumer Goods (FMCG) Index
- The strategy is backtested over the horizon 3-Jan-2011 till 15-Dec-15, for momentum signals look back horizons of 6 month and 1 month are used for low and high volatility regimes respectively
- The strategy is rebalanced weekly based on the combination of regime signal and corresponding momentum signal for all indices
- We aggregate the strategy using two methods
  - Average weighted strategy – Individual strategies are weighted equally
  - Dynamically weighted strategy- Weights of individual strategies are ranked based on their trailing 20 day standard deviation
- To identify different regimes log returns of the individual indices are used in our Markov switching model, and the output of the model which is state/regime switching probabilities is quantified into different regimes based on a threshold
- Threshold of 80% is used in this strategy which means whenever the switching probability exceeds 80% on a particular day we switch the market regime. For example if switching probability from low volatility to high volatility on a particular day is 92% we used high volatility regime signal in our strategy.
- Note: On any particular day sum of probability of switching from low to high volatility and probability of switching from high to low volatility regime is 1

Regime Switching Momentum Strategy

Market Regimes of NIFTY Index

- The charts show how Markov switching models segregates market into low and high volatility regimes
- The charts plots the market states over the NIFTY and NIFTY VIX Index with Market States taking a value of1 for low volatility regime and 2 for high volatility regime
- The first chart shows how market generally switches to a high volatility regime during Bearish cycles and to low volatility regime during bullish cycles
- This phenomenon is because Volatility and the underlying asset prices are negatively correlated, due to fat left tail distribution generally observed in equity markets
- So whenever the underlying equity prices falls volatility increases and when underlying equity prices rise volatility decreases
- In second chart Market regimes are plotted over the NIFTY VIX index, to indicate how the switching model performs in segregating the VIX index into high and low volatility regimes
- From the chart it is evident that whenever the VIX index rises the market switches to a high volatility regime and vice versa
- However we observe an exception to this phenomenon as circled
- This exception was observed during the period of National elections in May-14, where market priced in a very high implied volatility which was inconsistent with the realized volatility at that time. The Implied vs Realized vol spreads were at an all time high during this period





Regime Switching Momentum Strategy

Aggregate Performance Analysis of Average Weighted Strategy

- The average weighted strategy allocates equal weights to all 5 sectors and gains/Losses generated by them are aggregated over time. The aggregate strategy is analyzed on the basis 4 parameters namely:
  - Annual Percentage returns(APR)
  - Sharpe Ratio (APR/Annualized Volatility)
  - Maximum Drawdown(Max DD)
  - Calmar's Ratio (APR/Maximum Drawdown)
- The table below shows the performance of average weighted strategy

APR	Annual Vol	APR/Vol	Max DD	Calmar
17.00%	9.86%	1.72	-8.83%	1.93

Aggregate Performance Analysis of Dynamically Weighted Strategy

- The dynamic Strategy is constructed by allocating varying weights rebalanced weekly based on more recent performance of the individual sectors.
- Individual sectors are ranked based on rolling 20 day standard deviation of the standalone strategy returns, with lower standard deviation allocated higher weights. The table below shows the weights allocations based on the rank

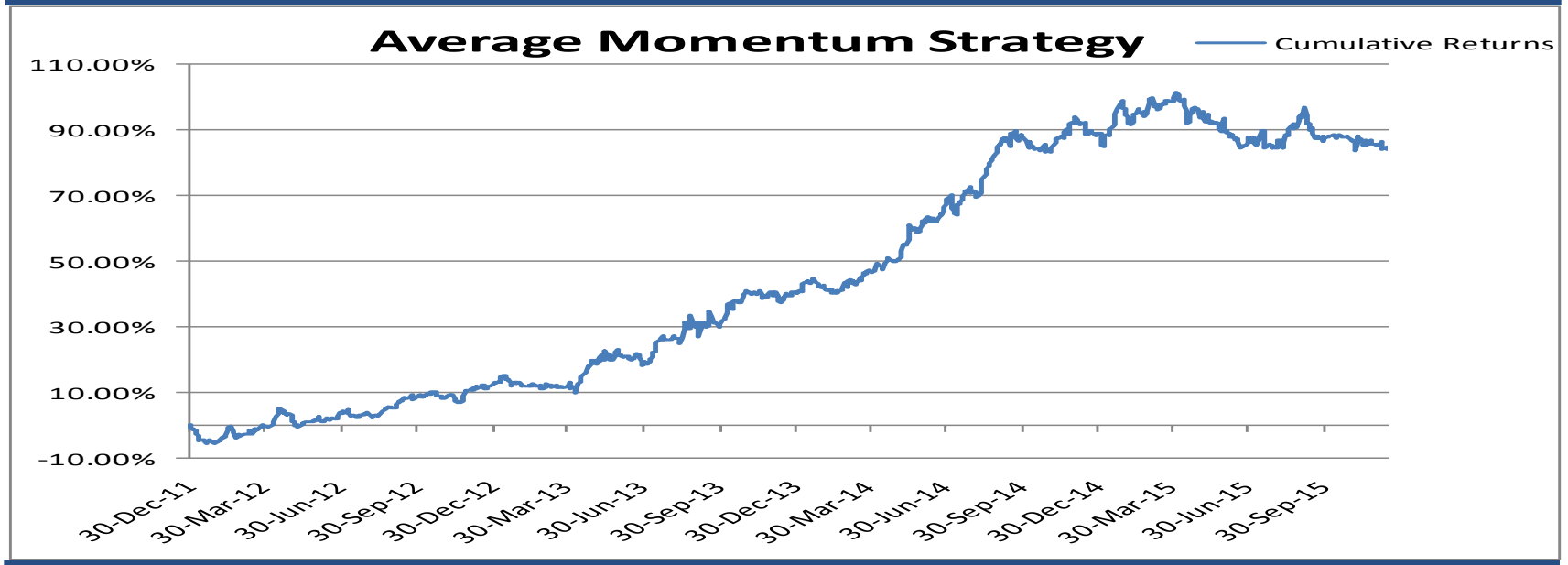
Rank	1	2	3	4	5
Weight	30%	25%	20%	15%	10%

- The table below indicates how dynamic strategy provides superior performance both in terms of annualized returns and sharpe ratio

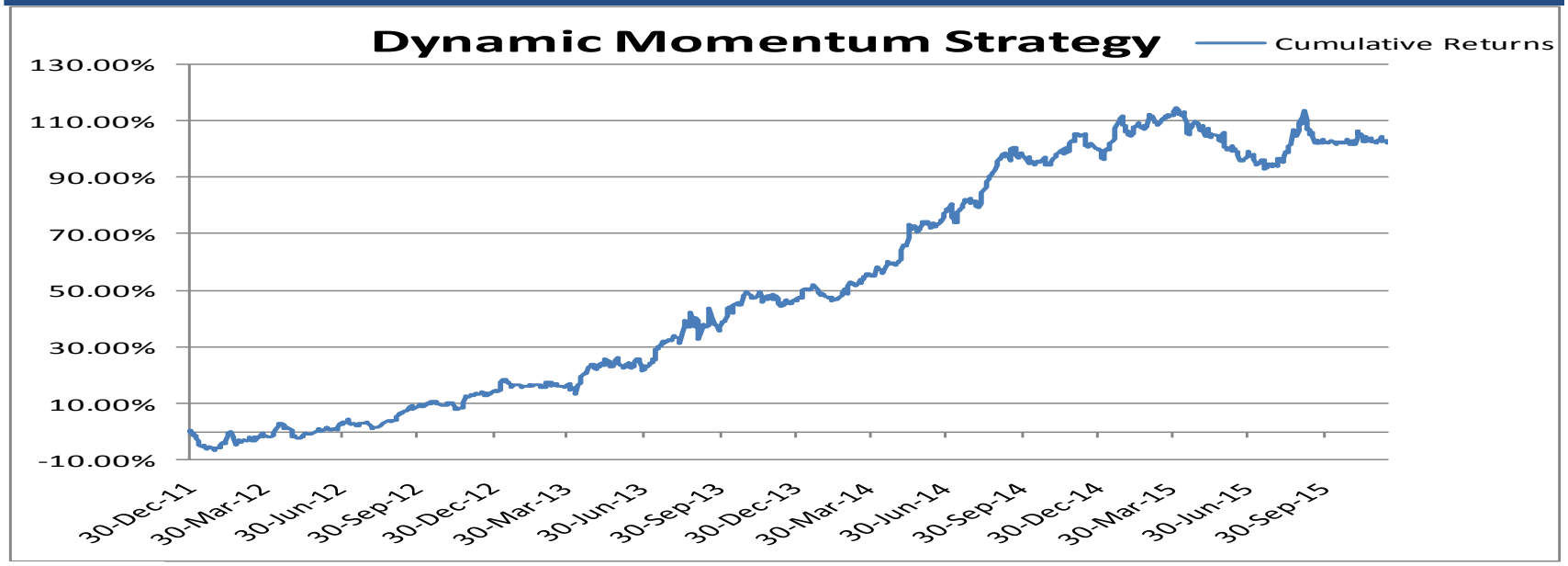
APR	Annual Vol	APR/Vol	Max DD	Calmar
19.78%	11.15%	1.77	-10.07%	1.96

Regime Switching Momentum Strategy

Return Profile of Average Weighted Index



Return Profile of Dynamically Weighted Index



Regime Switching Momentum Strategy

Performance Analysis of Individual Sectors

Index	BBG Ticker	APR	Annual Vol	APR/Vol
Pharmaceutical	NSEPHRM Index	32.76%	16.64%	1.97
Bank	NSEBANK Index	19.56%	24.34%	0.80
IT	NSEIT Index	6.68%	20.15%	0.33
Auto	NSEAUTO Index	13.57%	18.62%	0.73
FMCG	NSEFMCG Index	6.22%	17.26%	0.36

- Form the table above we see pharmaceutical sector and FMCG were the best and worst performers respectively
- Pharmaceutical, Bank and Auto sectors performed fairly well, however IT and FMCG sectors performed poorly
- Pharmaceutical sector along with the highest returns also provides a lower standard deviation of returns and hence a higher Sharpe ratio

Conclusion and Future Scope

Strategy	APR	Annual Vol	APR/Vol
Average Strategy	17.00%	9.86%	1.72
Dynamic Strategy	19.78%	11.15%	1.77
Long only Strategy	21.43%	13.51%	1.59

- The table above compares the performance of average weighted , Dynamically weighted and long only strategy
- Long only strategy is constructed by taking only long position is all underlying sectoral indices equally weighted
- From the above table we observe even though long only strategy provides better annualized returns over the backtesting horizon on risk adjusted basis both dynamically weighted and average weighted strategies perform better
- Even though such a regime switching momentum provides good performance , we can optimize this strategy by using a few risk management measures like implementing a stop loss at an aggregate or a standalone basis
- In this strategy we use a basic TS momentum indicator to generate long/short signals, by incorporating a more sophisticated momentum indicator we can significantly enhance the performance of the strategy
- This strategy rebalances weekly we can scale such a strategy on a more higher frequency data to check its performance