Trend Following

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Web Scraping Stoxx600

The names of the companies within the Stoxx600 on investing.com are first scrapped. Follow and request the hypertext reference of each row to obtain the ticker and exchange country or name. The data was however unreliable and only matched up 146 tickers on yahoo finance.

A better solution is later found. Using the official document on stoxx website, the code automatically looks up the name of the company on autocomplete yahoo finance, returning a ticker for each company. The list is further filtered as some companies are double listed outside Europe or other OTC markets. An API is used to download all the tickers. This method retrieves 412 stocks price history within stoxx600.

Results

Using the given method, the strategy

1. Returns are positively skewed, fat tail due to sudden drop in price, which is expected as market usually builds up parabolic and blow off out of investor’s panic. Trend following essentially “riding the wave” but fear always come quicker than the build up
2. The Spread between the long/ short cumulative returns widens during uptrend, but narrows during downtrend, which is most prominent between Mar-2020 and Apr-2020
3. The draw down in Mar-2020 shows trend following is like picking up pennies on a train track. We want to minimize the wipe out by exiting the trade earlier, most likely rely on our fast moving averages, but on the other hand we need to keep trading cost low.

Improvements I have tried

1. Continuous spread instead of binary signal
2. adjust by price volatility so big moves of slow movers’ weight more than big moves of big movers
3. Separating out the individual porrtfolios
4. Weighting the signals with their minimum variance combination, so an indication of upward trend should be stable and smooth over without missing opportunity due to slow moving averages.
   1. However not sure how to scale the signal the right way as the distribution of the moving averages spread is not normal, three rules are demonstrated here >0, 1 or 2. Easy to overfit, can test out-of-sample
5. Minimum Variance Portfolio as opposed to equal weighting scheme so far, calculate each day variance matrix of each individual trend-following stock’s return using an expanding look-back window, and rebalance daily to target optimal weight.

Observations of the Improvements:

1. PnLs are largely distorted by Mar 2020 market crash and recoup, especially for 50\_150 binary strategy. The fund would have closed down if this strategy were used.
2. However, we see an improvement in lowering maximum drawdown, systematic risk to stoxx 600 (beta) and most importantly volatility by giving up some alpha in using Combined Continuous Signal, weighted by minimum variance returns
3. Minimum variance portfolio is the perfect example of infrequent trading artificially inflating IR and staying IDLE most of the time

Backtest Results (2015 to 2020):

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| --- | --- | --- | --- | --- | --- | --- | --- |
| Metrics\Portfolio | Given (Binary) | 20\_50 (Binary) | 50\_150 (Binary) | Combined Continuous(0) | Combined Continuous(1) | Combined Continuous (2) | Minimum Variance |
| Profitability(End Equity, began as 1) | 1.3540 | 4.1909 | 5.627 | 1.0720 | 1.4180 | 2.7990 | 1.0719 |
| Alpha (daily) | 0.0003 | 0.0013 | -0.0008 | 0.00015 | 0.00035 | 0.0010 | 0.0001 |
| Beta (daily) | -0.4278 | 0.4000 | 3.1556 | -0.7230 | -0.5750 | -0.2610 | 0.0031 |
| Volatility (daily) | 0.0073 | 0.0233 | 0.1986 | 0.0080 | 0.0080 | 0.0100 | 0.0008 |
| Max Drawdown | -0.1910 | -0.5036 | -13.3919 | -0.2230 | -0.1700 | -0.2070 | -0.0131 |
| Avg. Information Ratio (Annualised) | 2.4763 | 3.1850 | 2.4338 | -0.3850 | 2.0230 | 2.4480 | n/a\*\* |

\*\* Too large due to infrequent trading

Transaction cost

Everything so far have ignored transaction cost as I simply used cumulative returns. For this strategy to work to its entirety as in the backtest here, one would require daily rebalancing (most likely not possible), large capital size or the ability to buy fractional shares (or most likely forego trade opportunity). Other cost such as slippage, illiquid stocks with no market maker are also largely ignored. All the above would drive out the profitability of the strategy. Last I checked on the brokerage IG trades are charged 0.1% for EU stocks and 3GBP per trade. If we approximate 0.1% weekly return deduction from our return due to rebalancing weekly, profitability has been dampened around 26% overall (percentage in brackets).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Metrics\Portfolio | Given (Binary) | 20\_50 (Binary) | 50\_150 (Binary) | Combined Signal(0,1,2) | Minimum Variance |
| Profitability(End Equity) | 1.038 (30%) | 3.290 (27%) | 4.419x (27%) | 0.729, 0.510, 0.254  (25%, 24%, 24%) | 1.072 (20%) |

which still haven’t accounted for slippage.

Potential Improvements

1. Have not tried shorting when fast MA cross under slow MA, possibly riskier and may not find a market. But potential of improving alpha
2. Momentum should be another indicator to confirm trending and quicker exit before market blow out
3. Weighting stocks based on other factors, such cap size as small-cap stocks maybe more susceptible to trending, but also riskier and more illiquid
4. Bet size should be determined by hedge ratio and Kelly’s criteria between long stock and short etf, so we bet large when we are confident and small when we are not
5. Minimum variance portfolio would need adjusting in calculating the covariance matrix
6. Maximum Sharpe portfolio should also be tested to find best weighting

Conclusion

Best strategy backtested seems to be using continuous signal, adjusted by price volatility with a high threshold of trading signal. Further improvements can be added such as shorting MA crossovers, using momentum indicator, different weighting scheme.